

Examining social outcomes from urban transport infrastructure: Long-term consequences and varied interests at multiple scales

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Abstract

Urban infrastructure has been promoted as catalyst of urban and regional development. However, infrastructure projects may not always improve society as a whole, as their long-term consequences often fail to meet the interests of all stakeholders. We explore the social outcomes arising from urban transport infrastructure by examining at multi-scales the long-term consequences of spatial changes triggered by urban infrastructure development. We also explore the varied interests in these projects, and the extent to which these interests were met. We use a multi-methods case study approach, using two exemplars, London and Seoul, to observe social outcomes in specific context of each case. We demonstrate that urban transport development tends to focus on achieving immediate outcomes at the macro scale, neglecting interests in the second-order, long-term societal consequences at multiple scales. Our two exemplars illustrated that the spatial changes, triggered by the projects over time, influenced the ultimate benefits for society. The spatial changes did not enhance the wellbeing of all citizens due to the spatially differentiated nature of the outcomes, and because of the negative consequences created at the local scale. We argue that urban infrastructure projects alone cannot bring social outcomes that meet all the varied interests in projects across cities and by scale. An integrated approach to urban transport and spatial development that addresses varied socio-economic conditions and interests of all communities across cities is suggested to enhance the social outcomes. Such approach will contribute to facilitating a fair distribution of benefits and positive social outcomes of life.

Keywords: Urban transport infrastructure, long-term consequence, multiple scale interests, social outcomes, transport planning

1. Introduction

Investment in urban infrastructure is often seen as a critical catalyst in the process of nation-building and in urban and regional development, providing step changes in connectivity for the development of society and the economy (ADB, 2006; OMEGA Centre, 2015). Urban infrastructure development is emphasized as a means of promoting economic growth, both in the West and increasingly in Asia (ADBI, 2017). Arguably, an over-emphasis has been placed on the positive outcomes of infrastructure development at a macro-economic perspective, while the social consequences over time and space have been under-assessed in planning and decision-making (Stolp et al., 2002; Beyazit, 2010; Bueno et al., 2015). The process of infrastructure development tends to focus on monetizing a very limited range of outcomes from projects, being primarily concerned about those outcomes at a macro levels that arise from urban infrastructure (Miller and Patassini, 2005). By utilizing top-down, cost-benefit approaches to ex-ante evaluation, urban infrastructure development tends to neglect the long-term consequences on society (Naess, 2006).

Rodrigue (2017) noted that there is only limited investigation of the socio-spatial implications of urban transport infrastructure development, often via simplistic forms of distributional analysis. They argued that infrastructure

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development has a strong influence on urban spatial structure and form, and that the long-term consequences of spatial changes at multiple scales also need to be considered in order to understand the outcomes of transport development. Several authors (e.g. Levinson, 2002) have emphasized that these consequences affect various socio-economic indicators, and that urban infrastructure development does not always improve wellbeing, as it often fails to meet many of the varied interests over time and space (Brenner, 2000; Graham and Marvin, 2001). In fact, the relation between transport development and urban forms has been much discussed (Bertolini, 2012; Wegener and Furst, 1999); however, limited research has been conducted on how spatial changes at macro and micro scale influence the outcomes of urban infrastructure development over time and space (e.g. improved accessibility – see Martens, 2012). Moreover, the outcomes are rarely examined in terms of the specific context of each setting, even though the spatial changes and long-term consequences are much influenced by the context (Switzer et al., 2013). In practice, the long-term outcomes of urban infrastructure development are rarely appraised or evaluated, especially in terms of how the respective interests are affected by the multi-scale spatial changes generated by the projects.

The aim of this paper is to analyse how the social outcomes from urban transport infrastructure typically play out, given the spatial changes over time and the varied interests in the outcomes of infrastructure projects. We do this by examining the long-term consequences at multiple scales of the spatial changes caused by urban transport infrastructure. We consider the respective interests in the projects from varying perspectives, particularly transport and urban development. We also consider the extent to which these interests were met. We specifically looked at two exemplars of urban metro projects, one in London (UK) and one in Seoul (Korea). Using a case study approach (Flyvbjerg, 2011), we investigated the social outcomes of the projects with consideration of the specific context of each case.

By ‘social outcomes’, we mean a qualitative overview of the societal consequences that actually occur at multiple scales over time as a result of the implementation of urban infrastructure projects, and the spatial transformation facilitated by such projects. These outcomes include, for example, enhanced mobility and accessibility, improved wellbeing, and increased livelihood opportunities for urban populations. Ultimately, we seek to contribute to planning practice and the field of transport geography by addressing how the ultimate benefits of transport development are shaped by multi-scale spatial changes over time, and by the context. Furthermore, we discuss how integrated approaches to transport and urban spatial development at macro and micro scale contribute to social outcomes at all levels.

2. Urban infrastructure development and spatial changes at multiple scales

Urban infrastructure is seen as an agent of change in the current era of the market-driven economy and globalization (Dimitriou et al., 2015). Infrastructure development is considered to play a key role in increasing the competitiveness of cities and the socio-economic wellbeing of urban populations (ADB, 2006). City rankings, such as the Global City Power Index, often include infrastructure as a key element in their assessments of the competitiveness of cities. The experience of urban infrastructure investment suggests there is an intertwined relationship between infrastructure development and urban growth (UN-HABITAT, 2009), and possibly decline (Bhatta, 2010). Infrastructure plays a critical role in the construction and development of urban territory, especially in the formation of networks and linkages (of all kinds), which create connections and interdependencies within and between places and their users, and designate the form and function of the space in physical and socio-economic terms (Castells, 2010; Pflieger and Rozenblat, 2010; Zanon, 2011).

Urban infrastructure facilitates changes in spatial structure, land use and the physical environment as it interacts with urban (re)development processes across spatial scales, i.e. national, metropolitan region, city, and local neighbourhood (Geurs and van Wee, 2004; Rodrigue, 2017; UN-HABITAT, 2009). At the macro scale, transport infrastructure can enhance net connectivity to major nodes, contributing to the expansion of cities (Hall and Pain, 2006). It can facilitate spatial (re)organisation, e.g. the concentration of social and economic activities in the core of cities (Rodrigue, 2017). However, Bhatta (2010) stressed that, with uncontrolled growth, urban transport development often results in urban sprawl, leading to the expansion of the population beyond the city’s boundaries in suboptimal and unsustainable ways. At a local scale, an increase in urban transport capacity could facilitate high density, mixed-use development at the nodes (Bertolini, 2012; Mumford, 1989). Transport development could enhance attractiveness

of a location for certain land uses (Bertolini et al., 2012; Gospodini, 2005). Urban infrastructure development not only connects areas, but also causes spatial severance, fragmentation, and the physical displacement of communities (Stolp et al., 2002; Vanclay, 2002).

Various authors have argued that the spatial changes facilitated by urban infrastructure influence the socio-economic wellbeing of society at macro and micro levels (Cervero, 2009; Hall, 2002; Jones and Lucas, 2012). At a macro level, urban transport infrastructure contributes to economic production and an increased supply of labour (ADB, 2006). At a micro scale, infrastructure development brings changes to the way people live, work, and play, which affects the overall quality of everyday life of local communities (Vanclay, 2002). It has consequences across all social dimensions, including education, health and wellbeing, and community cohesion (Colantonio, 2009). Improvement in accessibility should be the key social outcome indicator of transport development because it enhances people's life opportunities (Martens, 2012; Pereira et al., 2017). However, in practice, infrastructure projects often cause a spatially-differentiated distribution of benefits, affecting the social equity of cities (van Wee and Geurs, 2011; Martens and Ciommo, 2017). Changes to employment opportunities, housing and transport services can affect the distribution of locational advantage (Revington, 2015). Therefore, infrastructure development contributes to the social exclusion of low-income and older inhabitants through gentrification (Fainstein, 2014; Jones and Lucas, 2012; Vanclay, 2002), thus having effects on demographic and social structure (Fan et al., 2013; Lucas, 2012).

3. Varied interests and long-term consequences at multiple scales

The long-term consequences of urban infrastructure development are closely related to urban interventions such as regeneration schemes (Brenner, 2000; Hall, 1980). These consequences are complex, and are influenced by the interactions between various actors (Marsden and May, 2006) who have varied interests in urban spatial transformation (Healey, 2009). The diversity and complexity of the interests in urban infrastructure vary across urban areas and by scale (Heeres et al., 2012). Giddens (1985) emphasized that (urban) transformation reflects different interests from macro and micro perspectives. At the macro perspective, infrastructure development is viewed as a means to achieve the macro-economic goals of cities and regions, and is considered to be a catalyst for spatial development (Dimitriou et al., 2015). For example, infrastructure that would improve connectivity between cities is developed to strengthen the competitiveness of metropolitan regions as a driver of economic growth of the nation (Graham and Marvin, 2001). The micro perspective focuses on how infrastructure projects interface with the spaces in which everyday life occurs (Madanipour, 1996). For example, enhancing access to local infrastructure and services is important to improve the wellbeing of local communities (ADB, 2017). Madanipour (1996) argues that interests from both macro and micro perspective need to be addressed by the spatial transformation triggered by urban development projects. Understanding the long-term consequences of infrastructure requires investigating the processes of spatial change in conjunction with these interests at multiple scales (Giddens, 1985).

Decision making involves complex processes of interactions between various actors, who will have varying goals and ways of achieving these goals (Hall, 1980). Several authors (e.g. Legacy et al, 2012; Veeneman, 2018) argue that decision-making about urban infrastructure takes place within a system of negotiation among nested institutions and actors at several territorial tiers (i.e. national, urban region, and local neighbourhood). These actors and institutions often address their interests through planning process and policies, which may influence the outcomes of infrastructure development (Heeres et al., 2012; Switzer et al., 2013). In practice, the decision-making is largely framed by politics, reflecting macro scale economic goals, and often influences the long-term consequences likely to arise from urban development projects (Dimitriou et al., 2015; Priemus et al., 2008). With political and economic interests typically being dominant in the decision-making process, the high-level goals of the state or metropolitan governments (i.e. increasing access to economic centre of cities) are often prioritized over lower level goals (Baker and Hinks, 2009; Fainstein, 2008). Therefore, the outcomes of infrastructure development at the micro level may be less evident than those at the macro level because of the piecemeal approach to the production of the goals at the local scale (CSIL, 2013).

Despite claims that it needs to address broader goals of urban development, in practice, urban transport development tends to focus only on improving mobility in the short-term rather than increasing accessibility to opportunities over time (Legacy et al., 2012; Martens, 2012). Straatemeier and Bertolini (2008) argued that the outcomes of transport projects are influenced by the characteristics of both the transport and land-use systems, therefore an integrated

approach to planning is needed. However, transport planning and spatial planning still occur in separate silos, addressing different priorities. In fact, the impacts of spatial changes created by urban transport projects on the actual outcomes of projects are rarely examined (Martens, 2012; Martens and Ciommo 2017). Rydin (2010) argued that impacts of spatial changes, especially at a local scale, are not addressed with respect to the varying socio-economic interests of local neighbourhoods. A lack of concern about connectivity between opportunities and different social groups across urban areas could lead to negative consequences, such as spatial mismatches between low income groups and job opportunities (Martens, 2012; Ong and Miller, 2005).

4. Varied interests and long-term consequences at multiple scales

Various authors, including Levinson (2002), have found that urban transport infrastructure development creates winners and losers, especially from the standpoints of mobility, accessibility, environmental and economic concerns. Healey (2009) and Hoekveld and Needham (2013) emphasized that the outcomes of urban spatial development should reflect the diverse needs of the urban population who live and work in the city, and have concerns about the quality of the urban environment at multiple scales. Jones and Lucas (2012) argued that, by overlooking the long-term (social) consequences of transport decision-making at every level of the project process, infrastructure development undermines the quality of life and wellbeing of urban populations. As such, the ultimate benefits of urban infrastructure development to society need to be evaluated by examining the extent to which the outcomes of infrastructure development at multiple scales meet those varied interests over the long-term. As seen in Figure 1, we present a conceptual framework to illustrate the social outcomes of urban infrastructure development. It is based on the literature reviewed above. In this framework, spatial changes and the associated long-term consequences of infrastructure development at multiple scales are related to the multiple interests of varying social groups in urban transformation at macro and micro levels. It illustrates that high-level social outcomes are delivered when the spatial changes at macro and micro scale together increase the quality of life of people across an urban area. We apply this model to specific cases of urban development in London and Seoul.

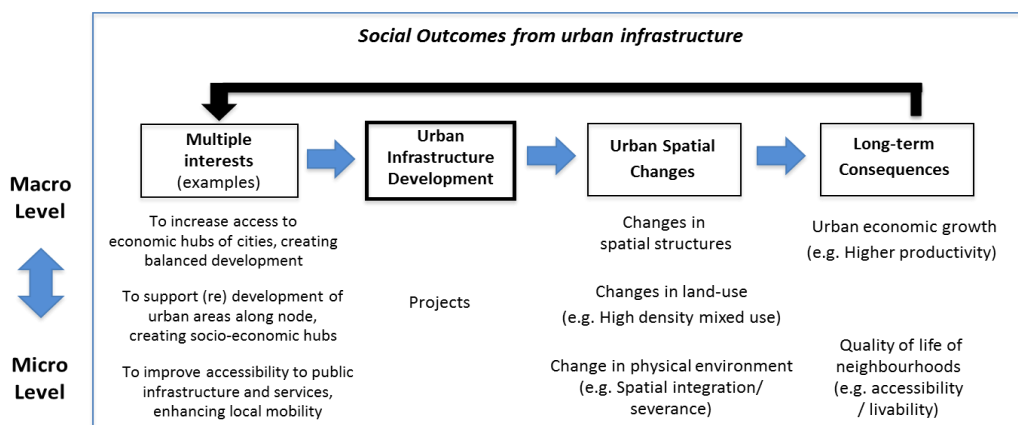


Fig. 1. An indicative conceptualization of social outcomes of urban infrastructure development

5. Methodology

We use two exemplars of urban transport infrastructure in megacities – the Jubilee Line Extension (JLE) in London, and the Second Phase Subway Development in Seoul – to examine the social outcomes from infrastructure development projects. Rather than undertake a comparative analysis, we use a multi-case study (Flyvbjerg, 2011), i.e. exemplars, to investigate how social outcomes from urban transport development play out over time within the context of each case. In both cases, the urban transport project was developed to support the (re)development of a metropolitan area of around ten million people in response to a growing economy. Each project started around 2000, creating spatial

changes at metropolitan and neighbourhood levels, influencing the socio-economic wellbeing of the urban population. As indicated in Figure 1, the long-term consequences (i.e. about 15 years) of the two projects were evaluated in relation to the varied interests in urban spatial transformation at multiple scales (i.e. urban regional and local neighbourhood scales).

Given that complexity of evaluating outcomes of urban projects, we used multiple methods in a pragmatic and contextualised approach (Hoch, 2002; Laurian et al., 2010) to investigate each exemplar. Our research included an analysis of primary source documents (e.g. key project documents, development plans, and evaluation reports); secondary sources (e.g. news reports, journal articles, and books), official data (e.g. census data); in-depth interviews with experts and key stakeholders; semi-structured interviews with residents; and onsite observation. The research process was recursive in that it examined the outcomes by considering the local context as well as the objectives of the project and policy goals. A key purpose of the study was to identify the extent to which each urban project met the varied interests, rather than to investigate the causal effects between transport development and its long-term consequences.

Desk-based assessment was conducted by collecting and assessing documents, official statistical data and surveys. In order to identify the interests and context of each case, we examined all relevant documents, including official project documents, White Papers, territorial policy and plans, transport plans at different scales, strategic urban plans, and local development plans and policies. To understand the outcomes of each case, we examined impact assessment reports, development impact studies, results of local surveys, historic maps, and empirical studies on spatial changes and long-term consequences of the projects. Press releases and other information were also considered. Official data and surveys were also examined, including station catchment data, journey-to-work time, and public transport accessibility data. Data on income data and the deprivation index across cities provided information about differential outcomes between and within neighbourhoods. Various time periods and scales of data were used to identify the changes taking place in London and Seoul over time and space. In addition to the desktop study, onsite observation was undertaken, especially to validate information relating to ease of access, and quality of public space. Observations were recorded in a field diary on most days for over one month in each city.

Some 22 in-depth interviews were conducted with a range of key stakeholders (i.e. 16 in Seoul and 6 in London) in 2018. They included people working for government or policy institutes (i.e. urban development and transport development institute) at national, metropolitan, and local neighbourhood level, on matters concerning transport, territorial (spatial) planning or project development. Interviewees were selected according to their level and role in the planning process. They were key decision-makers or technical planners in spatial and/or transport planning involved in the actual projects studied. The interviews were structured along the lines of the conceptual framework (Figure 1), identifying policy goals and key interests in the project, and views on the spatial changes and long-term consequences at macro and micro scales. They were asked which interests were prioritized during the planning and implementation of the project. Interviewees were also asked to give their opinions on the extent to which the project met the varied interests and to identify contextual and other factors, which affected the project process and outcomes. The interviews ranged in length from 60 to 90 minutes. They were audio-recorded and transcribed. Interviews were done in a manner consistent with ethical social research (Vanclay et al., 2013). The transcripts were reviewed to identify key topics related to the conceptual framework (Figure 1).

In London, semi-structured interviews were conducted in July 2016 with 29 local residents. This was used to investigate the spatially-differentiated outcomes and interests among the different social groups. Interviews were done in Canning Town, which was one of the most deprived neighbourhoods along the JLE (ONS, 2015a), although regeneration schemes had been implemented there since the JLE opened. The questionnaire asked about the long-term changes and consequences that were perceived by local people living at different locations in the study area. The people were selected for interview by asking individuals in public places, including the station, public spaces within the vicinity of the station, and in regenerated and non-regenerated residential areas. It was intended that there be a balance between males and females, and diversity in age and ethnicity. Of the people approached, more than half agreed to be interviewed. Questions were structured around three topics: life pattern of these residents, the positive and negative changes experienced, and the impacts of these changes on their quality of life.

The long-term consequences of the projects were evaluated by analysing all data collected, and specifically by examining the extent to which the diverse interests in project outcomes were met. The analysis was based around the specific questions: did the spatial transformation triggered by the project bring positive consequences at the local level

as well as the macro level?; were the varied interests of the population (at neighbourhood and metropolitan scale) addressed in the long-term?; and were the interests of different parts of the cities (i.e. centre and periphery, most deprived and least deprived) addressed in a fair manner?

6. Urban regeneration and Jubilee Line Extension, London

6.1. Background

Over time, London has transformed into one of the world's largest cities. This transformation was largely possible because of its network of metropolitan railways (Hall, 2002). The London metropolitan area now produces over 22% of GDP of the UK, and comprises 13% of the UK population (ONS, 2017). From World War II until the 1980s, economic decline associated with de-industrialization caused net out-migration (Hamnett, 2004). This resulted in various social issues affecting some parts of London, including poverty, social deprivation and arrested development. In the 1980s, the central and local governments put much effort into regenerating affected areas. Under-developed areas were identified as brownfield sites with potential to be locations for new housing, commercial space, and other developments. The Docklands Light Rail (DLR) in London's east side opened in 1987 to provide the transport infrastructure necessary to realize the full potential of the London Docklands. With economic growth and population increase in the greater London area in the 1990s, the need for an extended and enhanced urban mass transport system was discussed with the intention of reducing road congestion and supporting the development of new commercial centers.

The Jubilee Line Extension (JLE) was opened in 1999 to create a better link between the city center and Canary Wharf (see Figure 2). Canary Wharf developed from the early 1990s as a major financial and commercial center. An intention of the JLE was to increase accessibility to opportunities across London, as well as to relieve congestion on river crossings and other rail lines. The JLE also facilitated development of the Millennium Dome site (now the O2 center), which utilizes the North Greenwich station.

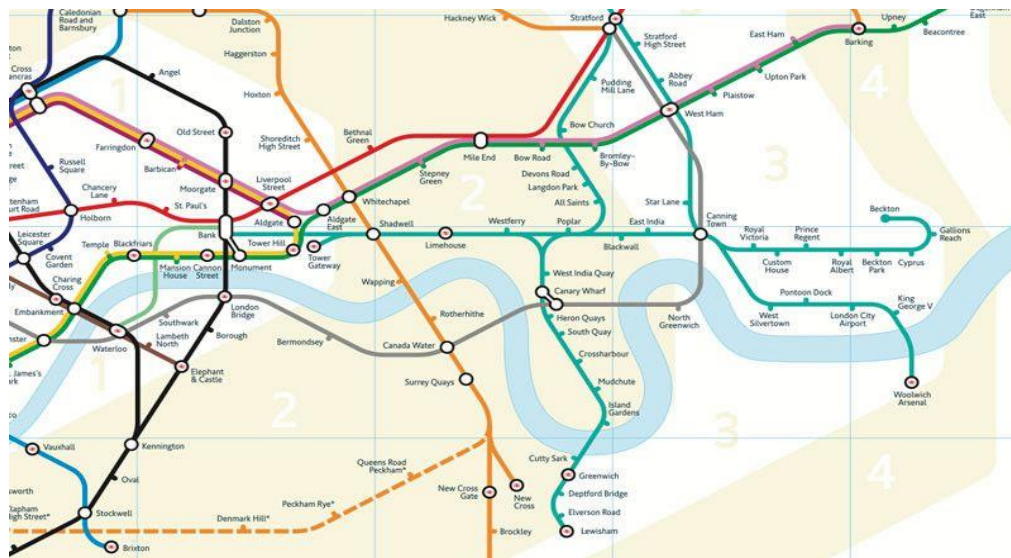


Fig. 2. The Jubilee Line Extension in East London (JLE in grey running from Westminster to Stratford)

6.2. Key interests related to the Jubilee Line Extension at multiple scales

Varying interests in the JLE were identified at national, city, and neighborhood scales from two perspectives, i.e. transport and urban development. The main focus of decision-makers was to contribute to sustaining London's predominant financial position by building a new commercial center (i.e. Canary Wharf). The interview with a principal transport planner confirmed that the top priority was to increase accessibility to the newly-developed financial center by providing a direct link between it and the city center as well as the mainline terminals (e.g. Waterloo and London Bridge). At the city scale, a key interest was to reduce development pressure in the city center by encouraging development of housing and office projects in East and South London, and by providing increased public facilities there (Omega Centre, 2015).

At a local level, the major interest was to increase accessibility to various destinations as well as to create jobs. The local authorities had different levels of interest regarding the secondary development effects (i.e. housing, office, commercial development) around the new stations in their neighborhood due to their differing priorities. Some showed aspiration for high-density mixed-use development, which would flow from the construction of the new stations, while others (such as some boroughs in South London) were not interested in such development (Pharoah, 2003). Furthermore, different interests in urban regeneration associated with JLE were identified among local communities in the same neighborhood: some people anticipated better living environments and business opportunities resulting from the JLE, while others were concerned that the development opportunities would be inconsistent with the needs of local people in their neighborhood. Table 1 presents a summary of the interests.

Table 1. Interests related to the outcomes of the Jubilee Line Extension at multiple scales

London	Interests related to transport development	Interests related to urban development
National and Regional scales	Increase access to a newly developed economic hub from central hubs and wider areas	Support continuation of investment and economic growth by establishing a financial center
City scale	Give better access to underground services for a wider area, and relieve traffic and congestion	Support development and enhance new regeneration along the routes
District (local)	Increase accessibility to major destinations and local areas (the aspiration since 1980s)	Jobs creation and better business opportunities; Provide modern facilities and housing; Public facilities development

6.3. Spatial Changes at a macro and micro scale

The JLE assisted in transforming the Docklands into a major commercial center in competition to the traditional commercial center of London thereby changing the spatial structure of London arguably from a monocentric to polycentric form (Hall and Pain, 2006). This brought about more development and transport projects, including the Cross Rail (i.e. a high capacity railway for London and the South East), which is expected to attract even more commercial activity. Major projects associated with the JLE included the Millennium Dome (O2 center), regeneration of Stratford and Olympic Park. JLE is also associated with enhancement of London's South Bank, a major center of entertainment. As a result of all this development, the conception of London's inner boundary has shifted to the east.

At the local scale, the JLE led to land-use changes around the stations along the route (MHCLG, 2005; 2011), especially catchments falling outside central London (i.e. most of Bermondsey and stations from there to Stratford) (Mitchell, 2003). The Canary Wharf development and related projects led to multi-nodal spatial concentration of economic activity and social interactions. A development impact study (Pharoah, 2003) and our interviews indicated that development has been strong in most areas served by the JLE since its completion. The major interchange stations, such as Waterloo and London Bridge, became renewed transport hubs, providing an interchange with National Rail services (Willis, 1997). They experienced mixed-use development of higher density, including of public space and

commercial development (JLEISU, 2004). Around some residential towns, such as Canning Town and West Ham, regeneration projects (i.e. with a high portion of residential development) occurred, although on a smaller scale. The interviews with local planners indicated that this involved re-designing formerly derelict areas, resulting in higher density mixed development. New local roads and pedestrian routes between stations and their catchments were gradually developed.

6.4. Long-term consequences on socio-economic wellbeing

The JLE increased overall accessibility to jobs and major cultural and commercial facilities around the principle nodes from wider areas, which continuously contributed to economic growth at the metropolitan and national scale (GLA, 2007). Development projects tended to follow existing transport routes, which then created increased demand for transport, requiring expansion of the system, which in turn then attracted further development. Moreover, creation of interchanges and improvement of public facilities resulted in vibrant socio-economic environment, benefiting for the whole London population.

At a local level, the JLE and the regeneration of the areas in close proximity to stations contributed to bringing positive changes to neighborhoods. The local population benefited from enhanced accessibility to jobs and services as well as increasing commercial services and socio-economic activities near intermodal interchange stations (Omega Centre, 2011). Positive changes in safety and the local built environment could be attributed to the creation of modern public spaces and facilities around the station (Lee, 2018). However, negative impacts were also noted in association with the regeneration projects. The mixed-use development projects often negatively influenced public activities by blocking public access while regenerated public spaces appear to be of poorer quality than before. Impacts on social cohesion were also identified with spatial differentiation in terms of level of income and employment rate, as well as built environment. The long-term displacement of some local communities arose from new housing development in the vicinity of stations.

A varying level of benefits from JLE occurred between neighborhoods and within neighborhoods. Among different boroughs along the JLE, varying levels of accessibility improvement and regeneration effects were identified. The proportion of local areas in East London that have high level public transport accessibility are much lower than central London (TfL, 2017). Some boroughs such North Greenwich have seen limited scales and scope of regeneration projects than others, e.g. Canary Wharf. Within the neighborhoods, people living in vicinity of stations benefit from improved accessibility and enhanced living environment to greater extent in comparison to the majority of the local population.

6.5. Analysis of issues related to the social returns from the Jubilee Line Extension

Our analysis of key documents, statistical data, and interviews illustrate that the JLE delivered outcomes that met the macro scale economic interests. The JLE contributed to increasing the competitiveness of the metropolitan area as a driver of economic growth of the nation by increasing accessibility to the new financial centre and other key destinations. It met the goal of bringing regeneration effects along the route by unlocking the development potential of South and East London and by increasing the socio-economic vibrancy of space along the transport corridor. This occurred gradually as new spatial development brought more demands for transport, which in turn led to further development. As such, the JLE met the objectives of enhancing access to the new economic hub and better access to the Underground, especially for those living further away.

At a local scale, however, it is not clear whether the JLE brought about net positive change over time, because of the spatially differentiated benefits and negative consequences of regeneration. The majority of neighbourhoods in East London have seen only a limited level of positive outcomes, primarily due to poor accessibility to opportunities and public transport, and because of the negative local consequences of the regeneration projects. Regeneration projects failed to address the interests of some neighbourhoods in improving social infrastructure, as they mainly resulted in high-density mixed-use development. Our research indicates that the JLE had impacts on the existing patterns of spatial differentiation and segregation between different social groups, especially within neighbourhoods in East London. The JLE and subsequent spatial development likely contributed to social exclusion of low-income groups due to multiple negative impacts on accessibility for people living in the most deprived areas. Overall, it is

questionable whether the JLE brought about positive net change in the wellbeing of the local population, or in meeting the interests of all the stakeholders in a balanced manner.

As confirmed by the interviews with principal transport planners at national and metropolitan levels, key decision-makers were mainly concerned about the cost efficiency of development and quickly increasing connectivity to Canary Wharf and between the principal nodes. The central government took over control of local planning, and the various local (social) impacts were rarely considered in the decision-making and planning processes. In particular, the long-term consequences of spatial changes on the quality of life of local communities were not concerned. The differing priorities and concerns of the various boroughs were also not taken into consideration, even though some local authorities expressed their concerns about the negative consequences on their neighbourhoods. In practice, the primary concern of the planners was to enhance the mobility of the urban population (i.e. to reduce journey time and increase capacity of transport), rather than to increase in overall accessibility to opportunities and connectivity to the station. Interestingly, the planner at one local borough suggested that the key objective of the regeneration projects was not increasing overall social wellbeing but increasing density by building more housing for sale in line with the direction of the current government.

7. Urban development and the Second Phase subway development in Seoul

7.1. Background

Seoul became a global megalopolis with population rising to 10 million, and income (GNI) increasing to 28,000 USD, going through rapid urbanization and economic growth since the 1950s (Seoul Institute, 2015). As of 2018, Seoul comprises 19% of the population and 21% of the GDP of South Korea. During recent decades, the city built large-scale urban infrastructure at an unprecedented rate, resulting in continuously rising population and increasing traffic congestion, along with economic growth (Ibid, 2015). The city center experienced rapid development and increasing employment, becoming a center of commerce and business. In the 1970s, the metropolitan government decided to distribute the key functions and population to the South of Han River, which had previously been a peripheral area. The increasingly urgent need for subway development was also considered, especially because of road congestion and to support the shift to a polycentric city structure (SMG, 1997). During the First Phase of subway development from 1970 to 1985, lines 1, 2, 3, and 4 were built, 116 km in total. These lines all pass through the commercial center and the newly created sub-centers (see Figure 3).

In the 1990s, the Second Phase of the subway development (lines 5 to 8) were constructed with an aim to support the continually-increasing employment growth concentrated in the centers, to increase accessibility to jobs and services from wider areas, and to support city expansion.

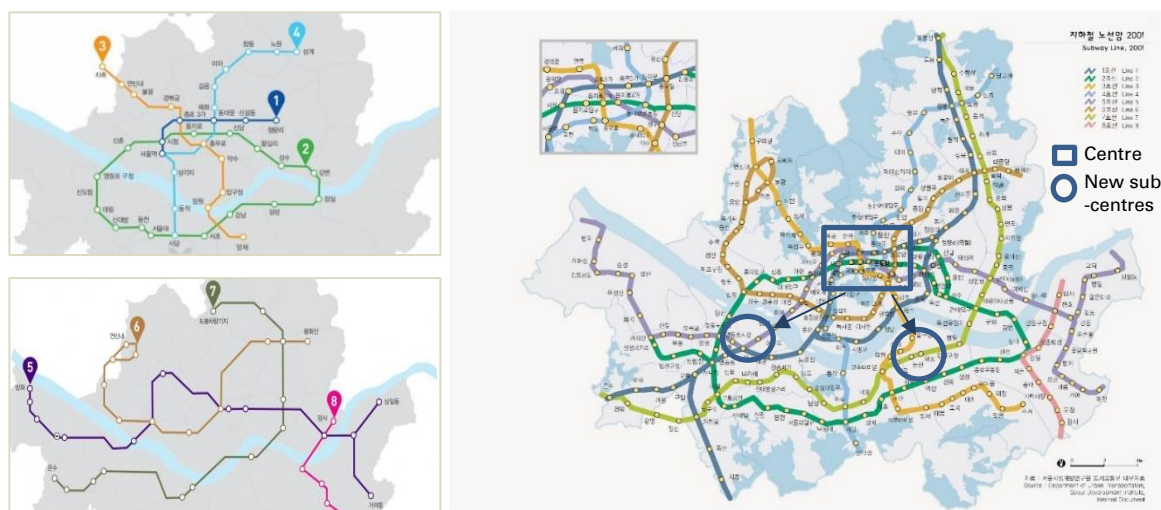


Fig. 3. Subway map of Seoul, South Korea (Seoul Metro, 2007)

7.2. Key interests related to the Second Phase subway development at multiple scales

The varying interests in the Second Phase of subway development were identified at national, city, and neighborhood scale from two perspectives, namely, transport and urban development. At the national level, the major interest of the Second Phase was in supporting the macro socio-economic goals in response to rapid urban development. As identified in the interview with a principal planner, the top priority was to deal with increasing demand for access to the economic hubs and the shift to a polycentric urban structure (Kim and Suh, 2016). To support new town development and to strengthen linkages (connectivity) between Seoul and the newly-developed residential areas was also a concern of the subway development (SMG, 1997). The project sought to create balanced spatial development within the metropolitan area.

At the city scale, high-density mixed-development around the stations was promoted to develop socio-economic hubs according to a spatial hierarchy, from metropolitan to neighborhood scale. The Mayor's office advocated reinvesting the tax revenue from station-oriented development into enhanced public facilities (SMG, 1997). From a transport perspective, key goals were increasing accessibility between centers and the remote areas, as well as improving network functionality, especially connection with other public transport types, such as local bus services. At the district level, a key interest was to improve accessibility to public transport, as well as to encourage regeneration effects in the immediate vicinity of the stations. The development of socio-economic hubs around stations was promoted especially in the peripheral areas to enhance the overall quality of the living environment in the disadvantaged areas (KSCE, 2004). A summary of interests is presented in Table 2.

Table 2. Interests related to the outcomes of the Second Phase subway development at multiple scales

Seoul	Interests related to transport development	Interests related to urban development
National and Regional scales	To deal with increase demand for access to economic hubs at a national/regional scale	To increase competitiveness of Seoul Metropolitan area and bring balanced development
City scale	Reduce congestion and improve accessibility to the major center	Develop socio-economic hubs of the city according to the spatial hierarchy by pursuing high-density mixed development around station areas
District (local)	Improve local transport network; improve accessibility to public transport and pedestrian networks	Develop local amenity and better social infrastructure and services

7.3. Spatial changes at a macro and micro scale

The Second Phase of subway development in Seoul contributed to change in spatial structure from a mono-centric to a polycentric metropolitan area over time (Kim and Suh, 2016). Commercial activity expanded, and the employment density (i.e. the number of workers in a given region) continuously increased in the core and in the newly-created sub-centers such as Yong Dong and Yeoido (Choi et al, 2010) in the southern part of Seoul. Since the Second Phase subway lines opened, major development projects, especially business complexes, continuously occurred in the sub-centers (e.g. Gangnam district and Samsung district). The South has seen its sub-centers develop into centers of metropolitan scale as further public transport projects were implemented to connect these centers with satellite cities further South. Some of the local centers (i.e. especially one in the northern part of Seoul), gradually lost their function as a socio-economic hub of the city (Kim et al., 2009).

An empirical study (Kim and Lim, 2011) and our interviews with spatial planners showed that high-density commercial development was only seen around some stations. The development effects around stations varied between North and South, as well as between commercial and residential centres. High density (re)development around stations and along transport routes was noted mainly in the commercial centres of the South, while some in

the North (Whangship-Li and Cheongrang-Li) have been redeveloped to a moderate extent due to the low availability of vacant land and restrictive planning regulations (Choi et al., 2012:8). Another issue is that, across Seoul, land near stations has become dominated by residential development rather than mixed-use development (Choi et al., 2012). Massive housing-led regeneration projects have occurred in close proximity to stations, while the majority of local amenities were positioned along roads (Kim and Lim, 2011). A limited level of positive change in the local built environment around the stations was noted (Lim, 2007). Public spaces and pedestrian paths near the stations were inadequate, and major regeneration projects were poorly integrated with the local environment (Go, 2008; Lee et al., 2015).

7.4. Long-term consequences on socio-economic wellbeing

Our research identifies that the Second Phase contributed to socio-economic development of the city at a macro scale. The centres of commerce and employment in Seoul were well connected to each other as well as to their wider areas, and had a continuously-increasing role as a socio-economic hub. However, because of the growing percentage of population who travelled by subway more than one hour to work (KOSIS, 2000; 2010; 2015), it is difficult to confirm whether the subway development has actually increased accessibility to opportunities in the city. Various studies (Jin and Jin, 2015; Lee and Kim, 2009) have indicated that different levels of accessibility to jobs were observed in different parts of the city. Districts in the South such as Gangnam District and Seocho District has the highest level of job accessibility with the highest level of increase, while North and East Seoul did not see much change since 2000.

Interviews with transport planners and a few studies (e.g. Go, 2008; Lee et al., 2015) indicated that there were limited consequences on quality of life at the local level, due to poor connectivity between stations and the rest of the neighbourhoods, as well as because of the moderate level of station area development, especially in the local residential areas (see also Choi et al., 2012). Station areas appeared to have played only a limited role as a socio-economic hub, given the dominance of residential projects. The majority of public amenities tended to be located along roads, beyond walking distance from stations (Kim and Lim, 2011), and much of the population (except those living in the sub-centres in the South) need to travel to access services (Jeong et al., 2011). Moreover, some negative impacts of the housing-led regeneration projects can be noted within the neighbourhood areas. Large-scale housing developments often restricted mobility within the neighbourhoods, and contributed to the loss of local identity (Chang et al., 2007; Go, 2008). Some local communities were displaced to make way for some from new housing developments in the vicinity of stations, but many of these developments were already planned, and are not strictly due to the subway expansion.

Our research shows that spatially differential outcomes can be noted across the urban area, especially between the least and most deprived areas. In those districts with highest income, such as Gangnam, about 70% of residents commuted to work within one hour, while less than half of the residents in the areas of lowest income (e.g. Gangbuk District) travelled to work within one hour (KOSIS, 2010; 2015). Such a difference was also seen with accessibility to public transport; the areas of highest income had much greater accessibility to public transport than the poorest areas (Lee et al, 2011).

7.5. Analysis of issues related to social returns from the Second Phase subway development in Seoul

Our study suggests that the Second Phase appeared to contribute to achieving the macro scale economic goals of the city. Within a short time period, the project increased connectivity to the major nodes from wider areas. However, it is not clear if the Second Phase contributed to bringing balanced development over the whole metropolitan area, even though this was a stated goal. In the (sub)centres, the positive impacts increased due to the iterative effect between development and the provision of transport infrastructure, while the peripheral areas experienced only limited positive impacts. The sub-centres in the South have seen increasing concentration of jobs, while other sub-centres and local centres have only had a limited level of change around the nodes, especially in the peripheral areas. As a result, more people commuted a longer time, especially those living in peripheral areas. It is questionable whether subway development contributed to obviating differences between the centre and the rest of the city, although subway lines have served a wider population.

The extent to which the respective interests at the local scale were met by the outcomes of the Second Phase is less clear due to the limited level of spatial change around stations, and the differential level of increase in accessibility between the centre and the rest of the city. What can be observed is that the subway development facilitated a limited level of high-density (commercial) development, especially in local centres in the peripheral areas, and the station areas only played a limited role as a local hub. In addition, the positive consequences on quality of life in local neighbourhoods were limited due to inadequacy of pedestrian pathways and poor connectivity between subways and neighbourhoods, especially in the peripheral low income areas. Due to the differential level of accessibility to opportunities between high and low income areas, the Second Phase may actually have contributed to socio-economic disparity.

Interviews with a principal transport planner and a project manager both suggested that, because of the rapidly growing economy and population, the central government only focused on achieving immediate outcomes. Cost efficiency and increasing connectivity between principal nodes, and between the nodes and the new residential developments, were the main issues that were considered. A key principle of route design was to link centres of employment to wider areas, which were being rapidly developed or planned at the time the Second Phase was being planned. Interviews with spatial planners and the project manager indicated that stimulating station areas as a catalyst for development of local hubs was not considered nor discussed in the project process, despite being a stated goal of the official Spatial Plan of Seoul. Long-term consequences at the local scale, such as (dis)connectivity to public transport and lack of pedestrian paths, were rarely taken into consideration or evaluated after the project. Furthermore, meeting the differential needs of the different parts of the city (e.g. centres and peripheral areas) was not considered throughout the project process, even though facilitating balanced development was stated as a key policy goal.

8. Discussion: understanding social returns from urban infrastructure development

The two exemplars of London and Seoul have illustrated that social outcomes from urban infrastructure development are produced in a complex manner, and are influenced by spatial changes and varied contexts. Our study suggests that evaluating social outcomes of transport projects requires investigating the negative and positive consequences of multi-scale spatial changes over time as well as the varied interests in the project in the specific context of the city in question. In this section, we discuss the importance of investigating spatial changes at multiple scales, especially in relation to the societal outcomes. We also discuss our insights on how social outcomes could be enhanced to address the varied interests in urban spatial transformation.

8.1. Multi-scale spatial development and long-term consequences of transport development

The two exemplars demonstrate the importance of understanding how spatial changes at macro and micro level influence the level of ultimate benefits for society that arise from urban transport development projects. In case of the JLE, the urban transport project contributed to the success of a new economic centre and to facilitating regeneration around nodes, which resulted in enhanced accessibility to opportunities for many members of society. However, poor connectivity to public transport and local services, and the negative consequences from spatial changes (i.e. triggered by the regeneration projects) offset the benefits from accessibility gains and enhanced living environments around stations. In the Seoul subway development case, despite increased mobility at the macro scale, the positive changes to quality of life were limited because of the low level of spatial change at many nodes and the poor connectivity. We suggest that evaluation of outcomes requires investigating multi-scale changes over time, and reflecting how these changes together affect accessibility and other socio-economic conditions of local neighbourhoods across urban areas. An increased emphasis on the influence of the multi-scale changes on the outcomes would enhance the discussion on the relation between transport and spatial development (e.g. Bertolini, 2012; Straatemeier and Bertolini, 2008), which tends to give limited attention to the scale and time dimensions of changes.

Our research suggests that urban transport projects alone may not bring positive changes to the wellbeing of the whole society. The expansion of transport networks does not guarantee access to opportunities for the whole society due to differential spatial changes occurring across cities. In Seoul and London, differential outcomes across urban areas were attributed to the varied pace and scale of spatial development occurring over time in the centres and local centres in the peripheral areas. In Seoul, the high-income districts in the South (i.e. Gangnam District) benefited from

enhanced accessibility arising from job density as well as increasing transport networks in the area. However, people in many other districts experienced only limited benefits, due to longer commuting times to jobs increasingly concentrated in the centre and to a low level of commercial development at the local centres. In London, our study identified the differential levels of benefits between and within neighbourhoods, and among different social groups. This could be attributed to the different scale and scope of regeneration projects as well as to varying accessibility to opportunities between the centre and peripheral areas, and between least and most deprived areas. Our study shows that there is a need for spatial development that addresses carefully the different socio-economic conditions of different neighbourhoods. Such balanced development is necessary to help transport development contribute to an even distribution of benefits for society – an issue discussed by many (e.g. Martens (2012) and Martens and Ciommo (2017)).

8.2. Addressing varied interests in outcomes from urban infrastructure development

Our study implies that enhancing social outcomes requires an integrated approach to urban transport development that considers the varied interests (needs) in outcomes across urban areas and by scale. As seen from the two exemplars, many of the interests were not appraised nor addressed through the planning and delivery of urban transport development, even though these were stated as policy goals. The discrepancies between transport and spatial development (planning) (Legacy et al., 2012), as well as lack of multi-scale project process, may result in limited positive change for society. These discrepancies may lead to a lack of concern about the consequences of spatial changes at multiple scales. These consequences relate to the spatially-differentiated nature of the outcomes, and other negative social impacts (see Jones and Lucas, 2012; van Wee and Geurs, 2011; Vanclay, 2002).

Integrated approaches to transport and spatial planning have been advocated by various authors (e.g. Heeres, 2017; Straatemeier and Bertolini, 2008). An insight that emerges from our research is that, in order to enhance the social outcome of urban transport, an integrated approach to transport and spatial planning must address long-term consequences of changes at both macro and micro scales. At a macro scale, urban policy that addresses the impacts of unbalanced spatial development on the outcomes from transport is required. Such an urban spatial policy should trigger spatial development at strategic positions, such as stations in peripheral area, especially those with the potential to become regional transit hubs. Incentives to attract investment in local infrastructure and amenities may be needed. At a micro scale, integrated measures to assess positive and negative consequences of spatial changes over time on wellbeing of local communities are needed for project planning.

8.3. Social outcomes within specific contexts

Our study illustrates that the social outcomes from urban infrastructure projects were related to the specific context of each case. The social outcomes were shaped by many factors, such as the stage of urban development as well as the key priorities of the projects. The factors varied between Seoul and London, which resulted in different issues related to social outcomes. In Seoul, a high-density subway network was developed during the Second Phase Subway Development to support rapid urban growth. At the city scale, the project connected the centre and sub-centres to a wider population base. However, it failed to achieve one of main goals, to facilitate efficient and balanced spatial development. The limited level of (re)development of local hubs across cities was due to restrictive planning regulations, the dominance of residential development around stations, as well as a linear development pattern of local amenities. The transport project might have contributed to spatial disparity between the centre and the periphery, due to concentrated development in one centre. At the local scale, the negative consequences of long-term change from the project were arguably limited because much of the spatial change that occurred around stations involved residential developments that had been built or occupied before the planning and development of the subway.

In London, the JLE successfully triggered (re)development of transit and commercial centres, contributing to the regeneration of East and South London. The project successfully facilitated spatial changes around nodes, especially in East London as the JLE catchment areas contained a substantial proportion of the developable land in the area. However, the long-term spatial changes that were triggered by the (re)development failed to meet the varied interests of the many local neighbourhoods, and created negative social consequences such as long-term displacement. Quality of life of local communities were influenced by degraded quality and quantity of local public amenities. Spatially

differential outcomes were noted within neighbourhoods in addition to across cities, due to the (re)development projects being concentrated around stations. The negative impacts of the regeneration projects, together the spatially and socially differentiated nature of the benefits, detracted from the social outcomes of urban transport development. Our research implies that an approach to enhance social outcomes should carefully address the specific contexts and the factors affecting spatial changes as well as all the varied interests.

9. Conclusion

Urban infrastructure development is a critical catalyst in the process of urban and regional development, sometimes contributing to the development of society and the economy. However, urban infrastructure alone may not always improve the wellbeing of the urban population as it often fails to meet many of the varied interests in the spatial transformation that arises from infrastructure projects. We investigated this through examining two exemplars, specifically by focusing on the social outcomes from urban transport infrastructure in London and Seoul. By social outcomes, we mean the societal consequences over time of spatial transformation at multiple scales that are facilitated by urban infrastructure development.

Our two exemplars demonstrated that the varied interests in the outcomes of urban infrastructure development are not well addressed in the planning and delivery of projects. Infrastructure development tends to prioritise the macro scale economic goals to be delivered within a short time. It rarely addresses broader, longer-term consequences at multiple-scales, neglecting the varied interests in urban infrastructure across cities. Many desired outcomes – such as enhancing living conditions, accessibility to opportunities, and balanced spatial development – are not commonly assessed or monitored through the project process, even where local (spatial) development had been stated as a project goal.

Our study suggests that the important question to ask is: how can infrastructure bring positive social outcomes in a long-term as well as a short-term? We consider four issues identified from our findings. First, positive outcomes of urban infrastructure development at the macro scale do not necessarily mean that there are positive consequences of spatial changes at the local neighbourhood scale. The overall result of urban infrastructure development needs to be measured with respect to the long-term secondary impacts both at the macro and local level. Second, urban infrastructure projects alone may not contribute to the wellbeing of the whole society. They hardly meet all the varied interests in such projects, especially over time. Third, urban infrastructure projects may influence the wellbeing of citizens in an unbalanced manner with spatially and socially differentiated outcomes across cities. They may reinforce existing patterns of spatial differentiation among different social groups, and might lead to the social exclusion of deprived areas, rather than contribute to overall distribution of accessibility for all. Fourth, our research suggests that social outcomes are influenced by the context of each setting. These contexts refer to not only decision-making process that prioritises political and economic interests over long-term societal consequences, but also other factors such as institutional frameworks and the stage of urban development.

We suggest that ensuring positive social outcomes requires an integrated approach to transport and urban spatial development (planning) that addresses desired outcomes at macro and micro levels. This requires an integrated planning and evaluation process, as well as urban policies that address the varied interests and needs of the urban population across cities. We make the following suggestions to enhance the social outcomes of urban infrastructure projects.

1. Delivering positive outcomes from spatial changes both at local and metropolitan scales should be a goal of urban infrastructure development. Infrastructure development should aim to benefit local communities in terms of improved mobility, accessibility and other socio-economic concerns. In order to bring net positive changes at the local level, these should be considered as key objectives of urban transport development projects. Such projects need to address local interests in enhancing connectivity between stations and neighbourhood areas in a proactive way, while also mitigating the negative consequences of long-term spatial changes. All this requires an integrated approach to local development planning as well as an integrated evaluation of outcomes at the local scale.

2. The temporal and intermediate impacts on various factors that influence quality of everyday life need to be appraised and monitored with consideration of local contexts. The contribution of urban infrastructure development to the wellbeing of population must be evaluated by examining varied respective interests that are affected by consequences of spatial changes over time across all local areas (e.g. a commercial and residential areas). A pragmatic, context-specific approach to outcome evaluation is required. This involves a much wider range of local actors to identify appropriate measures and to monitor the impacts of projects at a local neighbourhood scale.

3. There must be a fair distribution of benefits delivered both between and within local areas (i.e. between a centre and peripheral areas, and between a node and the rest of local neighbourhood). Urban (spatial) policies should rigorously address spatially (socially) differential outcomes, which are attributed to the varied scale of spatial development occurring across cities, and provide means by which a balanced distribution can be achieved among stakeholders. Such policies should trigger spatial development at strategic positions, such as stations in peripheral area with potentials to become regional transit hubs. These will help ensure that transport development facilitate a fair distribution of benefits between centres and peripheral areas.

We conclude that, for social outcomes to be the overarching objective of development projects, a transition in urban transport planning will be required. It will need to be supported, not only by an integrated approach to planning, but also by a governance structure and a long-term focus in spatial planning policy. We recommend that, to understand and enhance social outcomes at all scales, a careful examination of contextual factors that affect the planning process and delivery of urban infrastructure development is required. Further research is needed to explore how institutional conditions (e.g. local planning capacity) influence the way multi-scale interests are identified and managed so that overall social outcomes can be enhanced.

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