

WHITE PAPER

Airport-Rail Inter-modality in Southeast Asia: Opportunities and the Impact of High-Speed Rail

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Foreword

The Aviation Studies Institute, based at the Singapore University of Technology and Design, has been established to address the needs of aviation stakeholders and advance the development of aviation in the Asia-Pacific region. In this paper we focus on the developments in passenger rail transportation in Southeast Asia and whether there are opportunities for inter-modal connectivity with air transport.

There are several rail networks across the region. In recent years there has been a renewed interest in expanding these including in some cases with high-speed rail. As we learnt from All Nippon Airways at the Aviation Studies Institute's webinar¹, passengers tend to favour rail instead of air on journeys of up to 3.5 hours. In this paper we look at whether new rail infrastructure might affect the air transport networks in Southeast Asia. It includes a specific look into changes to air passenger demand after the opening of a new high-speed rail line in Lao PDR and developments in Indonesia.

In Europe, where there are already extensive rail networks, there is less focus on building infrastructure, and more on creating connectivity – not just with air-rail linkages but also through-ticketing and protections for passengers in the case of missed connections. While Southeast Asia invests in new physical infrastructure, is it considering the benefits of seamless airport-to-rail transfers and is it leaving enough space to build more such connectivity in the future?

This paper studies these questions further to give insights into how this region's air transport networks might be shaped in the future.

We hope that you find the analysis and recommendations provided useful and thought provoking.



Mr Jamie Bloomfield

At the Aviation Studies Institute we are keen to utilise research to solve real-world challenges and work with industry partners to translate our outcomes into industry-wide capabilities. If we have capabilities you want to leverage, if there is an improvement you would like us to investigate, a partnership opportunity you would like to explore, or a way we can help aviation in Asia-Pacific to develop further, please get in touch:

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You can also find more details on our website: <https://asi.sutd.edu.sg/>

¹ Aviation Studies Institute Webinar: Slot Allocation Amidst COVID-19 Recovery, Perspectives in Southeast Asia – July 2022. A replay is available at: <https://asi.sutd.edu.sg/events/event/asi-webinar-on-airport-slot-allocation-amidst-covid-19-recovery/>

On behalf of the Aviation Studies Institute, Assistant Professor Nuno Ribeiro recently completed research into Airfield Management and Economics.

If you are keen to learn more about this work, please let us know.

Assistant Professor Nuno Ribeiro has an interest in developing and applying operations research methods, such as optimisation, machine learning and simulations to support the decision-making processes in transportation system management.

His work has received attention from academia and industry stakeholders reflected in several research awards, such as the Anna Valicek Medal by the AGIFORS in 2018, best PhD dissertation by INFORMS-AAS in 2019 and the best paper award by INFORMS-AAS in 2020.

Nuno received his Ph.D. in Transport Systems in 2019 from the University of Coimbra (Portugal). During his stints as a Ph.D. student, he also held visiting research positions in MIT and Carnegie Mellon University.



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Note. Cartographic illustrations have been added by the Aviation Studies Institute with credit to: (i) the Great Circle Mapper (www.gcmap.com) - copyright © Karl L. Swartz, (ii) OpenStreetMap Contributors, inc. ESRI and MapBox.

About the Author

This paper was authored by Brendan Sobie. Brendan is an independent analyst who has been working in the aviation industry for over 20 years. He is a prolific author, having written several white papers, studies and commentaries on aviation issues across Asia over the last few years. He has provided strategic aviation-related advice to a wide range of organisations including airports, airlines, aircraft leasing companies, development banks, investment banks and IT suppliers.

Brendan is widely recognized as a thought leader on aviation issues in Asia-Pacific, giving frequent presentations and is often quoted by the international media. He previously served as chief analyst for CAPA from 2011 to 2019, based in Singapore, and as an editor for Flightglobal from 2000 to 2011, based in the USA, Singapore and UK. He holds a degree in industrial and labour relations from Cornell University in New York, USA.



Brendan Sobie

Executive Summary

Southeast Asia has more than 1 billion train passengers per year and over 20,000 km of railway lines, based on ASEAN Secretariat data. This includes local, regional and long-distance trains but excludes metros or MRTs.

Southeast Asian airports handled about 800 million passengers per year prior to the pandemic and are now again approaching pre-COVID levels. However, less than 1% of these passengers connect to trains.

Airport train stops are relatively uncommon in Southeast Asia compared to other regions. There is only one Southeast Asian airport with a long-distance train stop – Bangkok Don Mueang. About a dozen airports in Southeast Asia have rail connections to the city but the airport train often terminates at a different station than long distance trains, impeding connectivity. There are several examples where passenger train lines are adjacent to airports – or even pass the passenger terminal – but there are no active airport stops.

Southeast Asia would benefit from more and better airport-rail connections. Improved airport-city rail connectivity is critical in reducing road congestion and the impact on the environment. However, new or improved rail connections from airports to regional destinations could have a bigger impact as they would provide an alternative both to buses or cars and short-haul flights.

As new airports are developed rail connectivity should be a priority. Some Southeast Asian airports have opened in recent years with rail connections and some new airports are now under construction which will have rail connections. However, this is not always the case and surprisingly some new airports do not have any rail connectivity.

Similarly, as new rail lines are developed, airport connectivity should be considered. This has essentially not been happening in Southeast Asia although it is common in other regions. For example, new rail lines in Indonesia and Laos do not have any airport stops and there are several proposed new rail lines in other Southeast Asian countries that do include any airport stops. The principal recommendation of this white paper is that Southeast Asian governments should include rail connectivity when developing new airports and include airport stops when developing new rail lines.

This white paper particularly examines the potential of high-speed rail (HSR). There is growing interest in HSR throughout Southeast Asia with several new HSR lines now planned or proposed. As Southeast Asia starts to develop HSR lines stops at airports should be considered as connecting passengers account for a large portion of passengers on short-haul routes. HSR trains between cities can provide a new more sustainable option for local passengers on some of Southeast Asia's biggest short-haul routes but would have a bigger impact if they also stop at airports.

HSR is not a potential alternative for most short-haul air routes within Southeast Asia due to geography or a lack of sufficient traffic. However, HSR is feasible for thick domestic and international overland routes which combined account for about 30% of intra-Southeast Asia traffic. Bearing in mind that developing HSR lines is a slow and political process this white paper found that HSR is a realistic option for replacing 5% of intra-Southeast Asia passenger traffic within one decade and 10% within two decades.

Southeast Asia's first true HSR line opened in October 2023, connecting Jakarta and Bandung. As these two Indonesian cities are only about 150 km apart and the train does not stop at any airports, the Jakarta-Bandung HSR line has not had a significant impact on aviation. However, the proposed extension of the HSR line to Yogyakarta and Surabaya could have a significant impact on Indonesia's aviation market.

By most metrics, Indonesia has the largest rail network and the most rail passengers in Southeast Asia. A vast majority of this network is on the main island of Java, which includes Jakarta as well as Bandung and several other medium size cities. The Java market is assessed in detail in this white paper, which recommends more and improved airport-rail connections in Java as HSR is expanded. A rail stop at Kertajati Airport, which has replaced Bandung Airport but has been a white elephant since its opening due to its remote location, is particularly important.

There are also rail lines on Sumatra and Sulawesi, which are the second and third most populated islands in Indonesia. Sumatra now boasts three airports with rail connections, making it an unheralded leader in this segment, but does not have any long-distance trains. This white paper recommends further improving airport-rail connectivity in Sumatra, including airport stops on the proposed new Trans-Sumatra Railway.

Airport stops are also recommended for the proposed Trans-Sulawesi Railway. Sulawesi has one very short rail line that opened last year near the main city of Makassar. While very ambitious, the Trans-Sulawesi Railway could potentially replace the need to fly on several intra-island routes. Rail connectivity at Makassar Airport, which is not currently planned, is critical as many of the passengers on the intra-island routes connect from other parts of Indonesia.

Indonesia is one of two case studies examined in this white paper along with Laos, which opened a long-distance medium-speed rail line in late 2021. While not quite an HSR (although it is often referred to as one) the new train in Laos has impacted the country's small domestic market as well as some short-haul international routes. However, the overall impact has been positive as the train has made Laos more accessible, resulting in more tourists and more flights on longer international routes. Laos is now a more attractive destination for tourists, which is important as the country's economy relies heavily on tourism, with the train becoming an attraction itself.

This white paper recommends Laos pursues further development of rail lines including new airport rail options. Currently there are no airport rail stops in Laos and the capital Vientiane has two different stations for two train lines. Vientiane has the potential of becoming an intermodal hub with several train lines but would benefit from one central train station as well as an airport train station.

Overall, there is a need across Southeast Asia to better align airport and rail strategies. With the increased focus on the environment and on sustainable transportation it is a missed opportunity to be expanding or developing airports without considering rail – and likewise to be developing new rail lines without considering airports.

As Southeast Asia's population and economy continue to grow rapidly the region has massive potential across multiple transport modes. There are also tremendous intermodal opportunities, including in the air-rail segment, which can only be unlocked with the right policies and focus.

Recommendations

Principal Recommendation:

- Southeast Asian governments should include rail connectivity when developing new airports and include airport stops when developing new rail lines.

Related Recommendations:

- Southeast Asian countries should aim to establish HSR lines on short-haul routes that now account for 10% of regional capacity, providing a more sustainable option for both local and connecting passengers.

Country Specific Recommendations (Laos Case Study):

- Laos should consider improving connectivity between rail lines and airport-rail options.
- Laos should consider developing Vientiane as an intermodal hub with an expanded airport that is connected to one station for all train lines.

Country Specific Recommendations (Indonesia Case Study):

- Indonesia should consider opening more airport-rail connections in Java as HSR is extended. An HSR stop at Kertajati Airport outside Bandung is particularly important to attract flights and boost its now extremely low utilization.
- Sumatra has emerged as an unexpected leader in airport-rail development in Southeast Asia and should now consider further improving airport-rail connectivity and accelerating the development of new rail lines. New airport rail connections should be considered, particularly at Banda Aceh, Bengkulu, Bandar Lampung, Jambi and Pekanbaru as this would result in airport rail connectivity for all eight of Sumatra's main airports.
- Sulawesi should consider adding a rail stop at Makassar's airport as it would improve connectivity from Sulawesi's largest airport to central Makassar as well as several smaller cities as the Trans-Sulawesi Railway is constructed.

Introduction – The Regional Landscape

Overview of existing airport rail connections and opportunities

Of the 24 medium or large size airports in Southeast Asia, only seven or 29% have passenger rail connectivity. Almost all of these airport rail links are limited to providing local connections (to the city centre and other areas of the city).

Regional or longer distance connections (connectivity with other cities) are common from airports in other regions, particularly Europe and North Asia, but are virtually non-existent in Southeast Asia. The only exception is Bangkok Don Mueang Airport (in Thailand), which has a relatively unknown train station with limited facilities that serves as a stop on some trains heading to or from cities in northern Thailand.

Otherwise in Southeast Asia to connect to a regional or long-distance train an airport passenger must travel to a station in the city centre. Only in a few examples can a passenger take a train directly from the airport to a station that is used for regional or long-distance trains. Often this connection requires travelling between two unconnected stations as the station used for the airport train is different, making air-rail combinations an unattractive option for most travellers.

Below is a table highlighting which of the major Southeast Asian airports now have rail connectivity. This table lists all airports with at least 5 million annual passengers based on 2019 data. Recovery rates are provided, highlighting how the region was still not fully recovered from the pandemic last year, for those airports that have reported their 2023 traffic.

Table 1 – Passenger Rail Connectivity at Medium and Large Airports in Southeast Asia

Rank	Airport	Airport Code	Passenger Rail Connections	Airport Passengers, 2019 (millions)	Recovery rate, 2023 vs 2019
1.	Singapore Changi	SIN	Metro to City	68.3	86%
2.	Bangkok Suvarnabhumi	BKK	Train to City	65.4	79%
3.	Kuala Lumpur International	KUL	Train to City	62.3	76%
4.	Jakarta Soekarno-Hatta	CGK	Train to City	52.6	93%
5.	Manila Ninoy Aquino	MNL	Nearby (Local Light Rail)	47.9	95%
6.	Bangkok Don Mueang	DMK	Long Distance Trains	41.3	65%
7.	Ho Chi Minh Tan Son Nhat	SGN	None	41.2	99%
8.	Hanoi Noi Bai	HAN	None	29.3	N/A
9.	Bali Denpasar Ngurah Rai	DPS	None	23.7	88%
10.	Phuket International	HKT	None	18.1	77%
11.	Surabaya Juanda	SUB	None	15.8	84%
12.	Da Nang International	DAD	Nearby (Long Distance Trains)	15.5	N/A
13.	Mactan-Cebu International	CEB	None	12.7	79%
14.	Chiang Mai International	CNX	None	11.3	73%
15.	Nha Trang Cam Ranh	CXR	None	9.8	N/A
16.	Kota Kinabalu International	BKI	Nearby (Regional Train)	9.4	N/A
17.	Makassar Sultan Hasanuddin	UPG	None	8.6	N/A
18.	Penang International	PEN	None	8.3	84%
19.	Medan Kualanamu	KNO	Train to City	7.8	93%
20.	Yogyakarta International*	YIA	Train to City	6.9	N/A
21.	Yangon International	RGN	Nearby (Local Train)	6.5	N/A
22.	Phnom Penh International	PNH	Permanently Suspended	6.0	66%
23.	Jakarta Halim	HLP	None	6.0	N/A
24.	Kuching International	KCH	None	6.0	N/A

Notes: Jakarta, Bali, Surabaya and Medan recovery rates calculated using departing passenger data from Statistics Indonesia; all other recovery rates recovered using total passenger traffic reported by the airports

**Yogyakarta International Airport opened in 2020 with a rail connection to the city opening in 2021. The ranking and 2019 traffic figure are for Yogyakarta Adisucipto (JOG), which also has a rail station with service to Yogyakarta city.*

Most airports in Southeast Asia do not have any rail stations. Some of these airports have stations nearby (within 5 km). These airports in some cases – such as Da Nang in Vietnam – are near the city centre and therefore a short taxi from the city's main rail station where long distance trains are available. In other cases, such as Manila and Yangon there is a nearby station that only connects to trains that go to other parts of the city.

Prior to 2002, there were no train connectivity at any medium or large Southeast Asian airports except for Don Mueang and Indonesia's Yogyakarta Adisucipto (JOG). Airport rail connectivity in Southeast Asia has been gradually improving with the opening of new airports. For example, in Indonesia a new train line was constructed in conjunction with a new airport that opened outside Medan in 2013. In Malaysia and Thailand, new train lines were constructed to serve the new airports for Kuala Lumpur and Bangkok that initially opened in 1998 and 2006 respectively.

In 2002, the train from downtown Kuala Lumpur to Kuala Lumpur International Airport (KLIA) commenced operations as well as a subway station at Singapore Changi Airport. The train from Bangkok to Suvarnabhumi Airport began operating in 2010, followed by the train from Medan to Kualanamu Airport in 2013.

Indonesia also opened new rail lines from central Jakarta to Soekarno-Hatta Airport in December 2017, from central Padang to Minangkabau International Airport (PDG) in May 2018, from central Solo (also known as Surakarta) to Solo's Adi Soemarmo Airport (SOC) in December 2019 and from central Yogyakarta to the new Yogyakarta International Airport (YIA) in September 2021. In addition, in August 2018 a light rail line opened from central Palembang to Palembang's Sultan Mahmud Badaruddin II International Airport (PLM).

PDG handled 4.1 million passengers in 2019 and PLM handled 4.0 million, making them both top 50 airport in Southeast Asia. SOC is smaller, handling 1.6 million passengers in 2019. PDG, PLM and SOC were not included in the previous table, which only listed medium size airports (5 to 15 million annual passengers) and large airports (over 15 million annual passengers). JOG, which has essentially been replaced by YIA, was a medium size airport, while CGK is a large airport.

Several new airport rail lines are now under construction including from Manila to Clark International Airport (CRK), which is about 100 km outside Manila and handled 4.0 million passengers in 2019. However, there are still numerous untapped opportunities for existing airports to establish, resume or improve rail connectivity.

There are two recent examples where airport-rail connections have been suspended, a concerning trend given the number of connections should be increasing as countries focus more on providing sustainable transport options. In Cambodia, a rail service from central Phnom Penh to Phnom Penh International Airport (PNH) that was launched in April 2018 was permanently suspended in August 2020 with the tracks now used as a road. In Malaysia, a rail service from central Kuala Lumpur to the city's second airport, Subang (SZB), that was launched in May 2018 was suspended in February 2023.

PNH qualifies as a medium sized airport and is slated to be replaced by a new airport that is expected to open outside Phnom Penh in 2025. SZB handled only 2.3 million passengers in 2019 but would benefit from the rail connection resuming as the roads around Subang are often congested and the airport's passenger traffic is expected to grow significantly after it reopens to commercial passenger jets later this year. SZB has only handled commercial turboprop passenger flights (as well as cargo and business aviation) since KLIA opened in 1998.

There are also opportunities to significantly improve airport rail connectivity in Southeast Asia as more new airports are constructed. Several airports are currently under construction or planned to replace or supplement existing medium or large size airports, including at Manila, Ho Chi Minh, Bali, Phuket, Chiang Mai and Phnom Penh.

Unfortunately, in Southeast Asia rail lines are usually not planned in conjunction with new airports. For example, a new airport was constructed in Siem Reap without any plans for rail connectivity. Consideration of a light rail

connecting the Angkor International Airport (SAI), which is located about 50 km from Siem Reap, only emerged after the new airport opened in October 2023.

Siem Reap's old airport, which was located near the city centre and closed when the new airport opened, handled 3.9 million passengers in 2019 after peaking at 4.5 million passengers in 2018. The new airport has initial capacity for 7 million passengers with plans for 12 million as part of a second phase.

In Phnom Penh, the government is now only looking at rail options for the new Techo International Airport. The new airport, which will be designed to handle 13 million passengers per annum in the first phase and up to 50 million passengers in subsequent phases, will initially open without any rail connectivity.

The new airport outside Bandung in Indonesia is another example of an airport being constructed without any rail connectivity. Kertajati Airport (KJT), which is located about 70 km from Bandung, initially opened in 2018. Traffic at Bandung's Husein Sastranegara Airport (BDO), which is located near the centre of the city, peaked at 3.8 million passengers in 2018 and was closed for scheduled commercial flights in late 2023. KJT has initial capacity for 5.6 million passengers per year but is currently only handling a very small fraction of the traffic that BDO previously handled.

There is a new toll road connecting Bandung with KJT which opened in July 2023. However, KJT is not near the Jakarta-Bandung rail line, which now has a high-speed rail (HSR) service connecting the two cities, nor any other rail line.

There is a need to not only think about rail when developing new airports – about also to think about airports when developing new rail lines.

Indonesia opened two rail lines in 2023 including a new high-speed line from Jakarta to Bandung and the first phase of a new medium-speed line on the island of Sulawesi. However, neither have any airport stops. Similarly in Laos, the medium speed rail line that opened in late 2021, connecting the capital Vientiane with the popular tourist town of Luang Prabang and Boten at the China border does not stop at any airport. In 2019, Vientiane's Wattay International Airport handled 2.5 million passengers and Luang Prabang handled about 1 million.

Several proposed HSR lines also for now do not include airport stops. For example, the proposed HSR line from Singapore to Kuala Lumpur does not include stops at any airport – despite passing near Senai Airport in Johor and KLIA in Selangor.

The principal recommendation of this white paper is that Southeast Asian governments should include rail connectivity when developing new airports and include airport stops when developing new rail lines. This is particularly important given the increased focus on sustainability. Rail connectivity provides an opportunity for airports to reduce their carbon footprint by reducing landside vehicle emissions and by providing an alternative for some short-haul flights.

Overview of HSR potential in Southeast Asia

With convenient rail connections, passengers can potentially connect to other cities or destinations using trains rather than taking short flights. The first white paper in this two-part analysis, which was published by the Aviation Studies Institute in January 2024, briefly discussed the potential opportunity for HSR to replace super short-haul air travel on city pairs such as Kuala Lumpur-Singapore, Kuala Lumpur-Johor Bahru, Kuala Lumpur-Penang, Singapore-Penang, Jakarta-Yogyakarta, Jakarta-Solo, Jakarta-Surabaya, Bangkok-Khon Kaen, Bangkok-Udon Thani, Bangkok-Vientiane, Bangkok-Luang Prabang and Manila-Legazpi. While these are all large or medium size point to point routes, making high speed train travel between city centres potentially viable, they also have significant connecting traffic that could be carried on trains if airport stops are provided.

Kuala Lumpur-Singapore is a particularly obvious candidate for HSR given it is the largest international route in the world (based on scheduled seat capacity for both 2019 and 2023). The proposed Kuala Lumpur-Singapore HSR train would also stop in Johor Bahru, providing a new option for passengers now travelling the domestic route between Johor Bahru and Kuala Lumpur. The Kuala Lumpur-Singapore HSR line could potentially be

extended to Penang in future, providing a new option for the even larger domestic route from Kuala Lumpur to Penang as well the smaller but still significant Kuala Lumpur-Penang international route.

Jakarta-Yogyakarta and Jakarta-Surabaya are proposed extensions of the new HSR line that now connects Jakarta with Bandung in just one hour. The proposed extension would connect Jakarta with Yogyakarta in about two hours and Jakarta with Surabaya in about three hours. A stop in the city of Solo (also known as Surakarta) between Yogyakarta and Surabaya is part of the proposed extension.

Bangkok-Khon Kaen and Bangkok-Udon Thani are part of planned high-speed rail line in Thailand that will eventually continue to Nong Khai on the Laos border and Vientiane. The first phase, from Bangkok to Nakhon Ratchasima (a little more than halfway to Khon Kaen and a little less than halfway to Udon Thani), is already under construction. This HSR line would replace the current slow train that goes from Bangkok to Khon Kaen, Udon Thani and Nong Khai, where there is now a short infrequent shuttle train to a station on the Laos side of the border 13 km outside Vientiane.

The State Railway of Thailand (SRT) plans to improve the link from Nong Khai to Vientiane in April 2024, when it opens a new station in Khamsavath, which is closer central Vientiane. However, the train service from Bangkok will still be slow and Khamsavath is a different station than where the new train to Luang Prabang (and Kunming) originates. The future HSR from Bangkok to Vientiane (and to Luang Prabang and Kunming) will be more of a gamechanger, impacting several air routes.

Thailand plans to construct several other long distance HSR lines in other parts of the country but for now only the line to the northeast is under construction. It could be several years before the other lines are operational and whether all come to fruition could depend on the initial success of the first line and geopolitical factors.

In the Philippines there are proposals for HSR lines on the island of Luzon which could result in surface transport options for several city pairs. Manila-Legazpi would be the most impacted air route as it is the only city pair within Luzon that currently has several daily flights.

Below is a table highlighting the number of current flights and seats on the 12 city pairs mentioned in this section that could potentially be replaced by HSR (based on OAG schedule data for March 2024). The number of flights and seats prior to the pandemic is also provided for comparison purposes (based on OAG schedule data for March 2019).

Combined these 12 routes currently generate more than 200 one-way flights and about 35,000 one-way seats per day. These 12 routes account for about 8% of total scheduled flights and total seats within Southeast Asia, highlighting the role HSR could have in the region's aviation market.

Table 2 – 12 Southeast Asia routes with HSR potential ranked by one-way flight frequencies

Route	Daily Flights	Route	Daily Flights	Route
Jakarta-Surabaya	44.4	7,600	53.8	9,300
Kuala Lumpur-Singapore	42.3	7,200	48.7	7,900
Kuala Lumpur-Penang	24.6	3,500	43.0	5,700
Jakarta-Yogyakarta	21.0	3,200	35.9	6,200
Bangkok-Udon Thani	17.8	3,200	19.6	3,600
Penang-Singapore	15.4	2,800	14.4	2,500
Bangkok-Khon Kaen	13.1	2,300	15.7	2,500
Johor Bahru-Kuala Lumpur	10.5	1,400	25.0	3,100
Jakarta-Solo	9.9	1,700	15.0	2,800
Manila-Legazpi	8.0	1,100	7.8	1,200
Bangkok-Vientiane	6.0	1,000	8.0	1,400
Bangkok-Luang Prabang	3.0	400	4.9	600
TOTAL	216.0	35,200	291.8	46,700

Notes: seat capacity is one-way and rounded to the nearest hundred. Frequencies are one-way and rounded to the nearest 1

Daily frequencies and seats are based on the daily average for each month

Each route includes all airports in each city - BKK and DMK for Bangkok, CGK and HLP for Jakarta, KUL and SZB for Kuala Lumpur, DRP and LGP for Legazpi, SIN and XSP for Singapore, and JOG and YIA for Yogyakarta

Source: Sobie Aviation and OAG

This is meant to be only a sampling of city pairs and is limited to routes of less than 1,000 km within Southeast Asia where HSR lines could be in place over the next decade. Longer routes such as Ho Chi Minh-Hanoi, which is currently under consideration for HSR in Vietnam, are not included. Routes connecting Southeast Asia with other regions, such as Bangkok-Kunming, are also not included.

Illustration 1 – Illustration of the 12 Southeast Asia routes with HSR potential (as listed in Table 2)



Map generated by the Great Circle Mapper (www.gcmap.com) – © copyright Karl L. Swartz

With the possibility of a massive HSR line serving most of Vietnam, several HSR lines crisscrossing Thailand and several cross-border HSR connections, it is conceivable that up to 30% of the overall intra-Southeast Asian market could be impacted by HSR within the next two decades. In Vietnam, when excluding longer routes of more than 1,000 km as well as overwater routes to island destinations such as Con Dao and Phu Quoc, there are about 10 city pairs with at least five daily flights that could potentially be replaced by HSR. In Thailand, when excluding overwater routes to island destinations such as Phuket and Samui, there are also about another 10 domestic city pairs with at least five daily flights that could potentially be replaced by HSR (in addition to the Bangkok-Khon Kaen and Bangkok-Udon Thani routes that were included in the prior table).

One of the more interesting potential cross-border HSR connections would be from Bangkok to Phnom Penh and Ho Chi Minh, covering a relatively feasible distance of about 900 km. There are currently an average of 12 daily flights from Bangkok to Ho Chi Minh with another 15 daily flights from Bangkok to Phnom Penh and five daily flights from Phnom Penh to Ho Chi Minh (based on OAG schedules data for March 2024). There is currently a slow train option from Bangkok to Phnom Penh which takes about 18 hours (buses are about six hours faster) excluding the connection time at the border. There are no rail lines yet on the shorter sector from Phnom Penh to Ho Chi Minh.

While there is clearly tremendous potential for HSR in Southeast Asia, several of the proposed or mooted HSR projects may not materialize due to numerous factors including financial and political. **A realistic target would be for HSR to become an option within one decade on routes that now account for 5% of intra-Southeast Asia traffic and within two decades on routes that now account for 10% of intra-Southeast Asia traffic.** There would be a significant decline in the number of passengers flying these routes, but Southeast Asia's overall aviation sector would still grow significantly as airlines shift their focus to other routes.

It should also be noted that HSR is not a possibility for most routes within Southeast Asia. As the previous white paper on 'super short-haul' aviation outlined, HSR is only an option on relatively thick and short overland routes.

Most routes in Southeast Asia are overwater or do not have the traffic volumes to justify HSR. However, there are other potential options for decarbonizing the other super short-haul routes with the first paper particularly focusing on the possibility of electric and hydrogen aircraft.

- **Related Recommendation:** Southeast Asian countries should aim to establish HSR lines on short-haul routes that now account for 10% of regional capacity, providing a more sustainable option for both local and connecting passengers.

Scope of Study

The remainder of this white paper provides an overview of airport rail connectivity and opportunities by country. Indonesia and Laos are examined in depth as they have become the first two Southeast Asian countries with so-called HSR lines (technically the new train line in Laos is more medium speed).

Following the detailed case studies on Laos and Indonesia there is a section briefly outlining existing rail connections and future opportunities in Cambodia, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam. Two Southeast Asian countries, Brunei and Timor-Leste, are excluded as they are very small with no trains and limited rail potential.

The focus of this paper is on future opportunities for rail to improve airport and overall passenger connectivity in Southeast Asia as well as in some cases replace the need for flights. Other intermodal connections and cargo are not examined.

There are very few airport-sea connections in Southeast Asia. While there are opportunities in this segment, including in Indonesia and Singapore, this paper looks specifically at rail.

Laos Case Study

Laos: Overview

Laos is one of Southeast Asia's smallest countries with a population of only about 7.5 million. It also has one of the Southeast Asia's smallest aviation markets. There were only 3.5 million passengers in Laos in 2019, including 1.2 million domestic and 2.3 million international passengers. In Southeast Asia, only Brunei and Timor-Leste have smaller aviation markets.

However, Laos became in 2021 the first Southeast Asian country with a so-called HSR line (it is really medium speed). Indonesia in 2023 became the first Southeast Asian country with a true HSR line but the train line in Laos is three times longer and has essentially replaced what was Laos' biggest domestic air route. In Indonesia the train line is too short to directly impact any air route.

The first passenger train in Laos began operating in December 2021, connecting the capital Vientiane to the popular tourist town of Luang Prabang and the China border town of Boten. It takes about two hours to travel from Vientiane to Luang Prabang and another two hours to reach Boten for a total distance of about 420 km. The train travels at up to 160 km per hour, which puts it in the medium rather than high speed category although it is often referred to as HSR.

The train does not stop at any airport. Establishing airport rail connectivity would be difficult given that both the Vientiane and Luang Prabang rail stations are further from downtown than either airport. In Luang Prabang the train station is about 10 km from both the town and the airport while in Vientiane the station is about 15 km from the city centre and 20 km from the airport.

Better rail-airport connectivity would be beneficial. Currently there is only a bus service in Vientiane, which links the central part of the city with the new train station and started when the rail service to Luang Prabang began.

Laos: Impact on the Vientiane-Luang Prabang Route

Not surprisingly, the new train has had a major impact on the Vientiane-Luang Prabang air route given the downtown-to-downtown travel time is now about the same with the train. Travelling by train is also cheaper and generally considered less of a hassle. For some tourists, environmental sustainability is another factor, particularly given Laos is positioned as an ecotourism destination.

Prior to the pandemic about 300,000 passengers per year flew between Vientiane and Luang Prabang, making it by far the largest domestic route in Laos. Traffic declined significantly following the opening of the train. In 2023, there were only roughly 50,000 passengers on the Vientiane-Luang Prabang air route.

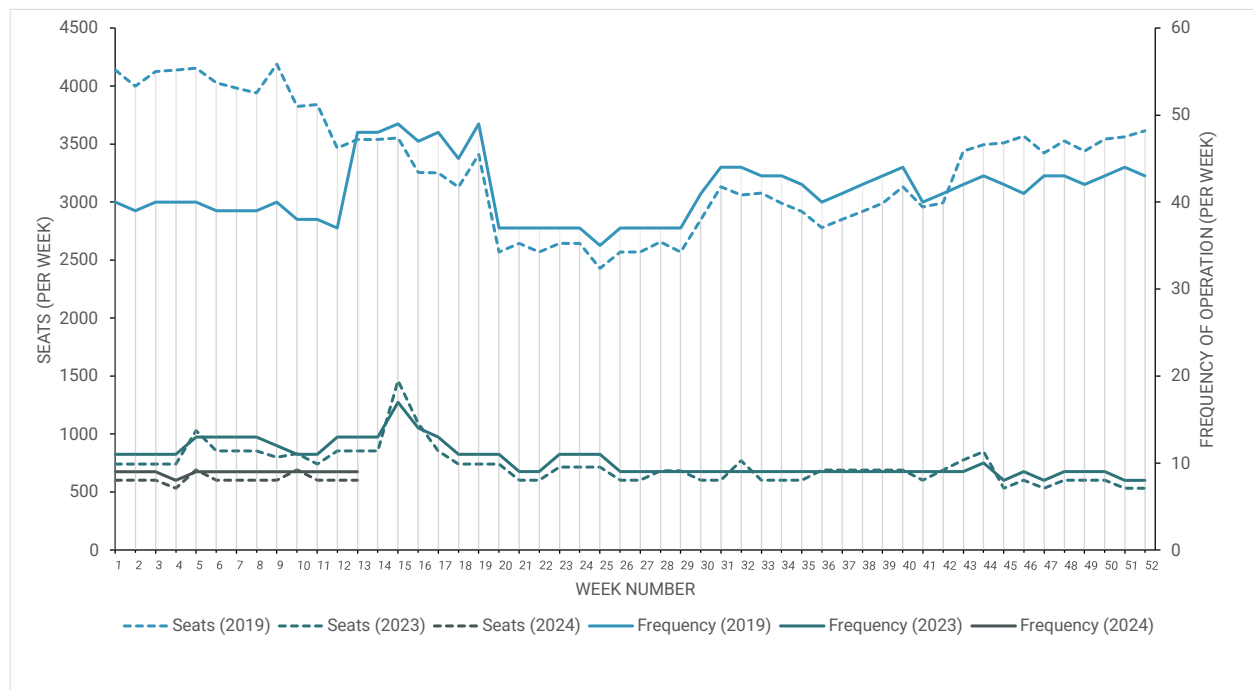
There is currently an average of 1.3 flights per day on the Vientiane-Luang Prabang route compared to an average of average of nearly 6 flights per day prior to the pandemic (based on OAG schedules data for March 2024 vs March 2019). The remaining Vientiane-Luang Prabang flights now cater to connecting passengers although there is also still some local traffic as all the trains are sometimes sold out.

Lao Airlines currently has only one daily between Vientiane and Luang Prabang compared to three to four daily flights prior to the pandemic. The route is also served by Lao Skyway with two weekly flights currently compared to two daily flights prior to the pandemic. Both airlines are government owned with Lao Skyway focusing mainly on routes to small rural communities and Lao Airlines serving the main domestic routes as well as international routes.

Lao Skyway operates 56-seat MA60 turboprops on Vientiane-Luang Prabang while Lao Airlines predominately uses 70-seat ATR 72 turboprops. Lao Airlines sometimes deploys much larger Airbus A320 narrowbody jets. Prior to the pandemic there were more jet frequencies, but the route has always been mainly served with turboprops.

Overall seat capacity on the Vientiane-Luang Prabang route is currently about 85% below pre-COVID levels (based on OAG data for March 2024 vs March 2019). There was an immediate reduction in capacity after the train opened in December 2021. There was a slight increase in early 2022 as it quickly became obvious there was not enough trains to meet the demand, resulting in some passengers opting to fly. As more trains were added in 2023 there was another reduction in the number of flights.

Figure 1 – Vientiane-Luang Prabang one-way weekly flight seats and frequencies



Source: Aviation Studies Institute and OAG

Airline capacity between Vientiane and Luang Prabang was already significantly below pre-pandemic levels prior to the opening of the train in December 2021 as borders were still closed. While domestic flights continued to operate in Laos during the pandemic there was a reduction in frequencies as traditionally a large share of domestic passengers in Laos are foreign visitors who fly to travel around.

Laos reopened its borders in 2022, initially at the beginning of the year to vaccinated travellers and later in the year fully opening without any restrictions. As visitors returned many opted to take the train between Vientiane and Luang Prabang, which are the most popular destinations in Laos. Flying to other destinations in Laos is still common but do not attract nearly as many international tourists.

It takes about seven hours to drive from Vientiane on Luang Prabang. Prior to the train, the two public transport options were buses or flights. Bus traffic also has declined as the price of a train ticket is not much more expensive than the bus. However, bus travel is still relatively common in part because the trains are often sold out – even with more trains being added last year.

There are now six trains per day from Vientiane to Luang Prabang with three continuing to Boten. While these trains are part of the China-Laos Railway, only one of the six daily passenger trains operating in Laos currently crosses the border and continues to the terminus at Kunming. There are currently an average of 40 domestic trains operating only on the China portion, which spans about 600 km.

China State Railway Group reported that in the first two years of the China-Laos Railway – December 2021 to December 2023 – 3.74 million passengers were carried on the Laos portion while the China portion handled more than 7 million passengers over the same period. The total travel time on the one train that runs the entire approximately 1,000 km length of the China-Laos Railway from Vientiane to Kunming is almost 10 hours. Passenger train service across the border began in April 2023. Initially as China had not yet reopened borders

only freight trains crossed the border and there were only domestic passenger services on both sides of the border.

Laos: Impact on the International Market

Although there is currently only one train per day that crosses the border the opening of the railway has impacted the Laos international market.

The Vientiane-Luang Prabang train has attracted a significant volume of Thai passengers that used to fly from Bangkok to Luang Prabang. Many of these passengers now fly from Bangkok to Udon Thani, a route that is well served by low-cost carriers, making the combination of a domestic flight followed by the train attractive from a cost perspective.

There also has been significant interest among Thais in the Laos train from a tourism perspective as it provides a new option for seeing a country which is well known for its rugged beauty and landscapes. Many of the tourists taking the train break up their journey by staying over at different destinations. Vang Vieng, located between Vientiane and Luang Prabang, is a particularly popular destination with a train station.

Some Bangkok-Luang Prabang passengers also now opt to take trains for the entire journey. This could become an even more common option once the planned HSR line from Bangkok to Vientiane is completed.

There are currently an average of three daily flights from Bangkok to Luang Prabang compared to five daily flights prior to the pandemic. The number of daily flights between Bangkok and Vientiane also has declined from eight per day prior to the pandemic to six currently. Both these routes were highlighted in Table 2 in a prior section of this white paper.

There also has been a reduction in flights from Vientiane and Luang Prabang to Kunming. There are currently two to three daily Vientiane-Kunming flights compared to an average of four daily flights prior the pandemic. The shorter Luang Prabang-Kunming route had an average of slightly more than one daily flight prior to the pandemic and is not currently served.

Chinese citizens account for a large portion of Luang Prabang-Vientiane train passengers. While only one train crosses the border, Chinese visitors are also crossing the border by other modes of transport and using the train once they are in Laos.

Below is a table listing the 10 largest international Laos prior to the pandemic and their current recovery rate. It highlights how the routes to Bangkok and Kunming have been impacted by the new train line.

Table 3 – Top 10 international routes for Laos and capacity recovery rate: March 2024 vs March 2019

Rank	Route	Return Seats March 2019	Return Seats March 2024	Recovery rate
1.	Vientiane-Bangkok (VTE-BKK/DMK)	85,400	61,500	72%
2.	Vientiane-Seoul (VTE-ICN)	39,500	47,300	120%
3.	Luang Prabang-Bangkok (LPQ-BKK/DMK)	38,000	23,300	61%
4.	Vientiane-Kunming (VTE-KMG)	36,700	27,500	75%
5.	Vientiane-Hanoi (VTE-HAN)	21,600	21,900	102%
6.	Luang Prabang-Hanoi (LPQ-HAN)	16,400	13,300	81%
7.	Vientiane-Phnom Penh (VTE-PNH)	12,600	14,500	115%
8.	Vientiane-Busan (VTE-PUS)	12,400	16,900	136%
9.	Luang Prabang-Siem Reap (LPQ-REP/SAI)	12,000	8,900	74%
10.	Luang Prabang-Kunming (KPQ-KMG)	8,200	0	0%
	Total (for the top 10 routes only)	282,700	235,000	83%

Note: monthly seats are rounded to the nearest hundred

Ranking is based on March 2019 capacity (pre-COVID)

The Vientiane-Bangkok and Luang Prabang-Bangkok routes include both Bangkok airports

Luang Prabang-Siem Reap includes Siem Reap's old airport for March 2019 and Siem Reap's new airport for March 2024

Source: Sobie Aviation and OAG

Vientiane-Bangkok was and is still the largest international route from Laos but is only 72% recovered (based on scheduled seat capacity for March 2024 vs March 2019). This compares to an overall recover rate for the Laos international market of 87%.

Luang Prabang-Bangkok seat capacity is only 61% recovered. It is now the third international largest route in Laos, down from the second spot prior to the pandemic.

Vientiane-Kunming seat capacity is 75% recovered while Luang Prabang-Kunming seat capacity has a recovery rate of zero as this route has been suspended. Vientiane-Kunming was the fourth largest international route in Laos prior to the pandemic and is now the third largest due the bigger decline on the Luang Prabang-Bangkok route. Luang Prabang-Kunming was the tenth largest international route from Laos prior to the pandemic.

These 10 routes accounted for 83% of total international seat capacity in Laos in March 2019. There were another 21 scheduled international routes in March 2019 (for a total of 31 routes), but these are smaller routes that are generally served less than daily. Currently there are 25 international routes in Laos and international seat capacity is 87% recovered (based on OAG schedules data for March 2024 vs March 2019). This matches the 87% international seat recovery rate for the overall Southeast Asian market.

In 2023, Laos international seat capacity was only 63% recovered while the overall Southeast Asian international market was 76% recovered, based on OAG schedules data. The acceleration of the international capacity recovery rate in Laos has been driven by an increase in capacity in markets not impacted by HSR, particularly South Korea. The 87% recovery figure for March 2024 indicates Laos is now on track for a full recovery, which is good news for Laos as the country and its economy relies heavily on tourism.

The opening of the train has made it more difficult to recover capacity on some of Laos' largest international routes. However, the overall impact of the train has been positive as the train has become a major tourist attraction of its own and has made visiting the country easier.

The impact has particularly been positive for Vientiane as the train has shifted some demand from Luang Prabang International Airport to Vientiane's Wattay International Airport due to Luang Prabang becoming much more accessible from larger Vientiane. International seat capacity at Vientiane is currently 97% recovered while international seat capacity at Luang Prabang it is only 59% recovered (based on OAG data for March 2024 vs March 2019). This suggests the train has had a significant impact on Luang Prabang's international market as a larger portion of visitors are now flying into Vientiane and taking the train to Luang Prabang rather than fly directly into Luang Prabang.

Higher average air fares at Luang Prabang, which has always had significantly less foreign airline competition than Vientiane, is a possible factor in the shift of traffic from Luang Prabang to Vientiane. But the popularity of the train as a tourist attraction is also a likely factor.

Vientiane has always been better connected. Vientiane currently has 17 international destinations compared to 20 prior to the pandemic while Luang Prabang currently has only five international destinations compared to nine prior to the pandemic. Vientiane will likely continue to attract new international routes.

There are still new route opportunities for Luang Prabang, but typically new routes for Luang Prabang have been routes that are already served from Vientiane. This becomes less feasible now that there is a train line connecting the two cities in just two hours. While an airport-rail connection would make flying into Vientiane even more attractive for visitors heading to or from Luang Prabang, this is not necessarily a major impediment as more tourists are now visiting both destinations and are using the train to see the country.

Laos: Impact on the Domestic Aviation Market

Domestic traffic at Luang Prabang also has declined significantly as it relied heavily on the route to Vientiane. Luang Prabang's current domestic seat capacity is down by 84% due to the 85% drop on the Vientiane route.

Luang Prabang currently only has one other domestic route, a three times weekly service to Pakse (PKZ), the second largest city and third largest airport in Laos. Luang Prabang-Pakse is the longest domestic route in Laos and the only route over 500 km.

Prior to the pandemic Luang Prabang had three domestic routes. However, service to Xieng Khouang Airport (XKH) in Phonsavan, which was operated by Lao Skyway with one daily flight, did not resume after the pandemic.

Domestic capacity at Vientiane is down a more modest 32% as it has a more diversified network with eight domestic destinations. Every airport with scheduled commercial service in Laos has a connection to Vientiane while only two have a connection to Luang Prabang.

Domestic capacity in Laos is currently only 61% recovered while Southeast Asia's overall domestic market is now almost 90% recovered. When excluding the Luang Prabang-Vientiane route the domestic market in Laos is 88% recovered, which is nearly identical to the overall Southeast Asia average. Only the Luang Prabang-Vientiane route has been impacted by the train as none of the other eight cities or towns in Laos with scheduled commercial air services have train stations.

Vientiane-Pakse has become the largest domestic route in Laos based on seat capacity following the massive reduction on Vientiane-Luang Prabang. Vientiane-Pakse is currently served with two to three flights per day with seat capacity 18% higher than March 2019 levels. The table below shows the capacity recovery rate of the top five domestic routes in Laos and further highlights how the train has only impacted Luang Prabang-Vientiane, which is now the fourth largest domestic route in Laos.

Table 4 - Top 5 domestic routes for Laos and capacity recovery rate: March 2024 vs March 2019

Rank	Route	Return Seats March 2019	Return Seats March 2024	Recovery rate
1.	Luang Prabang-Vientiane (LPQ-VTE)	36,900	5,600	15%
2.	Vientiane-Pakse (VTE-PKZ)	13,100	15,400	118%
3.	Vientiane-Xieng Khouang (VTE-XKH)	7,800	7,800	100%
4.	Vientiane-Luang Namtha (VTE-LXG)	7,300	10,000	136%
5.	Vientiane-Ban Huoeisay (VTE-HOE)	6,900	4,200	61%

Note: monthly seats are rounded to the nearest hundred

Ranking is based on March 2019 (pre-COVID)

Source: Sobie Aviation and OAG

Pakse is the main city in southern Laos. There are currently no plans to develop a train line to Pakse, but Pakse is accessible to train services across the border in northeastern Thailand.

Pakse is near the Thai border and is about a two-hour drive from Udon Ratchathani, which has a slow rail service and low-cost flights to Bangkok. However, unlike with Udon Thani and Nong Khai, there is no rail connection to this part of Laos-Thailand border.

Savannakhet is another city southern Laos that is on the Thailand border but is about three and half hours to the nearest train station at Khon Kaen. Savannakhet Airport (ZVK) currently has nine weekly flights to Vientiane and VTE-ZVK is currently the fifth largest domestic route in Laos. However, it was not one of the top five domestic routes prior to the pandemic.

Savannakhet and Pakse are the only other airports in Laos with international services. ZVK currently has three weekly flights to Bangkok while larger PKZ has three weekly flights to both Ho Chi Minh and Siem Reap. PKZ also had Bangkok flights prior to the pandemic.

Laos opened in late 2023 a fourth international airport, in the northern province of Bokeo near the borders of Myanmar and Thailand. Bokeo International Airport was officially inaugurated in early February 2024.

Bokeo has the third largest passenger terminal in Laos, with capacity to handle 2 million passengers per annum. However, it does not yet have any international services and Lao Airlines has dropped earlier plans to launch domestic service to Bokeo from Vientiane. Lao Airlines initially set an 8 February 2024 launch date for the Vientiane-Bokeo service but pulled flight just days before the planned launch.

A new Lao carrier, Lanexang Airways, is reportedly planning to serve Bokeo initially with domestic and possible international flights in future. Lanexang Airways took delivery of its first aircraft, an ATR 72 turboprop, in 2023 and launched commercial services in early 2024. So far it has been operating one daily flight on the Vientiane-Ban Houeisay route.

Ban Houeisay Airport (HOE) is near the town of Huay Xai, which is the capital of Bokeo province. Huay Xai and HOE are located about 50 km or a one-hour drive from Bokeo International Airport. Both airports are located near the Mekong River on the border with Thailand. HOE is about 100 km and less than two hours from Chiang Rai, a relatively large Thai city with low-cost carrier service to Bangkok. The new airport is in a more remote location and is about 150 km from Chiang Rai.

Chiang Rai currently does not have rail service, but construction recently began of a new Chiang Rai branch of the Bangkok-Chiang Mai line. The branch line to Chiang Rai, which has been talked about for several decades, is now expected to open in 2028. An extension of this branch to the Laos border near HOE is under consideration.

Illustration 2 – Laos passenger rail line with stations and location of mentioned airports shown



*Note. Airports shown are those mentioned in this case study; there are several smaller airports in Laos that are not shown
Official international borders are not depicted
© OpenStreetMap contributors, ESRI*

Laos: Future Train Options (Including Across the Thailand and Vietnam Borders) and Potential Impact

Extending more train lines in eastern Thailand to Laos is a future possibility and could provide rail connectivity to southern Laos, including Pakse and Savannakhet. However, the focus for improving Thailand-Laos connectivity in the near term will be on the Thailand-China Railway which will run through Laos, resulting in a better and much faster connection from Bangkok to Vientiane.

Currently it takes over 12 hours by train to go from Bangkok to Vientiane, including the long-distance train from Bangkok to Nong Khai and the short shuttle train across the Laos border to Thanaleng Station, which is 13 km from Vientiane. This connection will improve with the planned April 2024 opening of Khamsavath Station, a new station closer to the Vientiane, along with a new direct train from Bangkok to Khamsavath. This new train will stop at Nong Khai, from where it will be operated by crew from Laos, but switching to a shuttle train will no longer be required.

However, the real gamechanger will occur when an HSR line is opened from Bangkok to Vientiane and connects directly with the Vientiane-Kunming train, which terminates in a different station outside Vientiane. The first phase of this new HSR line is now expected to open by 2027 and connect Bangkok and Nakhon Ratchasima with the Nakhon Ratchasima-Nong Khai-Vientiane section opening later.

Connecting Bangkok and Nakhon Ratchasima with HSR also opens up the possibility of HSR to Ubon Ratchathani and Pakse as the current line Bangkok-Udon Ratchathani line runs on the same tracks as the Bangkok-Nong Khai line until Nakhon Ratchasima. However, there are no plans yet to upgrade to HSR the rail line from Nakhon Ratchasima to Udon Ratchathani, which is about 140 km from Pakse. There is also currently no rail link from Udon Ratchathani to the Thailand-Laos border 40 km outside Pakse.

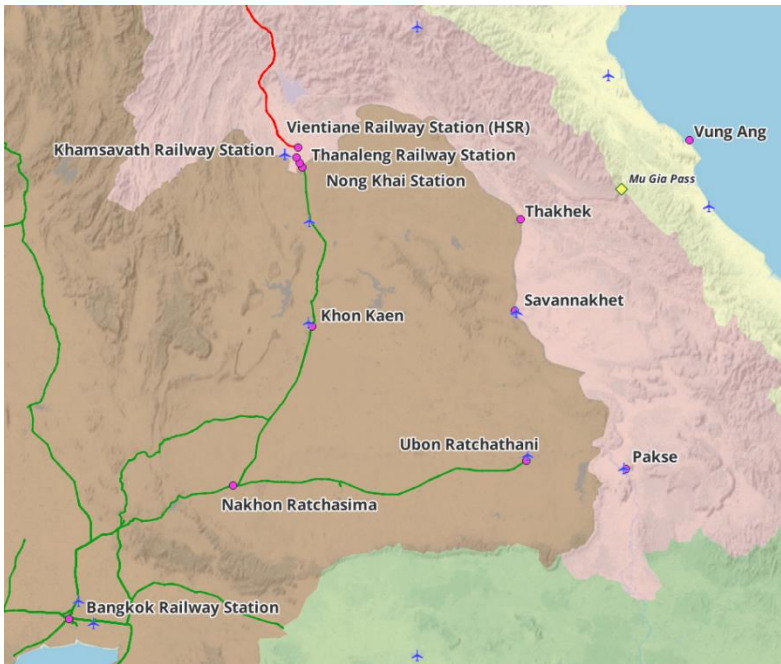
There are also currently no plans to build a train line east from Khon Kaen, which is a stop on the Bangkok-Nong Khai line, to the Thailand-Laos border at Suvannakhet. However, once there is HSR service to Khon Kaen as part of the second phase of the Thailand-China Railway it will provide a much faster surface travel option for passengers heading from Bangkok to Savannakhet with passengers transferring to buses at Khon Kaen, which is about 230 km from Suvannakhet.

The planned Vietnam-Laos Railway also potentially provides some options for improving rail connectivity in southern Laos. The first phase of constructing the Vietnam-Laos Railway includes a 150 km east-west section between the Laos-Thailand border and Laos-Vietnam borders in Khammouane province, which is just north of Suvannakhet province. This section goes through the town of Thakhek, which is the capital of Khammouane province and is about 125 km north of Suvannakhet town.

The train will eventually connect the seaport of Vung Ang in Vietnam with Vientiane. The second phase of the Laos portion involves connecting Thakhek with Vientiane, covering another 310 km. On the Vietnam side, Vung Ang is about 150 km to the Vietnam-Laos border. At the border the train will go through the Mu Gia pass, a remote mountainous area.

Construction of the first phase is slated to start later this year although this seems overly ambitious given Khammouane residents that would be impacted reportedly have not yet been informed. This rail line is being developed as a public-private joint venture by Lao and Vietnamese companies. It will carry both passengers and freight at speeds up to 150 km/hour.

Illustration 3 – Existing railway lines in Thailand and Laos with places mentioned shown



Notes. Red lines indicate existing railway lines in Laos; Green lines indicate existing railway lines in Thailand; Existing railway lines in Cambodia and Vietnam are not shown; Official international borders are not depicted
© OpenStreetMap contributors

Laos has ambitions to develop more rail lines which it refers to as high-speed, but they are actually medium-speed. A true high-speed train is not necessary given the size of the country and would be extremely expensive given the rugged geography. With several train lines, Laos could be transformed as a country, improving accessibility for both tourists and local residents.

The aviation market will also continue to be impacted. While there will be more options for taking the train domestically and to neighbouring countries, any impact on the domestic and short-haul markets could be offset by more flights on longer routes as Laos becomes a more attractive destination overall.

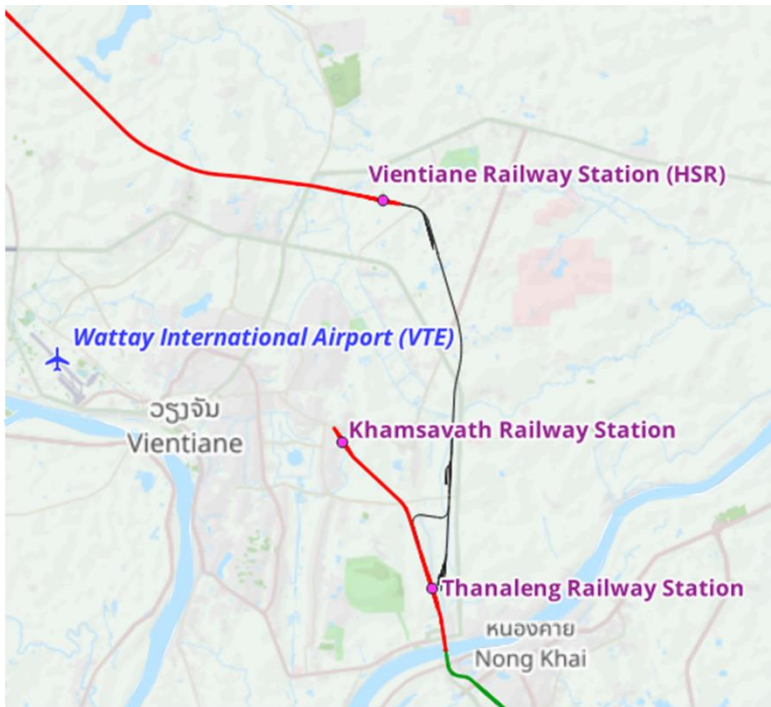
Laos needs to make sure all the new rail lines are connected to each other despite being developed with partners from different countries. Vientiane should ideally have one station for all railways and offer rail connectivity to Vientiane Airport, which is the main gateway to Laos. Vientiane has the potential of becoming a rail hub between China, Thailand and Vietnam. This would be beneficial for the Lao tourism sector and overall economy, potentially driving growth for the overall aviation sector even if some short-haul routes are impacted.

For other airports in Laos, there could be a decline in both domestic and international flights as more rail lines are opened. This would not necessarily be a negative development as super short-haul transport becomes more sustainable and convenient, driving growth in both domestic and international tourism.

Tourism growth is critical to improve Laos' economy, which is now in a fragile state, and income levels. Tourism is also critical to the Laos aviation sector as visitors accounted for about 70% of total international passengers prior to the pandemic. With the right policies and focus, Laos has an opportunity to develop tourism and transport, including aviation, in tandem while also improving sustainability.

- **Laos Specific Recommendation:** Laos should consider improving connectivity between rail lines and airport-rail options. Laos should consider developing Vientiane as an intermodal hub with an expanded airport that is connected to one station for all train lines.

Illustration 4 – Passenger rail stations and railway lines in and around Vientiane



Notes. Red line indicates passenger rail lines; Black lines indicate cargo-only rail segments; Green line indicates rail lines in Nong Khai, Thailand (approximate location)
This map shows locations in Laos and Thailand; International borders are not depicted
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INDONESIA CASE STUDY

Indonesia Overview

There are currently passenger train lines on three Indonesian islands – Java, Sumatra and Sulawesi. These are Indonesia's three most populated island. Java alone has a population of over 150 million while Sumatra has a population of about 60 million and Sulawesi about 20 million.

While Indonesia has more than 6,000 populated islands, Java, Sumatra and Sulawesi account for about 85% of Indonesia's total population. Six of Indonesia's seven largest airports are on these three islands. (The other major airport is on Bali, which has a population of only about 4 million but is Indonesia's most popular tourist destination.)

While most domestic air travel in Indonesia is between islands, Java, Sumatra and Sulawesi also have sizeable intra-island networks. As outlined in the previous section of this paper, intra-Java accounts for several of the largest domestic routes in Indonesia.

Indonesia is one of two case studies in this paper as it recently opened Southeast Asia's first true HSR line. This line is initially very short but could have a major impact on Indonesia's aviation market if a proposed extension comes to fruition. Rail has already impacted Indonesia's aviation market as new airports have opened with new airports having rail connectivity better positioned than those with limited or no rail connectivity.

Indonesia is a massive and complex market. This case study is meant to provide an overview of the current and planned rail lines and assess some of the implications for aviation.

Java

Java: overview

Java has the largest and most established rail network in Indonesia. However, it consists almost entirely of slow and ancient trains, making air travel more appealing even on short routes within the island. Airport rail connectivity has improved in recent years, resulting in new rail options for three of Java's airports, but there is still massive room for improvement.

There are currently 10 airports in Java with regularly scheduled services. There were 11 until late last year, when Bandung's old airport (BDO) was closed for scheduled commercial services and remaining flights shifted to Kertajati International Airport (KJT). Kertajati initially opened in 2018 and Yogyakarta International Airport (YIA) initially opened in 2019. Yogyakarta's old airport (JOG) still has commercial turboprop services and is therefore among the current 10 airports in Java. Jakarta also has two airports with Halim (HLP) reopening for commercial flights in 2014 to help alleviate congestion at Soekarno-Hatta (CGK), which is the largest airport in Java and Indonesia overall.

Java's airports handled a combined 91 million passengers in 2019, including 19 million domestic and 72 million international passengers. The passenger traffic breakdown by airport is listed in the table below. While 2019 data is used as it is the full last year prior the pandemic, the peak year in Indonesia was 2018 as the domestic market contracted by 22% in 2019, resulting in significant passenger traffic declines for virtually every airport.

Table 5 – Java’s airports: 2019 passenger traffic (in millions) and current number of routes

Airport	2019 domestic traffic	2019 international traffic	March 2024 domestic routes	March 2024 international routes
Jakarta Soekarno-Hatta (CGK)	37.424	15.164	43	45
Surabaya Juanda (SUB)	13.400	2.407	23	8
Yogyakarta Adisutjipto (JOG)	6.432	0.419	1	N/A
Jakarta Halim (HLP)	6.036	N/A	13	N/A
Semarang Jenderal Ahmad Yani (SRG)	3.657	0.229	9	0*
Bandung Husein Sastranegara (BDO)	1.599	0.622	N/A	N/A
Solo Adi Soemarmo (SOC)	1.565	0.155	5	2*
Malang Abdul Rachman Saleh (MLG)	0.894	N/A	2	0
Kertajati (KJT)	0.457	N/A	3	1
New Yogyakarta (YIA)	0.282	N/A	14	2
Banyuwangi (BWX)	0.266	N/A	2	N/A
Jakarta total (CGK+HLP)	43.460	15.164	44	45
Yogyakarta total (JOG+YIA)	6.714	0.419	14	2
Bandung total (BDO+KJT)	2.056	0.622	3	1

Note: Number of routes based on OAG schedules for March 2024

Passenger traffic based on Indonesia Ministry of Transportation data for 2019 (pre-pandemic)

*no longer permitted to handle scheduled international flights under Indonesia’s new post-pandemic airport policy but religious pilgrimage flights to Jeddah and Madinah in Saudi Arabia are still allowed (SOC currently has these but SRG does not have any in March 2024)

There are currently only four airports in Java that are permitted to handle scheduled international services – Jakarta Soekarno-Hatta, Surabaya Juanda, New Yogyakarta and Kertajati. Semarang and Solo had international services prior to the pandemic but were not included in Indonesia’s new post-pandemic policy limiting scheduled international flights to 12 airports, including four in Java.

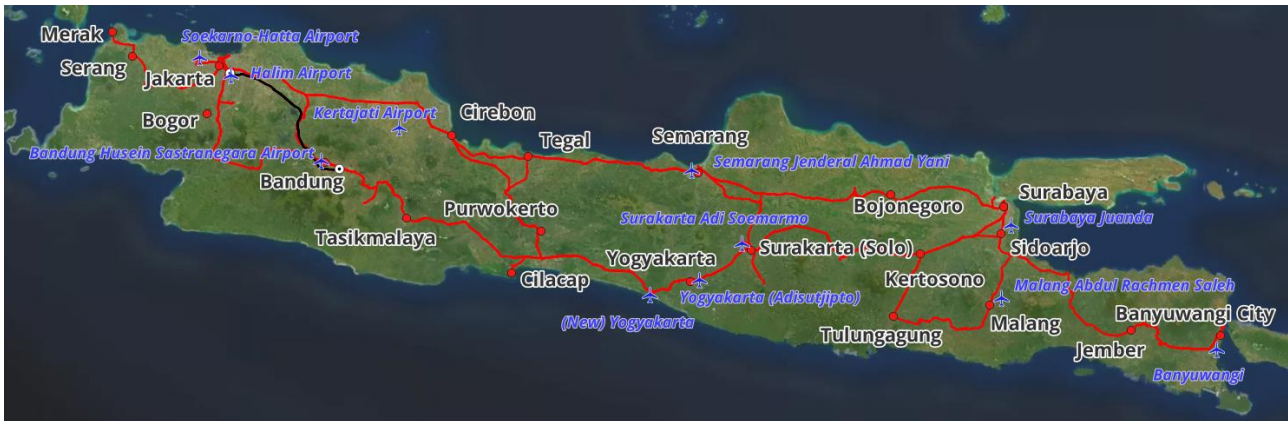
The old airports in Bandung and Yogyakarta both had scheduled international flights prior to the pandemic but were not permitted to handle any scheduled international flights after borders reopened. Kertajati was open to international flights from 2018 but its first international scheduled service began just before the pandemic in February 2020. New Yogyakarta opened for international flights in April 2022 after borders reopened.

Only Soekarno-Hatta has a large international network with 45 destinations. Surabaya currently has eight international destinations while Yogyakarta has two (Kuala Lumpur and Singapore) and Kertajati just one (Kuala Lumpur). Bandung also had services to Singapore prior to the pandemic. Solo had services to Kuala Lumpur and Kunming prior to the pandemic (as well as religious pilgrimage flights to Saudi Arabia). Semarang had services to Kuala Lumpur and Singapore prior to the pandemic (as well as religious pilgrimage flights to Saudi Arabia).

Banyuwangi and Malang are smaller airports that only have scheduled services within Java. There are several other small airports in Java that currently are only used by other types of operators, including air taxi operators. Some previously had scheduled airline services. None of these other airports handled more than 50,000 passengers in 2019.

Banyuwangi and Malang are in the remote southeast corner of Java. Banyuwangi, which is located near the ferry to Bali, is about 1,000 km from Jakarta and 300 km from Surabaya. Malang is only 100 km from Surabaya.

Illustration 5 – Railway lines in Java, Indonesia and location of airports



Notes. Red Lines indicate regular passenger railway lines; Black Line indicates high-speed rail; The selection of airports shown are those mentioned within this section

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There are passenger rail lines spanning the entire 1,200 km length of Java, from Merak at the western end to Banyuwangi at the eastern end. Although Java is only about 150 km wide there are east-west lines in both the south and north for most of the island and at a few points north-south services are provided.

The trains are slow but relatively frequent. The fastest train from Jakarta to Surabaya takes about eight hours. From Surabaya to Banyuwangi the train takes at least seven hours and from Jakarta to Merak the train takes at least four hours. The total journey from Merak to Banyuwangi is at least 23 hours including connection times.

Although many air passengers use the rail network to reach their final destinations, there are no rail stations at several of Java's airports. For most air-rail connections a taxi or bus is required. For example, it takes at least 40 minutes to drive (more at peak times) the 20 km from Surabaya's Juanda Airport to Surabaya's main railway station, Gubeng. Two other railway stations, Stasiun Waru and Gedangan, are closer, but are each still at least a 15-minute drive from Juanda (more at peak times) and not all trains stop at them.

The only airport train lines currently in Java are at Solo, Jakarta and Yogyakarta. While these lines provide some connectivity, they do not link well with the rest of the rail network, particularly in Jakarta. The lack of rail connectivity at the new airport outside Bandung is also a major concern and has contributed to much lower than initially expected passenger traffic at Kertajati.

Java: Jakarta airport rail connectivity and opportunities

The rail line to Jakarta's Soekarno-Hatta Airport was opened at the end of 2017. The Soekarno-Hatta Commuter Line now runs 54 km in about 50 minutes from the airport to Manggarai in south Jakarta. The line initially had four stops ending at BNI City in central Jakarta with the extension to Manggarai completed in 2019.

Manggarai is about 9 km from Halim Station, where the new HSR train to Bandung began operating in October 2023. There is a light rail connection at Halim Station but there is no direct connection to Manggarai or Soekarno-Hatta. It is therefore more convenient and generally faster to take a bus or taxi from Soekarno-Hatta to Bandung.

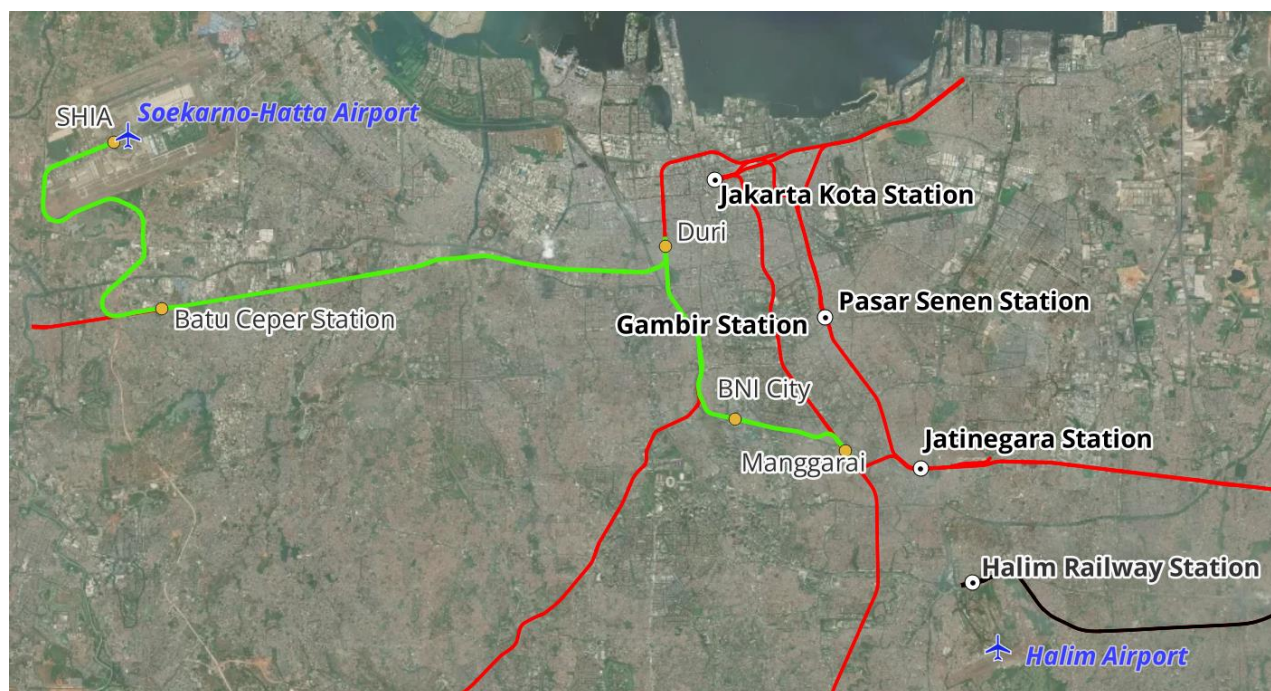
Halim Station is only about 5 km to Halim Airport, which has 13 domestic routes. However, there are no rail connections at Halim Airport – to Halim Station or anywhere else in Jakarta.

Bandung is only about 150 km from central Jakarta and about 175 km from Soekarno-Hatta. While the new HSR line from Jakarta to Bandung has reduced travel time to about one hour, compared to about three hours on the old train or by highway (without traffic), it will not appeal to many air passengers without better airport access.

Rail connectivity from Soekarno-Hatta to Gambir Station and Pasar Senen Station, which are used for the non-HSR trains to destinations throughout Java, is also relatively poor. Both Gambir and Pasar Senen are about 5 km from BNI City but there are no direct trains.

Indonesia should look at options for improving airport-rail connectivity in Jakarta as this would reduce reliance on cars or buses to reach other destinations in West Java province, including Bandung. It could also result in a reduced reliance on short connecting flights to other provinces in Java, freeing up slots at congested Jakarta-Soekarno Hatta for domestic flights to other islands in Indonesia where there will never be a rail option. Improving airport-rail connectivity in Jakarta will become particularly important if the Jakarta-Bandung HSR line is extended to Yogyakarta and Surabaya.

Illustration 6 – Railway lines of Relevance to airport connectivity in Jakarta, Indonesia



Notes. Green Line indicates Soekarno-Hatta Airport Commuter Line; Red Lines indicate regular passenger railway lines including metros; Black Line indicates high-speed rail line
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Java: Bandung/West Java airport rail connectivity and opportunities

The Jakarta-Bandung HSR line ends at Bandung's Tegalluar Station, which is about 15 km from central Bandung. Bandung Station, which is used by the non-HSR trains, is closer to central Bandung and is only about 3 km from the old airport. Bandung's old airport (BDO) is no longer open to commercial flights but never had a rail stop.

BDO has been replaced by Kertajati Airport (KJT), which is in a rural area about 100 km northeast of central Bandung. There is no rail line to KJT. The closest rail station is about 40 km to the north at Jatibarang, a town on the rail line from Jakarta to Cirebon, a port on the north coast that is about 60 km west of KJT. The train from either Jatibarang or Cirebon to Jakarta takes about two and a half hours although Jatibarang is closer to Jakarta.

Access to KJT improved in July 2023, when a new toll road to Bandung opened, reducing travel time to about an hour and a half. However, the accessibility is still not sufficient to attract most Bandung passengers. BDO was a popular airport because of its central location and most of the passengers that used to fly BDO have opted to travel to Jakarta instead of KJT.

KJT currently only has five to six departures per day. Most of the flights go to Bali, catering to domestic leisure traffic from Bandung and other parts of West Java. There are also flights to Balikpapan, Medan and Kuala Lumpur, but none of these operate daily.

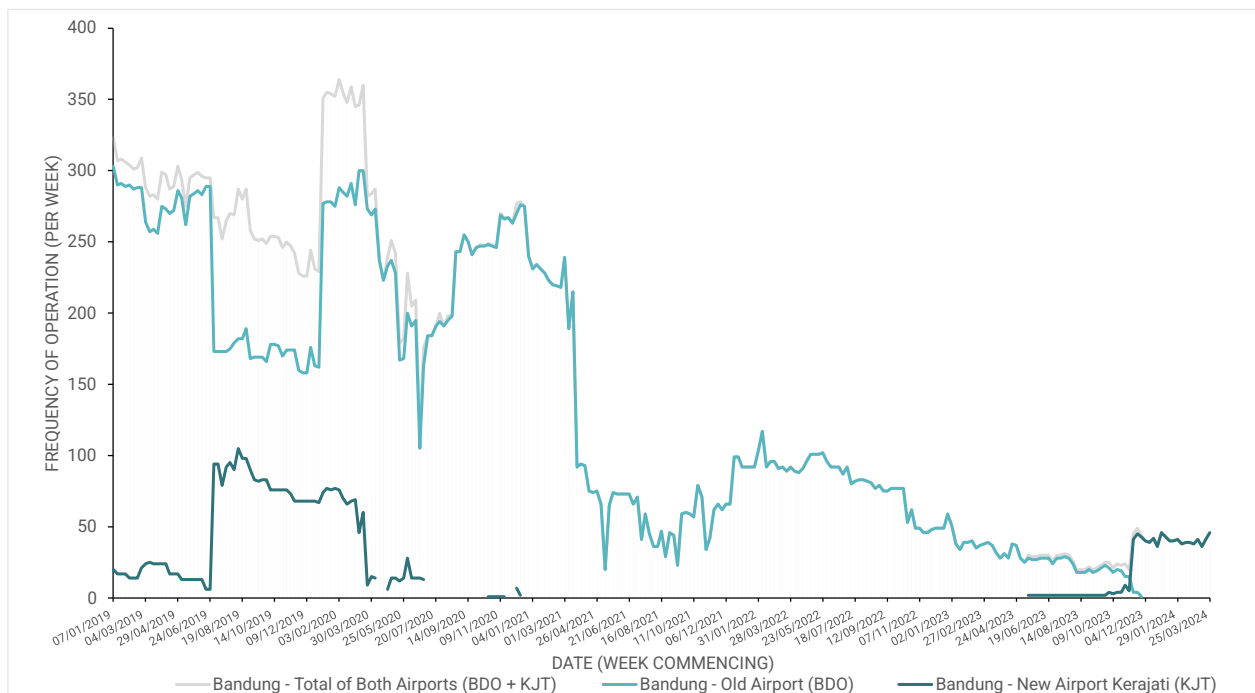
Prior to KJT opening in 2018, BDO had an average of 47 departures per day to 21 destinations. BDO's passenger traffic peaked at 3.2 million in 2018. KJT opened in May 2018 but had very few flights initially and handled only 34,000 passengers in 2018.

In mid-2019, authorities started imposing restrictions at BDO and encouraging airlines to shift flights to KJT. As a result, the number of departures at BDO flights dropped to only approximately 25 per day while the number of departures at KJT jumped from an average of only two per day to about 14. BDO traffic dropped to in 2019 to 2.2 million passengers while KJT handled almost 500,000 passengers, as outlined in the table in the Java overview section.

However, the KJT flights that were launched in 2019 were commercially unsuccessful due to low load factors and yields as airlines had to drop fares to attract passengers. At the beginning of 2020 airlines dropped most of their KJT flights and KJT again had only about two departures per day on average. At the same time airlines were able to bring back their BDO operations to 40 departures per day.

During the pandemic operations at BDO continued albeit at a reduced level due to domestic travel restrictions while KJT had virtually no flights. However, authorities started reimposing restrictions at BDO after travel restrictions were lifted and banned all commercial flights at BDO from late 2023. The closure of BDO was always planned but essentially airlines got a reprieve due to the pandemic and delays in constructing the toll road. The number of flights only increased to the current modest level of five to six per day after BDO was closed to commercial flights.

Figure 2 – Weekly one-way frequency of flights in the Bandung market (BDO and KJT)



Source: Aviation Studies Institute and OAG

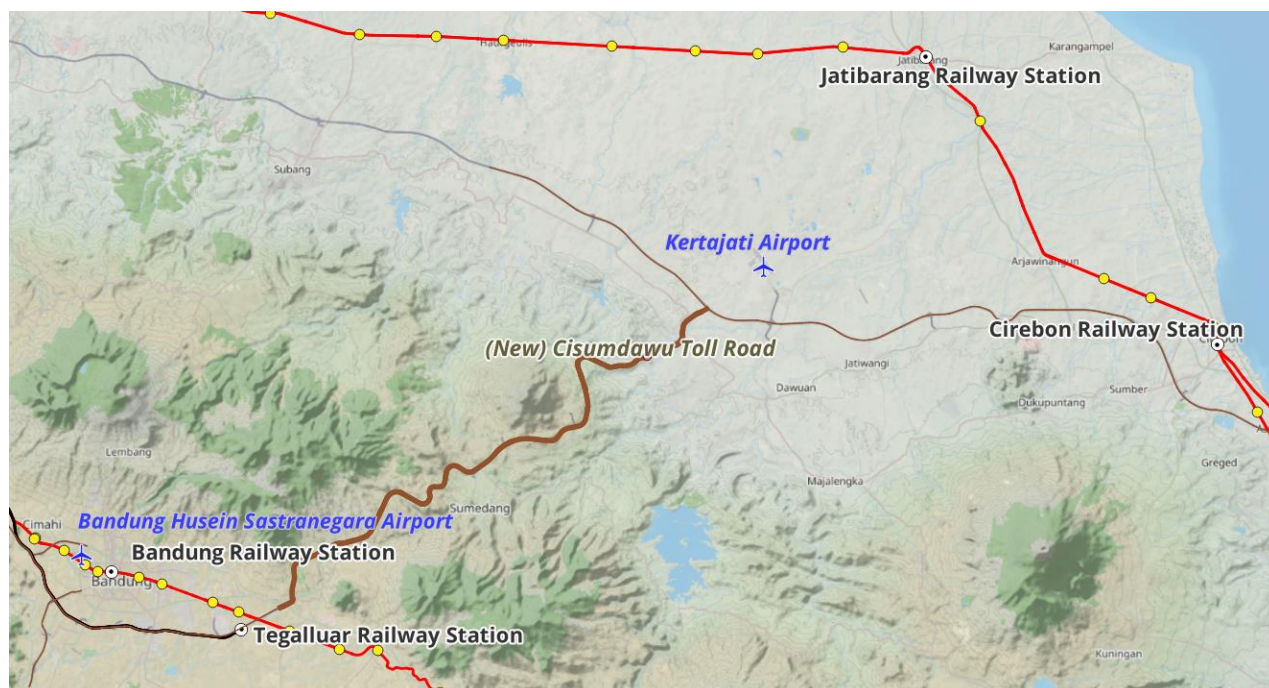
Airlines are still struggling commercially at KJT even with the current small number of flights. Airlines believe the toll road has not significantly helped attract most passengers to KJT given its remote location and distance from Bandung. KJT will likely handle roughly 600,000 passengers in 2024, indicating that about 2 million passengers that previously used BDO are now using other airports.

KJT's terminal is extremely underutilised as it has capacity to handle 5.6 million passengers per annum. Authorities were initially hopeful of reaching 5 million passengers within a few years and implementing expansion plans for up to 18 million passengers per annum. However, without rail connectivity KJT could struggle to reach 2 million passengers.

While it would be expensive, building an HSR line and rail stop to KJT is the only option to potentially boost the airport's utilisation to reasonable levels and avoid white elephant status. Indonesia has not yet decided on a routing for the proposed extension of the HSR line from Bandung to Yogyakarta and Surabaya, but one of the routings under consideration would run by KJT to Cirebon before crossing into the province of Central Java. This would instantly improve KJT's accessibility to not only Bandung but expand its catchment area to Central Java as well as the densely populated Jakarta area.

KJT could potentially become the first airport in Southeast Asia to have an HSR station. As the Jakarta-Bandung HSR runs at speeds up to 350 km per hour KJT's remote location would no longer be an issue.

Illustration 7 – Bandung area, showing location of airports, train stations and railway lines



Notes. Red Line indicates regular passenger railway line; Black Line indicates high-speed rail line; Brown Lines represent existing roads, with the thick Brown Line indicating the new Cisumdawu (Bandung – Kertajati) Toll Road
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Java: Central Java/East Java rail connectivity and opportunities

The new Yogyakarta International Airport (YIA) also has struggled to some extent due to its location. However, YIA has been able to attract relatively decent volumes of traffic and the opening of the airport rail line from central Yogyakarta has been critical in partially overcoming the much more remote location compared to the old airport.

YIA, which is about 40 km from the city, opened in May 2019 but initially had limited flights. YIA is in the southwestern corner of Special Region of Yogyakarta, which is surrounded by Central Java province.

The rail line to YIA opened in September 2021 with frequency increasing to 24 trips per day in August 2022. There are now local and express options with the express train running nonstop from YIA to Yogyakarta Station in 35 minutes while the local trains takes slightly longer as it stops at two other stations outside the city. This is significantly faster than driving, which takes at least one hour (more when there is traffic). Yogyakarta Station

is in the central part of the city and has local commuter and long-distance trains, making it easy to connect to other parts of Java.

YIA currently has an average about 47 departures per day (based on OAG schedules for March 2024). Prior to the pandemic it had less than 10 departures per day as most flights remained at the old Yogyakarta Adisutjipto (JOG) airport.

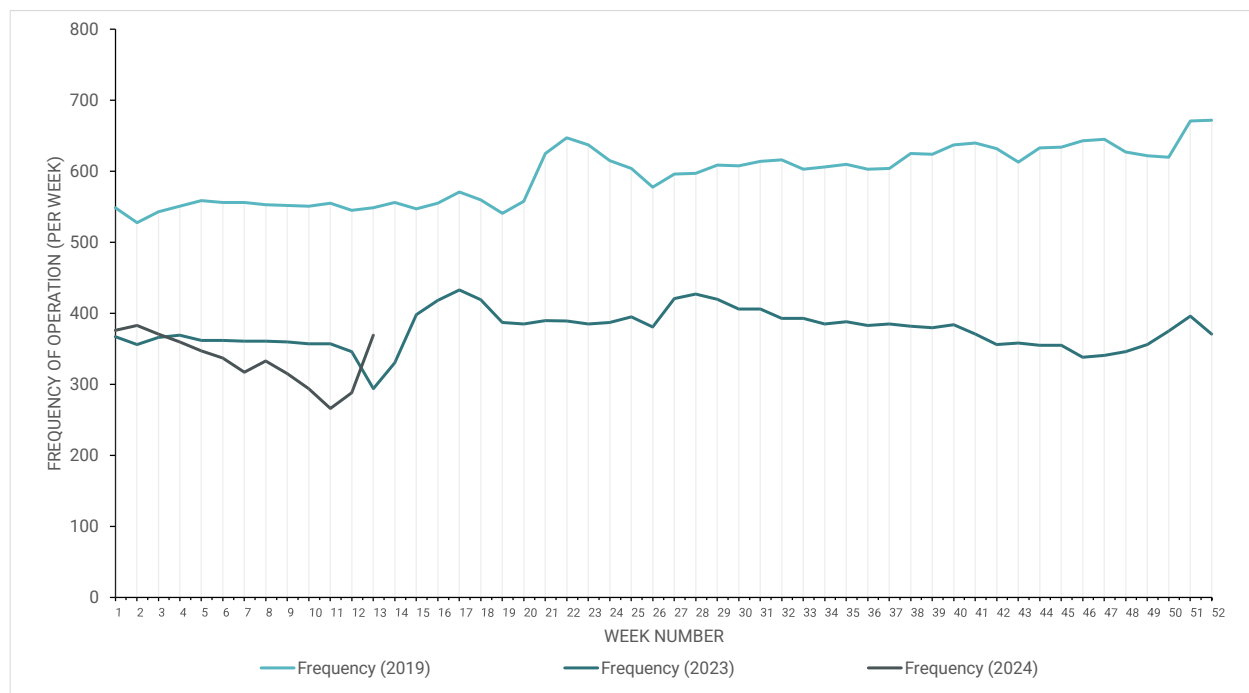
JOG also has a rail station, Maguwo Station, with trains to central Yogyakarta and. Maguwo was the only airport rail station in Indonesia prior to 2013, when the station at KNO outside Medan was opened. In 2018, Maguwo Station was expanded and its location was moved slightly to improve access for JOG passengers.

Maguwo is a local station on the Yogyakarta line, a commuter rail line which runs from Yogyakarta Station to Solo. Maguwo to Yogyakarta Station is just two stops and takes only 13 minutes as the distance is only about 7 km. Maguwo to Solo (also known as Surakarta) takes about an hour as the distance is about 55 km. For longer distance trains Maguwo or JOG passengers can connect in Solo or central Yogyakarta.

JOG now only has only two to three departures per day, all of which are turboprop services to Jakarta Halim. Just prior to the pandemic JOG had an average of about 85 departures per day. JOG's operation peaked at about 90 daily flights in 2018, when it handled a record 8.4 million passengers.

Airlines were able to maintain their operations at JOG during the pandemic – although frequencies were reduced due to domestic travel restrictions. In 2022 airlines were required to gradually phase out jet flights at JOG. By the end of 2022 there were no more jet flights and in 2023 JOG only had limited turboprop services.

Figure 3 – Weekly one-way frequency of flights in the Yogyakarta market (JOG and YIA)



Source: Aviation Studies Institute and OAG

The overall Yogyakarta market now has about 60% the number of flights and seats as just prior to the pandemic. This is less than Indonesia's overall market, which is now roughly 80% recovered, indicating YIA has struggled in attracting all the passengers that previously used JOG. However, the situation in the Yogyakarta market is not nearly as dire as in Bandung.

YIA has the potential of attracting more traffic by providing direct trains to other cities such as Semarang and Solo, which are no longer permitted to have scheduled international flights. Solo is 110 km from YIA, but the train takes over two hours with a connection at Yogyakarta Station. Semarang is about 150 km from YIA and

the train takes nearly five hours as connections in both Yogyakarta and Solo are required. With JOG, the train connections to Solo and Semarang were much faster and easier.

YIA could also potentially improve its position regionally in Central Java if the HSR line is extended to Yogyakarta. This would open faster connections particularly if the Bandung-Yogyakarta HSR stops in YIA on the way to Yogyakarta or if the YIA-Yogyakarta line is separately upgraded to HSR.

Solo's airport is much smaller and is no longer permitted to have scheduled international flights, making YIA an important gateway for the Solo/Surakarta region. Passenger traffic at Solo's Adi Soemarmo International Airport (SOC) peaked at 2.8 million in 2017, when it had about 30 departures per day. It currently has only slightly less than 20 departures per day, another indication the market in the central part of Java has recovered slower than the overall Indonesian market.

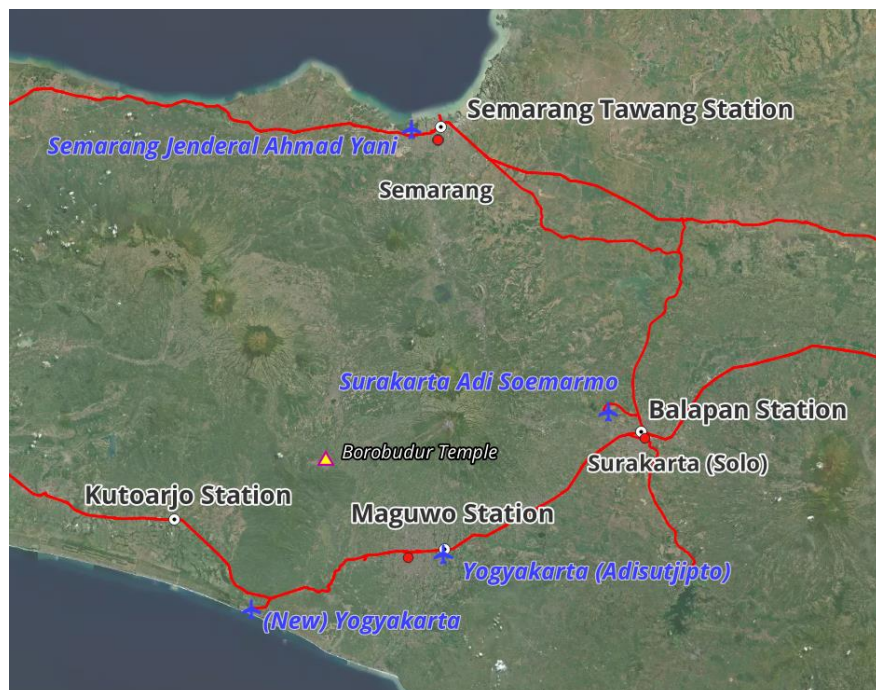
Despite its relatively small size SOC became in December 2019 the third airport in Java with a train line (after JOG and CGK). It takes 20 minutes to travel the 13 km train line between SOC and Balapan Station in central Solo compared to about 30 minutes by car (without traffic). Connections at Balapan are available to regional and long-distance trains.

When the train line from SOC to Balapan Station opened at the end of 2019 there were plans to add direct trains from SOC to Yogyakarta and Kutoarjo. However, this has still not materialized and passengers heading to Yogyakarta and Kutoarjo now must transfer trains at Balapan.

Interestingly Kutoarjo is located west of Yogyakarta and is only about 30 km from YIA. There are direct trains from Balapan to Kutoarjo taking about one and a half hours. A SOC-Kutoarjo train would open the possibility of a potential train in future connecting SOC with Kutoarjo and YIA. This would result in a direct YIA-Kutoarjo train as currently YIA passengers heading to Kutoarjo now have to switch trains in Yogyakarta. At Kutoarjo there are connections to other cities in Central Java such as Kebumen, which is 30 km west of Kutoarjo.

A SOC-YIA train could also potentially improve access to Borobudur Temple, one of the Java's most famous destinations. The temple, located in Central Java province about 40 km northwest of central Yogyakarta, is about 50 km from YIA and 80 km from SOC.

Illustration 8 – Special Region of Yogyakarta and Central Java (approximate), showing location of airports, train stations and railway lines



Notes. Red Line indicates regular passenger railway lines; Red Dots indicate city centres
© OpenStreetMap contributors, Mapbox

Semarang is the capital of Central Java province but is located on north coast about 130 km north of Yogyakarta. Semarang's Ahmad Yani International Airport (SRG) is located near the central part of the city and along the coast. Semarang Tawang Station is about 9 km from SRG near the old part of the city. There is no rail station at SRG although a rail line to Jakarta passes the south perimeter of the airport.

As is the case with SOC, SRG is no longer permitted to handle scheduled international flights. The impact of the policy only permitting scheduled international flights at four of Java's airports is more significant at SRG as it is a bigger airport than SOC and is further from any international airport. SRG's traffic peaked at over 5.1 million passengers in 2018, when it had about 70 departures per day. It currently only has about 25 departures per day, another indication of the slow recovery of Central Java's market.

From Semarang there are train lines to the west (to Jakarta), south (to Solo) and east (to Surabaya). While YIA is 200 km closer than Surabaya's Juanda Airport (SUB) to Semarang, SUB is only slightly further in terms of driving time. Travelling to YIA by train is faster – in part because SUB does not have a rail station – but would be much easier if there was a direct Semarang-YIA train, replacing the current double transfer at both Solo and Yogyakarta.

Surabaya is the capital of east Java and Indonesia's second largest city. SUB is a large airport, handling nearly 20 million passengers in the peak year of 2018, and is the gateway to the eastern part of Java. However, SUB's intermodal connectivity suffers due to a lack a rail station and the lack of any medium or high-speed train from Surabaya's main railway station, Gubeng. SUB is about 20 km from Gubeng. There are two smaller railway stations that are about 6 km from SUB – Waru and Gedangan – with more limited train services.

An HSR line to Surabaya would improve the situation significantly. However, it would be difficult to provide rail connectivity at the airport given SUB's location, which is close to the city near Java's east coast.

While an HSR stop at SUB may not be possible HSR would still have a major impact on Surabaya's market given Jakarta accounts for about a quarter of SUB's total seat capacity. SUB has only a few flights to Java destinations other than Jakarta, but the Jakarta flights (to both Soekarno-Hatta and Halim) are often used by passengers heading to other destinations in West Java.

As mentioned in the introduction section on HSR potential, an HSR from Jakarta to Surabaya would take about three hours compared to the eight plus hours it now takes using rail or car options. While HSR would result in a significant reduction in Surabaya-Jakarta air traffic, SUB is a congested airport with limited space for expansion and would benefit from freeing up slots now used for Jakarta flights for other routes.

Ultimately an HSR crossing Java would benefit both of Java's main airports, SUB and CGK, as well as several of the smaller airports. It also would have major environmental and economic benefits.

HSR could be a gamechanger in many respects for Java – and therefore Indonesia overall given over half of Indonesia's population is in Java. It could be an even bigger gamechanger if airport rail connectivity is considered as the HSR line is extended across Java.

- **Indonesia (Java) recommendation:** Indonesia should consider opening more airport-rail connections in Java as HSR is extended. An HSR stop at Kertajati Airport outside Bandung is particularly important to attract flights and boost its now extremely low utilization. While Jakarta, Solo and Yogyakarta now have airport-city rail links there are opportunities in all three cities to improve airport rail connectivity.

Sumatra

Sumatra: overview

Sumatra is Indonesia's largest island and has a length of about 1,800 km. There are eight provinces and Sumatra's eight largest airports are in the eight provincial capitals. However, they vary in size and only four are currently permitted to handle scheduled international flights.

Sumatra has two airport train lines, one airport light rail line and several regional train lines of up to 350 km. There are no high-speed or long-distance services.

The two airport train lines, at Medan and Padang, and the airport light rail line at Palembang have relatively frequent services. However, this is not the case on any of the regional train lines, making it difficult for passengers arriving at these airports to connect to points beyond the three main cities.

Improving connectivity between airport and regional trains is important as Medan, Padang and Palembang serve as gateways to their respective regions. Medan is the capital of North Sumatra province; Padang is the capital of West Sumatra and Palembang is the capital of South Sumatra.

There are regional rail lines in these three provinces as well as in the provinces of Aceh and Lampung. The capital of Lampung, Bandar Lampung, has one train line that ends at Palembang in neighbouring South Sumatra province. Aceh has one very short passenger train line that does not include the capital Banda Aceh.

Only the provinces of Bengkulu, Jambi and Riau do not currently have passenger rail lines. Riau is the largest of these three provinces – both by size and population – and the airport at the capital Pekanbaru is the third largest airport in Sumatra after Medan and Palembang.

Bengkulu and Jambi are the least populated provinces in Sumatra and border South Sumatra, making Palembang a potential hub for the southern part of Sumatra if rail connectivity could be improved and if international services can be resumed. Palembang had services to Kuala Lumpur and Singapore prior to the pandemic but is no longer able to handle any scheduled international flights under Indonesia's post-pandemic policy limiting the number of airports that are allowed scheduled international flights to four in Sumatra (and to 12 in all of Indonesia).

This policy was discussed in the last white paper, which recommended that "Indonesia reconsider its policy limiting international flights at only 12 airports to facilitate international connectivity with other Southeast Asian countries". Medan along with Banda Aceh, Pekanbaru and Padang are the now the only airports in Sumatra where scheduled international services are now permitted.

Medan's Kualanamu Airport is by far the largest airport in Sumatra and is positioned as a hub for all of Sumatra. However, it is not centrally located for domestic connections as it is in the north part of the island.

Kualanamu is also now trying to position itself as an international hub, particularly for services to South Asia and the Middle East. While geographically this is sensible given Medan's proximity to these regions compared to other parts of Indonesia, it is questionable if this strategy is commercially viable.

Kualanamu currently has seven international routes, including a new service from Qatar Airways to Doha that was launched in January 2024. The other six international routes are Bangkok, Kuala Lumpur, Penang and Singapore in Southeast Asia as well as Jeddah and Madinah in Saudi Arabia (operating on a Medan-Madinah-Jeddah-Medan rotation and catering to the religious pilgrimage market). Kualanamu does not have any South Asian route following the suspension last year of a short-lived route to Chennai.

Banda Aceh, Padang and Pekanbaru have even more limited international networks. Padang is currently only served from Kuala Lumpur and Jeddah as its Singapore route was suspended in 2018. Banda Aceh is currently only served from Kuala Lumpur and Penang. Pekanbaru is currently only served from Kuala Lumpur and Singapore. (Banda Aceh and Pekanbaru have seasonal religious pilgrimage flights to Saudi Arabia which are not currently operating.)

The overall international market in Sumatra is small, generating less than 4 million passengers per year prior to the pandemic. The top eight airports in Sumatra, serving the eight provincial capitals, handled 23 million total passengers in 2019, including more than 19 million domestic passengers.

The breakdown by airport is outlined in the table below. There are about another 10 airports in Sumatra with scheduled passenger services, but none had more than 400,000 passengers in 2019. While 2019 data is used, the peak year for Sumatra and Indonesia overall was 2018 as the domestic market contracted in 2019. Currently the market is still well below both 2019 and 2018 levels.

Table 6 – Sumatra’s main airports: 2019 passenger traffic (in millions) and current number of routes

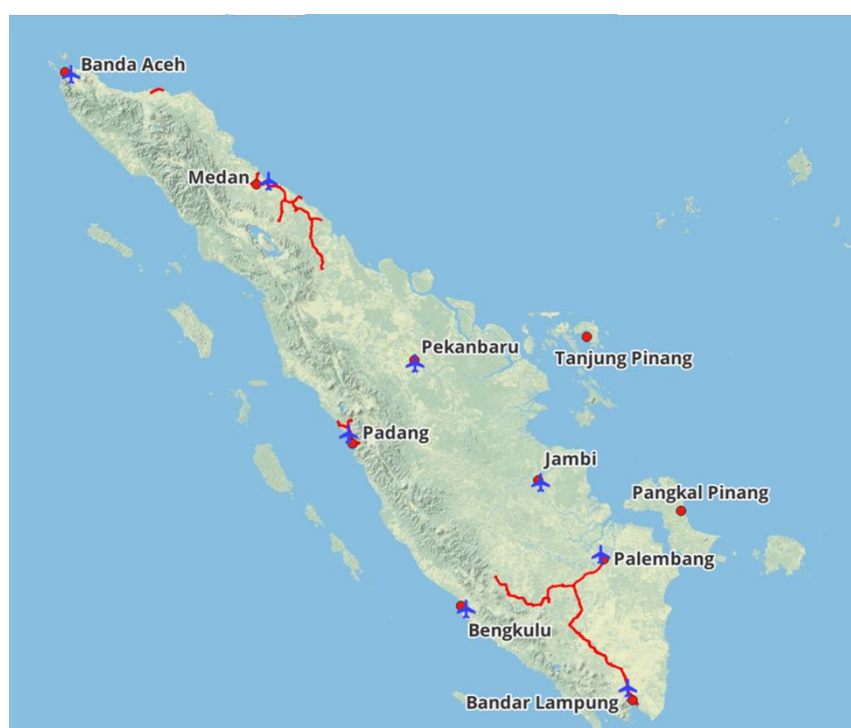
City	Airport Code	Province	2019 domestic traffic	2019 international traffic	March 2024 domestic routes	March 2024 international routes
Medan	KNO	North Sumatra	5.535	2.221	15	7
Palembang	PLM	South Sumatra	3.709	0.257	7	2*
Pekanbaru	PKU	Riau	2.802	0.322	6	2
Padang	PDG	West Sumatra	2.687	0.342	4	2
Bandar Lampung	TKG	Lampung	1.839	N/A	3	0
Jambi	DJB	Jambi	1.369	N/A	2	0
Banda Aceh	BTK	Aceh	0.696	0.329	2	2
Bengkulu	BKS	Bengkulu	0.774	N/A	1	0

Note: Number of routes based on OAG schedules for March 2024

Passenger traffic based on Indonesia Ministry of Transportation data for 2019 (pre-pandemic)

**no longer permitted to handle scheduled international flights under Indonesia’s new post-pandemic airport policy but religious pilgrimage flights to Jeddah and Madinah in Saudi Arabia are still permitted*

Illustration 9 – Main island of Sumatra showing passenger rail lines and main airports (as per Table 6)



Notes. This physical map is intended to depict only the main island of Sumatra; Administrative and other boundaries are not represented although all provincial capitals of the region are indicated; Other countries are not shown Red Line indicates railway lines; © OpenStreetMap contributors, ESRI

Sumatra: North Sumatra rail lines and airport connectivity

Sumatra’s largest city, Medan, has six rail lines including the 40 km airport line that was launched when Kualanamu International Airport (KNO) opened in 2013. The airport train runs every half hour and takes about 30 minutes to reach Medan Station.

The Kualanamu Airport Rail Link initially ran as an express service but in 2022 a stop at Bandar Khalipah Station, about 10 km outside central Medan, was added. This has resulted in faster connections to four of the other lines as well as better access to the airport from the western parts of Medan city.

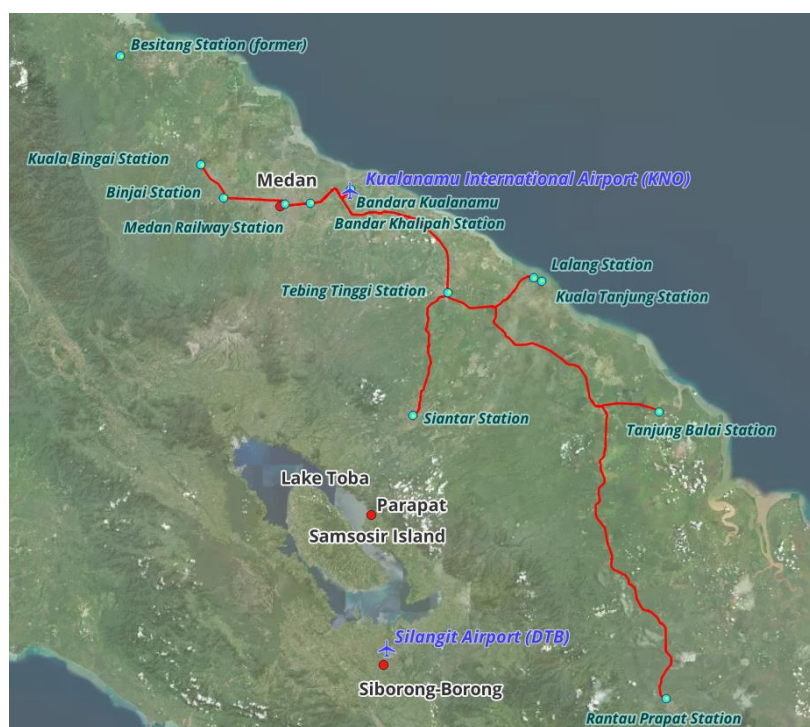
The other lines stopping at Bandar Khalipah Station originate at Medan Station and end in Siantar, Rantau Prapat and Tanjung Balai. A fourth line, to Lalang, is a short branch line requiring a connection at Tebing Tinggi, which is a stop about an hour and a half from Medan on the Siantar, Rantau Prapat and Tanjung Balai trains.

Rantau Prapat is the longest line, at about 270 km from Medan and takes nearly six hours. Tanjung Balai is about 180 km from Medan and takes about four hours by train. Siantar is also about 180 km and takes about four hours. Lalang takes about an hour from Tebing Tinggi. All these destinations and Kualanamu Airport are to the east or southeast of Medan.

The sixth line from Medan is line that goes to Binjai and Kuala Binjai, which is to the west of Medan. This for now is a very short line as Binjai is only about 20 km and 30 minutes from Medan. For several years the Indonesian state-owned railway company KAI has been planning to reactivate the line from Binjai to Besitang, which is about 90 km from Binjai and is about 20 km from the North Sumatra-Aceh border.

Binjai and Siantar are the largest cities in North Sumatra after Medan – and are the largest non-provincial capitals in all of Sumatra based on population. All the lines from Medan except the airport line have relatively infrequent services, generally running only a few times per day. None of the rail lines from Medan go beyond the province of North Sumatra.

Illustration 10 – Map of North Sumatra showing rail lines and stations mentioned in this section



Notes. Red Lines indicate passenger railway lines; Stations shown are limited to those mentioned in this section
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The Siantar line particularly has tourism potential as Siantar is about 50 km or an hour and a half by car to Lake Toba, one of the most popular destinations in Sumatra and all of Indonesia. An extension of the train line from Siantar to Parapat, the main gateway to Lake Toba, has been proposed previously. However, it would be difficult to attract airport passengers unless there is an upgrade with the train's speed and a direct connection to the airport.

The drive from Kualanamu Airport to Parapat, where there are short ferries to the island in the middle of Lake Toba where most visitors stay, is about four hours. A toll road is now under construction to from Tebing Tinggi to Parapat, which will further reduce the car or bus travel time to Lake Toba from Kualanamu to Medan city.

The closest airport to Lake Toba is at Silangit Airport, also known as Sisingamangaraja XII International Airport (DTB). But this is also nearly two hours from Samsosir, the island in Lake Toba where most of the resorts are located. There are no rail services in the Silangit area or anywhere south of Lake Toba.

DTB is the ninth largest airport in Sumatra – and the largest that is not in a provincial capital. However, there are currently only services to Jakarta and Batam, an Indonesian island close to Singapore. DTB previously had service to Kuala Lumpur and Singapore.

International flights are no longer permitted at DTB as part of Indonesia's post-pandemic policy which only permits scheduled international flights at 12 airports, including four in Sumatra. Without any international services at DTB, Kualanamu has an important role as the international gateway for Lake Toba and the rest of North Sumatra, which is the fourth most populated province in Indonesia. A fast and direct rail connection from Kualanamu to Lake Toba would help boost Lake Toba's aspirations to attract more international tourists. Lake Toba is already a very popular destination for domestic tourists, but access issues impede its international potential.

Better rail connectivity in North Sumatra, including to the Lake Toba region, could drive growth in both domestic and international traffic at KNO. The airport has so far struggled to meet initial targets and would benefit from improvements to the existing rail connections as well as new rail connections.

Sumatra: Rail lines and airport connectivity in other parts of Sumatra

The rest of Sumatra has a fragmented network of regional rail lines. There are ambitious plans to connect several of these lines as part of the Trans-Sumatra Railway, which would run over 2,000 km from Banda Aceh in the north to Bandar Lampung in the south. A rail line connecting all of Sumatra could attract more flights to several airports as accessibility for both domestic and international tourists improve. However, it would likely have more of a local impact with Sumatra residents using trains instead of cars or buses to travel regionally.

The proposed Trans-Sumatra Railway involves a combination of reactivating old lines and building new lines. However there has been little progress since the project was initially announced in 2014. Prior to the pandemic work was reportedly completed in reactivating the section from Binjai to Besitang, as mentioned in the previous section on North Sumatra. But service on the Binjai-Besitang line, which would eventually be extended into nearby Aceh province and 500 km to Banda Aceh, has still not started.

Banda Aceh, the capital of Aceh province, does not have an airport train or any train service. However, there is a 21 km regional line in another part of Aceh province connecting Krueng Geukuh with Kutablang. This train line, known as the Cut Meutia, opened in 2016, re-establishing service on one of many historic rail lines in Sumatra from the Dutch East Indies era. The train takes about an hour with four return trips per day.

The Cut Meutia train initially made only three stops from Krueng Geukueh, a port city also known as Lhokseumawe, to Krueng Mane. It was extended in 2022 by two more stops from Krueng Mane to Kutablang.

Krueng Mane is about 6 km from the Lhokseumawe's Malikus Saleh Airport (LSW), which currently has one daily turboprop flight to Medan. A branch line could potentially be extended to LSW. However, given the small size of LSW it would be more sensible to include a stop at Banda Aceh's Sultan Iskandar Muda International Airport (BTJ) if the train is successfully extended to the capital as part of the proposed Trans-Sumatra Railway. BTJ is about 15 km southeast from Banda Aceh and an airport stop should be feasible as it is in the same direction as Lhokseumawe, which is about 270 km to the southeast of Banda Aceh or just over halfway to the North Sumatra border and Besitang.

At the other end of the proposed Trans-Sumatra Railway, Bandar Lampung already has an active train line to Palembang. This is currently the only train line in Sumatra that connects two provinces, Lampung with South Sumatra. It is now Sumatra's longest train line at slightly over 300 km.

While the Bandar Lampung-Palembang line could form the bottom section of the Trans-Sumatra Railway, the speed would hopefully be improved. The current train is very slow, taking about nine hours, and runs only twice per day. Driving between the two cities is much faster at about four hours. There are more frequent commuter

trains on the southern section of this line, from Bandar Lampung's Tanjung Karang Station to Kotabumi, which is about 110 km north and two hours from Bandar Lampung.

There are currently no airport stops on the Bandar Lampung-Kotabumi-Palembang line although it passes Bandar Lampung's Radin Inten II International Airport (TKG), which is about 30 km north of the central Bandar Lampung and about 25 km north of Tanjung Karang Station. The closest stop is about 2 km from the TKG's passenger terminal.

The train line does not go near Palembang's Mahmud Badaruddin II Airport (PLM), which is about 40 km north of the city. The train station in Palembang, Kertapati, is about 8 km south of the city centre. There is a light rail connection from Palembang city to the airport but there are no light rail stops near Kertapati Station.

Palembang's Light Rail Transit (LRT) opened in 2018 and has 13 stops, running about 23 km from downtown to the airport in about 50 minutes. This is the only light rail line in all of Sumatra.

In addition to the train to Bandar Lampung, Palembang has two local rail lines with relatively infrequent service, going from Kertapati Station to Indralaya Station in Ogan Ilir and Lubuklinggau. Indralaya is only about 40 km to the south of Palembang. Lubuklinggau is a much longer line of about 300 km to the west and takes about seven hours by train.

It would be sensible to incorporate an airport rail stop at TKG given the proximity to the airport. It would be more difficult to improve the rail connection at PLM, but connectivity is critical as this is the second biggest airport in Sumatra and the main gateway for the southern half of the island.

As mentioned in the initial overview section on Sumatra, the other two provinces in the southern portion of Sumatra, Jambi and Bengkulu, do not currently have any rail services. Riau in central Sumatra also does not have any rail services although, under the Trans-Sumatra Railway proposal, there would be a line from Pekanbaru to Palembang (connecting to the existing line to Bandar Lampung) and from Pekanbaru to Rantau Prapat in North Sumatra (connecting to the existing line to Medan).

The Pekanbaru-Palembang section of the Trans-Sumatra Railway would run through Jambi, which is between Riau and South Sumatra, resulting in the first rail connection for Jambi province. Plans for this section were initially announced in 2017 but there have not been any recent developments.

It would be sensible to include airport stops in Pekanbaru, Jambi and Palembang if the Pekanbaru-Palembang rail line is established. This should be feasible as the airport in Pekanbaru is south of the city and the airport in Palembang is north of the city. The airport in Jambi is near the central part of the city.

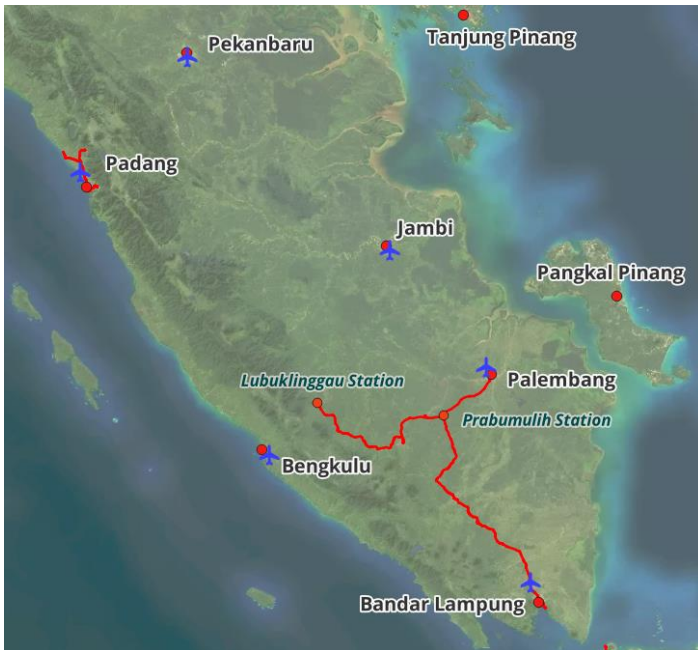
Padang, the main city in West Sumatra, now has a limited rail network including a 22 km airport train line that opened in 2018. The Minangkabau Express train initially only ran six times per day, or every other hour during operating hours, from Padang's Minangkabau International Airport (PDG) to Padang Station in the centre of the city. At the beginning of 2024 the number of trains was doubled to 12 trains per day, running every hour during the day. The local government hopes the increased frequency will boost ridership as in the first four years the train was relatively unpopular, with average occupancy rates of about 30%, due to long wait times for most flights.

The only other active train in West Sumatra runs from Padang Station to Naras, which is about 60 km from Padang. The frequency of this train, which is often full, also increased at the beginning of 2024 from four to six return trains per day. It takes about two hours to travel from Padang to Naras with several stops along the way, providing access to several small cities from both Padang and the airport. The airport train takes about 50 minutes and makes a handful of stops including at Duku Station, which is only about 4 km from the airport and is a stop on the Padang-Naras train.

There are not currently any other train services in West Sumatra but there are several historical train lines, some of which are under consideration for reactivation and could result in connections to other provincial capitals. For example, there is a historical line from Padang to Pekanbaru that crosses the West Sumatra-Riau border near Muaro. A reactivation of this line would potentially provide a connection for Padang and West Sumatra to the Trans-Sumatra Railway at Pekanbaru.

Bengkulu could potentially be connected to the Trans-Sumatra Railway at Palembang by extending the Palembang- Lubuklinggau line. Lubuklinggau is near the South Sumatra-Bengkulu border and only about 120 km from the city of Bengkulu.

Illustration 11 – Map of South Sumatra showing passenger rail lines and airports



Notes. Red Lines indicate railway lines; Cities and Airports shown are limited to those mentioned in this section
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It is important for any future train lines in West Sumatra to link up with the train to PDG, as it is the only major airport in the region. It would also be sensible to include a rail link to Bengkulu's Fatmawati Soekarno Airport (BKS), which is located only about 12 km from central Bengkulu, if a rail line is established to Bengkulu province.

There are opportunities across Sumatra to improving airport-rail connectivity and rail connectivity overall. The opening of two airport train lines and one airport light rail line in recent years is a positive development and makes Sumatra one of the leaders in Southeast Asia airport-rail connectivity. However, this is just a small step and Indonesia needs to accelerate rail development in Sumatra and consider more airport stops.

- **Indonesia (Sumatra) recommendation:** Sumatra has emerged as an unexpected leader in airport-rail development in Southeast Asia and should now consider further improving airport-rail connectivity and accelerating the development of new rail lines. New airport rail connections should be considered, particularly at Banda Aceh, Bengkulu, Bandar Lampung, Jambi and Pekanbaru as this would result in airport rail connectivity for all eight of Sumatra's main airports.

Sulawesi

Sulawesi became the third island in Indonesia with a passenger train line in 2023, when an initial 80 km section of a 145 km line between Makassar and Parepare opened. This represented the first phase of the Trans-Sulawesi Railway, an ambitious project which will cover about 2,000 km between Sulawesi's two largest cities of Makassar and Manado.

Construction of the Makassar-Parepare line began in 2014 and there are still no services from Makassar, the capital of South Sulawesi, or Parepare, a much smaller city north of Makassar. The initial section that is now open includes nine stations in provincial districts and starts at Maros, which is about 35 km north of central Makassar. Once the final portions are completed the train is expected to take one and half hours to travel from Makassar to Parepare, which is a significant improvement compared to the current drive time of about three hours.

The Makassar-Parepare rail line passes near Makassar’s Sultan Hasanuddin International Airport (UPG), which is located 20 km north of the city and 20 km south of Maros. However, there is no airport stop and the closest stop is about 7 km from the airport’s terminal. Adding an airport stop would be sensible as it would improve UPG’s connectivity to both Makassar and Parepare, which does not have an airport. It would also improve connectivity to other parts of Sulawesi once more sections of the Trans-Sulawesi Railway are completed.

A rail line and stop at Manado’s Sam Ratulangi International Airport (MDC) would also be sensible although would require an extension as MDC is another 15 km north of central Manado. MDC and UPG are the only two international airports on Sulawesi.

UPG handled 8.6 million passengers in 2019 including 300,000 international passengers. UPG is a domestic hub as it is centrally located in Indonesia, making it an ideal transit point for passengers heading to or from the more remote eastern part of the country. UPG currently has 28 domestic routes and three international routes (based on OAG schedules data for March 2024).

MDC handled 2.2 million passengers in 2019, also including 300,000 international passengers. MDC is more of a destination than a hub airport. It currently has 10 domestic and four international routes.

Makassar currently has scheduled international flights to Kuala Lumpur and Singapore as well as religious pilgrimage flights to Jeddah. Manado has flights to Singapore, Tokyo Narita, Guangzhou and Fuzhou although the Tokyo and Fuzhou flights are only operated once weekly. Manado is a smaller city but a more well-known tourist destination and is particularly known for scuba diving.

Flying is a common mode of transport within the island, given its large size and rugged geography. In addition to Makassar and Manado, there are about 10 airports on Sulawesi with scheduled commercial services. Two of these airports, in Kendari and Palu, handled over 1 million annual passengers prior to the pandemic and another four handled at least 100,000 passengers.

The eight airports with at least 100,000 passengers are included in the table below. Smaller airports on Sulawesi are excluded. Airports located in nearby islands are also excluded (for example, Baubau on Buton Island, which is part Southeast Sulawesi province and had 172,000 passengers in 2019).

Table 7 – Sulawesi’s main airports: 2019 passenger traffic (in millions) and current number of routes

City	Airport Code	Province	2019 domestic traffic	2019 international traffic	March 2024 domestic routes	March 2024 international routes
Makassar	UPG	South Sulawesi	8.295	0.286	30	3
Manado	MDC	North Sulawesi	1.943	0.310	10	4
Kendari	KDI	Southeast Sulawesi	1.241	N/A	3	0
Palu	PLW	Central Sulawesi	1.177	N/A	6	0
Gorontalo	GTO	Gorontalo	0.496	N/A	2	0
Luwuk	LUW	Central Sulawesi	0.269	N/A	3	0
Kolaka	KXB	Southeast Sulawesi	0.114	N/A	1	0
Mamuju	MJU	West Sulawesi	0.130	N/A	1	0

Note: Number of routes based on OAG schedules for March 2024

Passenger traffic based on Indonesia Ministry of Transportation data for 2019 (pre-pandemic)

There are six provinces in Sulawesi. All the provinces are expected to be connected by the Trans-Sulawesi Railway except Southeast Sulawesi. Makassar, Manado, Kendari, Palu, Gorontalo and Mamuju are all provincial capitals. All the capitals have service to Jakarta except Mamuju, which is only connected with Makassar. Most of the smaller non-capital airports on Sulawesi are also only connected to Makassar.

The Trans-Sulawesi Railway could potentially replace the need to fly on several smaller intra-island routes. However, rail connectivity at UPG is critical as many of the passengers on the intra-island routes connect at UPG to cities in other parts of Indonesia. A rail station at UPG would enable passengers to easily travel by train to their final destinations rather than hop on an intra-island flight.

Makassar-Manado is the largest intra-island route and is connected by an average of nine flights per day (based on OAG scheduled data for March 2024). However, flying between the two main cities in Sulawesi will likely continue to be popular as the Makassar-Manado train line, if completed, is not expected to be high speed. It is unclear how long it may take to travel the entire rail line, but based on the speed of the first section it will likely be about 20 hours.

A rail option could be a more attractive option on routes such as Makassar-Mamuju and Manado-Gorontalo. Both these routes are about 400 km and now take 10 hours to drive.

Illustration 12 – Sulawesi showing current railway line and main airports (as per Table 7)



Notes. Red Line indicates Makassar-Parepare railway; 11 Largest cities plus cities and airports mentioned in Table 7 © OpenStreetMap contributors, ESRI, Mapbox

- **Indonesia (Sulawesi) recommendation:** Sulawesi should consider adding a rail stop at Makassar’s airport as it would improve connectivity from Sulawesi’s largest airport to central Makassar as well as several smaller cities as the Trans-Sulawesi Railway is constructed.

The Rest of Indonesia

In Bali a circular train line has been proposed since 2011. The first phase of the new line will likely consist of a light rail connection from Bali’s airport to the popular resort area of Seminyak. This would improve connections to several resort areas along a highly congested 10 km stretch that often takes more than an hour to drive.

As Bali is a relatively small island the benefits of rail would be to improve connectivity to the airport and tourist attractions. There are several islands across Indonesia which could similarly benefit from local rail lines including airport rail lines. The potential of longer distance trains replacing air routes is limited mainly to Java, Sumatra and Sulawesi with Java having clearly the most potential given the density of the population with several cities that are in relatively close proximity.

RAIL CONNECTIVITY IN OTHER COUNTRIES

Overview

This section provides a brief outline of the rail services which are currently provided in seven other Southeast Asian countries along with proposed or planned new services. There are no rail services in Brunei or Timor-Leste.

There are opportunities in all these countries to establish or improve airport-rail connections. HSR lines are also planned or proposed in most of these countries, which would have an impact on the aviation sector if built.

Cambodia

In 2016, Cambodia reopened a 266 km passenger rail line from Phnom Penh to the resort town of Sihanoukville on the Gulf of Thailand coast. In 2018, a 382 km rail line from Phnom Penh to Poipet on the Thailand border was reopened. The opening of these low-speed rail lines did not have a significant impact on Cambodia's domestic aviation market, which is small and consists mainly of flights from Siem Reap to Sihanoukville and Phnom Penh.

There are now proposals to establish three HSR lines, including upgrades of the Poipet and Sihanoukville lines as well as a line from Phnom Penh to Ho Chi Minh. Several potential HSR lines to Siem Reap, including a line from Poipet which would open the possibility a Bangkok-Siem Reap HSR connection, are also being considered or studied. Siem Reap does not currently have any rail services but is a popular tourist town near Angkor Wat and the second most popular destination in Cambodia after Phnom Penh. Siem Reap is about 150 km from Poipet and about 100 km from Sisophon, which is on the Phnom Penh-Poipet railway line about 50 km before reaching Poipet.

On the Thailand side of the border there is already a train station at Ban Klong Luk Border, which is a short walk to Poipet Station on the Cambodia side, with service to Bangkok. The Bangkok-Ban Klong Luk train line could potentially be upgraded in future to HSR as Thailand rolls out more HSR services. Phnom Penh is about 650 km from Bangkok and Poipet is only about 250 km from Bangkok. Ho Chi Minh is about 230 km from Phnom Penh.

If the new HSR lines materialise, they could have a significant impact on Cambodia's aviation market. Phnom Penh-Bangkok is Cambodia's largest international route while Phnom Penh-Ho Chi Minh is sixth largest. There are currently an average of 15 daily flights from Phnom Penh to Bangkok (across both Bangkok airports) and five flights to Ho Chi Minh.

There are currently no airport rail links as a shuttle rail service (akin to a light rail) which ran from Phnom Penh Airport to central Phnom Penh was permanently suspended in August 2020. The tracks have been filled in and there is again road traffic where this line ran for just over two years, providing connectivity to the trains to Poipet and Sihanoukville. The airport service began in April 2018 at about the same time the Phnom Penh-Poipet service was launched and was made possible by the construction of a 1.6 km branch line.

A new airport outside Phnom Penh is currently under construction and is slated to open in 2025. While it will not have a rail station initially there are proposals to connect the new airport in future with a subway or light rail line. Similarly, a new airport in Siem Reap opened in October 2023 without any rail connectivity but a light rail service is now under consideration.

Malaysia

There are several passenger rail lines, connecting Kuala Lumpur with most of western or peninsular Malaysia. There is also a train service from Kuala Lumpur to Bangkok. However, the long-distance trains are very slow and flying is common despite the very short length of most routes within peninsular Malaysia.

Kuala Lumpur also has several commuter rail lines and a fast express train to Kuala Lumpur International Airport (KLIA) that runs from Sentral station near the city centre. There was also a train from Kuala Lumpur Sentral Station to Kuala Lumpur's Subang Airport that commenced in May 2018 but was suspended in February 2023 due to low ridership. Subang is Kuala Lumpur's old airport and has only been served with short-haul routes using turboprop aircraft since KLIA opened in 1998 although there is a plan to again allow commercial jet flights at Subang starting later this year.

The 24 km train line from Sentral to Subang's Terminal Skypark took 28 minutes with one stop in between. The express nonstop train to KLIA takes 28 minutes to KLIA Terminal 1 and 33 minutes to KLIA Terminal 2 with a total distance of 57 km. There is also a local train on the KLIA line which takes 36 minutes to Terminal 1 and 39 minutes to KLIA 2 with three stops in between Sentral and the airport.

Operating at speeds of up to 160 km per hour the KLIA Express was the fastest train in Southeast Asia prior to opening of the Jakarta-Bandung HSR line. KLIA Express passengers flying on Malaysia Airlines or Batik Air Malaysia can check in at Sentral with their checked bags being transferred directly to their flights. This is currently the only rail station airline check-in service in Southeast Asia.

In east Malaysia there is a rail line connecting Tanjung Aru in Kota Kinabalu with the tourist town of Tenom. This 134 km line is the only passenger rail service in Borneo, a larger island which includes two states of Malaysia, five provinces of Indonesia and the small country Brunei. The rail line goes by Kota Kinabalu Airport but the passenger terminal is about 3 km from the existing rail line and there is no stop at the airport.

There are several new rail line proposals in both east and west Malaysia including a 350 km HSR line Kuala Lumpur to Singapore. The Kuala Lumpur-Singapore HSR line has been mooted for several years and the latest plan was scrapped in early 2021. There is now consideration to revive the plan, which would impact the world's busiest international air route. This HSR line was discussed in a previous section of this white paper, assessing potential HSR opportunities. The current Kuala Lumpur-Singapore HSR proposal does not include stops at any airports although it would go near KLIA and Johor's Senai Airport.

Currently there is a short 3 km shuttle train from Johor Bahru, where there are rail services to Kuala Lumpur, across the Singapore border to Woodlands. A 4 km light rail line with two stops connecting Johor Bahru with Woodlands is now under construction and is slated to open in late 2026. On the Johor side, three light rail lines have been proposed to connect with the line to Woodlands, including a line to Senai Airport.

Myanmar

Myanmar has several old and very slow rail lines, including a commuter line that circles the city of Yangon. Services are available in most of the country, providing one of Southeast Asia's most extensive passenger rail networks.

There is no rail stop at Yangon International Airport. The closest station is only about 2 km from the terminal where there is a stop on the Yangon Circular Railway. The 46 km circular line has about 40 stations including Yangon Central but travels at very slow speeds. The trip from the station near the airport to Yangon Central takes about an hour and a half compared to about a half hour drive from the terminal to the city centre.

The train from Yangon to Mandalay, Myanmar's second largest city, takes at least 14 hours. The train from Yangon to Bagan, a UNESCO heritage site and a popular tourist destination, takes about 17 hours although the distance is shorter than Mandalay. Yangon-Mandalay and Yangon-Bagan are the largest domestic air routes in Myanmar with over 10 flights per day in the peak season on each route prior to the pandemic. A high speed or even medium speed train from Yangon to Bagan and Mandalay would provide a more meaningful rail option for these routes.

There have been talks for several years about establishing trains between Myanmar and China, including a proposed 431 km long line from Mandalay to Yunnan's capital Kunming. HSR to China is a possibility as there is a new line that is now being built in China from Dali to Ruili, a city in China's Yunnan province that borders Myanmar.

Philippines

In the Philippines there are several passenger rail lines on the main island of Luzon. There is a mix of commuter rail, metro rail and light rail services in the Manila area as well as some longer distance trains to other cities in Luzon.

There are stops on the metro and light rail near Manila's Ninoy Aquino International Airport (NAIA) but not at the terminal. A shuttle bus is available from the airport and is used mainly by workers as it is not a convenient option for passengers. A new station called Manila International Airport is under construction as part of an extension of the light rail line, but this is also located just outside NAIA and will not have any direct access to any of the terminals.

A rail line to Clark Airport, which is located about 100 km outside of Manila, is now under construction. This new rail line will provide direct access to Clark's new passenger terminal, which opened in 2022. The Clark Airport train could open later this year but will only initially run 53 km or slightly over halfway to Manila. It will eventually be connected to Manila as part of the new North-South Commuter Railway.

There are also plans to extend Manila's metro rail line to a new airport being constructed outside Manila at Bulacan. The proposed new line would run 30 km with seven stops from the new airport to the city.

There are plans to improve intra-island or inter-city rail connectivity throughout Luzon including developing a new long-distance line that would connect several cities southeast of Manila. If constructed this would link up with the North-South Commuter Railway, resulting in passenger rail services throughout Luzon. Some air routes such as Manila-Legazpi could be impacted but most of the main domestic routes in the Philippines connect islands, making the impact from potential rail projects relatively limited. However, establishing airport-rail connections is important to provide better airport access to local passengers, helping drive growth in a market with increasing demand for air travel.

There were previously rail services in other parts of the Philippines and there are proposals to restore some of these services or build new rail lines. In Cebu there is a proposal to develop two monorail lines, including a line to Mactan-Cebu International Airport (CEB) that would improve airport access and facilitate further growth at CEB. There is also a proposal to build a regional passenger line from the city of Davao which will provide connectivity throughout the island of Mindanao. This project has been talked about for many years and has been referred to as HSR, but construction has not yet begun.

Singapore

Singapore Changi Airport has a stop on the city state's mass rapid transport (MRT) system, which now spans six lines and 140 stations. There are no express trains and Changi Airport is only served via a branch of the east-west line, requiring a transfer to reach the city. The total travel time to the city is nearly an hour including the transfer.

The MRT stop at Changi Airport opened in 2002 and serves Terminal 2 and Terminal 3. Two automated people mover lines (called 'Skytrains') link Terminal 2 and 3 with Terminal 1 while Terminal 4 requires a longer bus connection. Singapore is building a new MRT station at Terminal 5, which will be by far Changi's largest terminal and is slated to open in the 2030s as part of a major expansion program.

There is no MRT connectivity to the train station in Woodlands that is used for the short shuttle train to Johor Bahru in Malaysia, where slow speed trains to Kuala Lumpur and other parts of Malaysia are available. However, the new light rail that is slated to replace the shuttle train in late 2026 will connect with Singapore's MRT at Woodlands North Station. On the Malaysia side the new light rail station will be located adjacent to Johor Bahru's main railway station where the shuttle train to Singapore now departs.

A Changi Airport stop is not currently included in the proposed new high speed rail link from Singapore to Kuala Lumpur. While the HSR will have an impact on Changi as Kuala Lumpur is its largest route it is not likely to have an impact on multi-modal itineraries.

Thailand

Thailand has an extensive passenger railway network with several long-distance train lines connecting Bangkok and all regions of Thailand. There are also several commuter and mass rapid transit lines in Bangkok.

One of the commuter lines ends at Bangkok's Suvarnabhumi Airport (BKK). Rail services from central Bangkok to Suvarnabhumi began in 2010 with an express train initially provided. The express train was suspended in 2014 and airport passengers have since had to use the same local train as commuters. A check-in service at Makkasan Station in Bangkok was launched in 2011 but dropped in 2014, further reducing the appeal of the train service to passengers. Attracting BKK passengers to use the train also has been challenging because there are no direct connections at Makkasan to other rail lines.

Bangkok's Don Mueang Airport (DMK) has a stop on three long distance rail lines to the north of Thailand. This provides connectivity to several destinations in north and northeastern Thailand as well as to Krung Thep Aphiwat, the main rail station in Bangkok. However, the trains are very slow and Don Mueang's train station has very limited facilities. DMK is Bangkok's original airport and is still a major airport, handling primarily low-cost carriers.

There is a plan to extend the BKK-Makkasan rail line to provide connectivity to DMK as well as U-Tapao Airport (UPT), which is about 150 km south of BKK and 170 km from Makkasan Station. This extended line would also stop in the beach resort of Pattaya, which is about 40 km from UPT and 120 km from BKK.

Connecting all three Bangkok area airports with an HSR line, operating of speeds of up to 250 km per hour, would significantly improve airport-rail connectivity in Thailand. However, the ambitious project has experienced multiple delays and construction has not yet begun. A consortium to develop the HSR line was selected in 2018 and the project was finally approved by the government in late 2019 but there has since been a change in the government, leading to further delays and uncertainties.

There are also plans for several longer distance HSR lines throughout Thailand. The first phase of the first of these lines, from Bangkok to Nakhon Ratchasima, is now under construction. This is discussed in the Laos case study as this line will be extended to Nong Khai on the Laos border as part of the second phase. There are also plans to provide a direct connection to Vientiane, linking up with the new Vientiane-Kunming rail line.

The potential of HSR lines impacting Thailand's domestic aviation market is also discussed in the introduction section of this white paper. If Thailand proceeds with current plans for several HSR lines, several major domestic air routes could be impacted. HSR will not impact the entire domestic market as there are also major domestic routes to island beach resorts, particularly Phuket and Samui.

Vietnam

Vietnam has a handful of passenger rail lines including the longest line in Southeast Asia, which connections Ho Chi Minh with Hanoi. The other rail lines are shorter lines heading north or east of Hanoi although there are proposals to build new rail lines to connect cities that are south of Ho Chi Minh.

The approximately 1,700 km Ho Chi Minh-Hanoi line includes stops in several of Vietnam's largest cities but there are no airport stops. It takes at least 31 hours to travel from Ho Chi Minh to Hanoi by rail. From Ho Chi Minh or Hanoi to Da Nang, Vietnam's third largest city located in the middle of the country, it takes at least 15 hours.

Even Ho Chi Minh to Nha Trang, a popular beach resort about 400 km from Ho Chi Minh, takes about eight hours by train. Flying is therefore generally the preferred mode of travel except on short distances such as Da Nang to Hue, a city only 90 km from Da Nang.

Vietnam's first metro rail line opened in 2021 in Hanoi. The first phase of a second metro line is expected to open later this year. An airport stop is planned as the fourth and final phase of the 42 km second line which following several delays is now slated to be completed in 2027.

Ho Chi Minh also has been developing a mass transit rail network with the first metro line slated to open later this year and a second line now under construction. There are several proposed additional lines including a line that would serve Ho Chi Minh's existing airport. There are also plans to build a 38 km light rail line from central Ho Chi Minh to a new airport that is under construction.

There is a proposal to build an HSR from Ho Chi Minh to Hanoi, including a stop at Ho Chi Minh's new airport. Any HSR in Vietnam could significantly impact the aviation market, attracting local passengers that now fly as well as connecting passengers. However, connecting Ho Chi Minh and Hanoi with HSR is an ambitious project that could take two decades to complete – assuming it proceeds as currently envisioned. As the two main cities are more than 1000 km apart there could be more of an impact on shorter routes such as Ho Chi Minh-Nha Trang.

References

- Angkasa Pura Airports. 29 December 2019. ADI Soemarmo Airport Train Starts Operation.
 - <https://ap1.co.id/en/information/news/detail/adi-soemarmo-airport-train-starts-operation>
- Asian Development Bank. May 2023. Landscape Study on Southeast Asia's Aviation Industry: COVID-19 Impact and Post-Pandemic Strategy.
 - <https://www.adb.org/publications/southeast-asia-aviation-covid19-post-pandemic-strategy>
- Aviation Studies Institute. January 2024. ASI White Paper: The Future of Super Short-Haul Air Travel in Southeast Asia.
 - <https://asi.sutd.edu.sg/white-papers/asi-white-paper-the-future-of-super-short-haul-air-travel-in-southeast-asia/>
- Bangkok Post. 6 June 2023. Phase 1 of High Speed Rail Ready by 2026.
 - <https://www.bangkokpost.com/thailand/general/2587969/phase-1-of-high-speed-rail-ready-by-2026>
- Bangkok Post. 15 December 2023. Work on Rail Tracks to Laos to End in 2028.
 - <https://www.bangkokpost.com/thailand/general/2705848/work-on-rail-tracks-to-laos-to-end-in-28>
- Bangkok Post. 25 January 2024. Bangkok-Vientiane Train to be Reality by April.
 - <https://www.bangkokpost.com/thailand/general/2730634/bangkok-vientiane-train-to-be-reality-by-april>
- Brunei Darussalam-Indonesia-Malaysia-Philippines East ASEAN Growth Area (BIMP-EAGA). 21 June 2023. Building Sulawesi's First Railway.
 - <https://bimp-eaga.asia/index.php/article/building-sulawesi-first-railway>
- China Daily. 24 October 2023. China-Laos Railway is Cutting Journey Times and Raising Living Standards.
 - <https://www.chinadaily.com.cn/a/202310/24/WS653714d0a31090682a5ea45b.html>
- China Daily. 4 December 2023. China-Laos Railway Sees Progress After Two Years.
 - <https://govt.chinadaily.com.cn/s/202312/04/WS656d6b3f498ed2d7b7ea1528/china-laos-railway-sees-progress-after-two-years.html>
- CNN. 9 November 2022. New Semi-High-Speed Train Makes Laos More Accessible Than Ever.
 - <https://www.cnn.com/travel/article/china-laos-semi-high-speed-train/index.html>
- East Asia Forum. 24 January 2024. Laos' Economic Reckoning.
 - <https://eastasiaforum.org/2024/01/24/laos-economic-reckoning/>
- Future Southeast Asia. 26 December 2023. Jakarta-Surabaya High Speed Railway.
 - <https://futuresoutheastasia.com/jakarta-surabaya-high-speed-railway/>
- IBS Software. June 2022. Indonesia's Aviation Market: Emerging Stronger in a Post-COVID World.
 - <https://www.ibsplc.com/white-papers/general/indonesia-s-aviation-market-emerging-stronger-in-a-post-covid-world>
- Global Construction Review. 30 August 2023. First Phase of Thai-China Railway to be Complete in 2027.
 - <https://www.globalconstructionreview.com/first-phase-of-thai-china-railway-to-be-complete-in-2027/>
- The Jakarta Post. 18 January 2017. North Sumatra-Aceh Train to Operate by 2019.
 - <https://www.thejakartapost.com/news/2017/01/18/north-sumatraaceh-train-to-operate-by-2019.html>
- Kompas (Indonesia). 21 November 2023. BTP Padang Proposes Reactivation of Sawahlunto-Solok and Solok-Batu Tabal Railway Lines.
 - <https://www.kompas.id/baca/english/2023/11/21/en-btp-padang-usulkan-reaktivasi-jalur-sawahlunto-solok-dan-solok-batu-tabal>

- Kompas (Indonesia). 21 November 2023. Reducing Waiting Times, KAI West Sumatra Increases Frequency of Airport Train Trips.
 - <https://www.kompas.id/baca/english/2023/11/21/en-kurangi-waktu-tunggu-kai-sumbar-tambah-frekuensi-perjalanan-kereta-bandara>
- The Laotian Times. 7 January 2022. Bus Connection Launched Between Morning Market and Vientiane Railway Station.
 - <https://laotiantimes.com/2022/01/07/bus-connection-launched-between-morning-market-and-vientiane-railway-station/>
- The Laotian Times. 25 July 2022. Khamsavath Station in Vientiane Capital Ready to Operate Soon.
 - <https://laotiantimes.com/2022/07/25/khamsavath-station-in-vientiane-capital-ready-to-operate-soon/>
- The Laotian Times. 11 December 2023. Laos Targets Global Audience for Visit Laos Year 2024.
 - <https://laotiantimes.com/2023/12/11/laos-targets-global-audience-for-visit-laos-year-2024/>
- The Laotian Times. 5 February 2024. Bokeo International Airport Launch Overshadowed by Sudden Flight Cancellations.
 - <https://laotiantimes.com/2024/02/05/bokeo-international-airport-launch-overshadowed-by-sudden-flight-cancellations/>
- The Nation (Thailand). 13 November 2023. Thailand's Most Romantic Railway Through Chiang Rai to Open in 2028.
 - <https://www.nationthailand.com/thailand/general/40032802>
- Nomadic Notes. 7 November 2019. Palembang to Bandar Lampung by Train – Riding the Coal-Subsidized Railway of South Sumatra.
 - <https://www.nomadicnotes.com/palembang-to-bandar-lampung-by-train/>
- Nomadic Notes. 21 September 2023. Sumatra Railways: a Guide to Every Railway Line in Sumatra.
 - <https://www.nomadicnotes.com/sumatra-railways/>
- The Phnom Penh Post. 27 December 2023. Proposed Rail Line to Link SAI to Siem Reap Town Centre.
 - <https://www.phnompenhpost.com/national/proposed-light-rail-line-to-link-sai-to-siem-reap-town-centre>
- Radio Free Asia. 10 October 2023. Lao Officials, Villagers in the Dark About Impacts of New Railway.
 - <https://www.rfa.org/english/news/laos/new-railway-10242023173831.html>
- Railink Indonesia. 28 September 2022. Official Announcement of KAI Bandara Service at Bandar Khalipah Station Trial Operation.
 - <https://www.railink.co.id/news-event/U2FsdGVkX1%2BpCDEKoP6MqJFTsg2n9bPkVEpG7U5%2FTUE=>
- Railink Indonesia. 1 November 2022. KIA Bandara YIA Increased Travel to 24 Trips Per Day.
 - <https://www.railink.co.id/news-event/U2FsdGVkX18ToLhD3RDLzndj0mftNH1eRhP7iaY8874=>
- Seetao. 2 December 2022. The China-Laos Railway Has Made Remarkable Achievements in the Past Year.
 - <https://www.seetao.com/details/193673.html>
- The Star (Malaysia). 31 October 2023. Lao and Thai PMs Inaugurate Vientiane-Khamsavath Railway Station Link Between Two Countries to Further Boost Trade.
 - <https://www.thestar.com.my/aseanplus/aseanplus-news/2023/10/31/lao-and-thai-pms-naugurate-vientiane-khamsavath-railway-station-link-between-two-countries-to-further-boost-trade>
- Transportation History. 26 December 2017. 2017: Indonesia's Railink on Java Opens to Passengers.
 - <https://transportationhistory.org/2019/12/26/2017-indonesias-railink-on-java-opens-for-passengers/>
- VN Express International. 18 August 2023. Railway Proposed to Connect Central Vietnam's Port With Laos.
 - <https://e.vnexpress.net/news/news/traffic/railway-proposed-to-connect-central-vietnam-s-port-with-laos-4643264.html>