POLICY NOTE

DERIVING POLICIES FROM LAND USE–TRANSPORT INTERACTIONS FOR SUSTAINABLE HIGH-SPEED RAIL DEVELOPMENT IN ASIA

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KEY POINTS

Over the 6 last decades, countries around the world have made significant investments in high-speed rail (HSR) systems. This policy note promotes new research to resolve questions related to the interaction between land use and transport that arise during HSR development. We highlight seven topics in particular:

(i) How does mode choice model at the national scale, taking into account the impact of HSR at the country level rather than on single corridors?

(ii) Over short distances HSR can foster the formation of megacities. The current literature has done very little to quantify this phenomenon. It will be useful to estimate a theoretical model to explain the mechanisms through which metropolitan areas integrate into megalopolises, and to identify the role of HSR systems in this respect.

(iii) The link between HSR systems and the tourism market is a hot topic still in need of research in terms of modeling to clarify how HSR affects the tourism market.

(iv) How does HSR impact temporary office location choice?

(v) This policy note also promotes the analysis of the effects of long-distance rail accessibility, such as HSR, on the property market.

(vi) What is the link between HSR systems and equity issues?

(vii) As stakeholder engagement in HSR evaluation projects is neglected, guidelines for quantifying the costs and benefits of stakeholder engagement in HSR projects should be provided.

We hope that the academics, researchers, and consultants involved in the study of HSR systems will benefit from reading this policy note and will help develop new models and strategies to answer the questions outlined above.

Keywords: mode choice models at a national scale, megalopolis formation, tourism market, temporary office location choice, property market, equity issues, stakeholder engagement

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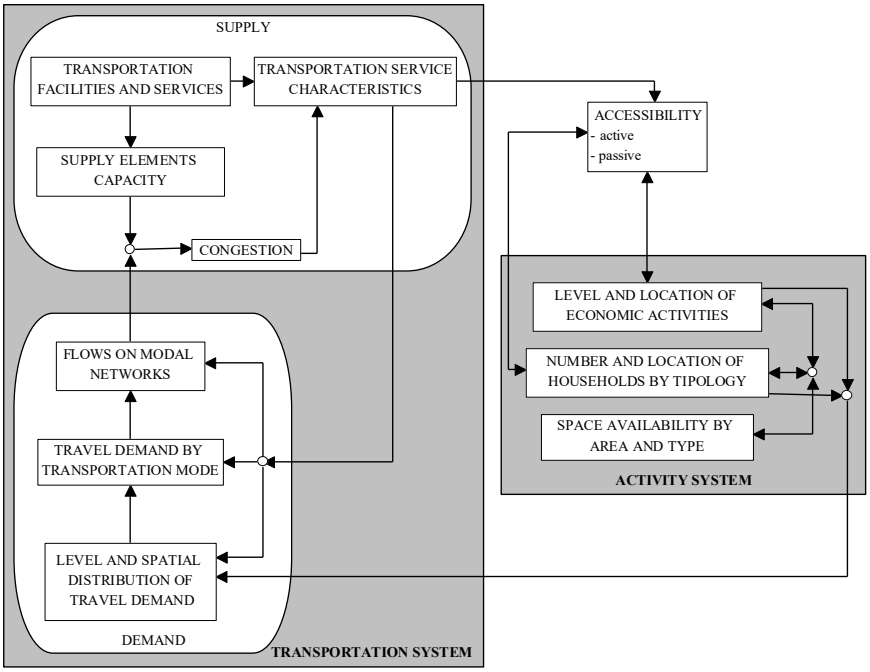
1. INTRODUCTION

The Asian Development Bank Institute (ADBI) hosted a conference on the spillover effects of high-speed rail (HSR) and quality of life in November 2018 in Tokyo, and five special sessions on transport and quality of life at the 15th World Conference on Transport Research (WCTR) during 26–31 May 2019 at the Indian Institute of Technology in Mumbai. Also in 2019, ADBI in association with the WCTR Society formed a special interest group on High-Speed Rail: Policy, Investments and Impacts to address the need for emerging research on HSR policy. Together, the conference and special sessions highlighted critical issues and delivered key messages on broad research on HSR and quality of life. ADBI also published selected papers from these activities in the *Handbook on High-Speed Rail and Quality of Life* released during the Virtual Conference on Transport Infrastructure Development, Spillover Effects, and Quality of Life in March 2020. During May–June 2020, ADBI in association with the WCTR Society special interest group and Chubu University hosted a series of three webinars on HSR, illustrating and discussing a wide range of pertinent topics for future research, such as land-use and transport interactions with HSR, sustainability and resiliency of transportation and living work systems in the context of the coronavirus disease outbreak, and spatial scenarios for the European Union 2050. Following the rich and diverse discussions during these webinars and to envision future directions for research, this policy note highlights new research topics and as well as the need to address unresolved questions related to land-use and transport interactions in the development of HSR.

2. INTERACTIONS BETWEEN THE TRANSPORTATION AND ACTIVITY SYSTEMS

Urban systems include households, workplaces, services, transportation facilities, and regulations. Several subsystems include the activity and transportation systems (Cascetta, Pagliara, and Papola 2007; Cascetta 2009) (Figure 1). The activity system of an urban area can be further broken down into several subsystems consisting of households divided by category, economic activities divided by sector, floor space available for various uses, and the corresponding property prices.

Figure 1: Relationship between the Transportation and Activity Systems



Source: Cascetta, E. 2009. *Transportation Systems Analysis: Models and Applications*. New York: Springer.

The characteristics of transportation services depend on the transportation supply, comprising facilities, services, regulations, and prices, which induce travel opportunities. Transportation

performance influences the relative accessibility of different urban zones by determining for a given zone the “cost” of reaching other zones (“active” accessibility), or being reached from other zones (“passive” accessibility), both of which influence the location of households, economic activity, and the property market (Cascetta 2009).

The same interactions can be adapted at the regional and national levels. The transportation facilities and services dealt with in this policy note relate to HSR systems.

Over the last 6 decades, countries around the world have made significant investments in HSR systems (Pagliara 2014a). Spending public money to construct HSR lines yields several benefits, such as time savings, increased comfort, induced demand, and reduced congestion, as well as wider economic benefits such as the development of less developed regions (Pagliara 2016). In pointing out the huge need for infrastructure investment in Asia and the Pacific, Yoshino, Xu, and Seetha Ram (2020) also argue that there is a large investment gap in terms of financing from tax revenues in many regions of Asia and the Pacific. In addition to this large need for infrastructure and public financing bottlenecks, there is also a dearth of studies that estimate the economic impacts of such investments.

This policy note aims to resolve certain questions related to the analysis of the impacts of HSR systems on activity systems. It is meant to help academics, professionals, and consultants promote further research on interactions between HSR systems and activity systems.

3. EX-POST EVIDENCE FOR MODE SUBSTITUTION AND INDUCED DEMAND AFTER THE INAUGURATION OF HIGH-SPEED RAIL

High-speed trains can be used to solve two different accessibility problems. First, where a point-to-point link is dominant, each train can be a substitute for an air connection between two cities, by connecting cities or central business districts over long distances via a direct train connection. The high-speed train links between Paris and Lyon, Paris and London, Tokyo and Osaka, and Madrid and Barcelona are examples of this type of train connection (Pagliara, Vassallo, and Román 2012). “In this case the train trip together with access and egress times should be compared with the competing solution which consists of the air trip plus the trip to the airport at the trip origin and the trip from the airport at the trip destination” (Pagliara, Vassallo, and Román 2012: 636). Second, in countries with a dominant high-speed network, the train system links together many cities and central business districts, creating a new type of region with high intra-regional accessibility sharing a common labor market and common market for household and business services. In this case, the high-speed train binds cities together in a band, with each pair of cities at a time distance of 20–55 minutes from each other, which enables daily commuting.

Givoni and Dobruszkes (2013) focus on mode substitution and induced demand effects on specific HSR corridors from Europe to Asia. Their review analyzes the ex-post demand for HSR services, of which 10%–20% was induced demand for HSR a few years after inauguration, with the rest attributed to mode substitution. In most cases, the majority of HSR passengers had previously used conventional rail, and substitutions from aircraft, car, and coach traffic were generally modest.

This work clearly demonstrates that the literature lacks contributions that look at national-scale models. One exception is the case of Italy. Cascetta and Coppola (2017) provide an overview of the dual effects of the inauguration of the new HSR line, with a single state operator (Trenitalia) between 2010 and 2012 and the entry of a new private operator, NTV (Nuovo Treno Viaggiatori), in 2012. This case is unique because before and after effects on supply, demand, and prices were reported, making it possible to analyze the evolution of new HSR services on the multimodal intercity travel market, and evaluate the competition within a typically monopolistic market. An integrated modeling system was developed to assess the effects of timetables, services, and prices in terms of HSR, and the analyses used competing modes (air, automobiles, and railway).

Researchers should estimate national-scale models instead of models on single corridors, to take into account the effects of the entry of HSR on the whole country. This policy note suggests this as

a future line of research that should be promoted and encouraged among academics, researchers, and consultants.

4. HIGH-SPEED RAIL SHRINKING SPACES, SHAPING PLACES: HIGH-SPEED RAIL AND MEGALOPOLIS FORMATION

Cities are pushing beyond their limits and merging into new physically and economically linked conurbations called megalopolises. The implementation of HSR lines plays an important role in reshaping people's travel patterns and activities, and consequently changing how cities develop (Pagliara et al. 2013). Indeed, HSR systems have also fostered the promotion of economic growth and regional development in many countries. A megalopolis is an integrated economic urban complex created by the fusion of multiple cities connected at high speeds (200–300 kilometers [km] per hour). Megalopolises can have many positive economic impacts stemming from larger labor markets, larger commercial markets, and expanded individual daily activity zones, among others (Sussman 2011). HSR can change the geography of a country, bringing regions and cities closer to each other by increasing accessibility. These benefits in turn can be the basis for promoting economic development, justifying the high cost of HSR investments.

For Japan, Kobayashi and Okumura (1997) propose a dynamic multi-regional growth model simulating the dynamic processes of economic development of city systems. This economic system consists of multiple cities interconnected by HSR systems, with each city comprising one production sector as well as residential land use. The model emphasizes how differences in the geographic and qualitative factors of HSR systems could affect regional economic development.

Perl and Goetz (2015) identify three models of HSR deployment: (i) exclusive corridors (e.g., Japan); (ii) hybrid networks, both national (e.g., France and Germany) and international (e.g., the European Union); and (iii) comprehensive national networks (e.g., the People's Republic of China [PRC] and Spain). In the first model, HSR systems serve as corridors 480–560 km long connecting two megacities. The second model is a "hybrid system that blended high speed travel across new dedicated trunk line infrastructure together with operation at conventional speeds along interconnected branch lines shared with regular trains" (Perl and Goetz 2015: 135). This hybrid strategy multiplies the number of origins and destinations that can be served by HSR. The third model serves major cities and mid-sized communities across countries such as the PRC and Spain. In the PRC, four east–west and four north–south HSR lines connect many large cities, covering routes up to 1,600 km long.

Ureña et al. (2009) propose large intermediate cities along HSR lines, and examine HSR's capacity to change time distances and accessibility. They highlight the role of HSR in promoting new opportunities for Cordoba and Zaragoza in Spain, and Lille in France. Introducing regional HSR services transformed the connections and time distances from certain smaller cities to metropolitan areas and large intermediate cities. This contribution demonstrated the power of HSR to change the balance and hierarchy of the established city system, by improving the regional centrality of large intermediate cities with respect to certain smaller regional cities.

Zheng and Kahn (2013) claim that the PRC's bullet trains play a significant role in the development of the country's growing megacities, which are facing several different problems. High levels of traffic congestion and pollution are primary factors degrading quality of life. Transportation technology that allows individuals to access a megacity without living within its boundaries provides large benefits by enabling people to enjoy the advantages of urban agglomeration, without paying megacity real estate rents and urban social costs. In 2007, the PRC introduced bullet trains connecting megacities such as Beijing, Shanghai, and Guangzhou with nearby cities. By facilitating market integration, bullet trains could stimulate the development of second- and third-tier cities, and help protect the growing urban population's quality of life.

Ross and Woo (2012) analyze the HSR programs proposed by the United States Department of Transportation's Federal Railroad Administration, and find that most HSR routes with high investment priority are located within mega regions and across state boundaries. They also find that the released federal HSR programs take multijurisdictional interactions into account when allocating

HSR funds. Their results imply that megaregions are an appropriate scale for developing HSR in terms of the benefits and effectiveness of implementation.

However, there is still a lack of studies concerning the building of a framework for understanding and exploring the relationship between the phenomena of megalopolis formation and HSR, and determining the possibility and magnitude of associated impacts on regional development. This is a real challenge! It is necessary to introduce new variables, such as commuting flows between two cities served by an HSR section or proxies therefor, such as the number of tickets sold. Other variables to be included are changing property prices and salaries in the two destinations served by an HSR line. HSR creates new value. This policy note suggests this as a future area of study by researchers, academics, and consultants, to better model the phenomena of HSR and megalopolis formation.

It is necessary to estimate a theoretical model to explain the mechanisms through which metro areas integrate into megalopolises and to understand the role of HSR systems in this respect. Pagliara (2020) attempted to estimate, where two corridors (the Milano–Torino line, in the north of Italy and Roma–Salerno line in the south) have been chosen, regions that have high potential to become megalopolises supported by HSR. The model estimation provides interesting results that highlight the need to plan on a new spatial scale with new boundaries and linkages.

5. THE IMPACT OF HIGH-SPEED RAIL SYSTEMS ON THE TOURISM MARKET

The transportation industry is a global industry that aims to move passengers and freight as efficiently as possible (Delaplace et al. 2014b). It is often observed that a country with a good transportation system can be considered a tourist destination. Increased accessibility to a given tourist destination thanks to new interventions in the transportation system is an important factor in tourism development. The introduction of new technologies in the transportation system, such as HSR systems, has benefited the tourism market in terms of increased tourist flows.

Some examples of international studies that investigate the link between HSR and the tourism industry are Khadarooa and Seetanah (2008); Chen and Haynes (2012); Coronado et al. (2013); Kurihara and Wu (2016); Pagliara, Mauriello, and Garofalo (2017b); and Pagliara and Mauriello (2020). In general, tourists perceived decreased travel time brought about by HSR as a good reason to choose a destination connected with this service (Delaplace, Pagliara, and Aguilera 2014; Pagliara 2014b; Pagliara 2014c; Pagliara, Delaplace, and Vassallo 2015a; Pagliara et al. 2015b). Kang, Kim, and Nicholls (2014) examine the changing distribution of domestic tourism in the Republic of Korea in 1989–2011, and find that, while domestic tourism activity became less concentrated at the macro level during this period, at the micro level this de-concentration clearly occurred in a clustered manner. Thus, while the traditional emphasis on Seoul and the southeast appears to have declined, tourism benefits are still unevenly distributed.

Examples of transport infrastructure investment have been scrutinized to investigate the spillover effects of infrastructure investment and provide a deeper understanding of these effects. The first applies the difference-in-difference method to a highway project in the Philippines (Yoshino and Pontines 2015), and the second to an HSR project in Kyushu, Japan (Yoshino and Abidhadjaev 2016).

To clarify the impact of the Shinkansen network extension on tourism development in Japan, Kurihara and Wu (2016) investigate changes in tourism demand and tourist behavior in the Tohoku and Kyushu regions. The results suggest that tourist arrivals increased significantly in cities connected by the extended Shinkansen network. Moreover, shorter distances from an HSR station resulted in increased tourism demand to a given destination. The simultaneous operation of Shinkansen and scenic trains would significantly increase tourism demand.

The link between HSR systems and the tourism market is a hot topic at the international level, and there is still much to do in modeling this relationship to understand how HSR can affect the tourism industry. This policy note encourages research in this direction (Yoshino et al. 2016).

6. THE IMPACT OF HIGH-SPEED RAIL SYSTEMS ON TEMPORARY OFFICE LOCATION CHOICE

The international literature has not yet modeled the impact of HSR on temporary office location choice.

> In Italy, HSR nodes have become centres for services and urban renewal. The HSR stations in the major metropolitan nodes of Turin, Milan, Bologna, Florence, Rome and Naples have been renewed or built by well-known architects. Stations are considered as protagonists of significant urban redevelopment operations and the expression of a new architectural language, and conceived as spaces not only dedicated to railway activities, but also meeting and communication places. The restyling of Rome Termini and more recently of Milan Central stations are pilot projects of the new way of interpreting stations as city squares. (Delaplace et al. 2014a)
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> The renewal of Milan Central, centre of urban mobility and a real gateway to the city, also for future visitors to Expo 2015, marks a milestone in the expansion of regional and metropolitan transport and exploits the role of the station as a junction for the new High Speed/High Capacity lines. In Naples, the new HSR station, designed by Zaha Hadid, built in the municipality of Afragola, will be integrated with the major roads and regional railway lines. The four-level building will take up 20.000 m^2 and Afragola will be a strategic node for local and international traffic and it will be a fundamental junction point for the Naples – Bari line. (Pagliara, Delaplace, and Cavuoto 2016a)

In France, central stations have also been renewed and in some cases new ones built outside the city center. For example, in the southeast of the country, renewal of stations that serve only a couple of daily stops has been minimal, whereas in some bigger cities with very good services, the central station has been completely renewed (e.g., Dijon and Chambéry) or a new one built (e.g., Lyon Part-Dieu). In the southwest of the country, a new Novaxis business center has been built near the HSR station (Bazin, Beckerich, and Delaplace 2009). Along the LGV Nord High-Speed Railway, a new TGV station and business center, EuraLille, have been built near the existing rail station. More recently, in the case of the East European High-Speed Line, new stations have been built near the city (e.g., the Champagne-Ardenne station) or outside the city (e.g., Meuse TGV and Lorraine TGV). In bigger cities like Reims, Metz, and Strasbourg, the central stations have been renewed to make them “new places” in the city.

Several authors have studied the influence of an HSR system on firm location. Pagliara, Delaplace, and Cavuoto (2016a) submitted a questionnaire to clients of the Regus business center, which is on the sixth floor of a modern, 16-story building in the HSR station in Naples, Italy, to determine their socioeconomic profile and travel choices. In this case, temporary offices inside the HSR station were rented, not only by mobile workers (i.e., those without a headquarters), but also by local workers, thus confirming the new trend of working at a third place near home.

This policy note suggests that there is still much work to do in this direction. Moreover, the current coronavirus disease pandemic will foster this trend since more and more workers will need to have meetings in a safe place.

7. THE IMPACT OF HIGH-SPEED RAIL SYSTEMS ON THE PROPERTY MARKET

Most studies looking at the impact of rail accessibility on property prices analyze local transit networks. In many Asian countries such as Bangladesh, India, Indonesia, and Thailand, land acquisition is a main issue in infrastructure development that delays the completion of projects and lowers the rate of return of private investment. For instance, 30 years ago Japan had planned an HSR project linking Narita Airport with Tokyo city center; this has not yet been implemented (Nakamura et al. 2019).

Very few studies have looked at commuter rail. Of these, Armstrong and Rodriguez (2006) estimate the local and regional accessibility benefits of commuter rail services in eastern Massachusetts, controlling for proximity-related negative externalities and other confounding influences. They used

geographic information system tools to measure both multimodal accessibility to commuter rail stations and distance from the rail right-of-way. Although the overall results were inconclusive, they did show that proximity to a commuter rail right-of-way had a significant negative effect on property values, because of local noise and crime effects. In Izmir, Turkey, Celik and Yankaya (2006) claim that investments in commuter rail have altered the land rent gradient in the vicinity of railway stations. They contend that their empirical results convinced decision-makers in developing countries that railway and transit investments could provide additional economic value beyond direct ticket revenues.

While the literature apart from these studies is very scarce, some information can be collected from websites and reports. For example, Spain's HSR network (Alta Velocidad Española [AVE]) played a significant role in pushing up property prices throughout the country. To prove this theory, a house price index was developed showing that property prices in towns and cities served by AVE stations outperformed their provincial averages. For example, house prices in Málaga, served by the AVE line, were 24.7% more expensive than in Andalusia and 23.7% higher than the national average. Prices in Seville and Córdoba also showed a similar trend, where properties were within easy reach of AVE stations. People liked living close to transportation, particularly fast and convenient services such as high-speed trains (Trains for America 2008).

Kantor (2008) states that the introduction of HSR in California's Central Valley will necessarily lead to higher property values as such real estate becomes more desirable. Both commercial and residential values are predicted to experience positive price appreciation as businesses move to Central Valley areas conveniently served by HSR, thus putting upward pressure on existing land and housing stocks. However, members of the California High Speed Blog, who oppose HSR, believe that HSR will cause their property values to crash, and that the government should prioritize protecting their current property values.

Improved accessibility and the changing image of HSR stations can boost property prices in the vicinity of the station. However, very few studies have analyzed the effects of long-distance rail accessibility on real estate prices. Andersson, Shyr, and Fu (2010) demonstrate that the opening of an HSR line in early 2007 decreased travel times along Taipei,China's west coast. Investments in transportation infrastructure affected land price patterns, in Taipei,China as well as elsewhere. Regional accessibility and land value maxima shifted from ports and harbors to emerging downtowns around urban stations.

Another case study is the HSR stations of St. Pancras and Stratford in the Camden and Newham boroughs of London, where house prices within walking distance of the station increased. Martinez, Pagliara, and Tramontano (2013) used hedonic price theory to derive a new formulation by assuming that bids for dwellings follow the extreme value Fréchet distribution.[1] They then compared the proposed formulation (assuming that land is auctioned to the highest bidder) against other usual formulations in the literature to estimate the land price impacts of improved accessibility brought about by the HSR station in the area surrounding the station.

For future research, this policy note encourages an analysis of the effects of long-distance rail accessibility, such as HSR, on the property market. Indeed, there is still much to do.

8. HIGH-SPEED RAIL AND EQUITY ISSUES

Spatial accessibility is a measure of spatial equity and can be represented by the ease of traveling from an origin to a given destination via a given mode or set of transport modes (Pagliara et al. 2016b; Biggiero et al. 2017). The positive social impact of HSR is represented by increased accessibility and the movement and activities of commuting HSR users. HSR improves work trips by providing fast train connections between major cities. On the other hand, users unable to afford HSR

[1] The hedonic pricing method is a method for estimating the market value of certain characters or services, based on market prices of goods that incorporate (isolating with multivariate regression techniques) the contribution of a given attribute to the observed price.

or who live far from stations can be socially excluded and have difficulty finding better jobs (Pagliara and Biggiero 2016; 2017).

Pagliara et al. (2017a) investigate the current situation of non-HSR users in Italy, Spain, and the United Kingdom as well as the factors preventing them from choosing this service. A relationship between social exclusion and HSR was evident, especially in terms of economic and geographical exclusion (due to, for example, the cost of an HSR ticket and low accessibility of the departure and/or arrival station). The fact that low-income travelers were greatly impacted by both criteria was matched with the location of the residences of these classes of travelers. Specifically, with respect to the higher cost of their residences, it was clear that those with higher incomes lived in city centers, which are usually served by good public transport and taxis.

In the current international literature there is a lack of contributions on the link between HSR systems and equity issues. This policy note highlights several unresolved questions, and identifies the following topics as items of special interest that should be developed further:

(i) the concept of social equity in long-distance HSR;

(ii) the socioeconomic profile of HSR users;

(iii) factors excluding non-HSR users from choosing HSR as an alternative transport mode;

(iv) the relationship between HSR and social equity;

(v) HSR pricing policies preventing non-HSR users from choosing this transport mode;

(vi) whether destinations not served by HSR are excluded from the possible development of tourism and other growth factors;

(vii) whether the introduction of more than one railway company competing on the same HSR network (such as Trenitalia and NTV in Italy) can improve social equity; and

(viii) policies to make HSR available to all socioeconomic users (such as new investments in low-cost HSR systems, such as Ouigo).

Surveys and methodologies supporting this investigation should also aim to inform investors in these systems. Before investing large amounts of money in a new HSR infrastructure, investors should ask, who will the users be? Does this infrastructure exclude certain socioeconomic categories, such as low-income people, immigrants, and women?

Italy today presents a unique example of market competition in the HSR sector (Cascetta and Coppola 2015). The history of the liberalization of the Italian HSR market began with the European directive CEE 440/1991 (implemented in Italy under the acts DPR277/1998, DL146/199, DL188/2003), which aimed to develop the European railway network. Although only the European First Railway Package (2001) was regulated, this legislation separated the management of rail infrastructure from the supply of transport services, which until then were under a single ownership. In 1997, in response to the European directive 91/440, the Italian Rail Network (RFI) founded the rail service company Italiana Trasporti Ferroviari, renamed Trenitalia in 2000. In 2001 the Government of Italy established the RFI to manage the railway network (supply-side). In 2007, the Italian law DL162/2007 (in response to the European Second Railway Package) established the National Rail Safety Agency for controlling and regulating use of the RFI. In 2007, the Third Railway Package was introduced (implemented in Italy under Law 99/2009), establishing the right to use the international passenger rail network. With the opening of competition in the rail market, in December 2006 NTV was established with an initial investment of €1 billion and no subsidy from the Italian government, becoming Trenitalia's unique competitor in the HSR market. NTV obtained a railway company license in February 2007 but only supplied the first HSR service in competition with Trenitalia in 2012. Today, Trenitalia runs 213 trains per day while NTV runs 90 trains. This competition has led to a reduction in HSR ticket fares.

9. HIGH-SPEED RAIL SYSTEMS EVALUATION AND STAKEHOLDER ENGAGEMENT

Stakeholder engagement involves stakeholders in the decision-making process to reach a shared and transparent decision on a given intervention. This policy note provides guidelines for transport projects to quantify the costs and benefits of stakeholder engagement, which appraisal analyses have largely neglected. It provides a range of examples of the direct (monetary) and indirect (non-monetary) costs and benefits of stakeholder engagement. Moreover, it provides guidelines for measuring and monetarizing such costs and benefits. These guidelines are a tool for analyzing stakeholder engagement in economic analysis. Broader and more analytical frameworks are necessary to capture participation. Few studies have looked at monetarizing the costs and benefits of stakeholder engagement when assessing the technical and economic feasibility phase.

To the best of our knowledge, only five examples in the published literature evaluate the impact of stakeholder engagement in transport projects using cost–benefit analysis (CBA), and only one (Pagliara and Di Ruocco 2018) deals with its impact in monetary terms.

Jenkins (1999) proposes an integrated financial, economic and distributive analysis with advantages for evaluating both public- and private-sector investments. Specifically, the author identified the role of stakeholders as key components in determining the likelihood of a project's successful implementation, as well as motivating the authorities to consider redesigning the project to have a more favorable impact on the stakeholders. The stakeholder analysis, which was undertaken by comparing the economic and financial outcomes, identified the groups likely to promote a project, and those which would not favor it.

Andersson, Fennell, and Shahrokh (2011) produced a report for Involve, the UK's leading public participation charity, proposing a Consumer Focus Toolkit to understand the value of engagement by looking at the actual costs and benefits of stakeholder engagement. Good-quality stakeholder engagement should be carefully designed to fit the purpose, context, and people for which it is intended. Poorly planned and implemented engagement could undermine the benefits. This toolkit shows how to build the case for engagement using monetary terms. There is much anecdotal evidence in support of stakeholder engagement and some case study evidence showing that the value of engagement, if done well, exceeds the upfront costs. The toolkit can be used for all kinds of engagement, from small-scale, "one off" projects, to major exercises across an entire town or wider local authority area. It is aimed at those who manage, design, deliver, plan, or commission stakeholder engagement projects. However, this toolkit presented no transport project.

Chambwera et al. (2012) define a stakeholder-focused CBA as an extended form of CBA covering the private sector, public sector, households, and (where appropriate) the environment. An analytical framework was proposed with four stakeholder groups feeding into overall decisions about climate change adaptation interventions. The activities considered included stakeholders' involvement in analyzing the costs and benefits of an initiative; reflecting on the costs and benefits ascribed to different stakeholders in the analysis, and assessing the weight that different stakeholder groups placed on different costs and benefits.

Rangarajan et al. (2013) highlight the role of stakeholder engagement in developing sustainable rail infrastructure systems in Missouri, in the United States. A stakeholder engagement process assessed the impact of stakeholders' needs, where data was gathered through interviews, surveys, focus group discussions, and public meetings across the state. The main outcome of this study was that stakeholders had high awareness of the benefits of rail service, especially those with easy access to them. Stakeholders considered the investments for improving rail infrastructure in the state and the benefits that the rail could bring to communities as two important factors that required attention. Several players undertook actions in rail settings, with different costs and benefits accruing to different stakeholder groups (Pagliara and Di Ruocco 2018).

Vignetti et al. (2020) provide an ex-post evaluation of 10 major transport projects cofinanced by the European Regional Development Fund and Cohesion Fund between 2000–2013 and located across nine EU member states. The original contribution consisted of a combination of a traditional ex-post CBA and a qualitative analysis. The authors used a retrospective CBA to quantify the costs and benefits of the projects, and interviewed relevant stakeholders to reconstruct the project history, discover behavioral patterns, and assess any wider non-quantifiable effects. The authors argued that the ex-post CBA, when appropriately implemented and integrated with qualitative evidence, could be a powerful tool for supporting the decision-making process and for identifying policy lessons. Pagliara and Di Ruocco (2018) were among the first to help measure the costs and benefits of participatory activity. They propose an ex-post evaluation analysis for the case study of the HSR Turin–Lyon line, and show that if the costs and benefits of stakeholder engagement had been monetarized and embedded in a CBA, it would have generated a different net present value.

This policy note suggests that governments should

(i) provide guidelines for quantifying the costs and benefits of stakeholder engagement in transport projects, building on a framework where it is embedded in the general transportation decision-making process; and
(ii) develop guidelines for measuring and monetarizing the direct and indirect costs and benefits of stakeholder engagement.

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