Report No: ACS17973

East Asia and Pacific

Enhancing ASEAN Connectivity Monitoring and Evaluation

May 24th, 2016

GCPDR

EAST ASIA AND PACIFIC

Public Disclosure Authorized

Enhancing ASEAN Connectivity Monitoring and Evaluation

Final Report

May 24th, 2016

Table of Contents

Preface

In pursuit of building an ASEAN Community by 2015, ASEAN adopted the 2010 Master Plan on ASEAN Connectivity (MPAC), which set forth a set of infrastructure, trade facilitation, and community-building strategies to promote economic, political, and social integration. To keep track of the Connectivity initiative, the ASEAN Connectivity Coordinating Committee (ACCC) developed an ASEAN Connectivity Implementation Matrix / Scorecard (ACIM), an assessment tool to monitor progress on physical, institutional, and people-to-people connectivity strategies and activities. The ACIM has evolved from a project dashboard report to provide a more comprehensive representation of the outcomes related to progressing ASEAN Connectivity. Since the start of the MPAC implementation period in 2011, the ACIM has been reviewed and improved, with an aim to incorporate more systematic, quantitative assessment of Connectivity and MPAC key actions and strategies.

This Final Report on Enhancing ASEAN Connectivity Monitoring and Evaluation presents the status of MPAC strategies and priority projects, progress to date on measures of ASEAN Connectivity, and observed and projected impacts of MPAC and improved connectivity measures on economic development and people to people connectivity. The report also presents progress to date on application and revision of the ACIM, including recommendations for improvements to the Monitoring and Evaluation program.

The World Bank, through its Singapore Infrastructure Hub, is providing technical assistance (TA) for enhancing the ACIM at the request of the ACCC and the ASEAN Secretariat (ASEC) and with funding from the ASEAN–Australia Development Cooperation Program Phase II (AADCPII). In collaboration with the ACCC, the World Bank reviewed the initial ACIM framework and alternative methods of monitoring and evaluating connectivity and proposed a set of systematic, largely quantitative indicators of connectivity linked to the MPAC's three strategic dimensions and 19 strategies. The report presents the application of this revised strategy-level evaluation tool and makes recommendations for its expanded and improved use at the close of the implementation period and beyond.

The First Interim Report summarized progress made by the World Bank from December 2013 to February 2014, based on early discussions to define the monitoring and evaluation framework, including assessment of the ACIM as it had been applied to that point. More importantly, the report framed the theoretical and methodological base for proposed indicators of connectivity. These indicators have since been further refined. The Second Interim Report

presented the Bank's assessment of the status of ASEAN Connectivity by way of the revised ACIM and served as a key input for the Final Report.

This report is authored by a World Bank team from the Singapore Infrastructure Hub including Darwin Marcelo (Task Team Leader), Cledan Mandri-Perrott and Schuyler House. Jared Haddon and Rong Hui Kan provided valuable inputs. The Institute of Developing Economies, Japan External Trade Organization (IDE-JETRO) provided Geographic Simulation Modeling and contextual inputs based on extensive geographic and economic analysis of the region. A team of economists at the Asia Competitiveness Institute (ACI) at the Lee Kuan Yew School of Public Policy, National University of Singapore, led by Professor Tan Khee Giap, contributed the SVAR Multiplier Effects models and supported gravity modeling and indicator inputs. The team would like to especially thank Mr. Lim Chze Cheen of the ASEAN Secretariat for his helpful guidance and comments throughout.

Abbreviations and Acronyms

ABC	ASEAN Broadband Corridor
ACCC	ASEAN Connectivity Coordinating Committee
AADCPII	ASEAN–Australia Development Cooperation Program Phase II
ACI	Asia Competitiveness Institute
ACIM	ASEAN Connectivity Implementation Matrix
AEC	ASEAN Economic Community
AFAFGIT	ASEAN Framework Agreement on the Facilitation of Goods in Transit
AFAFIST	ASEAN Framework Agreement on the Facilitation of Inter-State Transport
AFAMT	ASEAN Framework Agreement on Multimodal Transport
AFAS	ASEAN Framework Agreement on Services
AH	ASEAN Highway
AHN	ASEAN Highway Network
AJTP	ASEAN Japan Transportation Partnership
APG	ASEAN Power Grid
ASAM	ASEAN Single Aviation Market
ASEAN-5	Indonesia, Malaysia, Philippines, Singapore, Thailand
ASEC	ASEAN Secretariat
ASSM	ASEAN Single Shipping Market
ASTP	ASEAN Strategic Transport Plan
BCLMV	Brunei, Cambodia, Lao PDR, Myanmar, Vietnam
BIMP-EAGA	East ASEAN Growth Area (Brunei, Indonesia, Malaysia, Philippines)
CBTA	Cross Border Transport Agreement
FDI	Foreign direct investment
GCI	Global Competitiveness Index
GDP	Gross domestic product
GMS	Greater Mekong Sub-region
GRDP	Gross regional domestic product
GSM	Geographical Simulation Models
IA-TTI	Intra-ASEAN Merchandise Trade Intensity Index
ICT	Information and communications technology
IDE-JETRO	Institute of Developing Economies, Japan External Trade Organization
IMT-GT	Indonesia-Malaysia-Thailand Growth Triangle
ITU	International Telecommunications Union

LNG	Liquefied Natural Gas
LPI	Logistics Performance Index
LSCI	Liner Shipping Connectivity Index
M&E	Monitoring and Evaluation
MAAS	Multilateral Agreement on Air Services
MAFLAFS	Multilateral Agreement on the Full Liberalisation of Air Freight Services
MAFLPAS	Multilateral Agreement on the Full Liberalisation of Passenger Air Services
NSW	National Single Window
OECD	Organisation for Economic Cooperation and Development
PPP	Public-private partnership
RIATS	Roadmap for Integration of the Air Travel Sector
RICMTA	Roadmap towards an Integrated and Competitive Maritime Transport in ASEAN
RILS	Roadmap for Integration of Logistics Services
RoRo	Roll on / roll off shipping
SEZ	Special economic zone
SKRL	Singapore-Kunming Rail Link
SVAR	Structural Vector Auto-regression
TAGP	Trans-ASEAN Gas Pipeline
TiS	Trade in services
TTR	Transit Transport Routes
WITS	World Integrated Trade System
WGI	World Governance Indicators

Executive Summary

In pursuit of building the ASEAN Community, ASEAN has embarked on a course to advance regional Connectivity. Adopted in 2010, the Master Plan on ASEAN Connectivity (MPAC) set forth nineteen strategies for enhancing Connectivity in achieving wider goals of enhancing competitiveness and economic growth, narrowing development gaps, and deepening social and cultural understanding amongst Member States. As ASEAN approaches end 2015, the *Enhancing ASEAN Connectivity Monitoring and Evaluation (M&E)* report takes stock of progress to date and draws out lessons for the next stage of ASEAN's Connectivity journey.

The realization of an integrated ASEAN Community demands connectedness via improved and expanded transport, communications, and energy infrastructure; the reduction of barriers to trade and investment; and the opening of new opportunities for ASEAN-wide communication and exchange. The MPAC provides a blueprint for such advances via three strategic dimensions, each accompanied by strategies and key actions:

Physical Connectivity: Improving transportation, information communications, energy, and technology infrastructure,

Institutional Connectivity: Building effective processes, rules, and structures to facilitate the free flow of goods, services, investments, and skilled labour; and

People-to-people Connectivity: Promoting social and cultural understanding amongst the peoples of ASEAN.

Charting the Course for Enhanced Connectivity

A review of the MPAC involves three broad components. The first examines how Connectivity has progressed, and in particular, the role that the MPAC has played. The second sets forward a course for the Connectivity vision leading up to 2025. This too, calls for reflecting on performance to date to identify key areas of strength and weakness and potential policy levers to advance Connectivity. The third sets out improvements to the M&E system to allow for ongoing adjustment, policy reformulation and benchmarking. In this Executive Summary, we first summarize the state of ASEAN Connectivity, drawing on quantitative analysis and economic modeling, then follow with a discussion of implications for the future, both with respect to Connectivity policy and the M&E system.

Implementation of Master Plan on ASEAN Connectivity: 2011-2015

The assessment of progress on Connectivity relies on quantitative indicators associated with each of the nineteen Connectivity strategies and a series of economic models. The indicators illustrate the current state of Connectivity and demonstrate degrees of progress, while the economic models evaluate MPAC's specific role in advancing Connectivity and integration.

The indicators and economic models (see endnotes) show a number of policy areas that have progressed well. Significant improvements were observed, particularly for process-oriented and institutional measures related to transnational trade and people mobility. There has been a significant increase in land crossings in Thailand, Laos and Cambodia, for instance, and many Member States have experienced appreciably increasing scores on indices like Trading Across Borders[1] (as measured by the World Bank *Doing Business* project) and the Logistics Performance Index (LPI).

Other policy areas require further attention, either due to low performance or their key importance to future development. For example, geographic simulation models suggest that air and maritime sector development are particularly significant to projected trade volumes and growth. But indicators show that, while air services liberalization has developed apace, maritime developments are more modest, hampered by long gestation periods in port construction and problems associated with port efficiency and quality. Similarly, progress on the Singapore-Kunming Rail Link (SKRL), inland waterways development, and the development of the Trans-ASEAN Gas Pipelines (TAGP) are lagging.

Overall, the indicators and models show that Connectivity has increased, but to varying degrees of effect. While institutional measures have largely progressed apace, there remain opportunities based on process harmonization and the implementation of key liberalization policies that constitute 'easy wins'. Although some of the physical infrastructure components that make up the MPAC programme have progressed steadily, others encountered resource mobilization challenges. These areas of lower performance constitute opportunities for future development towards greater ASEAN Connectivity by 2025.

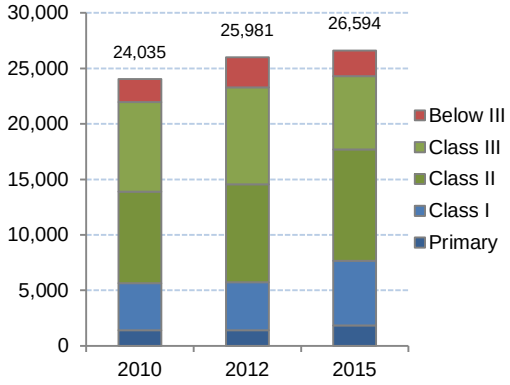
[1] This measures the time and cost associated with importing and exporting goods

Physical Connectivity Progress

Fundamental to the MPAC are interventions for improving and expanding the physical connections between ASEAN markets and societies. The construction of new infrastructure and the rehabilitation of existing assets aim to reduce the transaction costs of regional trade and mobility, as well as increase access to technology, communications and energy resources. This includes infrastructure projects like the ASEAN Highway Network (AHN), the SKRL, the Trans-ASEAN Gas Pipeline and the ASEAN Power Grid (APG), as well as more general sectoral initiatives to improve maritime networks, inland waterways, multi-modal transport, and information and communication technology (ICT) coverage.

Construction and rehabilitation of the AHN and the APG have progressed well over the implementation period (2011-2015). 2,559 km was added to the AHN (an increase of 10.6 per cent), between 2010 and 2015. Expansion for the sections specifically identified under MPAC was concentrated in Myanmar, where 70 per cent (141 km of a targeted 201 km) of the missing links specified in the MPAC were constructed.[2]

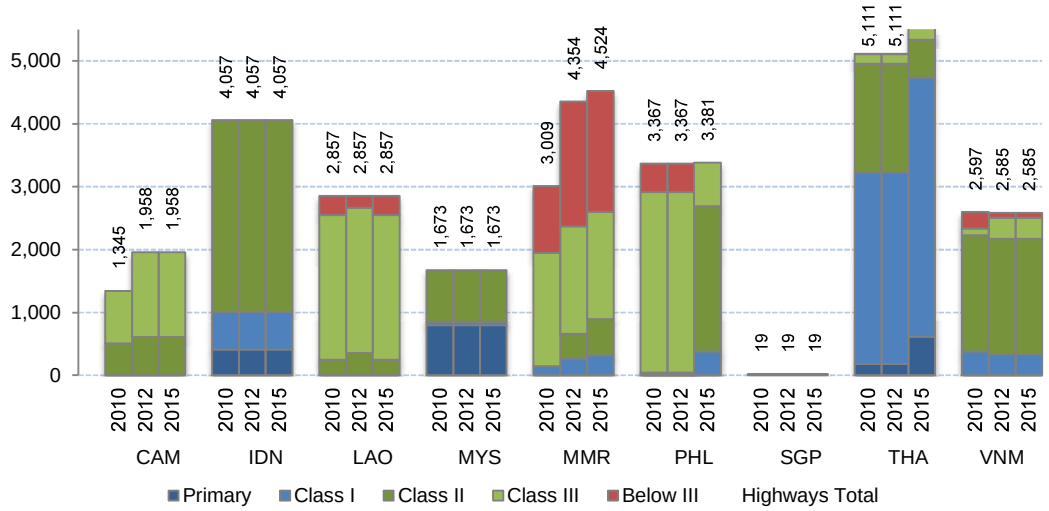
Figure 1. AHN overall length by road class (km)



Upgrading works, most importantly associated with Transit Transport Routes (TTRs), have progressed in Cambodia, Laos and Vietnam, but require continued attention to reach their targets. The most important issue looking forward is the upgrading of Below Class III roads for prioritized TTRs that remain incomplete, particularly in Laos and Myanmar. Project preparations are under way to upgrade two priority TTRs in Laos: AH-15, linking Ban Lao and Namphao and AH-12, linking Vientiane to Luang Prabang. Of the three TTRs marked for upgrading in Myanmar, a 93 km stretch of the AH-3 from Kyaington to Mongla has been upgraded, while AH-1 and AH-2 are in progress.

[2] It should be noted that these were at Below Class III standards.

Figure 2. AHN road length by road class and Member State (km)



Similarly, the APG has made significant progress following good progress on construction of interconnections. Eight of the 16 APG projects have projected commercial operation dates (CODs) between 2015 and 2020. Electricity trade between Thailand and Laos is likely to increase with APG project nine, which connects the two Member States, building upon existing high levels of bilateral electricity trade.

Table 1. ASEAN Power Grid Project Status Update, HAPUA, May 2015

Interconnection Project		Earliest COD
1. Peninsular Malaysia – Singapore		Post 2020
2. Thailand – Peninsular Malaysia	Sadao – Bukit Keteri	Existing
	Khlong Ngae - Gurun	Existing
	Su Ngai Kolok - Rantau Panjang	TBC
	Khlong Ngae – Gurun (2nd Phase, 300MW)	TBC
3. Sarawak - P. Malaysia		2025
4. P.Malaysia - Sumatra		2020
5. Batam - Singapore		2020
6. Sarawak - West Kalimantan		2015
7. Philippines - Sabah		2020
8. Sarawak - Sabah – Brunei	Sarawak –Sabah	2020
	Sabah – Brunei	Not selected
	Sarawak – Brunei	2018
9. Thailand - Laos	Roi Et 2 – Nam Theun 2	Existing
	Sakon Nakhon 2 – Thakhek – Then Hinboun	Existing
	Mae Moh 3 - Nan - Hong Sa	2015
	Udon Thani 3- Nabong (converted to 500KV)	2019
	Ubon Ratchathani 3 – Pakse – Xe Pian Xe Namnoy	2019
	Khon Kaen 4 – Loei 2 – Xayaburi	2019
	Nakhon Phanom – Thakhek	2015
	Thailand – Lao PDR (New)	2019-2023
10. Laos – Vietnam		2016-TBC

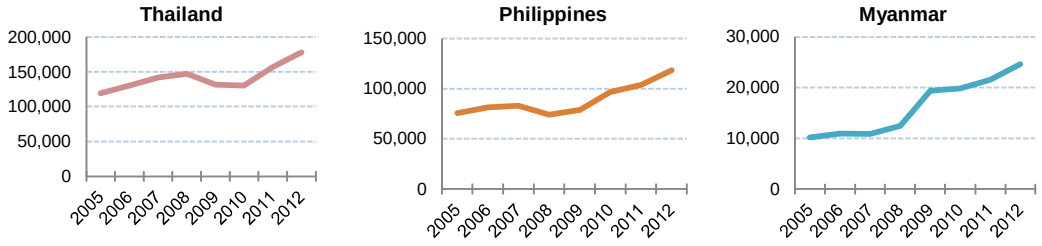
11. Thailand - Myanmar - Cambodia (new)	2018-2026
12. Vietnam (new)	TBC
13. Laos - Cambodia	2017
14. Thailand – Cambodia (new)	Post 2020
15. East Sabah – East Kalimantan	Post 2020
16. Singapore – Sumatra	Post 2020

Source: Project update, HAPUA, May 2015

Other Physical Connectivity projects have enjoyed less progress, most notably the SKRL. Of the 1285 km missing rail links targeted in the MPAC for construction by 2015, the SKRL expanded by only 6 km, with construction completed for a link from Aranyaprathet, Thailand, to the Cambodian border in 2016. The remaining 1259 km of missing links are currently in various stages of planning targeted for completion by 2020. Progress has been slow due to low traffic projections, competition for resources from other development projects and substitution by alternative transport sectors, including road and air. Similarly, in the energy sector, the development of the TAGP has been limited to progress on one domestic link within Indonesia, between Kalimantan and Java. Though intra-ASEAN imports in the natural gas sector grew between 2010 and 2013, trade increases were not attributable to the TAGP.

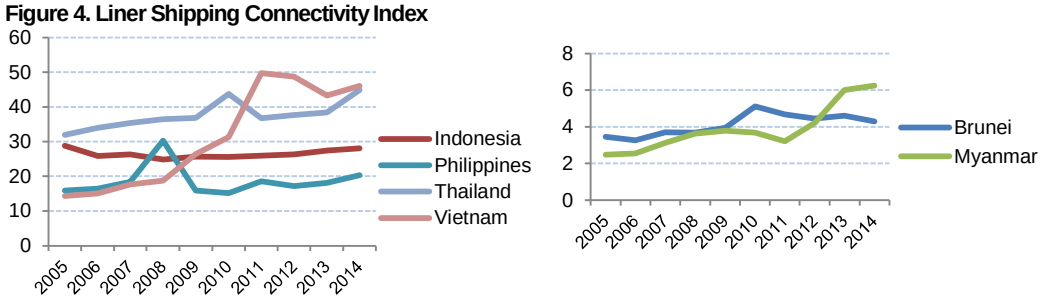
Further efforts are required to expedite the development of inland waterways and the establishment of an integrated maritime network. Data on river trade is limited to 2011-2012, but preliminary analysis suggests that Laos and Cambodia may have experienced increased cargo throughput in river ports. Nevertheless, river networks, especially in Cambodia, Laos and Myanmar, remain underdeveloped for trade and transit and require further support. Similarly, while seaport container throughput has increased, particularly in Thailand, Myanmar and the Philippines (Figure 3), maritime sector development has lagged with respect to physical and institutional targets. Vietnam and Myanmar are the only two Member States to have appreciably increased liner shipping connectivity over the MPAC period (Figure 4).

Figure 3. Sea container throughput, Thailand, Myanmar, Philippines (thousand tons)



Source: ASEAN-Japan Transport Partnership, 2015

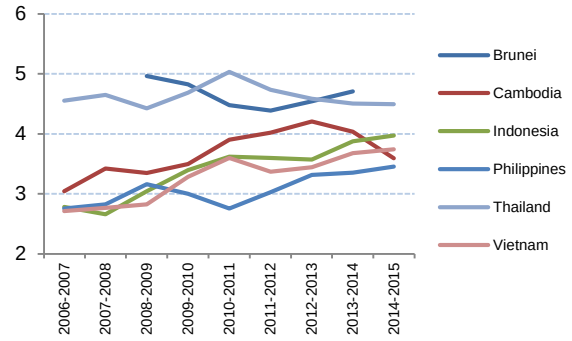
Figure 4. Liner Shipping Connectivity Index



Source: UNCTAD, 2015

There are, however, opportunities for improvement: the establishment of a roll-on/roll-off (RoRo) network is in the early stages of planning, following feasibility studies conducted in 2012-2013; and ASEAN is working on implementing the Roadmap for an Integrated and Competitive Maritime Transport in ASEAN (RICMTA) and the ASEAN Single Shipping Market (ASSM). Updated status reports on ASSM rules on foreign ownership, access, port productivity and efficiency, and local content laws would provide helpful qualitative data to contextualize the degree of shipping liberalization.

Figure 5. Global Competitiveness Indicators, Quality of port infrastructure[3]



Source: GCI, 2015

Progress in port quality has been somewhat uneven (Figure 5). While many Member States have improved facilities, a key emerging issue is the relative efficiency and quality of services. Rehabilitation and good planning in the sector are equally as important to maritime competitiveness as new developments.

The need for further support for sector development is corroborated by simulation models, which demonstrate the high potential impacts maritime sector development, particularly the RoRo network, could have on regional GDP growth leading up to 2025. These results suggest that maritime development is key to trade connectivity.

[3] Some Member States not included due to unavailability of data.

With respect to ICT, Connectivity has increased for all countries, but at a pace generally similar to pre-MPAC growth. Philippines and Cambodia have experienced the most apparent increases in Internet use growth rates during the MPAC period, and Cambodia has also experienced a significant increase in mobile telephone subscriptions. Further ASEAN mapping of mobile network coverage would inform a more comprehensive assessment of the access to mobile telecommunications across the region.

Figure 6. Internet users per 100 inhabitants

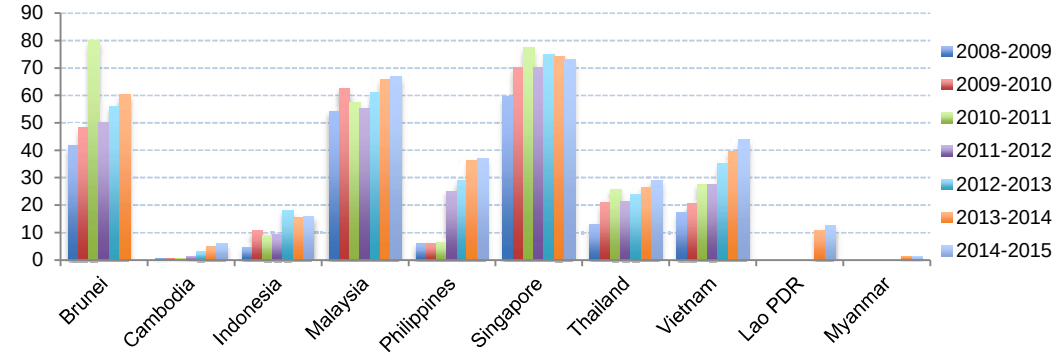
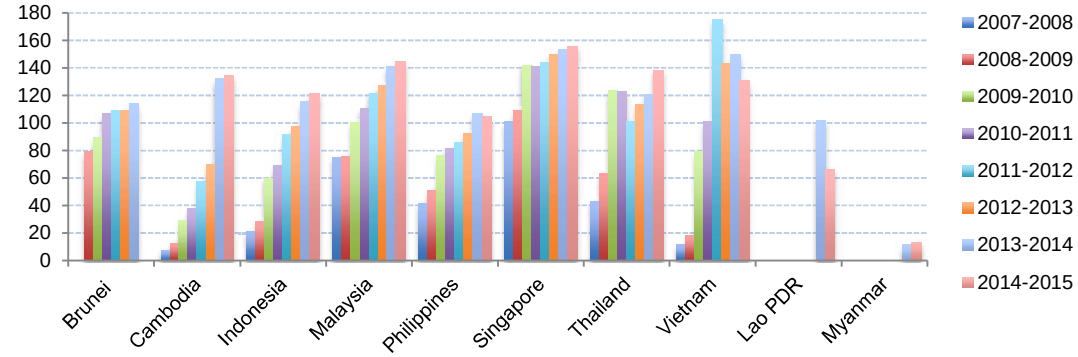


Figure 7. Mobile telephone subscriptions per 100 inhabitants



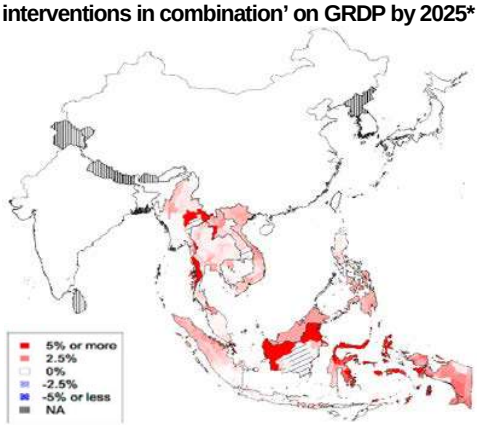
Source: Global Competitiveness Indicators, 2015

Lastly, the establishment of an integrated multi-modal transport system is a key area of development. This is supported by economic modelling and prospective simulations that demonstrate important complementarities between trade and transport strategies.

Geographic Simulation Models (GSM) project the economic impacts of several key MPAC interventions, including upgrading AHN roads and building missing links, constructing SKRL missing links, developing the RoRo maritime network, liberalizing air services and improving border facilitation. While the models suggest that, as individual interventions, border

facilitation and the development of maritime and air transport would have the largest impact, the most interesting results demonstrate the importance of network complementarities. The simulated impacts of key interventions in combination yield growth effects 9 per cent higher than the sum of results from individual interventions. The projected complementarity reaffirms the need to monitor and promote the development of multi-modal networks and highlights the need to enhance coordination with respect to infrastructure planning.

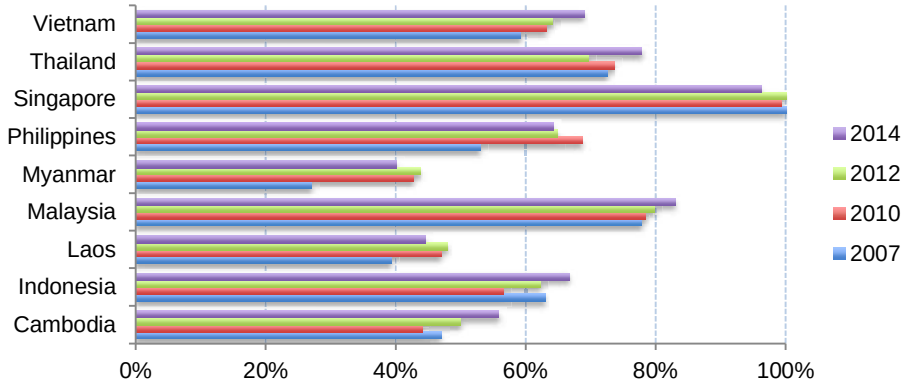
Figure 8. Projected impacts of 'All MPAC interventions in combination' on GRDP by 2025*



**Note: with Non-Tarrif Barriers (NTB) reduction*

To measure development of an integrated multi-modal network, further analysis, including mapping and optimization, requires data on cargo flows passing through transport nodes (e.g., air to road). In the absence of this data, the Logistics Performance Index (LPI) is used to proxy overall performance of logistics systems. LPI scores demonstrate overall improvement in the sector (Figure 9). Indonesia, Thailand, and Vietnam experienced sharp increases in logistics quality and competence and infrastructure quality, while Cambodia experienced a significant increase in logistics quality.

Figure 9. Overall LPI, % of highest performer's score

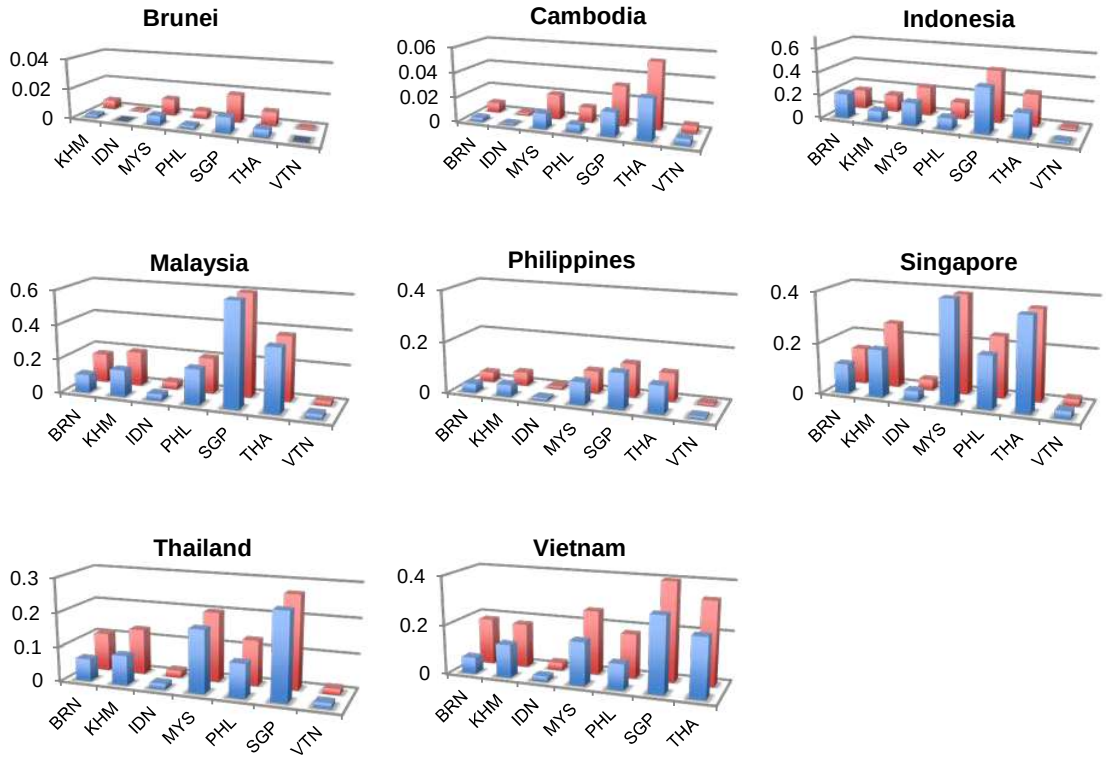


Source: Logistics Performance Index, 2015

Institutional Connectivity Progress

Over the MPAC implementation period of 2011-2015, regional trade integration has increased, suggesting that improved physical trade transport assets coupled with increased trade facilitation and improved border management have had an appreciable impact on the structure and pace of trade. These results are corroborated by analyses that show higher economic multiplier effects within ASEAN in 2011 and beyond (Figure 10).

Figure 10. Multiplier effects on ASEAN-8, comparing 2001-2010 to 2011-2013, by trading partner

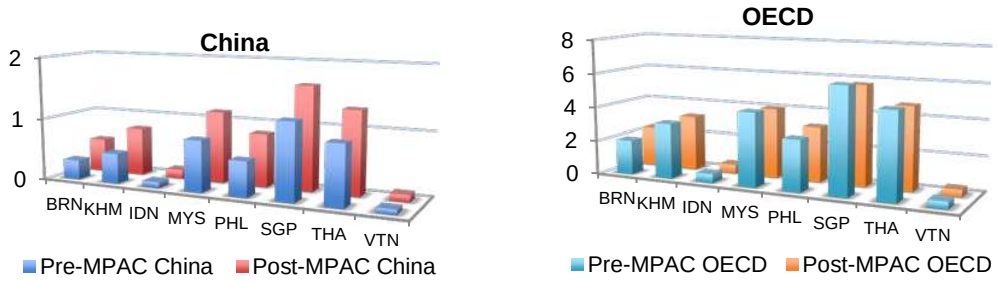


It is important to note, however, that major external trade partners like the OECD nations and China exhibit higher multiplier effects on ASEAN economies than do other Member States, both before and after the MPAC (Figure 11). The major external trade partners also demonstrate significantly higher increases in multiplier effects following the MPAC.[4] These

[4] Structural Vector Auto-regression analysis demonstrates increased integration during the MPAC period as compared to the ten years prior, both regionally and globally. By examining the structure of trade, pre- and post-MPAC, and its impact on GDP, we show via economic multiplier effects that macro-economic responsiveness has increased. In other words, economic shocks (positive or negative) in one ASEAN country have higher effects on the growth rates of other Member States. Myanmar and Laos are not included in the analysis due to unavailability of sufficient data.

results show that intra-ASEAN integration has increased at a more modest pace than integration with the global economy.

Figure 11. Multiplier effects on ASEAN-8, comparing 2001-2010 and 2011-2013, China and OECD



This points to the fact that, in line with the policy of 'open regionalism'[5] adopted by ASEAN, Member States must continue to leverage links with key external economies to generate growth within the region. The need to link Member States to major trading partners reaffirms the importance of Physical Connectivity projects (especially land-based projects) to link internal regions to China, India and ports serving key trade partners, as well as trade liberalization and transport cooperation policies that create an integrated production base for regional exports.

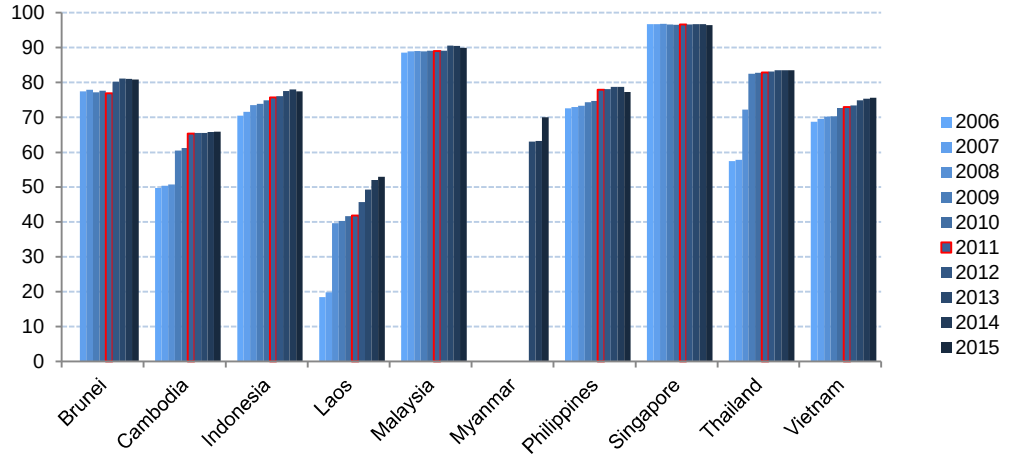
Modelling confirms the positive impact the MPAC has had on regional trade, via institutional measures aimed at reducing cross-border transaction costs.[6] Modelling results show that, since the implementation of the MPAC, a one-day reduction in the number of days required to export is expected to increase intra-ASEAN export volumes by nearly 8 per cent annually. Before the MPAC, the same reduction would have led to only a 3 per cent increase.

Trade facilitation and border management indicators demonstrate improvements, particularly in terms of accelerating the free flow of goods, improving trade facilitation and enhancing border management.[7] The World Bank's 'Trading Across Borders' scores – which include a measurement of 'distance to frontier'[8] (Figure 12) – have increased from 2011/2012 for nearly

[5] A policy of regional economic integration that is not discriminatory against external trading partners.
[6] Gravity models are used to isolate the effects of logistics performance, time to export, and efficiency of clearance processes associated with MPAC policies on intra-ASEAN import and export volumes.
[7] Institutional connectivity strategies 5, 7 and 8, respectively.
[8] The 'distance to frontier' score benchmarks economies with respect to regulatory best practice. When compared across years, the scores show how much the regulatory environment for local entrepreneurs in an economy has changed.

every Member State, indicating a reduction in both documentation burdens and the time and costs associated with international trade.

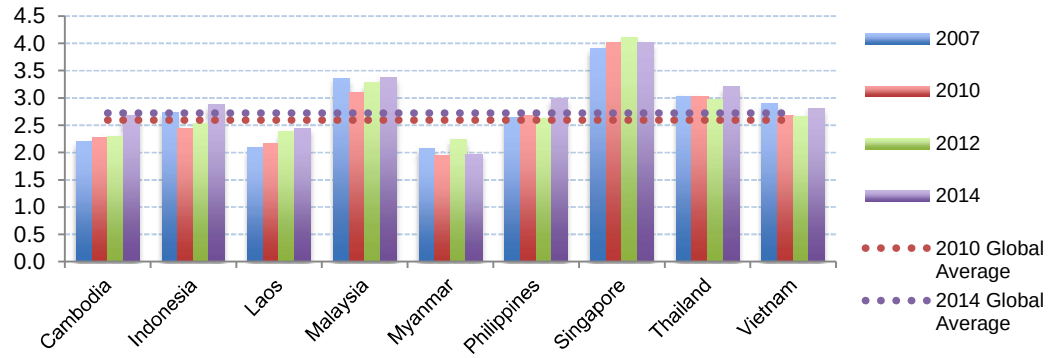
Figure 12. Distance to frontier, Trading Across Borders



Source: World Bank *Doing Business* database, 2015; red marks the start of MPAC implementation (2011)

This is especially apparent for Brunei, Laos and the Philippines, that experienced the sharpest score increases. Laos has made significant progress with respect to reducing the days required to export, from 36 days in 2011 to 23 days in 2014, and LPI scores for clearance efficiency have improved significantly for Cambodia, Indonesia, the Philippines and Thailand since 2012 (Figure 13).

Figure 13. Logistics Performance Index, Efficiency of the Clearance Process score



Source: Logistics Performance Index, 2015

It is important to note that the increased sensitivity of export volumes to customs procedures and border management – as cross-border trade barriers are reduced across ASEAN – is

likely to increase competitiveness within the region. This demands that all countries be vigilant in their efforts to improve trade efficiency to avoid falling behind with respect to trade and economic growth.

The implementation of the MPAC has also increased the relative importance of sharing borders within ASEAN: improved land border management has increased trade volumes between contiguous Member States. Whereas contiguity (i.e., sharing a border) would have resulted in an expected trade increase of 133-139 per cent compared with non-contiguous country trade levels before the MPAC, a shared border now increases this figure to 163-183 per cent. This suggests that improvements in border management have made a significant difference in easing trade across land borders.

As the composition of traded goods shifts from mainly bulk cargo, typically transported by sea and rail, to lighter, higher value components largely transported by air, the development of the air sector becomes ever more important. Since the MPAC, growth rates of intra-ASEAN air passenger and air cargo flows have significantly increased (Figure 14 and 15).[9]

Figure 14. Annual air passenger capacity, intra-ASEAN international arrivals (millions)

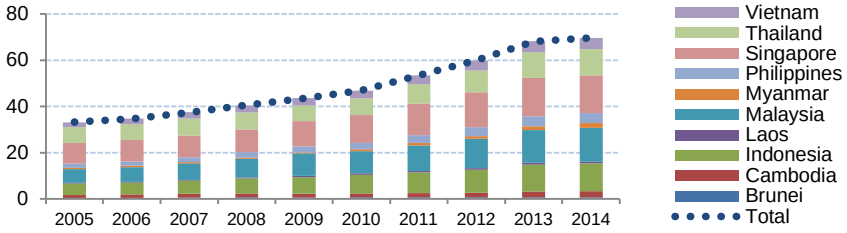
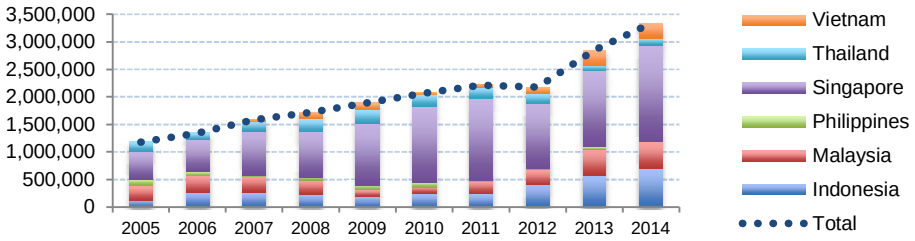


Figure 15. Estimated annual air cargo capacity, intra-ASEAN flights by country of origin (m^3)



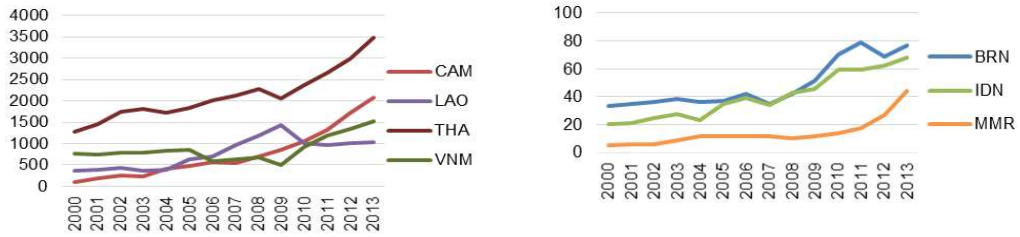
Source: DiiO database, accessed January 2015, World Bank figures

[9] Some Member States not included due to unavailability of data.

Despite limited progress in the quality of air transport infrastructure, passenger and cargo flows have risen markedly following the implementation of agreements underpinning the ASEAN Open Sky policy and the ASEAN Single Aviation Market (ASAM). This suggests the great importance of institutional factors relative to physical factors in determining air transit flows. Economic modelling confirms the significance of air liberalization policies to air transit and transport levels.[10] The granting of third and fourth air freedoms[11] under the ASEAN Open Skies initiative significantly increased intra-ASEAN air passenger flows – the ASEAN Multilateral Agreement on Air Services alone, increased expected bilateral flows by an estimated 70.5 per cent.

With respect to mobility, Thailand, Cambodia and Myanmar experienced noticeable growth increases in cross-border land arrivals after adoption of the MPAC, suggesting the positive effects of easing border restrictions on transit to those Member States. While the number of land arrivals for ASEAN overall has increased steadily since 2000, the growth rates of international passenger arrivals[12] decreased after MPAC implementation, from an average of 5.8 per cent over the period 2005-2010 to an average of 4.9 per cent for 2011-2013.

Figure 16. Passenger land arrivals (thousands)

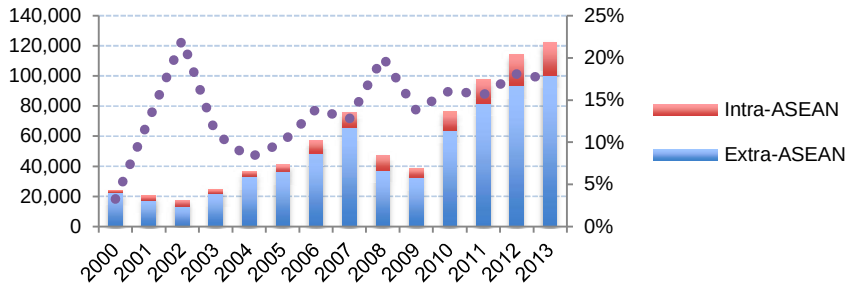


Source: Euromonitor, 2015

A key strategy of the MPAC is to further open up ASEAN economies to investment. ASEAN continues to perform well in attracting Foreign Direct Investment (FDI), with an increasing proportion of FDI inflows originating from within ASEAN. Since the MPAC, Thailand, The Philippines and Myanmar have experienced the most significant increases in their FDI growth rates. The proportion of intra-ASEAN FDI to total FDI has risen modestly, year-on-year since 2010, from approximately 12 per cent to nearly 15 per cent in 2013.

[10] Gravity models demonstrate the impact of the granting of third and fourth air freedoms on bilateral intra-ASEAN air passenger flows and cargo volumes.
[11] The freedoms of the airs are a set of commercial aviation rights granting a country's airline the privilege to enter and land in another country's airspace.
[12] This includes land, sea and air arrivals.

Figure 17. FDI Inflows to ASEAN Member States (US$ millions)



Source: ASEANstats, 2015

For the purposes of M&E – particularly with a view to improving the coordination of MPAC strategies and projects – a more comprehensive assessment of coordinating capacity is essential. This requires utilization of qualitative methods and data gathered at the project level, both of which are currently lacking. This is, therefore, a key area of M&E development, particularly considering the need to coordinate across infrastructure sectors to leverage complementarities and support Connectivity with trade-enabling institutional measures.

People to People Connectivity Progress

People-to-People Connectivity – which involves efforts to promote deeper intra-ASEAN social and cultural understanding, and encourage greater mobility – is the most difficult dimension of the MPAC to measure and evaluate. Assessment relies largely on proxy indicators, such as intra-ASEAN student exchange and tourism that only partially or indirectly reflect levels of People-to-People Connectivity. Nevertheless, it remains a key component of ASEAN integration and thus requires greater attention, both in terms of initiatives and the assessment of progress.

International student exchange and the matriculation of tertiary students throughout ASEAN remains a key and underutilized opportunity for building People-to-People Connectivity. In the early years of MPAC implementation, the number of tertiary international students from within ASEAN did not appreciably increase, and in fact decreased in many Member States. More data is required to assess exchange beyond 2012, but initial results suggest that improving opportunities for interaction amongst students remain a key development area. This can be supported by ASEAN's ongoing efforts to promote educational exchange and ASEAN-focused programs at the secondary and university levels.

On the other hand, there has been good progress in increasing tourism flows in ASEAN, with the growth rate of Intra-ASEAN international passenger arrivals increasing following MPAC from previous annual growth averaging 7.2% from 2006 to 2010, to a post-MPAC average of 10.5% between 2011 and 2014.

Looking Forward: MPAC Policy Implications

The policy implications discussed here emerge from the preceding analysis, which focuses on interventions at the strategic, regional and national level. The main policy implications relate to observed complementarities between strategies; identification of key policy levers; observed policy tradeoffs; and areas of lagging performance.

The first key lesson is that important complementarities exist between the strategic dimensions of Connectivity. GSM results confirm complementary effects between physical and institutional strategies and highlight the importance of coordinated development of infrastructure, processes, and trade rules. The economic models also demonstrate that rules governing trade and exchange – including liberalization agreements and process and measurement standardization, and the general quality of logistics services – have critical implications for the usability and efficiency of existing infrastructure. Ongoing efforts to measure and coordinate across strategies and sectors are important and would benefit from regular project- and policy-level updates.

Secondly, the analysis suggests several key policy ‘levers’. Economic models show that legal-institutional factors are among the most important to increased trade and mobility within the region. The availability of connecting physical infrastructure remains important to trade and growth, but border facilitation measures, the overall quality of logistics in importing and exporting countries, and the rules that determine the time and costs associated with exporting will enable ASEAN to make the best use of these physical assets. For example, GSM analysis shows that some of the most significant effects on projected 2025 GDPs result from the development of the ASEAN Single Aviation Market, development of the RoRo network, and border facilitation. And economic modelling shows that the number of days required to export a basket of goods is negatively related to trade volume, whereas the LPI and Trading Across Borders scores for importers and exporters are positively significant.

These measures are all functions of policies, processes and capacities that affect the transfer of goods and services across borders. Furthermore, results suggest that institutional factors can effectively stave off the negative effects of lagging physical developments. For example, despite limited progress in the quality of air transport infrastructure over the MPAC period, air passenger and cargo flows have risen significantly following ASAM, suggesting the greater importance of institutional factors to air flows.

Quality and efficiency improvements in existing infrastructure can also be as important as new developments. For instance, upgrading of roads to above Class–III status may have more effect on trade than new road construction. Similarly, maritime development must focus more on improving port efficiency and productivity rather than solely on the construction of new ports. Lastly, land-based infrastructure projects such as the AHN and the SKRL will continue to be important, as they are essential components of multi-modal transport networks and important linkages to contiguous trade partners, including India and China, whose growing economic impacts on the region are expected to continue.

A third major category of policy implications relates to policy tradeoffs, specifically between economic growth versus equitable development, and between aggregated national impact versus local impact. The analysis points to a number of cases where infrastructure and trade facilitation measures are expected to have different effects at local, national and regional levels. For instance, the overall economic impacts of developing the RoRo network are projected to be fairly minimal for Indonesia overall, but a closer look at the local level shows that some negative impacts on Java are offset by significant positive impacts in Sulawesi, Sumatra and Kalimantan. Similarly, the expected economic impacts of the AHN are moderate for Myanmar and Brunei, but the local effects are more pronounced in certain regions within these countries. These patterns demonstrate how developments with important local positive impacts help to close development gaps without necessarily having significant impacts on national GDP growth.

Finally, indicator results suggest that some Physical Connectivity initiatives should be revisited due to their limited progress. Where low performance is due to insufficient policy attention and project delays, Member States could prioritize them in their next strategic plan. This is likely the case for maritime development (particularly the RoRo network) and inland waterways

development. However, where low progress is due to low bankability, insufficient demand, institutional complications or low projected impacts, as with the SKRL, Member States must revisit project structuring.

Leveraging Knowledge: M&E Opportunities

Both assessing the past and charting the future course of ASEAN Connectivity entail advancing the monitoring and evaluation (M&E) system. The former depends on sound evaluation, whereas the latter demands finding opportunities for adjustment to stay the course towards integration. The evaluation of Connectivity progress and MPAC's role therein requires both a mechanism and program to systematically gather data, as well as a thorough, yet practical evaluation framework to measure impacts.

Connectivity M&E is framed by an ASEAN Connectivity Implementation Matrix / Scorecard (ACIM), which tracks the progress of the strategies and their key actions. The ACIM has progressed from qualitative progress updates to more comprehensive application of quantitative indicators and economic modeling techniques to evaluate MPAC impacts. Due to the diverse nature of the MPAC strategies and key actions, Connectivity progress may be assessed at three levels:

Outputs: The units of service that result from policy action (e.g., kilometers of road constructed, number of documents required to export);

Outcomes: The effects on 'clients' receiving services (e.g., reduced time and cost to export, increased quality of logistics, liberalization of air transport); and

Impacts: Higher-level effects that relate to macro-level goals (e.g., economic growth).

MPAC strategies and actions range in specificity and include aspirations, strategic goals, infrastructure projects, key decisions and measurable actions. Because of this, strategies and key actions lie at different analytical levels of effect. Strategies are mainly geared towards immediate outputs and intermediate outcomes, whereas the MPAC as a whole is aimed at long-term impacts such as economic growth and equitable development. With this in mind, the M&E system must be designed to measure performance at different levels.

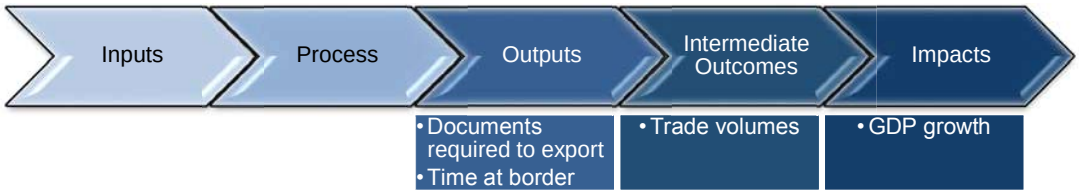
While M&E has progressed, the current framework could be developed to gather better data and provide more detailed analysis about root causes of performance that would help Member

States prioritize certain projects, trace effects on policy outcomes, and isolate MPAC effects from other drivers of connectivity. Moreover, there is currently insufficient information to compare the projected benefits of Connectivity projects with their expected costs. As such, a number of opportunities exist to improve oversight and assessment.

Recommendations relate to improving data access, quality and breadth, to more accurately assess strategic performance and provide valuable contextual information; and to expanding the ACIM to link performance at the project (or key action) output level to social and economic impacts. By applying a multi-level evaluation framework to unpack performance at the output and process levels, the ACIM can be used to identify important policy levers. Without this information, decision makers will not be able to address implementation challenges effectively.

We currently report the state of Connectivity per strategy, with indicator selection based on data availability and design. For example, progress on the AHN is reported at the output level, according to the length of AHN roads built (Figure 18). Its impact on GDP is also projected via modelling. In the future, however, ASEAN could also monitor outcomes such as the volume of exports by road and transit times between major cities. Maritime development, on the other hand, is currently monitored at the output (port capacity) and outcome (sea cargo throughout) levels, with future impacts on GDP projected via modelling. This is a similar case for trade facilitation strategies.

Figure 18. Example indicators linked to levels of analysis



We strive to identify a fuller set of linked output, outcome and impact indicators to develop a more robust, comprehensive evaluation program. There are also important assessment gains to be made by coupling quantitative indicator measurement with qualitative performance assessment (including survey and interview data), timely project and policy implementation data (including project costs), and risk assessment. The use of supportive qualitative data provides valuable contextual information and has three primary purposes: (1) maintaining updated records on project status and policy adoption; (2) triangulating results; and (3) determining underlying root causes of observed outcomes.

Lastly, identified data needs relate to untimely, incomplete or un-harmonized data. These may be summarized as follows:

> Data harmonization: In order to compare Connectivity year-on-year, indicator measures must be strictly defined and uniformly constructed. The issue of harmonization is pronounced, for example, in the case of energy trade data, where large asymmetries are observed due to major differences in the ways imports and exports are recorded.
>
> Data availability and timeliness: Much of the data on trade by transport sector (e.g., cargo throughput by river, exports by rail, etc.) is missing, irregular or too outdated for use in M&E. Many figures are reported only to 2012 or 2013, while others are altogether unavailable. Improved and timelier submission of statistics would allow better tracking of Physical Connectivity. Other shortfalls include the lack of baseline statistics with which to compare progress, the inability to disaggregate network extensions and expansions from upgrading and reclassifications, and a lack of important data on projected an annual project costs for key initiatives.

Building infrastructure asset registers could be another helpful solution to some of these data issues, particularly those related to project status. Asset registers could incorporate geographic information in the recording of physical and financial data for infrastructure, as well as in inventories and conditional assessments. National asset registers could be used to track the extension and improvement of segments of the AHN and the SKRL over time, as well as port capacity and development, inland waterways development projects, and targeted ICT and energy transmission projects.

The ACIM has become an increasingly useful tool, but there are clear opportunities for improving MPAC M&E. While strategy-level assessment is important to guide policy, evaluating impacts and defining opportunities for re-calibration requires analysis at the project level. This means regular and systematic data collection and a multi-level approach. These and other recommendations in this report give guidance as ASEAN embarks on building the monitoring and evaluation framework for the Post-2015 agenda for ASEAN Connectivity and the ASEAN Community 2025.

Endnote

Strategies of Master Plan on ASEAN Connectivity (MPAC)

A. Key Strategies to Enhance Physical Connectivity

1 Complete the ASEAN Highway Network (AHN)

2 Complete the implementation of Singapore Kunming Rail Link (SKRL) project

3 Establish an efficient and integrated inland waterways network

4 Accomplish an integrated, efficient and competitive maritime transport system

5 Establish integrated and seamless multimodal transport systems to make ASEAN the transport hub in the East Asia region

6 Accelerate the development of ICT infrastructure and services in each of the ASEAN Member States

7 Prioritise the processes to resolve institutional issues in ASEAN energy infrastructure projects

B. Key Strategies to Enhance Institutional Connectivity

1 Fully operationalise the three Framework Agreements on transport facilitation, i.e. ASEAN Framework Agreement on Framework Agreement on the Facilitation of the Facilitation of Goods in Transit (AFAFGIT), ASEAN Inter-State Transport (AFAFIST) and ASEAN Framework Agreement on Multimodal Transport (AFAMT).

2 Implement initiatives to facilitate inter-state passenger land transportation

3 Develop the ASEAN Single Aviation Market (ASAM)

4 Develop an ASEAN Single Shipping Market

5 Accelerate the free flow of goods within ASEAN region by eliminating barriers to merchandise trade within the region

6 Accelerate the development of an efficient and competitive logistics sector, in particular transport, telecommunications and other connectivity-related services in the region

7 Substantially improve trade facilitation in the region

8 Enhance border management capabilities

9 Accelerate further opening up of ASEAN Member States to investments from within and beyond the region under fair investment rules

10 Strengthen institutional capacity in lagging areas in the region and improve regional-sub-regional coordination of policies, programmes and projects

C. Key Strategies to Enhance People-to-People Connectivity

1 Promote deeper intra-ASEAN social and cultural understanding

2 Encourage greater intra-ASEAN people mobility

Indicators and Models

The indicators used to assess Connectivity (detailed in Chapter II and Annex 1) draw upon a wide variety of data sources, including ASEAN Statistics, the World Bank, UN ESCAP, World Economic Forum, and industry databases. These indicators demonstrate the changing state of Connectivity. To measure the significance of MPAC to outcomes and impacts, econometric analysis and spatial modeling are employed to control for the effect of other potential factors on Connectivity and growth. In other words, an increased indicator score may be attributable to

extra-MPAC factors. Conversely, decreased or stable scores may not mean MPAC strategies are *not* working; rather, countervailing factors that could have otherwise worsened Connectivity may be offset by MPAC gains. Because of this, unless output measures are solely attributable to MPAC policy (e.g., operationalizing MPAC frameworks or constructing AHN missing links), we recognize that indicators can only provide a 'pulse check'.

To offer a more definitive picture of MPAC impacts, we employ econometric modeling strategies. Geographic Simulation Modeling (GSM) directly simulates the impacts of key actions on patterns of economic growth at the sub-regional level; gravity models are employed to isolate the effects of MPAC and component policies on intra-ASEAN trade and air passenger flows; and structural vector auto-regression (SVAR) time series analysis allows us to examine the effects of MPAC on GDP growth through the Intra-ASEAN trade structure. At present, data availability restricts the ability to extensively model MPAC impacts. While future modeling (contingent on improved data) should be applied to assess the MPAC effects on more Connectivity measures like trade volumes by transport sector (e.g., maritime, air, land), Intra-ASEAN FDI, and energy trade, the methods used in this report provide a basis for future application.

PART I: Connectivity Strategies and Progress

Chapter I. Introduction: Connectivity and the MPAC

1.1 Background

In pursuit of a resilient, competitive, and sustainable ASEAN Community, and in recognition of the central role increased physical, institutional, and people-to-people connectivity would play in this endeavor, ASEAN Heads of State adopted the Master Plan on ASEAN Connectivity (MPAC) at the 16th ASEAN Summit in Hanoi in October 2010. The MPAC is an ambitious strategic plan to advance regional Connectivity in pursuit of wider goals of enhanced competitiveness, narrowing the development gap, global integration, and deeper social and cultural understanding.

Realizing the ASEAN Community, comprising the ASEAN Economic Community, the ASEAN Political-Security Community, and the ASEAN Socio-Cultural Community, depends on deeper integration of Member States, including the reduction of barriers to trade, communications, and people mobility, improved regional capacity to facilitate trade and transport goods and people, and harmonization of rules governing trade and movement within the region. The MPAC provides a blueprint for further integrating the people, trade, services, and capital of ASEAN, both within the region and with the global economy, via three strategic dimensions. The dimensions and their composite strategies aim to redress “hard” and “soft” barriers to integration. Under the physical Connectivity dimension, MPAC attends to improving transportation, information communications, energy, and technology infrastructure. Institutional Connectivity strategies focus on building effective processes, rules, structures, and organizations to facilitate the freer flow of goods, services, investments, and people. And people-to-people Connectivity seeks to promote social and cultural understanding amongst the peoples of ASEAN.

The MPAC specifies strategies and key actions for each of these dimensions, as well as priority projects for rapid implementation, detailed in Annexes 1 and 2. Project funding is generally the remit of Member States, though ASEAN established an ASEAN Infrastructure Fund with the Asian Development Bank in 2011, to provide financing to sovereign or sovereign-guaranteed infrastructure projects in the ASEAN region. Nonetheless, the

implementation of MPAC itself is nearly wholly dependent on the commitment of and collaboration amongst Member States.

This MPAC Monitoring and Evaluation Report illustrates the progress ASEAN has made to date with respect to improving ASEAN Connectivity over the 2011-2015 implementation period, as well as the likely impacts of the MPAC program on economic growth and equitable development in the future. Building on past analysis, research, and deliberation over the modes and methods of measuring connectivity, this report presents both a pulse check on ASEAN Connectivity as well as the earliest evaluation of MPAC's policy impact. The assessment of connectivity is framed by the ASEAN Connectivity Implementation Matrix / Scorecard, an evaluation tool currently applied at the strategy level.

1.2 The ACIM Framework

The ASEAN Connectivity Implementation Matrix / Scorecard (ACIM) has been developed and applied to monitor the progress on the initiatives associated with MPAC, as well as MPAC's role in progressing economic competitiveness and growth, regional integration, and equitable development. The ACIM tracks the progress of seven physical, ten institutional, and two people-to-people strategies and their associated key actions (32, 32, and 20, respectively), with special attention to fifteen high-impact priority projects designated for quick implementation (see Annex 2).

In its early inception (2010 to 2012), the ACIM was applied as a qualitative assessment of progress on key actions, with appraisal based on expert interviews. Results were documented on an ordinal scale which recorded the status of key action items and priority projects as "Complete / Early Achiever", "On Track", "Behind Schedule", or "Yet to Start". These descriptors were supplemented additionally by periodic project status reports. While this offered a dashboard view of project status, the approach was entirely retrospective, insufficient to capture degrees of progress or strategic relationships, and lacking measurements that could be meaningfully compared over time.

Following the 2014 First Interim Report and consultation with ASEAN, the World Bank suggested improvements to the ACIM to include quantitative indicators of progress towards the MPAC strategies and key action items within them, as well as economic modeling techniques to evaluate impacts. In doing so, the ACIM can evolve from a retrospective, qualitative status update to a more balanced assessment tool incorporating quantitative data

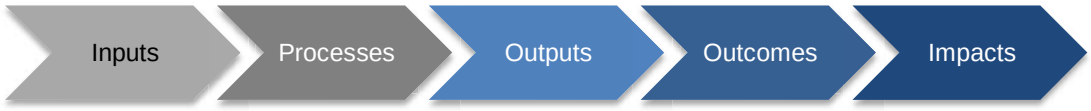
and strategic assessment at the regional, national, and subnational levels, as well as analysis of the impacts of MPAC on economic growth and regional and extra-ASEAN trade.

Measuring Outputs, Outcomes, and Impacts

Due to the diverse nature of the MPAC strategies and key actions, and their relationships to greater goals of ASEAN Community-building and Integration, assessments of progress of MPAC components are inevitably made at multiple levels of analysis. This analysis and assessment framework recognizes that a chain of effects results from policy intervention. The scope and scale of intervention extends the causal chain. As commonly applied in policy evaluation, we assess MPAC's effects in this report at three levels of analysis – output, outcome, and impact – with nested causal relationships.

Immediate policy outputs are the units of service that result from the conversion of inputs via government processes (e.g., number of kilometers of new road constructed, number of documents required for export, new ports developed). These drive outcomes, which are the effects on 'clients' receiving the government services or coming under the influence of new rules (e.g., reduced time and cost to export, increased quality of logistics, liberalization of air transport). Finally, impacts are the higher-level effects of interventions that relate to broader policy goals (e.g., increased trade, economic growth).

Figure 19. Causal chain of policy inputs to impacts



Because the expansive set of MPAC strategies and actions range in specificity and include policy aspirations, strategic goals, tangible infrastructure projects, key decisions, measurable actions, and calls for further study or rule implementation, they do not necessarily lie squarely in nested, causally linked configurations of output, outcome, and impact. While this is a challenge to monitoring and evaluation, it is not a strict impediment. Rather, this evaluation exercise accepts that, for each strategy, assessment of progress may involve reflections on output and / or outcome performance related to Connectivity, depending on the structuring of the strategy itself and the availability of data. Further, the analysis of MPAC impact on Connectivity assesses the influence of MPAC policies and key actions on intermediate connectedness outcomes (e.g., air cargo flows), as well as impacts such as economic growth, increased trade and, thus, a more unified production and distribution base.

By and large, the strategies themselves are geared towards intermediate outcomes related to improving levels of Connectivity, whereas the MPAC as a whole is aimed at long-term impacts such as economic competitiveness, equitable development, and cultural understanding. As such, the search for metrics utilized to measure strategy attainment prioritizes indicators that are also at the outcome-level of analysis. Where outcome data is unavailable, however, output indicators or outcome proxy indicators are utilized. Examples include 'Growth in the capacity of Intra-ASEAN passenger air travel' as a proxy outcome indicator for 'Building an ASEAN Single Aviation Market' and 'Cargo throughput by river' as an output indicator for 'Establishing an integrated inland waterway network'.

On the other hand, where a strategy or its key actions are aimed at producing specific outputs (e.g., constructing missing links of the AHN, developing National Single Windows), the comparison between the current level of execution and the expected outputs gives an indication of the degree of implementation. But inferences may also be made about intended outcomes, motivating inclusion of complementary outcome-level indicators. For example, the 'Time and cost required to import and export' are outcome indicators applied to output-oriented strategy, namely, operationalizing trade and transport frameworks.

In addition, there is evidence that improved Connectivity positively affects economic growth and socioeconomic conditions. For example, upgrading the ASEAN Highway Network (an output) is expected to reduce freight transport time and cost (an outcome) which, in turn, is expected to increase productivity, trade, and economic growth in the long run (an impact). To measure the significance of MPAC to outcomes and impacts, econometric analysis and spatial modeling is required.

Causal Inference

Several econometric modeling strategies are utilized herein to understand the causal links between the MPAC policy and several macroeconomic outcomes. Geographic Simulation Models (GSM) directly simulate the impacts of key actions on patterns of economic growth at the sub-regional level. The simulated outcomes are contingent on the Connectivity assumptions on which simulations are based and thus, reflect impacts of expanded and improved transportation networks and border transit conditions. The gravity models of trade and passenger air travel control for non-Connectivity factors that may also determine trade flows, including geographic distance, common borders, and shared languages, allowing us to isolate the effects of MPAC itself on trade flows and air passenger flows. Similarly, time series

regression analysis allows us to isolate the effects of MPAC from other contributing factors to GDP growth.

This brings about two important methodological points related to interpreting indicators. First, the indicators measure Connectivity, but not strictly MPAC's impact on Connectivity, as other factors affecting indicators are not controlled. An increased score for an indicator may be attributable to extra-MPAC economic, political, social, or physical factors. Conversely, decreased or stable scores may not mean MPAC strategies are *not* working; rather, countervailing factors that could have otherwise worsened Connectivity may be offset by MPAC gains.

Second, and because of this, we accept that many of the indicators are to be interpreted primarily as a pulse check on Connectivity during the MPAC period (unless they are output measures solely attributable to MPAC policy, e.g., operationalizing frameworks or constructing AHN missing links). We can reasonably infer beyond this, however, that pronounced changes in indicator trends following MPAC implementation suggest the positive influence of MPAC strategies and key actions on those particular indicators of connectivity.

1.3 Improving the ACIM

Pursuant to improvements proposed in the First Interim Report and further deliberated with the ACCC and ASEC, the ACIM has progressed to support the evaluation of MPAC outputs and intermediate outcomes via a set of strategy-level quantitative indicators. Further, ACIM indicators are used as inputs in the modeling of MPAC's significance to economic impacts such as increased trade and GDP growth, as well as in prospective models that forecast MPAC impacts on future economic growth at the national and regional levels.

While the ACIM is improving to provide a more forward-looking picture of progress that employs a more systematic approach to assessing MPAC, there remain opportunities to improve M&E. For one, the ACIM does not currently track outputs at the activity level and, thus, cannot offer assessments of the efficiency or effectiveness of activity-level processes. National and sub-national evaluations that capture these aspects of MPAC performance could be integrated into a more thorough multi-level assessment in the future. Secondarily, the MPAC's indicators cover outputs or outcomes, but not both, for each strategy. Thus, where outcomes but not outputs are reported, we may demonstrate performance, but without indication of causal relationships with particular activities. And where outputs but *not* outcomes are reported, one may only cautiously infer the effect on intermediate outcomes.

To improve this aspect, better information systems and data quality are essential. Proposed improvements (See 4.2) are based on identified data gaps associated with measuring outcomes, which in turn limit the precision of impact evaluation. These issues challenge the rigorous assessment of both current outcomes and likelihood of future strategy success.

Chapter II. MPAC Strategies and Connectivity Progress

This second chapter reports progress on physical, institutional, and people-to-people measures of ASEAN Connectivity, organized by the MPAC three dimensions and their associated strategies. Each strategy section specifies the indicator or set of indicators applied to measure progress and reports Connectivity performance according to these indicators.

The MPAC also includes a list of prioritized projects from amongst the lists of key actions under each strategy (See Annex 2). Where data is available, the status of these projects is discussed in summary. Whereas the indicators are identified in this section, detailed indicator definitions and technical notes on their selection and application are described, where needed, in Annex 3. Data sources are listed and described in Annex 4.

Pursuant to the broader goals of the Connectivity initiative, the MPAC is intended to support an integrated production and distribution base, which would require the seamless transportation and trade of goods across borders, as well as the free flow of investments. Recent research drawing on global trade data indicates that trade facilitation, transport connectivity and logistics quality are more important than geographical distance in explaining trade costs (Arvis et al, 2013). As such, the degree of connectivity between ASEAN States, as it relates to both hard infrastructure and the processes, rules, and systems applied in trade governance, are critical components of building a unified ASEAN Community. Similarly, the MPAC aims to free the connectivity of the peoples of ASEAN across national borders. Numerous aspects related to the flow of goods, services, and capital are attended to extensively in the physical and institutional Connectivity strategy sections, whereas the flow of people across ASEAN Member States is discussed in a review of people-to-people strategies.

2.1 Physical Connectivity Performance

Strategies within the physical Connectivity dimension aim to alleviate "hard" physical constraints to ASEAN Integration. The aims of physical Connectivity are to develop integrated, effective multimodal transport systems and ICT and energy networks. Strategies span all transportation sectors – road, rail, river, sea, and air – and their connection nodes, along with the energy and information and telecommunications sectors.

Overall, ASEAN's performance with respect to physical infrastructures has improved over the years. According to the *Global Competitiveness Report* measures of infrastructure quality, most Member States have maintained or incrementally improved the quality of their physical infrastructure since 2006. While the region well outperforms the low-income country average, it lags OECD as well as the global average.

Table 2. 2014-2015 *Global Competitiveness Report* Quality of Infrastructure

	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam	ASEAN	Average GCR	Low income	OECD
Quality of air transport infrastructure, 1-7 (best)	3.59	4.52	4.09	5.74	2.54	3.58	6.76	5.28	4.00	3.71	4.36	3.05	5.42
Quality of electricity supply, 1-7 (best)	3.04	4.34	5.02	5.73	2.84	4.20	6.68	5.12	4.19	3.83	4.50	2.37	6.24
Quality of port infrastructure, 1-7 (best)	3.59	3.97	2.57	5.58	2.64	3.46	6.71	4.50	3.74	3.34	4.13	2.83	5.24
Quality of railroad infrastructure, 1-7 (best)	1.64	3.69	N/A	5.04	1.82	2.29	N/A	2.40	3.02				
Quality of roads, 1-7 (best)	3.35	3.93	3.97	5.59	2.44	3.57	6.05	4.47	3.20	3.39	4.02	2.83	5.18

Source: World Economic Forum (Brunei 2014-2015 data unavailable)

The extension, expansion, rehabilitation, and upgrading of ASEAN physical infrastructure will, thus, remain central to its trade competitiveness.

Strategy 1. Complete the ASEAN Highway Network

Including 23 designated routes covering 38,400 kilometers, the ASEAN Highway Network (AHN) has been prioritized as a flagship transportation project due to the key role of overland transportation to the transit of goods and mobility of people in ASEAN. ASEAN Transport Ministers adopted a plan to develop the AHN in 1999, aiming to strengthen the system of land corridors linking ASEAN Member States to each other and to the greater Trans-Asian Highway Network. The MPAC reaffirmed this goal with specific targets to upgrade designated Transit

Transport Routes (TTRs) to at least Class III standards by 2012; upgrade "Class II or III" sections with high traffic volume to "Class I" by 2020; and construct AHN missing links by 2015.

In addition to two missing links in Myanmar, the MPAC identified over 5,300 km of Below Class III roads in Myanmar, Laos, Indonesia, Malaysia, Vietnam, and Philippines, including 2,070 km of TTRs in Laos, Myanmar, and Philippines. Of these, five TTRs (AH-12 and AH-15 in Laos; AH-1, AH-2, and AH-3 in Myanmar) were prioritized for upgrading.

Figure 20. ASEAN Highway Network

Source: Master Plan on ASEAN Connectivity, 2009

Progress has been made with respect to expanding and upgrading the AHN, but a remaining missing link (60 km on AH-112 in Myanmar) and slower than expected upgrading and network extension all challenge likelihood of full implementation by the 2015 and 2020 deadlines for the AHN strategy's key actions.

Indicator and Data Source

Both the ASEAN-Japan Transportation Partnership (AJTP) and UN Economic and Social Commission for Asia and the Pacific (UNESCAP) maintain data on the construction of ASEAN roads and AHN network roads by class. Whereas AJTP data relates to roadways in general, UNESCAP provides data specifically on the length of AHN roads, by class. The indicators and data sources employed include the length of AHN by road class (I, II, III and Below Class III) from UNESCAP, with observations for 2010, 2012, and 2015, and key project status updates from World Bank ASEAN PPP Pipeline Project country consultations with government and other participants in road development (2014).

MPAC Priority AHN Projects for 2015

Construction of missing links:

- Myanmar: AH112 (Thaton–Khlong Loy, 60 km)
- Myanmar: AH 123 (Dawei–Maesame Pass, 141 km)

Upgrading of 'Below Class III' TTRs:

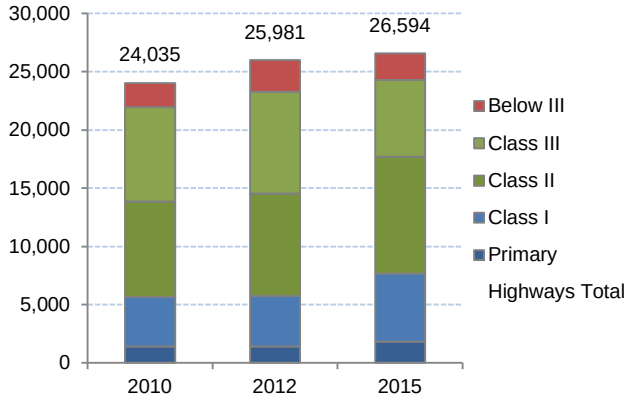
- Laos: AH12 (Vientiane–Luang Prabang, 393 km)
- Laos: AH15 (Ban Lao–Namphao, 98 km)
- Myanmar: AH1 (Tamu—Myawadi, 781 km)
- Myanmar: AH2 (Meikthila–Tachikeik, 593 km)
- Myanmar: AH3 (Kyaington–Mongla, 93 km)

Because information on specific road segments is not currently available, it is not possible to definitively report the distribution by road class of the over 2,500 kilometers of newly constructed road or to determine what proportion of the extensions in each class are attributable to new construction versus upgrading and reclassification. As such, we can only report changes to road length by class and changes to the proportionate distribution of the AHN by road class. Supplemental project updates would add important information on the additions attributed to construction versus upgrading.

Progress

UNESCAP data demonstrates progress between 2010 and 2015, both in terms of expanding the AHN, completing one missing link, and upgrading road quality.

Figure 21. AHN length by road class (km)



Source: World Bank figure, UNESCAP data

Extension and Missing Links: The AHN was extended during MPAC by over 2,559 km (10.6%) overall, though this does not necessarily correspond directly to the construction of missing links. Identified missing links totaled 201 km, of which 141 km were constructed. Thus, extension also reflects other additions to the network. Extensions were concentrated in Cambodia, Myanmar, and Thailand (Figure 22).[13] The AHN was virtually unchanged between 2010 and 2015 in Indonesia, Laos, Malaysia, and Singapore.

A series of 2014 World Bank consultations with key governmental contacts in ASEAN Member States suggests that in Brunei, Malaysia, and Singapore, the AHN is either complete or close to complete and within standard. In Indonesia, Philippines, Thailand, and Vietnam, road works are underway for significant portions of their respective segments of the AHN, beyond MPAC targets. In Laos and Myanmar, upgrading of TTRs as stipulated in MPAC has progressed but did not fully meet the 2012 implementation deadline. At the time of writing, one of the two missing links in Myanmar, the 141-km AH-123 link connecting the Dawei deep seaport to Thailand, had been constructed but not yet paved (i.e., Below Class III standard). The 60-km

[13] Some data disparities, e.g. decreases in total AHN length, suggest changes to national routes included in the AHN.

AH-112 link through southern-most Myanmar is currently under construction.[14] As such, at least 70% of the missing links road length identified in MPAC is complete (at Below Class III standards), and 30% is under construction.

Upgrading: Comparison of 2010, 2012, and 2015 data shows good progress in road upgrading (Table 3). The percentage of roads Class II and above rose from 57.7% in 2010 to 66.5% in 2015. In Cambodia, Myanmar, and Thailand, where much of the extension was concentrated, good progress was also made with respect to road quality (see upward reclassification in Figure 22). Philippines also demonstrated good progress upgrading Below Class III and Class III roads, and Vietnam brought much of its Below Class III road length to Class III standards. Generally, the length of Primary, Class I, and Class II roads grew by 31.3%, 36.8% and 22.1%, respectively, between 2010 and 2015, reflecting new additions along with good progress in upgrading Class III and below roads to higher standards.

Table 3. Comparing the AHN, 2010 and 2015

		Total	Primary	Class I	Class II	Class III	Below III
Total (km)	**2010**	24035	1397	4267	8213	8071	2087
	2015	26594	1834	5836	10028	6587	2309
Delta (2012-2015) (km)		2559	437	1569	1815	-1484	222
Growth (2010 to 2015)		10.6%	31.3%	36.8%	22.1%	-18.4%	10.6%
% of Total AHN Length	**2010**	100%	5.8%	17.8%	34.2%	33.6%	8.7%
	2015	100%	6.9%	21.9%	37.7%	24.8%	8.7%

Source: UNESCAP, 2015

Progress on upgrading the five prioritized TTR segments in Laos and Myanmar marked for construction by 2012 appears fair. 2012 ASEAN Project Information Sheets recorded the completed construction of Laos AH-15 and good progress on AH-11. Both roads are constructed but are only at the project structuring stage for upgrading. Further upgrading needs have been identified for both roads, which are stipulated as priority projects for the Laos government, but works have yet to begin.

In Myanmar, 2012 ASEAN project status reporting suggests progress, but with indeterminable results for AH-1 and AH-2, as the only overall highway lengths above Class III are reported. Nevertheless, the 93 km AH-3 stretch was completely upgraded by 2012, and 73% of AH-1 (1208 of 1656 km total) and 43% of AH-2 (350 of 807 km) were above Class III. It is not discernable how much of each road remains below standard.[15]

[14] Source: World Bank PPP Pipeline Project country consultations, 2014.

[15] 781 km of AH-3 and 593 km of AH-2 were identified in MPAC as in need of upgrading to Class III or above.

Figure 22. ASEAN Highway Network road length by class (km)

Source: UNESCAP 2015

In Summary

- Approximately 70% of the total length of missing links has been constructed in Myanmar, but at Below Class III standards (unpaved).
- The AHN was expanded by 2,559 km, or 10.6% between 2010 and 2015.
- Expansion in concentrated in Cambodia, Myanmar, and Thailand, whereas upgrading is evident in Myanmar, Cambodia, Philippines, Thailand, and Vietnam.
- Upgrading of Below Class III roads is a key area requiring added attention, especially for Laos and Myanmar.
- TTRs prioritized for completion by 2012 were progressing but not complete. Myanmar TTRs require further upgrading.

Strategy 2. Complete the implementation of SKRL project

The Singapore-Kunming Rail Link was proposed in 1995 at the fifth ASEAN Summit, reviving interest in developing the rail system to increase intra-regional connectivity of cargo and passenger transportation networks. As a priority project of the MPAC, the railway was identified as a crucial linkage in the "North-South Economic Corridor" by way of connecting ASEAN Member States from Singapore to southern China via Eastern and Western routes.

The planned network includes a prioritized Eastern line from Kunming through Vietnam, Cambodia, and Thailand (with a spur between Vietnam and Lao PDR), and the Western line through Myanmar and northern Thailand to Bangkok.[16]

Figure 23. SKRL Map

Source: ASEAN MPAC, 2010

Indicator and Data Source

It is difficult to assess progress with only two years of data available following MPAC implementation (2010-2012). Nevertheless, the pace of SKRL progress on constructing missing links has also been minimal. As such, quantitative assessment of the degree of completion is of limited use. For this reason, we supplement the early SKRL rail length data with status report updates for the SKRL specifically, as well as data on the overall length of the rail networks in ASEAN. Given the primary interest of MPAC in improving Intra-ASEAN Connectivity, however, overall network length should not be interpreted as a direct proxy of MPAC's rail impact on Connectivity. Rather, it is indicative of increased coverage of rail transportation networks in general. Status updates draw on reporting from 2014 World Bank ASEAN PPP Pipeline Project country consultations with key government officials. Total network length data is sourced from AJTP for observations in 2010 and 2012.

Progress

At the beginning of the MPAC 2011-2015 implementation period, there were 4,069 kilometers of missing links or links in need of rehabilitation in Cambodia, Laos, Malaysia, Myanmar, Thailand, and Vietnam. These spans included 1285 km of missing links targeted in MPAC for

[16] In view of the greater challenges in establishing the Western line, it was deemed preferable to first complete the Eastern to quickly develop an operational railway link between Singapore and China.

construction. Progress on construction and rehabilitation has been slow, limited only to three sections. Project status updates from 2013 and 2014 also show little progress, with implementation limited to constructing the 6 km missing link from Aranyaprathet to Klongluk in Thailand and upgrading 28 km of rail to usable standards at Poipet to Sisophon, linking Cambodia to Thailand. The missing spur linking Vietnam to Laos is currently under discussion with China for financing.[17]

Only the Singapore and Malaysia sections of SKRL are complete, with construction unrelated to MPAC, as national systems were built independently of the SKRL initiative. World Bank consultations suggest that the SKRL is of lower priority than other transport projects due to low projected traffic, competition for resources from other development projects, and relative attractiveness of alternative transport sectors (World Bank Infrastructure Hub 2014). The low level of development is also due to concerns over SKRL's overall impact on trade Connectivity and growth. These concerns are corroborated by limited impacts projected in the Geographic Simulation Model discussed in Section 3.1.

Table 4 shows that, of the set of expansion and upgrading activities to be completed by 2015, only 2% of the missing links are complete, with another 10% under construction.

Table 4. 2013 Status of SKRL Projects

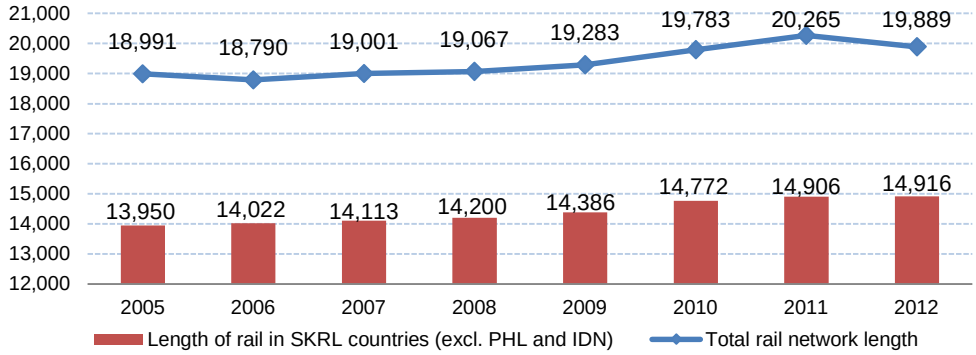
Country	Missing Sections	Rail Length		Implementation Status	Target Completion
		Existing	**Planned**		
Cambodia	Poipet (Thailand border) - Sisophon (upgrade)	-	48/28[18]	Under construction	2015
Cambodia	Phnom Penh - Loc Ninh (upgrade)	32	254	Not commenced; under negotiation for funding; not commenced due to lack of funding / low projected traffic	2015
Thailand	Aranyaprathet - Klongluk	-	6	Under construction, scheduled for completion in 2015	2014
Thailand	Three Pagoda Pass – Nam Tok	-	153	At planning stage, alternative route under discussion	2020
Laos	Spur: Vientiane - Thakhek - Mu Gia (Vietnam border)	-	466	Under discussion with financing from China	2020
Myanmar	Thanbyuzayat – Three Pagoda Pass	-	110	Feasibility study ongoing, alternative route under discussion	2020
Vietnam	Spur: Mu Gia (Laos border) - Tan Ap - Vung Ang	6	119	Feasibility study ongoing	2020
Vietnam	Loc Ninh (Cambodia border) - Ho Chi Minh City	20	129	Feasibility study complete: not commenced due to lack of funding / low projected traffic	2020

Source: ASEAN Connectivity Project Information Sheets (ASEAN Secretariat 2012); MPAC (2010); World Bank (2014)

[17] Status updates from the World Bank PPP Pipeline Project, January 2015.
[18] During planning, the length was reduced from 48 to 28 km (World Bank consultation, 2014).

Data on the overall rail network length (including SKRL) show an approximate 5% increase between 2005 and 2012, from 18,991 km in 2005 to 19,889 km in 2012. Decreases in the total rail length from 2005 to 2006 and 2011 and 2012 are due to reclassification and the removal of 420 km of Philippines rail sections from inclusion in the 2006-2010 and 2012 network data. Of this low rate of development, expansion was highest in Myanmar, where approximately 1,000 km were added to their national rail network since 2005. These extensions were constructed prior to the MPAC implementation period, however.

Figure 24. Length of ASEAN rail network, including SKRL (km)



Source: AJTP, 2015

In Summary

- Progress on the SKRL has been extremely limited due to projections of low traffic volume.
- Since 2002, the overall ASEAN rail network has grown by less than 5%. From 2010 to 2012, the entire ASEAN network was expanded by only 106 km, which accounts for growth of just over 0.5% in overall coverage.
- Of the expansion since 2010, less than 4% represents sections of the SKRL, limited to a 6km stretch in Thailand and upgrading of a 28km stretch in Cambodia.

Strategy 3. Establish an integrated inland waterways network

The ASEAN region has approximately 51,000 kilometers of navigable inland waterways with potential to develop passenger transport and regional trade, particularly for CLMV countries. At the time of MPAC adoption, however, inland waterways had been underutilized for cross-border freight transport. Thus, the MPAC included the direction to formulate and implement a regional framework for developing inland waterways transport services, to include plans for alleviating problems related to network underdevelopment, limited river ports and facilities, and low intermodal connectivity.

Indicator and Data Source

One primary trade goal associated with developing inland waterways is increasing river network usability for the transport of cargo. As such, progress is measured via a proxy indicator, namely the growth rate of cargo throughput by river, expressed volumetrically. This data is maintained by AJTP, available annually to 2012, for Cambodia, Indonesia, Laos, Myanmar, Thailand, and Vietnam.

Progress

Data on river cargo throughput since 2004 shows a moderate yet steady increase in cargo volumes transported via river ports up to 2011, with a slight decrease in the year following. Due to the short time frame of available data, it is difficult to determine whether any changes in throughput are associated with MPAC. That said, the limited implementation of MPAC actions associated with inland waterways suggests that gains may be attributable to the market rather than policy. Nevertheless, trade by inland waterway has increased.

Reviewing regional river trade, cargo volume throughout rose at an average rate of 6% annually between 2004 and 2012, reaching an approximate 258 million tons in 2012. Of this total, 251 million tons passed through river ports in Vietnam, Thailand, and Indonesia. Indeed, use of inland waterways highest amongst Vietnam, Thailand, and Indonesia, whose shares account for 59.9%, 20.3%, and 17.1% of total river port throughput, respectively, for the period of 2004 to 2012. While these countries combined recorded over 97% of the river throughput, Laos, Myanmar, and Cambodia – with large river networks but much smaller recorded river trade volumes – stand much to gain from further developing inland waterways.

Figure 25. ASEAN River Cargo Throughput (thousand tons)

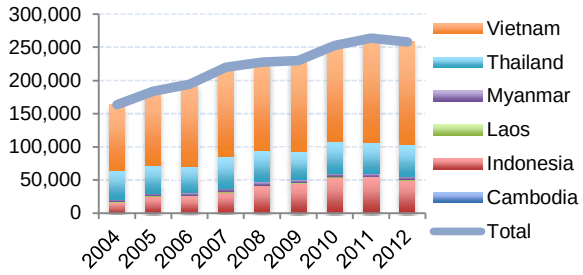


Figure 26. River cargo throughput, Indonesia and Vietnam (thousand tons)

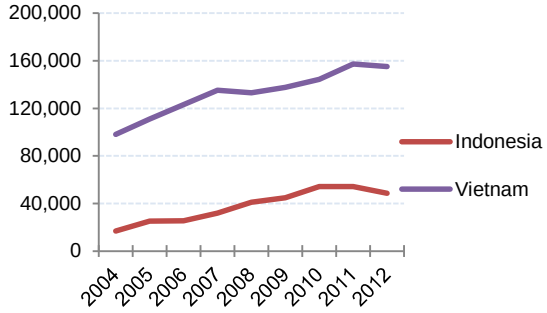
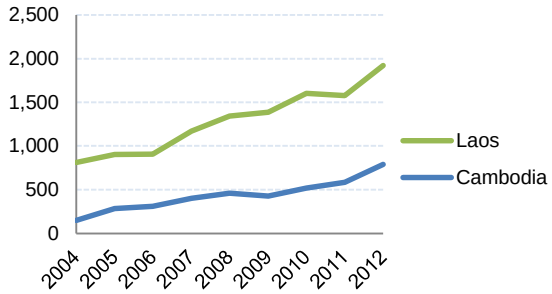


Figure 27. River cargo throughput, Laos and Cambodia (thousand tons)



Source: AJTP, 2015

While river cargo throughput has increased steadily since 2004, growth leveled and decreased slightly during the early years of MPAC. This pattern is attributable to decreases in throughput in Vietnam and Indonesia after 2010, which may be due to substitution of alternative transportation modes (i.e. road transport in Vietnam).

A closer look at two of the lowest volume countries, Cambodia and Laos, whose river economies are nevertheless important and underutilized, show a marked rise in (albeit low) recorded cargo throughputs following MPAC implementation.

In Summary

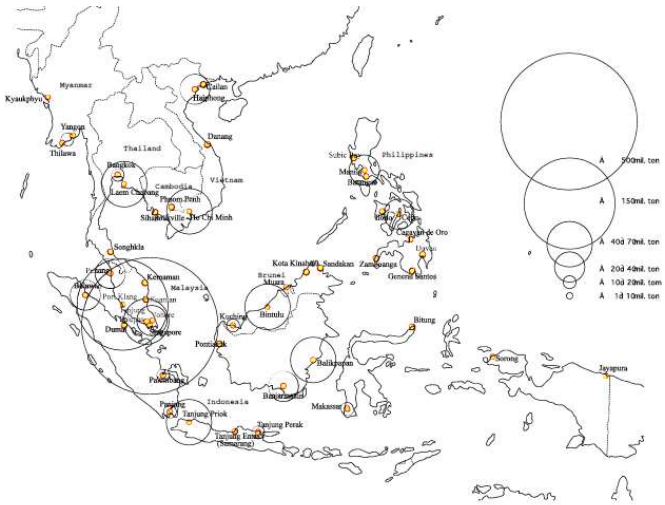
- Progress in the early implementation period (2011-2012) appears limited, though the short time frame and data limitations may be not be sufficient to demonstrate progress.
- Early data in Laos and Cambodia are promising, suggesting the possibility of increasing growth from 2011.
- River networks in Cambodia, Laos, and Myanmar are underdeveloped as trade transit modes.

Strategy 4. Accomplish an integrated maritime transport system

Maritime transport accounts for the greatest volume in international trade and is recognized as the most efficient and cost-effective mode of transporting large cargo volumes. As such, the development of a robust, integrated maritime transport system is critical to both ASEAN regional and global trade connectivity and competitiveness. Central to the development of a competitive maritime industry is the reinforcement and upgrading of existing infrastructure and the establishment of reliable, efficient shipping routes and a system of competitive ports. Steps towards these goals include increasing port capacity and services, particularly for 47 designated ports within the trans-ASEAN network, and establishing reliable roll-on/roll-off (RoRo) shipping routes to capture cost and time efficiencies.

ASEAN has taken important steps towards integrating the sector, including 2007 adoption of the Roadmap towards an Integrated and Competitive Maritime Transport in ASEAN (RICMTA). Nevertheless, unlike air transport, progress in the maritime sector is lagging, in part due to slow implementation of policy and exclusion of maritime cabotage from trade reform deliberations. This, naturally, has the most significance for the connectivity of archipelagic regions of ASEAN.

Figure 28. MPAC 47 designated ports and 2008 cargo throughput



Source: MPAC, 2009

ASEAN continues to work on implementation of RICTMA and the creation of an ASEAN Single Shipping Market (ASSM), with restated implementation goals of 2015. Further, the establishment of an ASEAN roll-on/roll-off (RoRo) network is still in the early stages of planning, with feasibility studies conducted only in 2012-2013. Outside of the Philippines, which has prioritized RoRo to connect less-developed regions with economic centers within and outside of the country, the network has been given limited attention on the ASEAN maritime development agenda.

There are currently three active projects in the ASEAN RoRo development framework. The Brunei-Malaysia corridor has been active since 2010; an Indonesia-Philippines link between Sulawesi and Mindanao was established in late 2014; and there are current plans for a route between Phuket, Thailand, and Penang and Langkawi, Malaysia. Further, a feasibility study has been undertaken by JICA, with three priority routes identified. Efforts to operationalize the network are currently ongoing.

With respect to port infrastructure, the World Bank ASEAN PPP Pipeline Project found that, as of December 2014, only 16 of the 47 identified ports have been completed or are under construction / rehabilitation, and another 24 are scheduled for construction or rehabilitation. Thus, 40 ports are constructed or have specific development plans, while the remaining seven have not progressed. Three of these (Kyaukphyu in Myanmar, Kemaman in Malaysia, and Ho Chi Minh in Vietnam) have been removed from national development plans due to limited resources and/or strategic shifts in infrastructure development.

Therefore, since neither the ASSM nor RoRo network have reached the implementation stage, and since port development is only approximately 30% implemented, progress on maritime connectivity over the MPAC implementation period is reflective of general progress in the sector and increased ASEAN attention to maritime development, rather than direct impact of the full suite of MPAC maritime actions.

Indicator and Data Source

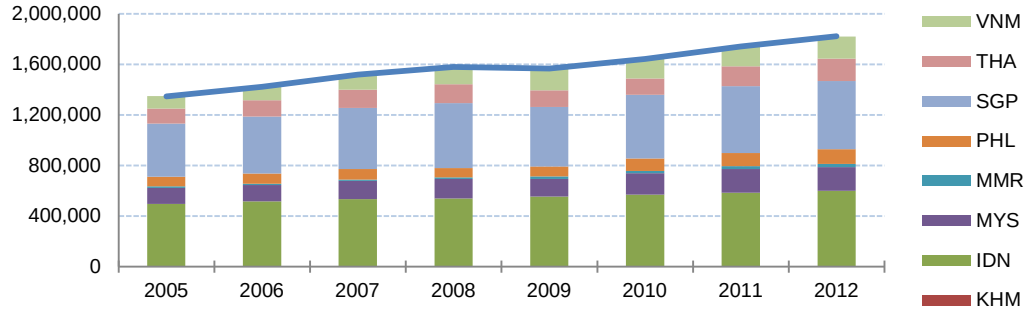
In addition to an overview of port and maritime network development key activities, progress in maritime connectivity is reflected partially in the growth of volume of maritime trade and port cargo throughputs, as well as changes in industry perceptions of port quality. Patterns of integration and competitiveness are described along two aspects: maritime trade activity and port quality. The first attends to international sea trade, drawing on import, export, and sea cargo throughput data for ASEAN Members States. Data is available from the ASEAN-Japan Transport Partnership (AJTP), with latest data recorded for 2012. The second aspect attends to business executives' perceptions of the quality of port facilities in each member state. The indicator ‘Quality of Port Infrastructure’ draws on perceptions data from the World Economic Forum’s Global Competitiveness Index (GCI) dataset, recorded up to 2015.

Progress

International sea cargo throughput has increased steadily over the past ten years at an average rate of 4.5-5.3%, growing in volume from 1.34 billion tons in 2005 to over 1.82 billion

tons in 2012.[19] While rate of throughput growth for ASEAN did not increase significantly during the early years of the MPAC implementation, the limited time frame of post-MPAC data (latest data is only available to 2012) and delayed implementation of key maritime activities also limit the ability to detect a trend shift for ASEAN overall.

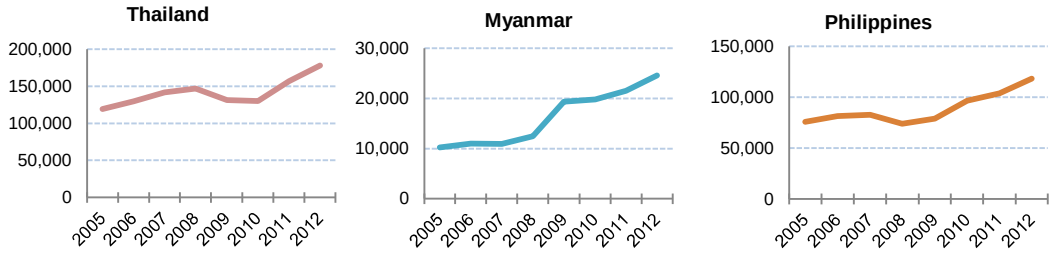
Figure 29. International sea container throughput (thousand tons)



Source: AJTP, 2015

Examination at the country level, however, suggests that some Member States have, indeed, experienced higher growth rates for sea cargo throughput during the early implementation period: Thailand, Myanmar, and the Philippines all experienced increased rates of cargo throughput growth in 2011 and 2012.

Figure 30. Sea container throughput, Thailand, Myanmar, Philippines (thousand tons)

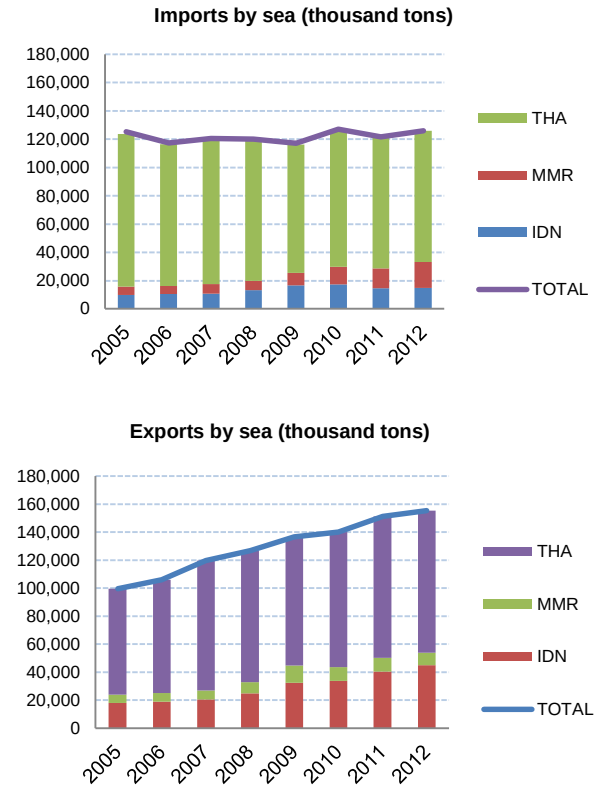


Source: AJTP, 2015

While imports by sea have been generally steady, exports by sea have grown steadily since 2005, albeit with no discernable trend shift following adoption of MPAC. Continuous monitoring of exports and access to data on bilateral trade flows of sea cargo would be the next step in monitoring the connectivity impacts of MPAC on sea trade, particularly following the implementation of key actions that have yet to be realized.

[19] 5.3% considering an average in growth over the seven year period, not accounting for the one year of negative growth (-0.8%) in 2009, following the Global Financial Crisis.

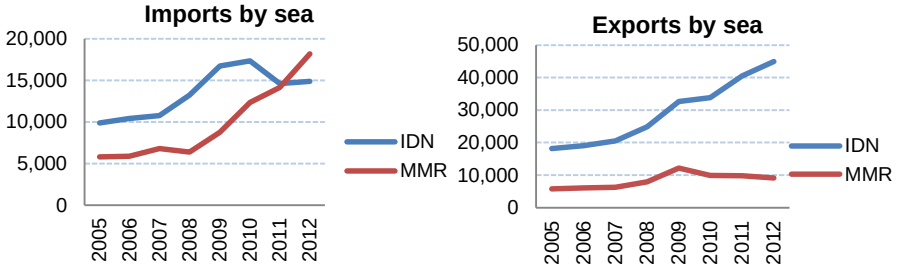
Figure 31. Imports and exports by sea (thousand tons)



Source: AJTP, 2015

While imports generally hold steady for ASEAN over the time period, they also fluctuate at the country level with offsetting effects. While sea imports to Thailand fell, whereas imports to Indonesia rose both before and after MPAC, Myanmar experienced a sharp increase in imports by sea starting in 2008, carrying through the implementation period. As for exports by sea, Indonesia data suggests an upward shift in growth from 2010 to 2012, though additional tracking for the periods following is necessary to detect a trend change, if any.

Figure 32. Imports and exports by sea, Indonesia and Myanmar (thousand tons)



Source: AJTP, 2015

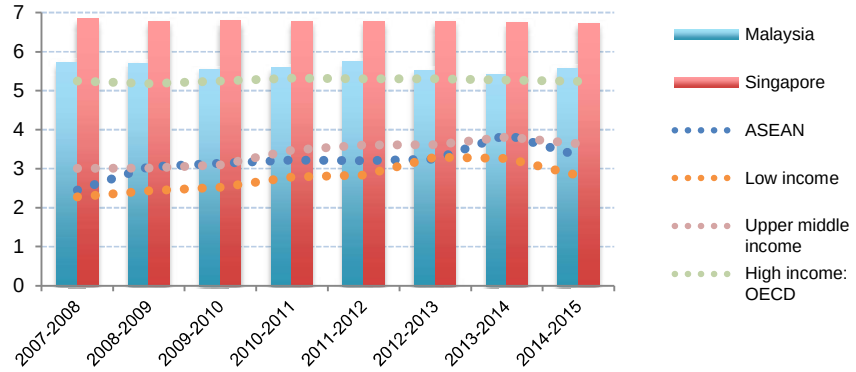
Port Quality

Amongst many indicators of trade and economic competitiveness, the World Economic Forum's Global Competitiveness Index (GCI) captures annual survey data on respondents' perceptions of the quality of port infrastructure across 133 economies. While these indicators are reflective of perceptions rather than directly measured performance, they are helpful to capture expert assessment of maritime infrastructure development over time.[20] In semi-annual surveys, maritime industry respondents rank port infrastructure on a scale from 1 (port infrastructure extremely underdeveloped) to 7 (efficient by international standards).

GCI Quality of Port Infrastructure data suggests that, while port services and capacity have generally improved over the past ten years, they have progressed slowly.[21] Nevertheless, the ASEAN average score for port quality has increased from 2007 to 2012, with a noticeable increase during the 2012-2013 period. This brief surge was followed, however, by a decrease. This may be simply a reflection of perception shifts, or may indicate that early attention to the quality of port services during early MPAC slipped in the middle implementation period. This pattern warrants further monitoring to determine whether a trend shift is to follow.

Country by country, Malaysia's and Singapore's port quality scores have remained at stable highs, with both exceeding average scores for high-income OECD countries each year.

Figure 33. GCI, Quality of port infrastructure, Malaysia and Singapore[22]



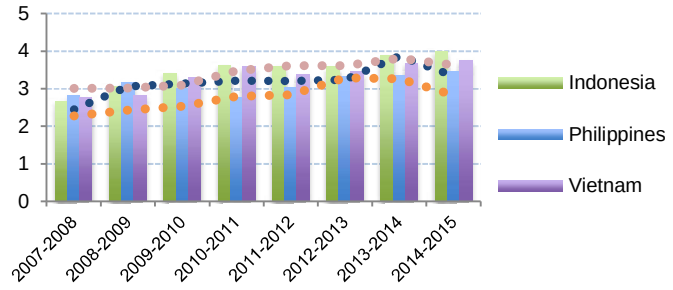
Source: GCI 2015

The Philippines and Indonesia, whose maritime trade is critical to both international and domestic trade and whose governments have both prioritized port development in recent

[20] Due to the nature of perceptions and survey responses and national-level influences, scores cannot be definitively compared across countries. Rather, the emphasis is on shifts within countries over time.
[21] Myanmar has not been included in quality assessment due to the lack of data (the only data available is for the last two operating periods) and land-locked Laos is also not assessed due to non-applicability.
[22] Member States graphed separately for readability purposes only.

years, have both steadily improved port quality, with a noticeable increase during the MPAC period. This is key for these countries, which are ASEAN's primary archipelagic regions. So, too, have Vietnam's ports improved over the past ten years, but with the sharpest increase in score improvement occurring just prior to MPAC implementation.

Figure 34. GCI, Quality of port infrastructure, Indonesia, Philippines, Vietnam

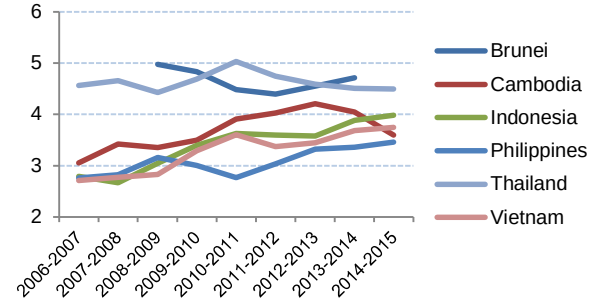


Source: GCI, 2015

There remain some potential areas of concern for ASEAN, however, with respect to shifts in perceptions of port quality. Brunei, Cambodia, and Thailand have experienced decreasing and fluctuating port quality scores over the past ten years. Brunei's port infrastructure quality has fluctuated, falling from 2008 to 2011, and increasing again by 2014 to just under its 2008 score. In Thailand, on the other hand, port quality assessment peaked in 2010 but has decreased moderately since. Similarly, a decrease in Cambodia's port quality since 2012-2013 requires further monitoring.

Country consultations during the World Bank ASEAN PPP Pipeline Project suggest that the growth of maritime trade may be limited by structural economic imbalances that increase transaction costs, over and above route and port quality. Low port traffic in some cases is attributable to directional port traffic imbalances and / or high dispersion of limited volumes.

Figure 35. GCI, Quality of port infrastructure, select ASEAN countries



Source: GCI, 2015

To the first point, consultations in Indonesia and Philippines suggest that maritime transport average costs are prohibitively high in some locations due to ships entering ports with high volumes and leaving empty (because of limited demand for those regions' exports). In southern Vietnam, on the other hand, a large port network is currently competing for low levels of traffic, which are insufficient to make efficient use of the system.

Another issue requiring attention is potential overdevelopment of new ports, as opposed to development and improvement of support infrastructure, rehabilitation of existing ports, and improved connectivity to other modes of transport. Consultations in Indonesia and the Philippines suggest that further investments in large equipment (e.g., cranes) and ICT are required to capture the benefits of prior investments in core infrastructure (e.g., berths, breakwaters, etc.) and reduce costs associated with low berth turnover and long port occupancies. Lastly, lack of sufficient investments in roads and rail connecting ports and follow-on freight services has led to two contrasting problems: excessive port congestion (e.g., Tanjung Priok, Manila) or low utilization (e.g., southern Vietnam) (World Bank Infrastructure Hub 2014). Further analysis of port capacity, productivity (e.g., average berthing / port stay times), and utilization (e.g., berthing occupancy rates) is required to assess port efficiency and identify areas of excess or insufficient capacity. Additionally, fieldwork and expert consultation on perceptions of port quality would be helpful to identify key issues related to patterns of port quality performance.

In Summary

- Seaport container throughput has increased, particularly in Thailand, Myanmar, and the Philippines since MPAC implementation.
- Indonesia's exports by sea have also increased significantly in the early years of MPAC.
- Progress in perceptions of port quality has been uneven: while most Member States' scores rose, Thailand's post-MPAC downward trend requires further monitoring, particularly given the country's importance to maritime trade.
- More data on port capacity, utilization, and productivity is required to assess the development of the maritime sector.

Strategy 5. Establish an integrated multimodal transport system

On order to facilitate regional logistics connectivity and leverage developments in the road, rail, air, river, and sea transport sectors, MPAC recognizes the need to integrate modes via linkages. A multi-modal transport system requires seamless integration across land, sea, and air, to connect the movement of goods across ASEAN. Key actions within this strategy correspond directly to physical Connectivity strategies 1, 2, and 4, as they relate to developing sections of the AHN and SKRL as well as upgrading and developing sea ports, particularly where modes of transport intersect. In addition to these, key components of the envisaged multimodal transport system include the development of terminal ports of the East West Economic Corridor at Yangon and Da Nang; the construction of the Dawei sea port and Mekong Bridge at Neak Loung as important components of the Mekong-India Economic Corridor; and development of ASEAN dry ports in coordination with the AHN and SKRL.

The statuses of the key actions of physical Connectivity Strategy 5 are as follows:

Activity	Status
Complete the East West Economic Corridor (EWEC)	
Construct the missing link in Myanmar	One of two missing links constructed, below Class III status
Develop / upgrade terminal ports at Yangon, Da Nang	Dawei feasibility study complete, no current plans for construction; Da Nang major upgrading underway for Tien Sa deep seaport, estimated completion in 2018
Promote the Mekong-India Economic Corridor (MIEC) as a land bridge	
Construct Mekong Bridge in Neak Loung (national road No.1 in Cambodia)	Under construction, scheduled for completion in early 2015
Develop Dawei deep sea port (by 2020)	No current development plans
Build Kanchanaburi-Dawei highway (by 2020)	150-km AH-123 road from Dawei to Maesamee pass constructed but unpaved; no further progress due to prioritization of Thilawa SEZ over Dawei SEZ project
Conduct feasibility study and preliminary design for Kanchanaburi-Dawei railway spur	Link from Kanchanaburi to Bangkok under active planning

Indicator and Data Source

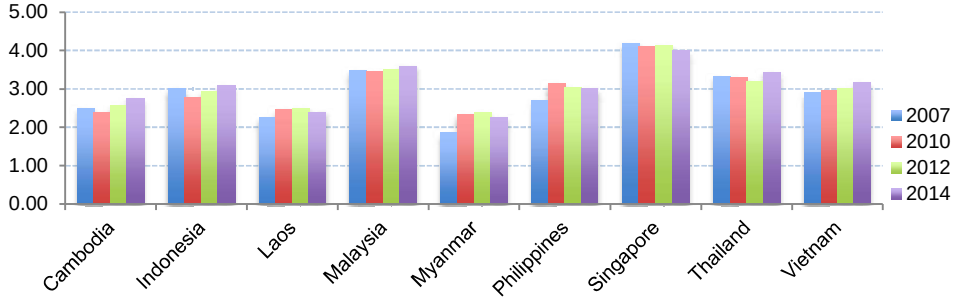
Quantitative assessment of development of multimodal transport capability relies on data for cargo flows passing through modal nodes (e.g. rail-to-sea, air-to-road, dry ports, etc.), which are currently unavailable. Considering, however, that the aims of developing an integrated multimodal system are akin to cultivating an efficient and extensive logistics sector, the World Bank's Logistics Performance Index (LPI) is employed as an overall demonstration of logistics sector progress. The LPI is constructed using data collected via expert respondent surveys

and interview responses along six key dimensions: efficiency of the clearance process; quality of trade and transport related infrastructure; the ease of arranging competitively priced shipments; the competence and quality of logistics services; the ability to track and trace consignments; and timeliness of shipments in reaching destination within the scheduled or expected delivery time. Data is available for 2007, 2010, 2012, and 2014.

Progress

Since 2007, ASEAN has revealed LPI progress, with increasing scores in overall performance for nearly every Member State. In the most recent data collection, however, Myanmar, Laos, Philippines, and Singapore, experienced slight declines from 2012. Cambodia, Indonesia, Malaysia, and Vietnam, on the other hand, have improved LPI standing steadily since 2010. Despite falling scores for Thailand between 2007 and 2012, the latest measurement period of 2014 shows a reversal and marked improvement.

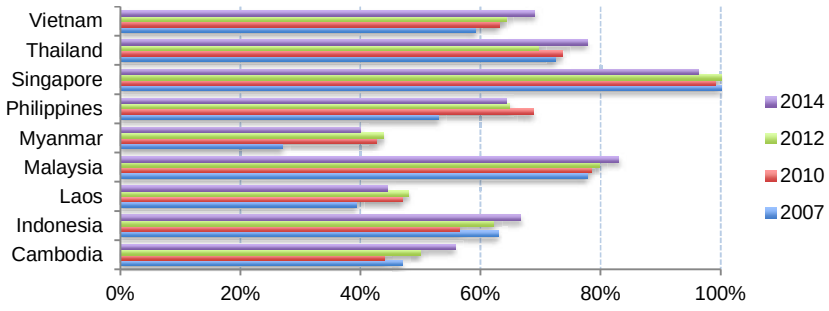
Figure 36. Overall LPI score, ASEAN



Source: Logistics Performance Index, 2015

Considering countries' LPI scores as a percentage of the highest performer's score (for the world) for each year, ASEAN Member States' improvement is relatively high for 2012 to 2014, with the exception of Laos, Myanmar, and Philippines. While Singapore's score fell slightly, it remains one of the world's top performers in logistics quality.

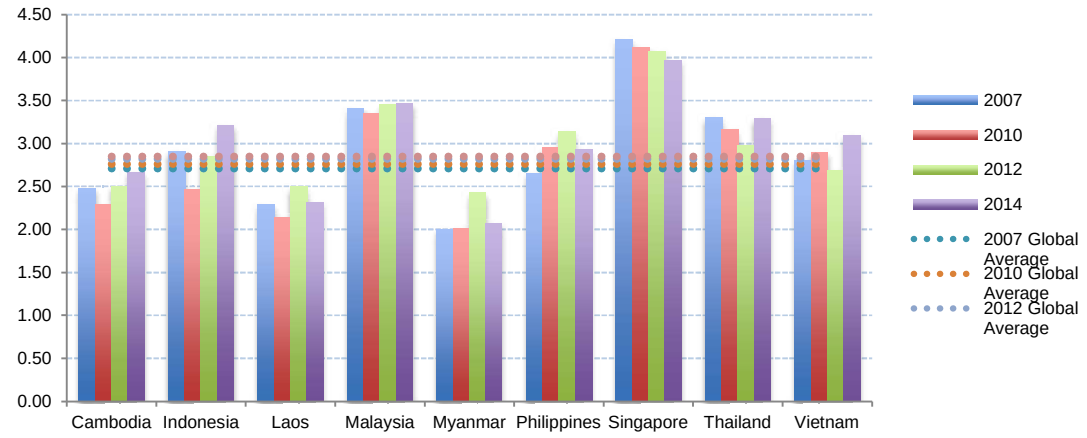
Figure 37. Overall LPI, % of highest performer's score



Source: Logistics Performance Index, 2015

‘Quality and competence of the logistics sector’ scores (Figure 38) show that Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam performed above the 2014 global average. Score shifts over time are potentially measurement-related (given the nature of perception-based surveys), making comparison across time periods imprecise. Nevertheless, some countries experienced slightly decreasing scores, warranting further country-level industry studies to identify the robustness of results and factors affecting assessments of performance.

Figure 38. LPI logistics quality and competence

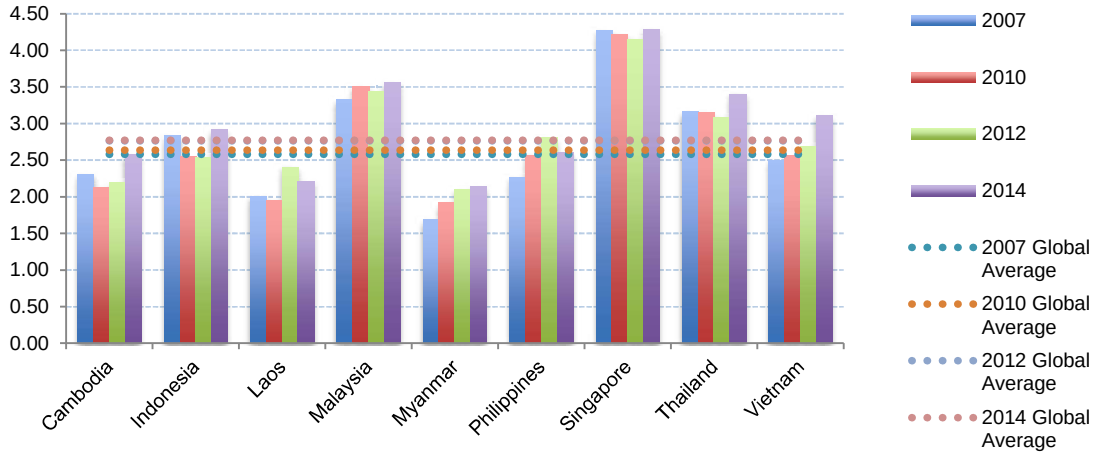


Source: Logistics Performance Index, 2015

Infrastructure quality (Figure 39) increased generally, including for Myanmar and Singapore, who experienced slightly decreasing scores in competence and quality. Again, while results must be interpreted cautiously, this highlights the differentiated issues facing Member States and potential offsetting of gains by losses in efficiency, traceability, or timeliness.

With respect to logistics infrastructure, it is also germane to MPAC that four Member States – Cambodia, Indonesia, Thailand, and Vietnam – demonstrated a significant score increase between 2012 and 2014, reflecting noticeable improvements in transport infrastructure during the latter half of the MPAC implementation period. These improvements brought scores for Indonesia and Vietnam over the global average in 2014 for the first time since 2010. From these sharp score increases, it is reasonable to infer that MPAC attention to developing logistics infrastructure has improved assessments of infrastructure quality in these Member States. Considering the declining patterns evident in assessment of port quality in Thailand and Cambodia (see physical Strategy 4), the increasing LPI in these same countries would suggest that logistics improvements may be related to air and land transport and infrastructure services.

Figure 39. LPI quality of infrastructure



Source: Logistics Performance Index, 2015

In Summary

- LPI scores demonstrate that the logistics sector is improving in ASEAN.
- With respect to LPI performance relative to top performers, Vietnam, Thailand, Malaysia, Cambodia, and Indonesia all made significant improvements between 2012 and 2014.
- Indonesia, Thailand, and Vietnam experienced sharp increases in both logistics quality and competence and infrastructure quality scores between 2012 and 2014.
- Cambodia experienced a significant increase in infrastructure quality during the MPAC period.
- Data on cargo flows passing through transport nodes (e.g., air to road, sea to rail) is needed to assess growth in multi-modal transport.

Strategy 6. Accelerate the development of ICT Infrastructure and services

The development of a robust and extensive information and telecommunications sector is critical to regional economic growth and competitiveness as well as human development and the creation of a culturally and socially connected ASEAN Community. While Internet usage and mobile telecommunications coverage have risen steadily over the past fifteen years, the MPAC attends to reducing the "digital divide" within Member States in order to improve trade infrastructure and promote equitable development. The set of priority MPAC ICT projects includes the ASEAN Broadband Corridor (ABC), the Melaka-Pekan Baru Interconnection, and the West Kalimantan-Sarawak Interconnection.

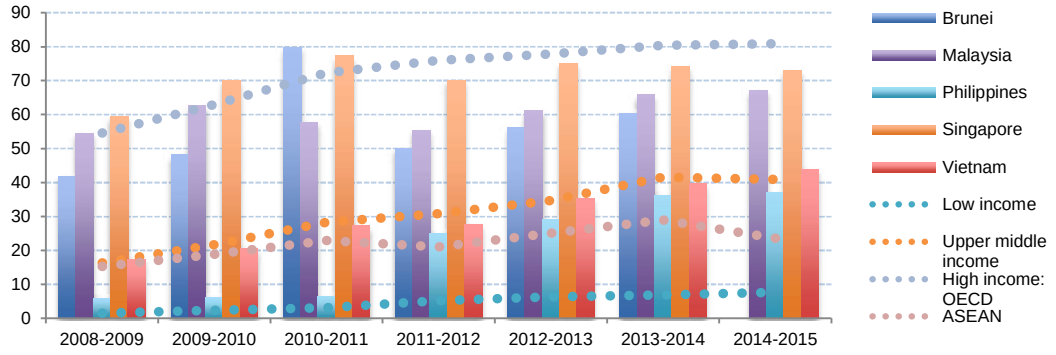
Indicator and Data Source

While ICT infrastructure includes fixed, mobile, and satellite communication networks in addition to the Internet, Internet usage and mobile telecommunications connectivity are useful, broad-covering proxies of citizen ICT connectedness. Thus, the growth of Internet users per 100 inhabitants[23] and mobile telephone subscription rates are employed herein. Internet data is drawn from the International Telecommunications Union's (ITU) database, which provides annual data up to 2013, and mobile telephony data is sourced from the Global Competitiveness Indicators, up to the 2014-2015 reporting period.

Progress

Internet connectivity continues to rise steadily in ASEAN, with growth rates naturally declining in highly connected regions as the space for expansion contracts.

Figure 40. Internet users per 100 inhabitants, Brunei, Malaysia, Philippines, Singapore, Vietnam

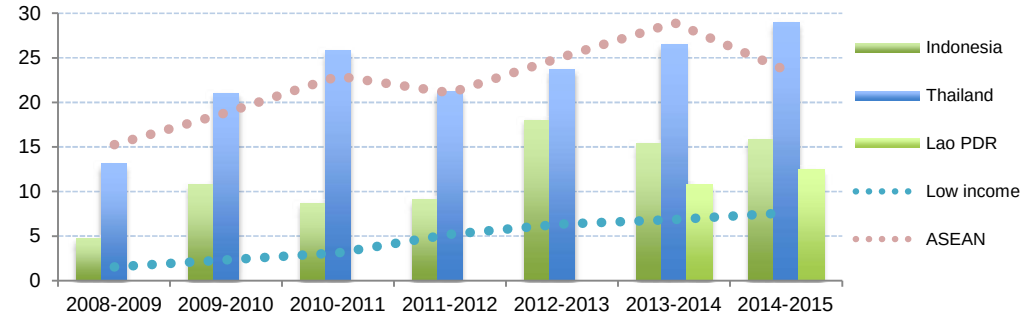


Source: International Telecommunications Union, 2015

[23] While data is available for broadband subscribers per 100 habitants, data may show a downward trend where Internet usage is up as users may increase on shared networks.

Figure 40 shows that Internet connectivity in Philippines increased significantly following MPAC implementation, from around 6.5% in 2010-2011 to 37% in 2014-2015. Similarly, Internet connectivity rates in Indonesia, Thailand, and Lao have increased steadily over the MPAC period, though an increase in growth is not easily discernable.

Figure 41. Internet users per 100 inhabitants (Indonesia, Laos, Thailand)

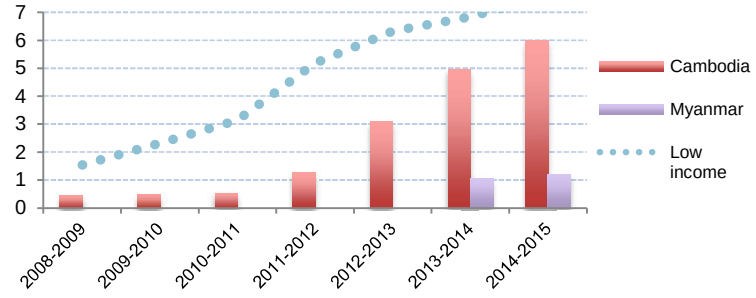


Source: International Telecommunications Union, 2015

While Cambodia's Internet usage rate remains very low compared to other ASEAN Member States, as well as low-income countries, coverage and the rate of growth in coverage have increased significantly since 2011, with rates increasing from less than 1% in 2010-2011 to nearly 6% in 2014-2015. Myanmar's coverage remains at just over 1% of the population.

Mobile telephone subscription rates are high and increasing for all ASEAN Member States, with rates amongst ASEAN-5 exceeding or nearly reaching those of the global average for upper middle-income countries by 2014-2015. ASEAN's average mobile subscription rates experienced a sharp increase during between the 2012-2013 and 2013-2014 recording periods, during the midpoint of MPAC implementation.

Figure 42. Internet users per 100 inhabitants (Cambodia and Myanmar)

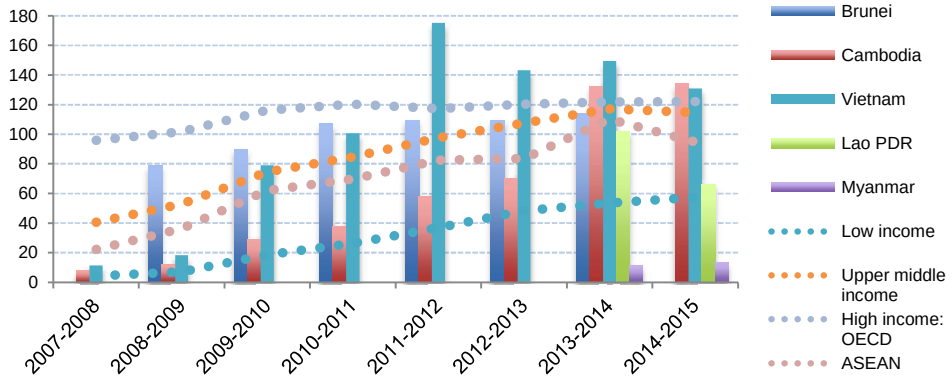


Source: International Telecommunications Union, 2015

BCLMV countries demonstrate much higher mobile telephone subscription rates than Internet user rates, with subscription over 100% for Brunei, Cambodia, and Vietnam. As with Internet

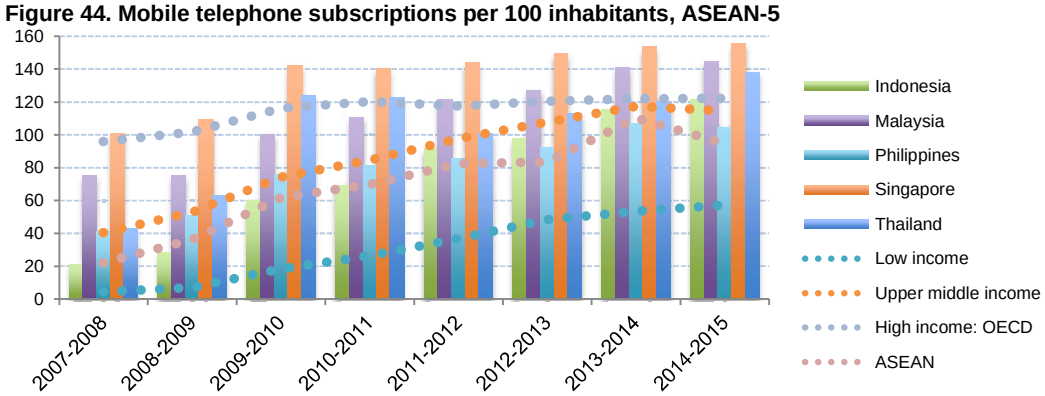
connectivity, Cambodia experienced sharp increases between the 2012-2013 and 2013-2014 operating periods. Myanmar's mobile connectivity remains very low.

Figure 43. Mobile telephone subscriptions per 100 inhabitants, BCLMV



Source: Global Competitiveness Indicators, 2015

Figure 44. Mobile telephone subscriptions per 100 inhabitants, ASEAN-5



Source: Global Competitiveness Indicators, 2015

In Summary

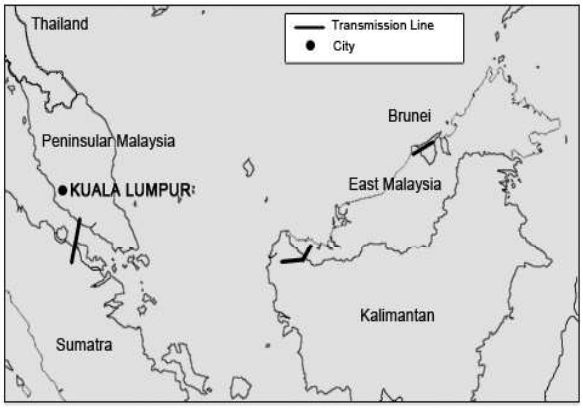
- While ICT Connectivity has increased for all countries, Philippines and Cambodia have demonstrated the most apparent increases in Internet user growth rates during MPAC.
- There is insufficient data to detect any change in Internet coverage in Laos and Myanmar due to the limitation of the time series to only two periods.
- Cambodia experienced a clear and significant increase in mobile telephone subscriptions since MPAC implementation.
- ASEAN mapping of mobile network coverage would supplement knowledge about the status of access to mobile telecommunications.

Strategy 7. Prioritize processes to resolve institutional issues in energy infrastructure

The transmission and trade of energy, a critical input to economic activity in the region, is captured in two major initiatives that comprise the MPAC's energy infrastructure connectivity strategy, namely the Trans-ASEAN Gas Pipeline (TAGP) and the ASEAN Power Grid (APG). These two key actions are united under the general goal of supplying sufficient power amongst and within ASEAN Member States to support economic and demographic growth. The integration of electricity and gas networks is aimed at capturing emergent benefits in terms of energy security, flexibility, and consistency and quality of supply.

Within Strategy 7, two priority projects of the APG have been marked for rapid implementation. These are the Melaka - Pekan Baru Interconnection (IMT-GT) and the West Kalimantan - Sarawak Interconnection (BIMP-EAGA).

Figure 45. APG Priority Project Map



Indicator and Data Source

In addition to APG and TAGP project updates, the progress of energy sector integration may be proxied by the growth rates of electricity and gas trade across borders. As such, we employ the export and import of electricity and gas between ASEAN trading partners as indications of the region's capacity to freely trade energy amongst Member States.

Data on the growth of energy exports and imports within ASEAN is sourced from World Bank World Integrated Trade Solution (WITS) and UN COMTRADE database up to 2013.[24] Significant bilateral import-export data asymmetries are observed in the data, likely due to differences in the recording approaches for electricity and gas applied by Member States (some of which may be resolved over time with further harmonization of national practices) as well as recording differences due to lack of customs or statistical declarations. As such, export and import data are both provided.

[24] The preferred data source, ASEANStats data, is not used since data is available only to 2011.

Progress

Project updates on key energy activities have been gathered from World Bank country consultations, as well as a May 2015 update from the Heads of ASEAN Power Utilities / Authorities (HAPUA). HAPUA reported revised dates for the earliest expected commercial operation dates (COD) for each interconnection on the ASEAN Power Grid (APG).

Table 5. APG Progress Update, ASEAN HAPUA May 2015

Interconnection Project		Earliest COD
1. Peninsular Malaysia – Singapore		Post 2020
2. Thailand – Peninsular Malaysia	Sadao – Bukit Keteri	Existing
	Khlong Ngae - Gurun	Existing
	Su Ngai Kolok - Rantau Panjang	TBC
	Khlong Ngae – Gurun (2nd Phase, 300MW)	TBC
3. Sarawak - P. Malaysia		2025
4. P.Malaysia - Sumatra		2020
5. Batam - Singapore		2020
6. Sarawak - West Kalimantan		2015
7. Philippines - Sabah		2020
9. Sarawak - Sabah – Brunei	Sarawak –Sabah	2020
	Sabah – Brunei	Not selected
	Sarawak – Brunei	2018
9. Thailand - Laos	Roi Et 2 – Nam Theun 2	Existing
	Sakon Nakhon 2 – Thakhek – Then Hinboun	Existing
	Mae Moh 3 - Nan - Hong Sa	2015
	Udon Thani 3- Nabong (converted to 500KV)	2019
	Ubon Ratchathani 3 – Pakse – Xe Pian Xe Namnoy	2019
	Khon Kaen 4 – Loei 2 – Xayaburi	2019
	Nakhon Phanom – Thakhek	2015
	Thailand – Lao PDR (New)	2019-2023
10. Laos – Vietnam		2016-TBC
11. Thailand - Myanmar - Cambodia (new)		2018-2026
12. Vietnam (new)		TBC
13. Laos - Cambodia		2017
14. Thailand – Cambodia (new)		Post 2020
15. East Sabah – East Kalimantan		Post 2020
16. Singapore – Sumatra		Post 2020

Source: Project update, HAPUA, May 2015

In addition to a fair outlook on expected CODs, World Bank consultations also found that progress has been good with respect to constructing APG interconnections. Upon completion of the set of projects currently under construction, the APG will link all Member States within the Greater Mekong Sub-region (GMS), excepting connections between Laos-Vietnam and Laos-Cambodia. The latter connection will be established, however, if current plans for construction are implemented. Electricity transmission connections amongst Malaysia – Indonesia – Brunei will also be strengthened by the completion of the two energy priority

projects, the Melaka – Pekan Baru Interconnection and Sarawak – Kalimantan Interconnection, as well as the Sarawak – Sabah – Brunei link.

Data on Intra-ASEAN trade flows for electricity similarly reflect notable progress. Both electricity imports and exports for the 2007 to 2013 period have increased (excepting a slight export decline from 2011 to 2012), with noticeable increases from 2012 to 2013. These trade increases are likely to continue as more of the APG projects reach completion, but further tracking of import and export data is necessary to detect whether a sustained shift in the growth rates of electricity imports and exports is experienced following implementation.

Figure 46. Intra-ASEAN electricity imports and exports (US$ thousands)

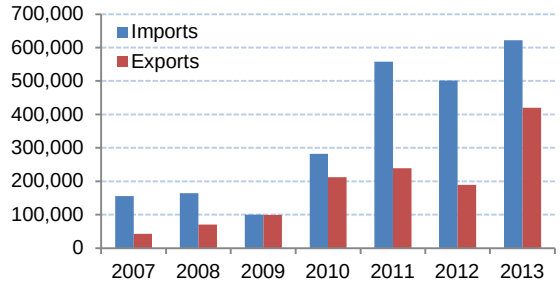


Figure 47. Thailand electricity imports / exports, Laos (US$ thousands)

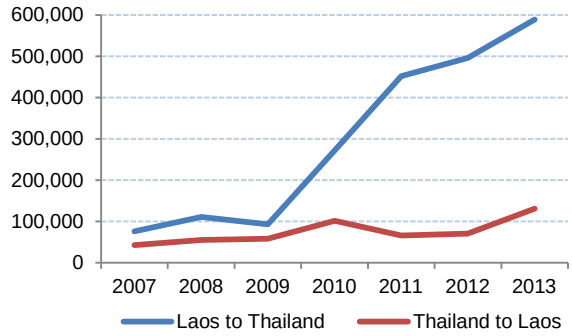
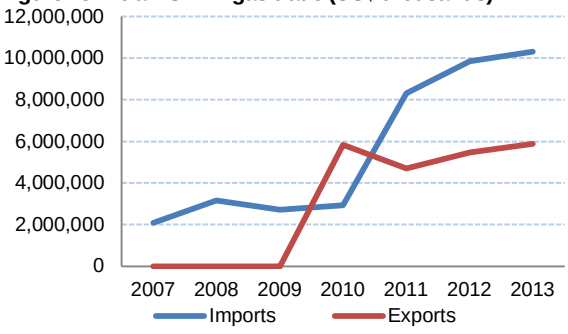


Figure 48. Intra-ASEAN gas trade (US$ thousands)



Source: World Bank WITS Database, 2015

High and growing electricity trade between Thailand and Laos is likely to increase with APG project nine, connecting the two Member States. According to Thailand's trade records, flows from Laos to Thailand have increased dramatically since 2009, with sharp growth increases from 2009-2011 and 2012-2013.

In contrast to electricity, progress on the Trans-ASEAN Gas Pipeline (TAGP) project has been limited. During ASEAN PPP Pipeline Project consultations, the only country that reported plans to build a TAGP segment was Indonesia for a domestic connection between Kalimantan and Java.

The lack of impetus was attributed to earmarking of existing reserves for domestic consumption and the availability of Liquefied Natural Gas (LNG) facilities as a viable alternative within an increasingly diversified set of energy sources. Increasing interest in pursuing a network of LNG facilities

across ASEAN and falling crude oil prices may further weaken the likelihood of implementation in the near-term.

Despite limited progress on the TAGP, gas trade as increased since MPAC implementation, with a sharp increase in import values after 2010. This was largely due to the Singapore's entrance as a key gas importer in 2011.

Table 6. Intra-ASEAN gas imports (US$ thousands)

	2007	2008	2009	2010	2011	2012	2013
BRN	0	0	0	0	0	19.72	6.03
IDN	0	0	0	8.89	4.12	7.62	0.47
CAM	14940.2	12543.52	14020.84	15588.03	13751.09	35070.13	31672.60
MMR	0	0	0	15.39	0	0	0
MYS	0	0	162640.09	331220.03	299088.16	304128.23	837457.89
SGP	0	0	0	0	4855678.50	6091865.66	5761384.74
THA	2070602.3	3125220.73	2540916.27	2595430.33	3129771.22	3422905.04	3674766.17
VNM	0	19963.00	1.02	0	0	0	0
Total	2085542.6	3157727.24	2717578.21	2942262.67	8298293.08	9853996.40	10305287.9

Source: WITS / COMTRADE 2015

In Summary

- Growth is apparent in electricity trade, with increases in the growth of international electricity imports and exports following MPAC implementation. These are expected to rise as more APG projects are implemented.
- While the APG has been progressing apace, much of the growth in electricity trade was nevertheless between Thailand and Laos, delinked from the APG.
- Limited progress has been made with respect to developing the TAGP. Nevertheless, Intra-ASEAN imports in the natural gas sector grew significantly between 2010 and 2013. Further monitoring of gas trade data is required to determine whether growth will level in the periods following.

2.2 Institutional Connectivity Performance

The MPAC institutional Connectivity strategies propose agreements, processes, and legal and institutional mechanisms to facilitate trade in goods and services, reduce non-tariff barriers, facilitate the movement of people within ASEAN, and promote increased productivity and investments amongst Member States. Whereas physical indicators describe the "hardware" of ASEAN Connectivity, the "software", including harmonization of processes and standards, implementation of rules and systems to facilitate trade and transit, and elimination of barriers to Connectivity, are equally as important to building an ASEAN Community.

While two of the institutional Connectivity strategies are somewhat delinked from infrastructure development (i.e., facilitating intra-ASEAN investment and improving coordination capacity), most complement and/or underpin one or more physical Connectivity strategies. These inter-linkages are critical to broader goals of economic growth and equitable development, and are the subject of Chapter III on physical and institutional impacts on mobility, trade, and GDP.

Strategy 1. Operationalize the 3 Framework Agreements on Transport Facilitation (AFAFGIT; AFAFIST; AFAMT)

Regional economic integration has been a priority for ASEAN since the early 1990s, coded in several treaties and agreements bringing trade integration to the ASEAN agenda.[25] The creation of a single market and production base, as envisaged in the ASEAN Economic Community Blueprint, depends on building an integrated transport network and supportive institutional arrangements, including the reduction of barriers to intra-regional trade.

Recognizing the high transaction costs associated with transiting across national borders, ASEAN adopted three initiatives to facilitate trade, whose operationalization has become a priority under MPAC. These include the 1998 ASEAN Framework Agreement on the Facilitation of Goods in Transit (AFAFGIT); the 2009 ASEAN Framework Agreement on the Facilitation of Inter-State Transport (AFAFIST); and the 2005 ASEAN Framework Agreement on Multimodal Transport (AFAMT). These trade measures recognize that attaining the goals of the AEC depends not only on enhancing connectivity via roads, railways, and air and sea networks, but also on creating supportive rules and processes that govern access to these transportation resources and remove barriers to the efficient and effective use of existing and new transit routes. For example, national rules may preclude border crossing by trucks,

[25] These include the ASEAN Free Trade Area (AFTA), the ASEAN Framework Agreement on Services (AFAS), the ASEAN Agreement for Promotion and Protection of Investment (IGA), and the Framework Agreement on the ASEAN Investment Agreement (AIA), all signed in the 1990s.

requiring unloading and reloading at borders, and requiring up to four customs procedures to cross a country lying between origin and destination.

Considering the high costs attributable to rules governing international trade and requirements at border crossings, Member States adopted these frameworks for operationalization by 2015. The AFAFGIT was signed in December 1998, with the objective of eliminating burdensome customs procedures in road and rail transport. As stipulated in Article 4, “goods carried in sealed road vehicles, a combination of vehicles, or a container shall not be subjected to examination at Customs offices in route,” with some exceptions.

The ASEAN Framework Agreement on the Facilitation of Inter-State Transport (AFAFIST) was signed in 2009, to allow ASEAN transport operators to provide services in other Member States when goods are transported from or to the country of registration. Together with the AFAFGIT, the AFAFIST is expected to significantly improve the efficiency of transit transport by eliminating the need to unload and reload goods at national borders.

The ASEAN Framework Agreement on Multimodal Transport (AFAMT) was signed in 2005, to determine the legal liability of multimodal transport operators and standardize multimodal transport contracts. The AFAMT applies to international multimodal transport services amongst ASEAN countries provided by officially registered ASEAN operators, thereby requiring domestic legislation on multimodal transport.

Progress

As stipulated in the 2005-2010 ATAP and 2007 AEC Blueprint, the AFAFGIT was planned for implementation by 2009, contingent on the conclusion of Protocols 2 (designation of frontier posts) and 7 (customs transit system). Protocol 6 (railways border and interchange stations) was signed in 2011 and is awaiting ratification by Member States. The main text of the AFAFIST was schedule for finalization and adoption in 2009, with implementation beginning in 2011 for ASEAN-wide implementation by 2015. As for the AFAMT, ASEAN Member States mandated supportive domestic legislation by 2009. AFAMT was scheduled in at least in two Member States by 2011, with ASEAN-wide implementation to be completed by 2013.

Due to the breadth of this strategy and its legislative nature, we rely on measures of Intra-regional trade intensity and trade models described in Chapter III, as well as related indicators for physical Connectivity Strategies 1 and 5 and institutional Connectivity Strategies 5, 7, and 8 to extricate indications of progress in facilitating trade within ASEAN.

The assessment of physical Connectivity Strategy 1 (ASEAN Highway Network) shows good progress with respect to the upgrading and maintenance of TTRs, as stipulated in the AFAFGIT, and physical Connectivity Strategy 5 (Developing the multimodal transport system) suggests increasing performance in logistics quality and competence. More salient are the indicators for institutional Connectivity Strategies 5, 6, and 8, which detail progress on trade facilitation and customs and exhibit reductions in time and costs to import and export and increased efficiency of border crossings across ASEAN (see section 2.3, Strategies 5, 7, 8).

With respect to goods trade and the creation of a united production and distribution system, patterns in ASEAN trade reflect a downward trend in intra-regional trade intensity. This is not to say, however, that ASEAN is suffering a regression with respect to integration. Indeed, the physical and institutional dimensions of Connectivity that apply to the transit and trade of goods across borders are also promoting *extra*-ASEAN trade Connectivity. Considering ASEAN's pursuit of an open regionalism strategy and the high multiplier effects of trade partners like China, India, and OECD on ASEAN GDP (see Section 3.4), this pattern is acceptable and merely reflects a more rapid integration with global markets. Further, market-related, non-Connectivity drivers of the increased proportion of trade with non-ASEAN partners may, in fact, be offset by trade increases derived from MPAC initiatives.

Nevertheless, measures of trade intensity are relevant to the discussion of ASEAN Connectivity, both regionally and globally. Here, we present one measure of trade intensity: the Intra-ASEAN Trade Intensity Index. The Intra-ASEAN Trade Intensity Index (IA-TII) is a measure of trade openness that is more internationally comparable than other indicators employed for similar purposes, due to lesser size dependence of the measures of integration. It is the ratio of the intraregional trade share (out of total country trade) to the share of world trade with the country or region (out of total world trade).

Figure 49. Intra-ASEAN Trade Intensity Index

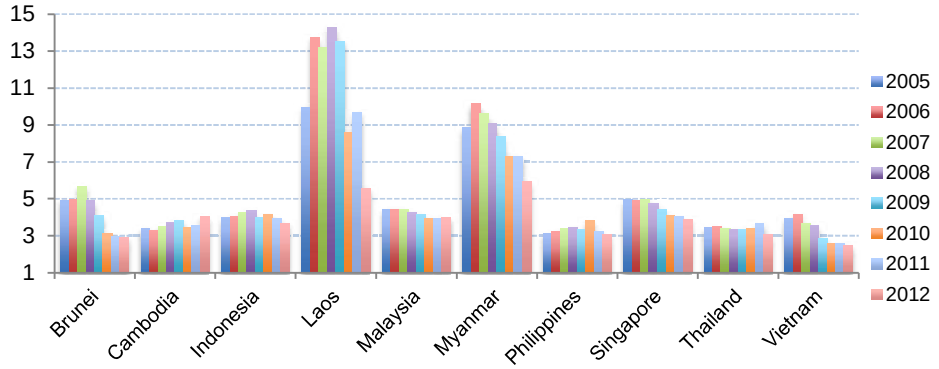
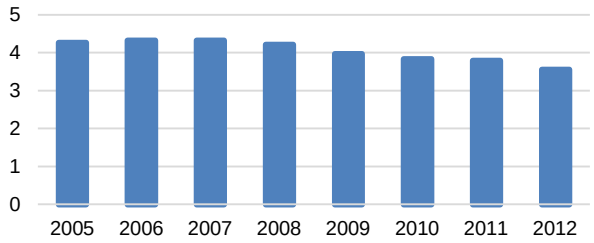


Figure 50. Intra-ASEAN Trade Intensity Index, ASEAN



Source: Data for Intra-ASEAN trade from ASEAN Statistics and world trade from World Bank COMTRADE, 2013; ACI and World Bank calculations and figures

Nevertheless, measures of trade intensity are relevant to the discussion of ASEAN Connectivity, both regionally and globally. Here, we present one measure of trade intensity: the Intra-ASEAN Trade Intensity Index. The Intra-ASEAN Trade Intensity Index (IA-TII) is a measure of trade openness that is more internationally comparable than other indicators employed for similar purposes, due to lesser size dependence of the measures of integration. It is the ratio of the intraregional trade share (out of total country trade) to the share of world trade with the country or region (out of total world trade).

This de-intensification of Intra-ASEAN simply points to a change in the relative regional intensity to the linkages between Member States and external engines of growth. Given the results of SVAR analysis in Section 3.4, this should not necessarily be a cause for concern, but could warrant a refocusing on lagging areas of MPAC implementation, as well as keen attendance to the policy levers within ASEAN that appear to be more salient to economic growth (See Chapter 3). These include positive projected economic impacts from connecting ASEAN to bordering markets such as China and India (See GSM, Section 3.1). Degrees of trade, communications, institutional, and social connectivity are exposited in detail hereafter, via application of a number of direct and proxy indicators for each. An assessment of patterns in trade and transport integration would benefit from the study of regional supply chains and changes in the linkages therein over periods of Connectivity policy implementation.

In Summary

Whilst ASEAN trade intensity is decreasing, trade integration within the region is rising. The results demonstrate relatively higher integration of ASEAN states into the global economy. These results are in line with the results of SVAR multiplier effects analysis in Section 3.

Strategy 2. Implement initiatives to facilitate inter-state passenger land transportation

MPAC proposes the expansion of road and rail connections not only for merchandise trade, but also for people mobility. Facilitating land travel amongst ASEAN Member States promotes travel and tourism, a key contributing industry in all ASEAN economies (Athanasopoulou 2013). MPAC recognized key challenges to transit across land borders, including restrictions on entry of motor vehicles, inconsistent customs clearance procedures, and restrictive visa requirements. In response, the GMS signed a Cross Border Transport Agreement (CBTA) to facilitate cross-border transport for both goods and people; BIMP-EAGA implemented a Memorandum of Understanding on Cross Border Movement for Buses and Coaches; and several Member States entered into bilateral agreements to improve cross-border mobility of passenger vehicles.

Indicator and Data Source

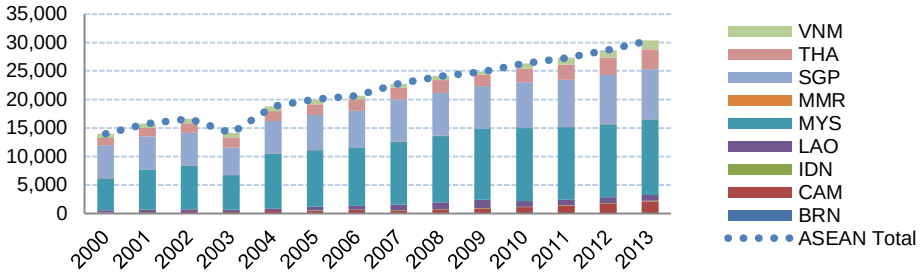
The growth of passenger land border crossings into ASEAN Member States is employed to reflect shifts in inter-state passenger land transportation as well as proxy the results of developments in border mobility initiatives. Passenger land arrivals data includes arrivals by car, bicycle, bus, hitchhiking, coach, and motorcycle. Data is sourced from Euromonitor International market research on travel and tourism, with annual observations to 2013.

Progress

International passenger land arrivals to ASEAN experienced a marked increase for several Member States during the MPAC implementation period, though the growth rate of arrivals for the region overall did not increase after 2011. The average growth rate for land arrivals in the period 2005-2010 was 5.8% compared to an average of 4.9% for 2011-2013.

Growth rates of land arrivals did appreciate noticeably for some countries, however. Myanmar's growth averaged an annual 3.6% for the period from 2005-2010, as compared to a massive 48.0% for the post-MPAC period between 2011 and 2013. Similarly, Cambodia's average growth rates rose from 18.0% to 25.1% pre- and post-MPAC, and Thailand's increased from 5.8% to 13.7% for the same two periods.

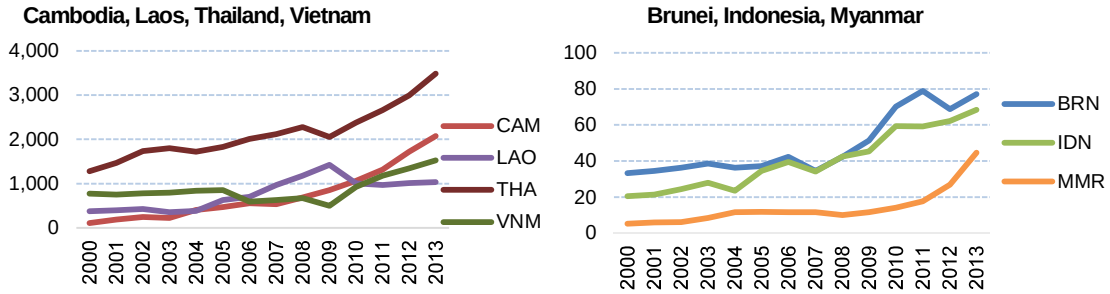
Figure 51. ASEAN international passenger land arrivals, ASEAN (thousands)



Source: Euromonitor, 2015

Examining Member States with lower scales[26] of international land transit volumes, the pattern of increased transit following MPAC implementation holds. Countries with mid-range land passenger volumes, including Thailand, Cambodia, and Vietnam, all experienced notably higher levels of land transit following 2010. So too, have low-volume countries, most notably Myanmar, experienced sharp increases. More field research, and qualitative data collection is needed to determine the factors behind these shifts.

Figure 52. Passenger land arrivals (thousands)



Source: Euromonitor, 2015

In Summary

- While land arrivals for ASEAN have increased steadily since 2000, the annual growth rate of international passenger arrivals decreased after MPAC implementation, from an average 5.8% over the period 2005-2010 to an average 4.9% for 2011-2013.
- Thailand, Cambodia, and Myanmar experienced noticeable growth increases after MPAC implementation, suggesting positive effect of MPAC on transit to those Member States.

[26] Member States graphed separately for readability purposes only, due to differences in scale.

Strategy 3. Develop the ASEAN Single Aviation Market (ASAM)

Key MPAC actions associated with creating an ASEAN Single Aviation Market (ASAM) include the ratification and implementation of a series of agreements for liberalization of air freight and passenger services, with an eye to meet the requirements of the ASEAN Roadmap for Integration of the Air Travel Sector (RIATS) by 2015. The key actions of ASAM, stipulated in MPAC are listed in Table 7.

Table 7. ASAM key actions stipulated in MPAC

Key Action	Deadline
Multilateral Agreement on the Full Liberalisation of Air Freight Services (MAFLAFS)	Implementation of Protocols 1 and 2 by December 2008 Implementation of Protocol 6 by December 2010
Multilateral Agreement on Air Services (MAAS)	Implementation of Protocol 5 by December 2008 Implementation of Protocol 6 by December 2010
Multilateral Agreement on the Full Liberalisation of Passenger Air Services (MAFLPAS)	Ratification by 2010 Implementation or Protocol 1 by June 2010 and 2 by June 2013
ASEAN Single Aviation Market (ASAM) Roadmap and Implementation Strategy	Formulation by 2009 Adoption by 2011 Implementation framework by 2015

Under MAFLPAS, Member State airlines were afforded unlimited third and fourth freedom air traffic rights between ASEAN cities by June 2010, and unlimited fifth freedom rights by June 2013, establishing the basis for the ASEAN Open Sky Policy. Reflecting on global experiences with similar air liberalization policies, the ASEAN Open Sky Policy is couched as an integral element for achievement of the ASEAN Community and is expected to significantly enhance international trade and people-to-people Connectivity. The RIATS agreements and protocols were signed in May 2009, and the MAFLAFS has already entered into force with all Member States except for Indonesia, which has ratified neither the main text nor its protocols.

Indicator and Data Source

Indicators of progress in the air transport sector draw on data on Intra-ASEAN passenger arrivals, Intra-ASEAN flight cargo capacities, and the Quality of Air Transport Infrastructure. Changes in the first two – passenger and cargo capacity – are proxy measures of tourism and air trade growth as well as air transit liberalization. While growth in air traffic is contingent on a number of factors, the rules governing air services and the opening of new routes are undoubtedly an important determinant of passenger and cargo flows. Data for these indicators

is sourced from the DiiO Aviation Intelligence database, via the World Bank's Transport Practice unit, with monthly data available up to year-end 2014. The database records air passenger seat availability, which may be used as a direct indication of passenger demand and access within ASEAN, for travel to other Member States.

A lesser but nevertheless significant determinant of competitiveness and quality in ASEAN air transport services is perceptions data on Quality of Air Transport Infrastructure from the World Economic Forum's Global Competitiveness Index (GCI), available up to the 2014-2015 reporting period. Based on expert respondent assessments of air transport infrastructure, countries are scored from 1 (extremely underdeveloped) to 7 (extensive and efficient – among the best in the world).

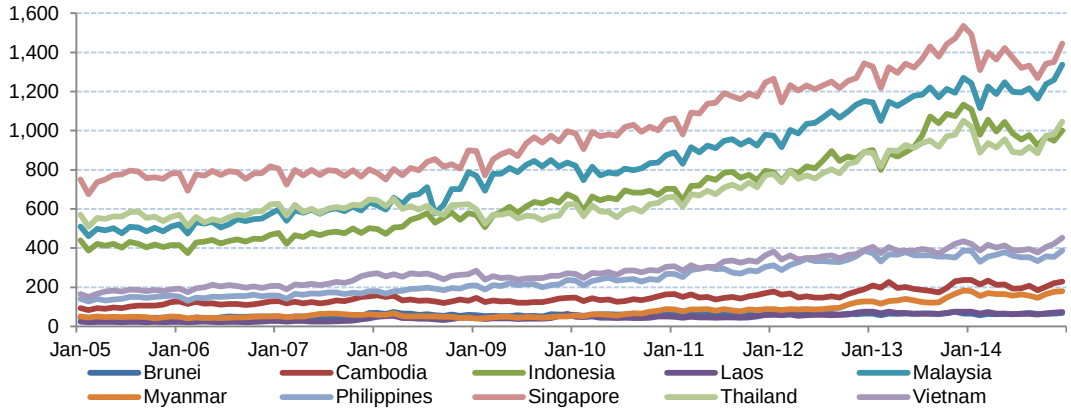
Progress

Air Passenger Capacity

Data on monthly and annual air passenger capacity for intra-ASEAN international flights indicates steady growth since 2005, with a noticeable surge since 2011. This surge in air travel and transport within the region follows on directly from MAAS implementation and ratification of MAFLPAS.

Figure 53 demonstrates this shift in growth rates to faster growth of Intra-ASEAN arrivals in 2011-2014 as compared to the pre-MPAC period.

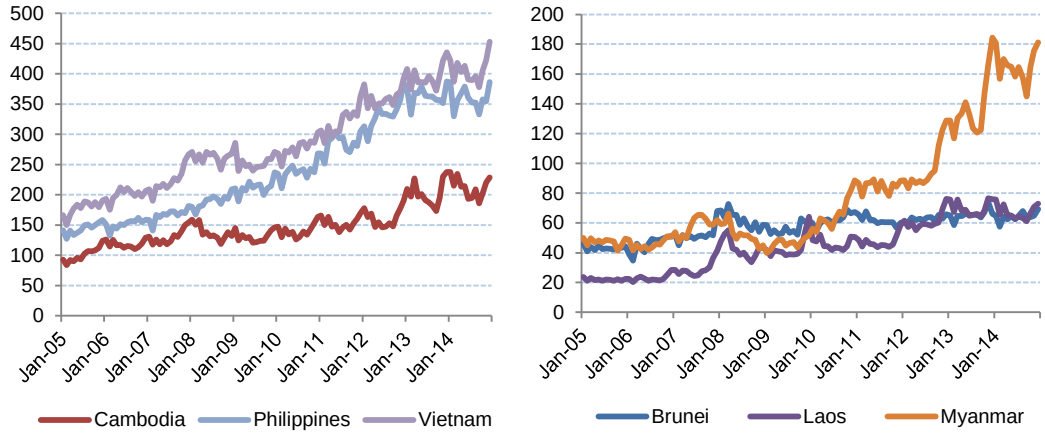
Figure 53. Monthly air passenger capacity, Intra-ASEAN international arrivals (thousands)



Source: DiiO database, accessed January 2015, World Bank figures

Figure 54 shows an increase in growth following 2011 for Member States with international arrivals in the lower ranges as well. Most noticeably, Myanmar's air openness increased drastically between mid-2012 to 2014.

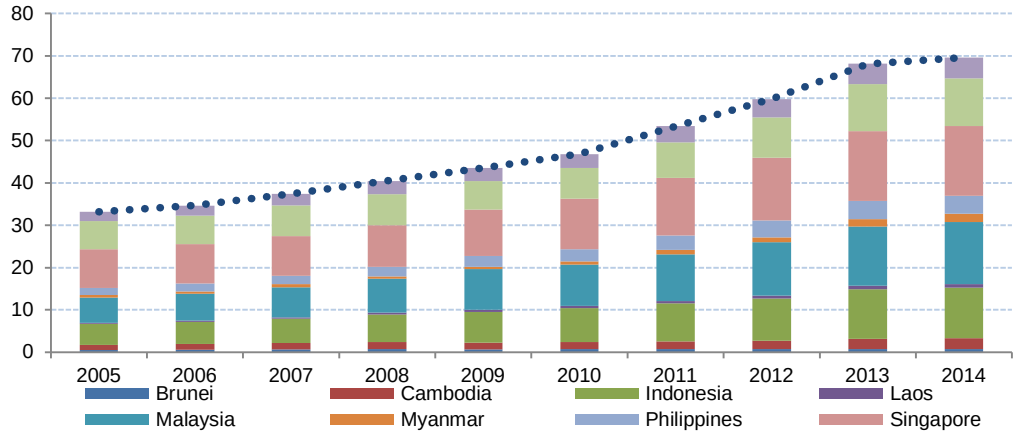
Figure 54. Monthly air passenger capacity, Intra-ASEAN arrivals (millions), lower arrival range



Source: DiiO database, accessed January 2015, World Bank figures

Figure 55 for annual air passenger arrival capacity shows growth for Intra-ASEAN air travel since 2005, with a growth surge in the period between 2010 and 2013, coinciding directly with implementation of the agreements underpinning the ASEAN Open Sky policy and ASAM.

Figure 55. Annual air passenger capacity, Intra ASEAN international arrivals (millions)



Source: DiiO database, accessed January 2015, World Bank figures

Air Cargo Capacity

Measures for air cargo capacity over time similarly reflect growth in air cargo volumes for intra-ASEAN transport over time, with the most significant increase in quarterly and annual

volumetric growth following 2012 (Figures 56 and 57). Much of the growth in cargo capacity was associated with flights originating from Indonesia, Malaysia, and Vietnam.

Figure 56. Quarterly Intra-ASEAN cargo capacity (m^3)

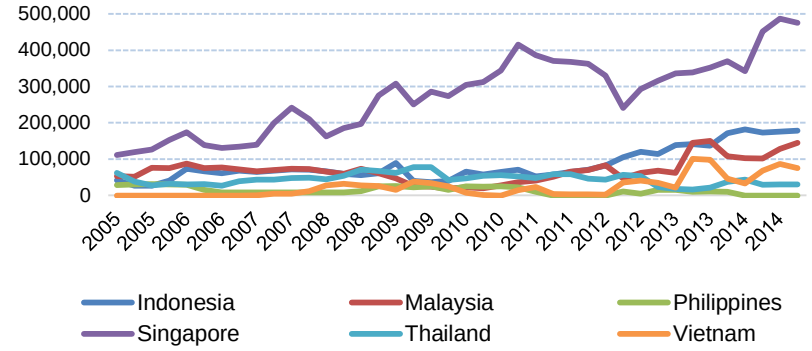
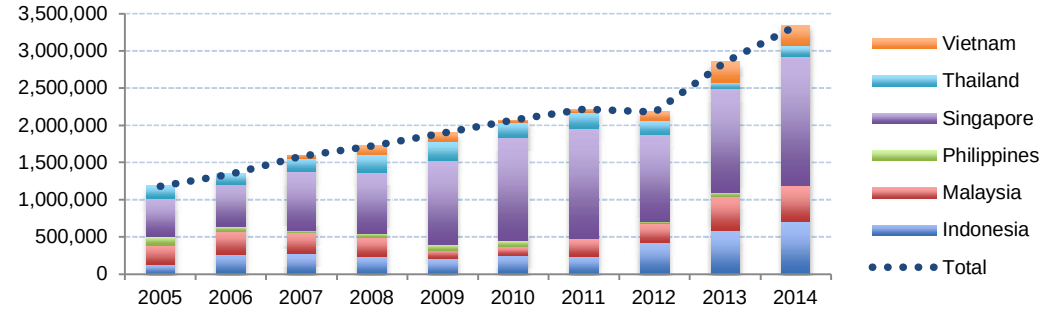


Figure 57. Estimated annual air cargo capacity, Intra-ASEAN flights by country of origin (m^3)



Source: DiiO database, accessed January 2015, World Bank figures

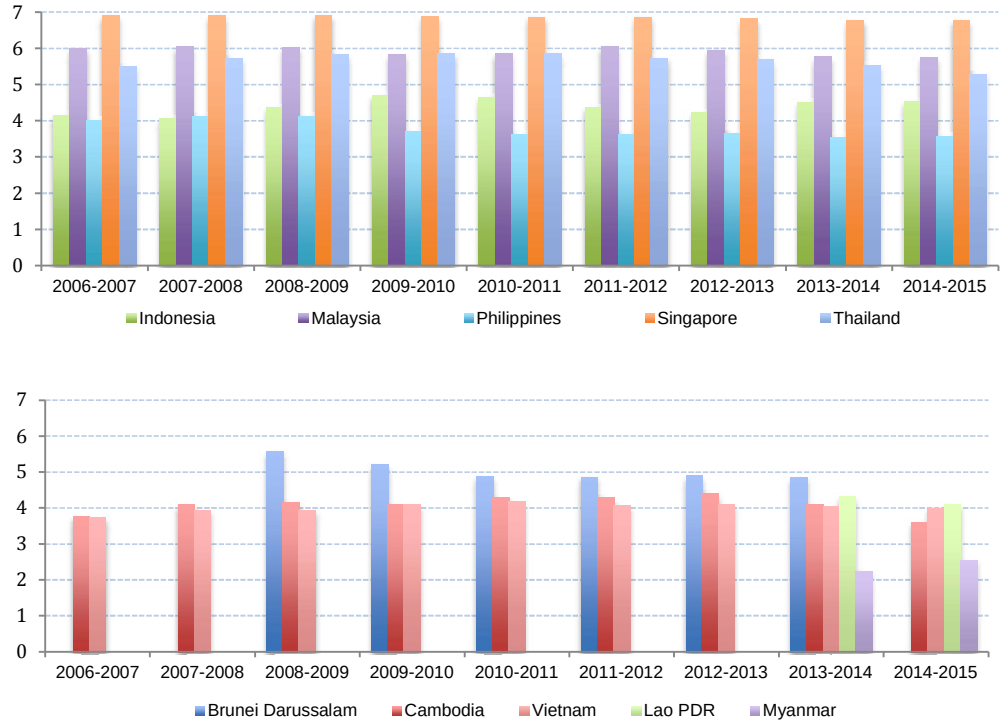
Air Infrastructure Quality

While the primary airports of ASEAN Member States are generally deemed sufficient in terms of runway lengths to accommodate existing operation, some face problems with respect to providing sufficient support services and facilities, including number of runways and warehouse capacity. These factors will become increasingly important in the face of anticipated air transport growth.

This should be a focal attention point for the sector and Member States, particularly since air transport infrastructure quality scores have not appreciably increased since MPAC (Figure 58), and in consideration of the high-profile concerns over air safety following a number of incidents in 2014. Nevertheless, since air cargo and passenger flows have increased despite

limited infrastructure improvement, these results also reinforce the importance of institutional factors to the development of the air transport sectors.

Figure 58. Quality of air transport infrastructure



Source: Global Competitiveness Index, 2015

In Summary

- Growth rates of Intra-ASEAN air passenger and air cargo flows have increased significantly since MPAC, suggesting direct impact on development in the air transport sector.
- Despite limited progress in the quality of air transport infrastructure, air passenger and cargo flows have increasingly risen following ASAM, suggesting the relatively greater importance of institutional factors to physical factors in determining air transit flows.

Strategy 4. Develop an ASEAN Single Shipping Market

In addition to the physical aspects of maritime connectivity, MPAC and the 2011-2015 ASEAN Strategic Transport Plan (ASTP) envisage the creation of an ASEAN Single Shipping Market (ASSM), based on “rationalization, synchronization, liberalization and harmonization of shipping services and trade procedures” (ERIA Study Team 2010). The liberal shipping environment envisaged in ASSM applies primarily to global networks, as domestic shipping services remain protected under the Cabotage Policy.

The MPAC and ASTP specify that Member States create a set of concrete actions by 2009 for 2015 implementation, with an eye to enhance regional maritime performance and cargo handling capacity and increase integration into global shipping networks. The rationalization of regional management and regulation of sea shipping has been slower than expected, however. The ASSM implementation study reached conclusion only in 2013. An ASSM task force was established at the 19th ASEAN Transport Ministers meeting in December 2013 to promote further formulation and implementation of ASSM.

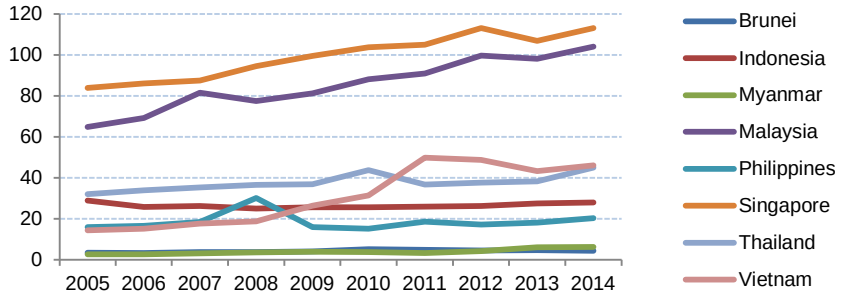
Indicator and Data Source

While the ASSM has not yet reached full implementation, the Liner Shipping Connectivity Index (LSCI) is presented as a measure of ASEAN Member States’ connectivity to global shipping networks. The LSCI is based on assessment of five components of the maritime transport sector: number of ships, container-carrying capacity, maximum vessel size, number of services, and number of companies that deploy container ships in a country's ports. A country’s score is a measure of relative performance against the best scores for each subcomponent and the overall LSCI score in base year 2004.

Progress

Even prior to ASSM implementation, changes in ASEAN LSCI scores over the past ten years demonstrate steady growth in sea connectivity, most prominently for Singapore, Malaysia, and Vietnam. During the MPAC implementation period, specifically, indicator performance increased significantly for Vietnam in the early phase only (2010 to 2011), whereas Singapore and Malaysia exhibit steady growth over the period at rates comparable to the pre-MPAC period.

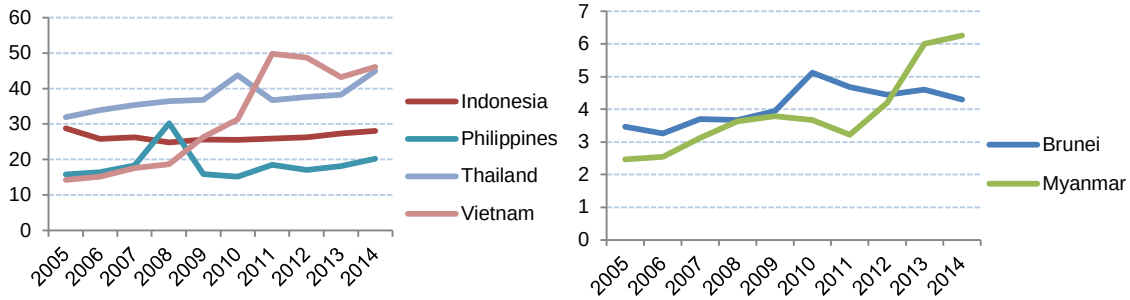
Figure 59. Liner Shipping Connectivity Index (maximum value in 2004=100)



Source: World Bank Liner Shipping Connectivity Index, 2015

Amongst mid-range LSCI countries (i.e. Indonesia, Philippines, Thailand, Vietnam), shipping connectivity increased limitedly, with the exception of Vietnam. Vietnam's sharp increase from 2009 to 2011 mirrors port developments discussed in Section 2.2, but the country experienced a decline after 2012, resuming the prior trend.

Figure 60. Liner Shipping Connectivity Index



Source: World Bank Liner Shipping Connectivity Index, 2015

Myanmar experienced upward growth over the MPAC period, particularly following 2011. A scan of the current status of ASSM-relevant rules on foreign ownership, access, port productivity and efficiency, and local content laws would provide helpful qualitative data to contextualize the degree of shipping liberalization.

In Summary

- Vietnam and Myanmar are the only two Member States to have appreciably increased liner shipping connectivity following MPAC.
- Additional data on status of maritime liberalization and shipping harmonization measures would provide valuable qualitative inputs to assess the degree of attainment of ASSM.

Strategy 5. Accelerate the free flow of goods within ASEAN

Strategy 7. Improve trade facilitation in the region

Strategy 8. Enhance border management capabilities

Institutional strategies 5, 7, and 8 share the common purpose of facilitating trade and reducing barriers in the region in order to deepen the integration of ASEAN's production and distribution bases and reduce high transaction costs associated with cross-border transit. While nuanced in their specific intentions, the measurements of progress in each depend on a common set of proxy indicators and are, thus, discussed in tandem.

The indicators employed (time and cost to import/exports; amount of documentation required for import/export; and the efficiency of clearance processes) together demonstrate progress towards creating seamless transportation of goods across borders. This goal necessitates reducing trade frictions and transaction costs associated with excessive documentation, disharmony amongst customs and systems, and inefficiencies in border management. Additionally, the status of National Single Windows (NSWs) projects is reviewed to provide context to some of the priority institutional projects aimed at improving trade facilitation.

Indicators and Data Source

Assessment of trade facilitation and border management improvements relies on several proxy indicators. The first set of indicators draws on the World Bank's *Doing Business* dataset for Trading Across Borders, which measures time and cost (excluding tariffs) associated with exporting and importing a standardized cargo of goods, as well as the number of documents required to import and export. Data is based on surveys of local freight forwarders, shipping lines, customs brokers, port officials and banks. The overall scoring of economies on Trading Across Borders is recorded as the Distance to Frontier –the distance of each country's score to the highest performer for each indicator. Observations are made annually, up to 2013.

The second proxy attends to the efficiency of the border clearance process. This data is sourced from the Logistic Performance Index (LPI) semi-annual measures of 'Efficiency of clearance', up to 2014.

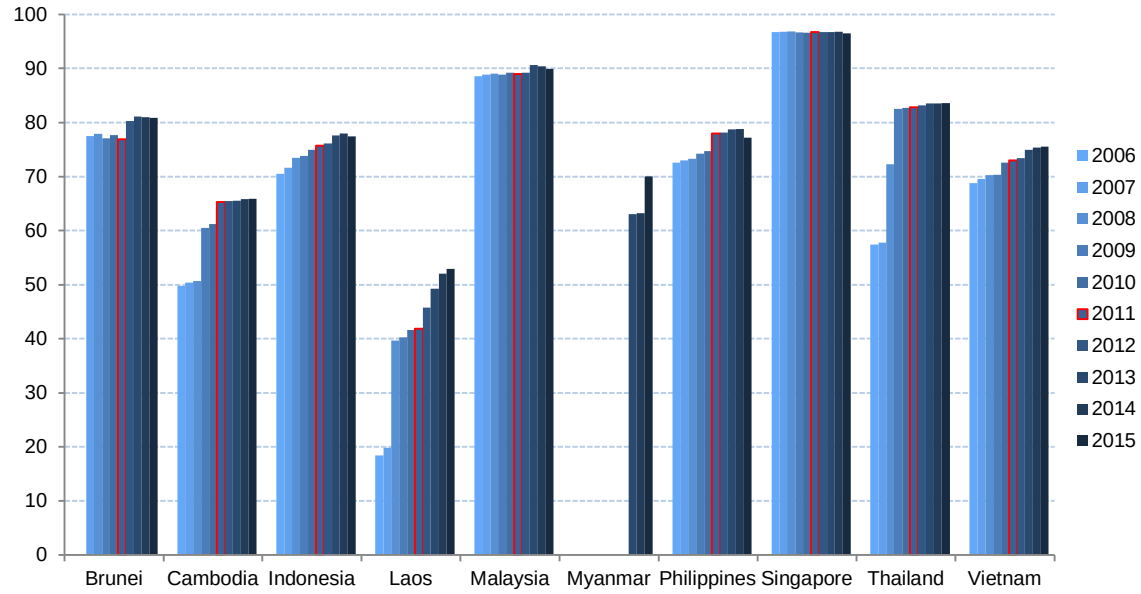
Progress

The Trading Across Borders topic attends directly to the national and sub-national regulatory impacts on the speed and cost of international trade. National performance is weighed against the "frontier" – the best performance for that particular indicator for each year – and recorded

as the percentage of attainment of the best score. All ASEAN countries have closed the gap to the frontier of Trading Across Borders performance since 2006, with the most noticeable increases in Cambodia, Laos, and Thailand.

The figure below demonstrates that, since 2011, nearly every country (except Singapore, who remains steadily near the frontier) has experienced a step change in performance in line with implementation of MPAC key actions, including progress towards National Single Windows and cross-border trade facilitation measures.

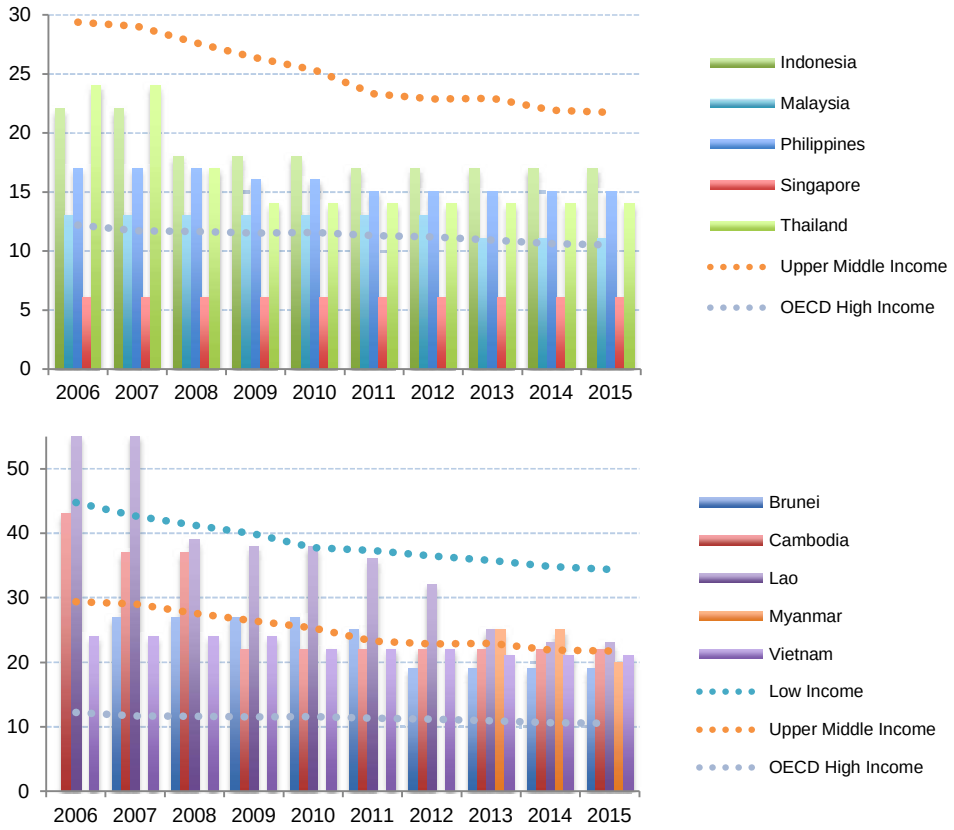
Figure 61. Distance to frontier, Trading Across Borders



Source: World Bank *Doing Business* database, 2015; red marks the start of MPAC implementation (2011)

Focusing further on the sub-components of the Trading Across Borders scores, Figure 62 demonstrates that the durations of time required to export goods from ASEAN Member States has fallen consistently over the past ten years, with the most significant reductions in time in Thailand, Cambodia, and Lao PDR. With further implementation of National Single Windows and customs harmonization, these export times are expected to decrease further.

Figure 62. Time to export (days)



Source: World Bank *Doing Business* database, 2015

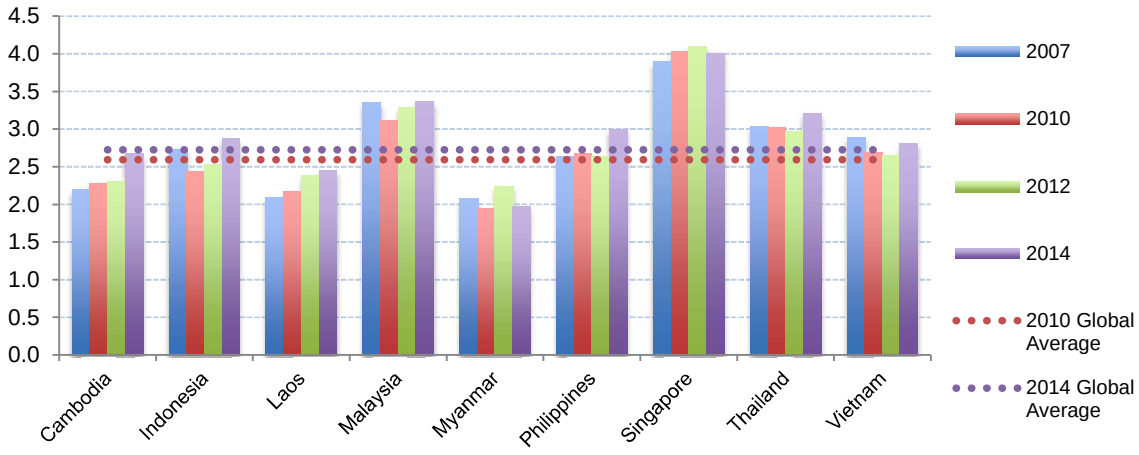
The AEC Blueprint prioritized National Single Windows (NSW) projects to streamline international clearance via a system enabling single submission and processing of customs data. Currently, Singapore and Malaysia have fully implemented NSWs. The 2013 ASEAN Integration Monitoring Report provided NSW status updates as follows:

Table 8. Status of NSWs

Country	Status
Singapore	TradeNet: 100% of trade declarations; average processing time of 10 minutes
Malaysia	99% of imports and 98% of exports in 2011
Indonesia	14 agencies linked, expected to increase to 17 by 2015; 33% of registered traders use NSW
Philippines	NSW links 38 agencies; covers 95% of imports and 25% of exports, but only 25% of registered traders use NSW; by 2015, all airports and ports should be covered and 50 agencies connected
Thailand	Piloting NSW with 26 agencies involved
Brunei	Developing systems architecture; with one major port and airport, expected to progress rapidly
Vietnam	National steering committee established in 2008; implementation of electronic customs underway; expected that 80% of customs declarations would be electronic by end of 2011
Cambodia	In progress, implementing electronic systems
Laos	In progress, implementing electronic systems; launched NSW roadmap in February 2012
Myanmar	In progress

The National Single Windows, border management procedure harmonization, and reduction of non-tariff barriers related to clearance appear to have improved the efficiency of clearance in a number of countries. Figure 63 demonstrates that LPI measures for 'Efficiency of the clearance process' have improved for all ASEAN Member States except Singapore, which nevertheless remains a top performer in border management and maintains a consistently high efficiency score. Cambodia, Indonesia, Philippines, Thailand, and to a lesser extent, Vietnam, experienced the most drastic score increases from 2012 to 2014.

Figure 63. Logistics Performance Index, Efficiency of the Clearance Process score



Source: Logistics Performance Index, 2015

In Summary

- The *Doing Business* Trading Across Borders scores demonstrate increases from 2011/2012 onwards for nearly every State, indicating reduced burdens with respect to documentation required, as well as reduced time and costs associated with international trade. This is especially apparent for Brunei, Laos, and Philippines, who experienced the sharpest score increases.
- Laos has made significant progress with respect to reducing the days required to export, from 36 in 2011 to 23 in 2014.
- LPI scores for Efficiency of the Clearance Process have improved significantly for Cambodia, Indonesia, Philippines, and Thailand since 2012, and to a lesser extent in Vietnam.

Strategy 6. Accelerate the development of an efficient and competitive logistics sector, in particular transport, telecommunications and other connectivity related services in the region

In 1995, ASEAN Member States endorsed the ASEAN Framework Agreement on Services (AFAS), which set out to liberalize financial, air transport, tourism, logistics, e-ASEAN, and healthcare services in order to improve efficiency and competitiveness of services within and outside ASEAN, eliminate restrictions on trade in services, and expand liberalization beyond GATS, with the end aim of a regional free trade area for trade in services. Parameters and targets were set in the AEC Blueprint, with the goal to eliminate restrictions on air transport and tourism by 2010, logistics by 2013, and all services by 2015.

The MPAC focuses both on liberalizing investments (see Section 2.2, strategy 9) as well as improving the quality and efficiency of Connectivity-related services, including logistics and communications. With respect to the liberalization of transport and logistics, the Roadmap for Integration of Logistics Services (RILS) was endorsed in 2008 to enhance competitiveness of logistics services, including cargo handling, storage and warehousing, freight transport, courier, packaging, and custom clearance services. The MPAC recognized that, while substantial liberalization would be needed to create a unified production and distribution base, several key challenges included domestic regulations and protectionism, as well as improving the quality of services within ASEAN.

With respect to liberalization, the 2013 ASEAN Integration Monitoring Report recognized good progress amongst Member States in implementing scheduled liberalizations under the AEC Blueprint, aside from some delays related to eliminating restrictions on foreign investment. Additionally, progress has been good in liberalizing the logistics sector in Brunei, Cambodia, Indonesia, Laos, Malaysia, and Myanmar. Even Singapore, which committed fewer subsectors for services trade liberalization, has made advanced commitments in telecommunications, and Malaysia and the Philippines liberalized their telecommunications markets in the late 1990s. The challenge remains to fully capture the efficiency and quality gains expected from liberalization, while promoting quality in services within ASEAN.

Indicator and Data Source

The indicators of services trade liberalization used herein include the growth rates of Intra-ASEAN trade in transportation and communications services along with world exports for the same sectors. Data for these indicators is drawn from ASEAN Statistics, with annual

observations to 2013. An additional proxy for the quality of logistics services is the Logistics Performance Index indicator for 'Competence of service providers', which is available from the World Bank's LPI database with semi-annual observations to 2014.

Progress

ASEAN trade in services data demonstrate a general increase in Intra-ASEAN trade for both transportation and ICT services over the past 10 years, with a significant increase in transportation services trade after MPAC implementation, though this may also be applicable to post-Financial Crisis recovery.

While Intra-ASEAN trade in communications services has grown slowly (with no appreciable impact since 2011), transportation integration is more pronounced (Figure 64): following a decrease after the Global Financial Crisis, transport services trade within ASEAN increased significantly. Further monitoring is needed to determine whether this is a sustained growth shift or a reversion to a prior growth trend.

Figure 64. Intra-ASEAN exports, transport and ICT services (US$ millions)

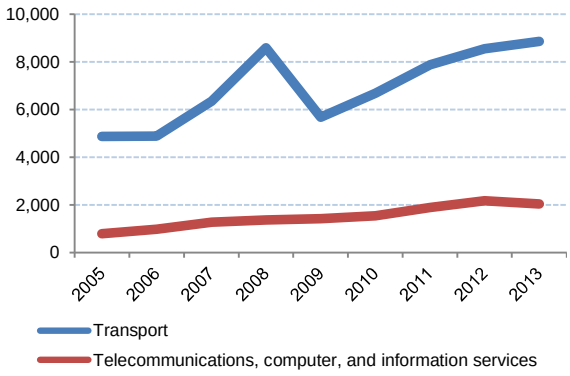
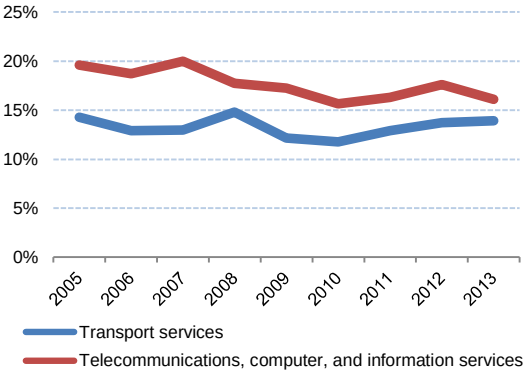


Figure 65. Intra-ASEAN exports as a share of ASEAN world exports (US$ millions)

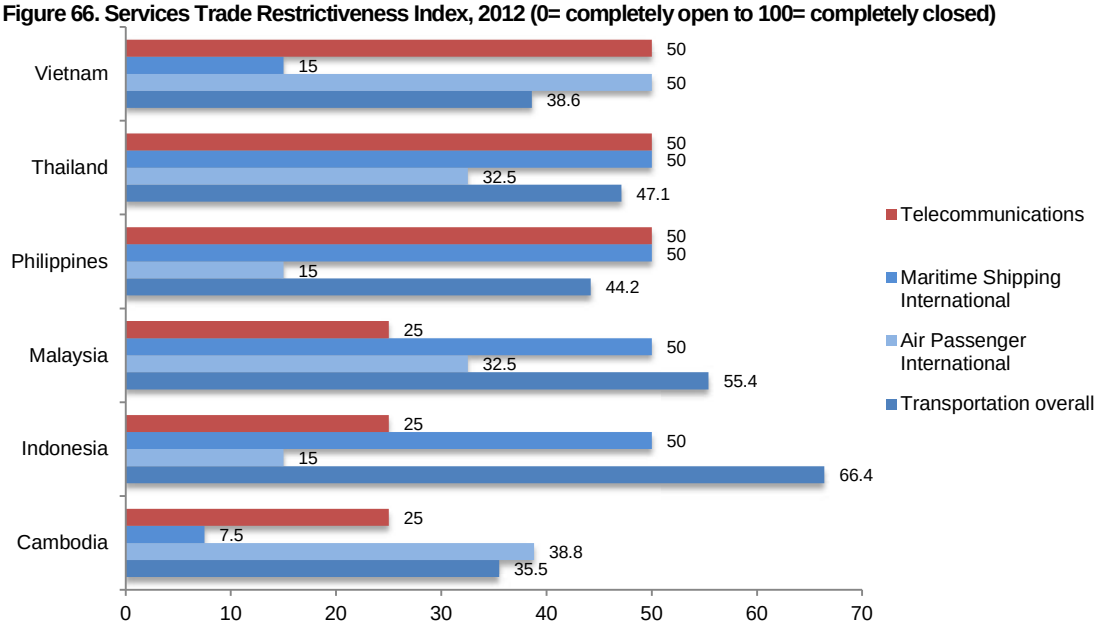


Source: ASEANstats, 2015, World Bank figure

Growth in services trade increased more outside of ASEAN than within, however. Shares of Intra-ASEAN exports in transportation and communications services as portions of world exports in each sector have fallen slightly since 2005, indicating relatively higher growth in services exports to regions outside ASEAN.

With respect to trade liberalization, details on restrictions on communications and transportation services for six Member States – Cambodia, Indonesia, Malaysia, Philippines, Thailand, and Vietnam – are detailed in Annex 5, Services Trade Restrictions, drawn from information in the World Bank's Services Trade Restrictions database, last updated in 2012.

Figure 66. Services Trade Restrictiveness Index, 2012 (0= completely open to 100= completely closed)



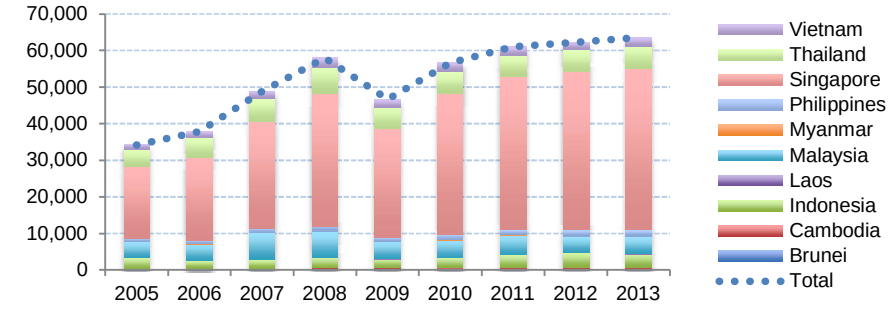
Source: World Bank Services Trade Restrictiveness Index, 2012

2012 scores reveal that Indonesia, Malaysia, the Philippines, and Thailand had median levels of maritime trade restrictiveness (scores of 50), but much less restrictive air transport sectors. Conversely, Vietnam and Cambodia were assessed as having median levels of air transport restrictiveness and low maritime restrictiveness (scores of 15 and 7.5, respectively). Amongst measured countries, Malaysia, Indonesia, and Cambodia had less restrictive telecommunications industries than Vietnam, Thailand, and the Philippines.

Transportation Services

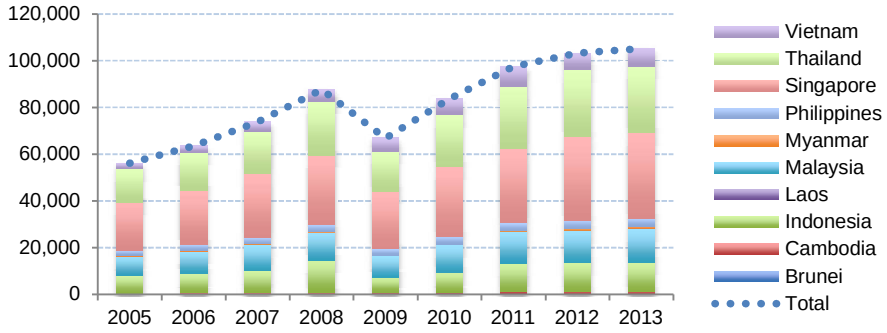
As depicted in Figure 67, Intra-ASEAN transportation services exports increased significantly after the Crisis, though the growth rate of transportation service exports and imports decreased after 2010 and 2011, respectively. As such additional monitoring is needed to detect the presence or absence of a growth trend change.

Figure 67. Transportation services exports by country (US$ million)



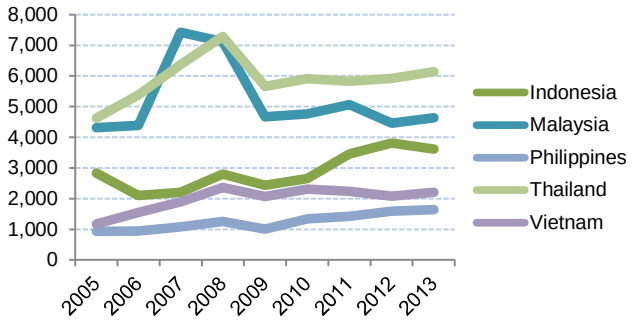
Source: ASEANstats, 2015

Figure 68. Transportation services world imports, by country (US$ millions)



Source: ASEANstats, 2015

Figure 69. Transportation services exports, Indonesia, Malaysia, Philippines, Thailand, Vietnam (US$ million)

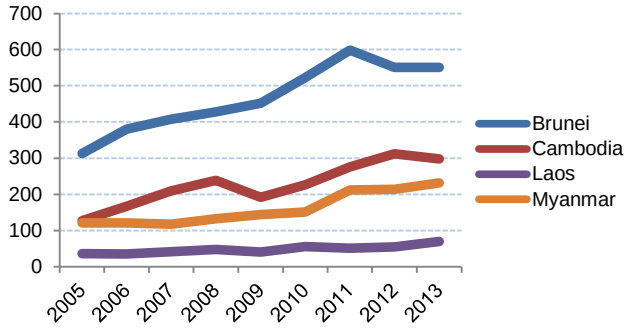


Source: ASEANstats, 2015

Patterns in world exports of transportation services for ASEAN Member States, specifically, suggest that much of the growth may be attributed to Singapore exports. Other countries, however, have also demonstrated increased trade, albeit at relatively much lower levels.

Indonesia (Figure 69), Cambodia, Laos, and Myanmar (Figure 70) saw some growth in transportation services exports after 2010, though fluctuations demand that more observations be recorded prior to assessment of the presence of a trend shift.

Figure 70. Transportation services exports, Brunei, Cambodia, Laos, Myanmar (US$ millions)

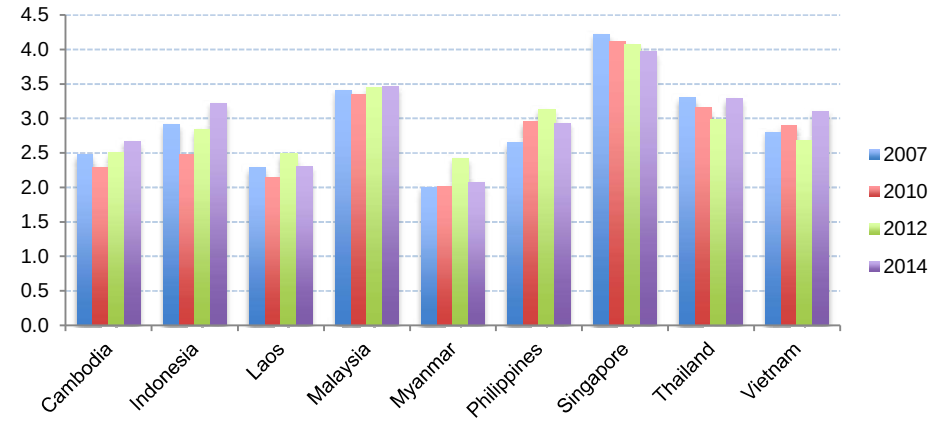


Source: ASEANstats, 2015

With respect to the quality of traded services, according to the World Bank's Logistics Performance Indicator scores for 'Competence of service providers', the quality of logistics services within ASEAN have mostly shown to slightly improvement between 2012 and 2014.

Cambodia, Indonesia, and to a lesser extent, Malaysia, have consistently improved their logistics competence scores since 2010, whereas Thailand and Vietnam have experienced improvements between 2012 and 2014. Laos, Myanmar, Philippines and Singapore, on the other hand, experienced decreasing scores between 2012 and 2014.

Figure 71. Logistics Performance Index score, Logistics quality and competence

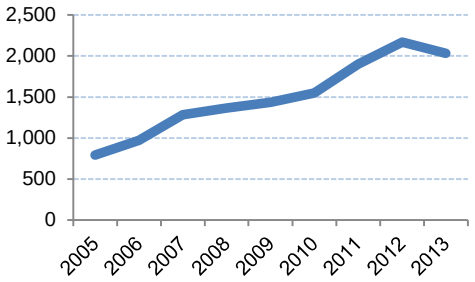


Source: World Bank Logistics Performance Index, January 2015

ICT Services

Intra-ASEAN trade in ICT services has also increased over the past ten years, with a notable increase in the growth rate of exports following 2010, coinciding with MPAC implementation (Figure 72). Nevertheless, this upswing was followed by a decline in 2013, necessitating further tracking to determine the path of growth for the latter half of the MPAC period.

Figure 72. Intra ASEAN ICT services exports (US$ million)



Source: ASEANstats, 2015, World Bank staff calculations

Patterns in ICT exports and imports to the world similarly demonstrate marked growth over the past ten years, with a notable increase in export and import growth from 2009 to 2011, as compared to the trends of growth in the previous and following periods (Fig. 73, 74).

Figure 73. ICT services exports (US$ million)

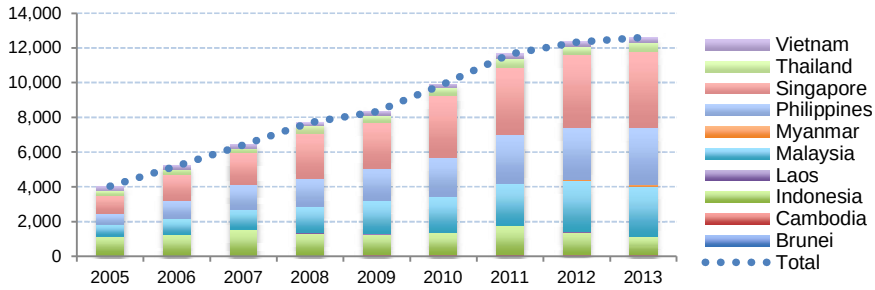
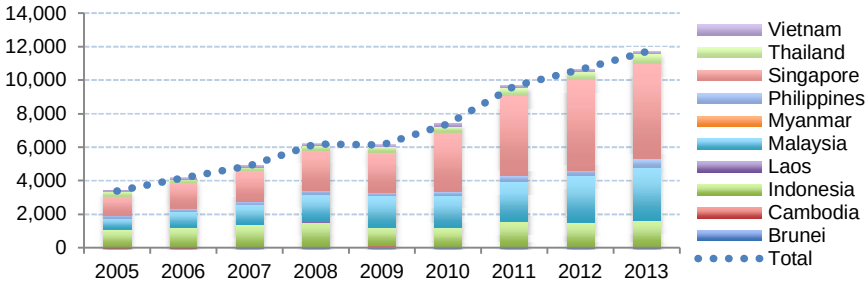


Figure 74. ICT services world imports (US$ million)



Source: ASEANstats, 2015

In Summary

- The growth rate of transportation services has been fairly congruent before and after MPAC implementation, though some States, namely Singapore, Indonesia, Cambodia, and Myanmar saw increased exports (Intra- and Extra-ASEAN exports).
- Cambodia, Thailand, Indonesia, and Vietnam have experienced the most notable improvements in LPI scores for Quality and Competence of logistics service providers.
- The growth rate of Intra-ASEAN ICT services exports increased during the first year of MPAC implementation, but decreased between 2012 and 2013. More recent data is required to discern the presence or absence of a trend shift in growth.

Strategy 9. Accelerate opening of ASEAN Member States to investments within and beyond the region

ASEAN Member States have performed well with respect to attracting foreign direct investment (FDI) over the past twenty years, and ASEAN Integration has further helped attract FDI from both outside and within the region. The MPAC recognizes that economic benefits from ASEAN Connectivity and Integration will be best attained and enhanced by increased investments from domestic, regional, and extra-ASEAN sources, placing an emphasis on the need to attract more investment into the region. Efforts to improve the investment climate are also closely linked to physical and institutional Connectivity initiatives that improve the flow of goods and services and thus boost profitability, along with AEC efforts to create fair and stable investment regimes. Indeed, improved ASEAN Connectivity has played a key role in drawing FDI to the region, though FDI destinations remain highly concentrated in particular areas (World Bank 2014).

Inflows to ASEAN rose by nearly 7% in 2013 to US$122 billion. The rapid growth of FDI inflows following the Financial Crisis up to 2012 has slowed, but ASEAN nevertheless remains the largest recipient of FDI relative to GDP in Asia Pacific. Between 1952 and 2012, Singapore accounts for more than half of total FDI to the region (52%), followed by Thailand (13%), Indonesia (11%), Malaysia (10%), Vietnam (8%), and the Philippines (3%) (World Bank 2014). Despite the importance of FDI to ASEAN economic growth, many Member States restrict foreign equity, an issue that will continue to require attention and deliberation by Member States. Experiences in ASEAN indicate that FDI increases when countries relax foreign ownership restrictions, yielding significant economic benefits.

Indicator and Data Source

The opening of ASEAN Member States to investments from within and outside of the region is assessed via the growth of and comparison between FDI inflows from Extra- and Intra-ASEAN sources. Data is drawn from ASEAN Statistics on Intra-ASEAN and Extra-ASEAN FDI inflows to ASEAN, with annual records from 2000 to 2013.

Progress

Total foreign investments in ASEAN rose from US$41 billion in 2005, to USD$76 billion in 2010 and US$122 billion in 2013. Nevertheless, FDI growth slowed over the early MPAC implementation period from 28% in 2011, to 17.2% in 2012, and 6.7% in 2013. Growth in Intra-ASEAN investments has risen steadily since 2009, with growth of 24% in 2011 and 36% in

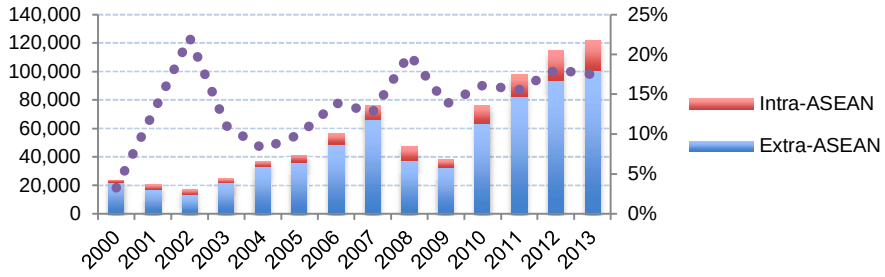
2012, until shrinking to 3% in 2013. The proportion of ASEAN FDI inflows from within the region to total FDI inflows has also risen since MPAC, from 13.8% in 2009, ranging from 15.6% to 18.1% following MPAC implementation.

Table 9. ASEAN FDI inflows, 2005 – 2013 (US$ millions) Source: ASEANStats, 2015

	2005	2006	2007	2008	2009	2010	2011	2012	2013
Extra-ASEAN	36654	48772	66025	37626	32995	63929	82310	93626	100628
Intra-ASEAN	4060	7876	9626	9449	5271	12279	15228	20658	21322
Total FDI Inflows	40714	56648	75651	47075	38266	76208	97538	114284	121950
Intra-ASEAN as a proportion of total	10.0%	13.9%	12.7%	20.1%	13.8%	16.1%	15.6%	18.1%	17.5%
Growth of total inflows	12.1%	39.1%	33.5%	-37.8%	-18.7%	99.2%	28.0%	17.2%	6.7%

The proportion of Intra-ASEAN FDI to other ASEAN countries rose sharply in 2002 and again in 2008 as Extra-ASEAN investments fell, bringing total inflows downwards. Since MPAC implementation, however, the proportion of Intra-ASEAN investments within overall inflows has risen (2010 onwards) even with as Extra-ASEAN inflows have risen, indicating the further opening of ASEAN Member States to ASEAN investment sources and increased regional investment liberalization. In other words, the structure of ASEAN FDI has shifted to include an increasing proportion of FDI flows originating from within ASEAN.

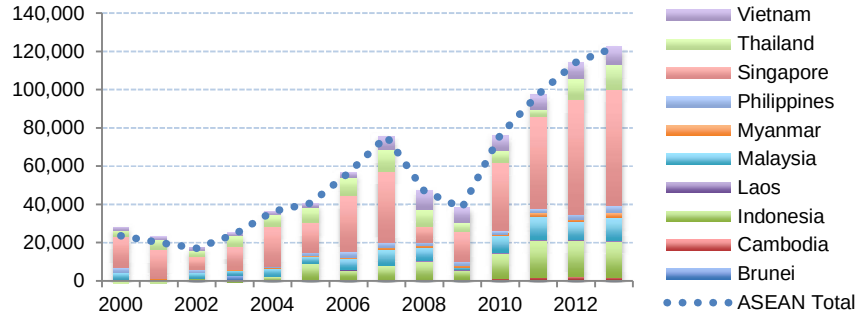
Figure 75. FDI Inflows to ASEAN Member States (US$ millions)



Source: ASEANStats, 2015

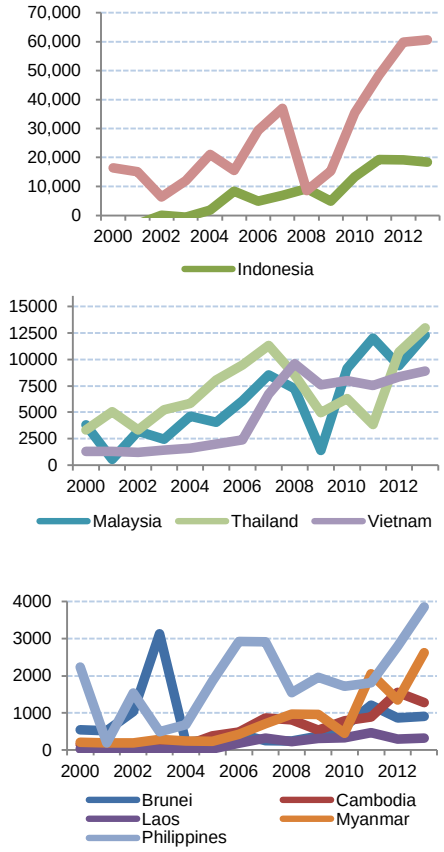
Figure 76 demonstrates that Intra-ASEAN inflows rose steadily since the 2009 Financial Crisis, but coincidence of MPAC implementation and global economic recovery requires that additional data be collected and econometric modeling be employed to isolate MPAC's role in the growth rate increase between 2009 and 2012.

Figure 76. Intra-ASEAN inflows by host country (US$ millions)



Source: ASEANStats, 2015

Figure 77. Intra-ASEAN inflows from world, select countries (US$ millions)



Total FDI inflows to the two highest recipient countries, Singapore and Indonesia, increased significantly between 2009 and 2011, with growth tapering thereafter. Similarly, Malaysia and Vietnam saw upturns in FDI growth in 2009 and 2011, respectively, but have not experienced the plateau in total inflows that Singapore and Indonesia have seen in the last recorded period. Vietnam's total inflows have stayed relatively stable since 2008, following a sharp increase from 2006 to 2008.

Amongst ASEAN Member States attracting lower FDI levels, Philippines has experienced the most growth during MPAC, with a notable upturn since 2011. The inception times of FDI upturns in Thailand, Philippines, and Myanmar occur after the period of crisis recovery, suggesting cautiously that MPAC has increased FDI to these countries.

In Summary

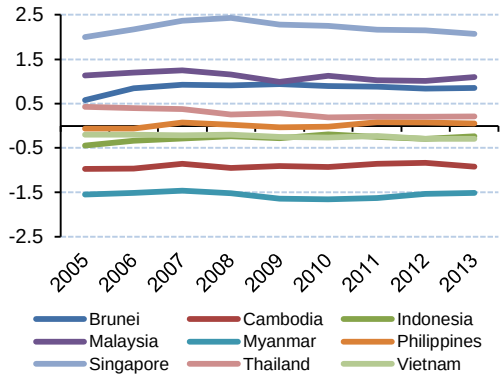
ASEAN continues to perform well in attracting FDI, with an increasing proportion of total FDI inflows originating from ASEAN. Since MPAC implementation, Thailand, Philippines, and Myanmar have experienced the most significant increases in their growth rates of FDI.

Strategy 10. Strengthen institutional capacity within the region and improve regional-sub-regional coordination of policies, programs, and projects

Measuring institutional capacity and the degree of regional coordination of MPAC policies, programs, and projects is an inevitably complex task for two reasons. For one, considering the diverse technical and bureaucratic inputs needed to effectively implement the many differentiated activities associated with each of the 19 MPAC strategies, it is difficult to define a set of measurable capacities that are both specific enough to MPAC to be meaningful, but general enough to apply to the governance and coordination of the MPAC program as a whole. Second, measuring regional-sub-regional coordination necessitates either activity-level assessment, which is not within the scope of this evaluation exercise, or MPAC-specific expert survey data, which is not currently part of the monitoring program.

Existing indicators such as the World Governance Indicators (WGI) measure of Government Effectiveness confirm that institutions and governance capacities tend to change slowly. Further, abstraction to the national level does little to describe the formulation, coordination, implementation, and evaluation capacities as they apply specifically to MPAC activities.

Figure 78. WGI score, Government Effectiveness



Source: World Governance Indicators, 2014

While strengthening institutional capacity in lagging areas is part of the MPAC institutional Connectivity Strategy 10, there is not currently a good quantitative indicator of institutional capacity specific enough to demonstrate change during the implementation period. Rather, ACCC could facilitate the collection of survey data from amongst implementing bodies associated with each MPAC key action on experiences related to the coordination of national, sub-regional, and regional Connectivity-related policies, and coordination between Member States. The ACCC could further take stock of the flow of technical assistance and training events or collaboration specifically geared to building bureaucratic capacity in relevant agencies.

In Summary

- Measuring institutional capacity and coordinating success with respect to MPAC activities requires utilization of qualitative data gathered at the project levels.

2.3 People to People Connectivity Performance

The MPAC recognizes Community-building and increased appreciation of the growing interrelatedness amongst the peoples of ASEAN as integral to physical and institutional Connectivity and regional integration. MPAC goals for people-to-people Connectivity center on initiatives that progress the intercultural and social aspects of ASEAN Community-building, including investments in education and human resources, programs that promote innovation and entrepreneurship across ASEAN, and tourism and cultural exchange. Priority MPAC projects include easing visa requirements to promote people mobility across the region, developing ASEAN education exchanges, strengthening Intra-ASEAN tourism, and developing skills amongst the peoples of ASEAN.

Strategy 1. Promote deeper intra-ASEAN social and cultural understanding

People-to-people strategy 1 is largely education-oriented and seeks to promote cultural and social exchange amongst the peoples of ASEAN via ASEAN-focused curricula, educational exchanges, virtual learning resource centers, ASEAN language programs, and ICT engagement across ASEAN borders. As such, proxy assessment of promoting deeper social ties is based on dispersion of students across the ASEAN region.

Indicator and Data Source

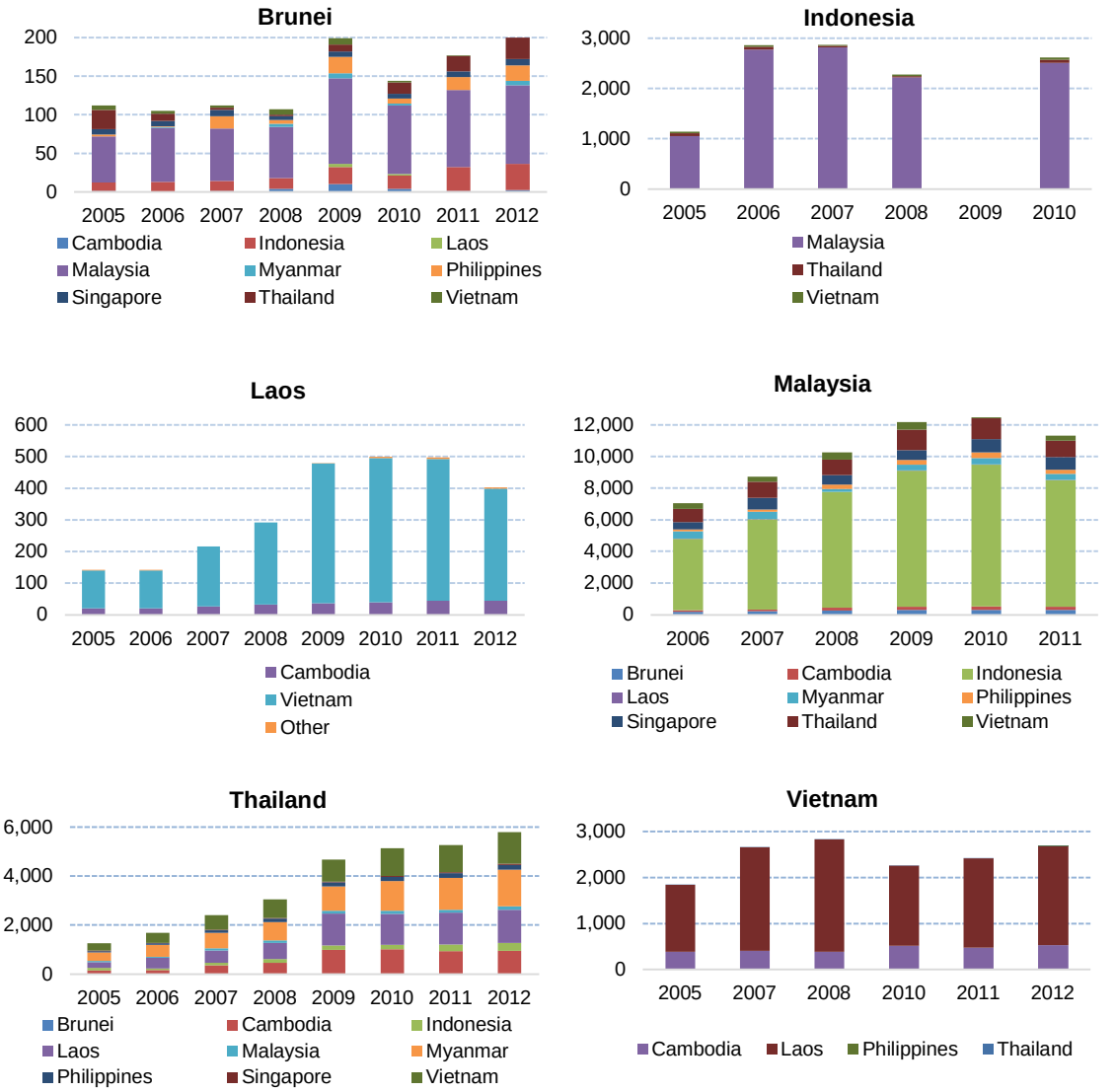
The indicator used to proxy deeper intra-ASEAN social and cultural understanding is the number of students from ASEAN countries enrolled in tertiary education programs in other ASEAN Member States for each year. Intra-ASEAN international student data comes from the UNESCO UIS databank, which includes data on international student flows up to 2012. The indicator, 'Inbound internationally mobile students' gives the headcount of students to a country, by country. Data is available for Brunei, Indonesia, Laos, Malaysia, Thailand, and Vietnam. Since records for many countries are only sporadically reported, however, it is difficult to generalize trends across ASEAN for all years. Moving forward, it would also be interesting to evaluate patterns in voice calls and data exchanges between ASEAN economic centers to measure the intensity of communication across the region.

Progress

The number of ASEAN international students studying abroad has increased for all reporting countries, though Indonesia, Laos, and Malaysia appear to have experienced slight declines

in international student participation in 2010 and 2011. Due to data discrepancies and missing observations, however, these declines may be reflective of reporting problems.

Figure 79. International students in ASEAN Member States



Source: UNESCO UIS, 2015

In Summary

- International student exchange and the matriculation of tertiary students throughout ASEAN remains a key and underutilized opportunity for building people-to-people Connectivity. In the early years of MPAC implementation, the amount of tertiary international students from with ASEAN did not appreciably increase, and in fact decreased in many States.
- Increased data is required to assess student mobility beyond 2012.

Strategy 2. Encourage greater intra-ASEAN people mobility

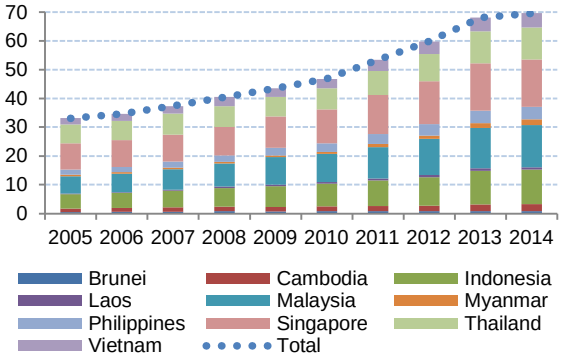
In addition to freeing the flow of goods, services, and capital, MPAC envisages and ASEAN where professional mobility is freed to allocate labor efficiently and promote regional tourism. Development of Intra-ASEAN tourism links to both ASEAN Community-building efforts as well as economic development of an important regional industry.

As for labor mobility, while data on bilateral labor flows is currently unavailable for ASEAN, there has been some noted progress with respect to increasing professional mobility. Member States have signed eight Mutual Recognition Arrangements for select professions, including engineering, architecture, accountancy, surveying, nursing, dental and medical practitioners, and tourism. Further, the ASEAN Agreement on the Movement of Natural Persons was signed in November 2012 to accelerate the movement of skilled professionals (ASEAN Secretariat and The World Bank 2013). To track labor mobility, it would be desirable to create an ASEAN dataset on bilateral labor flows. Example applications are works on social security and ASEAN migration (Pasadilla 2011) and the World Bank migration dataset (Ratha and Shaw 2007).

Indicator and Progress

As with Institutional Connectivity Strategy 3 (ASEAN Single Aviation Market), the growth of Intra-ASEAN tourism arrivals from 2005-2014 is used to proxy intra-regional tourism development. Intra-ASEAN arrivals have increased steadily, with growth noticeably increasing following MPAC implementation from pre-MPAC (2006-2010) year-over-year growth of an average 7.2% to a post-MPAC average of 10.5% between 2011 and 2014.

Figure 80. Annual air passenger capacity, Intra-ASEAN international arrivals (millions)



Source: DiiO database, World Bank, 2015

In Summary

- There has been good progress in increasing tourism flows in ASEAN, with the growth rate of Intra-ASEAN international passenger arrivals increasing following MPAC implementation from previous year-over-year growth of an average 7.2% between 2006-2010, to a post-MPAC average of 10.5% between 2011 and 2014.
- More data is required on international skilled and unskilled labor flows to assess this dimension of mobility.

PART II: Measuring MPAC Impacts on Connectivity and Growth

Chapter III. Modeling MPAC Impacts

This evaluation exercise recognizes that numerous demographic, economic, political, natural, and sociocultural factors can affect levels of physical, institutional, and people-to-people connectivity in any region. Indeed, regional policy and coordination are important structural factors determining ASEAN Connectivity, but some of the gains reported herein may be attributable to drivers outside of MPAC, including the market and other national and sub-national policies. Similarly, areas of limited gain may have otherwise worsened or stagnated in the absence of MPAC interventions. In other words, countervailing factors may be at work, especially related to outcomes such as increased trade or passenger flows.

Econometric and geo-economic modeling allows us to isolate the impacts of MPAC from the influences of other factors, including economic growth, market size, and geography, in patterns of economic growth and intra-ASEAN mobility. Additionally, modeling allows the examination of potential interactions amongst strategies and key actions of MPAC as they relate to economic growth and intra- and extra-regional trade patterns. The individual strategies of MPAC have important interactive and complementary effects that should be examined in tandem to understand both isolated and combined effects of strategies aimed at increasing Connectivity, trade, and economic growth.

As such, this chapter seeks to isolate and model the effects directly or indirectly attributable to MPAC strategies on goals of building an ASEAN Community, including those of economic growth, regional trade integration, and stronger global economic linkages. The models and results described in this chapter attend to MPAC's influence on macroeconomic factors such as trade, GDP, and human development indicators.

3.1 Geographical Simulation: MPAC Impacts on GRDP

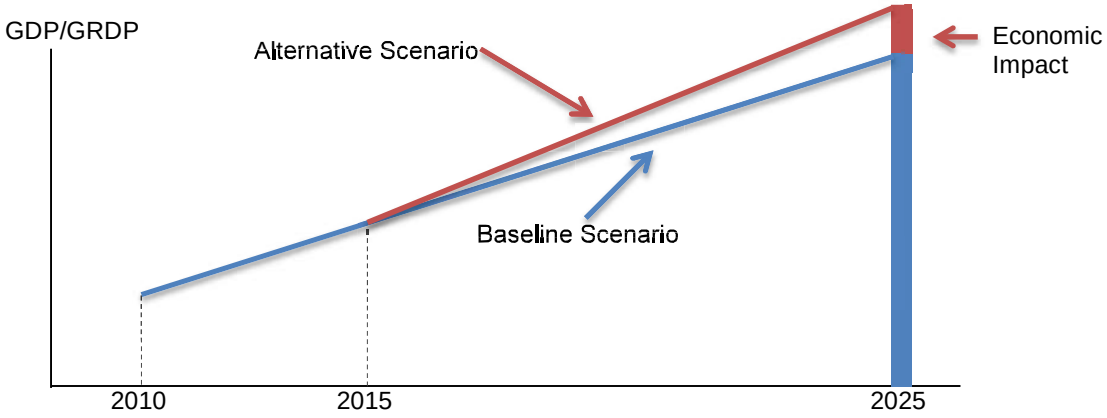
In this section, we present evidence that suggests ASEAN and its sub-regions should experience significant positive GDP impacts in 2025, derivative of key transportation and trade facilitation actions included in the MPAC. In order to demonstrate the impacts of MPAC on

economic growth, Geographical Simulation Models (GSM) attend to macro-level effects of select MPAC key actions on projected Gross Domestic Product (GDP) and Gross Regional Domestic Product (GRDP). Results show that, while individual strategies may have limited impacts at the national level, multiple strategies implemented in tandem have far more effect. In other words, positive interactions and complementarities may be leveraged when key actions are implemented in combination, with total effects that are significantly higher than the sum of the impacts of strategies implemented in isolation. Further, while overall ASEAN GDP impacts of some strategies are limited, the impacts on certain sub-regions are significant, pointing out important subnational considerations.

The Institute of Developing Economies (IDE-JETRO) has developed a Geographical Simulation Model (GSM), which expands on a model of new economic geography to incorporate both geographic and market factors, as well as additional realistic trade features such as such as multiple industrial sectors with intermediate inputs, a multimodal transport selection model, and the existence of tariff and non-tariff barriers (See Annex 6 for technical notes on the GSM model, including assumptions, formulae, and methodology). The IDE-GSM is one of a very few economic models that may be used to predict economic effects of transportation and trade integration measures at the sub-national level in East Asia.

The GSM predicts economic impacts of nine scenarios defined by MPAC projects or their combinations. The economic impacts are comparisons of projected GDP or Gross Regional Domestic Project (GRDP) between the baseline (minimal infrastructure development after 2010) and interventions based on implementation of MPAC key actions specified below in 2015. If the GRDP of a region under the scenario with specific trade and transport facilitation measures (TTFMs) is higher (lower) than that under the baseline scenario, this surplus (deficit) is the positive (negative) economic impact of the TTFM (Figure 81).

Figure 81. Economic impact, difference (absolute US$ value or %) between baseline and intervention scenarios



Intervention Scenarios

The intervention scenarios include seven MPAC-specific scenarios, as follows:

1. Upgrading Below Class III roads of the AHN (Myanmar);
2. Constructing two missing links of the ASEAN Highway Network (Myanmar);
3. Completing four missing links of the SKRL (Thailand, Cambodia, and Vietnam);
4. Implementing border facilitation measures (AFAFGIT, AFAMT, and AFAFIST), resulting in 50% reduction of time and cost of border clearance at 34 borders;
5. Developing roll-on / roll-off (RoRo) shipping routes;[27]
6. Liberalizing air transport (implementation of RIATS, ASEAN Open Sky, ASAM); and
7. Implementing all of the above in combination.

Additionally, the results from two supplementary interventions are modeled as follows:

S1. Increased connectivity between clusters (upgrading and constructing AHN missing links and improving border facilitation between Bangkok and Yangon);

S2. Increased connectivity between the Mekong region and India (connecting Dawei to Thailand and developing the Dawei deep sea port).

As such, this section compares geographically delimited impacts for physical strategies 1, 2, 4; institutional strategies 1, 3, 5, 7, and 8; and people-to-people strategy 2. The models are spatially dependent and multi-sectorial, allowing for simulation of impacts on GDP/GRDP, taking into consideration economic and sectorial factors, the locations of interventions, and iterative impacts on trade patterns, trade costs, urban agglomeration, and labor movement.

[27] These include seven routes amongst Philippines, Indonesia, Brunei, Malaysia, and Thailand.

Geographically delimited impacts are presented for projected impacts on 710 ASEAN regions at the sub-national level. The administrative unit is one below the national level for Cambodia, Laos Malaysia, Philippines, Thailand, and Vietnam, and two levels below national for Indonesia and Myanmar. Brunei and Singapore are treated as one unit, respectively.

In the figures below, red regions will experience positive impacts, and blue regions negative impacts. A criterion of "impact density" is applied, derived by dividing a GRDP difference between the baseline and development scenarios by the region's land size. The deeper color a region has, the higher impact one square kilometer of land of the region will experience with a given scenario.

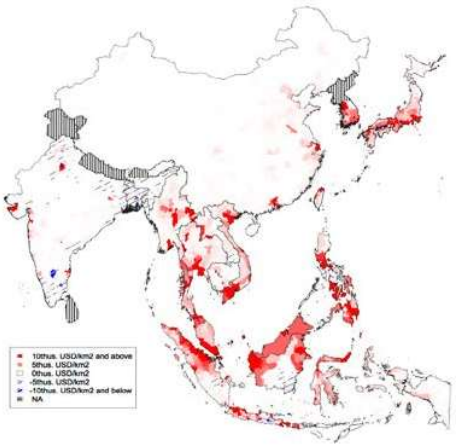
Scenario 1. All MPAC Projects

The results demonstrate that the MPAC activities implemented in tandem have the most significant effects, with a positive economic impact greater than the sum of impacts of the six MPAC strategies implemented in isolation.[28] In the 'All MPAC Projects' scenario below, ASEAN will have a 0.35% increment of GDP in 2025 compared with the baseline scenario without non-tariff barrier (NTB) reduction, and a 0.80% increment with NTB reduction. Given that current trend of economic growth is already incorporated in the baseline scenario, a result of nearly a 1% GDP increment from the baseline scenario is considerable.

Further, while these results may appear meager upon first glance, consideration of the size of regional GDP and the likely costs of MPAC projects reveals quite a large economic impact. For example, if ASEAN GDP were to grow at the 5.7% growth rate experienced in 2012 over the next ten years, a projected 0.80% positive impact in 2025 would be on the scale of an additional approximately US$38 billion for that year alone. The present value of that difference would be $22.2 billion – again, for 2025 alone. Summing projected incremental benefits for the years prior to and following 2025 and comparing these to the costs of MPAC projects would yield high net present value calculations.

[28] The sum of isolated MPAC impacts is .32%.

Figure 82. Economic impacts 'All MPAC ' on GRDP/GDP in 2025 with NTB reduction (impact density, US$ per km2)



Country	Impact on GDP (%)	
	Without NTB reduction	With NTB reduction
Brunei	1.38%	1.44%
Cambodia	0.09%	0.27%
Indonesia	0.40%	0.80%
Laos	1.09%	1.27%
Malaysia	0.35%	0.43%
Myanmar	1.00%	1.20%
Philippines	0.28%	0.78%
Singapore	0.33%	0.38%
Thailand	0.13%	1.15%
Vietnam	0.23%	1.12%
ASEAN	**0.35%**	**0.80%**

Source: JETRO IDE-GSM simulation results

The following figure illustrates the economic GRDP impacts by percentage. Whereas impacts measured by impact density demonstrate in which regions absolute impacts are experienced, the percentage change of each region from the baseline scenario shows which regions will experience higher economic growth. Results show that remote areas from the capital cities will generally have higher positive percentage impacts.

In particular, border cities in Myanmar and Laos and some regions in Kalimantan, Sulawesi, Maluku and North Maluku will experience higher economic growth. This suggests that MPAC projects will particularly benefit border areas and islands. In contrast to the figure above, economic impacts on countries outside of ASEAN are negligible as expressed in percentage changes, implying that the MPAC projects combined mainly contribute to ASEAN growth.

Figure 83. 'All MPAC Projects' economic impact on GRDP in 2025, with NTB reduction (%)

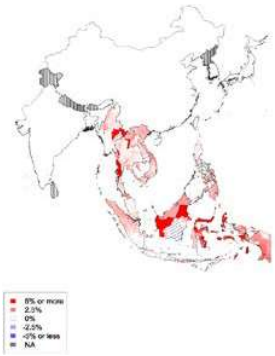
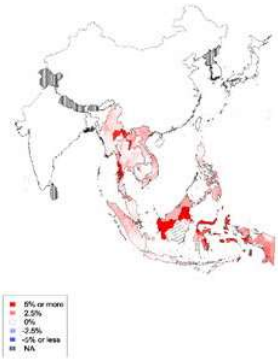
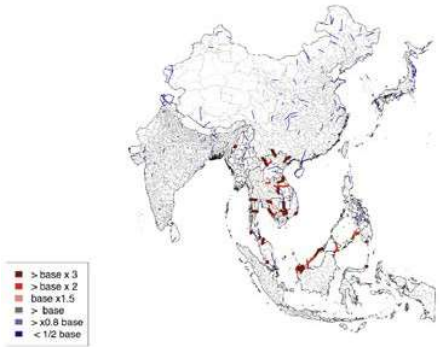


Figure 84. 'All MPAC Projects' economic impact on per capita GRDP, with NTB reduction (%)



The results for GRDP per capita growth are almost the same, but an interesting point is that the number of regions with positive per capita GRDP impacts is higher: of the 710 ASEAN

Figure 85. Traffic changes in 2025 due to 'All MPAC Projects', base



Source: JETRO IDE-GSM Simulation Results

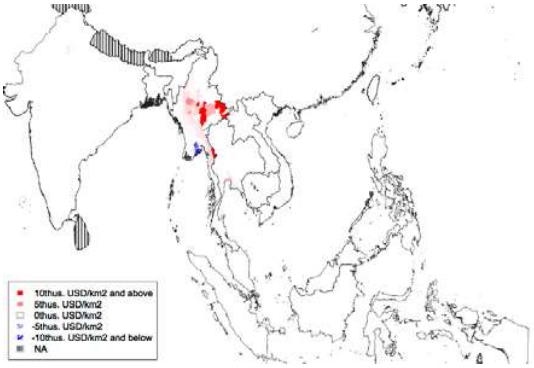
regions in the simulation, 637 have positive GRDP impacts and 664 have positive impacts on GRDP per capita. For example, Salavan, Laos, which is located south of Savarnakhet, will have a -0.22% of negative impact on GRDP and 0.15% of positive impact on GRDP per capita. This important finding demonstrates the importance of examining local dynamics and implies that, while some regions may experience negative impacts due to outflow of firms and households, the households that remain will be better off with improved Connectivity.

The 'All MPAC Projects' scenario also suggests that border transactions will intensify particularly in the Mekong region, with especially high growth in links between Thailand and Vietnam via Laos. Further, the Borneo Indonesia-Malaysia-Brunei links will experience high traffic growth.

Scenario 2. Upgrading Below Class III Roads

This section examines the impact of completing AHN upgrading projects not yet completed as of 2014, with completed projects incorporated in the baseline. This refers to upgrading Below Class III sections on TTRs in Myanmar, bringing average travel speed to 38.5 km/hr. Results show that Myanmar is the sole beneficiary, and that Yangon will actually experience some negative impacts as access to remote areas improves. This will reduce the number of firms and households moving into the Yangon over time. This does not mean that Yangon will experience negative growth, but that growth would be lower than the baseline rate.

Figure 86. Economic impact of upgrading Below Class III roads on GRDP / GDP (impact density, US$ per km^2)

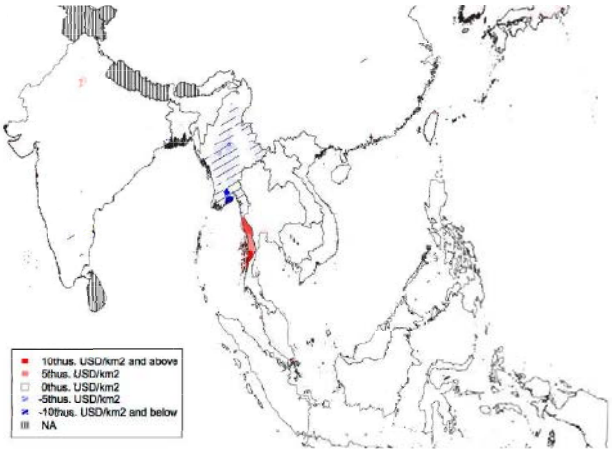


Country	Impact on GDP (%)
Brunei	0.00%
Cambodia	0.00%
Indonesia	0.00%
Laos	0.00%
Malaysia	0.00%
Myanmar	0.85%
Philippines	0.00%
Singapore	0.00%
Thailand	0.00%
Vietnam	0.00%
ASEAN	**0.03%**

Scenario 3. Developing Missing Links of AHN

Developing the 60-km AHN-112 link from Lehnya to Khongloy and the 141 km AHN-123 section from Dawei to Maesamee Pass also confers positive effects on Myanmar, with magnitudes smaller than road upgrading. The results demonstrate some shifts in economic activities within Myanmar from northern to southern regions due to better connectivity between Thailand and the Tanintharyi region (including Dawei, Lhnya, and Khongloy). The positive impacts coming from Tanintharyi region will be offset by some negative impacts in northern regions.

Figure 87. Economic impact of developing AHN missing links on GRDP / GDP (impact density, US$ per km^2)

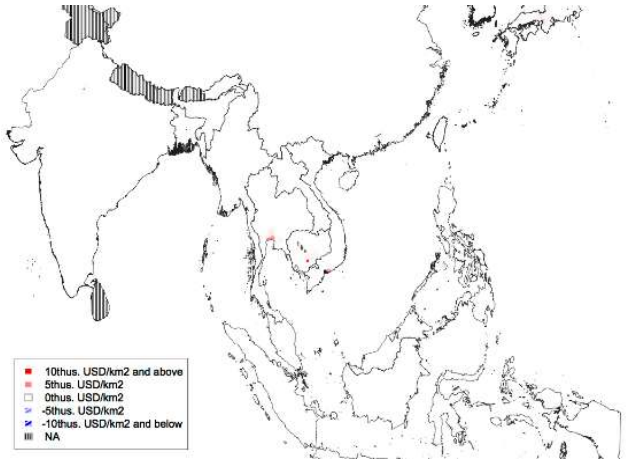


Scenario 4. Developing Missing Links of Singapore-Kunming Rail Link

This scenario focuses on the development of the SKRL links as follows: Aranyaprathet – Klongluk (Thailand) (6km) in 2015; Poipet – Sisophon (Cambodia) (48km) in 2015; Phnom Penh – Loc Ninh (Cambodia) (255km) in 2015; and Loc Ninh – Ho Chi Minh City (Vietnam) (129 km) in 2020.

While magnitudes are modest, Thailand, Cambodia and Vietnam will have some positive impacts. It is reasonable that developing specific sections of SKRL will not significantly affect firms and households in Singapore or Kunming, because most would not use the new sections developed in Cambodia and Vietnam (i.e., almost no firms in Singapore would use SKRL to export products to Kunming, even if directly connected by SKRL). In addition, economic gains of positively affected areas are too small for Singapore or Kunming to substantially increase the trade volume with the affected areas.

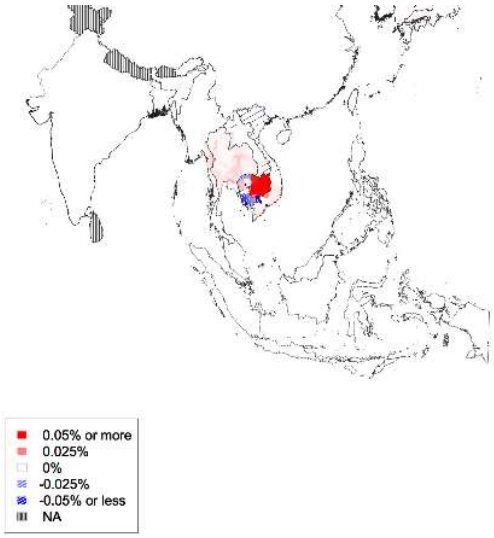
Figure 88. Economic impacts of SKRL missing links (impact density US$ per km2)



Country	Impact on GDP (%)
Brunei	0.00%
Cambodia	0.04%
Indonesia	0.00%
Laos	0.00%
Malaysia	0.00%
Myanmar	0.00%
Philippines	0.00%
Singapore	0.00%
Thailand	0.00%
Vietnam	0.00%
ASEAN	**0.00%**

Nevertheless, percentage impacts on GRDP demonstrate some impact on Cambodia. Northeastern regions of the country will be positively affected, implying that, while minimal, SKRL may have a positive affect on narrowing development gaps in poorer regions. The positive impacts in Samut Prakan, Thailand and Osaka, Japan, also suggest that some economic activities along value chains in the textile and garment industry will be stimulated.

Figure 89. Economic impacts of SKRL missing links on GRDP (%)

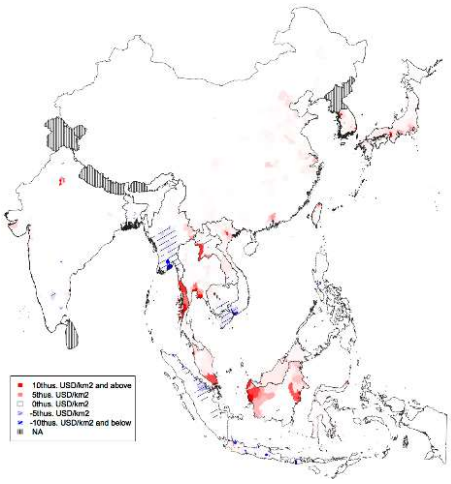


Scenario 5. Border Facilitation

The effects of border facilitation assume that implementation of AFAFGIT, AFAFIST and AFAMT, will contribute to 50% reductions in the time and costs of transiting across 34 ASEAN borders. Many ASEAN countries and border regions demonstrate positive impacts. Laos will

be the largest beneficiary, as the landlocked country requires improved Connectivity surrounding countries. Bangkok and its environs also demonstrate large positive impacts, as trade facilitation measures will encourage firms in Greater Bangkok area to buy parts and components from neighboring countries.

Figure 90. Economic impact of border facilitation on GRDP/GDP (impact density, US$ per km^2)



Country	Impact on GDP (%)
Brunei	0.04%
Cambodia	-0.03%
Indonesia	0.07%
Laos	0.80%
Malaysia	0.05%
Myanmar	0.11%
Philippines	0.00%
Singapore	0.06%
Thailand	0.05%
Vietnam	-0.01%
ASEAN	**0.05%**

It is worth noting that much of Cambodia could experience a negative impact. Border facilitation along the Southern Economic Corridor is predicted to foster a shift of economic activities from Phnom Penh to regions bordering Thailand and Vietnam, which may reduce national GDP as agglomeration in Phnom Penh is reduced. Nevertheless, it will also narrow development gaps within the country.

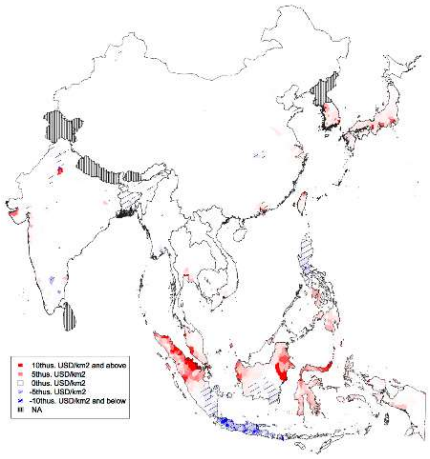
Further, border facilitation may worsen the economic outlook for automotive and electronics industries in Cambodia, which will face increasing competition as households can more easily purchase from Thailand and Vietnam. It is, thus, important for Cambodia to couple better trade connectivity with increased technological capacity and competitiveness. A strategic combination of border facilitation, road development (especially National Roads 5 and 1), SEZ development, and technical improvement is necessary to achieve higher economic growth and narrower development gaps in Cambodia (ERIA 2014).

Scenario 6. Developing RoRo Routes

The development of RoRo routes will contribute most to North Sumatra, and some parts of Kalimantan, Sulawesi, southern Philippines and peninsular Malaysia. Northern Philippines and Java, on the other hand, will experience negative impacts. The results in Indonesia and the Philippines demonstrate how GDP impacts at the national level may be very different from

local impacts. While Indonesia experiences the most positive overall impact, for instance, many regions in Java would experience the most negative impacts.

Figure 91. Economic impacts of RoRo (impact density, US$ per km²)

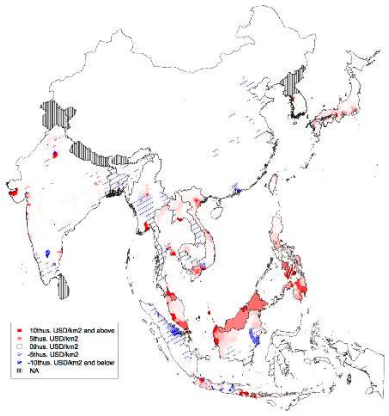


Country	Impact on GDP (%)
Brunei	0.05%
Cambodia	0.00%
Indonesia	0.11%
Laos	0.00%
Malaysia	0.04%
Myanmar	0.00%
Philippines	-0.03%
Singapore	0.05%
Thailand	0.01%
Vietnam	0.00%
ASEAN	**0.05%**

Scenario 7. Air Transport Liberalization

Simulation of air transport liberalization effects assumes 50% reductions in passenger airfares and per kilometer cargo costs. The impacts on GRDP / GDP show a clear tendency of higher impacts for capital cities and economic centers, implying better accessibility for firms and households in urban areas. The economic impacts on national GDP are also the highest, by a significant amount, of any of the MPAC project impacts simulated individually.

Figure 92. Economic impacts of upgrading air transport (impact density, US$ per km2)



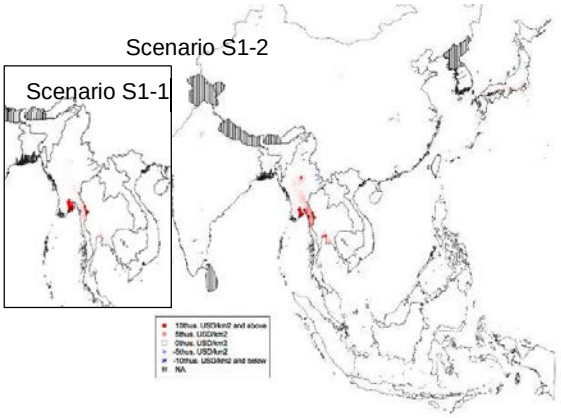
Country	Impact on GDP (%)
Brunei	1.30%
Cambodia	0.05%
Indonesia	0.17%
Laos	0.34%
Malaysia	0.26%
Myanmar	0.05%
Philippines	0.32%
Singapore	0.24%
Thailand	0.07%
Vietnam	0.23%
ASEAN	**0.19%**

The following two sections report results from supplemental scenarios that simulate interventions that relate to ASEAN Connectivity but are not MPAC prioritized projects, and were thus not included in the 'All MPAC Projects' simulation.

Supplement Scenario 1: Connecting Existing and Emerging Clusters

This scenario examines the importance of connecting existing and emerging clusters, such as Bangkok and Yangon. It is a subset of the AHN development scenario, more specific to the land linkages between the two urban agglomerations. There are two variations: in scenario S1-1, only the 195 km Below Class III section between Thaton and Myawaddy (part of the Bangkok-Yangon link) is developed, increasing average travel speed to 38.5 km/hr. In scenario S1-2, the 440 km section between Mae Sot and Yangon is developed, decreasing travel time between Yangon and the border (increasing average speed to 60 km/hr) and facilitating improved border transit (reduced time and cost, as in scenario 4 above).

Figure 93. Economic impacts of upgrading AHN between Mae Sot and Yangon on GRDP / GDP (impact density, US$ per km^2)



Country	Impact on GDP (%)	
	S1-1	S1-2
Brunei	0.00%	0.01%
Cambodia	0.00%	0.00%
Indonesia	0.00%	0.00%
Laos	0.00%	0.00%
Malaysia	0.00%	0.00%
Myanmar	0.07%	0.33%
Philippines	0.00%	0.00%
Singapore	0.00%	0.00%
Thailand	0.00%	0.01%
Vietnam	0.00%	0.00%
ASEAN	**0.00%**	**0.01%**

Myanmar would have much larger economic impacts under Scenario S1-2 than Scenario S1-1, with positive impacts extending to many regions. Samut Prakan and other provinces surrounding Bangkok would also experience larger positive impacts with better connectivity with Myanmar, suggesting that improved land transit connectivity along the Bangkok-Yangon route would benefit both Thailand and Myanmar.

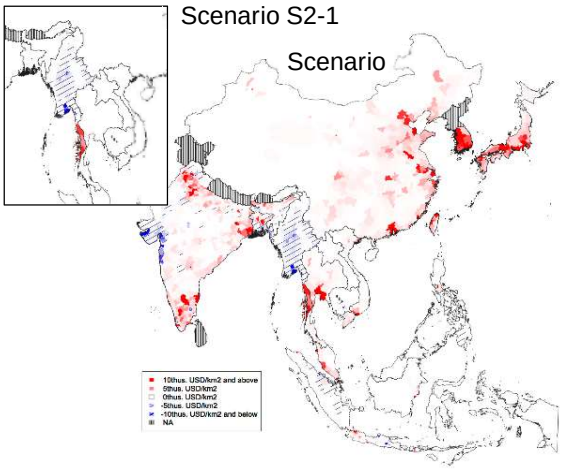
Supplement Scenario 2: Connecting the Mekong Region to India

The second supplemental scenario simulates improved linkages between the Mekong region and India, also with two variations. Scenario S2-1 improves connectivity between Dawei and Maesame Pass by developing the AH123 (141 km) missing link as well as a new 211 km link between Dawei and Kanchanaburi. In S2-2, Kanchanaburi is linked to India via the Dawei Deep Seaport. This scenario extends the first, including the same upgrades and new road linking Dawei and Kanchanaburi (211km), with an average speed of 60km/h, as well as

developing the Dawei Deep Seaport and SEZ in 2020 and establishing sea routes between Dawei and Chennai, Kolkata, and Visakhapatnam, India and Colombo, Sri Lanka.

The economic impacts of Scenario S2-2 are very different from that of S2-1. The limited S2-1 scenario contributes to economic activities in southern Myanmar, but impacts are offset by outflow of firms and households from northern Myanmar. Other countries experience almost no impacts. On the other hand, connecting Dawei to India and Sri Lanka port by port development and sea routes will make it possible for firms to transit more directly between Thailand, Laos, Cambodia and Vietnam to India and Bangladesh, circumventing the Strait of Malacca. This will have significant economic growth impacts in those regions and also benefits other countries including China, Japan, Korea, Malaysia, and Singapore.

Figure 94. Economic impacts of connecting Mekong region to India on GRDP / GDP (impact density, US$ per km^2)



Country	Impact on GDP (%)	
	S2-1	S2-2
Brunei	0.00%	0.04%
Cambodia	0.00%	-0.02%
Indonesia	0.00%	0.01%
Laos	0.00%	0.00%
Malaysia	0.00%	0.03%
Myanmar	0.01%	0.57%
Philippines	0.00%	0.01%
Singapore	0.00%	0.03%
Thailand	0.00%	0.26%
Vietnam	0.00%	0.05%
ASEAN	**0.00%**	**0.07%**

This figure suggests that developing the Dawei port is not alone enough to generate positive economic impacts for Myanmar. Rather, Myanmar must pursue a more integrated connectivity program, including domestic connectivity, development of the SEZ, and enhancement of technical capacity to achieve higher economic growth and narrower development gaps. These measures are also key to extract the maximized benefit from the Dawei project. As presented in Isono and Kumagai (2013), Myanmar could benefit significantly from a combination of regulatory reforms, industrial development in Yangon and Mandalay, development of domestic economic corridors along major national roads that connect to surrounding countries, and development of the Dawei Deep Seaport with better integration with Thailand.

Table 10. Comparing Scenario Impacts

								All-MPAC					
	Upgrading AHN	AHN Missing Links	SKRL	Border Facilitation	RoRo	Air Transport	Sum	Without NTB reduction	With NTB reduction	S1-1	S1-2	S2-1	S2-2
Brunei	0.00%	0.01%	0.00%	0.04%	0.05%	**1.30%**	**1.40%**	**1.38%**	**1.44%**	0.00%	0.01%	0.00%	0.04%
Cambodia	0.00%	0.00%	0.04%	-0.03%	0.00%	0.05%	0.06%	0.09%	**0.27%**	0.00%	0.00%	0.00%	-0.02%
Indonesia	0.00%	0.00%	0.00%	0.07%	0.11%	0.17%	**0.35%**	**0.40%**	**0.80%**	0.00%	0.00%	0.00%	0.01%
Laos	0.00%	0.00%	0.00%	**0.80%**	0.00%	**0.34%**	**1.14%**	**1.09%**	**1.27%**	0.00%	0.00%	0.00%	0.00%
Malaysia	0.00%	0.00%	0.00%	0.05%	0.04%	**0.26%**	**0.35%**	**0.35%**	**0.43%**	0.00%	0.00%	0.00%	0.03%
Myanmar	**0.85%**	0.02%	0.00%	0.11%	0.00%	0.05%	**1.03%**	**1.00%**	**1.20%**	0.07%	**0.33%**	0.01%	**0.57%**
Philippines	0.00%	0.00%	0.00%	0.00%	-0.03%	0.32%	**0.29%**	**0.28%**	**0.78%**	0.00%	0.00%	0.00%	0.01%
Singapore	0.00%	0.00%	0.00%	0.06%	0.05%	0.24%	**0.35%**	**0.33%**	**0.38%**	0.00%	0.00%	0.00%	0.03%
Thailand	0.00%	0.00%	0.00%	0.05%	0.01%	0.07%	0.13%	0.13%	**1.15%**	0.00%	0.01%	0.00%	**0.26%**
Vietnam	0.00%	0.00%	0.00%	-0.01%	0.00%	0.23%	0.22%	0.23%	**1.12%**	0.00%	0.00%	0.00%	0.05%
ASEAN	0.03%	0.00%	0.00%	0.05%	0.05%	0.19%	**0.32%**	**0.35%**	**0.80%**	0.00%	0.01%	0.00%	0.07%

Results with impacts of 0.25% or higher are presented in in bold font.

Policy Implications of GSM Analysis

The GSM analysis demonstrates that all MPAC Connectivity projects will bring positive impacts to ASEAN. Regions connected with upgraded roads and new RoRo routes have positive economic impacts as compared to the baseline scenario, but the geographic distribution and relative intensity of impacts is differentiated. For example, AHN development (including upgrading and completion of missing links) benefits limited regions along the route sections in Myanmar, whereas Yangon would experience some negative impacts, and impacts on other countries are negligible.

Second, there are important differences in projects' economic impacts, which present policy tradeoffs. Some projects contribute to higher national economic growth, whereas others narrow development gaps by benefiting poorer regions, but without affecting growth for the country overall. For example, in Scenario 4, improved border facilitation brings positive impacts to Cambodian provinces near Thailand, while the national impact on GDP is negative. This supports the strategic combination of projects that generate higher economic growth with projects that reduce development gaps – a notion supported by the relatively high positive results of the 'All MPAC Projects' scenario. The All-MPAC scenario yields results of a .35-.8% impact as compared to a .29% impact calculated by summing the six interventions in isolation.

The potential to leverage project complementarities is also supported by comparing supplemental strategies S1-1 and S1-2. In scenario S1-1, upgrading Below Class III roads between Myawaddy and Thaton brings a 19.01% positive impact on Myawaddy, while GDP impact is only 0.07%. With S1-2, on the other hand, upgrading a longer section between Myawaddy and Yangon would increase the GDP impact to 0.33%, and Myawaddy would enjoy a 24.53% positive impact.

These examples focus attention on developing multimodal transport (physical Connectivity Strategy 5) and increasing institutional and coordination capacity across sectors and governments (institutional Connectivity Strategy 10) to take advantage of complementarities between projects. Further, they encourage attention to a fuller suite of domestic and sub-regional transport infrastructure projects and initiatives amenable to synergistic coupling. Strategic combination of national projects, such as expressway construction between domestic cities; local projects, such as toll-way construction and provision of mass transit transport in urban areas; and international trade projects, such as upgrading of gateway ports, could capture complementary effects.

Third, regional impact disparities require that policy makers consider the local experiences of alternative interventions and engage in policy debate where tradeoffs exist between national economic growth and equitable development. With each of the interventions, there will inevitably be some 'winners' and 'losers' with respect to economic impacts. Again, however, the negative impacts presented are not equal to negative growth – the outlook of high growth for ASEAN will only be counteracted in part where negative growth impacts are reported.

Finally, there are critical cluster-to-cluster links that could have large impacts on ASEAN as a whole. Comparison of scenarios S2-1 and S2-2 suggests, for example, that the Dawei Deep Seaport project coupled with development of an SEZ and link with Thailand would bring huge positive impacts to the Mekong region. Simulation results imply that regional funding initiatives should pursue those critical infrastructure projects, since Japan, China, Korea, and India would also be beneficiaries of the Dawei project.

Further, key projects to connect ASEAN Member States and surrounding regions should be considered to complement current MPAC prioritized projects. Referring to Scenario S2-1, the results show that the isolated economic impact of connecting Kanchanaburi and Dawei by road brings a 0.01% impact on Myanmar's GDP and very limited on ASEAN. Conversely, impacts on Myanmar and ASEAN GDP can be increased to 0.57% and 0.07%, respectively, if the road project is combined with Dawei Deep Seaport development, Dawei SEZ development, and border facilitation between Kanchanaburi and Dawei. In other words, he higher economic impact of Scenario S2-2 on ASEAN depends on better Connectivity with surrounding countries.

In Summary

- Interventions, in combination, have greater effects (.80%) than the sum of the impacts when modeled in isolation (.32%).
- The introduction of trade facilitation measures that reduce non-tariff barriers brings the all-MPAC impact from .35% to.80%.
- The models in isolation suggest, however, that the most impactful interventions on economic growth for the region are border facilitation and development of maritime and air transport.
- Economic impacts of the AHN are limited to moderate impact on Myanmar and Brunei, whereas SKRL would benefit Cambodia only.
- Patterns of impact are differentiated at the local level, revealing important policy tradeoffs between national economic growth and equitable development.

3.2 Gravity Models of Trade and Travel

In this section, we utilize gravity models to examine the impacts of MPAC strategies and policies on trade and passenger flows amongst ASEAN Member States. Based on Newton's law for the gravitational force between two objects, expressed as a function of mass and distance, gravity models of international trade are similarly useful to explain the volumes of goods and capital traded between countries. Gravity models are widely used because they reliably explain much of the trade 'pull and push' between countries as functions of (a) size (in terms of economy, population, or both), (b) distance (geographical and/or cultural), and (c) trade factors (including laws, infrastructures, etc.). First introduced to model trade flows (Tinbergen 1962), gravity models have been expanded to include policy, social, and business factors and applied to analyze immigration (Lewer and Van den Berg 2008, Karemera, Oguledo, and Davis 2000) and passenger flows (Grosche, Rothlauf, and Heinzl 2007, Matsumoto 2004). In this section, we discuss the results of gravity model analysis of trade in goods and air passenger flows within ASEAN. Results demonstrate that MPAC component policies and strategies are positively significant to increased trade and air travel.

Gravity Model of Trade

Technical notes explaining the gravity model of trade are found in Annex 7. In summary, the model estimates a function to explain the flow of goods between any two Member States, based on underlying trade data (imports or exports) and additional trade-related variables, depending on the context. The basic equation explains the annual flow of exports from one country to another (US$) as a function of (1) the importer's and exporter's GDP and (2) the economic distance between them. The equation can be expanded, however, to control for a number of factors from that particular context that may affect the flows, such as shared language, contiguity (shared border), and institutional or trade-related variables of interest. It is the latter set of explanatory variables that is the focus of our analysis.

The gravity model equation may be generally expressed as

$$\ln E_{ij} = \alpha + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \beta_3 \ln D_{ij} + \beta_4 Contig_{ij} + \beta_5 Continent_{ij} + \beta_6 TradeFactor_{1i} + \beta_7 TradeFactor_{1j} + \ldots + \beta_r TradeFactor_{ni} + \beta_s TradeFactor_{nj}$$

where E_{ij} is the flow of exports from country i to country j, α is a constant term, $\ln GDP_i$ is the log GDP of the exporter i, $\ln GDP_j$ is the log GDP of the importer j, $\ln D_{ij}$ is the log distance between the two countries' capital cities, $Contig_{ij}$ is a dummy variable for contiguity, and $Continent_{ij}$ is a dummy variable for both partners' continental locus (i.e, not island states).

The cross-sectional model employs data from 2006 to 2013. The *TradeFactor* variables represent a number of policy, institutional, and contextual variables that potentially affect trade volumes between countries. In our analysis, these are of highest interest, as they represent importers' and exporters' performances with respect to border management and logistics and, thus, link directly to MPAC strategies. These variables include Logistics Performance Index scores, *Doing Business* "Trading Across Borders, Distance to the Frontier" scores, and the number of days to export/import. By controlling for these factors, we indirectly infer whether MPAC strategies are significant to trade.

Early modeling employed a binomial MPAC dummy (=0 in 2010 and before, =1 in 2011 onwards), which was not observably significant to trade. This is not surprising, as the broad dummy variable is too unspecific and captures many other potential factors besides MPAC implementation, rendering it unusable to isolate the combined effects of MPAC overall. We do not have sufficient activity-level data to model MPAC's direct effects on measures of improved trade facilitation; nevertheless, we can indirectly test MPAC by examining whether component goals – the policy sub-components that attend to logistics performance and border management – are, indeed, relevant. The results below confirm their significance and, thus, validate the trade facilitation and logistics efforts of MPAC.

Results below reveal that, in addition to the significance of economy size, distance, and contiguity, the number of days to export, trading across borders scores, and Logistics Performance Index scores are also significant.

Table 11. Regression Results: Gravity Model of Intra-ASEAN Trade (Exports)

	(1)	(2)	(3)	(4)	(5)
ln_gdp_exp	1.871***	1.778***	1.740***	1.657***	1.629***
ln_gdp_imp	1.414***	1.420***	1.414***	1.317***	1.142***
ln_dist	-1.005***	-0.968***	-1.035***	-0.875***	-0.320
contig	1.413***	1.441***	1.291***	0.030***	2.120***
continent	1.395***	1.455***	1.552***	1.616***	1.310***
days_export	-	-0.028**	-0.029**	-	-
days_import	-	-	0.001	-	-
dtf_exp	-	-	-	0.030***	-
dtf_imp	-	-	-	0.012**	-
lpi_exp	-	-	-	-	1.180***
lpi_imp	-	-	-	-	0.868***
constant	-25.608***	-24.608***	-23.568***	-26.370***	-31.395***
Observations	779	630	568	568	568
R^2	.792	.802	.802	.808	.811

**p < .10; **p <= .05; ***p <= .01*

The results in Table 11 demonstrate that every reduction of one day in the time required export goods increases the volume of exports by 2.9%. A one-point improvement in the exporter's *Doing Business* 'Trading Across Frontiers' score, on average, increases exports by 3%, whereas a one-point improvement to the importer's score increases the volume by 1.2%. The Logistics Performance Index (LPI) scores also have high estimated impacts on expected trade volume. By the model's outputs, an exporter's one-point improvement on the 5-point scale would translate, on average, to a 118% increase in export volume, whereas a one-point importer improvement would translate to an 87% increase. Results should be interpreted cautiously, however, as correlation amongst variables affects the robustness of the estimates; nevertheless, the positive significance of logistics performance can be confidently accepted.

Whilst these measures do not directly reflect the role of MPAC on trade, we can use them to validate the strategies employed by MPAC. Further, we can indirectly observe the influence of MPAC on trade dynamics through the variable by comparing results pre- and post-MPAC, particularly related to the variables *dtf_exp, dtf_imp,* and *days_export*. Following MPAC, trade volumes become more sensitive to trading partners' border management and international trade scores, implying that increased integration eases the way for geographic substitution of goods. In other words, the sensitivity of trade volumes to institutional trading factors has increased. Thus, countries must become increasingly competitive with respect to their trade regimes.

Table 12. Comparing Results: Gravity Models of Intra-ASEAN Trade, Pre- and Post-MPAC

	(1)		(2)	
	Pre-MPAC (MPAC dummy=0)	**Post-MPAC (MPAC dummy=1)**	**Pre-MPAC (MPAC dummy=0)**	**Post-MPAC (MPAC dummy=1)**
ln_gdp_exp	1.779***	1.680***	1.709***	1.548***
ln_gdp_imp	1.444***	1.526***	1.304***	1.302***
ln_dist	-0.941***	-0.961***	-0.880***	-0.676***
contig	1.394**	1.634***	1.326***	1.826***
continent	1.484***	1.392***	1.686***	1.578***
days_export	-0.033**	-0.079***	-	-
dtf_exp	-	-	0.027***	0.059***
dtf_imp	-	-	0.014**	0.033***
constant	-24.572***	-24.480***	-23.568***	-26.370***
Observations	382	248	336	232
R^2	.819	.823	.827	.827

**p < .10; **p <= .05; ***p <= .01*

The increasing coefficient for *contig* between the two time periods also suggests that improved land border management has increased the trade volumes between contiguous ASEAN Member States, and that proximity is increasingly important to volumes as the ease of transitioning land borders improves. Whereas contiguity would increase trade by 133-139%

prior to MPAC, a shared border increases expected trade by 163-183% post-MPAC. This suggests that border management has improved sufficiently to make a marked difference in easing trade across borders.

Gravity Model of Air Passenger Flows

One of the richest data sets available, specific to flows between ASEAN Member States, is the flow of Intra-ASEAN air passengers, drawn from the DiiO Aviation Intelligence database. We draw on this data set, from the years 2006 to 2013, to determine the influence of air liberalization policies associated with MPAC, i.e., the ASEAN Single Air Market (ASAM) measures that grant signatory States certain 'freedoms of the air' to operate air services. More specifically, we examine the influence of the Multilateral Agreement on Air Services (MAAS), the Multilateral Agreement on the Full Liberalisation of Passenger Air Services (MAFLPAS), and the granting of third freedom rights via other liberalization agreements (e.g., between CLMV, Brunei-Thailand-Singapore, and Singapore-Malaysia).

The gravity models of air passenger flows are similar to the model specified above for trade, but with a dependent variable ln $P_{ij,}$ the log of the bilateral annual flow of air passengers between two countries *i* and *j*. The formula is as follows:

$$\ln P_{ij} = \alpha + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \beta_3 \ln D_{ij} + \beta_4 Contig_{ij} + \beta_5 AirLib_{1ij} + \ldots + \beta_r AirLib_{nij}$$

where P_{ij} is the flow of passengers from country *i* to country *j*, α is a constant term, $\ln GDP_i$ is the log GDP of the origin country *i*, $\ln GDP_j$ is the log GDP of the destination country *j*, ln D_{ij} is the log physical distance between the two countries' capital cities, and $Contig_{ij}$ is a dummy variable for contiguity. The *AirLib* variables represent a number of air liberalization agreements between countries. These variables include three dummy variables: *maas, freedom,* and *freedom2,* described as follows:

maas	Dummy variable =1 if exporter and importer have both ratified MAAS (=0 for all countries before 2010; =1 for all countries, except Indonesia and Philippines in 2010 and later)
freedom	Dummy variable =1 if exporter and importer granted 3rd and 4th freedom rights via MAAS or through other bilateral agreements (=0 for all until 2004; =1 for travel amongst Laos, Vietnam, and Myanmar in 2004 and later; =1 for travel amongst Brunei, Thailand, and Singapore in 2005 and later; =1 for travel between Singapore and Malaysia in 2009; =1 for travel between all Member States, except Indonesia and Philippines, 2010 and later)
freedom2	Dummy variable =1, represents Philippines' adoption of MAFLPAS, partially includes travel between ASEAN and Philippines as with MAAS, as it granted 4th and 5th freedom rights to fly into Philippines, except Manila (=maas, with addition of =1 for Philippines in 2010 and onwards)

The results show that air liberalization, captured by the granting of 3rd and 4th air freedoms between capital cities (e.g., MAAS and other bilateral and multilateral agreements) or between

entire countries (e.g., MAFLPAS), has had a significant and positive effect on the number of passengers traveling between ASEAN Member States, even controlling for GDP of the origin and destination states.

Table 13 Regression Results: Gravity Model of Intra-ASEAN Passenger Flows

	(1) basic	(2) maas_0	(3) maas_full	(4) free_0	(5) free_full	(6) free2_0	(7) free2_full
ln_gdp_origin	1.663***	-	1.661***	-	1.708***	-	1.676***
ln_gdp_destination	1.676***	-	1.675***	-	1.721***	-	1.69***
ln_dist	-4.756***	-	-4.596***	-	-4.376***	-	-4.57***
contig	0.678	-	0.708	-	0.713	-	0.71
maas	-	1.813	0.705**	-	-	-	-
freedom	-	-	-	1.285***	1.146***	-	-
freedom2	-	-	-	-	-	1.199***	0.787***
constant	6.129**	8.517***	4.806	8.517***	1.908	8.445***	4.097
Observations	810	810	810	810	810	810	810
R^2	0.499	0.020	0.502	0.012	0.507	0.011	0.504

**p < .10; **p <= .05; ***p <= .01*

The model results demonstrate that air liberalization measures included in the MPAC strategy on air connectivity have, indeed, increased the number of passengers flying amongst ASEAN Member States. The coefficients for dummy variables for *maas* and the granting of 3rd and 4th freedoms between ASEAN capital cities and states are consistently positive and significant, with very strong effect. The adoption of MAAS is estimated to have increased passenger volumes 181%, controlling for GDP, whereas the granting of 3rd and 4th freedoms at any point is estimated to increase passenger volumes by 78.7%.

In Summary

- A one-day reduction of 'Days to Export' increases and ASEAN exporter's trade volume (US$) by nearly 3% annually, on average.
- Post-MPAC, ASEAN trade volumes are more sensitive to trading partners' *Doing Business* 'Trading Across Borders' scores and Logistics Performance Index scores.
- Contiguity (sharing a border) is more important to trade volume following MPAC implementation, demonstrating that the easing of transitions across borders is increasing trade volumes between neighboring Member States.
- The number of days required to export (a proxy of economic distance) is also more significant to trade volumes following MPAC implementation.
- The granting of 3rd and 4th air freedoms via ASEAN Open Skies has significantly increased intra-ASEAN air passenger flows. MAAS implementation increased bilateral flows by an estimated 70.5%.

3.3 SVAR Analysis of ASEAN Economic Interdependence

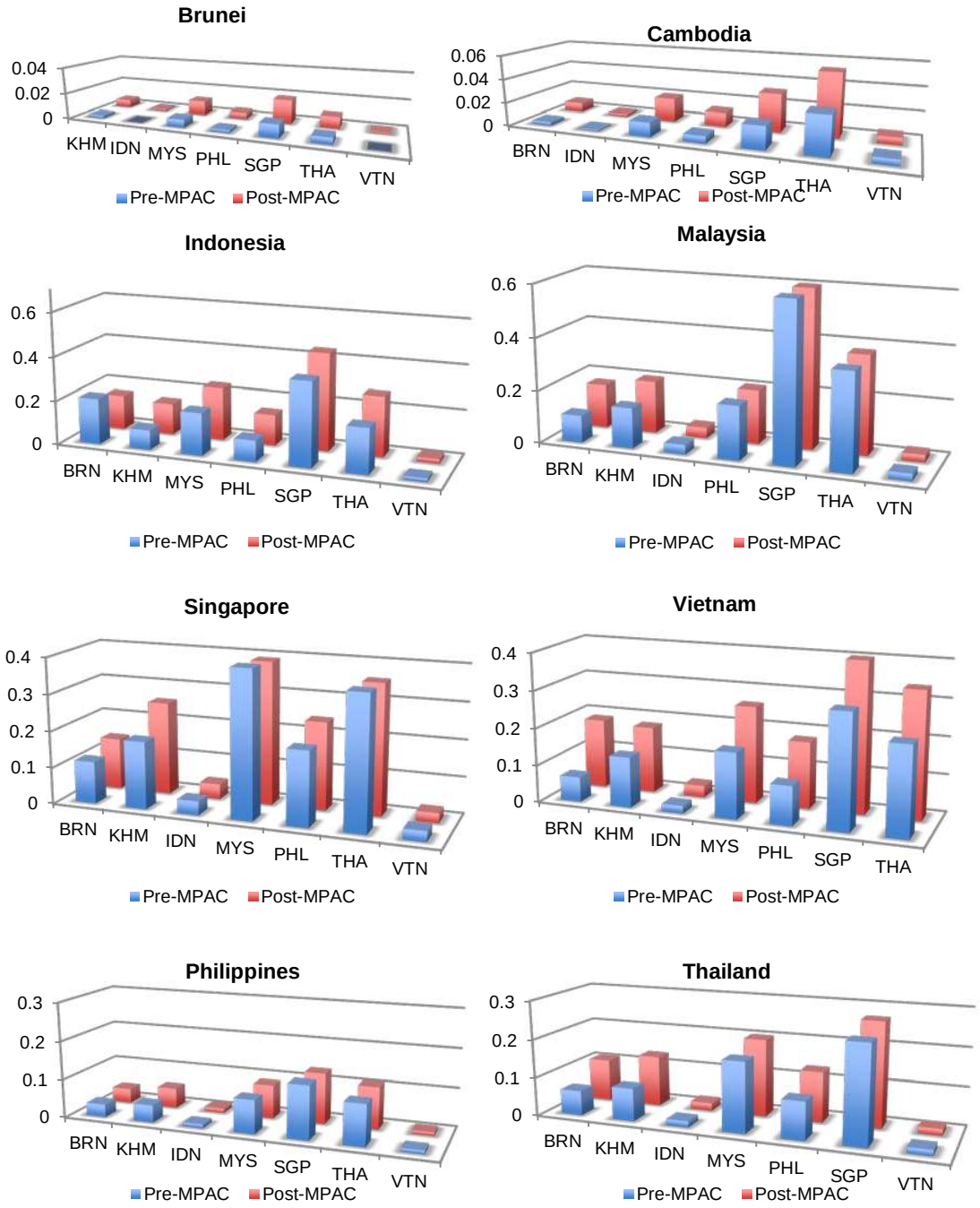
In this section, we share results of structural vector auto-regression (SVAR) analysis applied to ASEAN-8 countries, namely Brunei, Cambodia, Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam. Laos and Myanmar are not included in the analysis due to missing bilateral export data and quarterly GDP data inconsistencies, respectively.

Intuitively, a higher degree of integration (interdependency) would be expected between ASEAN economies after MPAC implementation. This would mean that positive or negative variations in one economy should have greater effects on the rest of the ASEAN economies, particularly on export and import levels. Nevertheless, because of the likelihood that impacts will lag policy implementation, it is recommended that analysis continue into the future to capture lagged impacts.

The proposed SVAR analysis estimates the multiplier effects of a 1% GDP growth shock in one economy on the growth of others (% change to GDP) in following (lagged) periods. These multiplier effects are estimated by linking 2001-2013 quarterly GDP data for ASEAN-8 and three control economies (China, India, and OECD) to their 110 bilateral export-share series in to generate a set of "impulse responses". These, in turn, are used to calculate multiplier effects. Data is drawn from the IMF's Direction of Trade Statistics database. Technical notes on the SVAR model may be found in Annex 8.

The estimated average annual multiplier effects for two separate periods, 2001-2010 and 2011-2013, representing pre- and post-MPAC, respectively, are given in Table 13 and illustrated, comparatively, in the charts of Figure 95. The multipliers reported for each period capture the average annual impact of an economic shock in one country (the "growth engine") on the GDP growth of another (the "impact economy") for the following year.

Figure 95. Multiplier effects on ASEAN-8, comparing 2001-2010 to 2011-2013, by trading partner



Results suggest that MPAC has contributed positively to intra-regional economic interdependence (Figure 95). Tables 14 and 15 show that the absolute values of incremental increases are small; nevertheless, the growth rates of multiplier effects are quite high for some countries.

Table 14. One-year multiplier effects of a one percentage point positive growth shock on ASEAN-8, comparing 2000-2010 (Pre-MPAC) and 2011-2013 (Post-MPAC) (%)

Impact Economy \ Growth Shock Economy	Brunei		Cambodia		Indonesia		Malaysia		Philippines		Singapore		Thailand		Vietnam	
	Pre-MPAC	*Post-MPAC*	*Pre-MPAC*	*Post-MPAC*	*Pre-MPAC*	*Post-MPAC*	*Pre-MPAC*	*Post-MPAC*	*Pre-MPAC*	*Post-MPAC*	*Pre-MPAC*	*Post-MPAC*	*Pre-MPAC*	*Post-MPAC*	*Pre-MPAC*	*Post-MPAC*
Brunei	**0.740**	**0.743**	0.003	0.008	**0.207**	0.156	0.103	0.168	0.033	0.038	0.115	0.141	0.064	0.109	0.066	0.186
Cambodia	0.002	0.006	**1.160**	**1.166**	0.089	0.142	0.152	0.200	0.045	0.052	0.184	0.255	0.085	0.131	0.134	0.178
Indonesia	0.000	0.001	0.001	0.002	**0.746**	**0.751**	0.036	0.040	0.010	0.011	0.038	0.041	0.016	0.020	0.020	0.031
Malaysia	0.006	0.011	0.012	0.020	0.192	**0.239**	**1.221**	**1.218**	0.087	0.087	0.403	0.390	0.180	0.201	0.175	0.259
Philippines	0.002	0.005	0.006	0.012	0.096	0.140	**0.203**	**0.205**	**0.822**	**0.828**	**0.203**	**0.240**	0.098	0.130	0.104	0.178
Singapore	0.010	0.018	0.019	0.032	**0.378**	**0.440**	**0.640**	**0.631**	0.137	0.130	**1.189**	**1.187**	**0.250**	**0.270**	**0.304**	**0.421**
Thailand	0.005	0.009	0.032	0.053	**0.205**	**0.272**	**0.367**	**0.375**	0.106	0.109	**0.361**	**0.355**	**0.848**	**0.874**	**0.237**	**0.337**
Vietnam	0.000	0.001	0.005	0.006	0.016	0.020	0.027	0.028	0.009	0.009	0.028	0.027	0.015	0.017	**1.839**	**1.845**

Impact Economy \ Growth Shock Economy	China		India		OECD	
	Pre-MPAC	*Post-MPAC*	*Pre-MPAC*	*Post-MPAC*	*Pre-MPAC*	*Post-MPAC*
Brunei	**0.311**	**0.535**	0.110	0.147	**2.010**	**2.320**
Cambodia	**0.481**	**0.772**	0.085	0.117	**3.190**	**3.198**
Indonesia	0.094	0.141	0.013	0.016	**0.516**	**0.525**
Malaysia	**0.813**	**1.145**	0.147	0.173	**4.242**	**4.036**
Philippines	**0.557**	**0.844**	0.072	0.096	**2.953**	**3.160**
Singapore	**1.206**	**1.641**	0.195	**0.221**	**6.065**	**5.755**
Thailand	**0.942**	**1.318**	0.152	0.187	**4.931**	**4.752**
Vietnam	0.077	0.112	0.013	0.017	**0.419**	**0.416**

Note: Bolded are the values greater than 0.20. Export shares are 12-quarter moving averages over 2006-2008 for pre-MPAC and 2011-2013 for post-MPAC.

For example, Vietnam's .12 multiplier effect increase on Brunei equates to a 181% increase. Similarly, Brunei's and Cambodia's multiplier effects on each other have increased 200% and 167%, respectively. On average, Indonesia, Malaysia, Singapore, and Vietnam have the highest multiplier effects on ASEAN, whereas Brunei and Cambodia have the lowest. Post-MPAC, Singapore's influence on Malaysia, Thailand, and Vietnam decreased slightly, as did its responsiveness to GDP growth in Malaysia and the Philippines.

The effects of ASEAN-8 growth engines on Indonesia and Vietnam are smallest, indicating their lesser dependence on external engines. Nevertheless, Indonesia's and Vietnam's multiplier effects on other countries, particularly Malaysia, Singapore, and Thailand, are appreciable and have increased post-MPAC.

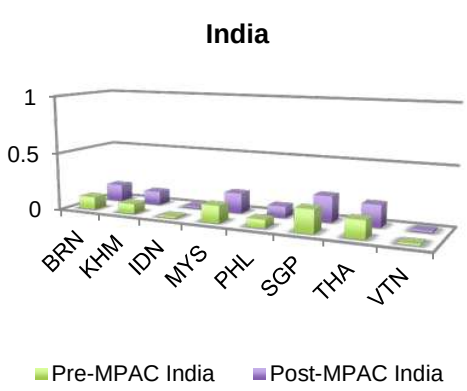
ASEAN multiplier effects on the Philippines are also small. Like Indonesia, the Philippines has low per capita income and is less dependent on external ASEAN engines for growth. For Philippines, OECD remains the main driver of growth, while China's importance has grown over the years. In fact, the same is true for all ASEAN-8: Figure 96 illustrates China's significantly increasing multiplier effect on ASEAN overall, post-MPAC. While this may be influenced by other factors affecting interdependence, beyond trade connectivity, China's increasing importance to ASEAN growth is apparent.

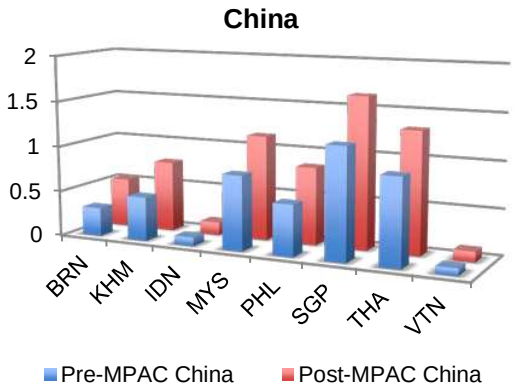
Table 15. Change in one-year multiplier effects, comparing 2001-2010 to 2011-2013

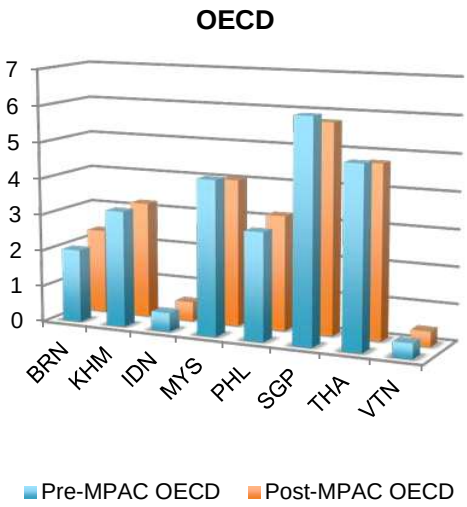
	Growth Shock Economy										
	ASEAN 8								Others		
	BRN	**KHM**	**IDN**	**MYS**	**PHL**	**SGP**	**THA**	**VTN**	**CHN**	**IND**	**OECD**
Brunei	0.003	0.005	-0.051	0.065	0.005	0.026	0.045	0.12	0.224	0.037	0.31
Cambodia	0.004	0.006	0.053	0.048	0.007	0.071	0.046	0.044	0.291	0.032	0.008
Indonesia	0.001	0.001	0.005	0.004	0.001	0.003	0.004	0.011	0.047	0.003	0.009
Malaysia	0.005	0.008	0.047	-0.003	0	-0.013	0.021	0.084	0.332	0.026	-0.206
Philippines	0.003	0.006	0.044	0.002	0.006	0.037	0.032	0.074	0.287	0.024	0.207
Singapore	0.008	0.013	0.062	-0.009	-0.007	-0.002	0.02	0.117	0.435	0.026	-0.31
Thailand	0.004	0.021	0.067	0.008	0.003	-0.006	0.026	0.1	0.376	0.035	-0.179
Vietnam	0.001	0.001	0.004	0.001	0	-0.001	0.002	0.006	0.035	0.004	-0.003

Table 14 summarizes the changes in average one-year multiplier effects between the two periods. Since SVAR cannot generate standard errors, the negative signs associated with extremely low changes should not be automatically taken to indicate a decrease. Rather, the analysis suggests very modest change, aside from China's growing influence on ASEAN-8 (excluding Indonesia and Vietnam) and OECD's declining and increasing effects on Malaysia and Philippines, respectively.

Figure 96. One-year multiplier effects of external economies (OECD, India, China) on ASEAN-8, comparing 2001-2010 to 2011-2013







While ASEAN-8 countries have become slightly more interdependent after MPAC, their multipliers are much lower than OECD and China. OECD remains the dominant engine of growth for ASEAN-8, though its relative importance has declined over time. India's multipliers have increased, but remain modest compared to OECD and China. China's growth effect has increased considerably, particularly for Cambodia, Malaysia, Philippines, Singapore and Thailand. India's multiplier effects remain very small in both periods.

In some cases, China is becoming increasingly influential on growth where other growth engines are exerting declining effects. In Cambodia, for example, China's multiplier effects have increased post-MPAC, whereas OECD's have decreased (though it remains the country's primary growth engine). In Malaysia, while Singapore remains a key driver of growth, its importance has decreased relative to China.

Within ASEAN, Singapore and Malaysia are most interdependent. Further, within the region, Singapore is the primary engine of growth, reflected in its relatively high multiplier effects on the remaining countries. Among Singapore's main growth engines, the effects of China, Vietnam and Indonesia have increased, while those of OECD and Malaysia have declined.

Growth multipliers derived in this exercise show that intra-ASEAN growth interdependence has increased to a limited extent after MPAC implementation, and the ASEAN-8 countries still rely on OECD as their primary driver of growth, with China gaining importance. While this

suggests that ASEAN-8 growth is limitedly interdependent, it also suggests increasing integration of ASEAN-8 into the global economy. Nevertheless, these trends indicate that ASEAN needs to intensify and accelerate the implementation of the MPAC strategies related to strengthening trade and investment linkages within the group.

Additionally, new policy initiatives may be required to balance the rising dependence on China. This could include the development of key labor-intensive industries with an eye to encourage relocation of multinational and East Asian companies currently operating in China to ASEAN for production for OECD, Japan, and ASEAN markets, with an added focus on developing trade Connectivity and logistics services required to support integrated production bases for those particular industries within ASEAN.

In Summary

- SVAR analysis suggests that ASEAN-8 economies have become more regionally integrated post-MPAC, but only moderately so, as measured by increased sensitivity to regional economic shocks.
- ASEAN-8 GDP multiplier effects are smallest on Indonesia, Vietnam, and Philippines, indicating lesser dependence on external drivers of growth. Nevertheless, Indonesia's and Vietnam's multiplier effects on other ASEAN-8 countries (particularly Malaysia, Singapore, and Thailand) are considerable and have increased since MPAC.
- Within ASEAN, Singapore and Malaysia are most interdependent, and Singapore has the highest multiplier effects on other ASEAN-8 countries.
- OECD remains the primary engine of growth for ASEAN exports, but China is quickly gaining importance to trade volumes and GDP.

Chapter IV. Enhancing ASEAN Connectivity M&E

Whilst the current 'Enhancing ASEAN Connectivity Monitoring and Evaluation' project is undertaken with an eye to draw out recommendations for improved oversight and assessment, the analysis herein also offers a number of policy implications for consideration by ASEAN Member States. Over time, improved monitoring and evaluation (M&E) will serve to draw out finer and more accurate assessments of Member State performance with respect to the MPAC strategies and component projects, in turn allowing Member States to periodically retool and recalibrate Connectivity policies based on new information.

4.1 Policy Implications

The locus of analysis for this report is currently at the strategic regional-national level; thus, the policy implications discussed herein are similarly abstracted. Another important realm of analysis, however, lies at the local and project levels, where the details of implementation are experienced and the immediate outcomes of policy realized. Recommendations for project-specific activities should be based on project-level evaluations, which, while not in the scope of this analysis, comprise important inputs for policy adjustment. In addition to national and regional analysis of Connectivity progress, Member States can complement ASEAN Connectivity M&E with systematic project-level evaluations (see 4.2) to identify specific opportunities for recalibration.

This analysis, on the other hand, suggests a number of MPAC components most important to the ASEAN Community, as well as a set of strategies that require increased attention and deliberation with respect to their roles in the overall Connectivity project. These are the subjects of Section 4.1. The policy implications emerging from the data and analysis primarily relate to observed complementarities between strategies, tradeoffs between local and national growth as well as between economic growth and closing development gaps, and areas of lagging performance. Additionally, a number of strategies require improved oversight and data collection in order to identify barriers to progress in physical, institutional, and people-to-people Connectivity. These are discussed in 4.2.

Complementarity and Intermodality

One key lesson that may be drawn from modeling MPAC impacts on trade and growth is that important complementarities exist between strategic pillars. These complementarities demand attention to system-wide coordination, potential policy and process misalignments, and

assessment of impacts in combination. While modeling results suggest that regional coordination is key to attaining Connectivity goals, there are no measurement tools in use to assess current levels of coordination. As such, this is also an important area of development with respect to improving M&E.

GSM results, however, clearly confirm complementary effects between physical and institutional strategies with respect to trade and economic development within the region. Impacts on GDP growth of MPAC strategies, in combination, are higher than the sum of individually modeled impacts, suggesting positive network effects of simultaneous infrastructure development and border facilitation. Available project-level information also highlights the importance of coordinated development of ports, roads, and airports. For example, the impact of Dawei Port development on trade and GDP growth is significantly augmented by the improvement of land routes connecting the port to Thailand and established sea routes connecting to South Asia.

Another key area of M&E development relates to the mapping of transitions between modes of transport, aimed at attaining a seamless multi-modal transport system. At present, there is no body of data available to trace the flow of goods across transport sectors; however, process mapping and network optimization analysis could be used to identify bottlenecks and key transition nodes for focused development. This is particularly important as the composition of traded goods shifts from mainly bulk cargo, typically transported by sea and rail, to lighter high value components, largely transported by air. While progress on rail and road development is lagging in many States, the relevance of rail and road transport projects must nevertheless be considered within the greater context of multi-modal transport networks. Improving rail and road connections to seemingly more important transport nodes – ports and airports – can have important benefits for landlocked countries and inland areas.

Lastly, GSM analysis and gravity models suggest that the rules governing trade and exchange, including liberalization agreements and process standardization, and the general quality of logistics services have critical implications for the usability and efficiency of existing infrastructures. Operational, project-level information on the status and effect of institutional measures that smooth transitions across borders and infrastructure sectors (such as the ASEAN Single Window and standardization of customs procedures) is required to better model the influence of specific coordinating rules on trade volumes. The analyses herein, particularly the GSM and gravity models of trade, demonstrate that border facilitation measures, the overall quality of logistics in importing and exporting countries, and the rules that determine time and cost of exporting are significant to trade volumes and growth.

Key Connectivity Policy Levers

The modeling in Chapter III suggests that legal-institutional factors are amongst the most important to increased trade and mobility within the region. For example, with respect to people-to-people Connectivity, gravity models of air passenger flows demonstrate that the granting of 3rd, 4th, and 5th air freedoms via air liberalization agreements has had a significant and notable positive impact on passenger flows between Member States. The degree of importance of a 3rd / 4th air freedom agreement is akin to the effect on air travel of a 0.5 - 0.75% increase in the GDP of the country of origin. This translates to a more striking 78.7 - 128.5% increase in the number of passengers flying between two countries in a given year.

The Geographic Simulation Models and Gravity Models of Trade also reveal the importance of institutional factors on trade Connectivity and economic growth. Of the policy and infrastructural factors simulated in the GSM, the strategies with the largest effects on projected 2025 GDPs are the development of the ASEAN Single Air Market, development of the RoRo network, and border facilitation and the reduction of non-tariff barriers to trade. The gravity models support the significance of border management to trade: the number of days to require to export a basket of goods is negatively related to trade volume, whereas the exporters' and importers' LPI and Trading Across Borders 'Distance to the Frontier' scores are positively significant. These measures are all functions of policies, processes, and capacities that affect the transfer of goods across borders. Furthermore, results suggest that institutional factors can effectively stave off the negative effects of lagging physical developments. For example, despite limited progress in the quality of air transport infrastructure over the MPAC period, air passenger and cargo flows have increasingly risen following ASAM, suggesting the great importance of institutional factors to air transit flows.

Another key finding across strategies is that quality and efficiency improvements, as opposed to new infrastructure developments, can be more important to increased trade in many cases. For instance, the upgrading of roads to above Class-III status has more effect on trade and growth in simulation than does the construction of new roads. Similarly, maritime development must be more carefully focused on improving port efficiency rather than building new ports and increasing capacity.

The indicator results also suggest that some physical Connectivity initiatives should be revisited due to their limited progress. Where low performance is due to insufficient policy attention or resource mobilization challenges, Member States may decide to promote the strategy and its key actions to a higher priority level in the future. This is likely the case for

maritime development (particularly the RoRo network) and inland waterways development, for example. But in cases where low progress is due to low bankability, insufficient demand, institutional complications, or low projected impacts, Member States must deliberate their inclusion in the regional infrastructure development agenda. In addition to lagging maritime and waterway development, ASEAN must particularly deliberate the future course of the Singapore-Kunming Rail Link and Trans-ASEAN Gas Pipeline. In the case of the former, while analysis does not deem the project valueless, GSM analysis suggests that positive effects of rail development will be limited to local impacts in Cambodia and the regions surrounding Yangon in Myanmar and Ho Chi Minh in Vietnam.

Managing Tradeoffs

A third major category of policy implications relates to policy tradeoffs, including those between economic growth versus equitable development and aggregated national impact versus local impacts. The analysis points out a number of cases where infrastructure and trade facilitation measures are expected to have different effects at local, national, and regional levels. For instance, the GSM shows that overall impacts of developing the RoRo are quite minimal for Indonesia overall. But a closer look at the local level shows that some negative impacts on Java are offset by significant positive impacts in Sulawesi, Sumatra, and Kalimantan. The case is similar for the Philippines. These patterns demonstrate how developments with important local positive impacts can help close development gaps without necessarily having significant impacts on national economic development.

Looking forward, tradeoffs will also arise when funding constraints force Member States to make difficult decisions about which infrastructures and institutional measures should be pursued immediately, and which may be postponed. For example, funding limits will demand that governments choose a finite set of Connectivity projects from amongst the set of key actions. For this reason, governments must establish clear principles upon which tradeoffs will be based and adopt systematic approaches to prioritizing infrastructure investments.

Lastly, the balance between regional and global economic integration is not a tradeoff, per se, but warrants consideration, nevertheless. Considering ASEAN's policy of open integration, the higher integration of ASEAN Member States with the global economy is acceptable. That said, more rapidly increasing integration with extra-ASEAN economies suggests that ASEAN must specifically examine the impacts of China's increasing integration and identify opportunities to leverage the benefits of increased integration regionally, and also ramp up efforts to promote intra-regional trade and investment.

4.2 Improving Connectivity Monitoring and Assessment

The Connectivity monitoring and evaluation program has progressed from a qualitative status update to incorporate more systematic quantitative indicators. With the exception of institutional Strategy 10, the present M&E system is sufficient to provide a general, albeit partial, "pulse check" on Connectivity. Where Connectivity developments are lagging, however, the current evaluation framework falls short of providing the kinds of detailed information about root causes of performance that would help Member States prioritize certain Connectivity-related projects, identify critical project-level links to policy outcomes and impacts, or isolate MPAC policy effects from other drivers of Connectivity development, Integration, and ASEAN Community-building. As such, there are a number of important ways to further improve the oversight and impact assessment MPAC initiatives.

These opportunities relate to improving data access, quality, and breadth to more accurately assess strategic performance and provide valuable contextual information; and expanding the ACIM to link performance at the project (or key action) output level to Connectivity outcomes and social and economic impacts. By applying a multi-level evaluation framework, ACIM can link project-level evaluation to policy outcomes and impacts to better identify key policy levers. And as data is improved, more advanced analysis of MPAC impacts on Connectivity and economic growth; flows of people, goods, and information; and patterns of development will be possible. Since many Connectivity and growth impacts will inevitably lag policy implementation (and since several initiatives have yet to be deployed), evaluation must continue well after implementation, justifying efforts to improve the M&E system.

An Expanded M&E Framework: Causality and Levels of Analysis

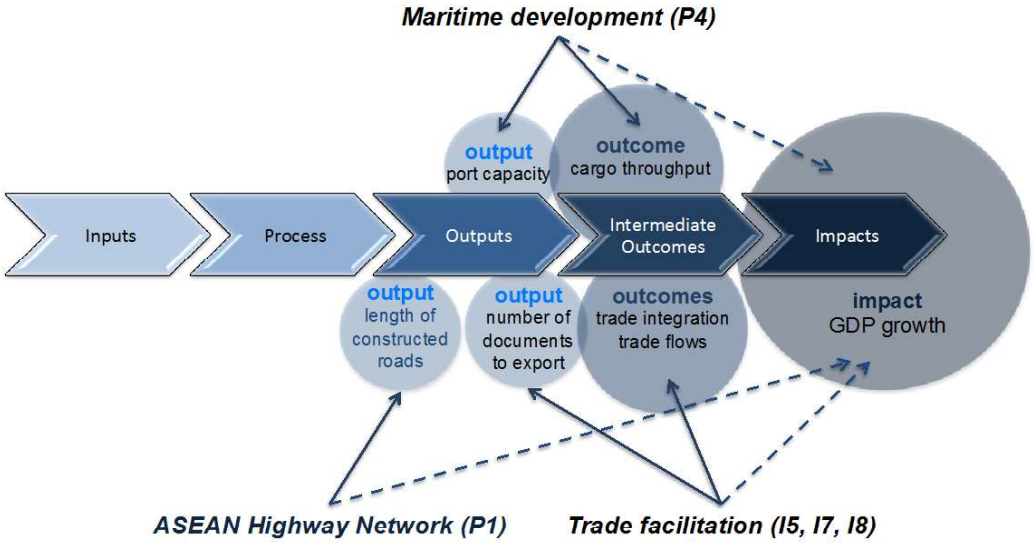
The impact of MPAC on goals of trade facilitation, Connectivity, and regional integration is dependent on the accomplishment of MPAC strategies, which in turn rely on the sets of actions associated with each. In other words, there is a causal chain: inputs go through processes to become outputs; these outputs have intermediate policy outcomes; and the outcomes, often in combination, yield policy impacts that are felt more broadly – and only after a period of time (see Figure 97). Understanding outcomes and impacts is most important to measuring the success of MPAC. But identifying *why* a policy is successful or unsuccessful requires unpacking performance at the output and process levels. Without this information, decision-makers cannot reliably determine how to correct underperformance.

Figure 97. Levels of analysis in evaluation

At present, the ACIM irregularly evaluates immediate outputs, intermediate outcomes, and a set of greater impacts (e.g., economic growth). This is for two reasons: the construction of the strategies themselves and data limitations. With respect to the former, some MPAC key actions and strategies are, in and of themselves, output-oriented, with no explicitly defined policy outcomes or impacts (though all, naturally, have implicit higher-level goals). For example, assessing the performance of physical Strategy 1, 'Complete the ASEAN Highway Network', could be limited to an outcome assessment of the percentage of AHN completed. Similarly, the attainment of institutional Strategy 1, operationalizing Framework Agreements on transport facilitation, is output-oriented and dependent solely on the ratification and adoption of a series of trade agreements. These both, however, may be attached to implicit goals of increased trade by road or reduction of transaction costs in trade, respectively, as well as ultimate impacts of increased economic growth. Conversely, some strategies are outcome- or impact-oriented, requiring identification of lower-level effects for monitoring. For example, people-to-people Strategy 1 calls for MPAC to promote deeper social and cultural understanding, and institutional Strategy 9 looks to further open Member States to investments from within and beyond the region. These both rely on a series of outputs and outcomes for their ultimate attainment.

At present, we report the state of Connectivity by strategy, with indicators selected at one or more levels, depending on data availability and the strategy itself, including its key actions (Figure 98). For example, progress on the AHN is reported at the output level, according to the length of AHN roads built. Its impact on GDP is also projected via modeling (see dashed line). In the future, however, ACCC could also monitor outcomes such as the volume of exports by road and transit times between major cities. Maritime development, on the other hand, is currently monitored at the output (port capacity) and outcome (sea cargo throughout) levels, with future impacts on GDP projected via modeling. The case is similar for trade facilitation strategies.

Figure 98. Example indicators linked to levels of analysis



With an eye to improve Connectivity M&E, however, we strive to identify a fuller set of linked output, outcome, and impact indicators to improve the robustness and thoroughness of the monitoring and evaluation program (see Table 15 below), which drives part of the data-specific recommendations below. Conscious of the time and effort that monitoring requires, however, we also prioritize particular indicators, based on the nature of the strategies themselves and MPAC-prioritized key actions.

Measurement and Context

The second set of recommendations centers on the benefits of coupling quantitative indicator measurement with qualitative performance assessment (including survey and interview data), timely project and policy implementation data (including project costs), and risk assessment. The use of supportive qualitative data provides valuable contextual information and has three primary purposes, ordered in level of increasing complexity:

(1) Maintaining updated records on project status and policy implementation / adoption;
(2) Triangulating quantitative results (confirming apparent trends); and
(3) Determining underlying root causes of observed outcomes.

First, there is a clear need to collect and maintain updated records on the statuses of MPAC-related infrastructure projects (e.g., current status of AHN upgrading, port developments, etc.), as the last publicly available records date to 2012. This recommendation calls back into play the earliest mode of the ACIM in suggesting the compilation of key action and priority project

progress reports. Further, ASEAN should create and maintain an updated log of the status of Member States' adoption and implementation of policies and processes attached to MPAC strategies and key actions. This is particularly salient for institutional Connectivity strategies that specify the adoption of ASEAN agreements and standardizations and for strategies that call for the creation of agreements and action plans. At present, for example, there is no publicly available register of each Member States' adoption, ratification, and implementation of key MPAC policies on air liberalization, multi-modal transport, etc. It is also important that ASEAN collect and maintain updated and consolidated information on projected and actual project costs and benefits to allow for meaningful cost-benefit comparisons. At present, the costs of many proposed projects are unknown, not published, our outdated.

In addition to project updates, several strategies are particularly suited to qualitative data and process evaluation. Most apparently, institutional Strategy 10, which calls for strengthening institutional capacity, would best be assessed through perception survey data. But strategies with clear quantitative indicators also benefit from additional qualitative data. For example, maritime sector development is complex, with many component parts. Contextual, qualitative information on significant issues, gains, and barriers to network expansion and port development, coupled with quantitative analysis, can generate useful information sets on which to base future policy decisions. This information should be generated from targeted reporting at the project level. Another final contribution of qualitative assessment is expert assessment of risks associated with the full implementation of MPAC strategies and key actions. In practice, this can be done by using the existing Connectivity Status Report framework. Prospective risk assessment, even if only qualitative, would help inform policy re-calibration and identify cases where excessive risk affects performance. In those cases, efforts can shift towards managing risks to promote improve sector and strategy performance.

Data Requirements

Identified data needs relate to the multi-level framing issues described above as well as to technical problems of untimely, incomplete, or un-harmonized data. Due to data limitations, both the specificity and completeness of indicators and the ability to model impacts of particular MPAC initiatives on both Connectivity and Community-building is limited. The current ACIM (in its form herein) makes best use of publicly available data collected by ASEAN Stats and AJTP and also draws on other sources, including the World Bank, UN ESCAP, and industry. Nevertheless, much of the data required to assess strategic performance is incomplete or not collected, requiring use of proxy indicators.

With respect to data quality, one concern relates to harmonization. The issue of measurement and reporting harmonization is pronounced, for example, in the case of energy trade data (electricity and gas), where large data asymmetries in Intra-ASEAN imports and exports are observed. This is problematic for two reasons: (1) it limits the ability to compare progress across Member States or give a dependable account of ASEAN trends in energy trade; and (2) it renders the data unusable for econometric modeling that might otherwise allow an assessment of the role MPAC strategies and key projects (e.g., ATP and TAGP) have had on energy trade flows. The ASEAN Stats office is currently addressing the issue of Member State data harmonization to promote consistent definition of reported statistics.

Another concern relates to timeliness, regularity, and availability of data. Much of the data on trade by transport sector (e.g., cargo throughput by river, exports by rail, etc.) is missing, irregular, or too outdated for use to evaluate Connectivity improvements during the MPAC period. Many figures are reported only to 2012 or 2013, whilst others are missing entirely. Improved and timelier submission of AJTP statistics, in particular, would allow better tracking of physical Connectivity performance. One major shortfall is the lack of baseline statistics with which to compare progress. Another issue relates to disaggregating network extensions and expansions from upgrading and reclassification. With respect to AHN development, for example, the UN ESCAP database reports the length of AHN roads by class, but it is not known what portion of increases per road class category are attributable to new construction, upgrading works, or simply the addition of existing roads to the AHN network by re-classification. As such, existing AHN statistics do not directly and specifically reflect progress on the stated key actions.

Building infrastructure asset registers and registers that track ratification and implementation of key agreements could be a helpful solution to these data issues. Asset registers could incorporate geographic information on the physical and financial attributes of infrastructures as well as inventories and conditional assessments. National asset registers could be used to track the extension and improvement of segments of the AHN and SKRL over time, as well as port capacity and development, inland waterways development projects, and targeted ICT and energy transmission projects.

Moreover, it is important that ASEAN gather updated information on the projected costs of Connectivity projects to allow for meaningful comparison of costs and projected benefits. This is a key weakness in the current system of MPAC monitoring and oversight, and a critical input to future Connectivity planning.

The ongoing monitoring and evaluation of Connectivity should also be aligned with existing reporting and data collection processes within ASEAN. It is recommended that ASEAN build upon and coordinate existing organizational structures within various ASEAN bodies to reduce costs of data collection and increase the likelihood of coherence in official data on various aspects of Connectivity.

The table below (Table 16) outlines suggestions for improved data collection across the output, outcome, and impact levels. The indicators in black font are those currently in use in the ACIM, as it is applied in the 2015 M&E report. Indicators in gray font are those for which either data is currently unavailable, partial, or significantly outdated.

Table 16. Suggested indicators for Future Data Collection, MPAC M&E

Strategy	Output Indicators	Outcome Indicators	Impact Indicators
Physical Dimension			
1. Complete the ASEAN Highway Network	Length of AHN roads, by class (*to be updated)* (%) Completion of missing links (project status / %) Coverage of route numbering signs Infrastructure asset register (AHN roads by class and condition)	Cargo / passenger volumes by road Import / export volumes by road Reduction in average transit times between major ASEAN cities	Trade volumes Economic growth Human mobility Safety (reduction of traffic incidents and fatalities)
2. Complete the implementation of the Singapore Kunming Rail Link (SKRL) project	Completed missing links Project updates (upgrading, construction status) Length of AHN rail network Infrastructure asset register	Domestic cargo / passenger volume by rail Imports / export volumes by rail Rail passenger flows (volumes between key rail nodes)	Projected economic impact (GDP)
3. Establish an efficient and integrated inland waterways network	River port capacity River passenger / cargo fleet by capacity Infrastructure asset register	Inland waterway port cargo throughput (to be updated) River port utilization Domestic freight volumes by river Import / export volumes by river	Trade Volumes Safety (reduction of traffic incidents and fatalities) Access to goods and services in remote areas
4. Accomplish an integrated, efficient and competitive maritime transport system	Port capacity Port efficiency (e.g. average berthing times) Infrastructure asset register	Sea container throughput Port utilization (berth occupancy) Domestic freight volumes by sea Imports / exports volumes by sea GCI Quality of Ports indicator	Projected economic impact (GDP) Trade volumes by sea
5. Establish integrated and seamless multimodal transport systems to make ASEAN the transport hub in the East Asia region	Number of multimodal transport hubs, dry ports Mapped transport corridors linked to national infrastructure asset registers	Logistics Performance Index Dry port volume throughput	Projected economic impact (GDP)
6. Accelerate the development of ICT infrastructure and services in each of the ASEAN Member States	Service coverage maps (mobile telecommunications) Internet bandwidth capacity	Number of Internet / mobile telephone users per 100 people	-

7. Prioritize the processes to resolve institutional issues in ASEAN energy infrastructure projects	Project updates, TAGP and APG	Intra-ASEAN electricity / gas exports and imports	-
Institutional Dimension			
1. Fully operationalize the three Framework Agreements on transport facilitation	Adoption / ratification updates	Intra-ASEAN Trade Intensity Index Qualitative assessment of changes in participation in regional value chains	Projected economic impact (GDP)
2. Implement initiatives to facilitate inter-state passenger land transportation	Border crossing (immigration) progress updates Average border crossing times	Inter-State passenger land arrivals	-
3. Develop the ASEAN Single Aviation Market	Air liberalization updates	Intra-ASEAN air passenger flows Intra-ASEAN air cargo capacity flows Imports / exports by air	Projected economic impact (GDP)
4. Develop an ASEAN Single Shipping Market	Status of ASSM ratification, implementation Number of incidents in international waters (security) Reduction in number of preferential agreements in shipping	Liner Shipping Connectivity Index	Projected economic impact (GDP)
5. Accelerate the free flow of goods by eliminating barriers to merchandise trade within the region	Trade Restrictiveness Index	Doing Business, Trading Across Borders Distance to Frontier; Time to import / export	Projected economic impact (GDP)
7. Improve trade facilitation, quality of customs, and timeliness of goods delivery; implement National Single Windows and ASEAN Single Window	Project status: NSWs Average border transit times (per container) Investments in modernized border facilities	Logistics Performance Index, Efficiency of clearance	Projected economic impact (GDP)
8. Enhance border management capabilities			
6. Accelerate development of an efficient and competitive logistics sector, in particular transport, telecommunications and other connectivity-related services	LPI: Quality and competence of logistics	Intra-ASEAN Trade in Services (TiS) Growth Rate: Transportation and ICT Services	-
9. Accelerate further opening up of ASEAN Member States to investments from within	Status of liberalization agreements	Growth rate of Intra-ASEAN Foreign Direct Investments and FDI overall	-

and beyond the region under fair investment rules	Reduction in number of preferential agreements		
10. Strengthen institutional capacity in lagging areas in the region and improve regional – sub-regional coordination of policies, programs and projects	Catalog of specific Connectivity capacity-building activities Social network analysis of coordinating and implementation agencies	Expert assessment of coordinating capacity (interview data) Degree of policy alignment on key issues (Q-sort)	-
People-to-People Dimension			
1. Promote deeper intra-ASEAN social and cultural understanding	Number of ASEAN-focused tertiary courses Investments in cultural awareness activities (ASEAN) Progress report on activities of ASEAN University Network	Growth rate of Intra-ASEAN international tertiary students Number of other-ASEAN language speakers Growth rate of voice calls / data exchange between economic centers	Citizen understanding of / relation with ASEAN (survey)
2. Encourage greater intra-ASEAN people mobility	Status update on professional mobility agreements	Growth rate of Intra-ASEAN air passenger arrivals Growth rates of Intra-ASEAN migration	-

Legend: **Black** indicators = in use, **Gray** indicators = data incomplete or currently unavailable

Additionally, application of econometric models that consider specific key actions as independent variables and outputs as dependent variables would determine the impact of MPAC, specifically, on measures of Connectivity as well as on higher-level impacts such as safety, people mobility, and economic development. For example, time series regression could be used to demonstrate the impact of MPAC on border facilitation by taking time and cost to transition over land borders as dependent variables and the imposition of key MPAC components (e.g., a Single Windows program, bilateral customs harmonization, established agreements on cross-border inspection, etc.) as independent variables (alongside standard determinants like economy size). This would require, however, specific records on the timing of implementation of process and rule changes. Similarly, the dates of implementation of agreements or process revisions could be used to model the impact of MPAC key actions on trade, both sector-specifically and generally.

Lastly, the importance of coordination and commitment of Member States to the Connectivity initiative cannot be underestimated. While there is no data available to assess the degree of cooperation and harmonization across Member States as it relates to Connectivity, ASEAN should critically examine its rules, processes, and accountability mechanisms at the programmatic level to identify opportunities to strengthen commitments to adopted plans, including those in the realm of infrastructure development and Connectivity. The successful implementation of plans for ASEAN Connectivity relies, perhaps most importantly, on the credible commitment and accountability of Member States to ASEAN's vision for Integration and improved Connectivity. Given the non-binding nature of the ASEAN organization, sound information gleaned via the monitoring system is itself an important tool for holding Member States accountable to agreed plans.

The ACIM has become an increasingly useful tool to objectively assess the attainment of ASEAN Connectivity measures, particularly via the inclusion of a set of quantitative indicators. Nevertheless, there is a clear path ahead to improve the M&E program. The table above summarizes a basic information set needed to track progress at the output and outcome levels and model MPAC's contribution to regional economic and social impacts. The analysis also suggests that, while strategy-level assessment is important to guiding policy, impacts and opportunities for re-calibration will originate from the project level. These and other recommendations in this report give guidance as ASEAN embarks on building the monitoring and evaluation framework for the Post-2015 agenda for ASEAN Connectivity and the ASEAN Community 2025.

REFERENCES

Abeysinghe, Tilak. 1998. “ESU Multi-country model”. Available at Singapore Centre for Applied and Policy Economics, http://www.fas.nus.edu.sg/ecs/esu/data.html.

Abeysinghe, Tilak and Gulasekaran Rajaguru. 2004. “Quarterly Real GDP Estimates for China and ASEAN4 with a Forecast Evaluation”. *Journal of Forecasting* 23: 431-447.

ASEAN Secretariat. 2008. ASEAN Economic Community Blueprint. Jakarta: Association of Southeast Asian Nations.

ASEAN Secretariat. 2012. ASEAN Connectivity Project Information Sheets. Edited by The ASEAN Secretariat. Jakarta, Indonesia.

ASEAN Secretariat, and The World Bank. 2013. ASEAN Integration Monitoring Report. Jakarta: ASEAN Integration Monitoring Office, ASEAN, and Office of the Chief Economist, East Asia and Pacific Region, The World Bank.

Athanasopoulou, Anna. 2013. Tourism as a driver of economic growth and development in the EU-27 and ASEAN regions. Singapore: European Union Centre in Singapore.

ERIA Study Team. 2010. "ASEAN Transport Cooperation Beyond 2015." In ASEAN Strategic Transport Plan 2011-2015. Jakarta: ASEAN Secretariat and ERIA.

Grosche, Tobias, Franz Rothlauf, and Armin Heinzl. 2007. "Gravity models for airline passenger volume estimation." *Journal of Air Transport Management* 13 (4):175-183.

Karemera, David, Victor Iwuagwu Oguledo, and Bobby Davis. 2000. "A gravity model analysis of international migration to North America." *Applied Economics* 32 (13):1745-1755.

Lewer, Joshua J, and Hendrik Van den Berg. 2008. "A gravity model of immigration." *Economics letters* 99 (1):164-167.

Matsumoto, Hidenobu. 2004. "International urban systems and air passenger and cargo flows: some calculations." *Journal of Air Transport Management* 10 (4):239-247.

Pasadilla, Gloria. 2011. Social security and labor migration in ASEAN. In *ADB Institute Research Policy Brief* 34: Asian Development Bank.

Ratha, Dilip, and William Shaw. 2007. "South-South migration and remittances." World Bank Working Paper 102.

Tan, Kong Yam, Tilak Abeysinghe and Khee Giap Tan. 2013. “Shifting Drivers of Growth: Policy Implications for ASEAN-5”. *Asian Economic Papers* 14 (1): 157-173.

Tinbergen, Jan. 1962. *Shaping the World Economy: Suggestions for an International Economic Policy*. New York: Twentieth Century Fund.

World Bank. 2014. Preserving stability and promoting growth: East Asia Pacific economic update. Washington, D.C.: The World Bank Group.

World Bank Infrastructure Hub. 2014. ASEAN PPP Pipeline Project consultations. The World Bank. Singapore.

Data set references are included in Annex 4.

Annex 1. At a Glance: MPAC Strategies, Key Actions, and ACIM Indicators

Strategies	Actions	Indicators
Physical Dimension		
1. Complete the ASEAN Highway Network	(i) Upgrade all "below Class III" sections of AHN into at least "Class III", with highest priority to the "below Class III" sections of the Transit Transport Routes (TTR), by 2012. (ii) Install common road signs in all designated routes, with a specific priority on TTR by 2013. (iii) Upgrade "Class II or III" sections with high traffic volume to "Class I" by 2020. (iv) Conduct a feasibility study on bridging archipelagic countries and mainland ASEAN by 2015. (v) Upgrade the extension of AHN to China and India, particularly sections from Ha Noi via northern Laos through Myanmar to the border with India, by 2015.	Length of ASEAN Highway Network by Class I, II, III and Below Class III (km) Project updates
2. Complete the implementation of the Singapore Kunming Rail Link (SKRL) project	(i) Construct missing link sections: • Thailand: Aranyaprathet – Klongluk (6km) by 2014; • Cambodia: Poipet – Sisophon (48km) by 2013; • Cambodia: Phnom Penh – Loc Ninh (254km) by 2015; • Vietnam: Loc Ninh – Ho Chi Minh (129km) by 2020; • Vietnam: Mu Gia – Tan Ap – Vung Ang (119km) by 2020; • Lao PDR: Vientiane – Thakek – Mu Gia (466km) by 2020; • Myanmar: Thanbyuzayat – Three Pagoda Pass (110km) by 2020; • Thailand: Three Pagoda Pass - Nam Tok (153km) by 2020. (ii) Formulate a strategy for a seamless operation of SKRL by 2013. (iii) Mobilise financial resources and technical assistance to support completion of SKRL in accordance with deadline. (iv) Study the possibility of extending the SKRL to Surabaya, Indonesia.	Status update on SKRL missing links Project updates Length of overall rail network (km)
3. Establish an efficient and integrated inland waterways network	a. Formulate a regional plan for developing inland waterways in ASEAN by 2012 and begin implementation thereafter.	Inland waterway port cargo throughput (thousand tons)

4. Accomplish an integrated, efficient and competitive maritime transport system	(i) Enhance the performance and capacity of the 47 designated ports, with the priority set in the studies undertaken and being undertaken under Measures 6, 7 and 8 of the Roadmap Towards an Integrated and Competitive Maritime Transport in ASEAN by 2015. The enhancement of capacity can include the improvement in associated services like warehousing as well as dredging of the water channels where needed. a) Establish efficient and reliable shipping routes (including RoRo) connecting mainland and archipelagic Southeast Asia including the related sub-regional initiatives such as BIMP-EAGA and IMT-GT. The emerging and/or potentially important international routes: Satun/Trang – Penang – Belawan, Malacca – Dumai, Davao – Bitung, Zamboanga - Sandakan, Muara – nearby ports; b) Strengthen linkages with global and regional trunk routes and domestic shipping routes; and c) Conduct a feasibility study on the establishment of an ASEAN RoRo network.	Sea container throughput (thousand tons) Imports and exports by sea (thousand tons) GCI Quality of Port Infrastructure (quality score)
5. Establish integrated and seamless multimodal transport systems to make ASEAN the transport hub in the East Asia region	(i) Conduct a study on potential multimodal transport corridors to empower parts of ASEAN to function as land bridges in global supply routes. (ii) Complete the East West Economic Corridor (EWEC). a) Construct the missing link in Myanmar; and b) Develop/upgrade terminal ports: Yangon, Da Nang. (iii) Promote the Mekong-India Economic Corridor (MIEC) as a land bridge. a) Construct the Mekong Bridge in Neak Loung (National road No.1 in Cambodia); b) Develop the Dawei deep sea port (by 2020); c) Build the highway between Kanchanaburi and Dawei (by 2020); and d) Conduct a feasibility study and preliminary design for the railway spur line between Kanchanaburi and Dawei. (iv) Identify and develop a network of ASEAN dry ports in accordance with existing ASEAN initiatives such as the ASEAN Highway Network and the SKRL.	Logistics Performance Index (perception score)
6. Accelerate the development of ICT infrastructure and services in each of the ASEAN Member States	(i) Establish an ASEAN Broadband Corridor by identifying and developing locations in each ASEAN Member State to offer quality broadband connectivity. (ii) Promote diversity of international connectivity among ASEAN Member States by 2015. (iii) Establish an ASEAN Internet Exchange Network to facilitate peering amongst ASEAN internet providers to reduce latency, increase speed, and lower costs by 2013. (iv) Promote network integrity and information security, data protection and Computer Emergency Response	Internet users per 100 inhabitants Mobile telephone subscribers per 100 inhabitants

	Team (CERT) cooperation by developing common frameworks and establishing common minimum standards where appropriate, to ensure a level of preparedness and integrity of networks across ASEAN by 2015. (v) Review Universal Service obligations and/or similar policies to ensure that infrastructure covered under these policies are broadband Internet capable by 2015. (vi) Prioritise and expedite roll-out of broadband Internet capable infrastructure to schools by 2015. (vii) Conduct feasibility study on developing after 2015 an ASEAN Single Telecommunications Market, in the context of free flow of products, services, investments and skilled human resources by 2015.	
7. Prioritise the processes to resolve institutional issues in ASEAN energy infrastructure projects	TAGP (i) Form a model for ASEAN Joint-Venture gas pipeline company. (ii) Adopt common technical standards for design, construction and maintenance of infrastructure. (iii) Adopt business model for TAGP. (iv) Implement regional safety/security plan for TAGP infrastructure. (v) Optimise and operationalise TAGP. (vi) Study the feasibility of extending the TAGP to BIMP-EAGA. APG (i) Harmonise legal and regulatory framework for bilateral and cross-border power interconnection and trade (2008 – 2010). (ii) Harmonise common technical standards codes or guidelines of the ASEAN Interconnection projects: Planning and Design, System Operation, and Maintenance (2008 – 2012). (iii) Identify and recommend financing modalities for realising the APG (2008 – 2011). (iv) Implement various bilateral/multilateral interconnection projects and reporting progress to Heads of ASEAN Power Utilities/Authorities (HAPUA) Council and ASEAN Senior Officials Meeting on Energy (SOME)/ASEAN Ministers on Energy Meeting (AMEM) (2008 – 2015).	Intra-ASEAN electricity / gas exports and imports (US$ thousands) Project updates
Institutional Dimension		
1. Fully operationalise the three Framework Agreements on transport facilitation:	(i) Expedite the ratification of the Agreements so as to enable their operationalisation in the region. (ii) Expedite the finalisation of Protocol 2 (Frontier Posts) and Protocol 7 (Customs Transit) under AFAFGIT for eventual signing by ASEAN Member States by 2011.	Intra-ASEAN Trade Intensity Index Reference to linked indicators and models

• ASEAN Framework Agreement on the Facilitation of Goods in Transit (AFAFGIT) • ASEAN Framework Agreement on the Facilitation of Inter-State Transport (AFAFIST) • ASEAN Framework Agreement on Multimodal Transport (AFAMT)	(iii) Accelerate the conclusion of Protocol 6 (Railway borders and interchange stations) under AFAFGIT for eventual signing by ASEAN Member States by 2011. (iv) Closely monitor the progress of implementation of AFAFGIT, AFAFIST and AFAMT in order to ensure	
2. Implement initiatives to facilitate inter-state passenger land transportation	(i) Expedite the implementation of the existing bilateral and sub-regional arrangements on facilitation of inter-state passenger land transportation in the region by 2013. (ii) Develop a regional ASEAN arrangement on facilitation of inter-state passenger land transportation, based on the assessment of the implementation of the bilateral and sub-regional arrangements by 2015.	Inter-State passenger land arrivals (thousand people)
3. Develop the ASEAN Single Aviation Market (ASAM)	(i) Ratify and implement the Multilateral Agreement on the Full Liberalisation of Air Freight Services (MAFLAFS) and its Protocols 1 and 2; implementation timelines of the MAFLAFS and its Protocols 1 and 2 as 31 December 2008. (ii) Ratify and implement the Multilateral Agreement on Air Services (MAAS) and its Protocols 1 to 6; implementation timelines of 31 December 2008 for Protocol 5 and 31 December 2010 for Protocol 6. (iii) Sign the ASEAN Multilateral Agreement on the Full Liberalisation of Passenger Air Services (MAFLPAS) by 2010 and ratify and implement MAFLPAS; implementation timelines of Protocols 1 and 2 are 30 June 2010 and 30 June 2013 respectively. (iv) Conclude the Air Transport Agreement (ATA) with China by 2010, India and ROK, not later than 2015, and thereafter consider the possible expansion to other partners. (v) Formulate an ASEAN Single Aviation Market (ASAM) Roadmap and implementation strategy by 2011 and develop an ASAM by 2015.	Intra-ASEAN air passenger flows Intra-ASEAN air cargo capacity flows (m^3)
4. Develop an ASEAN Single Shipping Market	(i) Finalise the development of strategies by 2012 for an ASEAN Single Shipping Market and develop the relevant framework for its implementation no later than 2015.	Liner Shipping Connectivity Index (index score)
5. Accelerate the free flow of goods within ASEAN region by eliminating barriers to merchandise trade within the region	(i) Rationalise and minimise non-tariff measures of ASEAN Member States. (ii) Harmonise and develop regional standards and strengthen conformity assessment capability in the region.	*Doing Business*, Trading Across Borders Distance to Frontier *Doing Business*, Time to import / export (days)

	(iii) Enhance the rules of origin (ROO), including introduction of facilitative processes such as electronic processing of certificate of origin (COO) by 2012 and harmonization of national procedures to the extent possible by 2015. (iv) Determine areas for further alignment of ROOs of Dialogue Partners to ATIGA ROOs, to strengthen production processes and expedite the movement of goods within ASEAN and between ASEAN and Dialogue Partners by 2015.	Logistics Performance Index (perception index score) Logistics Performance Index, Efficiency of clearance (perception score)
6. Accelerate the development of an efficient and competitive logistics sector, in particular transport, telecommunications and other connectivity-related services in the region.	(i) Remove substantially all restrictions on trade in services for logistics services by 2013. (ii) Expedite the liberalisation of the telecommunications services as soon as possible noting that the deadline in the AEC Blueprint is 2010.	Intra-ASEAN exports, transport and ICT services (US$ millions) Intra-ASEAN exports as a share of ASEAN world exports (%) Services Trade Restrictiveness Index score (perception index) Transportation / ICT services imports/exports (US$ million) Logistics Performance Index, Logistics quality and competence (perception score)
7. Substantially improve trade facilitation in the region, quality of customs services and the timeliness of delivery of goods; implementation of the National Single Windows and the ASEAN Single Window	(i) Accelerate the full implementation of the National Single Windows (NSWs) for ASEAN-6 as soon as possible, noting that the deadline for the establishment of NSWs in ASEAN-6 was 2008, and for CLMV in 2012. (ii) Activate and operate the ASEAN Single Window for all ASEAN Member States, by 2015. (iii) Simplify customs procedures, formalities and practices of all Member States with the target of reducing processing costs by 20% by 2013 and by 50% by 2015. (iv) Develop a comprehensive and compatible regulatory framework on customs procedures and border management operations by 2014. (v) Promote partnership and active engagement of businesses and industries into the process of policy making in fostering its speedy and smooth implementation. (vi) Develop the human resources necessary to complement the above actions by 2013.	See institutional Connectivity Strategy 5.

8. Enhance border management capabilities.	(i) Develop procedures of border management (Customs, Immigration, Quarantine, or CIQ) in managing cross-border movement of passengers and goods by 2013. (ii) Synchronize procedures, formalities and practices in border management and its harmonization to the extent possible by 2013. (iii) Promote joint border management in pursuing "One Single Inspection and Processing Point" by 2013.	See institutional Connectivity Strategy 5.
9. Accelerate further opening up of ASEAN Member States to investments from within and beyond the region under fair investment rules	(i) Establish a modality for the phased reduction/elimination of investment restrictions and impediments, in order to achieve a free and open investment regime with minimal investment restrictions within ASEAN by 2015. The reduction and elimination of investment restrictions and impediments is preferentially accelerated in the ASEAN priority integration sectors. (ii) Establish a review process at the level of Ministers to ensure effective implementation of the phased reduction of the investment restrictions and impediments in each ASEAN Member State by 2015.	FDI Inflows to ASEAN Member States (US$ millions)
10. Strengthen institutional capacity in lagging areas in the region and improve regional-subregional coordination of policies, programs and projects	(i) Facilitate the flow of technical assistance, including from the donor community, to CLMV countries and sub-regional groupings for capacity building needed to effectively undertake the initiatives under this Master Plan by 2012. (ii) Set up a coordinating mechanism and structure between the ASEAN Secretariat on the one hand and the respective secretariats of the sub-regional initiatives and the ADB on the other hand, so as to ensure the consistency and complementarities of the policies, programs and projects of the sub-regional initiatives with the policies, programs and projects of ASEAN by 2011. (iii) Strengthen the capability and resources of the ASEAN Secretariat and the secretariats of the sub-regional initiatives in monitoring and evaluating the implementation of the above-mentioned mandates by 2011.	-
People to People		
1. Promote deeper intra-ASEAN social and cultural understanding.		Intra-ASEAN international tertiary students (number of people)
2. Encourage greater intra-ASEAN people mobility.		Annual air passenger capacity, Intra-ASEAN international arrivals (millions people)

Annex 2. MPAC Priority Projects

Project	Associated Strategy
Physical Connectivity	
1. Completion of the ASEAN Highway Network (AHN) Missing Links and Upgrade of Transit Transport Routes	1, Land transport
2. Completion of the Singapore Kunming Rail Link (SKRL) Missing Links	2, Land transport
3. Establish an ASEAN Broadband Corridor (ABC)	6, ICT
4. Melaka-Pekan Baru Interconnection (IMT-GT: Indonesia)	7, Energy
5. West Kalimantan-Sarawak Interconnection (BIMP-EAGA: Indonesia)	7, Energy
6. Study on the Roll-on/roll off (RoRo) Network and Short-Sea Shipping	4, Maritime transport
Institutional Connectivity	
1. Developing and Operationalising Mutual Recognition Arrangements (MRAs) for Prioritised and Selected Industries	5, Free flow of goods
2. Establishing Common Rules for Standards and Conformity Assessment Procedures	Free flow of goods
3. Operationalise all National Single Windows (NSWs) by 2012	5, Free flow of goods / 7, ASEAN Single Window
4. Options for a Framework Modality towards the Phased Reduction and Elimination of Scheduled Investment Restrictions / Impediments	9, Free flow of investments
5. Operationalisation of the ASEAN Agreements on Transport Facilitation	1, Transport facilitation
People to People Connectivity	
1. Easing Visa Requirements for ASEAN Nationals	2, Movement of people, tourism
2. Development of ASEAN Virtual Learning Resource Centres	1, Culture
3. Develop ICT Skill Standards	ICT
4. ASEAN Community Building Programme	1, Culture, education

Annex 3. Technical Notes: Select Indicators

Strategy	Indicator / Unit of Measure	Indicator Technical Notes
Physical Dimension		
1. Complete the ASEAN Highway Network	Length of ASEAN Highway Network by Class I, II, III and Below Class III	*Reported absolute value, kilometer length by class*
2. Complete the implementation of the Singapore Kunming Rail Link (SKRL) project	Length of overall rail network	*Reported absolute value, kilometer length*
3. Establish an efficient and integrated inland waterways network	Inland waterway port cargo throughput	*Reported absolute value of cargo volume passing through port (thousand tons)*
4. Accomplish an integrated, efficient and competitive maritime transport system	Sea container throughput	*Reported absolute value of sea container cargo volume passing through seaports (thousand tons)*
	Imports and exports by sea	*Reported absolute value of import and export volumes passing through seaports (thousand tons)*
	GCI Quality of Port Infrastructure	Quality perception score, see Annex 4
5. Establish integrated and seamless multimodal transport systems to make ASEAN the transport hub in the East Asia region	Logistics Performance Index	Perception score, see Annex 4
6. Accelerate the development of ICT infrastructure and services in each of the ASEAN Member States	Internet users per 100 inhabitants	$\frac{Total\ Internet\ users}{Total\ population} \times 1000$
	Mobile telephone subscribers per 100 inhabitants	$\frac{Total\ mobile\ telephone\ users}{Total\ population} \times 1000$
7. Prioritize the processes to resolve institutional issues in ASEAN energy infrastructure projects	Intra-ASEAN electricity / gas exports and imports	*Reported absolute value of electricity and gas exports and imports (US$ thousands)*

Institutional Dimension		
1. Fully operationalize three Framework Agreements on transport facilitation	Intra-ASEAN Trade Intensity Index	$\frac{Total\ trade\ of\ country\ with\ ASEAN}{Total\ trade\ of\ country} \Big/ \frac{Total\ world\ trade\ with\ country}{Total\ world\ trade}$
2. Implement initiatives to facilitate inter-state passenger land transportation	Inter-State passenger land arrivals	*Reported absolute value of passenger land arrivals (thousand people)*
3. Develop the ASEAN Single Aviation Market (ASAM)	Intra-ASEAN air passenger flows	*Reported absolute value of bilateral passenger flows*
	Intra-ASEAN bilateral air cargo capacity (m^3)	*Estimated volume of available cargo capacity, based on bilateral cargo flight flow, aircraft in use, and aircraft capacity data (m^3)*
4. Develop an ASEAN Single Shipping Market	Liner Shipping Connectivity Index (	Index score, see Annex 4
5. Accelerate the free flow of goods within ASEAN region by eliminating barriers to merchandise trade. 7. Substantially improve trade facilitation, quality of customs services and timeliness of delivery of goods. 8. Enhance border management capabilities.	*Doing Business*, Trading Across Borders 'Distance to Frontier' Time to import / export	Index score, see Annex 4 *Observed average number of days to export a standardized cargo of goods*
	Logistics Performance Index Logistics Performance Index, Efficiency of clearance	Perception index score, see Annex 4 Perception score, see Annex 4
6. Accelerate development of an efficient and competitive logistics sector, in particular transport, telecommunications and connectivity-related services.	Intra-ASEAN exports, transport and ICT services	*Value of ASEAN services exports to ASEAN Member States (US$ millions)*
	Intra-ASEAN exports as a share of ASEAN world exports (%)	$\frac{Value\ of\ ASEAN\ exports\ to\ other\ ASEAN}{Value\ of\ ASEAN\ world\ exports} \times 100$
	Services Trade Restrictiveness Index score	Perception index score

	Transportation / ICT services imports/exports (	*Reported absolute value of services imports and exports (US$ millions)*
	Logistics Performance Index, Logistics quality and competence	Perception score, see Annex 4
9. Accelerate further opening up of ASEAN Member States to investments from within and beyond the region under fair investment rules	FDI Inflows to ASEAN Member States	*Reported absolute value of foreign direct investments to ASEAN Member States (US$ millions)*
People to People Dimension		
1. Promote deeper intra-ASEAN social and cultural understanding.	Intra-ASEAN international tertiary students (number of people)	*Reported absolute number of ASEAN international students, per year, in other ASEAN Member States (number of people)*
2. Encourage greater intra-ASEAN people mobility.	Annual air passenger capacity, Intra-ASEAN international arrivals	*Estimated absolute value of air passenger flows between ASEAN Member States (millions of people)*

Annex 4. ACIM Data Sources

Data Source, frequency	Observations / Description
AJTP Information Center http://www.ajtpweb.org/statistics 2004-2012	Total railway route length River cargo throughput (domestic/international) International sea container throughput Total import cargo by sea Total export cargo by sea
ASEANStats http://aseanstats.asean.org 2000-2013	Foreign Direct Investments FDI Flows from Extra-ASEAN (US$ millions) Intra-ASEAN FDI Flows (US$ millions), 2000-2010 Intra-ASEAN FDI Flows by Source Country, 2000-2010 (US$ millions) International Trade in Services
DiiO Aviation Intelligence database	Monthly bilateral passenger flows and cargo flights by city of origin and destination
Doing Business The World Bank http://www.doingbusiness.org	*Doing Business* measures the time and cost (excluding tariffs) associated with exporting and importing a standardized cargo of goods by sea transport. The time and cost necessary to complete 4 predefined stages (document preparation; customs clearance and inspections; inland transport and handling; and port and terminal handling) for exporting and importing the goods are recorded; however, the time and cost for sea transport are not included. All documents needed by the trader to export or import the goods across the border are also recorded. The process of exporting goods ranges from packing the goods into the container at the warehouse to their departure from the port of exit. The process of importing goods ranges from the vessel's arrival at the port of entry to the cargo's delivery at the warehouse. For landlocked economies, since the seaport is located in the transit economy, the time, cost and documents associated with the processes at the inland border are also included. It is assumed that the payment is made by letter of credit, and the time, cost and documents required for the issuance or advising of a letter of credit are taken into account. Local freight forwarders, shipping lines, customs brokers, port officials and banks provide information on required documents, cost and time to export and import. To make the data comparable across economies, several assumptions about the business and the traded goods are used. The indicators applied include: • Trading Across Borders rank, based on: documents to import / export (number); time to import / export; (days); cost to import / export (US$ per container) • Trading Across Borders DTF: The distance to frontier score aids in assessing the absolute level of regulatory performance and how it improves over time. This measure shows the distance of each economy to the "frontier," which represents the best performance observed on each indicator across all economies in the sample since 2005.

	• Documents to import / export (number) • Time to import / export (days) • Cost to import / export (US$ per container)
EuroMonitor, annual to 2013	Passenger land arrivals by country
Liner Shipping Connectivity Index The World Bank http://data.worldbank.org/indicator/IS.SHP.GCNW.XQ	The Liner Shipping Connectivity Index captures how well countries are connected to global shipping networks. It is computed by the United Nations Conference on Trade and Development (UNCTAD) based on five components of the maritime transport sector: number of ships, their container-carrying capacity, maximum vessel size, number of services, and number of companies that deploy container ships in a country's ports. For each component a country's value is divided by the maximum value of each component in 2004, the five components are averaged for each country, and the average is divided by the maximum average for 2004 and multiplied by 100. The index generates a value of 100 for the country with the highest average index in 2004. The underlying data come from Containerisation International Online.
Logistics Performance Index The World Bank http://lpi.worldbank.org 2007, 2010, 2012, 2014	The logistics performance (LPI) is the weighted average of the country scores on the six key dimensions: 1) Efficiency of the clearance process (speed, simplicity and predictability of formalities) by border control agencies, including customs; 2) Quality of trade and transport related infrastructure (e.g., ports, railroads, roads, information technology); 3) Ease of arranging competitively priced shipments; 4) Competence and quality of logistics services (e.g., transport operators, customs brokers); 5) Ability to track and trace consignments; 6) Timeliness of shipments in reaching destination within the scheduled or expected delivery time.
UN ESCAP, annual to 2012	AHN Highway length by road class
World Economic Forum Global Competitiveness Index (GCI) 2008-2014	The GCI Quality of Infrastructure indicators measure business executives' perceptions of their country's transport facilities. Data are from the World Economic Forum's Executive Opinion Survey, conducted for 30 years in collaboration with 150 partner institutes. The 2009 round included more than 13,000 respondents from 133 countries. Sampling follows a dual stratification based on company size and the sector of activity. Data are collected online or through in-person interviews. Responses are aggregated using sector-weighted averaging. The data for the latest year are combined with the data for the previous year to create a two-year moving average. Scores range from 1 (infrastructure considered extremely underdeveloped) to 7 (infrastructure considered efficient by international standards). Data used includes Quality of air transport infrastructure and Quality of port infrastructure

Annex 5. Current Services Trade Restrictions

Country	Label	Mode 1	Mode 3
Cambodia	Fixed-line telecommunications		There is no limit on foreign ownership. License criteria are not publicly available. The number of licenses is not fixed, their allocation is discretionary. The regulator is independent from the sector Ministry. IG: operated by a monopoly. VOIP: not allowed.
	Mobile telecommunications		There is no limit on foreign ownership. License criteria are not publicly available. The number of licenses is not fixed, allocation is discretionary. The regulator is independent from the sector Ministry. IG: operated by a monopoly. VOIP: not allowed.
	Air Passenger Domestic		For acquisition of a state-owned entity, the limit on foreign ownership is 49 percent. Regarding employment, 90 percent of the employees must be nationals.
	Air Passenger International		There are no equity restrictions.
	Maritime Shipping International	Open; national ships do not receive preferences and carrier agreements are subject to competition law.	There are no restrictions, except that the foreign ownership limit of 49 percent is required for acquiring state-owned entities.
	Maritime Auxiliary Services		This is closed, except for freight forwarding services.
	Road Freight Domestic		There is no equity restriction, except for acquiring a state-owned entity; the limit on foreign ownership is 49 percent.
	Rail Freight Domestic		There is no equity restriction, except for acquiring a state-owned entity; the limit on foreign ownership is 49 percent.
Indonesia	Fixed-line telecommunications		Applicants must form a JV. The limit on foreign ownership is 95 percent, which may be reduced to 35 percent. The regulator is not independent from the sector Ministry. The number of licenses not fixed, but allocated at the discretion of the regulator. IG: entry is allowed, the fee is 1 percent of annual gross income. VOIP: allowed.
	Mobile telecommunications		Applicants must form a JV. The limit on foreign ownership is 95 percent, which may be reduced to 35 percent. The regulator is not independent from the sector Ministry. The number of licenses not fixed, but allocated at the discretion of the regulator. IG: entry is allowed, the fee is 1 percent of annual gross income. VOIP: allowed.
	Air Passenger Domestic		Applicants must be a joint venture. The limit on foreign ownership is 49 percent. Approval from the Investment Board is required. Acquisition of part or all of a state-owned company is subject to approval by the House of Representatives, the President, and various sector Ministers.
	Air Passenger International		Applicants must be a joint venture. The limit on foreign ownership is 49 percent. Approval from the Investment Board is required. Acquisition of part or all of a state-owned company is subject to approval by the House of Representatives, the President, and various sector Ministers.
	Maritime Shipping International	Private cargo is open. Government cargo is reserved for national ships. Carrier agreements are subject to competition law.	Applicants must be a joint venture. The limit on foreign ownership is 49 percent. Approval from the Investment Board is required. Acquisition of part or all of a state-owned company is subject to approval by the House of Representatives, the President, and various sector Ministers.
	Maritime Auxiliary Services		This is closed, except for maritime cargo handling and freight forwarding services.

	Road Freight Domestic		Closed
	Rail Freight Domestic		Closed
Malaysia	Fixed-line telecommunications		Applicants must maintain 30 percent Bumiputera equity ownership. There are no limits on the issuance of a license, but ad hoc announcements of new license availability will include number of such licenses. The licensing fees for individual and class licenses are RM 50,000 and RM 2,500 respectively. The regulator is independent from the sector Ministry. IG: entry is allowed. VOIP: allowed, subject to licensing conditions.
	Mobile telecommunications		There are no restrictions on the form of entry. Applicants must maintain 30 percent Bumiputera equity ownership. There are no limits on the issuance of a license. The licensing fees for individual and class licenses are RM 50,000 and RM 2,500 respectively. The regulator is independent from the sector Ministry. IG: entry is allowed. VOIP: allowed, subject to licensing conditions.
	Air Passenger Domestic		License or permit is required. Must be locally incorporated to provide domestic services. Foreign equity is decided by the regulator of the industry. No foreign airline is allowed to operate domestic air transport services.
	Air Passenger International		No restriction on legal form of entry for international airlines to operate international services into Malaysia. However, before foreign airlines can start their operations into Malaysia, they must be designated under the provisions of the BASA. To be designated, the airline must fulfill the SOEC (substantial ownership and effective control) requirement. Foreign equity is decided by the regulator of the industry.
	Maritime Shipping International	This is open, except for government cargo.	Entry is allowed only through a representative office, regional office, or locally incorporated joint venture (JV) subsidiary, with Malaysian individuals or Malaysian-controlled corporations or both. The limit on aggregate foreign ownership in the JV and state-owned entity (M&A) is 30 percent.
	Maritime Auxiliary Services		Entry is allowed only through a representative office, regional office, or locally incorporated joint venture (JV), subsidiary, with Malaysian individuals or Malaysian-controlled corporations or both. The limit on aggregate foreign ownership in the JV and state-owned entity (M&A) is 30 percent. All sub-categories of services allowed, except for the customs clearance services.
	Road Freight Domestic		Several types of licenses are available. License A is given to companies with a foreign ownership limit of 49 percent and Bumiputera equity of 30 percent. The license is also given to companies with full foreign ownership if services rendered include renting and hiring for activity, technology, vehicles, and expertise not available in Malaysia. License C is given to companies with full foreign ownership in the manufacturing sector to transport their own freight.
	Rail Freight Domestic		Rail transport is wholly owned by the government through Keretapi Tanah Melayu Bhd. Under freight forwarding, licenses are issued by various authorities such as the Department of Customs, Port Authority, and Commercial Vehicle and Licensing Board.
Philippines	Fixed-line telecommunications		The limit on foreign ownership is 40 percent. For award of a license, NTC considers the applicant's capacity, the local economic conditions and public interest, and prescribes a maintenance fee for the license, based on the applicant. IG: entry is allowed, the filing fee is PhP225; a maintenance fee is also payable, which is based on the capitalization of the applicant. VOIP: allowed. The majority of the Board of Directors must be Filipinos.
	Mobile telecommunications		The limit on foreign ownership is 40 percent. Radio frequency spectrum may be limited. Licenses are allocated through a tender. Licenses are allocated through a tender. IG: entry is allowed, the filing fee is PhP225; a maintenance fee is also payable, which is based on the capitalization of the applicant. VOIP: allowed. The majority of the Board of Directors must be Filipinos.

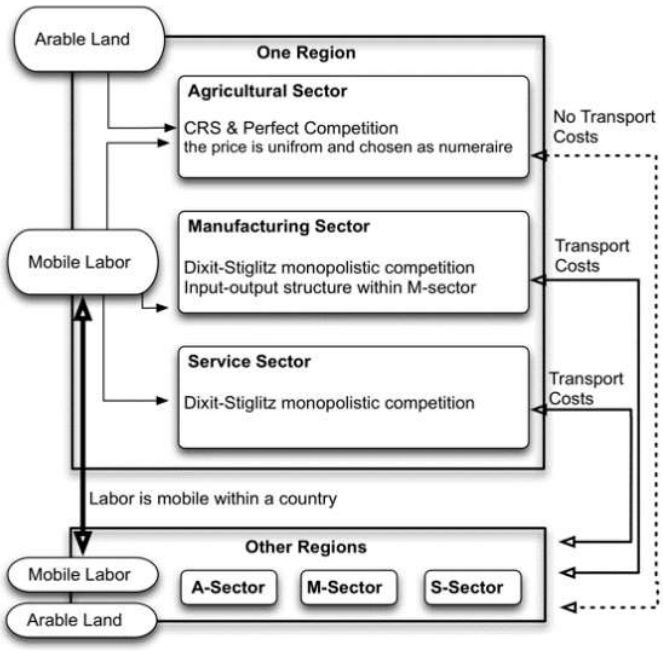
	Air Passenger Domestic		The limit on foreign ownership is 40 percent. Acquisition of a state-owned entity is not allowed. The participation of foreign investors in the Board of Directors is limited to their proportionate share of capital in the firm. A Certificate of Public Convenience must be issued; these are issued to firms that are majority domestically owned.
	Air Passenger International		The limit on foreign ownership is 40 percent. Acquisition of a state-owned entity is not allowed. The participation of foreign investors in the Board of Directors is limited to their proportionate share of capital in the firm. A Certificate of Public Convenience must be issued; these are issued to firms that are majority domestically owned.
	Maritime Shipping International	Private and government cargo: preference granted to national ships if transporter is given a loan or credit by the government, or the transporter's obligations are guaranteed by the government. Carrier agreements are subject to competition law.	The limit on foreign ownership is 40 percent. Acquisition of a state-owned entity is not allowed. The participation of foreign investors in the Board of Directors is limited to their proportionate share of capital in the firm. A Certificate of Public Convenience must be issued; these are issued to firms that are majority domestically owned.
	Maritime Auxiliary Services		The limit on foreign ownership is 40 percent. Further restrictions on customs clearance and maritime agency services apply. The majority of the Board of Directors must be Filipinos.
	Road Freight Domestic		The limit on foreign ownership is 40 percent. Acquisition of a state-owned entity is not allowed. The participation of foreign investors in the Board of Directors is limited to their proportionate share of capital in the firm. A Certificate of Public Convenience must be issued; these are issued to firms that are majority domestically owned. The majority of the Board of Directors must be Filipinos.
	Rail Freight Domestic		The limit on foreign ownership is 40 percent. The participation of foreign investors in the Board of Directors is limited to their proportionate share of capital in the firm. A Certificate of Public Convenience must be issued; these are issued to firms that are majority domestically owned. The majority of the Board of Directors must be Filipinos.
Thailand	Fixed-line telecommunications		The limit on foreign ownership is 49 percent. The number of licenses is not fixed, but allocated at the discretion of the regulator. The regulator is independent from the sector Ministry. Majority of BOD must be Thai nationals. IG: entry is allowed. VOIP: allowed.
	Mobile telecommunications		The limit on foreign ownership is 49 percent. The number of licenses is not fixed, but allocated at the discretion of the regulator. The regulator is independent from the sector Ministry. Majority of BOD must be Thai nationals. IG: entry is allowed. VOIP: allowed.
	Air Passenger Domestic		The limit on foreign ownership is 49 percent, with effective control by Thai nationals. Majority of BOD must be Thai nationals.
	Air Passenger International		The limit on foreign ownership is 49 percent, with effective control by Thai nationals.
	Maritime Shipping International	Private cargo open. For government cargo, preference given to Thai-flagged vessels. Carrier agreements subject to competition law.	The limit on foreign ownership is 49 percent for shipping firms operating Thai-flagged vessels. Foreign firms can acquire a controlling stake, but have no right to operate Thai-flagged vessels. Majority of BOD must be Thai nationals.
	Maritime Auxiliary Services		This is open, subject to domestic regulations. A license is required for certain sub-sectors, including customs clearance and container and depot services. The limit on foreign ownership is 49 percent. Majority of BOD must be Thai nationals.
	Road Freight Domestic		The foreign equity limit is 49 percent in private and/or state-owned entities. Majority of BOD must be Thai nationals.
	Rail Freight Domestic		The foreign equity limit is 49 percent in private and/or state-owned entities. Majority of BOD must be Thai nationals.

Vietnam	Fixed-line telecommunications		The limit on foreign ownership is 49 percent for facilities-based services (GATS). Entry is allowed only through a joint venture. For establishment of a telecom network and its provision of services, approval of the Prime Minister is required. Ownership and operation of IG is not allowed. VOIP is not regulated. Twenty percent of managers, executives, and employees must be nationals.
	Mobile telecommunications		The limit on foreign ownership is 49 percent for facilities-based services (GATS). Entry is allowed only through a joint venture. Foreign ownership limit for non facilities-based services is 51 percent. Foreign ownership limit for non facilities-based services will be raised to 65 percent 3 years after Vietnam's WTO accession (11 Jan 2007); joint ventures will be allowed without limitation on choice of partner. For establishment of a telecom network and its provision of services, approval of the Prime Minister is required. Operation of IG is not allowed. VOIP is not regulated. Twenty percent of managers, executives, and employees must be nationals.
	Air Passenger Domestic		Entry is allowed through a joint venture and/or acquisition of existing entities. The limit on foreign ownership is 30 percent if acquiring a state-owned entity. The limit on foreign ownership is 49 percent if establishing a joint venture. The limit on foreign ownership is 99 percent if acquiring a private entity.
	Air Passenger International		Entry is allowed through a joint venture and/or acquisition of existing entities. The limit on foreign ownership is 30 percent if acquiring a state-owned entity. The limit on foreign ownership is 49 percent if establishing a joint venture. The limit on foreign ownership is 99 percent if acquiring a private entity.
	Maritime Shipping International	No restrictions	Entry is allowed through a joint venture and/or acquisition of existing entities. The limit on foreign ownership is 30 percent if acquiring a state-owned entity. The limit on foreign ownership is 49 percent if establishing a joint venture. The limit on foreign ownership is 99 percent if acquiring a private entity. There is a limit on the number of providers.
	Maritime Auxiliary Services		No particular regulations govern the auxiliary services. For a joint venture, the limit on foreign ownership is 50 percent. For acquiring a private entity, the limit on foreign ownership is 99 percent; for a state-owned entity, the limit on foreign ownership is 30 percent. Certain types of auxiliary services may not be open to foreign investment.
	Road Freight Domestic		Entry allowed only through a joint venture with local partners, limit on foreign ownership is 49%. For acquisition of a state-owned entity, limit on foreign ownership is 30%.
	Rail Freight Domestic		Entry allowed only through acquisition; limit on foreign ownership 49% for acquisition of state-owned railway operator

Annex 6. Technical Notes: Geographical Simulation Model

The IDE-GSM[29] analyzes impacts of specific infrastructure projects and transport and trade-related policy measures on a regional economy at the sub-national level. The model is multi-regional and multi-sectoral, featuring agriculture, five manufacturing sectors, and the services sector, with goods tradable across sectors. The model accommodates worker mobility within countries and between sectors. Although transport of agricultural goods is assumed to be costless, transport of manufactured goods and services are assumed to be of the iceberg type.[30] The theoretical foundation follows Puga and Venables (1996), except that, for agriculture, it explicitly incorporates land size in production and set technology as featuring constant returns to scale.[31]

Figure 99. Basic structure of the GSM model



Source: IDE-JETRO

The simulation model is used to determine twelve values of the following regional variables: nominal wage rates in three sectors; land rent; regional income; regional expenditure on manufactured goods; price index of manufactured goods and of services; average real wage

[29] Modified version of Kumagai and Isono (2011)
[30] If one unit of a product is sent from one location to another, only a portion of the unit arrives. Depending on the lost portion, the supplier sets a higher price. The increase in price compared to the manufacturer's price is regarded as the transport cost. Transport costs within the same region are considered to be negligible.
[31] For detailed derivations, see Puga and Venables (1996) and Fujita et al. (1999).

rates in three sectors; population share of a location in a country; and population shares of a sector in three industries within one location.

The dynamics of labor are decided by three differential equations. Nominal wage rates in agriculture sector are derived from cost minimization, subject to the production function of the agriculture sector

$$f_A(r) = A_A(r)L_A(r)^{\alpha} F(r)^{1-\alpha}$$

where $A_A(r)$ is the efficiency of production at location *r*; $L_A(r)$ represents the labor inputs of the agriculture sector at location *r*; and $F(r)$ is the area of arable land at location *r*. Since the price of an agricultural good is the same in all locations, nominal wage rates in the agriculture sector in location *r*, which is expressed as $w_A(r)$, are the value of the marginal product for labor input as follows:

$$w_A(r) = A_A(r)\alpha\left(\frac{F(r)}{L_A(r)}\right)^{1-\alpha}$$

When used with the production amount, land rents are not used explicitly.

Regional incomes correspond to regional GDPs. Supposing that revenues from land at location *r* belong to households at location *r*, GDP at location *r* is expressed as follows:

$$Y(r) = w_M(r)L_M(r) + f_A(r) + w_S(r)L_S(r)$$

where $w_M(r)$ and $w_S(r)$ are, respectively, nominal wage rates in the manufacturing[32] and services sectors at location *r*, and $L_M(r)$ and $L_S(r)$ are labor inputs of the manufacturing sector and the services sector at location *r*, respectively.

Regional expenditure on manufactured goods at location *r*, which is expressed as $E(r)$, consists of household purchases as final consumption and manufacturing firms as intermediary consumption:

$$E(r) = \mu_M Y(r) + \frac{1-\beta}{\beta} w_M(r)L_M(r)$$

[32] In the actual model, the manufacturing sector is divided into 5 sub-sectors. So, the subscript *M* consists of M_1 to M_5. For simplicity, these subsectors are represented as a group by the "Manufacturing" sector in this description

where μ_M is the consumption share of expenditures on manufactured goods and β is the input share of labor in output. Thus, the first term shows expenditure on manufactured goods, and the last term expresses expenditure on manufactured goods as an intermediary purchase, since $1-\beta$ shows the share of intermediary purchases in the output of manufacturing firms.

The price index of manufactured goods at location *r* is expressed as follows:

$$G_M(r) = \left[\sum_{s=1}^{R} L_M(s) A_M(r)^{\sigma_M - 1} w_M(s)^{(1-\sigma_M)\beta} G_M(s)^{-\sigma_M(1-\beta)} T_{rs}^{M\,-(\sigma_M-1)} \right]^{\frac{1}{-(\sigma_M-1)}}$$

where T_{rs}^{M} stands for the iceberg transport costs from location *r* to location *s* for manufactured goods and σ_M is the elasticity of substitution between any two differentiated manufactured goods.

To derive (2.5), we substitute the price of manufactured goods and the number of varieties with the minimum cost of purchasing a unit of the manufacturing aggregate. Manufacturing firms at location *r* produce using the composite of labor and manufacturing aggregate. The technology for the composite requirements is the same for all varieties and in all locations and is expressed as a linear function of production quantity with a fixed input requirement. The price of manufactured goods is set as:

$$p_M(r) = w_M(r)^{\beta} G_M(r)^{1-\beta} / A_M(r)$$

where $w_M(r)$ is the nominal wage of the manufacturing sector at location *r*, and $G_M(r)$ is the price index of manufactured goods at location *r*. Here, the marginal input requirement is supposed to equal to the price-cost markup. The supply of a variety is decided by the zero-profit condition. The quantity of supply depends on the size of the fixed input requirement. Using the supply of manufactured goods and choosing the size of the fixed input requirement adequately, the number of manufacturing firms at a location is determined by using the relation between the share of β labor input and the demand for manufactured goods. As a first step, the price index of manufactured goods is derived from the expenditure minimization of a constant-elasticity-of-substitution function.

The price index of services at location *r* is expressed as follows:

$$G_S(r) = \left[\sum_{s=1}^{R} L_S(s) A_S(r)^{\sigma_S - 1} w_S(s)^{-(\sigma_S-1)} T_{rs}^{S\,-(\sigma_S-1)} \right]^{\frac{1}{-(\sigma_S-1)}}$$

where T_{rs}^{S} is the iceberg transport costs from location *r* to location *s*, for services, σ_S is the elasticity of substitution between any two differentiated services. We choose the production units of a firm that equals the inverse of the consumption share of services. Note that the derivation processes are slightly different. Using only labor, the technology is the same for all varieties and in all locations is expressed as a linear function of production quantity with a fixed input requirement. The price of services is set as

$$p_S(r) = w_S(r) / A_S(r)$$

where $w_S(r)$ is the nominal wage of the service sector at location r^{r} and $A_S(r)$ is the production efficiency of the service sector at location *r*. The number of varieties of services is decided from the equality of wage payment and the expenditure share of labor at location *r*.

The nominal wage in the manufacturing sector at location *r* is expressed as follows:

$$w_M(r) = \left[\frac{A_M(r)\beta^{\frac{1}{\sigma_M}} \left[\sum_{s=1}^{R} E(s) T_{rs}^{M\,1-\sigma_M} G_M(s)^{-(1-\sigma_M)} \right]^{\frac{1}{\sigma_M}}}{G_M(r)^{1-\beta}} \right]^{\frac{1}{\beta}}$$

using the equality of demand and supply on a variety of manufactured goods.

Similarly, nominal wages in the service sector are expressed as follows:

$$w_S(r) = A_S(r) \left[\sum_{s=1}^{R} Y(r) T_{rs}^{S\,1-\sigma_S} G_S(s)^{-(1-\sigma_S)} \right]^{\frac{1}{\sigma_S}}$$

From (2.1) to (2.8), the variables are decided using a given configuration of labor. Derived regional GDP, nominal wage rates, and price indexes are used to determine labor's decision on a working sector and place. The dynamics for labor to decide on a specific sector within a location is expressed as follows:

$$\dot{\lambda}_I(r) = \gamma_I \left(\frac{\omega_I(r)}{\bar{\omega}(r)} - 1 \right) \lambda_I(r), \quad I \in \{A, M, S\},$$

where $\dot{\lambda}_I(r)$ is the change in labor (population) share for a sector within a location, γ_I is a parameter used to determine the speed of switching jobs in a location, $\omega_I(r)$ is the real wage

rate of any sector at location *r*, and $\overline{\omega}(r)$ is the average real wage rate at location *r*. The population share for a sector in a country is expressed as:

$$\lambda_I(r) = \frac{L_I(r)}{L_A(r) + L_M(r) + L_S(r)}.$$

The dynamics of labor migration between regions is expressed as follows:

$$\dot{\lambda}_L(r) = \gamma_L \left(\frac{\omega(r)}{\bar{\omega}_C} - 1 \right) \lambda_L(r)$$

where $\dot{\lambda}_L(r)$ is the change in the labor (population) share of a location in a country, γ_L is the parameter for determining the speed of migration between locations, and $\lambda_L(r)$ is the population share of a location in a country. $\omega(r)$ shows the real wage rate of a location and is specified as follows:

$$\omega(r) = \frac{Y(r)/(L_A(r) + L_M(r) + L_S(r))}{G_M(r)^{\mu} G_S(r)^{\nu}},$$

where ν shows the consumption share of services. Furthermore, $\overline{\omega_C}$ shows the average real wage rate at location *r*. Notice that labor migration is affected by per capita regional GDP and price index.

Data

Data for IDE/GSM cover eighteen Asian countries/economies and 66 additional countries worldwide. The eighteen countries/economies are divided into 1,792 regions, while country data is used for the rest of the world. In total, we have 1,858 regions in the model. Primarily based on official statistics, we derive gross regional domestic product (GRDP) for the agriculture sector, five manufacturing sectors, and the service sector for 2005. The five manufacturing sectors are automotive, electronics and electric appliances, garment and textile, food processing, and other manufacturing. Population and area of arable land for each region are compiled from multiple statistical sources.

The administrative unit adopted in the simulation is one level below the national level for Cambodia, Japan, Korea, the Lao PDR, Malaysia, the Philippines, Taiwan, Thailand, and Vietnam. For Bangladesh, China, India, Indonesia, and Myanmar, the administrative unit is two levels below the national level. Brunei Darussalam, Hong Kong, Macao, and Singapore are treated as one unit, respectively. The United States and European Union are included as

one unit, respectively. In this version of IDE-GSM, we introduce countries other than East Asia, although most lack geographical dimension—i.e., the capital city represents the respective country.

Specifically, our data sources include several types of census or surveys conducted in each country. Some unique data sources are featured. For Cambodia, we use estimates of provincial income and labor employed in primary, secondary, and tertiary industries based on Cambodia's socioeconomic survey conducted between 2003 and 2005. Those estimates are provided by the Japan International Cooperation Agency. Provincial-level figures for the Lao PDR were obtained from unpublished annual provincial reports concerning implementation of their socioeconomic plan. For India, manufacturing GRDP for five sectors was compiled from the value added by industry with the India Annual Survey of Industries. Provincial data for Myanmar are drawn from the Household Income and Expenditure Survey published by the Central Statistical Organization. Even with these sources, we cannot obtain separate GRDP for five manufacturing sectors for some countries. In these cases, sector-level GRDP is derived by multiplying provincial-level GRDP of the total manufacturing industry by the share of each sector's national GDP.

Parameters

Transport cost comprises physical transport costs, time costs, tariff rates, and non-tariff barriers (TNTBs). Physical transport costs are a function of distance traveled, travel speed per hour, physical travel cost per kilometer, and holding costs for domestic / international trans-shipment at border crossings, stations, ports, or airports. Time costs depend on travel distance, travel speed per hour, time cost per hour, and holding time for domestic / international transshipment at border crossings, stations, ports, or airports.

Travel speed per hour is provided in the next section. These parameters are derived from the ASEAN Logistics Network Map 2008 by JETRO and by estimating the model of the firm-level transport mode choice with the "Establishment Survey on Innovation and Production Network" (ERIA) for 2008 and 2009, which includes manufacturers in Indonesia, the Philippines, Thailand, and Vietnam. Based on these parameters, we calculate the sum of physical transport and time costs for all possible routes between two regions. Employing the Floyd-Warshall algorithm for determining the optimal route and transport mode for each region and good, we obtain the sum of physical transport and time costs for each pairing of two regions by industry (Cormen et al., 2001).

We assume that firms choose a transportation mode from among the following three: air, sea, and land:

$$V_M \equiv U_M + \varepsilon_M = \alpha \cdot Abroad_{ji} + \sum_s \beta_s^M u_s \ln d_{ji} + \sum_k \gamma_k^M v_k + \varepsilon_M , \quad (2.11)$$

where ε_M denotes unobservable mode characteristics, while $Abroad_{ji}$ takes unity if regions *i* and *j* belong to different countries and zero otherwise; d_{ji} is the geographical distance between regions *i* and *j*. u_s is industry dummy. When ε_M is independent and follows the identical type I extreme value distribution across modes, the probability that the firm chooses mode *M* is given by:

$$\Pr\left(Y_i = M \mid Abroad_{ji}, \ln d_{ji}\right) = \frac{e^{U_M}}{1 + e^{U_{Air}} + e^{U_{Truck}} + e^{U_{Sea}}}$$

for M = Air, Sea, Truck. (2.12)

The coefficients are estimated by maximum likelihood procedures. In other words, a multinomial logit (MNL) model is used to estimate the probability that a firm chooses one of the three transportation modes: air, sea, and truck. In the following, truck is a base mode.

The geographical distance affects firms' modal choices through not only a per-unit physical charge for shipments but also shipping time costs due to the nature of demand for shipments. Transportation time has a larger influence on the price of products that decay rapidly over time; for example, time-sensitive products include perishable goods (fresh vegetables), new information goods (newspapers) and specialized intermediate inputs (parts for Just-In-Time production). A lengthy shipping time may lead to a complete loss of commercial opportunity for products and their components, which is more likely to be significant for goods with a rapid product life cycle and high demand volatility. Given the value of timeliness in selling a product, time costs are small for timely shipments (short transport time). In other words, time costs will be the highest for shipping by sea and the lowest for shipping by air. On the other hand, the physical transport costs will be highest for air and the lowest for sea. Truck transport will have a medium level of costs comparing air and sea transport. As a result, the coefficient for the geographical distance represents the (*average*) difference in the sum of the above two kinds of transport costs (time and physical transportation) per distance between truck and air/sea.

Furthermore, three points are noteworthy. First, as mentioned above, shipping time costs obviously differ amongst industries. Such differences are controlled by introducing intercepts of industry dummy variables (u_s) with distance variables. Second, the level of port infrastructure is obviously different among countries. This yields different impacts of the

aforementioned two kinds of transport costs among shipping countries. To control such differences among countries in which reporting firms locate, we introduce country dummy variables (v_k). Last, qualitative differences between intra- and international transactions are controlled by introducing a binary variable (*Abroad*), taking unity if transactions are international ones and zero if otherwise.

Our main data source is the Establishment Survey on Innovation and Production Network for selected manufacturing firms in four countries in East Asia for 2008 and 2009 (Table 13). The four countries covered in the survey were Indonesia, the Philippines, Thailand and Vietnam. The sample population is restricted to select manufacturing hubs in each country (JABODETABEK area, i.e., Jakarta, Bogor, Depok, Tangerang, and Bekasi, for Indonesia; CALABARZON area, i.e., Cavite, Laguna, Batangas, Rizal, and Quezon, for the Philippines; Greater Bangkok area for Thailand; and Hanoi area and Ho Chi Minh City for Vietnam). This dataset includes information on the mode of transport that each firm chooses in supplying its main product and sourcing its main intermediate inputs. From there, the products' origin and destination can be identified. In our analysis, however, the combination of origin and destination is restricted to one accessible by land transportation.

Table 17. Combination of trading partners in the data set

	Indonesia	Philippines	Thailand	Vietnam
Cambodia				1
China			6	52
Hong Kong				5
Indonesia	449			
Malaysia				2
Myanmar			1	
Philippines		254		
Singapore				2
Thailand			151	7
Vietnam				382

Source: The Establishment Survey on Innovation and Production Network

With respect to firms' choices of transportation modes, Table 17 reports the combination of trading partners in our dataset. There are three noteworthy points here. First, as mentioned above, firms in the Philippines and Indonesia are restricted to those with intra-national transactions, although most firms in other countries in our dataset are also engaged in intra-national transactions. Second, a large number of Vietnamese firms trade with China. Third, Table 17 shows the transportation mode by the location of firms, indicating that most sample

firms tend to choose truck. Intuitively, this may be consistent with the fact that most of firms trade domestically.

Table 18 Chosen transportation mode by location of firms

	Indonesia	Philippines	Thailand	Vietnam
Air	19	7	2	11
Sea	17	11	6	51
Truck	413	236	150	389

Source: The Establishment Survey on Innovation and Production Network

The multinomial logit regression result in Table 19 shows three noteworthy findings. First, in trading with partners abroad, firms are likely to choose air or sea. Second, the coefficients for distance are estimated to be significantly positive, indicating that the larger the distance between trading partners, the more likely firms are to choose air or sea. Specifically, this result implies that transport costs per distance are lower in air and sea than in truck. Third, the intercept term of distance in machinery industries has a significantly positive coefficient for air. This result may indicate the large amount of time costs in the machinery industry.

Table 19. Result of multinomial logit analysis

Truck as a basis	**Air**			**Sea**		
	Coef.		S.D.	Coef.		S.D.
Abroad	3.573	***	0.736	2.915	***	0.428
ln Distance (Food as a basis)	0.444	***	0.170	1.268	***	0.167
*Textiles	0.104		0.126	-0.151		0.094
*Machineries	0.300	**	0.135	0.112		0.086
*Automobile	0.201		0.174	-0.104		0.154
*Others	0.148		0.106	-0.068		0.066
Constant	-5.711	***	0.760	-9.621	***	0.993
Country dummy: Indonesia as a basis						
Philippines	-0.336		0.470	0.364		0.446
Thailand	-2.239	**	0.904	-0.794		0.624
Vietnam	-2.483	***	0.683	-0.437		0.419
Statistics						
Observations	1,312					
Pseudo R-squared	0.3407					
Log likelihood	-321.5					

*Note:****, **, and * show 1%, 5%, and 10% significance, respectively.

Lastly, we conduct some simulations to get a more accurate picture of transportation modal choice. Specifically, employing our estimators, we calculate the distance between trading partners in which the two transportation modes become indifferent in terms of their probability. For example, suppose that a firm in the food industry in Bangkok trades with a partner located

in another city. Our calculation reveals how far the city is from Bangkok if the probability of choosing air/sea is equal to that of choosing truck. In the calculation, we set Abroad to the value of one, i.e., international transactions. The results are reported in Table 20. In Bangkok, for example, firms in the machinery industry choose air or sea if their trading partners are located more than 400 km away. On the other hand, firms in the food industry basically only use truck.

Table 20. Probability equivalent distance with truck (km): Domestic and international transportation from Bangkok

	Domestic		International	
	Air	**Sea**	**Air**	**Sea**
Food	60,300,000	3,699	19,254	371
Textiles	2,022,900	11,218	2,968	825
Machineries	44,009	1,899	361	229
Automobile	225,394	7,693	886	628
Others	684,540	5,909	1,634	520

Source: Authors' calculation based on the MNL result in Table 15

We estimate some parameters necessary for calculating transport costs. Specifically, we estimate transportation speed and holding time. Our strategy for estimating those is very straightforward and simple. We regress the following equation:

$$Time_{ij}^{M} = \rho_0 + \rho_1 Abroad_{ij}^{M} + \rho_2 Distance_{ij}^{M} + \varepsilon_{ij}^{M}.$$

The coefficients $\rho_0^M$and ρ_1^Mrepresent mode M's holding time in domestic transportation and its additional time in international transportation, respectively. The inverse of ρ_2^M indicates the average transportation speed in mode M. We use the same data as in the previous section. However, the estimation in this section does not require us to restrict our sample to firms with transactions between regions accessible by truck.

The OLS regression results are reported in Table 21. Although some of the holding time coefficients, i.e., ρ_0^M and ρ_1^M, are estimated as being insignificant, their magnitude is reasonable enough. As for the distance coefficient, its magnitude in sea and truck is reasonable, but that in air is disappointing and too far from the intuitive speed, say, around 800 km/h. One possible reason is that "time" in our dataset always includes the land transportation time to airport. This will cause the air transportation speed to be understated.

Table 21. Results of OLS Regression: Holding time and transportation speed

	Air	**Sea**	**Truck**
Estimation Results			
Abroad	9.010	11.671	10.979***
	[8.350]	[13.320]	[2.440]

Distance	0.018*	0.068***	0.026***
	[0.010]	[0.018]	[0.002]
Constant	6.123	3.301	2.245***
	[7.940]	[13.099]	[0.739]
Holding Time (Hours)			
Domestic	9.010	11.671	10.979
International	15.133	14.972	13.224
Speed (Kilometers/Hour)	55.556	14.706	38.462
Observations	51	34	754
R-squared	0.1225	0.3698	0.1772

Notes: ***, **, and * show 1%, 5%, and 10% significance, respectively. Dependent variable is transportation time.

We specify a simple linear transport cost function, which consists of physical transport costs and time costs. We assume the behavior of the representative firm for each industry as follows:

- A representative firm in the machinery industry will make a choice between truck and air transport and choose the mode with the higher probability in (2.12).
- A representative firm in the other industries will make a choice between truck and sea transport and choose the mode with the higher probability in (2.12).

Specifically, the transport cost in industry s by mode M between regions i and j is assumed to be expressed as:

$$C_{ij}^{s,M} = \underbrace{\left[\left(\frac{dist_{ij}}{Speed_M}\right) + \left(1 - Abroad_{ij}\right) \times ttrans_M^{Dom} + Abroad_{ij} \times ttrans_M^{Intl}\right]}_{Total\ \ Transport\ \ Time} \times ctime_s + \underbrace{dist_{ij} \times cdist_M}_{Physical\ \ Transport\ \ Cost} + \underbrace{\left(1 - Abroad_{ij}\right) \times ctrans_M^{Dom} + Abroad_{ij} \times ctrans_M^{Intl}}_{Physical\ \ Transshipment\ \ Cost} \quad , (2.13)$$

where $dist_{ij}$ is the travel distance between regions i and j, $speed_M$ is travel speed per one hour by mode M, $cdist_M$ is physical travel cost per one kilometer by mode M, and $ctime_s$ is time cost per one hour perceived by firms in industry s. The parameters $ttrans_M^{Dom}$ and $ctrans_M^{Dom}$ are the holding time and cost, respectively, for domestic transshipment at ports or airports. Similarly, $ttrans_M^{Intl}$ and $ctrans_M^{Intl}$ are the holding time and cost, respectively, for international transshipment at borders, ports, or airports.

The parameters in the transport function are determined as follows. Firstly, by using the parameters obtained from the results of estimation and borrowing some parameters from the ASEAN Logistics Network Map 2008 by JETRO, we set some of the parameters in the

transport function. Notice that our estimates of $Speed_{Air}$ and $ttrans_{Air}^{Intl}$ in Table 6 went beyond our expectations. Thus, we set $Speed_{Air}$ at the usual level (800 km/h) and we made $ttrans_{Air}^{Intl}$ consistent with the ASEAN Logistics Network Map 2008.

Table 22. Parameters from estimation and ASEAN Logistics Network Map 2008

Secondly, after substituting those parameters for the equation (2.13) under domestic transportation, $C_{ij}^{s,M}$ becomes a function of $dist_{ij}$ and $ctime_s$. To meet the above-mentioned assumptions on firms' behavior, we add the following conditions:

	Truck	Sea	Air	Unit	Source
$cdist_M$	1	0.24	45.2	US$/km	Map
$Speed_M$	38.5	14.7	800	km/hour	Table 5
$ttrans_M^{Dom}$	0	11.671	9.01	hours	Table 5
$ttrans_M^{Intl}$	13.224	14.972	12.813	hours	Table 5 & Map
$ctrans_M^{Dom}$	0	190	690	US$	Map
$ctrans_M^{Intl}$	500	N.A.	N.A.	US$	Map

Notes: Costs are for a 20-foot container. The parameter $ctrans_M^{Dom}$ is assumed to be half of the sum of border costs and transshipment costs in international transport from Bangkok to Hanoi. The parameter s$ttrans_M^{Dom}$ and $ctrans_M^{Dom}$ for sea and air include one-time loading at the origin and one-time unloading at the destination.

- The transport cost using trucks becomes the lowest among the three modes when $dist_{ij}$ is zero for each industry.
- If the transport cost is depicted as a function of $dist_{ij}$, a line is drawn by the function where truck intersects with it at only one point for air and sea for the machinery industry, and at only one point for the other industries with all non-negative $dist_{ij}$.

Under the probability equivalent (domestic) distances, the transport cost $C^{s,Air}$ should be equal to $C^{s,Truck}$ in machineries, and $C^{s,Sea}$ should be equal to $C^{s,Truck}$ in the other industries. By using this equality, we calculate $ctime_s$ for each industry as in Table 23. The functions meet the above conditions.

Table 23. Time costs per one hour by industry perceived by firms (*ctimes*)

	Food	Textile	Machineries	Automobile	Others
$ctime_s$	15.7	17.2	1803.3	16.9	16.5

Source: IDE-JETRO author calculations

Thirdly, by substituting these parameters again, including $ctime_s$ and $ctrans_{Truck}^{Intl}$ under international transportation, $C_{ij}^{s,Truck}$ becomes a function of only $dist_{ij}$, and $C_{ij}^{s,M}$ for air and sea becomes a function of $dist_{ij}$ and $ctrans_M^{Intl}$. Then by using the probability equivalent (international) distances again, we can calculate $ctrans_{Air}^{Intl}$ and $ctrans_{Sea}^{Intl}$ for each industry.

Lastly, $ctrans_{Sea}^{Intl}$ is uniquely set as the average among the other industries. The functions obtained also fulfill the above conditions.

Table 24. Costs for Transshipment in International Transport ($ctrans_M^{Intl}$): US$

	Truck	Sea	Air
$ctrans_M^{Intl}$	500	504.2	1380.1

Source: IDE-JETRO author calculations

Additionally, $ttrans^{Dom}$ and speed of railway are estimated by the same dataset and the same estimating equation. Due to the minimal usage of railways in international transactions in the dataset, we adopted the same value for the time and cost of international transactions as in trucks. Finally, we set the cost per km as half the value of road transport.[33]

Table 25. Parameters for rail transport

	Railway	Unit	Source
$cdist_M$	0.5	US$/km	Half of Truck
$Speed_M$	19.1	km/hour	Estimation
$ttrans_M^{Dom}$	2.733	hours	Estimation
$ttrans_M^{Intl}$	13.224	hours	Same as Truck
$ctrans_M^{Intl}$	500	US$	Same as Truck

Source: IDE-JETRO author calculations

The sum of tariff and non-tariff barriers (TNTB) by countries is estimated by employing the "log odds ratio approach", which is initiated by Head and Mayer (2000). Namely, we estimate the industry-level border barriers for each country (not each subnational region). This approach looks more appropriate than other approaches because the theoretical model underlying on this approach is basically same as our GSM. We estimate for the ratio of "consumption of products from country *j* in country *i* (X_{ij})" to "consumption of products from country *i* in country *i* (X_{ii})". For brevity, we omit an industry subscript. Specifically, such a ratio is given by the following.

$$\frac{X_{ij}}{X_{ii}} = \left(\frac{n_j}{n_i}\right)\left(\frac{a_{ii}}{a_{ij}}\right)^{1-\sigma}\left(\frac{t_{ij}}{t_{ii}}\right)^{1-\sigma}\left(\frac{p_j}{p_i}\right)^{1-\sigma}$$

n, *a*, *t*, *σ*, and *p* represent the mass of varieties, a parameter on preference weight, transport costs, elasticity of substitution across varieties, and product prices, respectively.

[33] The ASEAN Logistics Network Map 2008 offers an example where the cost per km for railway is 0.85 times that of trucks. However, it is only for the case when we ship a quantity that can be loaded onto a truck. Railway has much larger economies of scale than trucks in terms of shipping volume so some industries such as coal haulage incur much lower cost per ton kilometer. Therefore, we need to deduct this from the value in the ASEAN Logistics Network Map 2008.

To estimate this model with available data, we assume the following. First, the mass of varieties is assumed to be related to GDP size. Second, we assume that the ratio of preference parameters is explained by linguistic commonality (*Language*), colonial relationship (*Colony*), and geographical contiguity (*Contiguity*). These variables are binary. Third, the transport costs are assumed as the following:

$$\ln\left(\frac{t_{ij}}{t_{ii}}\right) = Border_i + \alpha \ln\left(\frac{Distance_{ij}}{Distance_{ii}}\right) + \beta \ln Cost_{ij}$$

$Border_{ij}$ shows the TNTB while $Distance_{ij}$ is the geographical distance between countries *i* and *j*. The domestic distance, i.e., $Distance_{ii}$, is computed as the following.

$$Distance_{ii} = \frac{2}{3}\sqrt{\frac{Area_i}{\pi}}$$

π and *Area* are circular constant and surface area, respectively. *Cost* is the sum of physical transport costs and time costs, of which computation is explained before. Last, product prices are assumed to be a function of wages, for which GDP per capita is used as a proxy.

Under these assumptions, the above equation can be rewritten as follows.

$$\ln\left(\frac{X_{ij}}{X_{ii}}\right) = \gamma_1 \ln\left(\frac{GDP_j}{GDP_i}\right) + \gamma_2 Language_{ij} + \gamma_1 Colony_{ij} + \gamma_3 Contiguity_{ij} + \gamma_4 \ln\left(\frac{Distance_{ij}}{Distance_{ii}}\right) + \gamma_5 \ln Cost_{ij} + \gamma_6 \ln\left(\frac{GDP\ per\ capita_j}{GDP\ per\ capita_i}\right) + u_i + \epsilon_{ij}$$

u_i shows fixed effects for country *i* and, from the theoretical point of view, the log value of product between *Border* and $(1-\sigma)$. Therefore, we compute the TNTB by employing the estimates for these fixed effects and the elasticity of substitution. The estimation is conducted for agriculture, manufacturing, and services separately. In the case of manufacturing, we estimate the model by pooling the data for five sectors under controlling for sector fixed effects.

We estimate the above model for the year 2007. The consumption data are obtained from the GTAP 8 Data Base. The data on GDP and GDP per capita are obtained from World Development Indicator (World Bank). Those on geographical distance and three dummy variables on preferences are from CEPII database. With this methodology, we estimate industry-level fixed effects for 69 countries.

The estimation results by ordinary least square (OLS) method are reported in Table 26. Almost all variables have the significant coefficients with expected signs though the coefficients for GDP per capita ratio are positively significant in manufacturing and services. This estimation

provides us the estimates on industry-level fixed effects for 69 countries. In order to obtain those in the other countries, we assume that those in each country are highly correlated with her GDP per capita and regress (log of) GDP per capita in addition to industry dummy variables on the estimates of these fixed effects. The estimation results are the following.

Estimates on Fixed Effects = −17.797 + 1.245 * ln GDP per capita + 1.365 * Food
+ 2.555 * Textile + 2.052 * Electric Machinery + 1.569 * Automobile
+ 2.523 * Other Manufacturing − 1.149 * Services

The number of observations is 483. The adjusted R-squared is 0.7386. The base for industry dummy variables is agriculture. Using the estimation results and the data on GDP per capita, we predict industry-level fixed effects for other 126 countries. As a result, we obtain those for 195 countries in total. Applying the elasticity of substitution to these estimates, we compute the tariff equivalent of TNTB.

Table 26. OLS results

	Agriculture	Manufacturing	Services
GDP ratio	0.968***	1.346***	0.677***
	(0.020)	(0.011)	(0.008)
Language	1.115***	0.684***	0.146***
	(0.126)	(0.070)	(0.048)
Colony	0.508**	0.173	0.268***
	(0.204)	(0.114)	(0.078)
Contiguity	1.821***	1.090***	0.464***
	(0.186)	(0.103)	(0.071)
Distance ratio	-0.555***	-1.000***	-0.016
	(0.086)	(0.036)	(0.038)
Cost	-0.743***	-0.576***	-0.459***
	(0.194)	(0.206)	(0.068)
GDP per capita ratio	-0.593***	0.134***	0.301***
	(0.024)	(0.013)	(0.009)
Sector Dummy (Base: Automobile)			
Food		-0.207***	
		(0.064)	
Textile		1.016***	
		(0.070)	
Electric Machinery		0.491***	
		(0.053)	
Other Manufacturing		0.981***	
		(0.053)	
Number of Observations	4,592	23,460	4,692
Adjusted R-squared	0.6076	0.6192	0.8508

Notes: *** and ** indicate 1% and 5% significance, respectively. In the parenthesis is the robust standard error. All specifications include import country dummy variables.

Next, we obtain NTBs by subtracting tariff rates from TNTB. Our data source for tariff rates is World Integrated Trade Solution, particularly TRAINS (Trade Analysis and Information System) raw data. For each trading pair, we aggregate the lowest tariff rates among all available tariff schemes at the tariff-line level into single tariff rates for each industry by taking a simple average. Available tariff schemes include multilateral free trade agreements (FTAs) (e.g., ASEAN+1 FTAs) and bilateral FTAs (e.g., China–Singapore FTA) alongside other schemes such as the Generalized System of Preferences. Moreover, we somewhat take into account the gradual tariff elimination schedule in six ASEAN + 1 FTAs in addition to AFTA (ASEAN free trade area). For example, in the case of ASEAN–Japan Comprehensive Economic Partnership (AJCEP), tariff rates among member countries began to gradually decline from 2008. Tariff rates in Japan and ASEAN forerunners against members are for simplicity assumed to linearly decrease to become final rates in 2018, and those for ASEAN latecomers decrease linearly to final rates in 2026.[34] "Final rates" takes into account the final rates set in each agreement. Namely, even if tariff rates for a product were not zero in 2009, they are set to zero in 2026 if they involve preferential products. We obtain information about whether each product finally attains zero rates in ASEAN + 1 FTAs from the FTA database developed in ERIA. We set final rates for all products in the case of AFTA at zero due to the lack of such information. As a result, we obtain separately (bilateral) tariff rates and (importer-specific) NTBs by industry on a tariff-equivalent basis. Finally, our total transport costs are the product of the sum of physical transport and time costs and the sum of tariff rates and NTBs.

Another important setting on transport cost is the "cumulation rule" in multilateral FTAs, particularly ASEAN+1 FTAs and AFTA. There are several types of cumulation rules: bilateral, diagonal, and full. Some scholarly studies try to quantify the trade creation effect of diagonal cumulation. Particularly in Hayakawa (2012), which examines Thai exports to Japan, the tariff equivalent of the diagonal cumulation rule in AJCEP is estimated at 3%. Based on this estimate, we formalize the effect of diagonal cumulation among ASEAN+1 FTAs as 3% below NTBs in trading among members, after each FTA's entry into force.

We adopt the elasticity of substitution for manufacturing sectors from Hummels (1999) and estimate it for services as 5.1 for *FoodProc*, 8.4 for *Textile*, 8.8 for *E&E*, 7.1 for *Auto*, 5.3 for *OtherMfg*, and 5.0 for services. Estimates for elasticity of services are obtained from the estimation of the usual gravity equation for services trade, including the independent variables importer GDP, exporter GDP, importer corporate tax, geographical distance between

[34] We do not insert the exact schedule of gradual tariff reductions due to the lack of ready-made information.

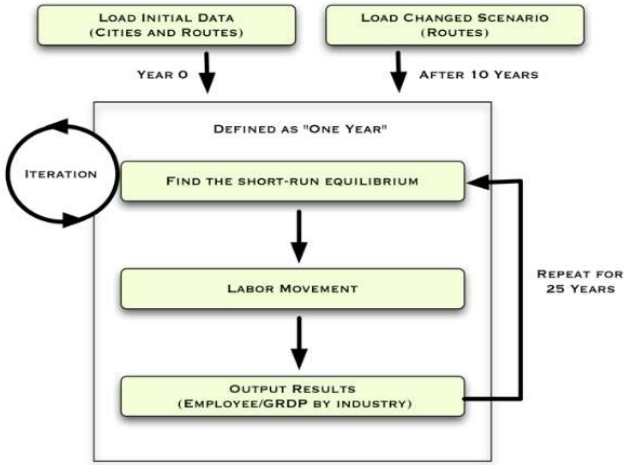
countries, a dummy for free trade agreements, a linguistic commonality dummy, and the colonial dummy. The elasticity for services is obtained from the transformation of a coefficient for the corporate tax because it changes prices of services directly. For this estimation, we mainly employ data from OECD Statistics on International Trade in Services.

Parameters β, μ, and ρ are obtained as follows. The consumption share of consumers by industry (μ) is uniformly determined for the entire region in the model. It would be more realistic to change the share by country or region, but we cannot do so because we lack sufficiently reliable consumption data. Therefore, the consumption share by industry is set to be identical to the industry's share of GDP for the entire region as follows: 0.0800 for agriculture, 0.0322 for FoodProc, 0.0243 for Textile, 0.0201 for E&E, 0.0232 for Auto, 0.1729 for OtherMfg, and 0.6470 for services. The single labor input share for each industry ($1 - \beta$) is uniformly applied for the entire region and the entire time period in the model. Although it may differ among countries/regions and across years, we use an "average" value, in this case that of Thailand as a country in the middle-stage of economic development, which is again taken from the Asian International Input Output Table 2000 by IDE. As a result, the parameter of β is 0.367 for agriculture, 0.204 for FoodProc, 0.346 for Textile, 0.367 for E&E, 0.379 for Auto, 0.267 for OtherMfg, and 0 for services.

Simulation Procedure

This sub-section explains our simulation procedures, which are depicted in Figure 100. First, with given distributions of employment and regional GDP by sector and regions, short-run equilibrium is obtained. The equilibrium nominal wages, price indices, output and GDP by region are calculated. Observing the achieved equilibrium, workers migrate among regions. Workers migrate to from the regions with lower real wages to the regions with higher real wages. Within a region, workers moves from lower wage industries to higher wage industries. One thing we need to note is that the process of this adjustment is gradual, and the real wages between regions and industries are not equalized immediately. After the migration process, we obtain the new distribution of workers and economic activities. With this new distribution and predicted population growth, the next short-run equilibrium is obtained for a following year, and we observe the migration process again. These computations are iterated for 15 years from 2010 to 2025.

Figure 100. Simulation procedure



Source: IDE-JETRO authors

To calculate the economic impacts of specific TTFMs, we take the differences of GRDPs between the baseline scenario and a specific scenario with TTFMs. The baseline scenario contains minimal additional infrastructure development after 2005. On the other hand, the alternative scenario contains specific TTFMs in 2015, for example, according to the information on the future implementation plans of TTFMs.

We compare the RGDPs between two scenarios typically at 2030. If the RGDP of a region under the scenario with TTFMs is higher (lower) than that under the baseline scenario, we regard this surplus (deficit) as the positive (negative) economic impacts by the TTFMs.

A notable merit of calculation of the economic impacts by taking difference between scenarios is the stability of the results. The economic indices forecasted by a simulation depend on various parameters while the differences of the economic indices are quite stable regardless of the changes of the parameters.

The following section identifies assumptions defining each simulated scenario.

- National population of each country is assumed to increase at the rate forecast by the UN Population Division until year 2030.
- International migration is prohibited.
- TNTBs are changing on the basis of FTA/EPAs currently in effect.
- Each country is assigned different exogenous growth rates based on country-level, industry-specific technological productivity parameters. A productivity parameter ‘A’ is determined by education / skill level; regional logistics infrastructure; regional

communications infrastructure; electricity and water supply; firm equipment; and the utilization ratio / efficiency of infrastructure and equipment.

We exogenously increase *A* for 18 countries/regions in East Asia, according to the rate that replicate the actual economic growth in these countries during 2005 and onward. For other countries, we give different growth rate of *A* for advanced, middle-income, and low-income countries. Typically, growth rates for each country group are 1%, 3%, and 5%, respectively. Note that *A* contains broader factors than TFP because our model omits capital as an input.

In the baseline scenario, transport settings are unchanged throughout the simulation period 2005–2030, except for some minor updates in 2010 and 2015. For instance, the average speed of land traffic is set at 38.5 km/h. However, speed on mountainous roads is set to half (19.25 km/h) and certain roads are set at 60 km/h (specifically, roads in Thailand outside Bangkok, road from the border of Thailand to Singapore through the west coast of Malaysia, and roads No. 9 and 13 from Vientiane to Pakse in Laos). The average speed for sea traffic is set at 14.7 km/h between international class ports and at half that on other routes. Average air traffic speed is set at 800 km/h between primary airports of each country and at 400 km/h on other routes. Average railway traffic speed is set at 19.1 km/h.

Trade and Transport Facilitation Measures (TTFMs): We have various trade and transport costs in the model. By changing these costs, we can replicate TTFMs as follows:

- Upgrading of the road: Increase average speed;
- Customs Facilitation: Reduce time and costs at national borders;
- FTA/RTA: Reduce import tariffs between member countries; and
- Overall improvements of business environments: Reduce NTBs.

SEZ/FTZ: In the model, each industry in each city has a different productivity parameter *A*. By increasing this parameter, we can simulate the impacts of setting up SEZ/FTZ for the city. We can also reduce NTBs for the city to simulate the impacts of SEZ/FTZ.

Natural Disasters: We can reduce the productivity parameter *A* for select cities to simulate the impacts of natural disasters, such as earthquakes and floods.

Annex 7. Technical Notes: Gravity Models of Trade and Air Passenger Flows

First introduced to model trade flows by Tinbergen (Tinbergen 1962) via simple OLS regressions with independent variables of economy size and physical distance, the gravity model of international trade has since been expanded to control for policy, social, and business factors. It has also been applied extensively to analyze the impacts on immigration (Lewer and Van den Berg 2008, Karemera, Oguledo, and Davis 2000) and passenger flows (Grosche, Rothlauf, and Heinzl 2007, Matsumoto 2004).

In its most basic form, the gravity model of trade may be expressed as follows:

$$\ln E_{ij} = \alpha + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \beta_3 \ln D_{ij}$$

where E_{ij} is the flow of exports from country *i* to country *j*, α is a constant term, $\ln GDP_i$ is the log GDP of the exporter *i*, $\ln GDP_j$ is the log GDP of the importer *j*, and $\ln D_{ij}$ is the log distance between the two countries' capital cities.

The model may be expanded to control for other factors that reduce or increase its "distance" in non-geographic terms. For example, the sharing of common language or common colonial ties may reduce the trading distance between partners. For this reason, it is common to expand the model to the following:

$$\ln E_{ij} = \alpha + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \beta_3 \ln D_{ij} + \beta_4 Contig_{ij}$$

where $Contig_{ij}$ is a dummy variable for contiguity.

Lastly, the model may control for border management and policy factors that affect trade. Here, we express a simple further expanded form as:

$$\ln E_{ij} = \alpha + \beta_1 \ln GDP_i + \beta_2 \ln GDP_j + \beta_3 \ln D_{ij} + \beta_4 Contig_{ij} + \beta_4 TradeFac + \beta_5 Policy$$

where $Contig_{ij}$ is a dummy variable for contiguity. *TradeFac* represents a hypothetical control variable(s) related to border management or trade facilitation measures, which may be binomial or continuous. *Policy* represents a hypothetical dummy variable for the presence or absence of a particular policy, whose effect is under examination. In the model results reported in Chapter *TradeFac* variables

TradeFac may be one of a set of trade facilitation variables, representing the importer's and exporter's performance with respect to border and customs management and logistics performance. In the model results below, this may include the Logistics Performance Index

scores of the importer and exporter, the *Doing Business* "Trading Across Borders, Distance to the Frontier" score for importer and exporter, or the *Doing Business* "Days to Export/Import" measures.

Gravity Model of Air Passenger Flows

One of the richest data sets we available, specific to flows between ASEAN Member States, is the flow of Intra-ASEAN air passengers, drawn from the DiiO Aviation Intelligence database. We draw on this data set to determine the influence of air liberalization policies coded or reinforced by MPAC. To model the impacts of MPAC on air passenger flows, we tested the influence of several key components of ASEAN air liberalization on flows between countries, based on the granting of air freedoms via ASAM agreements. More specifically, we examine the influence of the Multilateral Agreement on Air Services (MAAS), the ASEAN Multilateral Agreement on the Full Liberalisation of Passenger Air Services (MAFLPAS), and the granting of third freedom rights via other liberalization agreements (e.g., between CLMV, Brunei-Thailand-Singapore, and Singapore-Malaysia).

The gravity models of air passenger flows are similar to the model specified above for trade, but with the dependent variable *number of annual air passengers* between two countries *i and j.* In the results table below, the independent variables are coded as follows:

ln_gdp_exp	Log GDP of exporter (flight / passenger origin country)
ln_gdp_imp	Log GDP of importer (flight / passenger destination country)
ln_dist	Log physical distance between country's capital cities
contig	Dummy variable =1 if countries are contiguous
maas	Dummy variable =1 if exporter and importer have both ratified MAAS (=0 for all countries before 2010; =1 for all countries, except Indonesia and Philippines in 2010 and later)
freedom	Dummy variable =1 if exporter and importer have granted 3rd freedom rights (=0 for all countries until 2004; =1 for travel amongst Laos, Vietnam, and Myanmar in 2004 and later; =1 for travel amongst Brunei, Thailand, and Singapore in 2005 and later; =1 for travel between Singapore and Malaysia in 2009; =1 for travel between all ASEAN Member States, except for with Indonesia and Philippines, in 2010 and later)
freedom2	Dummy variable =1, represents Philippines' adoption of MAFLPAS, which partially includes travel between ASEAN and Philippines as with MAAS, as it granted 4th and 5th freedom rights to fly into Philippines, except Manila (=maas; =1 for Philippines in 2010)
constant	Estimated constant

Annex 8. Technical Notes: SVAR Analysis

The SVAR analysis was developed by the Asia Competitiveness Institute, National University of Singapore. Using data over 2000-2013, the SVAR model links GDP growth rates of 8 economies and 56 bilateral export-share series to generate multiplier effects of a growth shock in one economy on the growth of others. The 8 economies include ASEAN-5, China, India and OECD.

Multiplier effects of a growth shock are estimated by capturing the transmission of a growth shock through both direct and indirect trade channels. The steps to deriving the VAR structure are as follows:

The first step is to focus on determinants of total output (Y_i) for an individual country i and then extend the framework to a system of equations linking all n countries in the sample (with $i = 1,2,...,n$). Since we initially focus on only one country, we drop the subscript i to simplify notation. A country's output can be written as:

$$Y = X + A \qquad (1)$$

where X and A are the export and non-export components of output, respectively. The country's total exports can also be expressed as the sum of exports to each of the other n countries and exports to the rest of the world (ROW):

$$Y = \sum_{j=1}^{n+1} X_j + A \qquad (2)$$

Error! Bookmark not defined.where $i \neq j$ and the index value $(n+1)$ indicates ROW. This condition continues to apply to all of the equations below.

Writing equation (2) in terms of growth rates instead of levels yields:

$$dY/Y = 1/Y\left[\sum_{j=1}^{n+1} dX_j + dA\right]. \qquad (3)$$

Next, express exports from country i to country j as a reduced-form function of output (income) of country j :

$$X_j = X_j(Y_j) \qquad (4)$$

Differentiating (4) yields:

$$dX_j = (\partial X_j / \partial Y_j) dY_j \qquad (5)$$

Next, inserting (5) into (3) and rearranging terms yields:

$$dY/Y = X/Y \sum_{j=1}^{n+1} [\eta_j (X_j / X)(dY_j / Y_j)] + dA/Y \qquad (6)$$

where $\eta_j = (\partial X_j / \partial Y_j)(Y_j / X_j)$ is the income elasticity of exports with respect to country j's income. We assume that income elasticities are equal across countries and set $\eta_j = \eta$. Then adding country and time subscripts and using lower-case letters to indicate growth rates, equation (6) can be written as:

$$y_{it} = \alpha_i y_{it}^f + u_{it},\ i = 1,2,...,n \qquad (7)$$

where $\alpha = \eta X / Y$, $y^f = \sum_{j=1}^{n+1} (X_j / X) y_j$ and u_{it} captures any omitted variables not included in trade linkages. $\alpha = \eta X / Y$ is assumed to be time-invariant. The omitted variables captured by u_{it} are likely to be correlated over time as well as across equations. We assume that the vector $u_t = (u_{1t}, u_{2t}, ..., u_{nt})'$ follows a vector ARMA process,**Error! Bookmark not defined.Error! Bookmark not defined.** $D(L)u_t = E(L)e_t$, where $D(L)$ and $E(L)$ are vector polynomials in the lag operator L of orders p^* and q^*, respectively, and e_t is a vector white noise process with a zero mean and a diagonal covariance matrix. Using this error structure and rewriting (7) in vector format yields:

$$\begin{aligned} y_t &= A y_t^f + u_t \\ &= A y_t^f + D(L)^{-1} E(L) e_t \\ &= A y_t^f [D(L)^* / |D(L)|] E(L) e_t \end{aligned}$$

or

$$\left|D(L)\right| y_t = \left|D(L)\right| A y_t^f + v_t \qquad (8)$$

where $A = diag(\alpha_1, \alpha_2, ..., \alpha_n)$, $\left|D(L)\right|$, and $D(L)^*$ are the determinant and adjoint matrices of $D(L)$, respectively, and $v_t = D(L)^* E(L) e_t$ is an $(n \times 1)$ vector. Note that every equation of (8) has the same autoregressive (AR) polynomial given by $\left|D(L)\right|$, while each v_{it} follows a separate MA process.

Next, we assume that the serial correlation of v_{it} can be captured through an AR structure. This has the additional benefit of relaxing the constraint that each equation of (8) must follow the same AR polynomial. Equation (7) can therefore be expressed as an autoregressive distributed lag model with white noise errors:

$$y_{it} = \lambda_i + \sum_{j=1}^{p} \phi_{ji} y_{it-j} + \sum_{j=0}^{p} \beta_{ji} y_{it-j}^f + \varepsilon_{it} \qquad (9)$$

where $y_{it}^f = \sum_{j=1}^{n+1} w_{ij} y_{jt}$, $i \neq j$, and w_{ij} is the export share from the ith country to country j.

The entire system of equations is formed by estimating equation (9) for each of the n countries in the world. One may consider the similarity of (9) to factor models mentioned in Introduction.

Although these n equations appear to take the form of seemingly unrelated regressions (SUR), they can also be expressed as a structural VAR. This SVAR formulation is useful for the purpose of estimation, forecasting, and impulse-response analysis. More specifically, if $n = 3$ and $p = 1$, then the system of equations can be written as:

$$(B_0 \cdot W) y_t = \lambda + (B_1 \cdot W) y_{t-1} + \varepsilon_t \qquad (10)$$

where

$$B_0 = \begin{pmatrix} 1 & -\beta_{01} & -\beta_{01} \\ -\beta_{02} & 1 & -\beta_{02} \\ -\beta_{03} & -\beta_{03} & 1 \end{pmatrix}, \; B_1 = \begin{pmatrix} \phi_{11} & \beta_{11} & \beta_{11} \\ \beta_{12} & \phi_{22} & \beta_{12} \\ \beta_{13} & \beta_{13} & \phi_{33} \end{pmatrix}, \; W = \begin{pmatrix} 1 & w_{12} & w_{13} \\ w_{21} & 1 & w_{23} \\ w_{31} & w_{32} & 1 \end{pmatrix}$$

and "$\cdot$" indicates the Hadamard product giving the element-wise product of two matrices. Note that in the W matrix w_{ij}'s in each row do not sum to unity because ROW is not a country to be modeled in our study.

The general VAR(p) form of (10) is:

$$(B_0 \cdot W_t) y_t = \lambda + (B_1 \cdot W_{t-1}) y_{t-1} + ... + (B_p \cdot W_{t-p}) y_{t-p} + \varepsilon_t \quad (11)$$

where y_t, ε_t and λ are $(n \times 1)$ vectors, $B_j (j = 0,1,..., p)$ W and $Var(\varepsilon_t) = \Omega$ are $(n \times n)$ matrices, and $(B_j \cdot W_{t-j})$ are the effective parameter matrices that vary over time as the trading pattern changes.

Since *n* is large (14 in our case) the lag length, $p = 1$, would be sufficient to capture the dynamics. We use ordinary lease squares (OLS) to estimate the model. Abeysinghe and Forbes (2005) have experimented with 2SLS and 3SLS and found there was not much gain over OLS estimates. For a given W, and $p = 1$ the forecasting model can be written as

$$y_t = A_1 y_{t-1} + u_t$$

where $A_1 = (B_0 \cdot W)^{-1} (B_1 \cdot W)$ and $u_t = (B_0 \cdot W)^{-1} \varepsilon_t$.

In order to calculate the impulse responses and hence the output-multipliers, we write the moving-average representation of the VAR model as

Error! Bookmark not defined.

$$y_t = \sum_{i=0}^{\infty} C_i u_{t-i} = \sum_{i=0}^{\infty} C_i (B_0 \cdot W)^{-1} \varepsilon_{t-i} \quad (12)$$

where C_i matrices are computed from the recursive relationship:

$$C_0 = I_n,\ C_i = \sum_{j=1}^{i} C_{i-j} A_j,\ i = 1,2,...$$

and if Ω is diagonal the impulse response matrix is $C_i (B_0 \cdot W)^{-1}$. Thus the effect of a unit shock in the j th country on itself and others at time $t+i$ is given by $\partial y_{t+i} / \partial \varepsilon_{jt} = C_i b_j$, where b_j is the j th column of $(B_0 \cdot W)^{-1}$. Instead of a unit shock we may use a one-standard deviation shock to account for the relative variability of different shocks. For diagonal Ω, using the result that $P \Omega P' = I$, where $P = diag(\sigma_1^{-1}, \sigma_2^{-1}, ..., \sigma_n^{-1})$, we can replace ε_{t-i} in (12) with $P^{-1} P \varepsilon_{t-i}$ to obtain the standardized innovations $v_{t-i} = P \varepsilon_{t-i}$ with $\text{var}(v_{t-i}) = I$. The corresponding impulse-response matrix is $C_i (B_0 \cdot W)^{-1} P^{-1}$, from which we obtain $\partial y_{t+i} / \partial \varepsilon_{jt} = C_i b_j \sigma_j$, where σ_j is the innovation standard deviation of country j. The impulse

responses corresponding to a unit shock can be rescaled to obtain the effect of a shock of a desired magnitude.

Data

The complete SVAR model includes 8 GDP series (Indonesia, Malaysia, Philippines, Singapore, Thailand, China, India and OECD). For each of these economies we require their exports to each of the other 7 that makes up a total of 56 bilateral export share series. We interpolated quarterly GDP series from annual data to fill the missing data in our sample. The interpolation method, which is adapted from the Chow-Lin technique, entails deriving a predictive equation by running a regression of annual GDP on annual related series. We used trade and M1 as the related series. We then use the quarterly figures of the related series to predict the quarterly GDP figures and adjust them to match the annual aggregates.

GDP data was obtained from the Singapore Centre for Applied and Policy Economics (http://www.fas.nus.edu.sg/ecs/esu/data.html). The bilateral export data in US dollars were retrieved from the Direction of Trade Statistics, International Monetary Fund (IMF). We converted the export shares to 12-quarter moving averages to smooth out the movements of export shares.