Key Points

• The ongoing global shift in supply-chain priorities is certain to boost the pace of Transportation 2.0 and accelerate regional connectivity.
• Success of the Delhi Metro provided impetus for the idea of a wider footprint of urban rail transit projects across India.
• High-speed railway development has been the natural extension of the Japan–India partnership in transport infrastructure development.
• Japan has set the precedent of how development of high-speed corridors can usher in development and prosperity (quality of life), and how that gives rise to further high-speed railway development.
• As India expands its high-speed railway footprint, the emphasis is certain to widen from “Make in India” to “Make for India” tech solutions to suit its unique conditions and topography.
• Asia continues to take the lead in high-speed corridor development; the People’s Republic of China alone has built nearly 30,000 kilometers of high-speed railway network over the last two decades.

Of the People, for the People: Economic Corridors, High-Speed Railways, and Quality of Life in Post-COVID-19 Asia

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Introduction

As the coronavirus disease (COVID-19) pandemic continues to disrupt global economic activity, developing Asia’s gross domestic product (GDP) is now expected to have contracted by 0.7% in 2020. GDP is projected to grow by 6.8% in 2021 (Asian Development Bank 2020). However, beyond these numbers, what is underway beneath the tip of this iceberg offers strong clues on future prospects of trade and transportation development in the region.

What is underway since January 2020 suggests a widespread, accelerated, almost tectonic global shift in strategic preferences that will probably trigger opportunities for logistics and transportation expansion in Asia. The ongoing pandemic has already resulted in unprecedented change in global supply-chain priorities. Much of recent global dialogue has centered on the shift of supply chains from the People’s Republic of China (PRC), the world’s largest manufacturing hub and the country where the COVID-19 virus was first discovered in Wuhan Province.¹ The slowdown of manufacturing in the PRC due to the COVID-19 outbreak is disrupting world trade in its current form and could result in a $50 billion decline in exports across global value chains,² triggering a major rethink along the lines of vertical integration and geographic diversification.

Adding to concerns of COVID-19 spread has been the pressure to decouple the American economy from that of the PRC. We believe this shift in supply-chain priorities is highly likely to boost the pace of Transportation 2.0 (aiming for a safe, sustainable and resilient network of transportation infrastructure development) and trigger further acceleration in regional connectivity, including more robust land and maritime economic corridors, and greater regional cooperation and integration in the direction of stronger transportation-based cohesiveness in the Association of Southeast Asian Nations (ASEAN) and South Asia.

¹ See World Health Organization (2020).
Before proceeding further, it is important to define what we mean by an “economic corridor.” In this policy brief, we will be using the definition offered by the Asian Development Bank (ADB), which states:

Economic corridors connect economic agents along a defined geography. They provide important connections between economic nodes or hubs that are usually centered in urban landscapes. They do not stand alone, as their role in regional economic development can be comprehended only in terms of the network effects that they induce… Corridor characteristics interact dynamically to create patterns of regional economic development.³

Therefore, the phrase includes logistics that support both manufacturing (products) as well as human (passenger) movement, both interacting and cooperating to create a sustainable ecosystem to support development and prosperity where people and cultures can flourish.

Against this backdrop, the significance of high-speed railway (HSR) systems and the need for policy intervention and innovation for building national networks of high-speed rail in Asia was deliberated on at the ADBI–Chubu University Conference on Transportation Infrastructure Development, Spillover Effects and Quality of Life (12–16 October 2020). The virtual conference was attended by a number of eminent international researchers from academic institutions and government organizations, as well as senior officials from HSR-operating companies. It featured research on spillover impact from transportation infrastructure development on the economy, environment, society, and quality of life of countries, with an emphasis on high-speed rail growth.

This policy brief draws on discussions conducted at the session titled Policy and Innovation for Transport 2.0 – Building a National Network of the High-Speed Rail in Asian Countries, held on 15 October 2020. The policy brief analyzes how emerging trends in transport infrastructure development and Transportation 2.0 can be expected to create positive spillover impact on the economy, environment, and society across India and the rest of Asia, with particular focus on expected contribution from high-speed railway networks.

We note that as a leader in HSR development, Japan has set a precedent of how construction and development of HSR networks can usher in an era of development and prosperity (quality of life, or QOL), and in turn, that regional development often gives rise to further HSR corridor development (Hiraishi 2019; Hikasa 2020). The shinkansen (bullet train) is rightfully regarded as an invaluable and indispensable part of Japan's trajectory in mobility and economic growth.

What is also noteworthy is how countries in Asia are expanding the scope of country-to-country partnerships to include intercity transportation and mobility as a tool for growth. A month before he ended his first term as Japan's prime minister in 2007, Prime Minister Shinzo Abe made a landmark address to the Indian Parliament in New Delhi. Quoting the Mughal scholar-prince Dara Shikoh, Prime Minister Abe spoke of the “confluence of the two seas”—the Indian and Pacific Oceans—that were undergoing a “dynamic coupling as seas of freedom and of prosperity.” India and Japan, said the prime minister, shared an interest in and responsibility for providing stability and integration to the region.⁴

Current efforts underway, including the flagship Japan–India partnership in developing the Mumbai–Ahmedabad High Speed Rail (MAHSR) Project in India, are expected to bring in such intended synergies to India and the rest of Asia. This policy brief notes that this trend of plurilateral partnerships in the sphere of mobility and high-speed transportation as a tool for growth is certain to enhance the already growing economic and geopolitical significance of Asia in the global economy, especially in the wake of the COVID-19 crisis.

The Asia Story: Toward the Association of East Asian Nations as a Regionally Integrated Bloc

ASEAN celebrated its 50th anniversary in 2017. The organization has since opened doors to what is now an association that comprises 10 of the 11 countries that make up Southeast Asia. Already considered a loose economic monolith, ASEAN, and particularly nations such as Viet Nam, has also provided global examples in effective handling and control of the COVID-19 outbreak.

⁴ See Ministry of Foreign Affairs (2007).
In terms of potential, even excluding the PRC and India, emerging Asia’s contribution to world growth today already exceeds that of the US and is three times greater than that of the euro area. In a world of stagnating growth, the contrast between western nations and emerging Asia stands out. According to a recent report, Asian economies are expected to grow by at least 7% in the coming years—roughly the pace at which an economy can double in size every decade. The region’s likely “7% club” members in the 2020s include India, Bangladesh, Viet Nam, and the Philippines (Jha 2019).

With a focus on connectivity (physical, institutional, and people-to-people), Japan has been a steady partner of the region for the development of land and maritime economic corridors. An economic corridor is much more complex than a mere railway or highway connecting hubs. It involves the crafting of benchmarks and regulations that comprehensively make it easier to do business, access markets, and conduct activities that support trade and development.

While great strides have already been made, in order for ASEAN countries to further develop and deepen integration, it is necessary to concurrently strengthen connectivity within ASEAN member states and between ASEAN and the rest of Asia. The Japan International Cooperation Agency (JICA) has been the foremost proponent for this initiative and has been aligning itself with ASEAN’s various policies for deepening connectivity. It has also been consistently providing support for infrastructure development, investment climate and business environment improvement, and legal systems development (Yamamoto 2020).

The impact of key JICA-supported transportation infrastructure projects in ASEAN so far has been impressive. For example, the opening of the Second Mekong International Bridge of the East West Economic Corridor has shortened the travel time between Hanoi and Bangkok from two weeks (by sea) to just three days by land. This is a groundbreaking advance and a welcome step forward for the overall region.

Today, in spite of and maybe even in part spurred by the consequences of the COVID-19 induced crisis, Asia is marching on a steady path toward regional integration and enhanced connectivity. Emerging market economies, including India, make up more than a quarter of world GDP at market exchange rates. Sustained economic growth of the Asian economies (other than the PRC) in the post-COVID-19 world is certain to open further doors for the development of infrastructure in the region, which has unfortunately lagged behind its commercial potential.

India and High-Speed Corridors: An Idea That Meets Its Moment?

Background: Why the Shinkansen?

Why Now? Why India?

The Japan–India relationship is recognized as Asia’s fastest-growing bilateral partnership. Even before the collaboration in the area of high-speed railways, we have the example of stellar partnership in the Delhi Metro, one of the most successful examples of Japanese cooperation through the utilization of its official development assistance (ODA) model of assistance.

The Delhi Mass Rapid Transport System Project (Delhi Metro) truly met the need of the hour. New Delhi is one of the world’s largest cities in terms of spread. Traffic congestion is immense, and until 2002 when the first metro trains began operating, the only railways in the populous capital city were long-distance broad-gauge lines linking it to the rest of India. It is a modern miracle that a project the size and scale of the Delhi Metro was completed within the planned timelines and budget. (Phase 1 started in 1996; the project is currently in Phase 4.) The metro in Delhi has also tremendously improved lifestyle and transportation options for residents.

The success of the Delhi Metro additionally provided valuable impetus for an enthusiastic embracing of the idea of a wider footprint for urban rail transit projects across India. Now an indispensable lifeline of Delhi, the Delhi Metro is rightly considered one of the most successful urban transport projects in the world and is an example of a JICA-supported India–Japan partnership.6

The natural extension of this collaboration in transport infrastructure development has been in the area of intercity transport and high-speed railways. The potential is enormous in terms of both what India needs and the need to balance growth with environmental

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6 See Japan International Cooperation Agency (2016).
concerns. HSR systems offer inherent and prominent advantages over similar systems, as is evident from past global trajectories. For the recipient country, HSR systems additionally bring with them a bouquet of new learnings and technology transfer in areas as wide as track laying, signaling, and station management, as well as the opportunity to form a new outlook on punctuality and safety.

The foremost factor that makes high-speed railways significant is the pace of growth in India’s megacities. A robust, young nation with a population of roughly 1.3 billion, India can expect an estimated 275 million people or more to move into its teeming cities over the next two decades, a population roughly equivalent to that of the United States. Such “gateway cities” will continue to provide employment and lifestyle choices to a population searching for growth and opportunity for many years.

However, realizing the limits on burdening a few core megacities and the need to allow breathing space in the form of more hubs of employment and industrial activity, the Indian government is on course to develop several industrial corridor projects in an integrated and coordinated manner as part of the National Industrial Corridor Development Programme. This effort is aimed at developing multiple contiguous strings of future-ready industrial cities along corridors that offer “plug and play” infrastructure connectivity. The underlying principle supporting this initiative is that faster transportation options and multiple urban centers along industrial corridors are not just a decongestion tool and a means of gaining competitive advantage, but also a driver of economic growth in its own right.

Against this backdrop, it is essential to note that as a sector responsible for producing 23% of all worldwide carbon dioxide (CO₂) emissions, transport is the second largest source of human-made CO₂, second only to commercial energy production. This alarming statistic is largely the result of the skew toward road traffic, which alone accounts for 73% of all global transport emissions. Compared to this, railways are widely accepted as the most carbon efficient among all mass transportation systems. Comparative data shows a crucial advantage that railway systems enjoy in terms of carbon emissions, with emissions standing at around 19 grams (g) of CO₂/passenger/kilometer (km), compared to 51 g of CO₂/passenger/km for buses and 109 g of CO₂/passenger/km for airlines (Takeshita 2020; Takeshita 2012). Although average emissions may depend on a variety of factors, such data points overall reaffirm the inherent benefits of railway systems in general and HSR in particular due to speed and coverage advantages.

In emerging economies such as India, intercity transport is most often performed by road or air. As a result, the carbon footprint is much higher than the share of overall passenger transport performance. This creates a challenge for governments to develop an economically and environmentally sustainable ecosystem of intercity transport.

In terms of direction, India under Prime Minister Modi has been committed to addressing environmental concerns and achieving Paris Agreement commitments. In the last few years, the government has undertaken a series of environmentally conscious policy measures, and the carbon data is already showing reassuring results (emission intensity down 21% vs. 2005 levels; solar capacity up from 2.63 gigawatts in 2014 to 36 gigawatts in 2020; renewable energy capacity grown to fourth largest globally).

In the railways segment, Indian Railways is on track in its mission to achieve its 20-gigawatt renewable energy generation target and to become a net-zero carbon emitter by 2030 through a combination of new technology initiatives, increasing the mix of renewable energy to the grid, and active deployment of solar energy projects (Yadav 2020). Given this trend and the targets outlined in the National Rail Plan, it is only befitting that India is incorporating an environmentally sensitive transportation system such as high-speed railways even as it strives to surpass green commitments.

Another reason high-speed corridors are a credible option for India is apparent from the data on policy interventions and carbon footprint in intercity transportation. Results from recent research suggest that for achieving and maintaining viability of HSR corridors, governments need to develop and introduce

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7 See data on industrial corridor development by the Department for Promotion of Industry and Internal Trade, Government of India: https://dipp.gov.in/programmes-and-schemes/infrastructure/industrial-corridors.
9 See PMIndia (2020).
low-carbon transport policies from a longer-term perspective. This, however, needs to be undertaken at the optimum economic growth stage of a country in order to achieve policy objectives.

The viability of a mass transit system depends on both population density and per capita GDP. With a population of around 1.3 billion and a population density of 367/km² (higher than Japan's 337/km²), a burgeoning economy such as India finds in systems such as high-speed railways the ideal solution to environmental and transportation issues. The size of the Indian middle class hovered at some 50 million people in 2007, but by 2025 will have expanded dramatically to 583 million—some 41% of the population. These households will potentially see their incomes increase to $1.5 trillion Indian rupees ($1.1 billion)—11 times the level of 2007 and 58% of total Indian income.10

Additionally, India’s GDP per capita in purchasing power parity (PPP) terms already crossed the $6,000 mark as of 2007. This is relevant and can be considered an inflection point: the work of creating a high-speed corridor spans a decade or more, but countries that are considered heavyweights in HSR development today took the lead in initiating corridor development at similar or even lower GDP levels (Japan at $4,700, PRC at $6,200) (Seetha Ram and Bharule 2019).

Thus, in terms of GDP indicators and data-based criteria, there is little doubt that India meets the requirements for the introduction of HSR systems. The key issue for Indian planners and policymakers going forward might be the where rather than the why—i.e., correct and suitable corridor selection in a country with diverse demographics and needs. Selecting optimum connecting hubs would then set the stage in the larger region to offer sizable benefits to stakeholders such as local residents and industry, passengers, and railway operators.

For corridor-level criteria, indicators such as railway passenger volume and corridor distance must be taken into consideration when identifying suitable HSR corridors. A daily passenger volume of approximately 5,000 between terminal stations is considered sufficient to support the economics of the effort and to propel growth along the corridor. Data also suggests that in terms of intermodal preferences, on average passengers are likely to prefer a high-speed train over air travel for journeys where the distance is under 1,000 km, since travelling by high-speed train is time- and price-competitive.

While laying the groundwork for a fully-fledged high-speed rail network can take decades, once implemented, such efforts bear rich fruit over many decades. Steady growth in passenger volume can be expected in areas along shinkansen lines as they become more populated in response to the benefits offered by the new transportation ecosystem. For example, passenger volume along the Tokaido shinkansen route, which stood at 85,000/day in 1965 before the bullet train became operational, has since growth at a steady pace to reach the now formidable number of 378,000/day (Takeshita 2019).

As India extends the initiative to create, nurture, and link urban hubs along corridor routes with faster, sustainable, and more environmentally sensitive transportation networks11 (Yadav 2020), it is only natural that it has turned to a partner such as Japan to continue its work on high-speed railways. Appreciating that integration of technology is essential, the Indian government has chosen one country and one technology system as a partner for this ambitious project—Japan and its shinkansen.

As two strong Asian nations held together by shared cultural and democratic values, in 2013 Japan and India embarked on the next step of joint partnership in the sphere of transportation with the signing of a memorandum of understanding for an Indian HSR project. With the commitment to the 508-km bullet train corridor between Mumbai and Ahmedabad consecrated, and financial and technological contours agreed upon, the ambitious MAHSR Project is on course to bring Japan’s shinkansen technology to India and to again change not only the way India commutes and connects, but also how India thinks about safety and mobility.

It is a promising and decisive step forward. There is little doubt that the MAHSR Corridor has the potential to be an inflection point, to revitalize India’s view of railway transportation, and to trigger new dynamics for economic growth.

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10 See Farrell and Beinhocker (2007).
11 See Indian Railways (2020a).
Contours of the Mumbai–Ahmedabad High-Speed Rail Corridor

The MAHSR Corridor will be the first-ever high-speed corridor in India and will link the two largest cities in the neighboring states of Maharashtra and Gujarat in western India. Technical and financial assistance from the Government of Japan through JICA will enable the creation of twelve *shinkansen* stations along a stretch of 508.17 km. The project will be executed and maintained by the National High-Speed Rail Corporation Limited (NHSRCL), a special purpose vehicle (SPV) incorporated in 2016 with equity participation by the government of India and the two stakeholder state governments.

The *shinkansen* is known to be gentle to the environment and to have a low carbon footprint compared to air transportation. In keeping with that philosophy and India’s own environmental guidelines, the Mumbai–Ahmedabad project has taken exceptional efforts to avoid disturbance to wildlife sanctuaries and natural ecosystems that exist along its route. These efforts have resulted in some creative and ambitious technological workarounds, some of which are sure to become textbook reference cases of the future.

One definitive example of innovation is the handling an area near the nodal station of Mumbai, the Thane Creek track, which passes a protected flamingo sanctuary. Respecting the mangrove home of the pink flamingoes that migrate to the area (also known as “the forests of Mumbai’s breathing roots”) between December and May each year, rail tracks for the high-speed train system there will be taken undersea through a special single-tube tunnel that will run 40 meters below ground level under the marshland. Once constructed, this tunnel will become the longest rail transport tunnel and also the first-ever undersea rail tunnel in India. NHSRCL completed the survey of the mangroves around the creek using light distance and ranging (LIDAR)—an aerial survey of the forest using a 100-megapixel camera. This is the first time for the LIDAR technology to be used in India, as opposed to a traditional manual survey on foot. Aerial survey allowed the process to be completed in under three months.12

One more key element of the MAHSR Project is the transfer of technology and personnel training in HSR expertise. Japan’s bullet train is a symbol of Japan’s dedication to constant innovation, precision, and a stellar safety record. Going forward, key technological and business culture aspects of the Japanese philosophy on bullet trains are expected to be adopted in India as it garners confidence and expertise in building and maintaining high-speed rail systems.

Additionally, the “Make in India” concept is expected to provide strong motivation for Indian industry to develop and imbibe high-end railway technology and practices, and to provide the required momentum for a leap forward in capability building (Khare 2020). This is expected to occur through joint ventures and knowledge transfer partnerships between the two countries, as well as collaboration between research institutions to create indigenous solutions.

To facilitate the training of personnel who will build and maintain the high-speed train corridor, a high-speed rail training institute will be set up alongside the National Academy of Indian Railways (NAIR) in the western Indian city of Vadodara. This training institute will be the seat of learning and the core training ground for NHSRCL staff, some of whom will be trained in Japan by Japanese experts in *shinkansen* technology and practices. The High-Speed Rail Training Institute is expected to serve as a backbone for future development efforts as India expands its footprint of high-speed corridors beyond the flagship project.

In its draft Vision 2024 of the National Rail Plan issued in December 2020, the Indian Railways has called for infrastructure capacity enhancement and preparatory work for the expansion of high-speed railways to additional corridors across India.13 This vision for expansion suggests strong potential for business opportunities not only for Indian contractors, but also for private sector participants and high-speed rail contenders from across the globe, including Japan.

During his 2017 official visit to India for the groundbreaking ceremony for the bullet train project, Prime Minister Shinzo Abe expressed a strong desire to travel with Prime Minister Narendra Modi on the inaugural trip of the Mumbai–Ahmedabad bullet train. India and Japan remain steadfast allies in a number of spheres, and the inauguration of the first Indian *shinkansen* is certain to be a milestone that is warmly welcomed by both countries.

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12 See NHSRCL data on the MAHSR project: https://nhsrcl.in/en/home.
13 Indian Railways (2020b)
The Japan Precedent: Safety, Spillovers, and Lessons for India and Beyond

History

Global experience suggests that as the actual number of cities and the population of emerging economies increase, the areas along train lines and corridors meld and we begin to see cities growing and merging, further increasing their clout as a result of ease of transport and commuting. High-speed rail is a major contributor to this fusion of urban centers (Pagliara, Hayashi, and Seetha Ram 2019).

As an example, Japan’s high-speed system has transformed the greater Tokyo area into a super city-region of close to 100 million people. The shinkansen has emerged as an invaluable part of Japan’s mobility and economy story and has grown to a 22,000-km high-speed network of nine passenger dedicated lines (PDLs) operated by the Japan Railways (JR) Group through six regional companies. Of these, JR East alone oversees five different radial corridors with Tokyo as the terminal station, servicing an astounding 106 million passengers a year (Kawai 2020).

HSR in Japan is respected for its speed (optimal time utilization for passengers), safety (zero fatal accidents since inception), punctuality (less than 30-second average delay per train), and convenience (one train every four minutes). In time, these benefits and benchmarks are expected to percolate to Indian operators and passengers as the shinkansen takes off in its new home outside Japan.

Shinkansen and Safety

A zero fatality rate over more than half a century of operation is a formidable achievement by all standards. Japan was able to sustain this impressive record thanks to a mix of factors that provide key insights for emerging economies that hope to incorporate HSR systems into future regional development plans. Undoubtedly, the mix of stringent and continuous efforts in technology improvement, human resource management, operation and maintenance, and safety measures has been the result of a series of iterations and improvements.

At the technology level, the Railway Technical Research Institute (RTRI) has been the nodal organization for research and technological development since 1986. For the shinkansen, RTRI’s research efforts have focused on three key areas: (i) safety improvement (such as early disaster warning systems), (ii) green measures (enhanced energy efficiency/noise reduction), and (iii) enhanced customer experience (reducing vehicle vibration, smartcard-based ticketing systems, etc.). As an example, consistent efforts aimed at addressing one key problem area—noise reduction—have resulted in a series of solution-oriented advances such as lower noise-emitting pantographs, lighter car bodies, advances in streamlining the nose of the shinkansen car, and better rail and wheel grinding practices to produce smoother surfaces and lower friction and noise (Uzuka 2020).

Such advances have been incorporated into bullet train hardware over iterative efforts with active participation from stakeholders such as operators and manufacturers. As India expands its HSR footprint in the years ahead, it will become an interesting case study as the country widens its thrust from “Make in India” to “Make for India” technological innovations to suit its unique conditions and topography (Khare 2020).

At the operator level, since the start of operations in 1964, JR companies have been on the front line defending the shinkansen’s pristine safety record of zero fatalities. This is the result of a combination of infrastructural and systemic measures and personnel training for human interventions. At the systemic level, the shinkansen has some unique built-in efficiencies, such as dedicated tracks, the absence of level crossings, and automatic train control (ATC) systems that respond to track conditions to assess the distance from the next train. But even beyond these systemic measures, it is the effort and resources committed to training staff and the thoroughness of the maintenance and operation regime that have contributed significantly to the safety record of zero fatalities (Kawai 2020).

Iterations and improvements continue, and even as recently as 2019, JR East spun off a new dedicated division—the shinkansen management department—to focus on shinkansen operation and maintenance activities as a separate entity from conventional-line operations. According to Masatoshi Kawai, Senior Executive Officer (JR East), the operator works on the philosophy that while what is foreseeable can be prevented through non-human interventions such as ATC systems, “our efforts need to be and are equally focused on sensitizing personnel to the importance of making correct and timely human interventions for emergencies that are bound to occur in the course of operation.” The essence
of these efforts is effective training of the key human
triangle of drivers, conductors, and dispatchers to
respond to a range of potential emergencies, from snow
and fog to the coupling and uncoupling of train cars.

Apart from the operator’s own training modules, a
national level accreditation system is overseen by the
Ministry of Land, Infrastructure and Transport. Here, the
shinkansen driver’s license requires trainees to pass an
aptitude test, a test to become a learner driver, a written
test, and then, finally, a technical-ability test. As more
countries in Asia create faster mobility options and high-
speed corridors, the improvement curve of operators
such as JR East provides a valuable reference point
regarding the critical need to nurture human talent and
a supportive ecosystem in addition deploying cutting-
edge technology.

An encouraging fact for new embracers of HSR technology
is that these learnings have in the past been transferred
effectively in success stories such as Taipei, China’s
shinkansen project. Considered the first true export of
the Japanese HSR system, the THSR opened operations
in 2007. The Japan Railway Technical Service (JARTS), an
association of major railway operators, suppliers, and
builders in Japan, front-ended technical assistance efforts
through the dispatch of Japanese experts in electrical
and mechanical (rolling stock, electrical, signaling, track)
systems. The THSR is based on an as-is model of Japanese
electrical and mechanical systems.

A key learning from the THSR project seems to be that the key to knowledge transfer and sustainability
often lies in steadily building local capabilities, which
makes that task the “most critical factor for determining sustained success” (Kono 2020). Given the long post-
construction period when an operator is responsible for
maintaining the sophisticated mobility system, JARTS’s
efforts in Taipei, China focused on providing effective
advisory support through international experts at the
initial stages of a project, coupled with a transfer of
knowledge and technology to assist local counterparts.
Based on the Taipei, China experience and data, it is clear
that effective transfer of knowledge needs to work in
conjunction with effective percolation of knowledge and
capability building in order to achieve true success.

In the MAHSR Project, such assistive interventions will
again be essential especially in the early stages and
are certain to spur growth in in-house talent at the
operator, NHRRL. As the construction work for the India
shinkansen project takes off and Indian counterparts
mature to a stage where training and certification of
experts is handled solely by Indian shinkansen experts
at its training facility in Vadodara, the project promises
to become a seat for learning for future generation of
engineers and experts of India-oriented high-speed rail
operations.

Shinkansen Networks, Quality of Life,
and Spillover Effects for Communities

Experience from Japan demonstrates that the impact
of HSR on quality of life stretches beyond the evident.
While an HSR may not in itself be a sufficient tool
for socioeconomic growth, benefits accrued from a
robust and expansive HSR network are irrefutably
numerous, as greater regional reach and integration
triggers QOL benefits in terms of greater well-being,
ease of transportation, decongestion of cities, and
more comfortable and affordable housing options in
heretofore underexplored and underpopulated areas
along network lines.

Such diversion to outer cities also contributes to
alleviating the problem of congestion and pollution in
high-density urban areas. The COVID-19 pandemic has
pushed countries and communities to urgently address
the twin issues of congestion and commuting. The HSR
serves well on both counts—it is a mode of transport
that requires comparatively lower close contact with
fellow passengers in tight spaces while simultaneously
offering easy access to work and housing options in
uncongested areas outside main cities (Hayashi 2020).

The business model of a typical HSR station also provides
a springboard for commercial activity. An HSR station in
Japan is typically filled with shops and public services
that attract footfall and is integrated with urban railways
and taxi services to facilitate last-mile connectivity and
convenience of transfer. This makes the area around an
HSR station an ideal hub for commercial spaces and
economic activity, forming a growth driver that in turn
boosts real estate value, income levels, and revenue
sources. These are only some of the salient spillover
effects of HSR.

Timely policy interventions to optimize economic
activity along HSR corridors have in the past reaped
considerable benefits for impacted regions. Data from
Japan demonstrates a clear correlation between GDP
growth and shinkansen ridership along all routes,
making shinkansen a tool of transformation as well as
transportation. An HSR network should be considered a
tool that can help achieve a variety of policy objectives,
including (i) addressing existing congestion or transport capability issues, (ii) improving mobility options as a means for achieving overall economic growth, and (iii) revitalizing regional economies through better access (Shukuri 2020).

Although questions linger about the commercial viability of capital-intensive systems such as HSR (by some reports the Tokaido shinkansen recovered costs in 7–8 years),\(^ {14}\) the QOL benefits are indisputable. Even in terms of construction cost, newer entrants that borrow from Japan’s case studies should be able to improve breakeven periods by adopting creative approaches that have succeeded in the past.

For example, the operator in Japan is no longer burdened with the construction cost of new shinkansen lines. This cost is typically shared between the local and central government, and the construction itself is carried out by the Japan Railway Construction, Transport and Technology Agency (JRTT) (Shukuri 2020). This gives the operator the leeway to focus on operation and ownership of rolling stock while exploring additional revenue streams such as the ever-promising “lifestyle business” of retail and commercial services in and around HSR stations.

The Road Ahead

Capital constraints and land acquisition issues are touted as key reasons why HSR adoption has been slower than expected in some parts of Asia. What may be as pertinent is that Asian countries that have already adopted and invested in HSR systems are reaping tangible benefits in terms of mobility, QOL, and a sharp pace of regional integration, leading them to invest further in HSR systems.

Even amid a once-in-a-century global pandemic, considerable strides are being made in the space. In Japan, JR East has announced plans to conduct autonomous test runs of its E7-series shinkansen bullet trains next fall, with the aim of operating such automated trains in the future.\(^ {15}\) This is even as Japan proceeds with the construction of the Chuo shinkansen using maglev technology\(^ {16}\) to connect the three major metropolitan areas (Tokyo, Nagoya, and Osaka). Among later entrants, the PRC alone has built an HSR network of over 30,000 km in nearly two decades to connect 80% of the country’s large cities;\(^ {17}\) in November 2020, Bombardier’s Chinese joint venture announced it has secured a new contract to build 112 additional CR300AF high-speed train cars\(^ {18}\) for the PRC’s high-speed rail network.

Much of the world is only beginning to emerge slowly from the cycle of COVID-19 outbreaks and lockdowns that paralyzed economic activity for the larger part of 2020. As a positive, the pandemic has triggered a rethink regarding global supply-chain dependencies, the value of living in uncongested communities, and the idea of commuting through safe and sustainable means.

This is a pivotal turning point for Asia as it waits for its moment. As a safe and environment-friendly tool for mobility and regional integration, high-speed railway systems have much to offer and could well become the vehicle to transport Asian countries to their true age of growth and prosperity.

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\(^{15}\) Railway Gazette (2020).
\(^{16}\) Bharule, Kidokoro, and Seta (2019).
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