

Assessment and recommendations

Korea’s road infrastructure creates great economic potential, but inclusive development and traffic safety require further consideration

Prolonged economic growth, together with industrial and social development have made Korea one of the most advanced economies in the world

Korea has experienced a prolonged period of economic growth and industrial development that has taken it from “developing country” status to the group of “high income countries” in decades. Korea is also one of the fastest growing OECD economies, growing at more than twice the average growth rate across the OECD between 2005 and 2014. By 2012, Korea had become the world’s leading shipbuilder and fifth-largest car producer. Korea’s internationalisation has not been limited to the economic sector. Seoul was the host city for the 1988 Summer Olympics, Korea hosted the 2002 Football World Championship jointly with Japan and the 2018 Winter Olympics will take place in Pyeongchang. Politically, Korea also increased its participation in international fora. The country joined the OECD in 1996, is part of the G20 and, since 2007, the UN Secretariat has been led by Korea’s former Minister of Foreign Affairs and Trade.

Growth has greatly increased prosperity, but inclusiveness remains a challenge in some areas

Korea is one of the most urbanised countries in the OECD: over 82% of the population live in urban areas and, in 2013, 47% of Korea’s 49 million mainland residents lived in Seoul or one of six metropolitan cities. The economy is similarly concentrated, with the majority of firms located in the largest cities and their commuting zones. There are large disparities in demographic development between the urban centres, their surrounding commuting zones and the more remote rural areas. While the total population in Korea has grown without interruption since the 1950s, population growth has slowed and during the first decade of the 2000s, it had already turned negative in many local areas. While the population of Seoul and most of its surrounding cities continued to grow, the median growth rate for urban and rural municipalities outside of Gyeonggi-Do, the province surrounding Seoul, was already negative.

Low population growth is accompanied by an increase in the percentage of elderly people. This percentage is already high in rural areas. In Korea’s largest cities the number of residents aged 65+ grew by 2.6% annually between 2001 and 2011, a period during which the total population grew by only 0.3% per annum. For local communities, a high elderly dependency rate is already a challenge in itself, but poverty among the elderly creates additional pressure. In the medium term, the shrinking labour force raises the associated risk of a contraction in GDP. Continued economic growth requires compensating demographic trends by increasing labour force participation and productivity.

Since the early 2000s Korea has focused on balancing the economy and quality of life across regions

Since 2003, Korea has tried to combat the increased concentration of economic activity in Seoul and the corresponding relative decline in smaller cities and towns in rural areas. The strategy outlined in the National Balanced Development Act adopted in 2004 has been pursued and amended by all three subsequent administrations. A major part of this effort was the decision to relocate government agencies, including most ministries. Sejong, a city about a 90-minute drive south of Seoul, was incorporated in 2012 to become the new “administrative capital”, housing the prime minister’s office and most ministries. When the Act was adopted in the mid-2000s, the area that has become the city of Sejong had less than 100 000 inhabitants. Ten years later its population has doubled and the plans aim at establishing a city of 500 000 inhabitants. In addition to Sejong, nine other “innovation cities” have been chosen as targets for the relocation of government agencies from Seoul. While previous administrations considered balancing the economy centrally and across large macro regions (outside of Seoul), the current administration, in place since 2013, aims at revitalising local economies within 56 areas in a bottom-up approach that engages local governments and the civil society in developing plans for each area.

The expansion of Korea’s road network has accompanied and supported its economic success, but traffic safety lacks behind international standards

The rapid economic expansion was accompanied by major infrastructure investments. At the end of the Korean War in 1951, the country had 580 kilometres of paved roads. By 2013, the total paved road length exceeded 87 000 kilometres, including more than 4 100 kilometres of high-speed expressways. Korea continues to invest in its road and rail infrastructure with a total budget of KRW 15.8 trillion (Korean Won) (USD 14.4 billion) or 1.1% of 2013 GDP. As people are taking to the roads, the risk of being involved in accidents rises. Korea has one of the worst traffic-safety records among OECD countries and pedestrians, in particular, are exposed to significantly higher risks than in most other OECD countries. This record is to a significant extent the result of shortcomings in traffic safety governance and a lack of co-ordination across levels of government.

Roads are essential for economic growth and inclusiveness, but other factors are also important

Economic benefits of roads: Extending agglomeration benefits

Transport infrastructure can help create agglomeration economies – positive economic externalities created by bringing a large number of people and firms close to each other. Traditionally, these benefits arise from minimising the distance, and therefore transport costs, between firms and their suppliers. In modern production, the depth of the pool of qualified and locally available workers and knowledge exchange between local firms have become more important in creating agglomeration benefits. These effects come on top of direct benefits from major construction work, like the development of a new expressway that creates jobs and demand for inputs, directly raising local economic activity. Agglomeration economies become even more important when transport

infrastructure reaches a mature stage and the returns from creating new long-distance links start to diminish.

Road investments have increased connectivity and (market) access

The expansion of the road network between 1992 and 2008 improved access for the population centres along the West Coast and Central expressways as well as in many less densely populated areas, by significantly reducing the distance to the nearest expressway. It is mainly sparsely populated coastal regions that retain relatively low levels of connectivity to the expressway network. This is evident in two separate indicators that are used to capture the changes associated with road construction and its impact on potential mobility beyond administrative or statistical boundaries. “Connectivity” measures the ease of accessing the high speed road network for the population living in an area. “(Market) access” captures the opportunities for firms and residents that can be reached within a reasonable time of driving on Korea’s major roads, which includes, but goes beyond, the extent of a firm’s output market or a worker’s labour market.

Manufacturing in Korea benefited from the road network expansion, but not all types of firms benefited equally

The expansion of the road network between 2003 and 2013 had, in general, a positive effect on the number of manufacturing firms, as well as their output, employment and worker compensation in both urban and rural municipalities (*Si, Gun, Gu*). However, not all manufacturing firms and municipalities were equally well-equipped to capture agglomeration benefits from road infrastructure improvements. New manufacturing establishments in all sectors preferred well-connected neighbourhoods. The attraction of areas where connectivity improved was particularly pronounced for establishments in more technology-intensive manufacturing sectors. Technology-intensive production particularly benefits from the improved access to skilled employees and specialised business services that accompany increased connectivity. For manufacturing firms that were already located in areas where the road network improved, the competitive pressure resulting from increased market access resulted in shifts in employment from low-tech to more technology-intensive manufacturing establishments and increases in total factor productivity for medium-high- and high-tech manufacturers.

Going inclusive: Economic growth that creates opportunities for everyone

Inclusive growth aims to approach economic growth from a new angle. Instead of focussing on aggregate GDP growth only, inclusive growth aims to improve living standards and share the benefits of increased prosperity more evenly across social groups. Equitable access to efficient socio-economic infrastructure and effective public services are essential to achieving inclusive growth. Improving access to vital services – including transport, energy, information and communication technology, healthcare and education – contributes to economic growth and boosts inclusiveness. In mature economies this can take the form of increasing competition in service provision to ensure that consumers pay lower prices, or focusing infrastructure planning on people’s needs.

Only part of the benefit of road infrastructure is economic. Residents also benefit by having access to a wider range of goods and services. Employees and job seekers can choose among more employers increasing the chance of finding a job or moving to a better one. A “good” job can enhance inclusiveness by creating benefits that are not captured in people’s earnings but rather in their satisfaction with their employer, their position and their life in general.

Inclusive development by putting “people first”

Investment in road infrastructure and public transport in Korea led to an increase in people’s commuting zones and simultaneously reduced the time people actually spent commuting. In Korea, the number of cars per resident increased by 40% between 2000 and 2010, in part driven by Korea’s increased prosperity, as motorisation rates typically increase with per capita GDP. Given the developments in Korea it is unsurprising that road transport now accounts for more than 95% of transport related CO₂ emissions. Improved road infrastructure can lead to sprawling development, especially in dense urban centres where housing costs are high. Reducing the negative impact on city structure and the environment requires an integrated approach that incentivises sufficiently dense development along transport corridors.

The increased attractiveness of local areas that results from better access will be reflected in local price levels. For example, land prices in Seoul increased around the bus stops when the city’s bus rapid transit system was introduced. This can lead to the displacement of residents who can no longer afford housing in the better connected areas or to firms relocating, or even shutting down, as price levels rise. Strategies to alleviate the potential social cost, e.g. by supporting densification around newly developed infrastructure, including measures to provide affordable housing, can combine the economic benefits with an inclusive agenda. As prices increase in response to transport improvements, an inclusive strategy requires that opportunities for all income levels are created. Co-ordination between national and local planning and public housing provision are essential. For example, Seoul’s urban planning promotes dense developments around underground stations and targets these areas for their long term public lease scheme “SHIFT”.

The expansion of major roads has contributed to balanced development and inclusiveness

The expansion of Korea’s expressway, highway and major road network has created benefits for cities and rural areas across the country. Improved connectivity to the expressway network contributed to more balanced national development by creating income opportunities for residents outside of the major urban centres. This is evident by an increase in personal income taxes collected by tax offices outside major urban centres following improvements in connectivity.

Improved road infrastructure has also made a positive contribution to inclusiveness. The new infrastructure has increased the size of people’s local labour markets, i.e. it increased the potential number of employment opportunities. International evidence suggests that this is particularly relevant for the employment of women, which is confirmed by the empirical estimates for Korea. Female employment rates increase in cities where women gain access to a larger labour market within 60 minutes of driving. Activating underutilised employment potential is essential to alleviate the impact of ageing on the labour force and ultimately for continued growth. Road infrastructure

investments also created better access for areas with a high percentage of elderly residents. This is particularly relevant as it creates opportunities for mobile service solutions for a growing group of people. Despite improvements in connectivity road infrastructure was, however, ineffective in preventing or slowing the global shift of population towards the larger urban centres.

Complementary measures can increase the impact of road investment

A regional development strategy that relies solely on constructing roads to less connected cities and rural areas is unlikely to create substantial benefits. Complementary measures are often required to utilise the potential created by new or improved infrastructure, e.g. land-use policies that incentivise intensive land use around new transport infrastructure. As evidence from surveys and the empirical estimates presented here show, firms consider the accessibility of the location they choose, but accessibility is only one determinant of their location decision process. The access to business and the deep labour markets in the commuting zones of large cities creates agglomeration benefits, whereas rural areas need to rely on their specific comparative advantage, i.e. local resources – both human and physical – to attract and retain firms and residents. Since 2013, Korea’s HOPE (happiness, opportunity, partnership, everywhere) project aims at revitalising local areas to foster balanced development. The project combines initiatives on housing, employment, education, culture and on closing local welfare and medical service gaps. Transport access is essential for all of these fields. HOPE relies on a bottom-up approach, engaging local governments in the development of plans and has the Presidential Committee on Regional Development, which consists of 12 ministers and 19 experts, as a co-ordinating “control tower”.

Road safety has not kept pace with Korea’s development

Roads created prosperity but at a price

The rate of road traffic fatalities in Korea is nearly 50% above the OECD average. In 2013, more than 10 people per 100 000 inhabitants were killed on Korea’s roads, while across the OECD the rate was less than 7 people in the same year. This large difference remains in spite of Korea having reduced annual traffic fatalities from more than 10 000 in 2000 to around 5 000 in 2013, a reduction of more than 50%. Korea’s pedestrian fatality rate in 2013 was almost four times the OECD average and this difference explains nearly all (88%) of the difference in total traffic fatality rates between Korea and the OECD average. Among pedestrian fatalities, the elderly are overrepresented. Korea had the highest average elderly traffic fatality rate among OECD countries between 2000 and 2013.

Wider roads and crossroads exert the greatest safety toll

The structure of roads and the design of intersections strongly influences the incidence of accidents and their severity. Compared to their prevalence, relatively more accidents with more severe injuries occur on wider roads. “Injury-related accident costs”, a composite indicator that combines the incidence of accidents and the severity of injuries sustained, increases with the width of roads. Findings based on a large dataset of individual accident records show that the per kilometre accident cost was lowest on small

two-lane roads, the most ubiquitous type of road in Korea. On four-lane roads the per kilometre accident cost was nearly six times as high as on small roads, with twelve times the cost on six-lane roads and for Korea's widest roads, with eight or more lanes, the accident cost per kilometre was more than 21 times the cost on small roads.

Traffic risk has been highest around traditional crossroads. Crossroads, among all the possible segments of roads, accounted for 40% of injury related accident costs in the individual accident data. The contribution of crossroads is even more significant in accident hotspots, i.e. in municipalities with the worst traffic safety performance, where more than 90% of accident costs arose on or around crossroads. The high incidence of accidents can, in part, be attributed to the design of crossroads in Korea. Typical crossroads are right angle intersections of two roads with a traffic signal that is installed high and on the opposite side of the crossroad. Since 2009 the intended location of traffic lights has been changed to the front of crossroads and as of September 2015, nearly 20% of traffic lights have been improved to reduce related traffic accidents.

Roundabouts can both save lives and make economic sense

Any policy that makes accident hotspots safer is likely to yield significant returns. In a pilot project between 2010 and 2012, the (then) Ministry of Security and Public Administration replaced 192 traditional crossroads with roundabouts across Korea. The project led to a 42% reduction in accident fatalities from the year before the installation to the year after. The effect arose purely from the change in the crossroads design, without complementary measures that might result in drivers adjusting their behaviour and create additional safety benefits. Similar evidence from other OECD countries supports the positive impact of roundabouts on traffic safety. Roundabouts might not be a solution for all dangerous crossroads, but evidence shows that they can make many hotspots safer. The impact assessment that followed the project was conducted by KOTI and concluded that the installation of roundabouts was also cost-effective. Travel speeds for crossing cars increased by 20% and the time it took to cross fell by 30%. Monetised and combined, the benefits of the 192 roundabouts added up to more than three times the cost of installation.

Regular safety-related maintenance can help avoid casualties

A variety of structural deficiencies in traffic safety facilities – often minor problems that can be remedied by basic maintenance – contribute to accident risk and severity. Among the accident costs in the areas with the worst traffic safety performance, absent or improper traffic signs or pavement markings and obstacles to drivers' visibility contributed the two largest amounts of total injury-related accident costs, jointly accounting for nearly one-quarter of these costs. Addressing traffic-safety related structural deficits of roads is costly – estimates suggest KRW 2 million (about USD 1 700) per kilometre of road – but, compared to the cost of new road construction the price is trivial, accounting for less than 0.05% of the price for a kilometre of new road.

Traffic risks are significant for pedestrians, in particular for elderly pedestrians

Pedestrians are less protected than occupants of cars or even motorcyclists. This results in more severe injuries in accidents, especially among the elderly, statistically the most vulnerable group of pedestrians. Injury-related accident costs in accidents involving a collision between a pedestrian and a motorised vehicle accounted for more than half of the total costs among the elderly, while for other age groups the amount was less than one-third. The difference arises both because relatively more elderly people are victims in such accidents and because the injuries they sustain tend to be more severe than the injuries of younger victims.

Safety risks arise from both private and professional drivers' behaviour

Pedestrians are at risk in accidents involving both private and professional drivers. Collisions between public utility vehicles – buses for the most part – and pedestrians accounted for nearly 12% of the total injury-related accident costs and collisions between passenger cars and pedestrians for about another 8%. Overall, drivers' negligence, a disregard for traffic signals and violations of priority orders accounted for almost two-thirds of injury-related accident costs. Negligence is the main cause of accident cost for both private and professional drivers, nearly 17% of total costs for passenger car collisions and nearly 15% for buses arose in accidents where the driver failed to maintain focus on safe driving. A factor contributing to risky behaviour and a disregard for traffic laws are the regulations on driver licensing. After the streamlining of driving licence tests in 2011, reducing the requirements for obtaining a licence, the percentage of car accidents where the driver had less than one year of experience increased, reversing a declining trend that had lasted for more than three years.

Protecting all road users requires rethinking speed limits and seatbelt regulations

Speed limits in Korea's urban, and especially in its residential areas, are high by international standards. While Korea maintains a general speed limit of 60 km/h, most OECD countries set the maximum at 50 km/h, with several cities moving towards 30 km/h in a large part of the city and especially in residential areas. A plethora of evidence suggests that the severity of accidents and the number of traffic fatalities, especially among pedestrians, increases significantly the higher the vehicle speed at the time of collision. A pedestrian hit by a car is more than four times as likely to be fatally injured in collisions where the car travels at 50 km/h than when the car's speed is 30 km/h or less. To reduce fatalities and protect pedestrians, Korea should consider readjusting its speed limits, especially in residential areas.

The empirical evidence shows clear benefits of wearing seatbelts in reducing the number of fatalities in traffic accidents. In Korea, wearing a seatbelt is mandatory in the front seats but not in the back. The seatbelt wearing rates in Korea are the lowest among OECD countries with available data, both for front-seat passengers and for passengers sitting in the rear of the car. Less than 80% of front-seat passengers were wearing a seatbelt in 2013 and less than 20% – one in five – rear-seat passengers were belted in. Stricter enforcement of seatbelt wearing regulations and an extension of mandatory seatbelt wearing for rear passengers will save lives.

It may take only a few agencies to build a road, but many more actors to make it safe

Governance arrangements have not kept pace with road safety challenges in Korea

The magnitude of road safety challenges in Korea stands in stark contrast to the country's current top policy priorities and governance arrangements. While the number of road traffic casualties per 100 000 inhabitants remains well above OECD average, road safety is not a top political priority in Korea, whereas several OECD countries have engaged in road safety promotion at the highest level of government (e.g. the President of France, the UK Prime Minister). In contrast, key high-level bodies that used to co-ordinate road safety programmes and projects across the government have been abolished or restructured in Korea. This is all the more regrettable given that past attempts to improve the co-ordination of road safety activities in Korea have been followed by strong improvements in road safety performance. In particular, the designation of “school zones” to protect children's safety was followed by a significant reduction in child road fatalities. Overall traffic safety improved with the creation of an inter-ministerial Task Force for Safety Management Improvement in the prime minister's office in 1999, which was followed by a decrease in deaths caused by road accidents by 29.4% between 2000 and 2003.

Governing the road infrastructure network in Korea involves a variety of actors at different levels

As in other OECD countries, the road network in Korea is composed of different types of roads, which are managed and financed by different levels of government and institutions. The Ministry of Land, Infrastructure and Transport (MOLIT) is the main authority in charge, while subnational governments are responsible for provincial, metropolitan and local roads, as well as national highways that go through cities. Korea has also developed an extremely sophisticated public investment management system (called the Total Project Cost Management, TPCM) that combines close monitoring from the Ministry of Strategy and Finance and independent expert assessment from the Public and Private Infrastructure Investment Management Centre (PIMAC) within the Korea Development Institute (KDI).

Responsibilities for road safety remain highly fragmented, with unclear accountability

While road safety *planning* is co-ordinated by MOLIT, the responsibility for road safety activities is shared across a much wider variety of actors. When examining road safety activities in Korea through the prism of the “3Es” model (engineering, enforcement, education), in broad terms, “engineering” is addressed primarily by MOLIT, supported by its affiliated organisation, the Korea Transportation Safety Authority (KoTSA); “enforcement” by the National Police Agency, supported by its affiliated organisation, the Korea Road Traffic Authority (KoROAD); and “education” by the Ministry of Education – together with other stakeholders, ranging from additional ministries and agencies to subnational governments and civil society organisations. The fragmentation of actors undermines the chances of achieving the ambitious target set by the Korean government of reducing the number of road deaths by 45% between 2010 and 2016.

Although there is a plethora of commissions and task forces pulling together strong knowledge from experts, the link from such knowledge to policy action is largely missing. Besides KoTSA and KoROAD, as well as highly specialised research institutes such as the Korean Transport Institute (KOTI), several other advisory bodies have been established recently. However, the extent to which the various measures recommended by these commissions will be taken into account in actual policy implementation remains to be seen.

A supra-ministerial, multi-level co-ordination mechanism for road safety can help achieve Korea's ambitious traffic safety targets

Korea needs a much stronger and more visible political commitment for road safety to gain traction. Achieving further progress in road safety performance requires the creation (or rekindling) of a strong “control tower”, tasked with an official mandate to co-ordinate policies and funds among the different stakeholders beyond vested interests. This control tower does not need to centralise all activities related to road safety by itself, which would in any event be unrealistic given the complexity of the tasks involved. The role of the control tower would rather consist of championing a clear, shared line of action across levels of government, avoiding the waste of scarce public resources in duplicated activities, and encouraging partnerships for creating a safer road culture. A variety of organisational models can be found throughout OECD countries. In Korea, building on the encouraging results of its past experience with the Safety Management Improvement Task Force under the prime minister and re-adjusting it to today's needs might offer a promising option – rather than creating yet another new agency that would compete with existing authorities in an already crowded institutional landscape.

Road safety requires a reliable and effective source of funding ...

A key task for improving the effectiveness of road safety measures in Korea is to ensure a reliable source of funding. Institutional fragmentation is also reflected in financial fragmentation, as there is no unified budget for road safety activities in Korea. Each ministry that conducts road safety activities submits its own budget proposal to the Ministry of Strategy and Finance, which reviews the various requests and allocates corresponding resources. A sizeable share of the budget goes to wages rather than to the financing of specific projects for road safety. It would therefore be particularly desirable to establish a clear distinction between the operating costs (including wages) and investment costs (for concrete programmes and projects). At the subnational level, financial and human resource constraints are even more salient, particularly in smaller municipalities and rural areas. Accident hotspots, i.e. municipalities with the worst traffic safety record, are on average, raising less of their budget locally and are more reliant on central governmental transfers. Given the limitations on their budget, traffic safety is unlikely to be a spending priority in these areas. Targeted spending might require earmarked support to align policy priorities.

...and efforts to increase public support for a more effective traffic law enforcement system

A recurring argument is that one of the root causes of the high number of traffic fatalities in Korea is linked to people's generally poor level of adherence to traffic law and to a reckless culture of speed (both among drivers and pedestrians), together with a

general lack of incentives for enforcement of road safety legislation. As in any other country, it is likely that strengthening traffic law enforcement will attract heavy criticism from many parts of the society. Traffic law violations are often regarded as minor compared with more “urgent” tasks of the police and traffic enforcement activities may be accused of unduly distracting from the fight against more important crimes. It is essential to anticipate such arguments and to proactively build public support for traffic law enforcement.

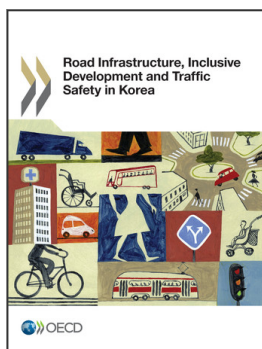
Best practice upfront project assessments should be followed by rigorous ex-post analysis...

An important question for any investment is: what are its (net) benefits? Especially for large scale investment projects, like road infrastructure, a clear understanding of the potential benefits, the costs and the risks involved are essential for decision makers. The Korean public investment management system is very much in line with the OECD Recommendation on Effective Public Investment and in particular the upfront assessment of long-term impacts and risks of public investment are considered “best practice”. An important part of this system is one of the most rigorous independent assessments of large scale public projects across the OECD, the preliminary feasibility study (PFS). The PFS combines economic, policy and an analysis of the impact on regional balance. Comparability is high as the same standards apply to all projects. Its strong gatekeeper function sets incentives for carefully selecting and preparing projects that are submitted for funding approval. Less than 50% of projects were deemed “feasible” between 2000 and 2004, but about 75% gained approval between 2010 and 2014.

Rigorous ex-post evaluation of policies, i.e. an evaluation after the policy has been implemented, allows policy makers to identify successful strategies and optimise their limited resources. Evaluation can guide programme selection, but also guide adaption or reforms of existing programmes to improve efficiency or effectiveness. Ex-post evaluation in Korea focuses on the output created by the investment and the bid compliance of the implementing company, but assessing outcomes – the results associated with investments or policies – is essential to understand and refine policies and help communicate their impact. The impact assessment for the construction of 192 roundabouts in Korea provides an unambiguous picture of their safety benefits that can support strong policy messages. In some cases it may even lead to evidence-based abrogation of the policy. Evaluation can help uncover externalities, additional outcomes or affected populations that were not considered – or even unforeseeable – in the initial policy design. The results can also support and refine ex-ante evaluation methods by providing a clearer picture on the functioning of the policy.

... and build on a strengthened and expanded collection of road safety data

Korea has already taken successful steps to improve its traffic safety database by integrating the data from the National Police Agency, insurance companies and mutual aid organisations. However, opportunities to increase the data coverage and deepen the understanding of accidents and their causes and consequences remain. Other databases that could be cross-exploited include the Death Cause Statistics and independently maintained hospital databases concerning people who were admitted to hospitals.



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