Assessment and recommendations

Urban transport has played a major role in Korea's rapid urbanisation and economic boom.

Korea has combined rapid urbanisation (82.2% in 2013 according to the Korea Statistical Office) with a steep rise in gross domestic product (GDP) per capita (more than twice the average growth rate across the OECD between 2005 and 2014). This stands in stark contrast with several countries in the world (including Colombia and Senegal, for example). Massive investment in transport infrastructure has driven this development pattern, primarily by improving road connectivity between the largest cities. Korea devoted 6.6% of its total public investment to transport infrastructure in 2015 (even though this share represents a drop from 8.2% in 2006). For about four decades until the early 2000s, transport investment was tilted towards road infrastructure to support the development of export-oriented heavy industries in the largest cities. The investment mix has changed over time, and in 2015, roads and railways accounted for around 45% and 33% of total traffic-related public investment, respectively. Korea's motorisation rate (number of cars per 1 000 residents) relative to its income level remains below the OECD average and is among the lowest in the OECD, which can help prevent further congestion and promote environmental sustainability. However, given its high population density, Korea has the second highest vehicle density in the OECD, more than three times the OECD average (190.3 vs. 61 vehicles per kilometre in 2014).

New challenges require urban transport to be not only economically efficient, but also environmentally sustainable and socially inclusive.

Such a car-centred model is now reaching its limits. According to estimates from the Korea Transport Institute (KOTI), congestion costs have risen steadily in Korea, and represented 2.16% of national GDP in 2015 – around two-thirds of such costs accrued from urban roads. Korea registers the longest commuting time among OECD countries and ranks third lowest among 38 countries in terms of work-life balance according to the OECD Better Life Index. Congestion also puts a drag on Korea's sustainable development potential, notably by fuelling pollution. Four of the five OECD metropolitan areas with the highest level of particulate matter concentration are located in Korea in 2013 (Cheongju, Seoul, Incheon, and Jeonju).

Getting urban transport right in Korea could therefore help the country implement the New Urban Agenda put forward at the UN Habitat III Conference, and contribute to achieving the Sustainable Development Goals (SDGs), such as Target 11.2 – access to safe, affordable, accessible and sustainable transport systems for all by 2030 – notably by expanding public transport. Both central and local governments in Korea are moving

away from a concept of mobility focused on high-speed motorised transport toward a notion of transport as an enabler of access to opportunities.

Many cities in Korea are shifting towards public transport.

Large, densely populated cities around the world typically have both greater needs and larger resources in terms of public transport systems. However, there can be large differences across cities within the same country. Among the largest cities in Korea (Seoul and the six cities classified as "metropolitan cities" in the Korean territorial framework), the modal share of public transport (as defined by the percentage of total trips made via public transport, mostly bus and rail) ranges from 28.5% in Daejeon to 52.4% in Seoul, compared with a national average of 35.8%. Modal shares also differ within cities between the urban core and the periphery. Such a core-periphery gap is particularly large in the capital area (Seoul, Incheon and Gyeonggi), Gwangju and Busan, while it is slightly lower in Daegu, Daejeon and Ulsan. Several cities have taken initiatives to foster greener transport, by inhibiting car use or promoting alternative modes. Seoul implemented a congestion charge in two urban tunnels as early as 1996, although so far it remains the only city that has done so in Korea. Sejong, which was planned and created by the central government as an alternative administrative hub to the capital, adopted aggressive "road diet" policies to discourage car use (e.g. narrow driving lanes, little or no parking space in buildings) and combined them with strong investment in the supply of public transport (e.g. drastic increase in the number and frequency of buses, introduction of bus-rapid transit [BRT]). Suwon experimented with a car-free neighbourhood during an entire month (the Eco-Mobility Village in September 2013), which helped change residents' behaviour even after the experiment ended. In 2008, Changwon established the first public bike-sharing system in Korea (called Nubija), which is still expanding after the central government merged the city with the neighbouring Masan and Jinhae in 2010. Such encouraging initiatives offer interesting insights and could be further developed in other parts of Korea.

How can accessibility to urban public transport be measured in Korea with regard to inclusiveness?

Even where available, however, urban public transport is not equally accessible to all social groups. While accessibility can take different forms, the present research focused on measuring physical accessibility to urban public transport by calculating how long it takes for residents to walk to a bus stop or to a train station. After exploiting the GIS maps of all roads, bus stops, train and subway stations in Korea at an extremely granular scale through population grids, it was possible to calculate the ratio of residents who live within a 10-minute walking distance from a bus stop or train/metro station in total Territorial Level 5 (TL5) population (as an indicator of "accessibility") and the ratio of people who live farther than a 30-minute walking distance (as an indicator of "inaccessibility"). Such indicators of accessibility and inaccessibility were then regressed against a set of socio-economic indicators (notably related to income, age and gender) to analyse to what extent public transport is both accessible and inclusive in Korean cities.

In some cases, urban public transport is more accessible to the rich and to men in Korea.

A first, unsurprising result is that the areas that are the most densely populated and offer better economic and educational opportunities enjoy greater accessibility to buses and trains. Higher income individuals also tend to live closer to public transport (bus stops). However, there are major differences across Korean cities and regions in terms of inclusiveness of public transport. In some large cities (including Seoul, Incheon, Daejeon, Ulsan and Busan), the transport system shows a high degree of inclusiveness with respect to income, as there is no systematic difference in access to public transport across income groups. In other areas (such as Daegu, Gyeonggi and some other provinces), people with lower incomes tend to live further away from bus stops. This may be in part related to the difficulty of providing public transport in those areas where population density is lower. Interestingly, there is also a strong positive correlation between bus accessibility and the ratio of men in TL5 population throughout Korea. Conversely, women tend to live in areas with lower bus accessibility, which are less densely populated and have fewer firms (thus fewer job opportunities).

Women's lower accessibility to buses may reflect a deeper, underlying aspect of the Korean society – the relative lack of economic opportunities for women compared to men. High accessibility areas are likely to offer more expensive housing than elsewhere, which only higher income people can afford. Income is directly linked with the status of employment. The employment rate of women in Korea was 49.9%, whereas the one for men was 71.1% in 2015. This gap has barely changed in ten years. Likewise, the wage gap between men and women in Korea is 36.6%, the widest gap among OECD countries, more than twice the OECD average gap of 15.5% in 2013. Evidence also shows that roughly a quarter of total households in Korea are single households (either a man or a woman living alone), which may underlie the gender gap observed in accessibility to public transport.

Some demographic groups such as the elderly and school-age children also enjoy better access to urban public transport in Korea.

Looking at specific age groups, the analysis found that the elderly tend to live close to bus stops, in high-income areas. What affects this age group is particularly relevant considering that Korea's population ageing is projected to be the fastest in the OECD area, with projections showing that by 2050 Korea will have the third oldest population (only behind Japan and Spain). In Korea as a whole, and in a number of Territorial Level 3 regions (TL3) – especially Gangwon, but also Gyeonggi, Gwangju, Gyeongnam, Jeju and Chungbuk) –, there was a significantly positive correlation between the ratio of the elderly in TL5 population and bus accessibility.

Intriguingly, the elderly also tend to live in areas that have many school-age children. This pattern was consistent from elementary school students to middle and high school students. A possible explanation may be that many elderly are unable to drive or to walk, thus tend to locate closer to bus stops, and school-age children have similar needs for commuting to education facilities. Both the elderly and school-age children are unlikely to own a car or to be able to drive one. Part of the elderly might live with their children and grandchildren for financial reasons (according to a survey of Korean housing welfare, 13.2% of households included both elderly and grandchildren members in 2010, up from 12.7% in 2007 and higher than 6.6% on average in European Union (EU) countries

in 2008). Elderly poverty might contribute to this pattern. Korea has the highest rate of elderly poverty by far among OECD countries (49.6% of Koreans aged 65 or more lived below the poverty line as of 2012, a staggering almost four times the OECD average of 12.6%).

Further analysis through "space syntax" techniques, which overlays public transport networks with urban street networks in a selection of Korean cities, helped identify a number of areas within these cities where lower income residents were likely to be disconnected from economic and social opportunities (e.g. old north-eastern part of Seoul, several areas within Busan due to its fragmented topography, the new centre in the Special City of Sejong).

The legal and institutional framework provides a solid basis for designing urban public transport in Korea.

Korea has the advantage that a single ministry – the Ministry of Land, Infrastructure and Transport (MOLIT) – is in charge of both urban policy and transport policy. MOLIT prepares both a 20-year strategic plan for the development of the entire territory, including urban areas (the Comprehensive National Territorial Plan, or CNTP, currently in its 4th edition), and a 5-year Public Transport Master Plan (currently in its 2nd edition, 2012-16). Based on these national frameworks, each city government establishes both a city master plan and a local public transport plan over the same time span.

This planning scheme also fits in a sophisticated public investment management system, called the Total Project Cost Management (TPCM) system, which combines close monitoring from the Ministry of Strategy and Finance and independent expert assessment in three phases (*ex ante*, intermediate and *ex post* assessment). The TPCM applies to projects – including transport projects – that are implemented by central or local governments (or private actors relying on public funding), have a construction period of two years or longer, and incur costs of at least KRW 50 billion (about USD 47.5 million) in the case of civil engineering projects or at least KRW 20 billion (about USD 19 million) in the case of architectural projects. Such a system is well aligned with the *OECD Recommendation on Effective Public Investment Across Levels of Government* and has been acknowledged as a good practice, particularly in terms of assessing upfront the long-term impacts and risks of public investment.

Ambitious reforms in the governance of urban public transport have helped improve service delivery and user convenience.

Three examples of key reforms in the governance of urban public transport in Korea can illustrate the considerable potential for improving service delivery and user convenience: the introduction of a semi-public bus operating system, the harmonisation of the fare-collection system and the use of big data in urban public transport management systems.

First, major cities in Korea have introduced a unique type of public-private partnership model in the bus sector. Korea has a very particular system in which private bus operators hold quasi-monopolistic rights on the routes once they have obtained a license. However, the law also provides for exceptional measures in case of financial deficits. In the 1990s, public subsidies were introduced to compensate for the swelling deficits of private bus operators and counter the deterioration of service quality. In 2004, Seoul was the first city to adopt a semi-public bus operating system, later replicated in five out of Korea's six

metropolitan cities (only Ulsan did not follow suit). The new system is a form of gross cost contract, in which the city government fully compensates private operators for their operation costs under the condition that the private operators share their authority over routes with the city government. While this reform came at a considerable cost, it is estimated to have substantially increased bus ridership and improved safety. In Seoul, the bus reform was combined with a wider set of urban renewal strategies, such as the replacement of an elevated highway with a multi-purpose waterfront (Cheonggyecheon).

Second, Korea has managed to harmonise its public transport fare-collection system nationwide. Originally launched in 2004 by the city of Seoul and later expanded by MOLIT to cover almost the entire country, a single mobility pass allows users to ride any public transport network in Korea and benefit from discounts when they transfer from one mode to another. MOLIT worked on testing relevant technologies, building nationally standardised infrastructures, as well as building consensus among subnational governments and private card companies. Finally, a series of Memoranda of Understanding were signed with all the 17 TL3-level subnational governments and public transport operators in 2013. The "One Card, One Pass" can be easily purchased and recharged, and today it is accepted in all buses, subways, taxis, trains, inter-city buses, express buses, toll gates and even major retailers.

Third, Korea has capitalised on its strong IT uptake to build sophisticated urban transport management systems using big data. A shining example is the Transport Operation and Information Service (TOPIS), which was launched by the city of Seoul in 2004 and has inspired similar endeavours in other cities both domestically and abroad. TOPIS tracks all vehicles in the city in real time by processing a massive flow of data coming from cameras, sensors, GPS systems and fare-collecting devices. It also collects information from the Korea Meteorological Administration, the Seoul Metropolitan Police Agency and information provided by citizens to prevent natural disasters, react quickly to accidents, reorient traffic in case of street protests, among others. The public can access the collected information via smart phone apps, the TOPIS website and digital information boards in stations. Other cities are also running or building similar information systems, most notably Suwon's Urban Safety Integrated Center, which provides multi-sectoral monitoring on traffic, crime and natural disasters. MOLIT plans to expand the system to 80 additional subnational jurisdictions by 2021 and a Taxi Information Management System (TIMS) is also expected to be completed in 2018 across 157 subnational governments.

Nonetheless, urban transport systems face important financial and institutional constraints in Korea.

While urban public transport services in Korea are generally well developed and fast, they also tend to run large chronic deficits. Cities in Korea, as in other OECD countries, are grappling with a variety of financial challenges in the urban transport sector, both in the short term and in the long term – including the long-term cumulated costs of infrastructure repair and maintenance, and the need to make urban transport affordable for the most vulnerable users (such as the lower income groups, the elderly and the disabled). This financial burden is particularly salient in Korea where local governments have a relatively low fiscal autonomy to start with. Although the 1988 Local Finance Act was amended several times (in 2005, 2009 and 2011) to enhance fiscal decentralisation, the share of central government in total subnational government revenue in Korea remained well above the OECD average (61.6% vs. 37.3% in 2013). According to the Act on the

Management of Grants, the national government provides grants to cover part or all of the costs of traffic-related investments in cities and provinces. In general, these are earmarked, discretionary and matching grants. Costs are shared in accordance with predetermined ratios or lump sums, applied identically across all local jurisdictions.

Adopting a holistic approach to urban transport as part of a broader metropolitan development strategy is essential.

An important aspect of rethinking the governance of urban transport systems in Korea is how to help the latter better serve economic, social and environmental objectives by promoting a holistic approach. In particular, both central and local governments are focusing on reducing reliance on cars and promoting public transport and soft mobility. Implementing such a vision requires developing a transport strategy within a broader long-term economic planning framework. For example, Transport for London (TfL) – the transport authority for the Greater London Authority – has been successful in designing economically driven transport policies, which are well aligned with demographic and employment dynamics and effectively promote public and non-motorised transport modes.

Developing a measurement and monitoring tool that bundles transport and housing costs together could also be particularly useful in Korean cities. For example, in the United States, a federal government initiative called the US Partnership for Sustainable Communities has aimed to develop more sustainable communities by integrating transport, housing and energy policies. Recognising that housing and transport costs account for almost half the average household's budget, a Location Affordability Index (LAI) was developed to provide estimates of the percentage of a family's income dedicated to the combined cost of housing and transport in a given location and help inform people's locational choices as well as better target public investment. The Korean government has also started to move in this direction, for example by promoting "Happy Housing" policies to provide public rental housing located close to public transport or to job opportunities specifically for young residents (e.g. newlyweds, university students or workers in their first year of employment).

Enhancing monitoring and evaluation of urban transport performance can help build public support.

Finally, it is critical to better identify citizen needs by engaging stakeholders effectively in the design of urban transport policies. For example, Suwon set up a Civil Transport Evaluation Committee, which brings together 150 representatives (e.g. members of non-governmental organisations, traffic experts, citizens and youth) to collaborate on formulating the city's urban transport vision for 2030. Measuring and communicating successful performances in urban transport policies on a regular basis – such as MOLIT's evaluation of local governments in terms of public transport and sustainable transport – can also help increase trust in the capacity of Korean central and local authorities to deliver concrete improvements in people's daily life and build public support for necessary reforms.

Towards more efficient, sustainable and inclusive urban transport in Korea.

Korea has already demonstrated its capacity to implement ambitious governance reforms to improve urban transport service delivery, as illustrated by the introduction of the semi-public bus operating system in several cities and the harmonisation of fares throughout the country. Strengthening partnerships among local governments and across different levels of government on mutually agreed objectives, and a fair distribution of costs could help address chronic financial constraints in Korean urban transport systems. Introducing financial disincentives to make car use less attractive, particularly in high-density urban areas, also constitutes a powerful tool. A shared, forward-looking vision of urban transport as an enabler of economic, environmental and social opportunities will play a key role in upgrading growth and well-being in Korean cities.