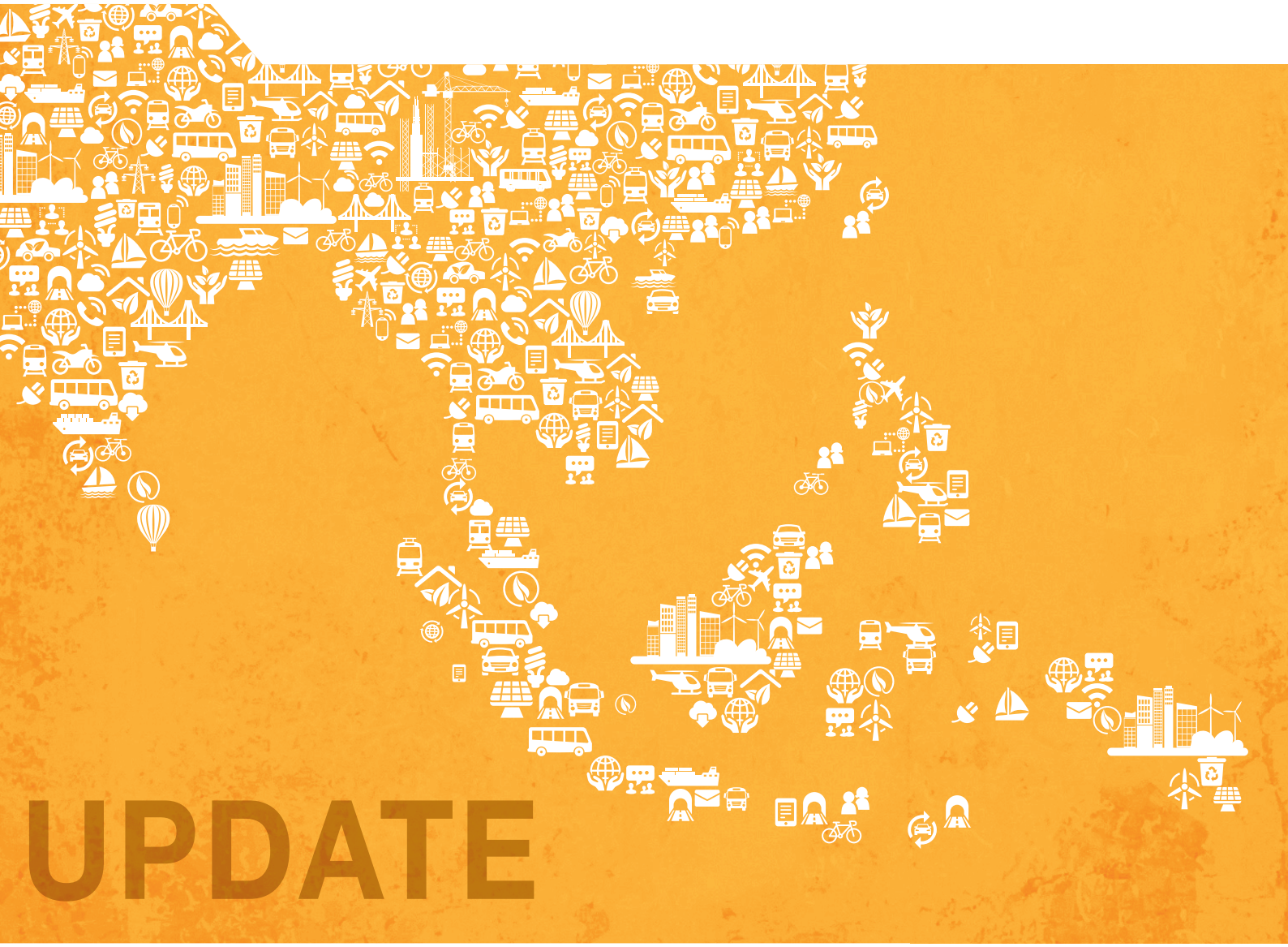
Economic Outlook for Southeast Asia, China and India 2019 - UPDATE

RESPONDING TO ENVIRONMENTAL HAZARDS IN CITIES



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Foreword

The *Economic Outlook for Southeast Asia, China and India – Update* is released following the main report of the Outlook, to ensure that its data, projections and policy discussions remain up-to-date and relevant. The Outlook is a biannual publication on Asia's regional economic growth, development and regional integration processes. It focuses on the economic conditions of the Association of Southeast Asian Nations (ASEAN) member countries (Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Viet Nam) and two large economies in the region, China and India. This publication evolved from the *Southeast Asian Economic Outlook*. Beginning with the first release of the June 2016 Update, the Outlook has become a biannual publication, with the main report released in the fall and its update released the following spring.

The Outlook was initially proposed at an informal reflection group on Southeast Asia in 2008 as a follow-up of the Council Meeting at Ministerial level (MCM) in 2007 and was accepted by ministers/senior officials from ASEAN countries at the occasion of the 2nd OECD-Southeast Asia Regional Forum in Bangkok in 2009. The Outlook project was officially launched in 2010 and each edition is regularly presented at the occasion of the ASEAN/East Asia Summit. It was included in the OECD's Southeast Asia Regional Programme (SEARP) at the Steering Group Meeting in Jakarta, Indonesia in March 2015, with its role of providing a horizontal view of activities, identifying emerging trends in the region and providing a backbone for the different streams of the Programme confirmed at the 2015 MCM. The Outlook serves as a strategic foresight and policy dialogue tool for the SEARP and includes summaries of recent developments in the region on issues related to the Programme's six Regional Policy Networks and four Initiatives.

This edition of the Update is comprised of three main parts, each highlighting a particular dimension of recent economic developments in the region. The first chapter presents the regional economic monitor, depicting the economic outlook and macroeconomic challenges in the region. The second and third thematic chapters address a major issue facing the region. This update focuses on smart cities, discussing in particular challenges for smart city strategies and addressing environmental risks in Emerging Asian cities in light of rising urbanisation, increasing economic activity and climate change. High levels of air pollution have serious health consequences, especially among lower-income households, and can curtail economic growth prospects. Policy makers in the region would need to strengthen the enforcement of existing rules and work towards clearer and targeted policy frameworks with the participation of all levels of government. Co-operation between countries in the region is just as crucial since environmental hazards are often transborder issues.

The OECD Development Centre is committed to working alongside governments of developing and emerging economies and regional actors to identify key areas of intervention in order to address these challenges. The Centre enjoys the full membership of three Southeast Asian countries, namely Indonesia, Thailand and Viet Nam, as well as India and China. This project has also benefited from the generous support of other Emerging Asian countries.

Like other regional economic outlooks produced by the OECD Development Centre, this report was prepared in collaboration with a regional partner; the Economic Research Institute for ASEAN and East Asia (ERIA) contributed to the 2019 Update. The Outlook also benefited from discussions with the Asian Development Bank Institute (ADBI), the ASEAN+3 Macroeconomic Research Office (AMRO) and ASEAN Secretariat. The OECD is committed to supporting Asian countries in their efforts to promote economic and social well-being through rigorous analysis, peer learning and the sharing of best practices.

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The *Economic Outlook for Southeast Asia, China and India 2019 – Update: Responding to Environmental Hazards in Cities* was prepared by the Asia Desk of the OECD Development Centre, in co-operation with the Economic Research Institute for ASEAN and East Asia (ERIA) and the OECD Centre for Entrepreneurship, SMEs, Regions and Cities (CFE). The publication also benefited from discussions with the ASEAN Secretariat. The team was led by Kensuke Tanaka, Head of the Asia Desk and valuable guidance was provided by Mario Pezzini, Director of the OECD Development Centre.

This volume was drafted by a core team composed of Kensuke Tanaka, Prasiwi Ibrahim, Ryan Jacildo, Derek Carnegie, Jingjing Xia, Sybrand Brekelmans, Tadashi Matsumoto and Lurong Chen. Rahmalia Devita, Isabelle Chatry, Jonathan Crook, Juliana Chia, Yuanita Suhud, and Shom Teoh provided significant inputs. Elizabeth Nash, Delphine Grandrieux, Studio Pykha, Elisa Lopez Roldan, and Aida Buendia turned the manuscript into the publication.

The 2019 Outlook Update benefited from discussions with OECD Delegations at the Outlook Consultation Group (OCG) meetings in February 2018, October 2018 and February 2019 in Paris, led by co-chairs of this consultation group, Ambassador Nguyen Thiep and Christoph Graf, as well as Ambassador Ma. Theresa Lazaro and Jurg Schneider, together with Ambassador Manuel Escudero and Ambassador Monica Aspe. The Outlook also benefited from discussion with experts in the region at the 6th Asian Regional Roundtable on Macroeconomic and Structural Policies, jointly organised by the ASEAN+3 Macroeconomic Research Office (AMRO), the Asian Development Bank (ADB), the Asian Development Bank Institute (ADBI), ERIA and the OECD Development Centre, in Manila on 26-27 July 2018. The authors are grateful to Chang Junhong, Director of AMRO, Naoyuki Yoshino, Dean of the ADBI, Hidetoshi Nishimura, President of ERIA, as well as Izuru Kobayashi, Fukunari Kimura, Yasuyuki Sawada, Joseph E. Zveglich, Jr, Ng Chuin Hwei, Anthony Tan, Aladdin Rillo, Wawan Juswanto, Yumiko Murakami, Atsushi Higuchi, Dahlia Rosly, Siti Maimunah and Termsap Taelakul. The full Outlook 2019 report was also presented at the occasion of the ASEAN/East Asia Summit in Singapore in November 2018.

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Table of contents

Executive summary 11

Overview 13

Chapter 1. **Macroeconomic assessment and economic outlook** 23
- Introduction 24
- Overview and main findings 25
- Recent developments and near-term outlook 26
- Inflationary pressures are easing across most of Emerging Asia 38
- Current account balances are under pressure 40
- Fiscal policy direction will be mixed across Emerging Asia in the near term 41
- Challenges to robust growth 42
- Emerging Asian economies are susceptible to direct and value chain spillover effects 42
- Trade diversion will impact countries differently 43
- The speed of export adjustment matters in containing spillover effects 44
- Adjustments in China's currency have been mild as the US dollar strengthens 45
- The global trade tensions present an opportunity to shift the region's investment and trade strategies 47
- Notes 48
- References 49

Chapter 2. **Overview of trends for smart city strategies in Emerging Asia** 53
- Introduction 54
- Promoting a "territorial" approach 55
- Smart city strategies in Emerging Asia 57
- Conclusion 71
- References 72

Chapter 3. **Addressing urban environmental risks** 75
- Introduction 76
- Reducing urban air pollution 76
- Conclusion 88
- Annex 3.A1. Urban ambient air pollution cost estimation methodology 89
- Notes 91
- References 91

Statistical annex 95

Tables

1. Real GDP growth in ASEAN, China and India 13
2. Estimated additional urban mortality and welfare costs associated with elevated pollution levels 19
3. Fossil fuel power plants near selected Emerging Asian cities 21

1.1. Real GDP growth in ASEAN, China and India 25
1.2. Recent real GDP growth in ASEAN, China and India, 2018-19 27
2.1. National-level smart city strategies in Emerging Asia 58
2.2. Bandung's smart city initiatives 64
2.3. Six smart city domains identified in Thailand 68
2.4. Key features of the smart city strategies assessed in this study 69
3.1. Actual and prescribed number of monitoring sites in selected Emerging Asian cities, 2014 77
3.2. Estimated additional urban mortality and welfare costs associated with elevated pollution levels 79
3.3. Emerging Asian countries with national air quality standards, by pollutant 81
3.4. Fossil fuel power plants near selected Emerging Asian cities 85
3.A1.1. Estimated air pollution in Emerging Asian urban areas 89
3.A1.2. Estimated additional urban mortality associated with elevated pollution levels 90
3.A1.3. Estimated additional urban mortality associated with elevated pollution levels 91
A.1. Real GDP growth of Southeast Asia, China and India 95
A.2. Current account balances of Southeast Asia, China and India 95

Figures

1. Selected goods exports of Thailand and Viet Nam by partner economy, 2018-19 16
2. Distribution of urban population exposure to air pollution, 2016 19
1.1. Real GDP growth of Southeast Asia, China and India 24
1.2. Percentage of business owners satisfied with transport infrastructure in Viet Nam by province, 2016 28
1.3. Agriculture total factor productivity average annual growth in Emerging Asian economies, 1986-2015 29
1.4. Contribution to growth in ASEAN, China and India, 2016-18 32
1.5. Business and consumer confidence indices in China, India, Indonesia, Malaysia, Philippines and Thailand, 2017-19 33
1.6. Private consumption and gross exports real growth in India, Indonesia, Malaysia, Philippines and Thailand, 2017-19 33
1.8. Inflation in ASEAN, China and India, 2017-19 39
1.9. Current account balances of ASEAN, China and India, 2016-20 40
1.10. Capital flows in ASEAN, China and India, 2016-18 41
1.11. Goods imports of China by partner economy, 2017-19 43
1.12. Selected goods exports of Thailand and Viet Nam by partner economy, 2018-19 44
1.13. Nominal effective exchange rates of selected currencies, 2018-19 46
1.14. Yield and terms spreads, US and Emerging Asia, 2012-19 47
2.1. Breakdown of subnational expenditure as a share of total public expenditure, 2016 56
2.2. Breakdown of subnational government expenditure by function (COFOG), OECD countries, 2015 57
3.1. Ambient air pollution in selected Emerging Asian cities in recent years 77
3.2. Distribution of urban population exposure to air pollution, 2016 78
3.3. Fossil fuel subsidies in Emerging Asia, 2016 82

3.4. Transportation energy use in selected Emerging Asian cities 83
3.5. Share of population with electricity access by location, 2016 84
3.6. OECD Environmental Policy Stringency Index, 2015 87
3.7. Air pollution abatement technology patents, 2010-14 88

Boxes

1.1. Investment in infrastructure can spur local development 27
1.2. Facilitating the use of digital services to promote rural agriculture 29
1.3. The potential impact of Brexit on Cambodia's textile industry 35
1.4. Capital markets in Emerging Asia – Stable but headwinds persist 46
2.1. Bandung Command Centre 63
2.2. Singapore Smart Nation Initiative: Digital Economy, Digital Government, Digital Society 66
2.3. Ageing population in the ASEAN region 67
2.4. Subnational smart city and capacity building networks in Asia 70
3.1. The need for improved air quality monitoring in Emerging Asian cities 77
3.2. Regional co-operation to deal with transborder air pollution 80
3.3. Fossil fuel subsidies and air pollution 82
3.4. Innovation to improve air quality and the environment: More can be done 87

Executive summary

The *Economic Outlook for Southeast Asia, China and India – Update* is released following the main report of the Outlook, to ensure that its data, projections and policy discussions remain up-to-date and relevant. The 2019 edition of the Update covers three main topics related to Emerging Asia: the near-term regional economic outlook in 2019 and 2020 (Chapter 1), smart cities – the thematic focus of this edition, discussing in particular challenges for smart city strategies (Chapter 2), and addressing urban environmental risks (Chapter 3).

Economic outlook for 2018 and 2019

Economic growth shows signs of slowing in Emerging Asia – Southeast Asia, China and India, partly due to trade tensions. However, domestic private consumption is holding up well. Gross domestic product (GDP) growth rates in 2019 and 2020 are expected to remain high, at 6.2% for both 2019 and 2020 in Emerging Asia and 4.9% in 2019 and 5.0% in 2020 in ASEAN. Among the ASEAN-5, Viet Nam and the Philippines will remain as the growth leaders. The CLM countries – Cambodia, Lao PDR and Myanmar – will continue to set the pace in Southeast Asia in the near term. Growth is projected to slow in China to 6.2% in 2019 and 6.0% in 2020, but to stay robust in India, at above 7.0% for both years.

Inflation has generally eased partly due to restabilisation of most exchange rates, fiscal support and the pullback in global oil prices. Monetary authorities have moved to support growth and contain financial market vulnerabilities. Weakness in trade has dampened the current account positions of a number of economies in the region. Nevertheless, the overall balance-of-payments positions have remained in good stead. Direct investment, portfolio and other investment flows have propped up the balances of countries with current account deficits. Fiscal policy direction will be mixed in the near term. The stability in the fiscal positions of the region's economies has remained intact at the close of recent fiscal years.

Emerging Asia faces several growth risks, one of which is the trade tension between the United States and China. The rising trade tensions may affect Emerging Asia through various channels, including global value chains, foreign investment, trade diversion and exchange-rate reaction, among other channels. In the near term, the speed at which exports adjust to the price shock caused by new tariffs will partly determine the impact of trade tensions on sectors and the economy as a whole. On the upside, the ongoing shifts in import sourcing present an opportunity for Emerging Asian countries to adjust their investment and export strategies. It is crucial for Emerging Asian countries to persevere in efforts to improve the investment climate in order to make the most out of these changing patterns. There is scope to improve targeting of foreign capital towards underdeveloped sectors and towards sectors where domestic firms can participate more extensively. In order to pursue these objectives, foreign investment policy must be aligned with the local enterprise development framework.

Overview of smart city strategies in Emerging Asia

Smart city strategies are widely used in Emerging Asia. China, India, Indonesia, Malaysia, Singapore and Thailand have a dedicated smart city strategy.

China published two national-level strategies, which lay out principles for smart city design and applications of smart technologies. These strategies were developed further in

the 13th Five-Year Plan (2016-2020). The Chinese approach is rather centralised as smart city initiatives are steered, monitored and evaluated by the central government, with funding provided by national ministries.

India launched in 2015 its own smart city strategy called the "Smart Cities Mission", an advanced strategy for the development of 100 smart cities based on retrofitting, redevelopment and greenfield development. Although it is partially funded by the central government, each city is required to put forward its own locally-tailored vision.

In Indonesia, the "Movement to 100 Smart Cities" features a competition and selection process under which candidates submit their plans. They will then undergo an assessment process to measure readiness to pursue each stage. Successful pitches will receive support from the academic community to prepare a Smart City Development Plan for the city or district for a 5-10 year horizon.

Malaysia has outlined its smart city strategy in its 11th five-year plan for 2016-20 and focuses on improving the coverage, quality and affordability of digital infrastructure. The plan takes into account different cross-sectional applications of smart city technologies, identifying specific challenges related to urban services, such as providing better transportation, utilities and waste management. To enable connectivity and integration of services, the strategy will focus on developing widespread broadband, sensor networks and applications.

Singapore has launched its Smart Nation Initiative, which reflects the country's effort to improve its economy by ensuring that all segments of society can harness digital technologies and benefit from these advancements. It focuses on a broad range of items related to smart city planning and the optimisation of government services. It is centred on three key components: digital economy, digital government and digital society.

Thailand's Plan for the Promotion of the Digital Economy 2018-21 encompasses five different components: digital infrastructure, digital manpower, digital technology development, cyber security and digital government. Smart city strategies are highlighted under the 'digital technology' component, where Thailand has identified six smart city domains, including: the economy, living conditions, people, governance, energy and environment and mobility.

Addressing urban environmental risks

Rapid population growth and urbanisation, expanding economic activity, along with rising incomes have contributed to growing levels of air pollution in Emerging Asian cities. Exposure to ambient air pollution is a serious challenge in Emerging Asian cities, though the severity of pollution varies considerably between and within countries. Research has shown that high levels of fine particulate air pollution are correlated with other air pollutants and are linked to elevated risks of mortality and other health related issues.

As urban areas are growing rapidly in the region, managing levels of air pollution is increasingly important. Policy makers need to co-ordinate across levels of government to reduce emissions in a targeted way and promote resilience against natural disaster risks. Progress can be made, among others, through the expansion and improvement of public transport systems, the reduction of power generation emissions occurring close to cities and by setting more stringent regulations for polluting industries to drive greener growth.

Overview

Chapter 1: Macroeconomic assessment and economic outlook

Overview of the economic outlook for 2019 and 2020

Economic growth is showing signs of slowing in Emerging Asia – Southeast Asia, China and India, partly due to trade tensions. However, domestic private consumption is holding up well. Overall, gross domestic product (GDP) growth rates in 2019 and 2020 are expected to remain high, at 6.2% for both 2019 and 2020 in Emerging Asia and 4.9% in 2019 and 5.0% in 2020 in ASEAN (Table 1). Among the ASEAN-5, Viet Nam and the Philippines will remain as the growth leaders. The CLM countries – Cambodia, Lao PDR and Myanmar – will continue to set the pace in Southeast Asia in the near term. Growth is projected to slow in China to 6.2% in 2019 and 6.0% in 2020, but to stay robust in India, at above 7.0% for both years.

Table 1. **Real GDP growth in ASEAN, China and India**

Annual percentage change

	2017	2018	2019	Changes from the previous forecast (Nov. 2018)	2020
ASEAN-5 countries					
Indonesia	5.1	5.2	5.1	↓	5.1
Malaysia	5.7	4.7	4.4	↓	4.6
Philippines	6.7	6.2	6.0	↓	6.3
Thailand	4.0	4.1	3.5	↓	3.6
Viet Nam	6.8	7.1	6.7	-	6.6
Brunei Darussalam and Singapore					
Brunei Darussalam	1.3	0.1	1.6	↓	1.9
Singapore	3.7	3.1	2.4	↓	2.5
CLM countries					
Cambodia	7.0	7.5	7.0	↑	6.8
Lao PDR	6.9	6.4	6.6	↓	6.7
Myanmar	6.8	6.2	6.9	-	6.9
China and India					
China	6.8	6.6	6.2	↓	6.0
India	7.2	6.8	7.2	↓	7.4
ASEAN-10	5.3	5.1	4.9	↓	5.0
Emerging Asia	6.6	6.4	6.2	↓	6.2

Note: Data are as of 31 May 2019. Data of Cambodia and Myanmar in 2018 are preliminary estimates. Data of India and Myanmar relate to fiscal years. For Myanmar, the 2018 data are based on ADB (2019) and IMF (2019a) and refer to the interim period ending September 2018. Singapore and Thailand data are based on chain-linked volume measures. The projections for China, India and Indonesia are based on the OECD Economic Outlook No. 105 database.
Source: OECD Development Centre.

ASEAN-5

- Indonesia's GDP growth in 2019 and 2020 is projected to remain strong, on par with figures from the past three years. Consumer confidence has stayed upbeat while the stabilisation of rupiah, tapering on interest rates, efforts to mitigate capital outflow and adjustments to business incentives augur well for the investment climate.

- Malaysia's growth is projected to soften in 2019 before bouncing back slightly in 2020. The fiscal and monetary support coupled with the steady decline in the household debt-to-GDP ratio bode well for growth. However, the ongoing erosion of consumer confidence and the government's commitment to fiscal consolidation could weigh on the country's economic prospects.
- GDP growth in the Philippines is expected to edge lower in 2019 though it is forecast to recover marginally in 2020. Growth prospects are buoyed by the anticipated pickup in public spending, declining inflation and interest rates and robust bank lending.
- Thailand's GDP growth in 2019 is projected to be lower than the rate in 2018 before rising slightly in 2020. The price support measures, recent tourism incentives and big-ticket Eastern Economic Corridor projects provide some growth upsides although the level of banks' non-peforming loans in certain sectors still needs attention.
- GDP growth in Viet Nam is projected to come in at a slower pace in 2019 and will continue to moderate in 2020. Receding inflation, farm sector programmes and efforts to lower public debt should help offset uncertainties.

Brunei Darussalam and Singapore

- In 2019 and 2020, GDP growth in Brunei Darussalam is projected to rise modestly. Its improving fiscal position means well for domestic demand. Offshore energy demand uncertainties could be a potential drag.
- Singapore's GDP growth is forecast to slow in 2019 from 2018 before stabilising in 2020. Planned social and infrastructure spending is a boon to domestic demand.

CLM countries

- Cambodia's growth prospects are more uncertain in 2019 and 2020 than in 2018. Domestic demand, supported by an uptick in tourism, robust bank lending and moderate inflation, should remain buoyant though the potential changes in access to key export markets carry downside risks.
- GDP growth in Lao PDR is forecast to recover for 2019 and 2020. The government's new electricity trade deals and the infrastructure spending push are providing upsides amid increasing risks to exports.
- Myanmar's GDP growth is forecast to rebound in fiscal year 2018-19 and hold steady the year after. Improvement in access to credit, banking sector liberalisation and the expansion of the visa-free policy for foreign tourists provide the growth upsides while the potential changes of trade privileges could be a drag.

China and India

- China's GDP growth is projected to taper further in 2019 and 2020. Robust FDI inflows coupled with monetary policy accommodation and fiscal expansion are sources of growth as the country navigates trade and private debt related-risks.
- India's GDP growth is expected to improve in fiscal years 2019-20 and 2020-21. The rise in consumer optimism, monetary accommodation and some tax reductions provide some upsides even as export prospects are uncertain and infrastructure projects are facing delays and cost overruns.

Other key points of the economic outlook and assessment

- Inflation has generally eased partly due to restabilisation of most exchange rates, fiscal support and the pullback in global oil prices. In Myanmar, however, the persistent weakness of the kyat has fuelled a rise in domestic prices, and in China, supply-side pressures have pushed food prices upwards.
- Monetary authorities have moved to support growth and contain financial market vulnerabilities. Thailand raised interest rates as a precautionary measure against risks in the real estate market, while China, India, Malaysia and the Philippines have eased monetary controls to a certain degree.
- Weakness in trade has dampened the current account positions of a number of economies in the region. Nevertheless, the overall balance-of-payments positions have remained in good stead. Direct investment, portfolio and other investment flows have propped up the balances of countries with current account deficits.
- The stability in the fiscal positions of the region's economies has remained intact at the close of recent fiscal years. In the near term, the fiscal policy direction will be somewhat mixed. With the exception of the Philippines and to a certain extent, Indonesia, the ASEAN-5 economies are looking to consolidate their positions, while Brunei Darussalam, Cambodia, China, India and Singapore are heading toward a mild expansionary path.

Risks and challenges to the outlook – trade tensions

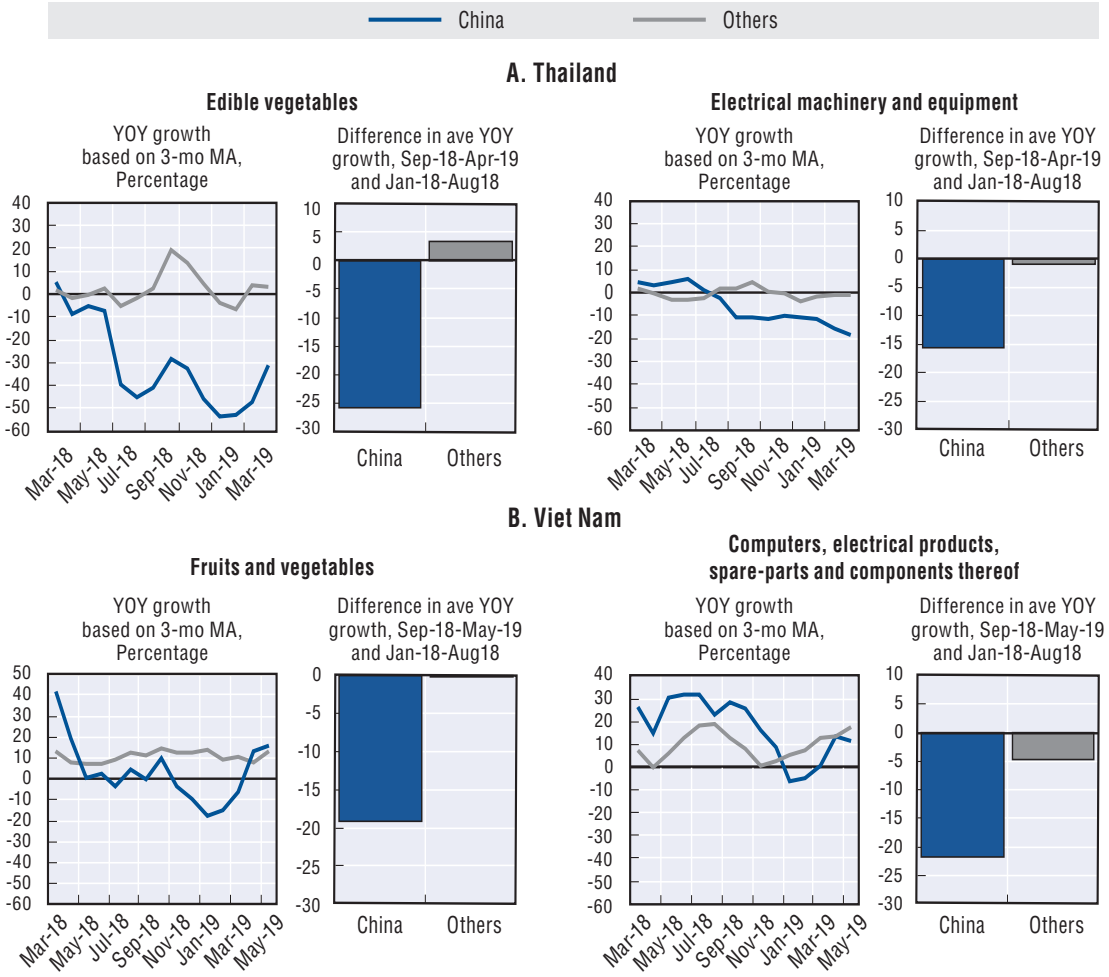
Emerging Asia faces several growth risks. One of the most prominent risks is the trade tension between the United States and China. The rising trade tensions may affect Emerging Asia through various channels.

With trade flows between the United States and China weakening, China's goods imports from ASEAN and India have slowed or contracted since September-November 2018. Import growth from ASEAN showed signs of improving in March 2019, but prospects are uncertain. While new tariff measures were announced in May 2019, the resumption of trade talks during the G20 summit sends a positive signal. The downturn in China's imports since late 2018 has affected ASEAN to varying degrees.

Trade diversion can have positive and negative effects, depending on the trade profile of a country. As such, the impact will likely be uneven across Emerging Asia. Other potential effects could come in the form of increased price pressures and disruption in supply channels leading to difficulties in disposing inventories.

In the near term, the speed at which exports adjust to the price shock caused by new tariffs will partly determine the impact of trade tensions on sectors and the economy as a whole. Though it is challenging to pin down the speed of adjustments and the patterns of re-allocation caused by the trade tensions, the export data of Thailand and Viet Nam by commodity and partner country yield some notable findings. While the growth trends are somewhat comparable for certain commodities, the speed of adjustment between commodities and markets differs (Figure 1). These dynamics are presumably determined by the macroeconomic structure, extent of global value chain involvement of each sector in the economy, free trade agreements and investment linkages, among other factors.

Figure 1. **Selected goods exports of Thailand and Viet Nam by partner economy, 2018-19**



Note: "Others" refers to the aggregate of other countries included in the data release excluding China, Hong Kong, China and Chinese Taipei. Commodity nomenclatures are not necessarily the same across countries. 3-mo MA means three-month moving average.

Source: OECD Development Centre based on CEIC and national sources.

StatLink https://doi.org/10.1787/888933966371

Currency-related policies can similarly influence how tariffs will affect trade flows, in as much as they reconfigure export competitiveness and change the cost of imports. In this regard, concerns mainly revolve around the movement of the Chinese yuan. Thus far, data show that the exchange rate dynamics involving the Chinese yuan and the US dollar are more about the strength of the US dollar than the weakness of the Chinese yuan. The dip of the Chinese yuan from mid-2018 to end-2018 was milder than that of other Emerging Asian currencies, such as the Indian rupee or the Indonesian rupiah.

The ongoing global changes in import sourcing – away from the epicentre of the trade dispute to avoid higher levies – present an opportunity for Emerging Asian economies to alter their investment and export strategies. It is crucial for Emerging Asian countries to persevere in efforts to improve the investment climate in order to make the most out of

these changing patterns. There is scope to improve targeting of foreign capital towards underdeveloped sectors and towards sectors where domestic firms can participate more extensively. In order to pursue these objectives, foreign investment policy must be aligned with the local enterprise development framework.

Special thematic focus for Update 2019: Smart urbanisation

Chapter 2: Overview of smart city strategies in Emerging Asia

Smart city strategies in Emerging Asia

Smart city strategies are widely used in Emerging Asia. Six of the 12 countries have a dedicated smart city strategy, namely China, India, Indonesia, Malaysia, Singapore and Thailand. Smart city strategies in Emerging Asian countries are at varying stages of advancement, with those of China and Singapore being the most comprehensive, followed by those of India, Indonesia, Malaysia and Thailand. Key recent trends are discussed below.

China

The urban population in China has risen rapidly in the last several decades. As a response, China published two national-level strategies, which lay out principles for smart city design and applications of smart technologies. These strategies were developed further in the 13th Five-Year Plan (2016-2020). The Chinese approach is rather centralised as smart city initiatives are steered, monitored and evaluated by the central government, with funding provided by national ministries. With regards to planning, although there is some evidence of horizontal co-ordination across national ministries for smart city implementation over several years, the extent of vertical co-ordination remains limited.

India

India launched in 2015 its own smart city strategy called the “Smart Cities Mission”; it is an advanced strategy for the development of 100 smart cities based on retrofitting, redevelopment and greenfield development. Although it is partially funded by the central government, each city is required to put forward its own locally-tailored vision. This encourages every city to compete for funds and to leverage their strengths. However, this approach might also lead to a lack of coherence given that no national strategy has been formulated. Smart city strategies in India will be carried out using special purpose vehicles (SPVs) to oversee the implementation process at the city level, and each smart city will have a Smart City Centre (SCC), which will act as an integrated command centre and control hub.

Indonesia

In Indonesia, the “Movement to 100 Smart Cities” features a competition and selection process under which candidates submit their plans. They will then undergo an assessment process to measure readiness to pursue each stage. Successful pitches will receive support from the academic community to prepare a Smart City Development Plan for the city or district for a 5-10 year horizon. Bandung City offers an interesting case of a subnational vision for a smart city, it is focused on the use of ICT to optimise resources within the city and to maximise services to its citizens. The Bandung Command Centre,

the flagship smart city project for Bandung City, collects data on traffic and violations, emergency needs and the location of public utility vehicles.

Malaysia

Malaysia has outlined its smart city strategy in its 11th five-year plan for 2016-20 and focuses on improving the coverage, quality and affordability of digital infrastructure. The plan takes into account different cross-sectional applications of smart city technologies, identifying specific challenges related to urban services, such as providing better transportation, utilities and waste management. To enable connectivity and integration of services, the strategy will focus on developing widespread broadband, sensor networks and applications. Malaysia has also formulated a strategy to provide smart services to its citizens in its "Communications and Multimedia Blueprint 2018-2025". It aims to provide digital services to its citizens and to make government services more readily available.

Singapore

Singapore has launched its Smart Nation Initiative, which reflects the country's effort to improve its economy by ensuring that all segments of society can harness digital technologies and benefit from these advancements. It focuses on a broad range of items related to smart city planning and the optimisation of government services. It is centred on three key components: digital economy, digital government and digital society. The Smart Nation Initiative follows a multi-stakeholder approach and is highly inclusive; it aims at preparing Singaporean society for the digital era. For instance, it provides retraining schemes to the elderly, improving digital and physical infrastructure and cybersecurity and ensuring privacy of data.

Thailand

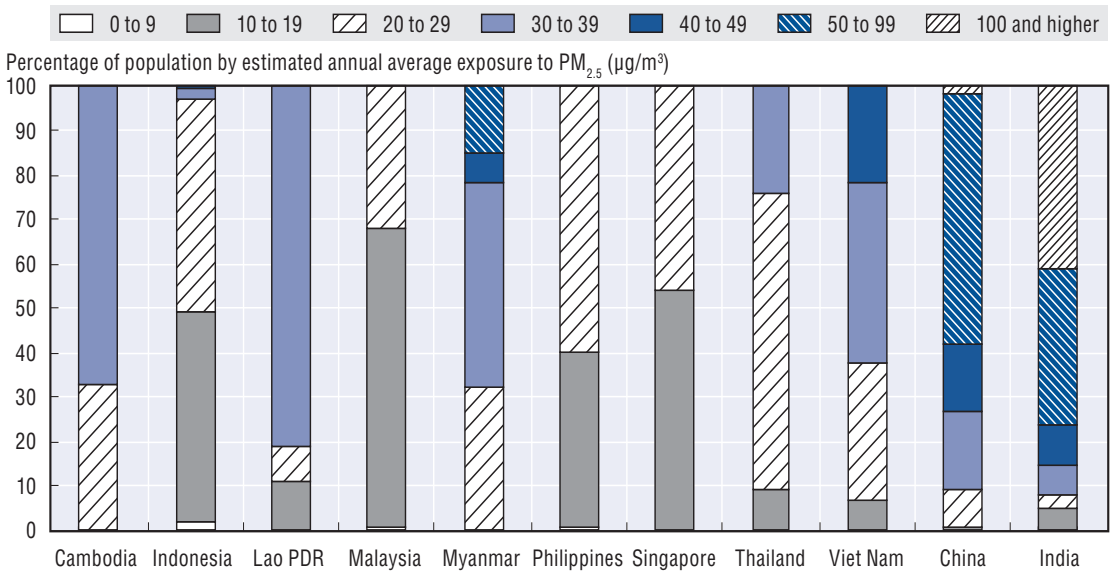
Thailand's Plan for the Promotion of the Digital Economy 2018-2021 encompasses five different components: digital infrastructure, digital manpower, digital technology development, cyber security and digital government. Smart city strategies are highlighted under the 'digital technology' component, where Thailand has identified six smart city domains, including: the economy, living conditions, people, governance, energy and environment and mobility. The city of Phuket offers a good example of smart city implementation as it was allocated a budget of THB 386 million by the Ministry of Digital Economy and Society for its smart city programme. With this budget, high-speed internet services with at least 1 000 Wi-Fi hotspots are planned in 100 areas in Phuket. Given its tourism-oriented economy, the city has also set up a mobile app, which informs both tourists and locals of what to do in Phuket.

Chapter 3: Addressing urban environmental risks

Rapid population growth and urbanisation, expanding economic activity, along with rising incomes have contributed to growing levels of air pollution in Emerging Asian cities. To illustrate this trend, outdoor concentrations of fine particulate matter ($PM_{2.5}$), which is hazardous to health, is commonly used as a proxy measure of pollution.

Exposure to ambient air pollution is a serious challenge in Emerging Asian cities, though the severity of pollution varies considerably between and within countries. Practically all urban residents in the region are exposed to ambient air pollution exceeding the WHO guidelines on the concentration of fine particulate ambient air pollution (i.e., 10 PM2.5 µg/m3). Only 0.2% of urban residents in Emerging Asia live in areas with pollution concentrations at or below this level (Figure 2).

Figure 2. **Distribution of urban population exposure to air pollution, 2016**



Notes: Areas with population densities of at least 1 500 people per square kilometre are defined as urban, following the threshold of a high-density cluster defined in OECD (2013). This definition excludes data on Brunei Darussalam, where levels of fine particulate air pollution also tend to be relatively low.

Source: OECD Development Centre's calculations, using WHO (2017), *Data Integration Model for Air Quality* (database).

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Research has shown that high levels of fine particulate air pollution are highly correlated with other air pollutants and are linked to elevated risks of mortality and other health related issues. In urban areas in Emerging Asia, fine particulate air pollution in excess of WHO guideline levels is estimated to cause an additional 1.5 million premature deaths per year (Table 2). Most of these deaths occur in China and India, due to their large urban populations and high levels of exposure to air pollution.

Table 2. **Estimated additional urban mortality and welfare costs associated with elevated pollution levels**

Country	Additional deaths (thousands)	Welfare loss of pollution-related mortality (2015 USD millions)
Cambodia	1.3	237.6
Indonesia	28.9	17 094.3
Lao PDR	0.3	88.0
Malaysia	2.5	4 477.4
Myanmar	7.4	1 477.4
Philippines	15.7	9 585.5
Singapore	1.2	10 404.6
Thailand	11.3	11 129.4
Viet Nam	17.4	5 937.8
China	767.8	1 047 240.8
India	614.5	168 993.5
Emerging Asia	1 468.1	1 276 666.5

Notes: Areas with a population density of at least 1 500 people per square kilometre are defined as urban, following OECD (2013). This definition excludes data on Brunei Darussalam, where levels of fine particulate air pollution are relatively low. See Annex 3.A1 for data and methodology used in the estimations.

Sources: OECD Development Centre's calculations, using WHO (2017), *Data Integration Model for Air Quality* (database); Viscusi, K. and C. J. Masterman (2017), "Income elasticities and global values of a statistical life", *Journal of Benefit-Cost Analysis*, 8:2.

All levels of government have shared responsibilities in addressing urban air pollution externalities

Policy responses cannot be limited to the local level as air pollution crosses administrative borders. Different levels of government must coordinate to address emissions and to establish minimum standards and boundaries for action at the local level. National legal frameworks should co-ordinate action on pollution reduction and set penalties or incentives. Furthermore, given that air pollution does not stop at one country's borders, all countries in the region should co-operate to tackle this issue.

Setting emissions standards is an essential tool for air pollution reduction strategies. Most countries in the region (except for Brunei Darussalam, Lao PDR and Myanmar) have national air quality standards covering at least some of the main outdoor air pollutants. The level of these standards varies across countries in the region, which have very different average levels of exposure to air pollutants. Separate local pollution standards may also be set for particular cities or regions.

The use of cleaner transportation options can be facilitated

Motor vehicles are a major cause of pollution in Emerging Asian cities, as the number of vehicles on the region's roads continues to soar. Enforcing standards on fuel quality and vehicle emissions can reduce dangerous emissions from motor vehicles. Many countries in the region follow European standards for emissions, which define maximum acceptable emission rates of hydrocarbons and nitrogen oxide per kilometre travelled.

To curb transport related air pollution, policies on the pricing of private transportation may be considered, also, cutting support to fossil fuels would help. Vehicle retirement or scrappage programmes are another way of reducing air pollution and road safety. Finally, pollution could be reduced if the public's perception of private vehicles were to change. Indeed, rising incomes have usually been associated with increased car use in the region.

The use of cleaner alternatives to private vehicles is also needed, which means improving the public transport network. Measured by energy use per passenger kilometre, urban public transport is much more energy efficient than private transport, although the design and use of these modes of transport affect efficiency. As such, there are sizable differences amongst Emerging Asian cities when it comes to the efficiency of public transport systems.

Reducing emissions from power plants

Fossil fuels produce the lion's share of electricity in the region. In 2016, coal and oil produced 39% of the region's energy; this number is expected to rise to 44% by 2040. Power generation through the burning of fossil fuels is a large cause of air pollution and a considerable number of plants are located close to large cities in Emerging Asia, affecting their inhabitants' health. National authorities have taken steps to regulate emissions from power plants, setting standards for particulate matter, nitrogen oxide and sulphur oxide. In most countries, national and local governments share the responsibility for regulating power plants. Although in some countries, local authorities yield the power to set emission standards.

Power plant emissions can be reduced by upgrading power plants in accordance with the ASEAN Clean Coal Technology (CCT) Handbook for Power Plant. Increasing the share of renewables in power generation is another option. This transition is already underway as ASEAN's energy ministers target a 23% share of renewables by 2025 and providing

the right incentives will help with this effort. Finally, a better use of current resources will also help in reducing pollution, by slowing potentially needed increases in power generation and other forms of energy.

Table 3. **Fossil fuel power plants near selected Emerging Asian cities**

Plants within 100 kilometres of city centres

	Number of plants			Total annual estimated generation (GWh)		
	Coal	Gas	Oil	Coal	Gas	Oil
Phnom Penh, Cambodia	-	-	2	-	-	296.5
Jakarta, Indonesia	6	14	1	34 626.4	29 136.5	931.4
Kuala Lumpur, Malaysia	1	6	-	8 513.9	33 550.2	-
Yangon, Myanmar	-	4	-	-	2 237.7	-
Manila, Philippines	6	3	5	9 511.5	8 821.7	3 997.6
Singapore, Singapore	3	8	3	26 126.0	47 042.0	345.0
Bangkok, Thailand	-	17	-	-	83 039.9	-
Ho Chi Minh City, Viet Nam	1	7	4	792.2	33 769.2	339.1
Shanghai, China	27	14	-	161 519.1	19 124.5	-
Mumbai, India	4	8	8	18 344.5	2 367.8	1 969.9

Notes: Plants are classified by their primary fuel source. Selected cities are the largest by population in their respective countries. The database does not include any plants using coal, gas or oil within 100 km of Bandar Seri Begawan, Brunei Darussalam or of Vientiane, Lao PDR. Annual estimated generation refers to actual electricity generated.
Source: OECD Development Centre's calculations, using Global Energy Observatory, Google, KTH Royal Institute of Technology in Stockholm, University of Groningen and WRI (2018), *Global Power Plant Database*.

Investment in reducing industrial pollution to drive greener growth

Heavy industries are another major source of air pollution in Emerging Asian cities. This is driven both by indirect factors (manufacturing needs the electricity generated at power plants that burn fossil fuels) and by direct ones such as industrial boilers and plants that produce cement, iron and steel, which emit nitrogen oxide, sulphur dioxide and particulate matter. Given the continuous increase in nominal industrial production in most Emerging Asian countries, pollution from industry is likely to increase in the future.

Policy measures to reduce air pollution can help in developing synergies with other environmental, social and economic priorities, such as developing the green economy and combating climate change. As such, countries in the region have implemented tax incentive and subsidy schemes to encourage various industries to invest in pollution reduction. However, to further incentivise investment in green technologies polluters should face higher costs. Indeed, environmental regulations in China, India and Indonesia are still relatively lax.

Furthermore, urban air pollution in the region could be reduced as green growth expands through environmentally-friendly investments in a broad range of areas of economic activity and urban development. One such example is the building sector, where space heating and cooling, boilers, lighting, appliances and cooking equipment in residential, commercial and industrial buildings could be upgraded to reduce their environmental impact. Increasing the energy efficiency of home appliances is another way to decrease pollution and, improve safety and comfort at the same time.

Chapter 1

Macroeconomic assessment and economic outlook

Economic growth shows signs of slowing in Emerging Asia – Southeast Asia, China and India. Trade tensions underpin the weakening economic performance. However, domestic private consumption is holding up well. Gross domestic product (GDP) growth rates are expected to remain encouraging overall. In the near term, Cambodia, Lao PDR and Myanmar will likely continue to lead ASEAN in terms of growth, and Viet Nam is on track to lead the ASEAN-5. In China, moderation of GDP growth will persist at a gradual rate. In contrast, India's economy will expand more briskly.

The easing of inflation in many economies in the region has shifted the focus of policy makers to mitigating financial risks and supporting growth. On the external front, current account positions have generally deteriorated somewhat, partly owing to the trade uncertainties. Nevertheless, the overall balance-of-payments positions have remained in good stead. Stability in the fiscal positions of the region's economies has similarly remained intact at the close of recent fiscal years. Moving forward, policy directions are expected to diverge. Most of the ASEAN-5 economies are gearing for fiscal consolidation, while the other Emerging Asian countries are looking to take an expansionary path.

Introduction

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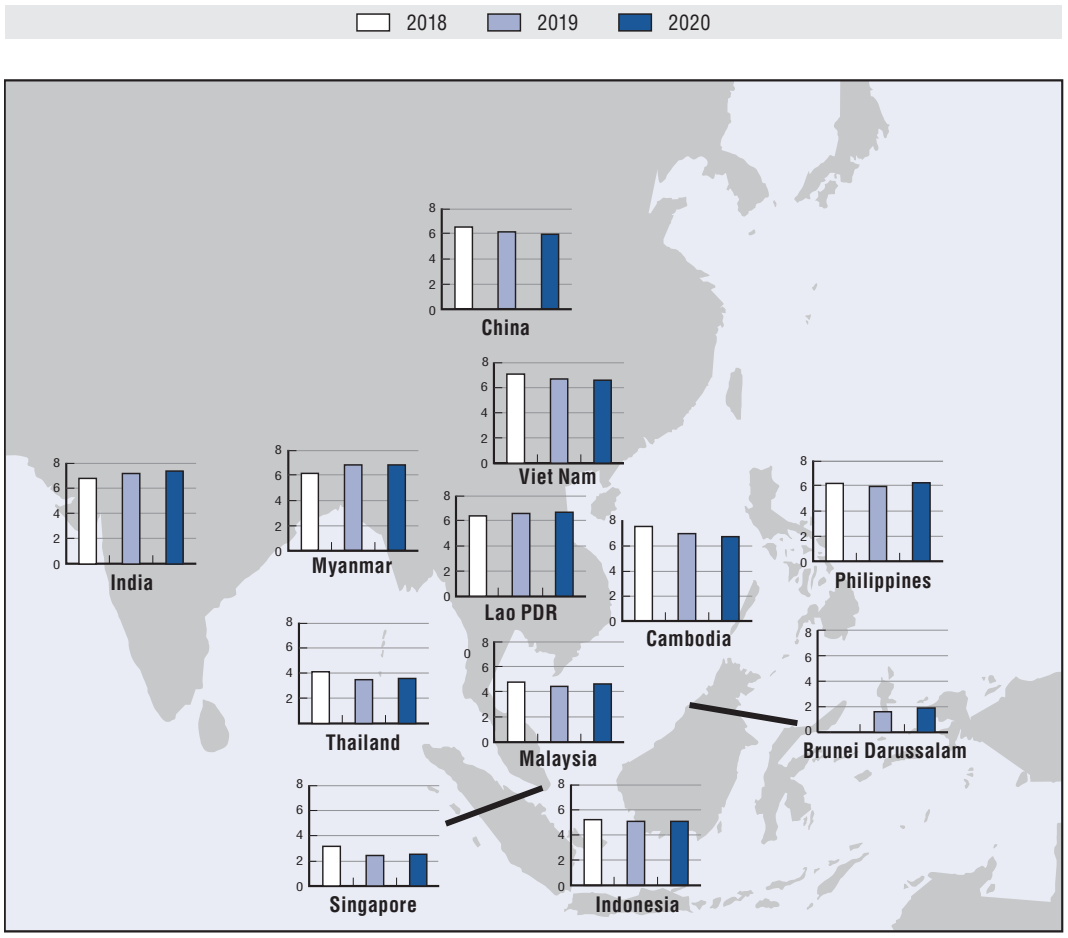
Figure 1.1. **Real GDP growth of Southeast Asia, China and India**

Comparison between 2018, 2019 and 2020 growth rates, in percentage



Source: OECD Development Centre.

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Overview and main findings

- Growth in the region shows signs of slowing, although it is still robust in general. Weakening sentiment in the first quarter of 2019 is underpinned by trade tensions and the slowdown in China's growth. Nonetheless, private consumption is holding up well. Overall, growth rates in 2019 and 2020 are expected to remain high, at 6.2% in Emerging Asia and 4.9% and 5.0%, respectively, in ASEAN. Among the ASEAN-5, Viet Nam and the Philippines will remain as the growth leaders. The CLM countries – Cambodia, Lao PDR and Myanmar – will continue to set the pace in Southeast Asia in the near term. Growth is projected to slow in China to 6.2% and 6.0%, but to stay robust in India, at above 7.0% (Table 1.1).

Table 1.1. **Real GDP growth in ASEAN, China and India**

Annual percentage change

	2017	2018	2019	Changes from the previous forecast (Nov. 2018)	2020
ASEAN-5 countries					
Indonesia	5.1	5.2	5.1	↓	5.1
Malaysia	5.7	4.7	4.4	↓	4.6
Philippines	6.7	6.2	6.0	↓	6.3
Thailand	4.0	4.1	3.5	↓	3.6
Viet Nam	6.8	7.1	6.7	-	6.6
Brunei Darussalam and Singapore					
Brunei Darussalam	1.3	0.1	1.6	↓	1.9
Singapore	3.7	3.1	2.4	↓	2.5
CLM countries					
Cambodia	7.0	7.5	7.0	↑	6.8
Lao PDR	6.9	6.4	6.6	↓	6.7
Myanmar	6.8	6.2	6.9	-	6.9
China and India					
China	6.8	6.6	6.2	↓	6.0
India	7.2	6.8	7.2	↓	7.4
ASEAN-10	5.3	5.1	4.9	↓	5.0
Emerging Asia	6.6	6.4	6.2	↓	6.2

Note: Data are as of 31 May 2019. Data of Cambodia and Myanmar in 2018 are preliminary estimates. Data of India and Myanmar relate to fiscal years. For Myanmar, the 2018 data are based on ADB (2019) and IMF (2019a) and refer to the interim period ending September 2018. Singapore and Thailand data are based on chain-linked volume measures. The projections for China, India and Indonesia are based on the OECD Economic Outlook No. 105 database.
Source: OECD Development Centre.

- Inflation has generally eased. Restabilisation of most exchange rates, fiscal support and the pullback in global oil prices have helped to ease the pressure on inflation in the region. El Niño posed risks to agricultural production this year, but the impact had been mild thus far. In Myanmar, however, the persistent weakness of the kyat anchors a rise in domestic prices, and in China, supply-side pressures have pushed food prices upwards.
- Monetary authorities have moved to support growth and contain financial market vulnerabilities. Thailand raised interest rates as a precautionary measure against risks in the real estate market, while China, India, Malaysia and the Philippines have eased monetary stances to a certain degree.
- Current account balances have largely deteriorated, though the overall positions remain solid. Weakness in trade has dampened the current account positions of a number of economies in the region. And while levels have stayed positive in Brunei

Darussalam, China, Malaysia, Singapore, Thailand and Viet Nam, they are negative in the other five Emerging Asian economies. Nevertheless, overall balance-of-payments positions have remained in good stead. Direct investment, portfolio and other investment flows have propped up the balances of countries with current account deficits.

- The stability in the fiscal positions of the region's economies has remained intact at the close of recent fiscal years. In the near term, the fiscal policy direction will be somewhat mixed. With the exception of the Philippines and to a certain extent, Indonesia, the ASEAN-5 economies are looking to consolidate their positions, while Brunei Darussalam, Cambodia, China, India and Singapore are heading for a mild expansionary path.
- Trade tensions between the United States and China could affect economies in the region differently. The rising trade tensions make Emerging Asian economies susceptible to a slowdown in consumer spending in their key export markets, particularly China, and to spillovers through the global production chain. In the near term, the speed at which exports adjust to the price shock caused by new tariffs will be different by commodity and country in the region. On the upside, the ongoing global changes in import sourcing present an opportunity for Emerging Asian economies to alter their trade patterns.

Recent developments and near-term outlook[1]

Growth in Emerging Asia, while robust, shows signs of slowing

ASEAN-5

Indonesia's GDP growth in Q1 2019 marginally slowed from the previous quarter, although it stayed in line with the average since Q1 2014 (Table 1.2). The growth was mainly anchored by public and private consumption as well as fixed investment. Bank lending growth has remained brisk despite an increase of 175 basis points in Bank Indonesia's seven-day repo rate since April 2018. The purchasing power of consumers and investors was supported by monetary and capital flow measures that eased pressure on the rupiah, which had been losing ground until October 2018. Activities leading up to the general elections in April 2019 contributed to the spending momentum. Economic growth in 2019 and 2020 is projected to remain strong, in line with the pace of the past three years. Consumer confidence has remained upbeat, and this is mirrored by the robust retail sales growth. The stabilisation of the rupiah in recent months and the tapering of interest rates in the secondary debt market since September-October 2018 augur well for business operations and for public and private capital spending. Tax cuts for exporters who keep their earnings in the domestic banking system should strengthen external buffers, while the adjustment of the negative list and new rules on tax holidays look positive for investment. Near-term growth challenges include sustaining the improvement in the tax-to-GDP ratio through more transparent administration and appropriately managing the foreign share in central government debt amid an infrastructure push. External geopolitical shocks that can result in energy-price volatility also pose a risk to stability in capital flows and growth prospects. Ironing out the known sources of infrastructure project delays, such as land acquisition, and effectively engaging local governments in the process is another challenge (Box 1.1). Enhancing the disaster resilience of local governments is also key for sustaining the promising economic prospects and spreading their benefits.

Table 1.2. **Recent real GDP growth in ASEAN, China and India, 2018-19**

Quarterly year-on-year percentage changes

	2018 Q1	2018 Q2	2018 Q3	2018 Q4	2019 Q1
ASEAN-5 countries					
Indonesia	5.1	5.3	5.2	5.2	5.1
Malaysia	5.3	4.5	4.4	4.7	4.5
Philippines	6.5	6.2	6.0	6.3	5.6
Thailand	5.0	4.7	3.2	3.6	2.8
Viet Nam	7.5	6.7	6.8	7.3	6.8
Brunei Darussalam and Singapore					
Brunei Darussalam	2.8	-2.6	-1.1	1.0	-
Singapore	4.6	4.2	2.6	1.3	1.2
China and India					
China	6.8	6.7	6.5	6.4	6.4
India	8.0	7.0	6.6	5.8	-

Note: Data are as of 31 May 2019. Data of India relate to fiscal years.
Source: OECD Development Centre based on CEIC and national sources.

Box 1.1. **Investment in infrastructure can spur local development**

Local governments have an important role to play in developing and maintaining infrastructure. Investments in quality transport infrastructure result in benefits to the communities directly affected. They can directly generate employment opportunities related to construction, operations and maintenance; indirectly improve opportunities for individuals and firms; improve the efficiency of existing forms of economic activity; and generate various social and environmental benefits. Affected communities also benefit from spillovers such as lower input costs, increased choice in input supplies, expanded local trade and access to new markets for output (White and Raitzer, 2017).

Empirical studies have strongly tied infrastructure to local development. Using data from 4 000 households in rural Indonesia, Gibson and Olivia (2010) showed that improved access to roads and electricity positively affected both employment and income for non-farm enterprises. The Program Nasional Pemberdayaan Masyarakat (PNPM) Mandiri Rural Infrastructure Support helped villagers of Trimulyo to develop the local economy by constructing an all-weather road. The new road lowered transportation costs, which allowed greater use of fertiliser and in turn increased outputs. In the Philippines, Llanto (2007a; 2007b) indicated a critical link between infrastructure and regional growth. The authors' findings support the view that infrastructure stock and growth potential are positively correlated. Francisco (2017) provided evidence that roll-on-roll-off transport systems stimulated both agricultural and non-agricultural activities, resulting in higher incomes for agricultural households, which in turn increased the likelihood that these households would send their children to school. In Viet Nam, Minh and Huong (2016) found that, from 2009 to 2013, increases in both the consumption of electric energy and the length of roads in 13 provinces in the Mekong delta helped to increase economic growth. Chung (2015), who analysed data for Viet Nam's 63 provinces from 2006 to 2010, likewise showed that investment in infrastructure helped reduce poverty rates.

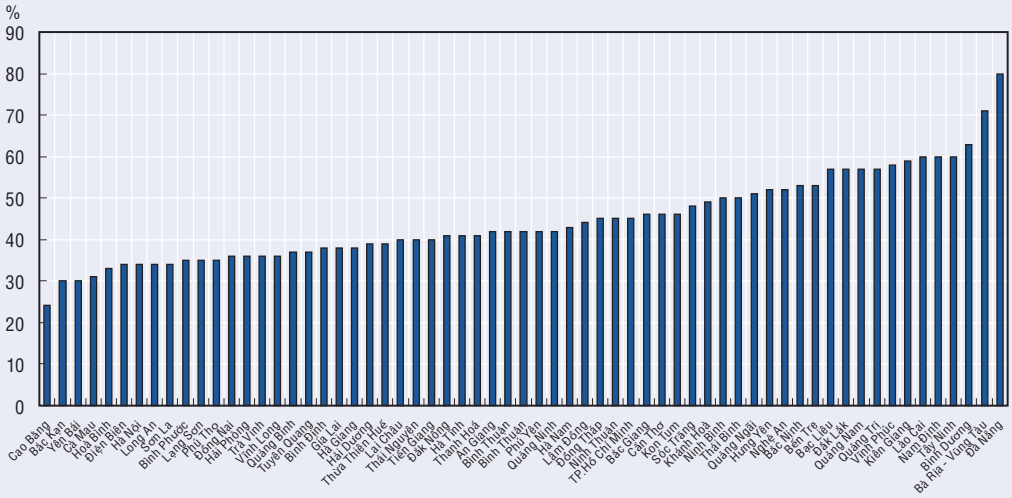
Despite the importance of infrastructure, access still varies considerably across regions in Indonesia, the Philippines and Viet Nam. In Indonesia, for example, 84.3% of the country's 80 337 villages had roads that are passable throughout the year as of 2014,

Box 1.1. **Investment in infrastructure can spur local development** *(cont.)*

and 67.1% had their widest road paved. In the province of Papua, the proportions drop to 29.6% and 19.4%, respectively, compared to more than 99% in both measures in the province of Bali (OECD, 2018a).

Similarly, many people in Viet Nam perceive access to local infrastructure as insufficient. According to the country's provincial competitiveness index for 2016, in 44 out of the country's 63 provinces fewer than half of business owners stated that they were satisfied with the quality of the transport infrastructure (Figure 1.2). Across all provinces, the median approval rate was only 42%.

Figure 1.2. **Percentage of business owners satisfied with transport infrastructure in Viet Nam by province, 2016**



Source: OECD Development Centre calculations based on VCCI (2016).

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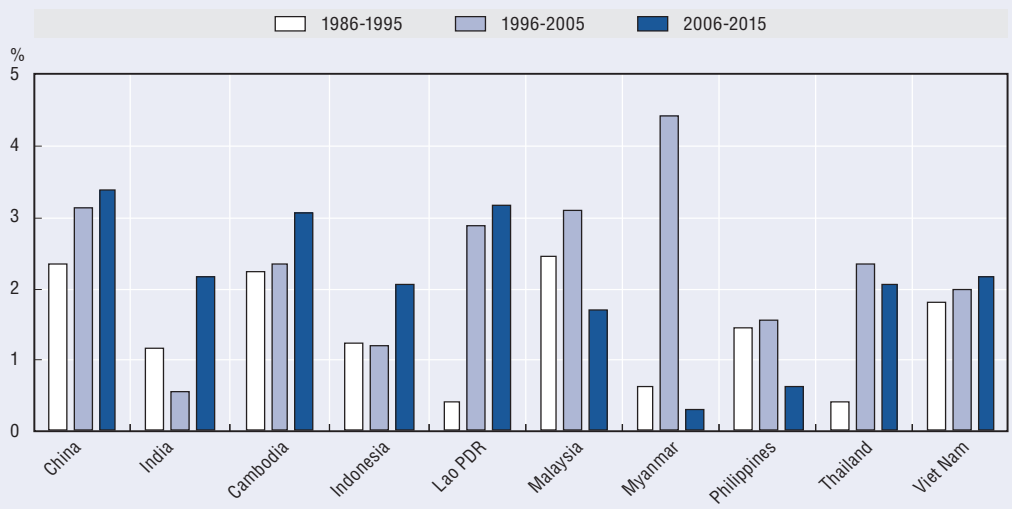
In *Malaysia,* GDP growth in Q1 2019 slid marginally from the previous quarter. Growth of exports has weakened while fixed-capital formation has contracted, offsetting the strength of private and government consumption. Private spending appears to have absorbed the reintroduction of sales and services tax in September 2018 (Figure 1.4). Monetary support, fiscal assistance and the low inflation environment have helped to anchor consumption and investment appetite. However, consumer confidence has continued to dissipate (Figure 1.5). Malaysia's growth is projected to moderate in 2019 before bouncing back slightly in 2020. Fiscal management reforms and additional tax measures should generate much-needed space in light of the intent to rein in the budget deficit-to-GDP ratio through 2020.[2] The decision to continue the fuel-subsidy and income-transfer programmes, coupled by a steady decline in the household debt-to-GDP ratio, also bode well for private consumption. High dependence on the oil and gas sector for fiscal revenues is one of the prominent challenges. Bolstering Malaysia's global branding and maximising domestic use of returns of offshore assets is another key. Notably, the aggregate outward direct investment of Malaysia from 2010 to 2018 has outstripped inward foreign direct investment (FDI), though outward investment has somewhat pulled back in recent quarters. Managing urbanisation and addressing unevenness in the level of development across states and federal territories are also issues.

GDP growth in the *Philippines* moderated in Q1 2019 from Q4 2018. Private spending continued to grow briskly, while growth in government expenditures, fixed investment and exports eased. Election-related expenditures provided a one-off boost. However, a delay in the passage of the budget law held up some key public spending items. Annual growth is expected to edge lower in 2019, though it is forecast to recover marginally in 2020. Budgetary outlays and fixed investment will likely rebound during the rest of the year on anticipated backloading of public spending. Relatively benign inflation, the pullback in debt-market interest rates and robust growth in bank lending are likewise favourable for capital expenditures and personal spending. Notably, the tightening of policy rates was reversed in May 2019 following a 25-basis-point rate cut. The central bank is also looking to lower the reserve requirement ratio further in line with the reductions in March and June 2018. The capacity to meet the infrastructure plan while limiting associated fiscal risks remains a prominent near-term challenge. Concrete policies for continuing to develop regions outside Metro Manila, particularly in agriculture-dependent areas (Box 1.2), are crucial to spreading economic opportunities and managing population concentration and activities in the coming years.

Box 1.2. **Facilitating the use of digital services to promote rural agriculture**

Improvement of socio-economic conditions in the agricultural sector is one key to keeping growth in private consumption robust in the medium term. A number of Emerging Asian countries have managed to sustain or improve total factor productivity growth in agriculture in recent years (Figure 1.3). Nonetheless, long-standing issues that affect rural agriculture persist despite interventions undertaken over the years. They include: access to financing and risk-hedging options; access to upstream and downstream markets; export facilitation frictions; and research and infrastructure gaps. Smaller farmers are particularly vulnerable to the shortcomings of the existing agricultural value chain and support systems.

Figure 1.3. **Agriculture total factor productivity average annual growth in Emerging Asian economies, 1986-2015**



Source: OECD Development Centre based on USDA-ERS (2019) International Agricultural Productivity Database.

StatLink https://doi.org/10.1787/888933966200

Box 1.2. **Facilitating the use of digital services to promote rural agriculture** *(cont.)*

Developments in digital services and the use of big data could help to narrow the gaps in many respects, financing and insurance included. For instance, India's more than 250 agriculture technology (agtech) firms provide platforms for matching input sellers to farmers to retail and wholesale produce consumers, and for farming-as-a-service, big data analytical support and engineering support (MAFW, 2018). Agtech start-ups have also sprung up in other parts of Asia (AgFunder, 2018; EIU, 2018; Hvidsten, 2017). Meanwhile, financial technology (fintech) firms are creating opportunities for farmers to obtain credit despite limited formal-sector credit history. In the same manner, increased usage of drones and the availability of deep learning tools and distributed ledger technologies (DLT) are advancing the viability of agriculture insurance mechanisms in developing countries. Moreover, DLT have the potential to improve the efficiency of monitoring of compliance with standards and agreements, and of payments for agricultural financial services (Tripoli and Schmidhuber, 2018).

Governments have strengthened the technology dimension of their agricultural policy agenda and have incorporated start-ups working on related technology in their efforts. One example is the Regional Inclusive Innovation Centres, which were launched in the Philippines to strengthen innovation capacity of target sectors including agriculture while facilitating the growth of start-ups (DTI 2018; DTI, 2019). Another example is One Commune, One Product in Viet Nam, which was linked to the start-up campaign to deepen technology penetration in the agriculture sector (MARD, 2019). At the regional level, the Mekong Agriculture Technology Challenge (MATCh) start-up accelerator initiative was rolled out by the Mekong subregion countries and institutional partners in 2017 to promote innovation in the farm sectors of Cambodia, Lao PDR, Myanmar and Viet Nam (GMS-EOC, 2017).

Tripoli and Schmidhuber (2018) have suggested broad policy options to further facilitate adoption of innovations like DLT. These include: i) a clear set of rules for data accessibility; ii) improving access to internet service for farming-sector stakeholders; iii) developing public key infrastructure and the digital skills of personnel across the sectors involved; and iv) harmonisation of standards and legal frameworks across jurisdictions for DLT interoperability. In terms of making fintech responsive to the needs of the agriculture in Asia, McIntosh and Mancini (2018) have suggested the creation or empowerment of asset registries, standard certification entities and credit bureaus; government use of reinsurance to deepen private-sector exposure to agriculture; and the establishment of information-sharing rules across financial institutions regardless of type and size as well as financial literacy programs suitable to the socio-economic context.

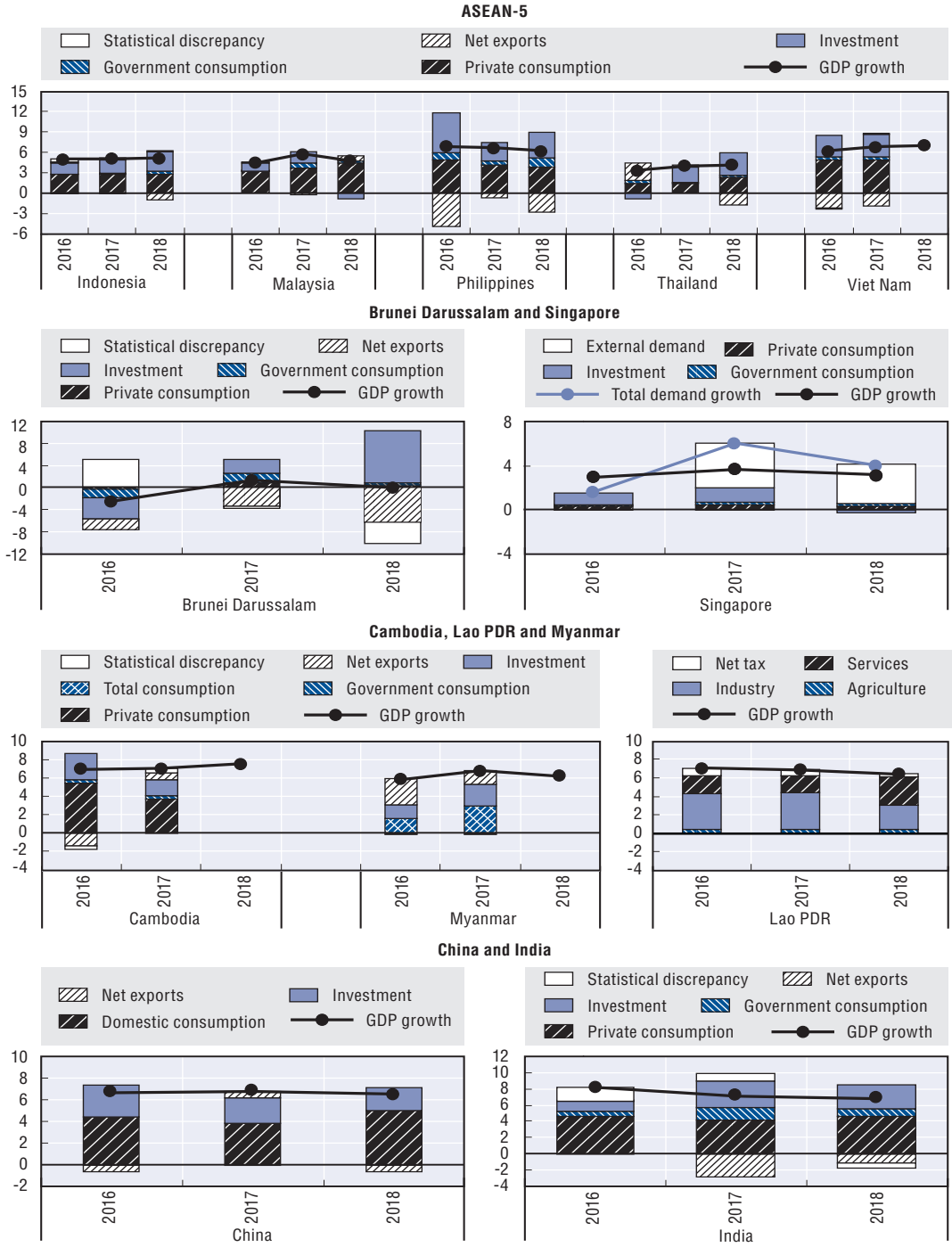
GDP growth in *Thailand* edged lower in Q1 2019 from the previous quarter. Private consumption, government outlays and fixed investment grew modestly. Apart from election-related spending, subsidies (e.g. on fuel, rubber production and rural broadband) have seemingly kept domestic spending afloat. However, exports contracted anew after a mild recovery in Q4 2018 (Figure 1.6). GDP growth in 2019 is projected to be lower than the rate in 2018 before rising slightly in 2020. Continuation of price support measures, and recent tourism incentives like visa waivers, tax breaks and free flights to second-tier destinations, should buoy private spending. Big-ticket Eastern Economic Corridor projects that were approved last year (e.g. U-Tapao aviation city, Laem Chabang Seaport-3

and Map Ta Phut Seaport-3) are similarly a boon to capital formation. On the other hand, the banking sector still exhibits pockets of vulnerability. The steady decline in banks' overall non-performing loans ratio is encouraging, yet the ratios of certain sectors remain elevated at more than 5% (agriculture, manufacturing and construction). The persistently high household debt-to-GDP ratio likewise calls for sustained intervention on both the supply and demand sides. The fact that the policy rate was raised in December 2018, the first hike since August 2011, could mitigate the flow of credit to less productive sectors. Curbing poverty in the agriculture sector, which has remained high (Chantarat, Athawanich and Saengniam, 2018) despite the fall in national poverty, crucially requires increased focus.

Viet Nam's economic growth in Q1 2019 has softened from Q4 2018. Supply-side sectors continued to perform well, though slightly less robustly than in the previous quarter as export weakness persists. A solid expansion in real retail sales indicates that household spending is holding up well, although the component associated with tourism has slid somewhat, reflecting a slowdown in arrival growth. Realised *investment capital under the state budget* and *realised FDI capital* also maintain a robust momentum. GDP growth is projected to come in at a slower pace in 2019 and will moderate further in 2020. Lower uptick in offshore sales is a developing growth friction that can slow investment. The government has limited elbow room to absorb the slack at this juncture given the extent of public debt. On the upside, private consumption should benefit from receding inflation. Prospects of the farm sector are likewise good, supported by: efforts to spread FDI inflow to various subsectors; connectivity projects in agricultural areas, including industrial-agricultural zones; and local government-based initiatives like the *One Commune One Product Programme*. Strengthening the banking sector's position remains a key challenge, though various measures have been undertaken to work out a portion of the bad debts. Pursuing policies such as calibrated liberalisation and adjustments in intellectual property regulations in order to leverage the country's participation in the Comprehensive and Progressive Agreement for Trans-Pacific Partnership can help to diversify exports and FDI sectoral recipients.

Figure 1.4. **Contribution to growth in ASEAN, China and India, 2016-18**

Percentage points

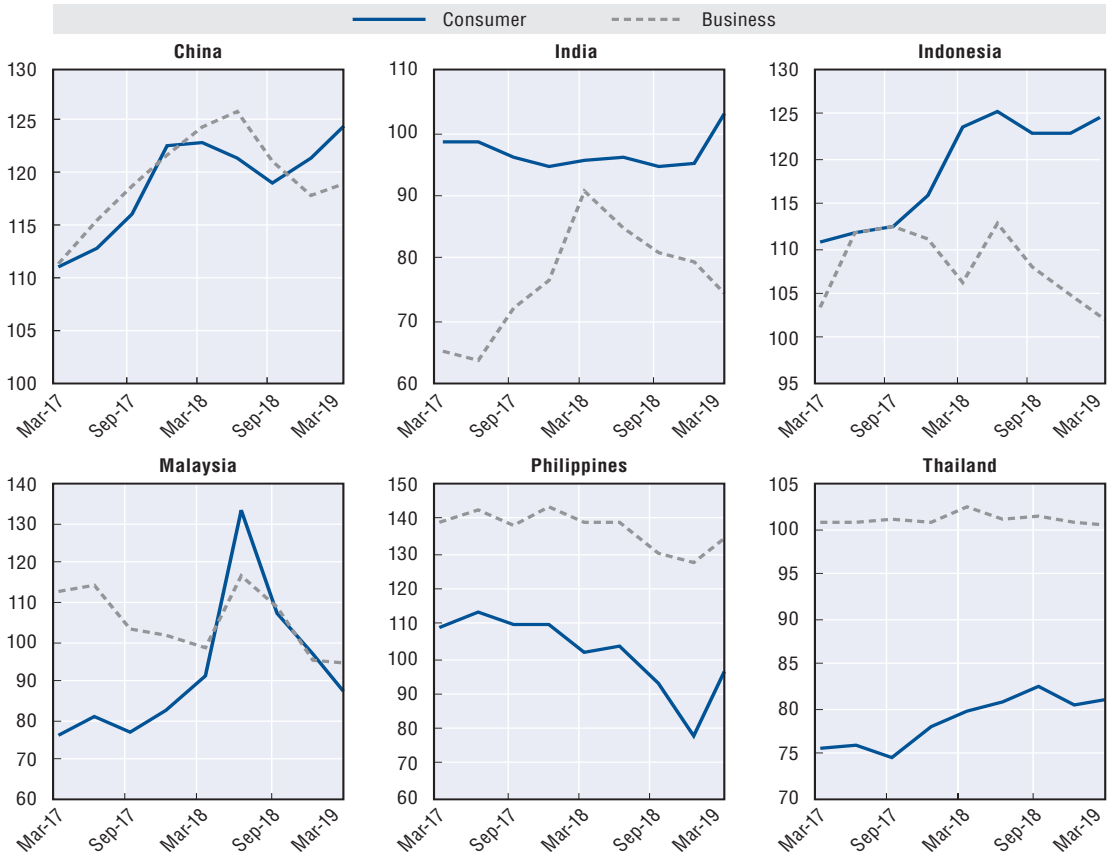


Note: Data are as of 31 May 2019. Data of Cambodia and Myanmar in 2018 are preliminary estimates. Data of India and Myanmar relate to fiscal years. For Myanmar, the 2018 data are based on ADB (2019) and IMF (2019a) and refer to the interim period ending September 2018; and the dataset does not disaggregate consumption into public and private. Lao PDR has no demand-side data. Net tax equals taxes minus subsidies. Singapore and Thailand data are based on chain-linked volume measures. Disaggregation of Singapore data refers to contribution to growth in total demand. The sum of contributions to growth in total demand is not necessarily equal to GDP growth. For Viet Nam, demand-side components of GDP in 2018 are not yet published.

Source: OECD Development Centre based on CEIC and national sources.

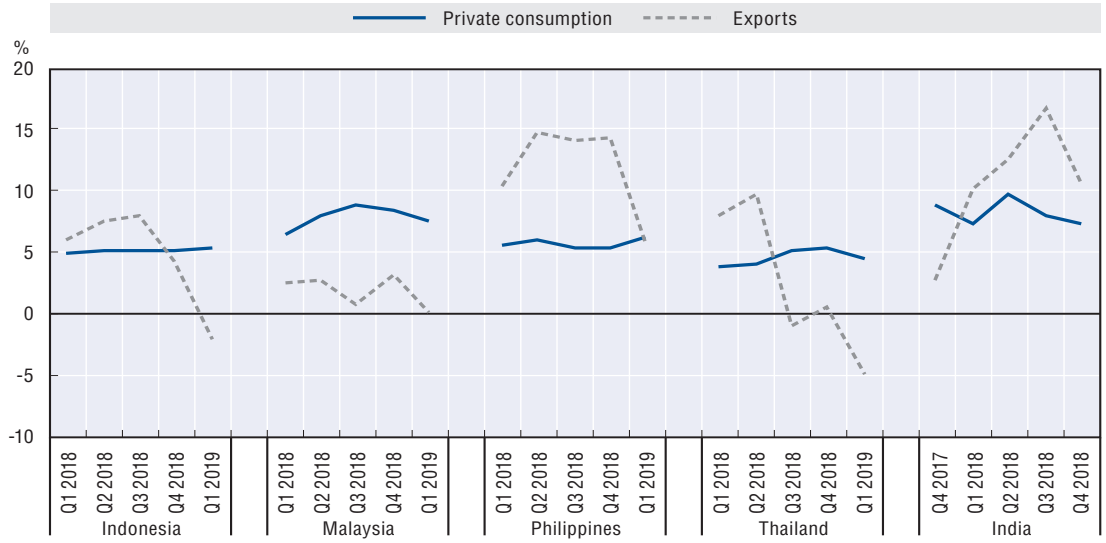
StatLink https://doi.org/10.1787/888933966219

Figure 1.5. **Business and consumer confidence indices in China, India, Indonesia, Malaysia, Philippines and Thailand, 2017-19**



Note: All indices are adjusted to set 100 as neutral confidence point.
Source: OECD Development Centre based on CEIC and national sources.
StatLink https://doi.org/10.1787/888933966238

Figure 1.6. **Private consumption and gross exports real growth in India, Indonesia, Malaysia, Philippines and Thailand, 2017-19**



Note: Data are as of 31 May 2019. Data of India relate to fiscal years.
Source: OECD Development Centre based on CEIC and national sources.
StatLink https://doi.org/10.1787/888933966257

Brunei Darussalam and Singapore

Brunei Darussalam's economy ended 2018 barely in the black after posting modest growth in Q4 2018 to reverse the contraction in the second and third quarters. Fixed investment grew robustly, fuelling imports of machinery and related equipment. Exports recovered in the last quarter following lacklustre performance in the preceding two quarters. Private consumption growth also rebounded strongly in the last three months, as did government spending. In 2019 and 2020, GDP growth is projected to rise modestly. Slowing global economic growth, which will likely put a lid on energy demand, is one of potential drag. Though government revenues are expected to recover marginally, the overall fiscal position does not warrant extensive stimulus spending. Increasing local private participation remains a key challenge despite long-standing policy on the matter (e.g. Wawasan Brunei 2035 and Outline of Strategies and Policies for Development 2007-17). Private-sector engagement is relevant both for broadening the drivers of growth and government revenue sources, and for addressing the rising unemployment rate (9.3% in 2017) amid declining labour-force participation. The digital industries are a promising area. Initiatives like *LiveWIRE* Brunei and Bank Islam Brunei Darussalam's SME 360° Centre have been instrumental in the emergence of start-ups in sectors like smart farming, Islamic finance, sports equipment and retail business. Policy options worth examining to enhance the efficacy of the entrepreneurship drive include deepening the government's partnership with educational institutions and harnessing equity financing in addition to debt products.

GDP growth in *Singapore* weakened further in Q1 2019, weighed down by a contraction in exports and fixed investment, although private and government spending stayed robust. Real retail sales index growth continued a downward trend, but the take up of new homes has strengthened. With vacancy rates in office, residential and factory spaces gradually decreasing, fixed investment in construction has exited the 10-quarter contraction cycle. Singapore's GDP growth is forecast to slow in 2019 before stabilising in 2020. The signing of a free-trade agreement with the European Union in October 2018 improved trade prospects amid heightened uncertainty. Private spending is unlikely to expand much with real wage increases levelling off. Nonetheless, the 2019 fiscal year budget details broader support for low-income households, seniors and non-large enterprises (e.g. Merdeka generation package, bicentennial bonus and SME coinvestment fund III). Infrastructure spending is also likely to pick up in 2020 when construction commences on airport and rail projects. Moving forward, strengthening the safety nets for firms and workers that could be affected by trade frictions has merit even if recent stress tests (MAS, 2018) suggest that corporate risk management has remained solid and that a high proportion of firms are likely to withstand interest rate and income shocks of a certain degree. Notably, as of Q3 2018, the non-performing loan (NPL) ratios of the manufacturing sector, at 4.6%, and the transport, communication and storage sector, at 9.7%, are still far from comfortable, and trade tensions are still evolving.

Cambodia, Lao PDR and Myanmar

Cambodia's 2018 GDP growth strengthened from 2017, based on preliminary estimates. Export growth picked up pace, propelling manufacturing output, particularly garments. Private consumption appears to have remained solid, based on the trend of durable goods imports like motor bikes and vehicles. Private spending was supported by steady double-digit growth in tourist arrivals, robust growth in bank lending and moderate inflation. Increased business activity, including the opening of new malls, buoyed demand for office and retail spaces (CBRE 2019); this was matched by an uptrend in supply that is partially financed by FDI, particularly from China. Growth prospects are more uncertain in 2019 and 2020 than in 2018. The base case scenario points to a steady

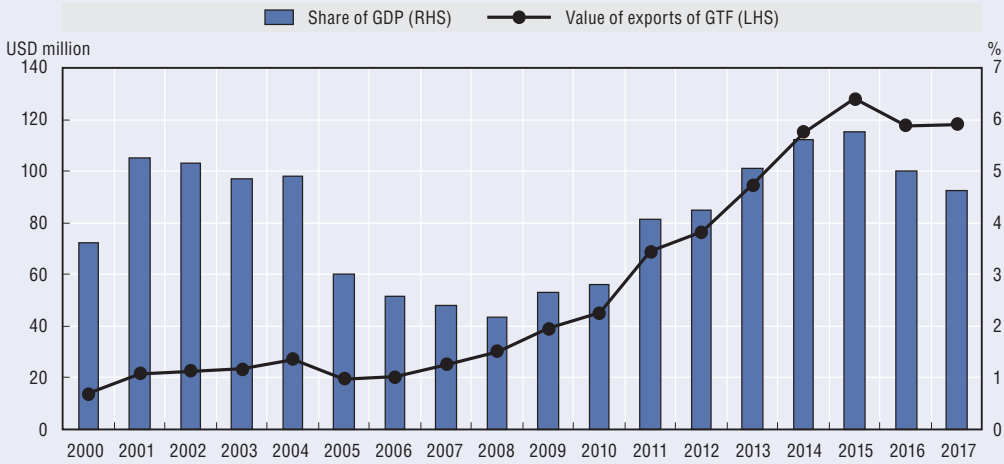
rate of expansion, but potential changes in access to key export markets carry substantial downside growth risks. These can mute aggregate demand, especially considering the economy's reliance on convertible currencies for domestic transactions. Brexit could also negatively impact the country's textile industry (Box 1.3). Deepening the use of the local currency remains a key challenge. The very first corporate bond issuance, which was denominated in Cambodian riel, and the opening of riel-yuan trade settlement are promising developments in this respect. The riel is also being promoted via bank loan holding requirements, taxes and wages. Diversification of exports (mainly garments and footwear) is another challenge long recognised by the government. However, fostering other industries calls for a coordinated and targeted inter-agency effort. Progress in diversification has been fairly limited thus far despite the adoption of an Industrial Development Policy in 2015. Labour issues also necessitate a credible platform for constructive dialogue among employees, firms and relevant government agencies to minimise the disruptive strike-retrenchment cycle.

Box 1.3. **The potential impact of Brexit on Cambodia's textile industry**

The garment, textile and footwear (GTF) industry is a key driver of Cambodia's economy, representing 17.8% of GDP in 2017. It is important in supporting people's livelihoods, as the sector employs 7% of the population and provides 20% of Cambodian households with at least one income (ILO, 2018a). Furthermore, the incomes of GTF workers are rapidly expanding, with the minimum monthly wage in the sector rising from USD 80 (US dollars) in 2013 to USD 170 in 2018. Given that a large part of a GTF worker's pay is non-wage, the median take-home revenue totalled USD 225 in 2017, well above the national average (ILO, 2018b).

The European Union is the main buyer of Cambodian GTF exports and represented 46% of its sales abroad in 2017. The United Kingdom is the main contributor, with 37% of the EU's share. These UK imports of GTF goods represented 4.6% of Cambodia's GDP in 2017 (Figure 1.7). This suggests a high level of exposure to the UK business cycle. Reliance has been decreasing since reaching a high of 5.8% in 2015, but a negative shock to the UK economy could be damaging to Cambodian trade.

Figure 1.7. **Cambodia's exports of textile and clothing to the United Kingdom**



Note: RHS means right hand scale. LHS means left hand scale.

Source: OECD Development Centre calculations based on UN Statistics Division (2019).

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Box 1.3. **The potential impact of Brexit on Cambodia's textile industry** *(cont.)*

The United Kingdom's forthcoming departure from the European Union, known as Brexit, poses exactly such a risk to Cambodia's trade. If the United Kingdom crashes out of the EU single market without a deal on its subsequent relations, its EU trade treaties would become invalid. Unless the UK government reacted immediately by removing most external tariffs, as it has suggested in the past, it would presumably return to World Trade Organisation rules, with Most Favoured Nation (MFN) tariffs applied on goods coming in and out the country. Cambodia currently enjoys access to the EU single market that is virtually duty and quota free (under a branch of the EU's Generalized Scheme of Preferences called the "Everything But Arms" scheme). In the case of a no-deal Brexit, Cambodia would face a tariff rate of 11.3% on GTF goods entering the United Kingdom, based on a simple average of the EU's current MFN rates.

Such a scenario could have an adverse impact on the Cambodian economy, recent research suggests. A first estimate, obtained using a general equilibrium model encompassing multiple regions, multiple sectors and heterogeneous firms, indicates that Cambodian exports overall would shrink by 1.7% (Olekseyuk and Osorio Rodarte, 2019). Another study, employing a more basic method based on trade data, projected duties and estimated elasticities of UK imports, finds a similar result. It approximates a 1.7% shrinkage of Cambodian exports under a no-deal Brexit (Timmis, 2019). The chances of such a scenario are low, and were it to happen the United Kingdom would most likely take contingent measures, including prolonging access to the UK market. Nevertheless, the Brexit situation is a reminder of the risks associated with large trade exposure to a single country. In future, it might be beneficial for Cambodia to diversify its export destinations.

Lao PDR posted marginally slower GDP growth in 2018 from 2017. Merchandise exports expanded at a more modest rate than the previous year, muting production in the agriculture and industry sectors. Growth in electricity production in particular has slowed markedly, while construction has gained traction. Healthy growth in services related to real estate and to wholesale, retail and trade also indicates buoyant private consumption. In 2019 and 2020, GDP growth is forecast to recover. Export prospects are held back by growth uncertainties in China and some ASEAN countries. However, the government's new electricity trade deals and an infrastructure spending push in many countries provide upsides. The doubling of capacity of Vientiane International Airport and an increase in international flight routes, according to CAPA Centre for Aviation (2018), are positive developments for tourism, although domestic connectivity can still be improved. Fiscal management requires judicious policy actions moving forward. The budget deficit has been persistently high the last few years, resulting in a marked rise in the government debt-to-GDP ratio. While the imposition of appropriate spending restrictions is helpful, the falling revenue-to-GDP ratio needs attention. Furthermore, sustaining growth requires the leveraging of economic gains from electricity and mining production and from infrastructure projects (e.g. the railway from Lao PDR to China) to develop other industries. For instance, agriculture could use additional investment to enhance its climate resilience, operational efficiency and productivity. Despite the movement of labour to other sectors over the years, agriculture still accounts for more than 60% of total employment.

Myanmar's GDP growth in the interim six-month period (April-September 2018) slowed from the previous fiscal year, based on initial data. Growth in commodity exports and FDI of *permitted enterprises* has tapered. In contrast, household consumption was supported by

brisk growth in bank lending to the private sector and a minimum-wage adjustment in April 2018 covering firms with ten or more workers. Government spending had also been sturdy, with a lower fiscal deficit-to-GDP ratio as tax collection improved (IMF, 2019a). GDP growth is forecast to rebound in fiscal year 2018-19 (ending September 2019) and hold steady in fiscal year 2019-20. Private spending will likely remain robust. Improving access to mortgages with longer maturities and a move to enhance the real estate transactions framework bode well for the real estate business. The visa-free policy rolled out in 2018 for some countries is another upside, supported by a continued expansion of accommodation capacity. Similarly, regulations allowing foreign banks to lend to local businesses and to hold up to 35% of the equity of local banks are encouraging for investment. However, while exports mainly go to other Asian countries, potential withdrawal of trade privileges could be a drag on growth. Public expenditure will likewise be relatively muted if the current budget holds. Expanding the tax base is one of key challenges, with tax intake hovering around 7% of GDP. A gradual approach to liberalisation of interest rates may also be needed to avert a build-up of credit risk, considering the volatility in inflation.

China and India

China's GDP growth in Q1 2019 kept pace with the previous quarter. The trade surplus recovered during the quarter, but balance-of-payments data indicate that export growth deteriorated, albeit less sharply than the slippage in import growth. Private consumption held up, as suggested by solid though slightly slower growth in retail consumer goods sales and residential building spaces. Government spending also grew healthily based on budget data. Public investment in fixed assets moderated slightly, as did private fixed-asset investment. The central bank has notably lowered the cash reserve ratio for banks by about 3.5 percentage points since March 2018 to support domestic demand. GDP is projected to moderate further in 2019 and 2020. Adjustments to trade and debt related risks will continue to underpin the growth trend. On the upside, the robustness of FDI inflow even in the last two quarters bodes well for capital formation in the coming months. Monetary accommodation and fiscal expansion, though measured, are likewise keeping consumption prospects upbeat. Apart from reserve requirement ratio cuts, the national government penned a larger increase in spending in 2019 while broadening subsidies and tax reductions (e.g. a tax cut for small enterprises announced in January 2019). Consumer confidence has inflected upwards in 2019 following a slight dip at the end of 2018. Managing the fiscal risks as government implements stimulus measures is a near-term challenge, taking outstanding contingent liabilities into account (e.g. debt of local governments and state-owned enterprises). A calibrated approach is also needed towards curbing private-sector debt amid expectations of lower corporate earnings due to external frictions.

India's GDP growth remained strong in fiscal year 2018-19 (ending March 2019), although it was slower than a year ago. Exports grew markedly, propelled by shipments of petroleum and manufactures. Private consumption growth was also solid, anchored by election spending, stable bank credit flows and an easing of inflation. Capital formation was supported by a decline in secondary-market interest rates and a steady inflow of FDI during the year. Government spending likewise expanded strongly, though less so than the previous year. Growth is expected to improve in fiscal years 2019-20 and 2020-21. A pickup in consumer optimism bodes well for private consumption. Monetary accommodation (e.g. policy rate cuts in February and April 2019) and a reduction in some taxes (e.g. on new home purchases) could provide additional boosts. Exports have been resurgent of late, but prospects are hampered by uncertainties given the situation in global trade negotiations. Industrial production index growth had been softening since October 2018, and delays and cost overruns affect some infrastructure projects. The gross non-performing assets ratio of banks fell by about 70 basis points between March 2018

and September 2018 (RBI, 2018). However, the absolute rate of close to 11% (and close to 15% among public banks) calls for continued vigilance as stresses on earnings build up. The government already recapitalised some public banks pursuant to a plan announced in October 2017. The downward revision of the tax-to-GDP ratio is another key issue at a time when greater space is needed for fiscal intervention.

Inflationary pressures are easing across most of Emerging Asia

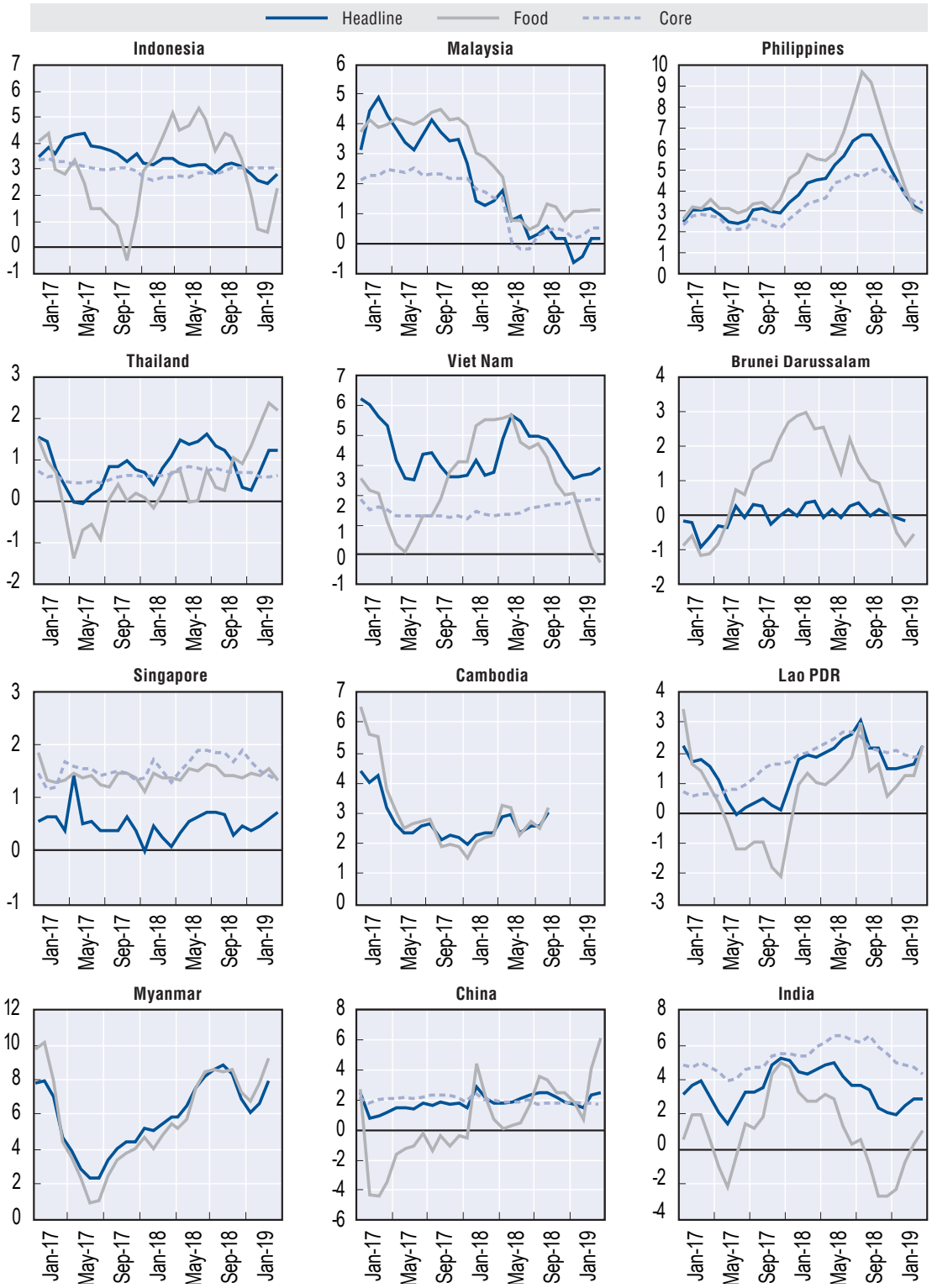
Inflationary pressures have generally eased in Emerging Asia since the latter part of 2018 (Figure 1.8). Exchange rate stabilisation, owing to a combination of monetary actions and capital controls, helped to reduce inflationary pressures, particularly in India, Indonesia and the Philippines. Singapore similarly steepened the slope of its nominal effective exchange rate guidance in 2018 to put a lid on core inflation. In Viet Nam, a credit growth ceiling imposed by the central bank and a rise in interbank rates helped ease consumer price momentum. Subsidies, tax forbearance and the easing of global energy prices have also been used to moderate inflation in some Emerging Asian countries. In Myanmar, in contrast, weakness in the kyat has fed into domestic inflation, while in China, food inflation gained pace, partly owing to the supply-side pressures.

Recent weeks have seen an easing of the initial upward pressure on global oil prices spurred by production cuts in compliance with the Vienna Agreement and geopolitical issues among the major oil producers. Production is expected to pick up in 2020 (IEA, 2019). The generally ample supply of key staples like rice, coupled by a continuation of support measures in many countries, should help to keep food prices stable for the rest of the year. While El Niño poses risks to agricultural production this year, the impact has been generally mild thus far. The continuation of price support and similar measures should also limit a base effect induced inflation push.

With the inflation picture improving, some central banks are moving to nip financial risks while keeping an eye on the economic growth. Thailand announced a precautionary policy rate hike in December 2018 against risk taking in the property market. Two months earlier, the loan-to-value limit on mortgages for properties exceeding THB 10 million (Thai baht) and for acquisition of second homes was also set at 80% (i.e. 20% required upfront payment), effective January 2019. Malaysia mentioned a similar reason when it raised the policy rate in January 2018 before reducing it again in May 2019. By comparison, China has kept reverse repurchase rates unchanged since March 2018 and is maintaining the policy rate that has prevailed since October 2015 owing to growth concerns. Instead, the reserve requirement ratio for big banks was reduced by 1 percentage point in January 2019, following a 2.5 percentage point cut in 2018. The Philippines, which trimmed its policy rate in May 2019 on growth concerns, signalled its intention to follow up with bank reserve requirement cuts. For the same reason, India reversed its tightening course in February 2019 before lowering the policy rate again in April 2019.

Figure 1.8. **Inflation in ASEAN, China and India, 2017-19**

Percentage



Note: Data are up to April 2019 if available.

Source: OECD Development Centre based on CEIC and national sources.

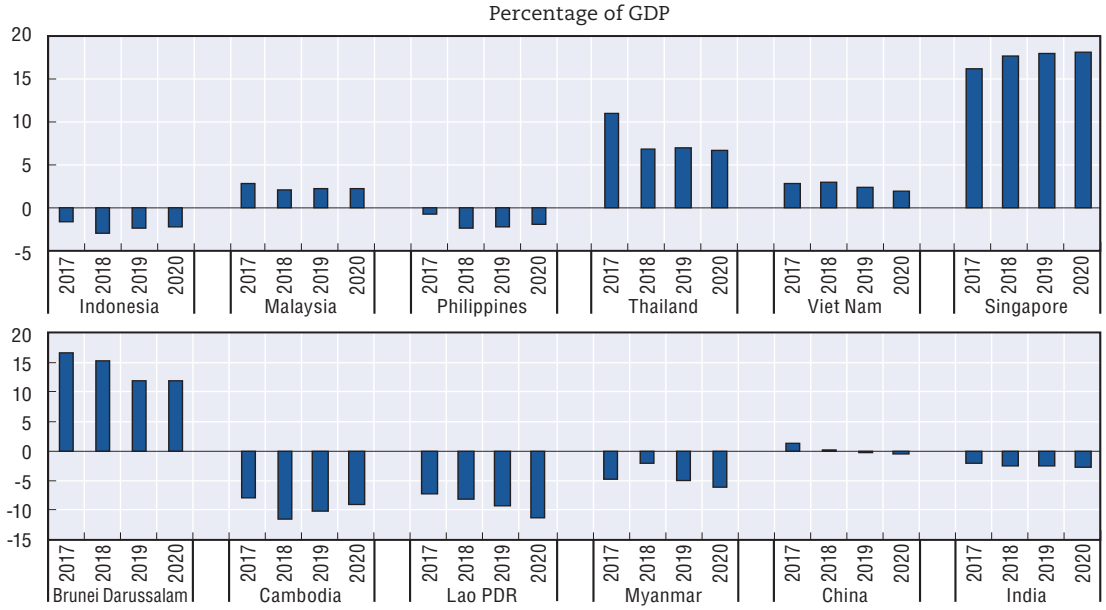
StatLink https://doi.org/10.1787/888933966295

Current account balances are under pressure

The current account balances (CABs) of Emerging Asian economies as a proportion of GDP have mostly deteriorated (Figure 1.9). With the exception of Viet Nam, the ASEAN-5 economies saw their CABs weaken in 2018. A sharp rise in merchandise imports reversed Indonesia's trade position in 2018 from the previous year, while export growth receded and the deficit in primary income transfers remained large. Malaysia's trade position improved, but it was outdone by a net outflow in gross transfers. In the Philippines, payments for capital and intermediate goods imports continued to drive the widening of trade and current account deficits, although this was partially offset by robust remittance inflows from overseas workers. Thailand's large trade surplus shrank, while a deficit in primary income transfers increased. Viet Nam saw its net trade earnings rise substantially in the first half of 2018 from the previous year, and this more than matched an increase in net transfer outflows. Elsewhere in the region, Singapore's CAB stayed healthy in 2018 on the strength of its net goods trade position, while Brunei Darussalam's surplus decreased. The CABs of the CLM economies (Cambodia, Lao PDR and Myanmar) remained in the red, weighed down by imports of capital and durable consumer goods. The CABs of China and India are declining, although China's balance remains in surplus. In both countries, export growth pulled back relative to the rate in the previous year. An improvement in trade relations between China and the United States could spur a recovery in the exports of Emerging Asia, particularly among larger economies in the near term. However, an infrastructure drive and rising per capita incomes, especially in smaller countries, create sustained demand for imports of capital and consumer goods.

Despite the decline in CABs, the overall balance of payment positions of Emerging Asian countries remained in good stead (Figure 1.10). The direct investment balance largely counterweighed the current account shortfalls in many Emerging Asian countries in 2018. During the same period, portfolio and other investment balances also posted surpluses in a number of countries, especially India and Indonesia. Moving forward, the sizeable flows lumped under *net errors and omissions* in many countries in the region require a thorough assessment.

Figure 1.9. **Current account balances of ASEAN, China and India, 2016-20**



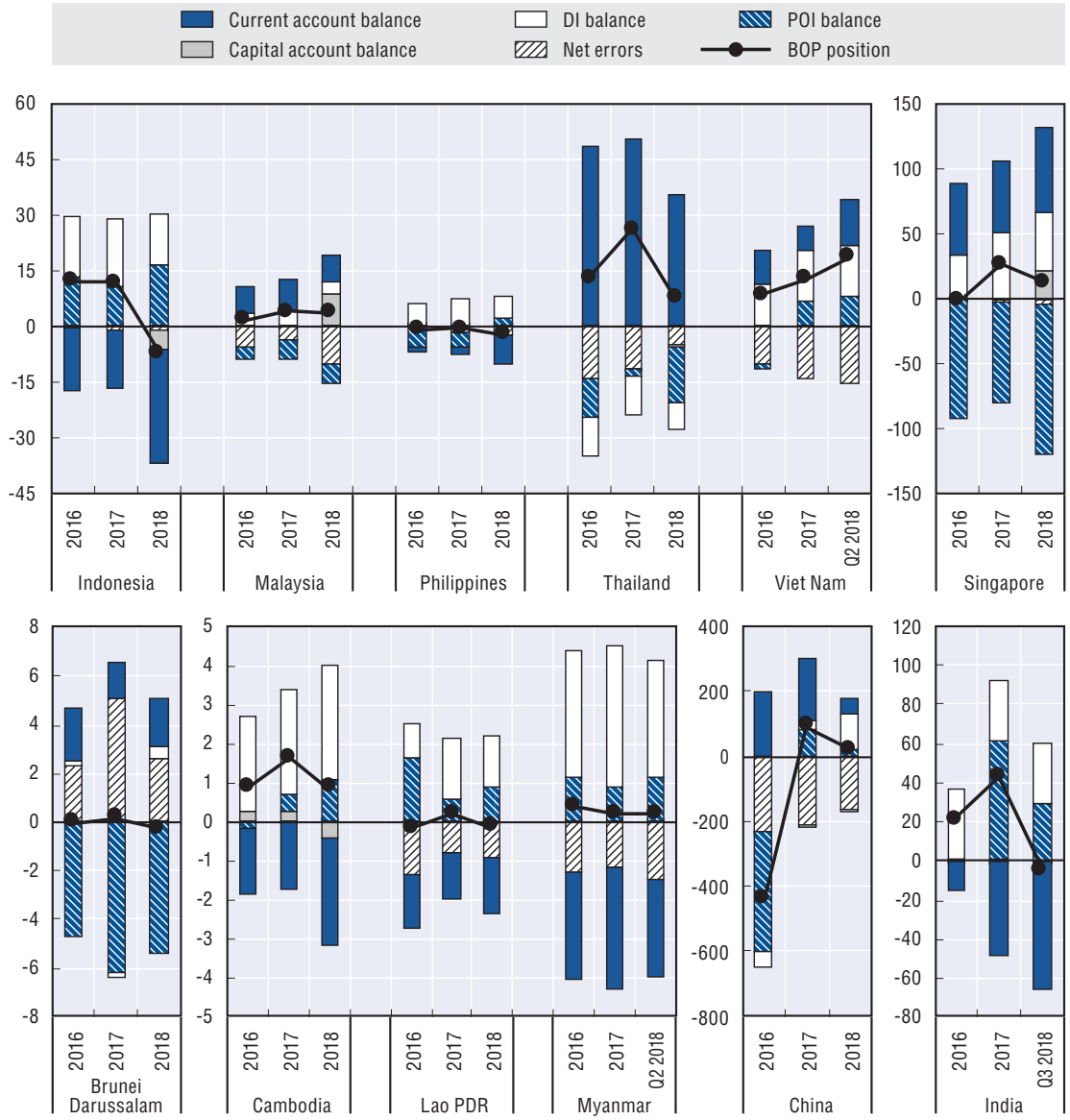
Note: Data are as of 31 May 2019. Data of Brunei Darussalam, Myanmar and Viet Nam in 2018 are estimates based on ADB (2019). Data of India and Myanmar relate to fiscal years. For Myanmar, the 2018 data refers to the interim period ending September 2018. The projections for China, India and Indonesia are based on the *OECD Economic Outlook* No. 105 database.

Source: OECD Development Centre.

StatLink https://doi.org/10.1787/888933966314

Figure 1.10. **Capital flows in ASEAN, China and India, 2016-18**

USD billion



Note: DI means direct investment. POI means portfolio, derivatives and other investment. BOP means balance of payment. DI and POI balances are computed as net liabilities (i.e. foreigners' placements domestically minus their withdrawals) minus net assets (locals' placements overseas minus their withdrawals). Quarterly data are annualised (i.e. 4-quarter sum ending on the period indicated). Data of India and Myanmar relate to fiscal years.

Source: OECD Development Centre based on CEIC and national sources.

StatLink https://doi.org/10.1787/888933966333

Fiscal policy direction will be mixed across Emerging Asia in the near term

The fiscal positions of Emerging Asian economies relative to GDP generally deviated mildly from a year ago, mostly favouring consolidation. However, outside of ASEAN-5, expansionary stances appear to be gaining traction in the near term.[3] Indonesia is expected keep its budget deficit ratio muted over the next two years. The budget plan includes a modest spending increase, and revenue growth should accelerate given

revenue measures (e.g. e-commerce and natural resource revenue tax), notwithstanding the expansion of tax holidays. Malaysia's budget deficit ratio is likely to hover closely around the 2018 ratio in the near term. Sizeable *Goods and Services Tax* refunds due in 2019 will be offset by revenue measures like an import service tax, a sugary beverage tax and higher duties on gaming firms. The Philippines will likely miss its spending target in 2019 owing to a delay in budget legislation. The deficit ratio could widen again in 2020 on expected faster project rollout before the end of the administration's term in 2022. Thailand's budget deficit ratio is also projected to pull back in the near term as the government looks to raise tax intake and limit public outlays on infrastructure in favour of public-private partnerships. Viet Nam's relatively large budget gap ratio is anticipated to decrease marginally in the near term due to a reduction in recurrent spending items, yet revenues can be weighed down by lower trade tariff income.

Brunei Darussalam's budget deficit ratio continued to improve on controlled spending and stronger revenue intake, driven by higher energy prices. It is expected to decrease further if the stability in energy prices holds. Although Singapore's budget stayed in surplus for the third year running in 2018, it appears likely to reverse in the next two years as the government seeks to broaden social spending. Among the CLM economies, Cambodia's budget balance stayed solid in 2018. Mild deficits are expected in the next two years, with the government aiming to maintain the growth rate, although the potential removal of its trade privileges could lower revenue realisation. With Lao PDR's deficit ratio remaining at around 5% in 2018 (World Bank, 2019) and its debt ratio becoming a concern, the country imposed spending restrictions (e.g. limits to the allowances of government officials and vehicle purchases) to narrow the gap in 2019 and 2020. Similarly, Myanmar moved to raise tax collection and rein in spending in the near term to deal with persistently wide budget shortfalls. Even when supplementary budget approvals were curtailed, the deficit ratio is estimated to have remained elevated during the interim 6-month period ending September 2018.

Emerging Asia's two biggest economies are expected to take somewhat similar fiscal paths in the near term. China's deficit ratio target was raised in 2019 from 2018 and is expected to remain expansionary in 2020 to provide growth support. Lower value-added and personal tax rates, as well as tax incentives for certain firms, were rolled out by the government to buoy domestic private demand. India aims to steady its deficit ratio in the coming fiscal years. The shortfall in fiscal year 2018 (ending March 2019) will likely exceed the initial target and deficit ratio set in the previous year.

Challenges to robust growth

Trade tensions between the United States and China have deepened since the first tariff changes in early 2018.[4] Against this backdrop, Emerging Asian economies need to pay attention to different spillover channels. The trade tensions could affect economies in the region via global value chains, foreign investment, trade diversion and exchange-rate reaction, among other channels. The ability of countries to reallocate their exports will be a factor in the depth of the impact. On the upside, the ongoing shifts in import sourcing present an opportunity for Emerging Asian countries to change their trading patterns.

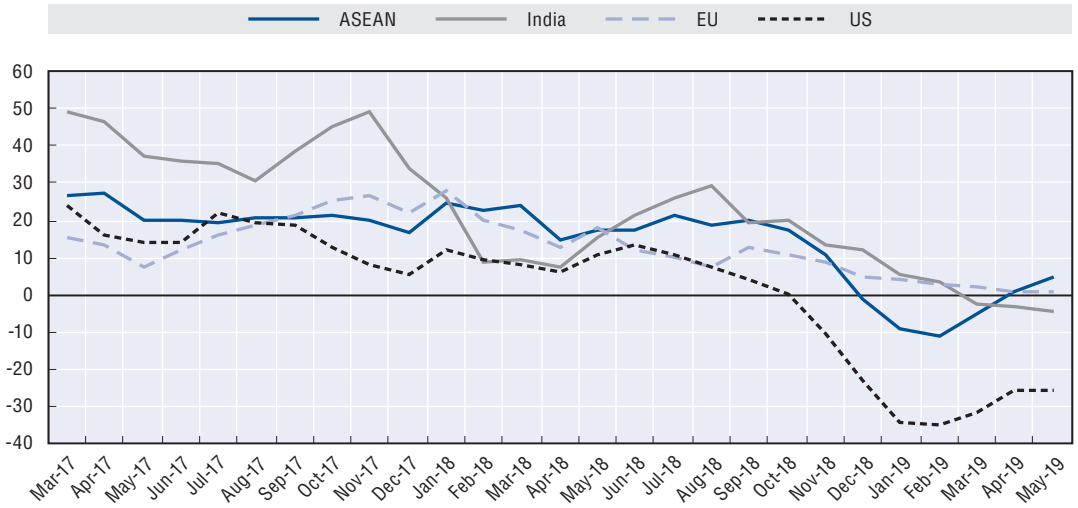
Emerging Asian economies are susceptible to direct and value chain spillover effects

Rising trade tensions make Emerging Asian economies susceptible to a slowdown in consumer spending in their key export markets, particularly China, and to spillovers through the global production chain. In 2018, the share of China in the goods exports value of ASEAN and India ranged from 1.5% to about 35%.[5] Intermediate goods account for a sizeable portion of these exports.[6] As a proportion of GDP, it is highest in Malaysia and Viet Nam, while it is lowest in Cambodia and India (OECD, 2018b).

With trade flows between the United States and China weakening, China's goods imports from ASEAN and India have slowed or contracted since September-November 2018 (Figure 1.11). Import growth from ASEAN showed signs of improving in March 2019, but the announcement of new tariff measures in May 2019 does not augur well for the momentum. The downturn in China's imports since late 2018 has affected ASEAN to varying degrees. For instance, the year-on-year decline in monthly imports from Indonesia is more persistent than in other countries in the region. The decline in imports from Viet Nam may have been shorter in duration, but the rates of contraction were substantially steeper relative to Indonesia. Meanwhile, the growth in imports from Cambodia has stayed quite brisk.

Figure 1.11. **Goods imports of China by partner economy, 2017-19**

YOY growth in value based on 3-month moving average, %



Source: OECD Development Centre based on CEIC and national sources.

StatLink https://doi.org/10.1787/888933966352

Trade diversion will impact countries differently

The effects of trade tensions between the United States and China will likely be uneven across Emerging Asia (Abiad et al., 2018; UNCTAD, 2019; IMF, 2018). Beyond the upfront trade gains or losses, the shifting trade patterns can result in difficulty in inventory disposal in countries that lost a portion of their offshore market. It can also lead to domestic price pressures, which can materialise both in countries where import costs have risen and in countries that experience a sudden surge in external demand for products.

As it is, the growth in goods imports of China from the US and that of the US from China have been declining since mid-2018. However, while manifestations of import diversion involving other Emerging Asian economies is not that clear at the aggregate level in China based on available data, there appears some indications of shift in import sourcing in the US.

Tracking the goods that have been subjected to higher tariffs by the United States provides some information on the drivers of the shift (although this is inconclusive in the absence of additional micro-level analysis). For instance, US imports from India of goods under the first and third lists of new US tariffs (based on Trade Act Section 301) have risen substantially at a time when growth in imports of the same goods from China and other economies has declined markedly.[7] US imports from ASEAN countries of certain commodities under the second list also grew notably as growth in imports of the same goods from China fell (e.g. plastic and rubber articles from Cambodia, Myanmar and Viet Nam, machinery and electrical equipment from Cambodia and Lao PDR, and base

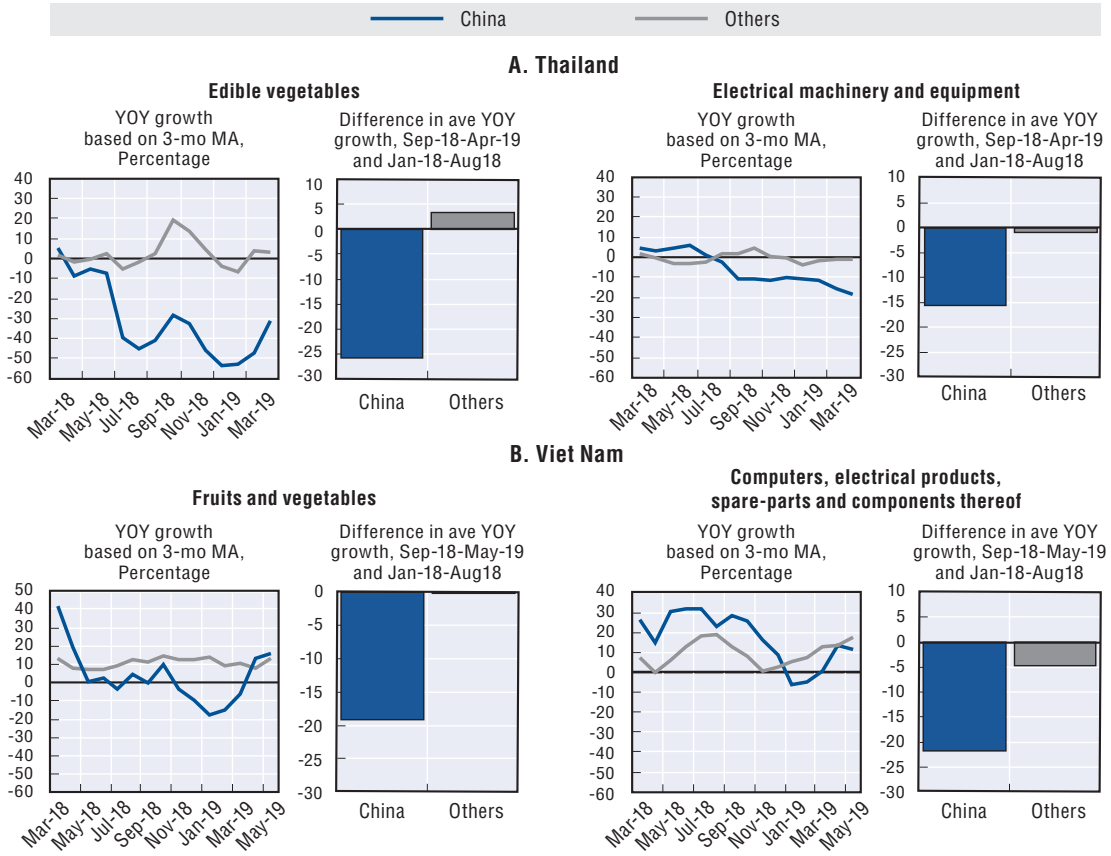
metals from Indonesia, Malaysia, Thailand and Viet Nam). It is difficult at the moment to see either the extent of the shift in import sourcing from China to other countries or the extent of import substitution in the United States. Moreover, it is uncertain whether there will be a buildup in the supply of certain commodities in Emerging Asian economies due to drags on trade, akin to the scenario in early 2018 when tariffs on steel were raised.

The speed of export adjustment matters in containing spillover effects

In the near term, the speed at which exports adjust to the price shock caused by new tariffs will partly determine the impact of trade tensions on sectors and the economy as a whole. The ability of the countries to maintain growth in export sales of the affected goods as they are re-allocated to other markets will likewise matter in this respect.[8] In the absence of thorough micro data analysis, it is challenging to pin down the speed of adjustments and the patterns of re-allocation caused by the trade tensions. Nonetheless, export data by commodity and partner country yield some notable findings.

Thailand and Viet Nam were selected as case studies on the bases of their higher share in China's goods imports value relative to other Emerging Asian economies; and the availability of detailed and updated export dataset with disaggregation by commodity and partner country. As can be gleaned from Figure 1.12, exports of certain goods to China from Thailand and Viet Nam exhibit somewhat comparable trends over the year through April-May 2019.

Figure 1.12. **Selected goods exports of Thailand and Viet Nam by partner economy, 2018-19**



Note: "Others" refers to the aggregate of other countries included in the data release excluding China; Hong Kong, China and Chinese Taipei. Commodity nomenclatures are not necessarily the same across countries. 3-mo MA means three-month moving average.

Source: OECD Development Centre based on CEIC and national sources.

StatLink https://doi.org/10.1787/888933966371

However, it can be observed that the speed of adjustment (i.e. growth in exports to other partners outside of China) is slower for electrical machineries than vegetables in the case of Thailand. Meanwhile, in Viet Nam, fruits and vegetables seem to adjust less quickly than computers and electrical products. This indicates that the speed of adjustment tends to vary by commodity and by country, which is presumably determined by the macroeconomic structure, extent of global value chain involvement of each sector in the economy, free trade agreements and investment linkages, among other factors.

In Thailand, the value of edible vegetable exports to China has pulled back relatively more steeply in the last few months than the exports of electrical machinery. The dip in exports of electrical machinery began more recently and less pronouncedly than that of edible vegetables, though in both cases the weakness appears to be persistent. In the case of Viet Nam, the trend of declining growth in fruit and vegetable exports to China also began earlier than that of computers and electronics, which started to edge lower late in 2018, although both categories appear to be recovering in 2019.

In terms of export performance in markets outside China, growth in Thailand's exports of edible vegetables picked up briefly before gradually slowing. The speed of upward adjustment of exports this good to other markets is substantially slower than the downward adjustment of exports to China. However, within this group of other countries, the growth in Thailand's exports to the European Union, India and the United States has been robust. Exports of Thai electrical machinery to other countries as a collective has been fairly subdued at a time when exports to China are contracting, yet there appears to be budding momentum in export growth of these goods to Japan and the Philippines.

The growth in Viet Nam's exports of fruits and vegetables to countries other than China has been stable on the whole. Similar to Thailand's exports of vegetables, the adjustment speed of exports to other countries is slower than the adjustment of exports to China. Nonetheless, at the country-level, data show a marked uptick in exports to Italy and Lao PDR, and to a certain extent, to Australia and the United States. Growth in Viet Nam's exports of computers and electronics to other partners as a group has gained momentum since late 2018, helping to offset the weakness in exports to China albeit the average growth from September 2018 to May 2019 is still weaker than the average growth in the prior eight months. Key markets providing the boost include Italy, Russia and Panama.

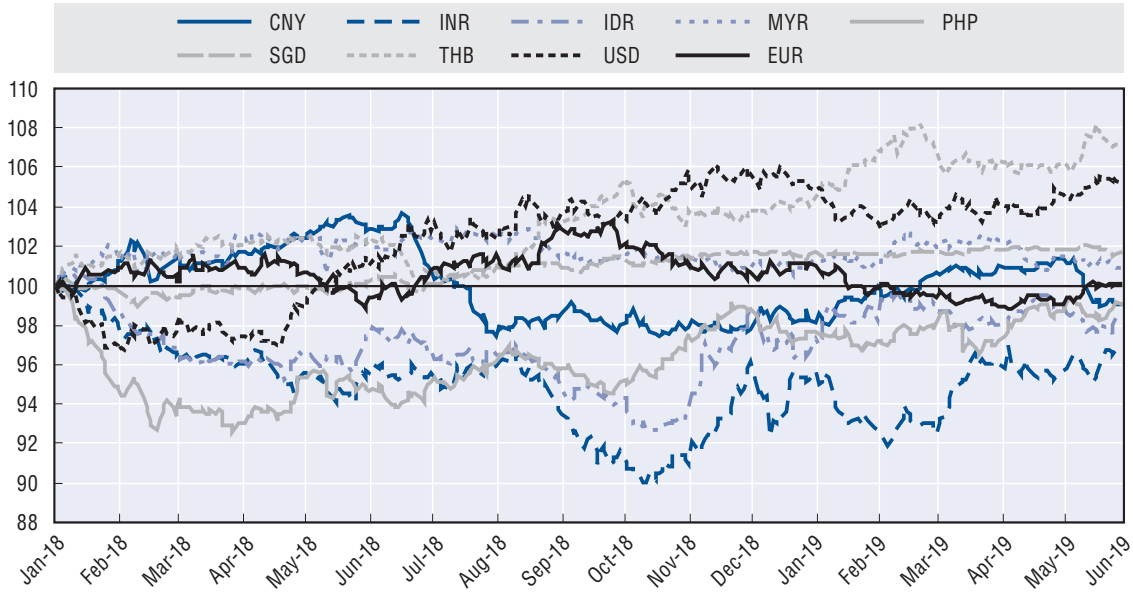
Adjustments in China's currency have been mild as the US dollar strengthens

Currency-related policies can similarly influence how tariffs will affect trade flows. In this regard, concerns mainly revolve around the possibility of a sharp depreciation in Chinese yuan. However, while it could soften the effects of tariffs on China's exports, it could make China's imports more expensive as well. Against this backdrop, although the currencies will continue to be sensitive to trade developments, it is unlikely that the volatility will be disruptive.

Data of the Bank for International Settlements show that the nominal effective exchange rate (NEER) of the Chinese yuan has weakened starting around May-June 2018, recovered marginally by end-2018 before weakening anew after the announcement of new tariff hikes in early May 2019 (BIS, 2019) (Figure 1.13). By comparison, the US dollar has generally strengthened against the currencies of its trading partners since April-May 2018, and this is mirrored by the trend of the DXY index in a tight-knit fashion.[9] Notably, the Chinese currency's NEER depreciation is shallower than its depreciation against the US dollar on a bilateral basis. These trends suggest that the exchange rate dynamics involving this currency pair are more about the strength of the US dollar than the weakness of the Chinese yuan thus far.

Figure 1.13. **Nominal effective exchange rates of selected currencies, 2018-19**

Index, 1 January 2018=100



Note: CNY=Chinese yuan; INR=Indian rupee; IDR=Indonesian rupiah; MYR=Malaysian ringgit; PHP=Philippine peso; SGD=Singaporean dollar; THB=Thai baht; VND=Vietnamese dong; USD=US dollar; EUR=euro.

Source: OECD Development Centre based on BIS (2019).

StatLink https://doi.org/10.1787/888933966390

Furthermore, both metrics – the bilateral exchange rate against the US dollar and the nominal effective exchange rate – show that the dip of the Chinese yuan from mid-2018 to end-2018 was milder than that of other Emerging Asian currencies, such as the Indian rupee or the Indonesian rupiah. Among the region's currencies, the rupee, the rupiah and the Myanmar kyat weakened most against the US dollar last year, although they have been on an uptrend since November-December 2018.

Putting the prevailing trends aside, maintaining or strengthening the mechanisms for policy coordination among Emerging Asian economies may be needed given the increasing policy uncertainty.

Additionally, while it is encouraging that FDI, foreign portfolio and other investments into Emerging Asian economies have been fairly stable through December 2018/March 2019 (for those with available data), vigilance on capital outflow pressures also needs to remain high. These pressures could disrupt the credit market, i.e. push interest rates sharply upwards and feed the accumulation of stale credit as revenue intake of exporting firms gets strained. As it is, the risks remain manageable and the capital market volatility has been well-anchored (Box 1.4), but a cautious stance on credit provision may be needed .

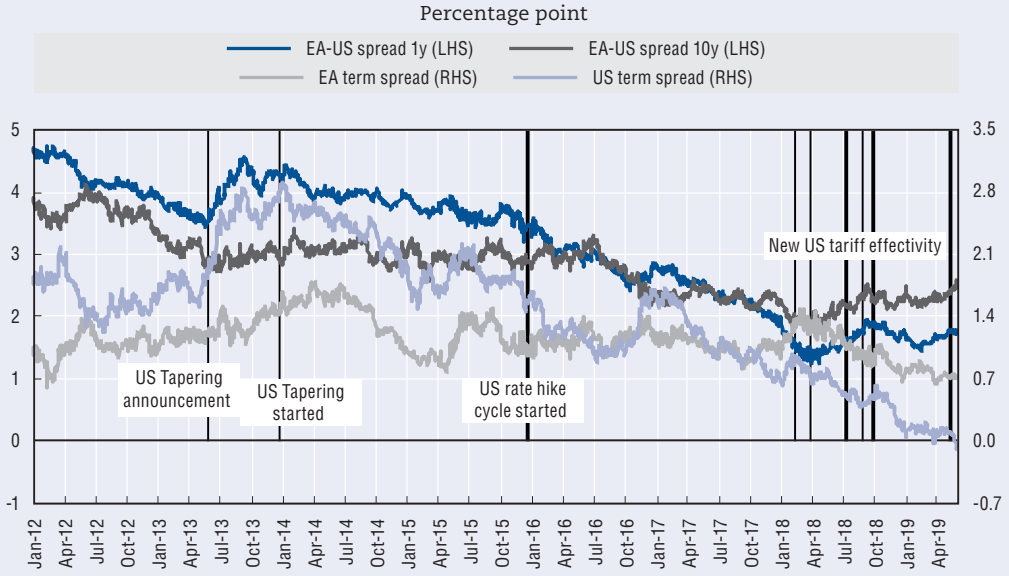
Box 1.4. **Capital markets in Emerging Asia – Stable but headwinds persist**[10]

Global economic policy uncertainty appears to be broadening. This is reflected in the flattening of the US yield curve, although the short-term end has tapered of late. Falling yields (except at the very short end) and a flattening yield curve can be observed in the euro area as well. However, while the euro has been generally stable against the currencies of major trading partners, the US dollar has strengthened. Meanwhile, the equity market volatility index, which has ebbed since the start of 2019, is picking up again somewhat following the new tariff measures introduced by the United States and China in May 2019.

Box 1.4. **Capital markets in Emerging Asia – Stable but headwinds persist**[10] *(cont.)*

With bond yields in Emerging Asia moving sideways, if not gradually inching upwards, the 1-year and 10-year yield spreads against US dollar bonds reverted upwards with the establishment of the new US import tariff schedules (Figure 1.14). Short-term bond yields have risen relatively more steeply in the Philippines than in other Emerging Asian economies, according to available data, though they have eased since mid-January 2019. Long-term yields in the region have been stable by and large.

Figure 1.14. **Yield and terms spreads, US and Emerging Asia, 2012-19**



Note: Emerging Asia refers to the simple average of government bond yields of China, India, Indonesia, Philippines, Singapore, Thailand and Viet Nam. Term spread refers to the difference between 10-year yield and 1-year yield. RHS means right hand scale. LHS means left hand scale. Data are as of 31 May 2019.

Source: OECD Development Centre using data from Fusion Media Ltd., www.investing.com.

StatLink https://doi.org/10.1787/888933966409

The currencies of Emerging Asian economies have weakened against the US dollar since March-April 2018, when trade uncertainties began gaining traction. They partly recovered towards the end of 2018, but the depreciation pressures appear to persist. The Thai baht has outperformed the region's other currencies during this period, while the Indian rupee and Myanmar kyat have weakened the most.

The year 2019 has been relatively better thus far for the region's large equity markets. China, the Philippines, Singapore, Thailand and Viet Nam have recouped part of their 2018 losses, with India looking to emulate the growth posted the year prior. Nonetheless, the trends since April-May 2019 suggest that the equity markets remain uneasy. Among the CLM economies, returns in the Cambodian stock exchange have stayed solid, driven by increasing foreign and domestic retail participation, even as the bellwether indices in Lao PDR and Myanmar have pulled back.

The global trade tensions present an opportunity to shift the region's investment and trade strategies

The ongoing global changes in import sourcing – away from the centre of the trade dispute to avoid higher levies – present an opportunity for Emerging Asian economies to

alter their trade patterns. With appropriate supporting policies, this could spur investment that could change the structural foundations of the exporting sectors.

At present, India and some ASEAN countries may have a degree of diversification comparable to many advanced economies, based on IMF data (IMF, 2017). In Thailand, for instance, the number of exported products has expanded over the years, while dependence on exports in the top decile has declined to below 60%.[11] Similarly, the number of products that Viet Nam exports has risen in the last two decades and the share of total exports in the top decile has edged downwards to just above 70%. In both these countries, the share of exported machinery and equipment has risen significantly while that of food and live animals declined. Yet there is a gap between these countries and the CLM economies. Cambodia, Lao PDR and Myanmar have managed to increase the number of products exported in recent years, but the concentration of export revenues in the top decile remains higher, at over 90% in Cambodia and over 85% in Lao PDR and Myanmar. Agriculture products, textiles and garments, mineral fuels and metals account for the largest portion of these economies' exports.

The degree to which foreign investment is used to move production of certain goods as a result of the trade war is hard to determine based on the information at hand. Nonetheless, it is crucial for Emerging Asian countries to persevere in efforts to improve the investment climate in order to make the most out of these changing patterns. On top of customary trade facilitation anchors such as openness, human capital, economic institutions, infrastructure and level of development, there is scope to improve targeting of foreign capital towards underdeveloped sectors and towards sectors where domestic firms can participate more extensively. Pursuing these objectives necessitates alignment of foreign investment policy with the local enterprise development framework.

Notes

1. The data used in the text are as of 31 May 2019 unless otherwise indicated.
2. These include the shift to zero-based budgeting; increase in real estate gains tax, stamp tax and casino license fees; introduction of air travel levy and floating fuel price mechanism; stricter monitoring of services imports; and deepening of anti-smuggling drive, among others.
3. Ratios in this subsection are relative to nominal GDP unless otherwise stated.
4. Williams et al. (2019) provide a detailed account of the tariff measures until February 2019.
5. The calculation is based on IMF (2019b).
6. Intermediate goods definition is based on the Broad Economic Categories classification, https://unstats.un.org/unsd/tradekb/Knowledgebase/50090/Intermediate-Goods-in-Trade-Statistics. Data from UN Comtrade (UN Statistics Division, 2019) were used in numerical validation.
7. The commodity grouping is based on the 8-digit US HTS nomenclature. The calculations used the data from USA Trade Online, US Census Bureau.
8. In principle, the ease of re-allocation can be influenced by the type of product and the existing market network of the product as well as by the changes in the value chain, i.e. to what extent trade diversion will be confined within the value chains in Asia or whether trade will be diverted to a country in a another regional value chain. It also necessitates navigating the rules on anti-dumping, countervailing and quotas, among others, in certain cases.
9. The DXY index shows the value of United States dollar relative to a basket of foreign currencies. It is maintained and published by the Intercontinental Exchange, Inc.
10. The trends in this box are as of May 2019 except for the global economic policy uncertainty index, which is as of April 2019. Data sources are the BIS (2019), Economic Policy Uncertainty (2019), ECB (2019), Thomson Reuters and US Department of Treasury (2019).
11. The calculations are based on UN Comtrade (UN Statistics Division, 2019), using SITC Revision 2, 3-digit commodity classification. The latest data are from 2016 in Cambodia and Lao PDR; 2017 in Viet Nam; and 2018 in Myanmar and Thailand.

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Chapter 2

Overview of trends for smart city strategies in Emerging Asia

Smart cities represent the future of urban development in Emerging Asia as more and more cities and countries resort to smart technologies to build more efficient and liveable urban environments, boost economic growth, foster well-being and facilitate citizen engagement. Policy makers in the region have adopted plans to develop and promote the use of technology to organise and run urban areas. Governments have also provided significant financial backing to smart city projects, acknowledging the importance of public support in this field. The development of smart cities offers significant prospects to tackle enduring issues faced by Emerging Asian cities in policy areas such as transport, the provision of public services, education, healthcare and utilities.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Introduction

This chapter discusses smart city strategies in Emerging Asia (Southeast Asia, China and India). Since the 2008 global financial crisis spurred the development of a generalised smart city concept (UNDP, 2017), a wealth of definitions of – and approaches to – smart cities has been developed and used. This chapter defines smart cities as "initiatives or approaches that effectively leverage digitalisation to boost citizen well-being and deliver more efficient, sustainable and inclusive urban services and environments as part of a collaborative, multi-stakeholder process" (OECD, 2019a).

Around the world, governments are making cities "smarter" by leveraging data and digital technology to build more efficient and liveable urban environments, boost economic growth, foster well-being and facilitate citizen engagement. Indeed, as digitalisation evolves, smart cities are increasingly viewed as unprecedented opportunities to drive economic growth and enhance citizen well-being in cities. Emerging digital technologies such as the Internet of Things (IoT), big data analytics, artificial intelligence, energy-storage technologies and blockchain technology are having a major impact on smart city strategies in urban hubs and regions. The opportunities created by digital innovation in urban areas are well-documented both in the literature and from concrete practices. Examples of innovation include: smart grids that improve the management of energy consumption; smart meters and pipes that help track water quality and detect leaks; smart sensors that improve traffic flow, transport efficiency and garbage truck routes; e-career platforms that provide broader access to job opportunities; telemedicine and video-consultations that improve health outcomes and lower healthcare costs; mobile applications that allow citizens to report problems in real-time and engage directly with city services.

However, digitally-driven innovations can also pose acute challenges to policy makers. Without a multi-sectoral perspective, these innovations can: deepen inequality among digitally marginalised groups; upend legal and regulatory frameworks safeguarding affordability objectives, consumer protection, taxation, labour contracts and fair competition; and pose risks for data security and privacy. With urban populations growing and infrastructure under strain, the smart city movement also influences how policy makers and other stakeholders address mega-trends such as globalisation, rapid urbanisation, ageing population, climate change and digitalisation. Therefore, to capitalise on the opportunities, governments will need to have a much deeper understanding of what smart cities can offer their constituents – as well as the potential benefits and risks – and to incorporate this understanding in their policies.

No single level of government can do this alone. From a public policy perspective, subnational governments are on the frontlines of advancing the smart city agenda. Indeed, they are responsible for most local public services that stand to gain from digitalisation. The national government can work closely with subnational governments to enable and support them. Moreover, being closer to citizens than national governments, subnational governments can make use of technological advancements to connect different stakeholders to citizens. As such, citizens can become involved in the development of their cities and regions, while public services can become more citizen-centric. This is key to ensure that digitalisation is pursued as a means for improving the lives of citizens rather than as an end in and of itself.

This chapter examines current policy trends at the national and subnational levels in the aim of offering key takeaways for policy makers and includes three parts. After the introduction, it presents the analytical framework needed to design and implement smart city strategies (promoting a territorial approach). Then, the chapter presents the results of the assessment, focusing on the six countries (China, India, Indonesia, Malaysia,

Singapore and Thailand) that have already developed dedicated smart city strategies at the national level. Where possible, the chapter also presents subnational smart city strategies and practices in Emerging Asia and from OECD countries. Given the complexity of smart cities and the current urban policy and governance contexts in Emerging Asia, sharing global best practices and learning from the experience of peers is undoubtedly useful to policy makers.

Promoting a "territorial" approach

This section aims to present the framework that was used for assessing national and subnational smart city strategies in Emerging Asia, based on promoting a "territorial approach". This approach is essential for national and subnational governments when designing and implementing their smart city strategies.

From literature review, some key features of a territorial approach can be summarised as follows:

Focusing on the needs for cities and regions. Cities and regions are primarily responsible for providing services (Figure 2.1) and there are certain policy areas (e.g. education, health) where cities and regions have a strong role to play in general (Figure 2.2).

Addressing diversity and disparity across – and within – all countries. Taking into account the diversity of contexts across all countries is key for inclusive digitalisation (OECD, 2018a). In Emerging Asia, the rates of internet use among the population varies and such gaps exist not only between countries but also across cities and regions within the same country. In Viet Nam in 2014, only 21% of households had access to the internet on a national level compared to 42% in urban areas (OECD, 2018b). Wages per capita in Ha Noi and Ho Chi Minh City were almost three times higher than Viet Nam's country average (OECD, 2018b). It is also important to note that subnational government structures in Emerging Asia vary tremendously from one country to the next. For example, there are more than 250 000 municipalities in India, while Malaysia only has 149 local authorities. The average population of a local level government varies from 2 359 people in Philippines to 500 894 in Indonesia (OECD/UCLG, 2016). Such diversity clearly underlines that the "one-size-fits-all" approach does not work.

Pursuing citizen engagement and collaborative partnerships. Smart city technologies can boost civic engagement through citizen participation and feedback, co-creation and co-production models, as well as citizen-centred services and engagement platforms. They can also experiment with public access to open data and other forms of collaboration among diverse actors. London is among the most active in the development of various services and infrastructures through private finance. Indeed, Londoners can participate as developers and as investors through the crowdfunding platform "Funding Options" (OECD, 2018c).

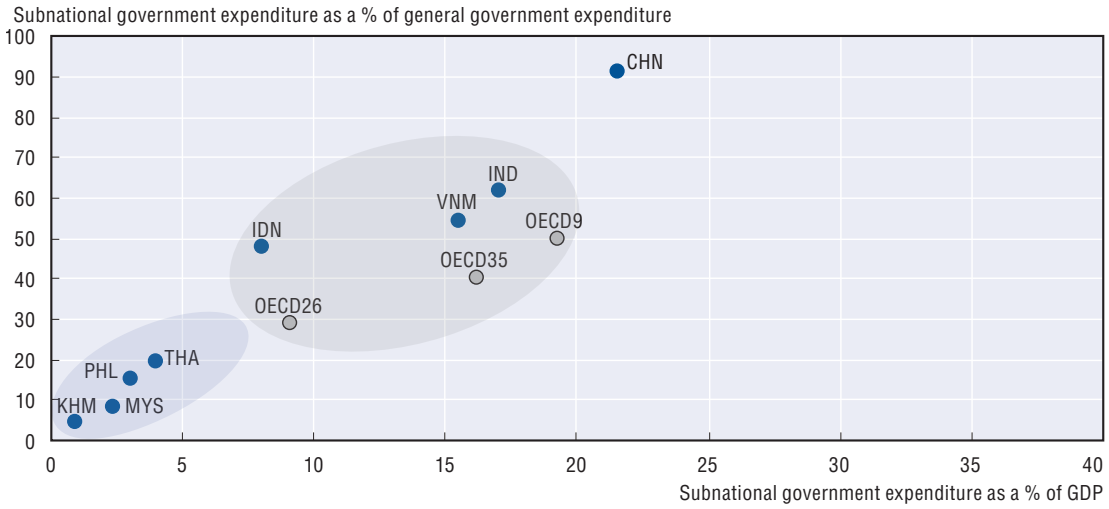
Establishing an integrated, holistic approach. The digital technologies underpinning smart cities are designed using a silo approach specific to individual sectors such as transport, education, healthcare, utilities and other public services, rather than considering the broader, cross-sectoral urban contexts. A territorial approach avoids the missteps of a sectoral approach by applying digital innovation to a city's governance, planning, and investment system as a whole in an integrated manner.

Developing a clear understanding, and allocating responsibilities across levels of government. Subnational governments often understand local specificities better than national governments. They can also better engage their constituents, which fosters inclusiveness. National governments play a significant role in developing a legal framework and

providing assistance to cities and regions. With a clear understanding of who should do what, different actors can work together and reduce inefficiencies and misaligned policies. Coherent national strategies that align regulation and investment and cut across relevant policy fields are known to yield positive results. Korea is a successful example of a national government pursuing a co-ordinated approach focused on developing smart cities, applying smart technologies to solve urban challenges and developing a global market for smart services and technologies. Similarly, cities such as Seoul and Busan are embracing smart city solutions and collaborating with the national government on a number of testbed initiatives with the aim of rolling out successful examples across the country. Similar approaches are being implemented in Japan, in Europe and in the United States (OECD, 2018c).

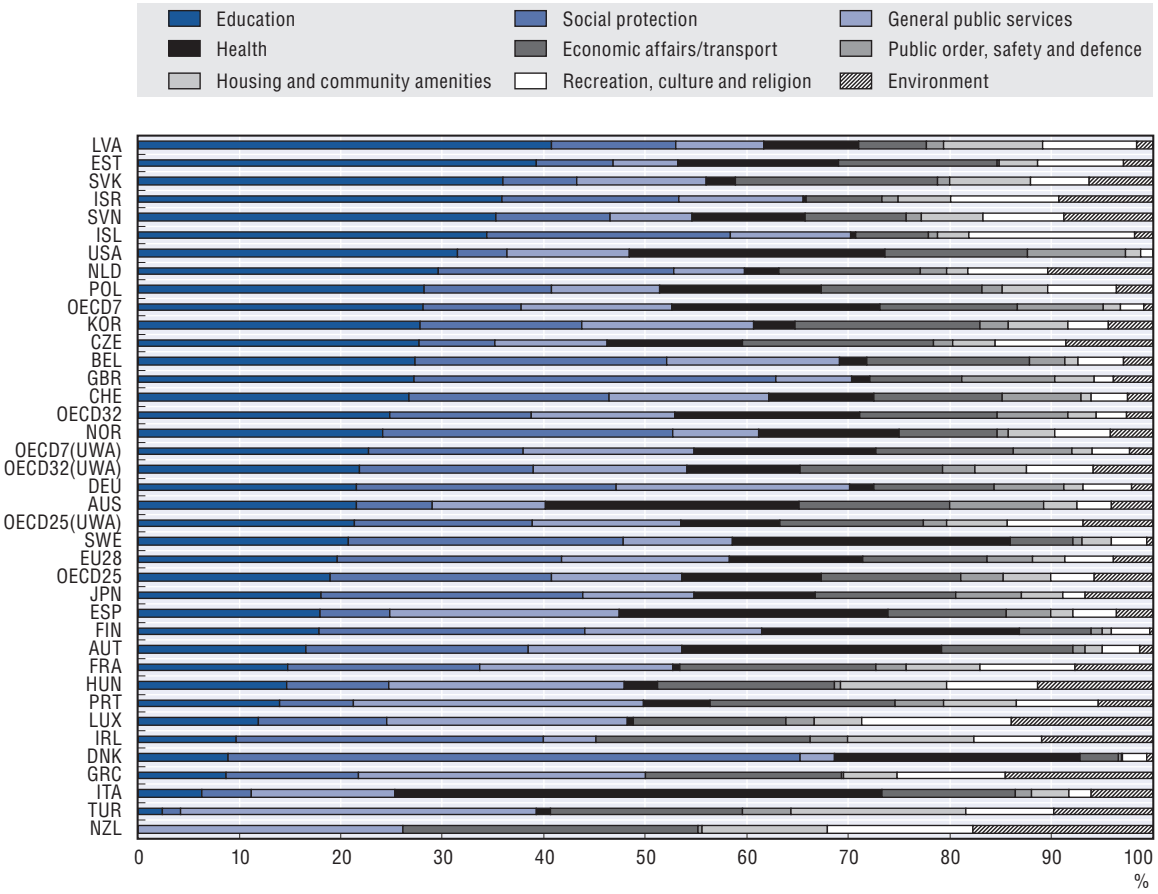
Tracking progress at the city and regional scales. An integrated and holistic approach will require increased capacity and skills for collecting, storing and analysing data. This adds to the associated digital infrastructure, computing power and data scientists that are also required, which may pose a challenge for cities with limited capacity (OECD, 2019b). Data and information at the city level can be compared to data and information from the regional level to see if there is a gap. Data can also be compared with other peer cities to ensure that smart city strategies do not widen the gap between cities. Commonly defined data can also facilitate international comparisons and benchmarking. However, the fact that there is no common definition of a smart city makes it difficult to develop a common methodology to measure smart city advancement.

Figure 2.1. **Breakdown of subnational expenditure as a share of total public expenditure, 2016**



Source: Authors' compilation.
StatLink https://doi.org/10.1787/888933966428

Figure 2.2. **Breakdown of subnational government expenditure by function (COFOG), OECD countries, 2015**



Source: OECD (2018d), *OECD Regions and Cities at a Glance 2018*.
StatLink https://doi.org/10.1787/888933966447

Smart city strategies in Emerging Asia

This section presents an assessment of national and local smart city strategies in Emerging Asia, based on the approaches described in the previous section. The methodology for the assessment relied on desk research reviewing OECD publications, research papers, and national and subnational smart city strategies obtained through government websites. At the national level, the assessment considered not only explicit or dedicated national smart city strategies but also national development plans and strategies, since in many countries elements of smart city strategies are incorporated into the broader framework of these plans and strategies.

The analysis found that smart city strategies tend to be developed at the national level in Emerging Asia (Table 2.1). It found that all of the countries studied have included an element of smart city development in their national development plans and strategies. At the very least, every national development plan describes a strategy for improving ICT or e-government services. In addition, six of the 12 countries have a dedicated smart city strategy, namely China, India, Indonesia, Malaysia, Singapore and Thailand.

In terms of scope, the assessment found that smart city strategies in Emerging Asian countries are at varying stages of advancement, with those of China and Singapore being

the most comprehensive, followed by those of India, Indonesia, Malaysia and Thailand. In terms of institutional arrangements, this assessment has also found that these strategies have not explicitly spelled out the roles of subnational governments or the allocation of responsibility across levels of government in the development of smart cities. For instance, resource and investment allocation at the subnational level remains unclear. Moreover, few national strategies have addressed either diversity between places within a country or challenges faced by different population groups in a country. However, a comprehensive follow-up would be required to determine whether such multi-level co-ordination also exists in practice. Below, the results of this assessment of the smart city strategies of six countries are detailed. As the strategies of Indonesia and Thailand have only been published in the original language, access to further documentation would be required in order to assess them in greater detail.

Table 2.1. **National-level smart city strategies in Emerging Asia**

Country	Name of strategy	Type of strategy	Description of strategy
Brunei Darussalam	Wawasan Brunei 2035/Brunei Vision 2035	National development strategy	The long-term development plan has no explicit focus on smart cities but consists of 13 strategies, which includes "strategy 12 on infrastructure and info-communication technology".
	Strategic Plan 2018-2023	National development strategy	Core Strategy 3 is entitled "Leveraging on Information Technology to Streamline Operational and Process-Structure" and details a strategy to improve governmental e-services, to digitise key information in order to ensure accessibility and proper governance, and to develop a centralised database to enhance data integrity and security, among other plans.
Cambodia	National Strategic Development Plan 2014 – 2018	National development strategy	No explicit focus on smart cities, but it defines 4 key areas of development, of which the second, "Development of Physical Infrastructure", contains a strategy for the development of information and communication technology. The strategy aims to "strengthen the regulatory framework, build institutional capacity, modernise the technological equipment base, foster competition, strengthen the efficient use of IT system and e-Government, and build and enhance the efficiency of the backbone infrastructure of the information and communication technology sector".
Indonesia	Movement to 100 Smart City	Explicit smart city strategy	Established in 2017, the plan involves a selection process and features three goals: Smart Connectivity (Infrastructure), Smart Solution (Environment, Governance, Citizen, Security, Education, Transportation, Health Care) and Smart User (Community). In 2017, 25 cities were selected for the first phase, and 50 were selected in 2018 for the second phase. Candidate cities that qualify will receive assistance from academics and a number of other institutions as well as mentoring to prepare a master plan.
Lao PDR	8th Five-Year National Socio-Economic Development Plan 2016 – 2020	National development strategy	One of the identified priority activities is to achieve integration of information and communications technology (ICT). ICT is viewed as a key to socio-economic development to facilitate communications and data transfer as a favourable condition for attracting investment, manufacturing and tourism. A focus is also placed on developing quality ICT networks with high speed services in all areas and to meet ASEAN and international technology standards. Further, an emphasis is placed on developing a system of ICT integration and internet connectivity with countries in the ASEAN region.
Malaysia	11th Malaysian Plan 2016 – 2020	National development strategy	The plan has a strategy devoted to "strengthening infrastructure for smart cities" to address specific challenges related to urban services such as transportation, utilities, waste management, greater connectivity and integration of services. The plan also specifies that the Ministry of Communication and Multimedia will develop a smart cities framework.
	Communications and Multimedia Blueprint 2018-2025*	Smart services strategy	The plan details a smart services strategy. Two programmes have been identified to accelerate and broaden the creation of digital government services and bridge capabilities beyond the public service: 1) the "digital service unit" is a public-private initiative that will make a broader range of government services more easily available; 2) the "smart services working group" will orchestrate future smart service development efforts and co-ordinate activities among developers and providers and across agencies.
Myanmar	Myanmar Sustainable Development Plan 2018 – 2030	National development strategy	Launched in July 2016, the plan details twelve policies: policy 4 concerns the prioritisation of a digital government strategy and an e-government system, while policy 9 specifically aims to "build environmentally sustainable cities, upgrading public services and utilities, expanding public spaces, and making greater efforts to protect and conserve our cultural heritage". Strategy 5.6, "Manage cities, towns, historical and cultural centers efficiently and sustainably", consists of several actions which include promoting climate-resilient and low-carbon energy, transport and industrial systems and introducing an e-government system.
Philippines	Philippine Development Plan 2017 – 2022	National development strategy	"Accelerating infrastructure development", a key focus area of the plan, formulates a strategy to expand the deployment of ICT infrastructure and address the gaps in digital connectivity and to continue to enhance the country's e-government service.
Singapore	Smart Nation Initiative	Explicit smart city strategy	Launched in 2014, it consists of 3 key pillars: digital economy; digital society; and digital government. Within the framework of the initiative, there are 6 national projects: 1) national digital identity; 2) e-payments; 3) smart nation sensor platform; 4) smart urban mobility; 5) moments of life; and 6) the CODEX digital platform to deliver government digital services.

Table 2.1. **National-level smart city strategies in Emerging Asia** *(cont.)*

Country	Name of strategy	Type of strategy	Description of strategy
Thailand	Thailand 4.0 National Development Plan	National development strategy	Considers the pursuit of "integrated research on smart cities" as one of ten future industries to pursue within "Agenda 2: Development of Technology Cluster and Future Industries". Other groups of technology identified in the plan are smart devices, robotics, mechatronics, Internet of Things (IoT), Artificial Intelligence as well as other digital and embedded technologies.
	Digital Economy Promotion Masterplan 2018-2021	Explicit smart city strategy	Aims to shape a dynamic digital economy, with digital-ready workforce and greater digital awareness to propel change. The agenda focuses on smart cities and IoT development to achieve Digital Thailand. The 5 areas are: 1) Digital Infrastructure 2) Digital Government 3) Digital Manpower 4) Cyber Security 5) Digital Technology Developments.
Viet Nam	Sustainable Smart City Development Plan	Explicit smart city strategy	A Sustainable Smart City Development Plan was approved in August 2018.
China	13th 5-Year Plan (2016-2020)	National development strategy	The plan describes several smart city strategies and industries and the manner in which they will be supported through big data, IoT, e-government services and smart manufacturing transportation and energy.
	Guidance on Promoting Healthy Smart City Development	Explicit smart city strategy	Established in 2014, it lays out principles for smart city development in China, including strengthening comprehensive public services using smart technologies, promoting data collection and sharing on digital platforms, supporting law enforcement, including taxation compliance through smart technologies, and establishing e-government and online channels for citizens to express their opinions.
	New-Type Urbanisation Plan	Explicit smart city strategy	Released in 2014, the plan identifies the construction of smart cities as a priority. The critical applications for smart technologies in cities are identified as 1) broadband information networks; 2) informatisation of planning and management, including building public information platforms; 3) intelligent infrastructure in transportation, power, water and sewage, and pipeline networks; 4) convenient public services; 5) industrial development; and 6) social governance.
	Guidance on Accelerating "Internet Plus Government Services" Initiative	Explicit smart city strategy	Released in 2016, it includes a section dedicated to smart city development where it calls for 1) accelerating the development of new-type smart cities; 2) utilising technologies such as the Internet, IoT, Cloud Computing, Big Data, etc. in an innovative way; 3) building smart cities step by step according to their levels and types; and 4) establishing transparent and efficient service-oriented government.
	Opinions of the State Council on Improving Urban Planning and Development Control	Explicit smart city strategy	Released in 2016, it states that China shall develop a number of smart cities with distinct features by 2020 and the government should enhance digitalisation of city management and service system, facilitate fusion between city management service and emerging digital technologies such as Big Data, IoT, Cloud Computing, etc., and improve the efficiency of city governance and service quality.
India	Smart Cities Mission	Explicit smart city strategy	The strategic components of area-based development in the Smart Cities Mission are city improvement (retrofitting), city renewal (redevelopment) and city extension (greenfield development) plus a pan-city initiative in which Smart Solutions are applied covering larger parts of the city. USD 7.5 billion has been set aside for subnational smart city strategies. Each of the 100 cities will have a Special Purpose Vehicle with nominees of Central Government, State Government and Urban Local Bodies on its board.

Source: Authors' compilation based on government documents.

China

The proportion of China's population living in urban areas has rapidly risen from 18% in 1977 to 58% in 2017, illustrating one of the most striking examples of the global megatrend of urbanisation (UN, 2018). In the context of such rapid urbanisation, China published two national-level strategic documents in 2014: "Guidance on Promoting Healthy Smart City Development" and "New-Type Urbanisation Plan", which laid out principles for smart city design as well as specific technological uses of smart technologies that are also developed further in the 13th 5-Year Plan (2016-2020). Later in 2016, the State Council of China provided additional guidance on smart city strategies in two national development documents: "Guidance on Accelerating 'Internet Plus Government Services' Initiative" and "Opinions of the State Council on Improving Urban Planning and Development Control".

- The "Guidance on Promoting Healthy Smart City Development", jointly issued by the National Development Reform Commission and seven other ministries, lays out principles for smart city development in China, including strengthening comprehensive public services using smart technologies, promoting data collection and sharing on digital platforms, supporting law enforcement, including taxation compliance through smart technologies, and establishing e-government and online channels for citizens to express their opinions (UNDP, 2017).
- The "New-Type Urbanisation Plan" identifies the construction of smart cities as a priority in China's urbanisation strategy. The critical applications for smart technologies in cities are identified as 1) broadband information networks; 2) informatisation of planning and management, including building public information platforms; 3) intelligent infrastructure in transport, power, water and sewage, and pipeline networks; 4) convenient public services; 5) industrial development; and nbs (UNDP, 2017).
- Building on these plans, the 13th 5-Year Plan details how the development of big data, IoT, smart manufacturing, smart transport, smart energy, and e-government services will be further pursued within the context of "A New Style of City" prioritising green and smart cities (Central Committee of the Communist Party of China, 2015).
- The "Guidance on Accelerating 'Internet Plus Government Services' Initiative" dedicates one section to smart city development which calls for 1) accelerating the development of new-type smart cities, 2) utilising technologies such as the Internet, IoT, Cloud Computing, Big Data, etc. in an innovative way, 3) building smart cities step by step according to their levels and types, and 4) establishing transparent and efficient service-oriented government (State Council, 2016a).
- The "Opinions of the State Council on Improving Urban Planning and Development Control" states that China shall develop a number of smart cities with distinct features by 2020 and the government should enhance digitalisation of city management and service system, facilitate fusion between city management service and emerging digital technologies such as Big Data, IoT, Cloud Computing, etc., and improve the efficiency of city governance and service quality (State Council, 2016b).

Smart city initiatives are steered, monitored and evaluated by the central government, with funding provided by national ministries. For example, in 2013, the Ministry of Housing and Urban-Rural Development had designated 193 official smart city project sites, eligible for up to CNY 100 billion in funding (UNDP, 2015). As of 2017, up to 500 cities were selected as pilots, with a total estimated investment of CNY 1.6 trillion during the 12th 5-Year Plan (2011-2015) (Deloitte, 2017; UNDP, 2015). The ambitious multi-scalar scope of China's smart city programme is remarkable: large, medium and small cities have all featured as pilots, reflecting different contexts and forming smart city clusters. While a significant number of smart cities have been selected as pilots, highlighting the government's commitment to their widespread implementation, China's smart city initiatives remain overwhelmingly designed and funded by the government. Limited private sector financial contribution thus places a significant financial burden on the central government.

Although there is evidence of horizontal co-ordination across national ministries for smart city implementation over several years, the extent of vertical co-ordination remains limited or unclear. The distribution of competences across levels of government is sometimes unclear and uneven, with further differences in hierarchal status across

cities and provinces. This limits subnational authority and financial autonomy in implementing smart city initiatives. Delegation is the underlying basis of subnational governance, handed down by administrative directive from the central and provincial levels, which can be unpredictable and subject to modification, rendering municipal planning and budgeting difficult. Moreover, there is no legal requirement for co-ordination across levels of government, nor are there fiscal incentives for enhancing co-ordination or for promoting regional urbanisation initiatives (OECD, 2015; Kamal-Chaoui et al., 2009). However, in order to definitively assess multi-level co-ordination for smart city implementation, further follow-up is required.

India

India's Smart Cities Mission, launched in 2015, is an advanced strategy for the development of 100 smart cities based on retrofitting, redevelopment and greenfield development. It requires each city to develop its own locally-tailored vision. The national government has set aside USD 7.5 billion for the Smart Cities Mission, which comes under the purview of the Ministry of Housing and Urban Affairs. While many instances of national government support to smart city development involves prescribing areas where money should be allocated, India's Smart Cities Mission required every city that took part in the challenge to develop a vision, thereby allowing cities to play to their strengths. Through this national competition, cities sought funding from the national government for their context-specific ideas. However, the lack of a national-level master plan with a clear definition of what constitutes a smart city may lead to a lack of co-ordination across cities as well as the development of silo approaches to common issues. Not only is India's strategy ambitious in scope but it is also a good example of co-operation between the national and subnational levels of government in the development of smart cities.

Following the selection process, winning cities carry out their smart city plans through special purpose vehicles (SPVs) created by urban local bodies to oversee the implementation process at the city level. Each of the 100 cities will have an SPV (headed by a full-time officer) that includes, on its board, representatives of the central, state and local city governments (India Ministry of Urban Development, 2015). The SPVs were established to ensure transparency and multi-level co-ordination because they foster autonomy in the implementation of each mission.

Digitalisation – a key global megatrend with significant implications for smart city developments – is highlighted as an important feature in the Smart Cities Mission. In fact, part of the programme ensures that each selected city will have a Smart City Centre (SCC), which acts as an integrated command and control hub. Digital technologies are integrated into the city's social, physical and environmental policies, thus enabling centralised monitoring and decision-making. As of July 2018, SCCs had already been set up in ten cities (Naya Raipur, Ahmedabad, Vadodara, Surat, Pune, Nagpur, Rajkot, Visakhapatnam, Kakinada, and Bhopal) and a further 13 cities had begun the process of setting up their SCCs (Hindustan Times, 2018).

The Smart Cities Mission was designed in such a way that either the state government or the urban local body is required to match the sum – INR 1 billion per year for five years – provided by the central government (India Ministry of Urban Development, 2017). This design thereby grants the subnational government more responsibility, along with the associated potential difficulties and opportunities, as well as greater flexibility regarding how financing can be secured through, for instance, PPPs, user charges, multilateral funding and other taxes. In this way, such a framework provides subnational governments with a degree of flexibility in pursuing their priorities.

Indonesia

Indonesia's "Movement to 100 Smart City" features a competition and selection process similar to those of India's "Smart Cities Mission". The plan was established in 2017 by the Ministry of Communication and Information Technology in co-operation with the Ministry of Internal Affairs, the Ministry of National Development Planning (Bappenas), the Ministry for Public Works and Human Settlements, the Presidential Staff Office, the Ministry of Finance and the Ministry of Economic Affairs. The plan includes three goals: 1) Smart Connectivity (Infrastructure); 2) Smart Solutions (Environment, Governance, Citizen, Security, Education, Transport, Healthcare); and 3) Smart Users (Community).

"Movement to 100 Smart City" begins with a selection process for cities or districts in Indonesia, after which the candidates undergo an assessment process in Jakarta to measure readiness to pursue each stage. Candidate cities that qualify will receive assistance from academics from the University of Indonesia, Bandung Institute of Technology, STIE Perbanas, and the Technology Research and Development Agency (BBPT) and a number of other institutions. Mentoring includes preparing a master plan that includes a Smart City Development Plan in each city or district on a 5-10 year horizon. Twenty-five cities were selected in 2017 for the first phase, and fifty were selected in 2018 for the second phase (Indonesia Ministry of Communication and Information Technology, 2018a; 2018b). In order to facilitate communication and data sharing among smart cities, the Ministry of Communication and Information Technology is currently preparing assessment for systems and applications used by cities.

At the subnational level, Bandung City has elaborated a "Smart City Bandung" vision, in which it defines its smart city approach as "the use of ICTs to connect, monitor efficiently and effectively and control a variety of resources that exist within the city in order to maximise service to citizens" (City of Bandung, 2015). The vision to develop Bandung as a smart city was initially spelled out in a strategic document entitled "Smart City Grand Design" and was later revised and incorporated into the 2013-2018 ICT Master Plan. This plan placed significant emphasis on e-government and basic digital infrastructure (OECD, 2016). As "Smart City Bandung" was tailored to local knowledge, it demonstrates the capacity of local governments to develop effective and relevant smart city strategies.

The Bandung Command Centre, the flagship smart city project for Bandung City, collects data on traffic and violations, emergency needs and the location of public utility vehicles (Box 2.1). Collecting input from citizens on a range of issues through social media helps authorities to identify problems and react to them more rapidly. It also increases citizens' participation and engagement in the city's smart city plans. This fosters citizen centricity and social inclusion, which remain at the core of a successful smart city. Involving inhabitants is especially crucial for a city like Bandung, where more than 120 000 people live in slums. The Command Centre is managed by the Information and Communication Agency of Bandung City, but each district of the municipality possesses a scaled-down version, as part of its strategy for local government to decentralise smart city actions. However, internal governance can be further improved as there is not enough involvement of line departments such as Bappeda, the Provincial Development Planning Agency (Badan Perencanaan Pembangunan Daerah), and those in charge of transport and environment issues. Likewise, one area of improvement is the data sharing and digital application alignment in order to minimise inefficiency (OECD, 2016).

Box 2.1. **Bandung Command Centre**

The Bandung Command Centre is Bandung City's flagship project for its vision to become a smart city. It was initiated in early 2015, in partnership with IBM and Institut Teknologi Bandung (ITB), one of the top universities in Indonesia. The Centre is similar to other command centres in Japan and Korea, which all aim to improve public services. The Centre consists of a digital control board that allows city staff to remotely monitor traffic and manage crises in the city (e.g. accidents, crime, etc.). Fifteen operators from the Bandung Telecommunication and Information Agency work permanently in the Command Centre, but it is also accessible to other city departments, such as fire brigades, police officers and transport agencies. It collects information from the street level to make informed decisions to improve such public services as ambulances, fire fighters and police intervention. The information is shown on a digital screen in the Command Centre. Two types of methods are used to collect street-level data:

- It uses CCTV cameras in streets and GPS tracking installed in school buses, ambulances, public buses and garbage trucks. For instance, a traffic violation could be easily spotted by the cameras and the information would be immediately transmitted to the Centre and appear on the screen.
- In addition to CCTV cameras and GPS tracking, social media is used by the Command Centre to collect information at street level. The Command Centre can be reached directly by citizens through Twitter, and they can transmit via their smartphones or computers any concerns they might have regarding safety and traffic (e.g., poor road conditions).

Some of the information gathered by the Command Centre is also accessible to the public. The data collected through GPS devices in school buses can be viewed by the local population, so they can make an informed decision if a bus is held up by traffic. The Command Centre is being developed as the exclusive interface for communication between governments and local communities in the city.

The Bandung Command Centre also works as a data bank, storing information on traffic violations, road infrastructure conditions, safety performance, disaster frequency and locations, etc. It makes it possible to visualise the types of problems that occur most frequently in every district of the city, and make a performance assessment for each of them. In the future, smaller operational centres will be opened in each district, as part of a strategy to decentralise smart city tool management. The Centre is being developed in three stages, only the first of which has been completed; in the future, the Centre will be expanded so that it can manage other sectors.

Source: OECD (2016), *Green Growth in Bandung, Indonesia*.

With transport systems stretched to the limit and given challenges related to climate change, Bandung's smart city initiatives have largely targeted the transport sector (Table 2.2). A third-generation bicycle-sharing programme, an electronic parking system, smart cards and traffic visualisation are being developed; although as of 2016, they were still in the pilot or design stage. Bandung could become "smarter" through the use of digital technologies to analyse traffic congestion and commuting flows. It could also develop smart city initiatives that target the energy sector (i.e., reduce energy consumption and increase the use of more renewable energy sources) (OECD, 2016). In addition to e-government and digital infrastructure integrated on transportation and

environment sector, Bandung's smart city initiatives also take into account the tourism and economic sector. Projects in both sectors aim to improve city's competitiveness and to adapt to the rapidly changing economic ecosystem (e.g. increasing financial literacy through less-cash society programme).

Table 2.2. **Bandung's smart city initiatives**

Smart environment	CO_2 and CO emissions sensors Air pollution monitoring (in development) Digitalisation of clean water disaster reports GPS tracking of garbage trucks
Smart transport	Smart card (in development) Bicycle-sharing (pilot stage) Electronic parking (in development) Emergency services management
Smart governance	Bandung Command Centre Citizens communication through social networks Electronic remuneration and performance Electronic planning and budgeting Bandung Planning Gallery
Smart people	Video crime monitoring Panic button Digital classes Digital education administration Online administrative procedures (e.g., building permits, tax records) Counselling car
Smart branding	Stunning Bandung Thematic parks Bandung Technopolis (in development) Gadget Application Mobile for Licence
Smart economy	Little Bandung New entrepreneur portal

Source: OECD (2016), *Green Growth in Bandung, Indonesia.*

Malaysia

The 11th Malaysian Plan 2016-2020 has a dedicated focus area on "improving coverage, quality and affordability of digital infrastructure" with a specific strategy on "Strengthening infrastructure for smart cities". The Ministry of Communications and Multimedia has been identified as the responsible ministry for implementing smart city strategies across Malaysia. The strategy takes into account different cross-sectoral applications of smart city technologies, identifying specific challenges related to urban services, such as providing better transportation, utilities and waste management. To enable connectivity and integration of services, the strategy will focus on developing widespread broadband, sensor networks and applications. Data is also planned to be made available on an open basis to support analytics and planning as well as to create opportunities for businesses and individuals (Malaysia Prime Minister's Department, 2015). The Malaysia Industry Government Group for High Technology (MIGHT) is a good example of a national mechanism providing technical support. In 2014, MIGHT collaborated with the Malacca State Government to translate its Green City Action Plan into concrete business ideas with the private sector. Outside of Malacca, MIGHT has also engaged with other federal agencies in formulating smart city frameworks for different cities. In doing so, it integrates components that are designed specifically for each city, which facilitates the development of sustainable, competitive and green city models for cities across Malaysia.

The Ministry of Communication and Multimedia has developed a smart services strategy in its "Communications and Multimedia Blueprint 2018-2025". "Government service delivery" and "information communications" are two key focuses of the blueprint. According to the blueprint 1) the "digital service unit" is a public-private initiative that will make a broader range of government services more readily available and 2) the "smart services working group" will orchestrate future smart service development efforts and co-ordinate activities among developers and providers. It will facilitate co-operation across public and private stakeholders. An objective of the working group is to "help facilitate the approval process with local authorities", which indicates that multi-level co-ordination will be pursued. However, specific details regarding the role played by subnational governments remains unclear. The working group will also be made up of different stakeholders, who will help shape the governance model of the group, among other contributions. This indicates that the group will be based on principles of inclusion and engagement. However, details are scant and it is unclear which stakeholders (or which sectors) will be present in the working group, how participants will be selected, and what direct responsibilities they will have. This initial assessment thus finds that the smart services working group has potential in terms of stakeholder engagement and that the blueprint benefits from horizontal co-ordination, but that there appears to be a lack of vertical co-ordination regarding the role and inclusion of subnational governments in smart service strategy design and implementation.

Singapore

Singapore's status as a city-state is unique as there are no local governments. Rather, there is only one overarching national government responsible for the smart city strategies of Singapore. Despite the fact that this responsibility falls under the purview of the national government only, Singapore has a comprehensive smart city strategy from which other countries can draw lessons.

Singapore's Smart Nation Initiative is a comprehensive smart city strategy that was launched in November 2014. It reflects the country's efforts to improve the economy by ensuring that all segments of society can "harness digital technologies and benefit from these advancements" (Smart Nation Singapore, 2018). Within the framework of the Smart Nation Initiative, there are six national projects: 1) national digital identity (a system for digital operations with public and private sectors); 2) e-payments (a national e-payment infrastructure); 3) smart nation sensor platform (sensor and data development); 4) smart urban mobility (public transport); 5) moments of life (a personalised services for citizens to improve the government's digital services); and 6) CODEX (a digital platform to deliver government digital services) (Smart Nation Singapore, 2018). The three key components of Singapore's Smart Nation initiative are digital economy, digital government and digital society. Each initiative includes framework documents, which are, respectively, the Digital Economy Framework for Action, the Digital Government Blueprint and the Digital Readiness Blueprint (Box 2.2). The three components are intended to ensure a comprehensive and inclusive smart city strategy through the participation of the government, businesses and citizens.

Box 2.2. **Singapore Smart Nation Initiative: Digital Economy, Digital Government, Digital Society**

1. **Digital Economy**: Developed in 2018, the "Digital Economy Framework for Action" sets out to guide businesses and the workforce about how to adopt digitalisation in order to keep the economy attractive through the creation of opportunities. Organised around three principles – Accelerate, Compete and Transform – the plan lays out a strategy for Singapore to become a digital economy capable of reinventing and adapting itself to change. In addition to strengthening physical and digital infrastructure, the plan details programmes for (re)training the workforce as well as adapting policies, regulations and standards in a manner that intends to strike a balance between making Singapore competitive and protecting the public interest.
2. **Digital Government**: Launched in 2018, the "Digital Government Blueprint" details a multi-stakeholder and multi-level approach to building a digital government that "will be able to build stakeholder-centric services that cater to citizens' and businesses' needs". The blueprint details six strategies: 1) Integrating services around citizen and business needs; 2) Strengthening integration between policy, operations and technology; 3) Building common digital and data platforms; 4) Operating reliable, resilient and secure systems; 5) Improving digital capabilities to pursue innovation; and 6) Co-creating with citizens and businesses, and facilitating adoption of technology. The blueprint lays the foundation for engagement with the public, private and civil sectors: the priority for digital government is to be easy-to-use, seamless and secure for the private sector and civil society; while for the public sector, emphasis is placed on training public employees and on designing better policies based on data and hard evidence.
3. **Digital Society**: Published in 2018, the "Digital Readiness Blueprint" takes an inclusive approach by ensuring that citizens have the technical knowledge to use technology safely and confidently. Structured on the principles of digital access, digital literacy and digital participation, the blueprint sets out recommendations to enable citizens to tap into the opportunities that a smart city offers, and to keep citizens engaged in the country's efforts in adopting smart technologies. These recommendations include: customising digital services for those with specific needs; strengthening digital literacy; providing one-on-one assistance; supporting community projects; and reaching out to more citizens in a language that is easy to understand.

Sources: IMDA (2018), *Digital Economy Framework for Action*; Smart Nation Digital Government Group (2018), *Digital Government Blueprint*; Ministry of Communications and Information (2018), *Digital Readiness Blueprint*.

An assessment of these framework documents underscores the Smart Nation Initiative's multi-stakeholder approach. Specialised courses and programmes have been established not only to teach coding and other digital skills to school children but also to retrain displaced workers. Beyond educating and retraining younger and middle-aged generations, applications and relevant information have been developed and conveyed in multiple languages and are geared specifically to elderly, disabled and low-income residents who may be at risk of exclusion from digital services. Given that the median age in Singapore is 40.5, the government has placed an emphasis on addressing the challenges associated with an ageing population (Box 2.3). Reaching out to all segments

of the population is a reflection of the initiative's coherent and inclusive strategy, which aims to minimise the impact of the disruptions that can result from digitalisation. Indeed, social inclusion is a key feature of the Smart Nation Initiative. For instance, the purpose of the Digital Readiness Framework is to improve citizens' quality of life. The framework documents also repeatedly identify improving digital and physical infrastructure and cybersecurity while ensuring privacy of data as key focus areas. Regarding institutional organisation, the Digital Government Blueprint describes co-ordination measures between ministries, notably through increased sharing and alignment of data between ministries as well as the appointment of Chief Digital Strategy Officers and Chief Information Officers to lead and implement digitalisation plans within their ministries and respective agencies. Key performance indicators for digital government have also been identified that will evaluate stakeholder satisfaction, end-to-end digital options, end-to-end digital transactions, digital capabilities, transformative digital projects, as well as AI and data analytics.

Box 2.3. **Ageing population in the ASEAN region**

The projected median age for the entire ASEAN region in 2020 is 29.8 years and 60% of the ASEAN population is below the age of 35. In 2017, in Brunei Darussalam, just 4.6% of the population was aged 65 and above, and only 6.0% in India. In contrast, Singapore has the oldest society in the region with a median age of 40.5. In 2017 in the Southeast Asian region and China, the percentage of people aged 65 and over was respectively 12.9% and 10.6% of the total population. Nevertheless, most countries in Emerging Asia will be confronted with issues related to the ageing population in the near future.

Shifting demographics will entail a change in lifestyle and consumption patterns, as well as changing demand for housing, infrastructure and services, with particular stress on health and social care systems (OECD, 2019a). Smart technologies are being applied to support independent living for the elderly and monitor long-term health conditions with the intent to enhance citizen well-being and ease the stress on public budgets. In the OECD, younger people tend to dominate digital communication, content creation, social networking, online purchases, cloud computing, and software downloads, whereas older people are more frequent users of e-government and e-banking services (OECD, 2017).

Sources: OECD (2019a), "Enhancing the contribution of digitalisation to the smart cities of the future", background paper submitted to the OECD Ministerial Council Meeting, CFE/RDPC/URB(2019)1/REV1. OECD (2017), *OECD Science, Technology and Industry Scoreboard 2017: The digital transformation*.

Thailand

Thailand's Digital Economy Promotion Master Plan 2018-2021 encompasses five different components: digital infrastructure, digital manpower, digital technology development, cyber security and digital government. The agenda propels Thailand towards greater digitalisation, through plans such as equipping 75 000 villages with internet (digital infrastructure), digital literacy training (digital manpower) and moving towards a paperless and cashless society (digital government). Smart city strategies are highlighted under the "digital technology" component, where Thailand has identified six smart city domains (Table 2.3).

Table 2.3. **Six smart city domains identified in Thailand**

Domain	Elements
Smart economy	Ease of doing business Networking Innovating
Smart living	Healthcare services Public safety Living comfort
Smart people	Digital awareness Lifelong learning Citizen centric
Smart governance	Accessible Citizen centric Transparent
Smart energy and environment	Efficient Green Environmentally friendly
Smart mobility	Safe and accessible Efficient Sharing

Source: Authors' compilation based on national sources.

Thailand's National Smart City Committee is constituted by the Office of Energy Policy and Planning (Ministry of Energy), the Digital Economy Promotion Agency (Ministry of Digital Economy and Society) and the Office of Transport and Traffic Policy and Planning (Ministry of Transport). Established in 2018, the committee had set and achieved a first-year target of establishing smart city action plans in seven pilot cities: Bangkok, Chachoengsao, Chiang Mai, Chon Buri, Khon Kaen, Phuket and Rayong (Tortermvasana, 2019). In March 2019, the Committee and the Digital Economy Promotion Agency convened to launch an event, "Smart City Thailand Takeoff", which marked the country's first open call for smart city proposals – with the definition of the application process and qualifying criteria – as well as the announcement of a new city data platform for smart city implementation with an expected launch date by the end of the year (Smart City Thailand Office, 2019). The event also established the committee's new targets for the upcoming years: the development of 24 total smart city plans in 2019, extending to 76 by 2022. Moreover, it was announced that the Digital Economy Promotion Agency, under the supervision of the National Smart City Committee, has initiated the establishment of a national Smart City Thailand Office in Bangkok (Digital Economy Promotion Agency, 2019).

At the subnational level, among the seven pilot cities, Phuket was allocated a budget of THB 386 million by the Ministry of Digital Economy and Society for its smart city programme. With this budget, high-speed internet services with at least 1 000 Wi-Fi hotspots are planned in 100 areas in Phuket. As Phuket is highly dependent on tourism, current smart tourism strategies include free public Wi-Fi and a drove of mobile applications such as "FlaminGO!", which informs both tourists and locals of what to do in Phuket (shopping, restaurants, sights to visit, etc.). Future plans include integrating data with the Smart City Data Platform.

Challenges for smart city strategies in Emerging Asia

Different cities have different strategies and focuses but cities will face a few common challenges (Table 2.4), as follows:

- Managing positive and negative impacts of smart city strategies
- A more holistic approach including a unified national-level master plan
- Lack of data and indicators at the subnational level
- Fostering peer learning through networks across and within countries.

Table 2.4. **Key features of the smart city strategies assessed in this study**

Country	Key features of smart city initiatives
China	Significant scope of 500 cities as of 2017 – with pilots including large, medium and small cities as well as smart city clusters – that have been equipped with a range of technologies (e.g. smart transport, CCTV). Strong national-level engagement with corresponding financial support, but a lack of private sector financial contribution places a burden on public expenditure. While there is evidence of horizontal co-ordination across national ministries, a lack of vertical co-ordination limits subnational authority and financial autonomy.
India	Broad scope (targeting the development of 100 smart cities) with the establishment of urban-led special purpose vehicles intended to promote transparency in decision making. Strong national-level engagement with corresponding financial support as well as flexibility regarding how local government can secure financing: the local government must match the sum provided by the national government but may do so via PPPs, multi-lateral funding, user charges, or other taxes. The bottom-up approach requiring each city to establish its own smart city vision empowers local government with competences and autonomy; however, the lack of a national-level master plan may hamper co-ordination and lead to silo approaches to common issues.
Indonesia	Broad scope targeting the development of 100 smart cities. The bottom-up approach allows cities to propose strategies adapted to local context that are subsequently subject to assessment. The lack of clear national-level smart city criteria and objectives may hinder co-ordination and lead to the development of silo approaches to common issues.
Malaysia	The lack of a national-level master smart city plan stands as an obstacle to the development of smart cities. A national-level smart services strategy identifies multi-stakeholder working groups that seek to promote multi-level co-ordination for the development and deployment of smart services but the participants and responsibilities of these working groups remain unclear. There appears to be a lack of vertical co-ordination concerning the involvement of local government in designing and implementing the smart services strategy.
Singapore	Comprehensive and advanced smart city initiative promoting a multi-stakeholder approach that accounts for key digital and socio-economic opportunities as well as challenges, including measures to boost cybersecurity, ensure data privacy and (re)train different segments of the population (e.g., displaced workers, low-income residents, students, the elderly). Co-ordination between ministries and agencies is promoted through the appointment of Chief Digital Strategy Officers and Chief Information Officers in order to share data and optimise co-ordinated decision making. Key performance indicators for digital government will assess a range of objectives such as stakeholder satisfaction, AI and data analytics.
Thailand	The lack of a national-level master smart city plan could slow development of smart cities. The current national development plan, Thailand 4.0, acknowledges the development of smart cities but has no explicit strategy per se, while Thailand's "Plan for the Promotion of the Digital Economy 2018-2021" details six smart city domains (economy, living, people governance, mobility and energy and environment) to be pursued. The range of themes covered in the six smart city domains reflects efforts to promote co-ordination and to limit silo approaches to common issues. The extent of multi-level co-ordination is unclear.

Source: Authors' compilation.

First, smart city strategies require a critical perspective focusing not only on the benefits emerging technologies can provide, but also the associated challenges posed by digitalisation, demographic change and globalisation, which are global megatrends that affect cities in profound and long-lasting ways (OECD, 2019b). In addition to implementation challenges concerning human, technical and governance capacity, there are also key considerations that need to be addressed concerning privacy, security, the future of work and accessibility among citizens of diverse backgrounds. For instance, Singapore identified that rapid digitalisation would have important repercussions for its ageing population and for workers in certain industries. Therefore, the Smart Nation Initiative specifically addresses strategies for retraining displaced workers and for providing relevant information in multiple languages across varied forms of media (e.g., theatre performances, classes, printed material, digital applications) in order to ensure that vast swaths of the population, such as the elderly, are not left behind.

Second, countries often lack a scope of "unified" national-level master plan that would provide a clear definition of a smart city (as well as smart city criteria and objectives). This shortcoming can stand in the way of co-ordination, which can unfortunately cause silo approaches to develop. For instance, while smart energy grids and transport are included in certain smart city strategies, they are not always considered within the framework of urban climate resilience and environmental sustainability, thereby missing important opportunities

for synergy. Since urban climate resilience and environmental sustainability are often addressed in separate strategic documents, their integration into smart city initiatives would eliminate silo approaches and provide co-benefits that are especially important to consider in the context of climate change (see Chapter 3 for more detailed discussions). In a similar vein, smart urban transportation initiatives can be integrated with land-use, urban planning and related policy frameworks (OECD 2018e). At the local level, it has also been observed that, partly due to the lack of a shared understanding of what constitutes a smart city, smart city strategies have not yet featured as a key component in public policy discussions and policy frameworks. The private sector has tended to focus exclusively on a technology-driven phenomenon: how digital innovation can improve city government operations and services. As a result, the smart city concept has been largely supply-side driven, with the private sector having "taken the lead role so far in defining both the problem and the solution" (Kleinman, 2016). A more holistic approach is needed in order to include a wider range of policy areas based on local needs and the potential that digitalisation can unlock.

Third, there is dearth of data and indicators at the subnational level. Data-driven assessments are needed in order to design better policies that take into account the opportunities and challenges that are unique to each local context. While mature smart city strategies, such as those in China and Singapore, have developed key performance indicators and collected data, the majority of the strategies analysed in this assessment have not yet collected sufficiently granular data at the local level. Going forward, each strategy thus needs to start by clearly prioritising what a smart city initiative aims to accomplish. Subsequently, relevant indicators should be developed, for which data can be collected. The indicators should be developed in such a way that the performance of cities can be compared to other international peers as well as to the national average.

Fourth, fostering peer learning through networks across and within countries can help to scale up smart city initiatives. Municipal governments in many cases may not have the human capacity or infrastructure required to develop and adopt comprehensive smart city initiatives on their own. Countries are at different levels of development in the Emerging Asia Region, which provides an opportunity for cities that are less developed to learn from leaders of smart city initiatives within the region. The ASEAN Smart Cities Network as well as the United Cities and Local Governments Asia-Pacific are two subnational networks aiming to contribute to capacity building, to facilitate co-operation across cities and to raise funding from a range of public and private sources (Box 2.4).

Box 2.4. **Subnational smart city and capacity building networks in Asia**

In April 2018 at the 32nd ASEAN Summit, Singapore revealed that the ASEAN Smart Cities Network (ACSN) would be one of the key deliverables during its chairmanship of ASEAN. Recognising that the Southeast Asian region is undergoing rapid urbanisation and that many cities across the region have established smart city plans, ACSN was created to synergise smart city development efforts and bring smart cities in ASEAN States together. The 26 pilot cities within the ASEAN Smart Cities Network are as follows: Bandar Seri Begawan (Brunei Darussalam); Battambang, Phnom Penh and Siem Reap (Cambodia); Banyuwangi, DKI Jakarta and Makassar (Indonesia); Luang Prabang and Vientiane (Lao PDR); Johor Bahru, Kota Kinabalu, Kuala Lumpur and Kuching (Malaysia); Mandalay, Nay Pyi Taw and Yangon (Myanmar); Cebu City, Davao City and Manila (Philippines); Singapore (Singapore); Bangkok, Chonburi and Phuket (Thailand); Da Nang, Ha Noi and Ho Chi Minh City (Viet Nam). By using technology as an enabler to improve the lives of ASEAN citizens, this current 26-city strong collaborative platform will help to facilitate co-operation on smart cities development, catalyse bankable projects with the private sector, and secure funding and support from ASEAN's external partners. This network

Box 2.4. **Subnational smart city and capacity building networks in Asia** *(cont.)*

also helps cities shift from theoretical smart city strategies to developing concrete city-level plans through the recognition of diversity in the region. While national strategies are not the focus of this network, ACSN will help to improve the inter-operability of smart city initiatives among cities in the network, and will work towards creating opportunities to harmonise different national systems (ASEAN, 2018).

Capacity building, which is an integral component of making smart city strategies a reality, has been actively pursued by subnational networks such as the United Cities and Local Governments Asia-Pacific (UCLG ASPAC), which promotes co-operation between governments and within wider international communities in the region. The organisation's scope of work includes advocacy, capacity building and training, research and knowledge management, project development and management, and decentralised co-operation. Regarding capacity building, UCLG ASPAC specialises in four areas that are of relevance for smart city strategies: sustainable mobility; climate change adaptation and disaster risk reduction; tourism and culture; and local economic development. To promote capacity building, UCLG ASPAC has organised several training workshops and peer exchanges over the years. For example, UCLG ASPAC has worked for a long time with the Seoul Human Resource Development Center to share, with other cities in the region, Seoul's best practices in the field of transport. This collaboration led to the establishment of the Local Government Transport Officer Forum in Indonesia, serving as a platform for officials at the national and regional level to address escalating transport challenges in urban areas. In fact, the forum developed an action plan to adopt Seoul's best practices during its first meeting in March 2016, in Salatiga City, Indonesia (UCLG ASPAC, n.d.).

Sources: ASEAN (2018), Concept Note of the ASEAN Smart Cities Network; UCLG ASPAC (n.d.) "Capacity Building".

Conclusion

Smart city initiatives present unique opportunities and challenges to cities, but their implementation faces obstacles for both subnational and national levels of government. The rapid spread of digitalisation has led many cities across Emerging Asia to undertake smart initiatives. On the one hand, the diversity across and within Emerging Asian countries can pose challenges for national governments to implement smart city initiatives. On the other hand, such diversity is an opportunity for the development of innovative ideas, precisely because cities at an earlier stage of development can learn from best practices and "leapfrog" the most difficult stages, thereby avoiding the pitfalls and challenges that peer cities have already faced. The sharing of best practices on smart city initiatives is especially valuable in light of the global megatrends of globalisation, urbanisation, ageing population, climate change and digitalisation. Despite the fact that these megatrends impact Emerging Asian countries in different ways and that each country is at a different starting point in tackling their associated challenges, they pose risks to all cities. A range of subnational indicators are required in order to monitor how smart city initiatives impact the lives of citizens and to provide a benchmark for governments to develop even smarter cities.

Effective planning and implementation of smart city initiatives requires a territorial approach underpinned by co-ordination across levels of government. Top-down approaches that disregard or do not involve the subnational level run the risk of being exclusive and failing to meet the varied needs of all citizens. National governments have

greater access to funds and are in an ideal position to develop national urban plans that incorporate "smart" goals. However, national smart city strategies do not always consider subnational actors, missing key opportunities for effective planning of smart city solutions. The subnational level of government, which is closest to the local populace, has a better understanding of citizen needs but has little incentive to be an early adopter of new smart city technologies due to the high risk involved. Moreover, with limited investment scope, subnational governments may not choose to invest in research and development, even though it is critical to the success of smart cities. The successful implementation of smart city initiatives that are citizen-centric and socially inclusive thus requires co-ordination between national and subnational levels of government.

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Chapter 3

Addressing urban environmental risks

Environmental hazards are a rising challenge for cities in Emerging Asia. As urban areas are growing rapidly in the region, managing levels of air pollution is increasingly important in the region. Policy makers need to co-ordinate across levels of government to reduce emissions in a targeted way and promote resilience against natural disaster risks. Progress can be made through the expansion of public transport systems, the reduction of power generation emissions occurring close to cities and by setting more stringent regulations for polluting industries among others.

Introduction

Cities often face challenges from environmental hazards because of their exposure to threats arising from or exacerbated by human activity and from the geographic factors associated with urbanisation. Concentrations of population and economic activity in urban areas are additional complicating factors. Among the important issues facing cities, this chapter discusses the challenges related to air pollution and how to respond to them through smart city policies.

High levels of air pollution in Emerging Asian cities have serious consequences for human health, and directly and indirectly affect economic growth prospects. Air pollution can damage human capital and create other non-health costs.

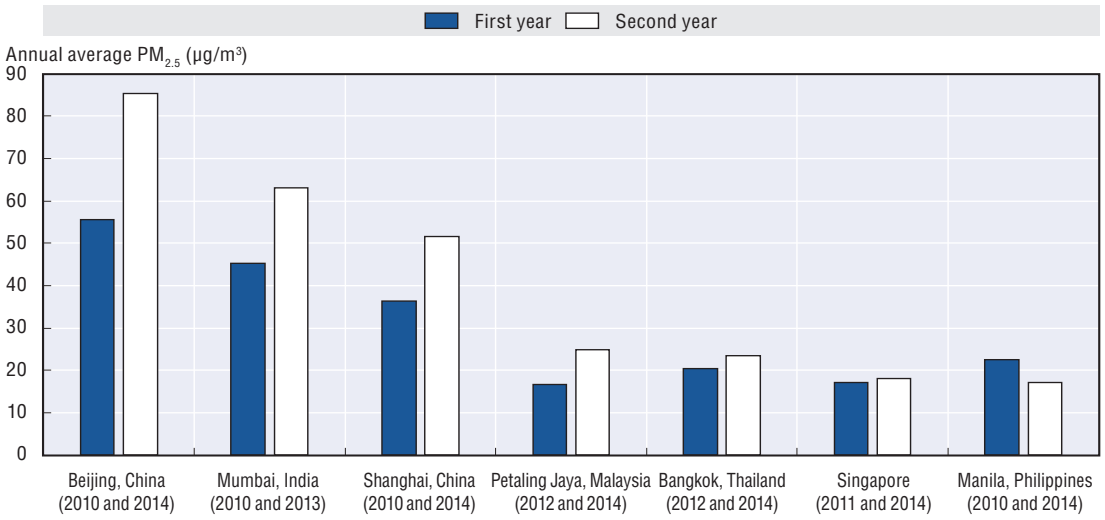
Policy responses at local and higher levels of government – in addition to regional co-operation – are needed to deal with urban environmental hazards. Combating the effects of air pollution requires interventions targeting the main sources of pollution, including the transportation, power generation and industrial sectors. Cities can be made more resilient to natural disasters by improving planning and institutional reform, strengthening financing tools, and implementing effective early warning systems.

Reducing urban air pollution

The importance of clean air to well-being and development is widely recognised in Emerging Asia and globally. For example, the Sustainable Development Goals (SDGs) aim, by 2030, to reduce substantially death and illness from hazardous chemicals and pollution (in target 3.9) and improve air quality by lowering the adverse per capita environmental impact of cities (in target 11.6). Still, much work remains to reduce urban air pollution in the region. Such pollution leads to economic costs and effects on well-being (through increased mortality and morbidity, as well as non-health costs including those associated with building soiling, reduced visibility and reduced crop yields). Local and national governments must develop policies on urban sources of air pollution, notably transportation, power generation and industry.

Some emissions reduction measures targeting stationary and transportation sources, along with cleaner fuels, and structural transformation, have helped to limit air pollution. But population growth and urbanisation, expanding economic activity and rising incomes, increased vehicle use, and increased electricity consumption have all contributed, in varying degrees, to growing levels of air pollution in many Emerging Asian cities. Outdoor concentrations of fine particulate matter ($PM_{2.5}$) – which is hazardous to health and commonly used as a proxy measure of pollution more generally, including NO_x, ozone, carbon monoxide and sulphur dioxides (WHO, 2016a) – have increased in Beijing from 55.6 to 85.2 µg/m^3 between 2010 and 2014 and in Mumbai from 45.2 to 62.9 µg/m^3 between 2010 and 2013 (Figure 3.1). Pollution did fall in Manila as part of a longer-term decline with the implementation of stricter fuel standards and other measures, but increases were seen in other large cities, including Shanghai, Petaling Jaya, Bangkok and Singapore in recent years. Improvements can also be made to air quality monitoring across the region. This would help in the development of effective public health policy interventions (Box 3.1).

Figure 3.1. **Ambient air pollution in selected Emerging Asian cities in recent years**



Source: WHO (2016b), *Global Health Observatory Data Repository*.
StatLink https://doi.org/10.1787/888933966466

Box 3.1. **The need for improved air quality monitoring in Emerging Asian cities**

Effective measurement of pollutants and improvements in monitoring in much of the region are needed to identify and respond to sources of excessive or hazardous emissions. An ADB study compared actual and recommended numbers of air quality monitoring stations in Asian cities based on population and pollution level, as implied by an EU directive though terrain and other factors also affect the number of sites needed (ADB, 2014). Generally, cities in developed Asian economies had enough monitoring sites for their population; Singapore, for example, has 15, while 13 are recommended for a city of its size (Table 3.1). The nine Chinese cities studied also had sufficient monitoring stations. Not all studied cities in other Emerging Asian countries, however, had enough monitoring sites and Brunei Darussalam, Cambodia, Lao PDR or Viet Nam had none.

Table 3.1. **Actual and prescribed number of monitoring sites in selected Emerging Asian cities, 2014**

Country	Number of cities studied	Number of cities with at least the recommended number of sites	Total number of sites	Total recommended number of sites
Brunei Darussalam	1	0	1	2
Cambodia	1	0	1	7
Indonesia	3	1	39	33
Lao PDR	1	0	0	4
Philippines	3	1	28	26
Singapore	1	1	15	13
Thailand	5	3	24	19
Viet Nam	2	0	10	25
China	9	9	199	124
India	10	2	64	116

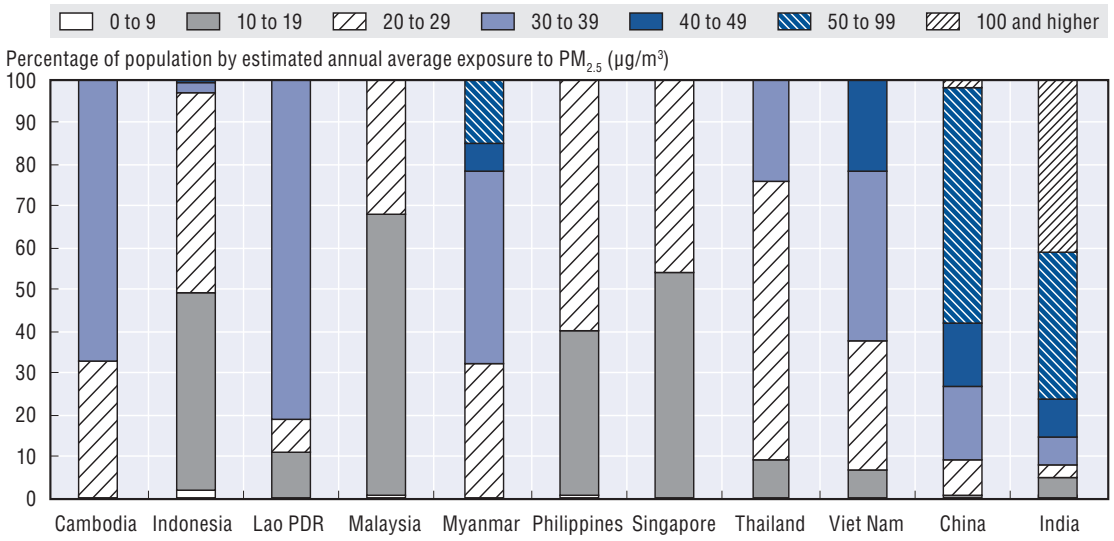
Source: ADB (2014), *Improving Air Quality Monitoring in Asia: A Good Practice Guide*.

Box 3.1. **The need for improved air quality monitoring in Emerging Asian cities** *(cont.)*

In addition to investing in additional monitoring, including in smaller cities, the design of these systems may need to be improved. The design of monitoring systems should keep in mind local conditions, quality assurance and quality control procedures, and sustainable operations (ADB, 2017). On an institutional level, the need is for timely information on air quality to be made publicly available (Hight and Kirkpatrick, 2006). Accessible real-time and historical data are both important. Indicators from a combination of satellite-based estimates and ground-based measurements can help to overcome the limited geographic coverage and lack of comparability across ground-based networks and potential accuracy issues of remote sensing estimates (Mackie et al., 2016).

Exposure to ambient air pollution is a serious challenge in Emerging Asian cities, though the severity of pollution varies considerably between and within countries. Practically all urban residents in the region are exposed to ambient air pollution exceeding the WHO guideline concentration of fine particulate ambient air pollution of 10 $PM_{2.5}$ µg/m³; only 0.2% of urban residents in Emerging Asia live in areas with pollution concentrations at or below the guideline level (Figure 3.2). In most countries in 2016 no urban areas were estimated to have concentrations of fine particulate matter above 100 µg/m³. This was not the case with India, where 41.5% of the urban population lived in areas with this degree of exposure. Among urban residents, median level of estimated annual average exposure to air pollution in Emerging Asia was 52.8 $PM_{2.5}$ µg/m³ in 2016, and was highest in India (84.6) and lowest in Singapore (16.9).

Figure 3.2. **Distribution of urban population exposure to air pollution, 2016**



Notes: Areas with population densities of at least 1 500 people per square kilometre are defined as urban, following the threshold of a high-density cluster defined in OECD (2013). This definition excludes data on Brunei Darussalam, where levels of fine particulate air pollution also tend to be relatively low.

Source: OECD Development Centre's calculations, using WHO (2017), *Data Integration Model for Air Quality* (database).

StatLink https://doi.org/10.1787/888933966485

Numerous studies have shown that levels of fine particulate air pollution are highly correlated with other air pollutants and are linked to elevated risks of mortality (including from ischemic heart disease, cerebrovascular disease, chronic obstructive pulmonary

disease, lung cancer and acute lower respiratory infection) and other health impacts, including chronic bronchitis, restricted activity and lower respiratory symptoms (Martinez et al., 2018; WHO, 2013). In urban areas in Emerging Asia, fine particulate air pollution in excess of WHO guideline level is estimated to cause an additional 1.5 million premature deaths per year (Table 3.2). Most of these deaths occur in the People's Republic of China (hereafter China) (767 772) and India (614 522), due to their large urban populations and high levels of exposure to air pollution. The welfare costs associated with this increased mortality totalled USD 1.28 trillion in 2015 dollars. Within countries, the negative effects of air pollution are particularly serious for lower-income urban residents. They are more likely to work outside and have less access to protection against poor air quality and to health care, and are exposed to poor indoor air quality. Across Ho Chi Minh City, for example, poor individuals face higher exposure to airborne particulate matter (Mehta et al., 2014).

Table 3.2. **Estimated additional urban mortality and welfare costs associated with elevated pollution levels**

Country	Additional deaths (thousands)	Welfare loss of pollution-related mortality (2015 USD millions)
Cambodia	1.3	237.6
Indonesia	28.9	17 094.3
Lao PDR	0.3	88.0
Malaysia	2.5	4 477.4
Myanmar	7.4	1 477.4
Philippines	15.7	9 585.5
Singapore	1.2	10 404.6
Thailand	11.3	11 129.4
Viet Nam	17.4	5 937.8
China	767.8	1 047 240.8
India	614.5	168 993.5
Emerging Asia	1 468.1	1 276 666.5

Notes: Areas with a population density of at least 1 500 people per square kilometre are defined as urban, following OECD (2013). This definition excludes data on Brunei Darussalam, where levels of fine particulate air pollution are relatively low. See Annex 3.A1 for data and methodology used in the estimations.
Sources: OECD Development Centre's calculations, using WHO (2017), *Data Integration Model for Air Quality* (database); Viscusi, K. and C. J. Masterman (2017), "Income elasticities and global values of a statistical life", *Journal of Benefit-Cost Analysis*, 8:2.

All levels of government have shared responsibilities in addressing urban air pollution externalities

All levels of government must work together to limit urban air pollution in the region. Urban air pollution is not exclusively caused by urban sources of emissions, and is affected by various anthropogenic and natural factors. Particular attention has to be paid to transportation, power generation, and industry to deal with local sources of emissions in cities. These three sectors are major causes of air pollution in Emerging Asia. Traffic is estimated to account for 36% of urban $PM_{2.5}$ pollution in Southeast Asia, 37% in India, 15% in Northern China and 18% in Southern China, while power generation and industry are estimated to account for 18% in Southeast Asia, 4% in India, 16% in Northern China and 27% in Southern China. The remaining shares are due to domestic fuel burning, unspecified anthropogenic sources and natural sources (Karagulian et al., 2015).

Policy responses cannot be limited to the local level. The metropolitan, provincial and central government must address emissions that cross administrative boundaries and establish minimum standards and boundaries for action at the local level (OECD, 2014a).

In addition, local responses cannot properly deal with emissions originating elsewhere, including those from agricultural sources. National legal frameworks should co-ordinate action on pollution reduction and set penalties or incentives. While all countries in the region have some form of environmental protection or resource management law, specific national air quality policies are limited. The potential transborder nature of the issue may also require co-operation at the regional level, as is being done in Emerging Asia (Box 3.2).

Box 3.2. **Regional co-operation to deal with transborder air pollution**

Local and national approaches are not sufficient when the sources and consequences of emissions are spread across borders. This frequently happens with emissions from energy production and heavy industry or from the burning of forests for agriculture. Regional solutions are therefore required. Regional co-operation can also help in setting standards, monitoring, developing collective responses and sharing experiences on policies for improving air quality in urban and other areas.

Transboundary haze has been a particularly important area of regional co-operation. The ASEAN Agreement on Transboundary Haze Pollution (AATHP) was signed by the ten member states in June 2002, after land and forest fires in 1997 and 1998 that caused severe haze across much of the region. The agreement contains measures on a range of issues, including monitoring and assessment, prevention, preparedness and emergency response, and technical co-operation and scientific research. In 2003, the Conference of the Parties (COP) to the ASEAN Agreement on Transboundary Haze Pollution was established, with a committee responsible for assisting in the implementation of the Agreement. The Roadmap on ASEAN Cooperation towards Transboundary Haze Pollution Control with Means of Implementation was adopted in August 2016. The goal is to eliminate transboundary haze in the region by 2020.

Other relevant regional plans include the ASEAN Environmental Education Action Plan 2014-2018, ASEAN Action Plan on Joint Response to Climate Change and ASEAN-China Strategy on Environmental Cooperation (2016-2020). Air pollution has often been the subject of the East Asia Summit Environment Ministers Meeting (EAS EMM) since its inaugural meeting in October 2008. There are also regional efforts to monitor air quality. The ASEAN Specialised Meteorological Centre (ASMC), for example, was established in 1993 to enhance the capacities of meteorological services. It is also responsible for monitoring and assessing land and forest fires and haze in the region, as well as providing real-time air quality information from multiple stations in the region.

Air quality standards are important in setting clear targets for air pollution reduction strategies (Kutlar Joss et al., 2017). Some countries in the region have national air quality standards covering at least some of the six main outdoor air pollutants: fine ($PM_{2.5}$) and coarse (PM_{10}) particulate matter, ozone (O_3), nitrogen dioxide (NO_2), and sulphur dioxide (SO_2) (Table 3.3). For particulate matter, standards are defined at daily and annual average maximums, while maximum levels are defined for shorter periods for ozone, nitrogen dioxide and sulphur dioxide. The level of these standards vary across countries in the region, which have very different average levels of exposure to air pollutants. For example, the annual average exposure standard for fine particulate matter varies from 15 $PM_{2.5}$ µg/m^3 in Singapore to 40 in India. Separate local pollution standards may also be set for particular cities or regions. In 2013, a target of 60 $PM_{2.5}$ µg/m^3 was set for Beijing by 2017, and was achieved, according to the Beijing Municipal Environmental Protection Bureau.

Table 3.3. **Emerging Asian countries with national air quality standards, by pollutant**

	Fine particulate matter ($PM_{2.5}$)	Coarse particulate matter (PM_{10})	Ozone (O_3)	Nitrogen dioxide (NO_2)	Sulphur dioxide (SO_2)
Brunei Darussalam					
Cambodia			✓	✓	✓
Indonesia		✓	✓	✓	✓
Lao PDR					
Malaysia	✓	✓	✓	✓	✓
Myanmar					
Philippines		✓	✓	✓	✓
Singapore	✓	✓	✓	✓	✓
Thailand		✓	✓	✓	✓
Viet Nam	✓	✓			✓
China	✓	✓	✓	✓	✓
India	✓	✓	✓	✓	✓

Source: OECD Development Centre's compilation, using Kutlar Joss et al. (2017), "Time to harmonize national ambient air quality standards", *International Journal of Public Health*, 62(4).

The use of cleaner transportation options can be facilitated

Motor vehicle use has increased rapidly in Emerging Asian cities and in the region as a whole; between 2005 and 2015 the estimated total vehicles in use in the region increased from 72.2 million to 250.2 million.[1] Further increases in vehicle use are to be expected with continued growth in incomes across the region (Dargay, Gately and Summer, 2007). Motor vehicle engines produce a range of pollutants, including carbon monoxide, nitrogen oxides, particulate matter and hydrocarbons. Particulate matter pollution is also produced by vehicles from non-exhaust sources such as road, brake and tire wear.

Enforcing standards on fuel quality and vehicle emissions can reduce dangerous emissions from motor vehicles. The implementation of a tax on leaded petrol in Thailand in 1991, for example, led to significant reductions in the use of these fuels (later phased out altogether) and to a lowering of lead air pollution levels in Bangkok. All countries in the region set limits on fuel sulphur content. Many of them follow European emissions standards, which define maximum acceptable emission rates of hydrocarbons and nitrogen oxides per kilometre travelled. These standards have become progressively stricter over time.

Several countries in the region also use vehicle retirement or scrappage programmes to encourage drivers to replace ageing vehicles. Generally, such programmes are most effective in reducing emissions and improving traffic safety when vehicles are not reused and others are required to be replaced with lighter and cleaner ones (OECD/ITF, 2011). Other programmes used in the region, such as the Green Vehicle Rebate in Singapore and tax incentives for the purchase of eco cars in Thailand, are used to encourage the purchase of low-polluting vehicles.

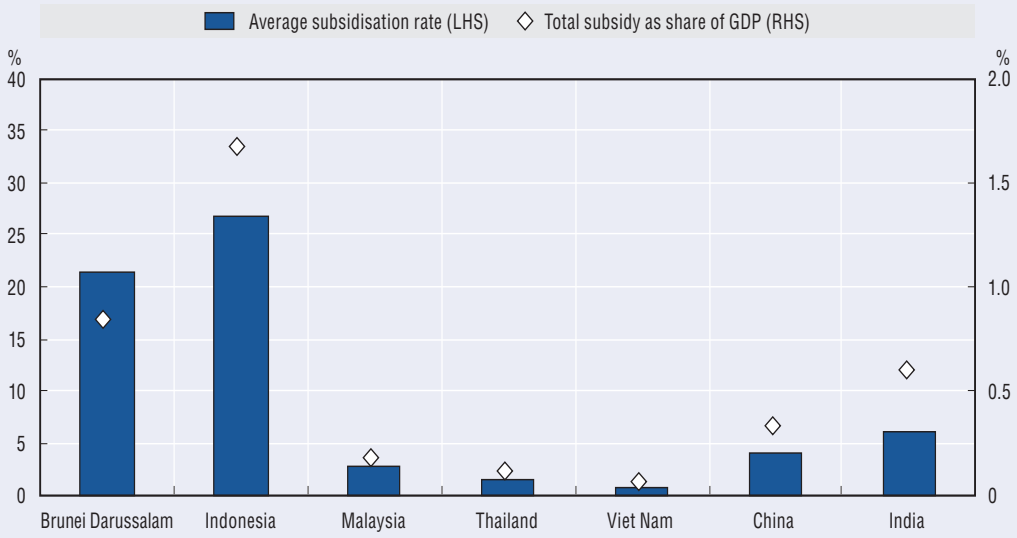
To account for the negative externalities produced through air pollution, policies on the pricing of private transportation may be considered, including congestion pricing, flat tolls and vehicle travel fees, efficient parking pricing, fuel tax increases and distance-based pricing schemes. Further reform of gasoline, diesel and other fossil fuel

subsidies would also be beneficial (Box 3.3). The use of policies to lower air pollution from transportation by affecting vehicle ownership and driving habits may be most effective in the region's fast-growing middle-income economies, where the association between income growth and vehicle ownership tends to be strongest (Dargay, Gately and Summer, 2007).

Box 3.3. **Fossil fuel subsidies and air pollution**

Reductions in subsidies of fossil fuels used in transportation and other activities, which are considerable in several countries in the region, should also be considered. Relative to output, these subsidies were particularly high in 2016 in Indonesia, where they represented 1.7% of GDP, with an average subsidisation rate of 26.8% (Figure 3.3). Although in a period of depressed oil prices, recent declines in the total value of subsidies are a promising trend in most of these countries; between 2014 and 2016, total fossil fuel subsides declined by 90.2% in Viet Nam, 87.9% in Malaysia, 78.4% in Thailand, 62.8% in India, 62.6% in Brunei Darussalam and 52.8% in Indonesia, though they increased by 47.7% in China. In addition to increasing fiscal burdens, these payments discourage activities and investments that could improve energy efficiency or the switch to alternative energy sources. Fuel subsidies are an inefficient means of assisting poorer households in developing countries because they tend to benefit highest-income groups most, while subsidy reductions have similar effects across income groups (Arze del Granado et al., 2012). Savings produced from subsidy reforms could therefore do more for low-income groups through better-targeted social programmes or investment in public transport.

Figure 3.3. **Fossil fuel subsidies in Emerging Asia, 2016**

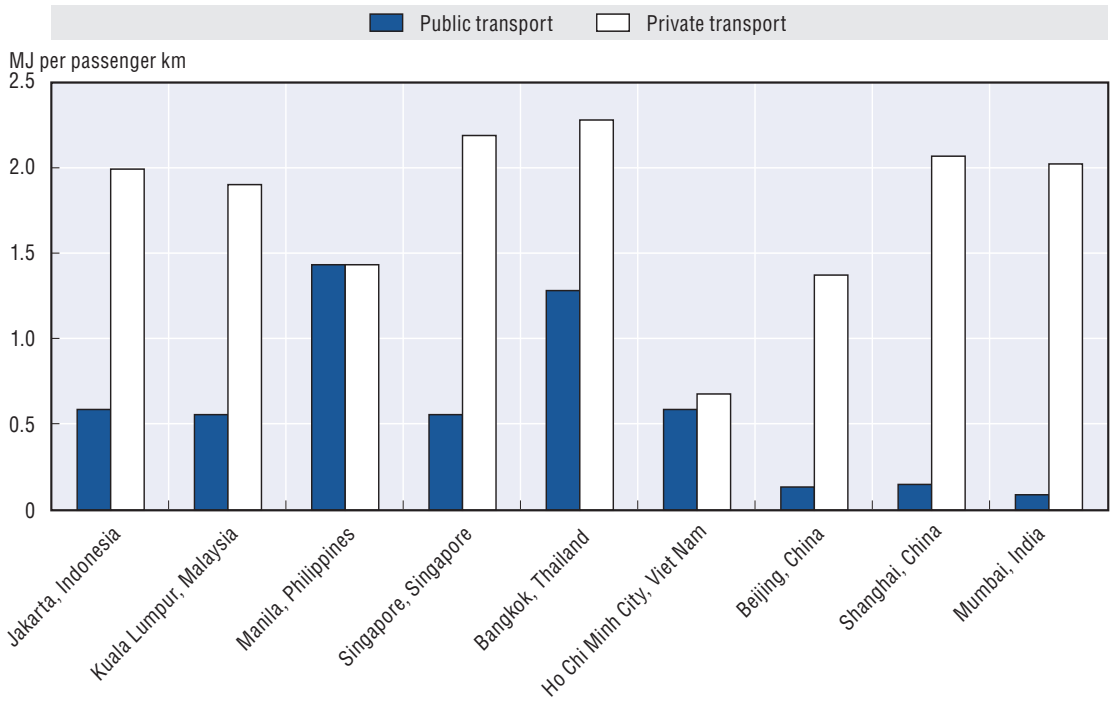


Source: IEA (2017a), *IEA Fossil-Fuel Subsidies Database*.
StatLink https://doi.org/10.1787/888933966504

Cleaner alternatives to private vehicle use are needed, including expanded systems of public transport. Measured by energy use per passenger kilometre, urban public transport is much more energy efficient than private transport, although the design

and use of these modes of transport affect efficiency (Figure 3.4). There is no difference in energy use per passenger kilometre in Manila, but public transport uses 25 times less energy than private transport in Mumbai. The extent to which these systems are used varies considerably, however; the ratio of mass transit ridership to population is 0.42 in Beijing, 0.39 in Singapore and 0.37 in Shanghai, but 0.01 in Jakarta and 0.02 in Kuala Lumpur. Cities across the region are planning expansions to their public transport systems, including the development of the Ho Chi Minh City Metro system and the expansion of mass rapid transit in Bangkok under a new Ministry of Transport plan. Financing improvements in the accessibility of urban public transport systems requires co-operation across a wide range of actors, including donors; local, regional and national governments; public transport authorities; citizens; and private sector actors and financiers (OECD, 2014b).

Figure 3.4. **Transportation energy use in selected Emerging Asian cities**

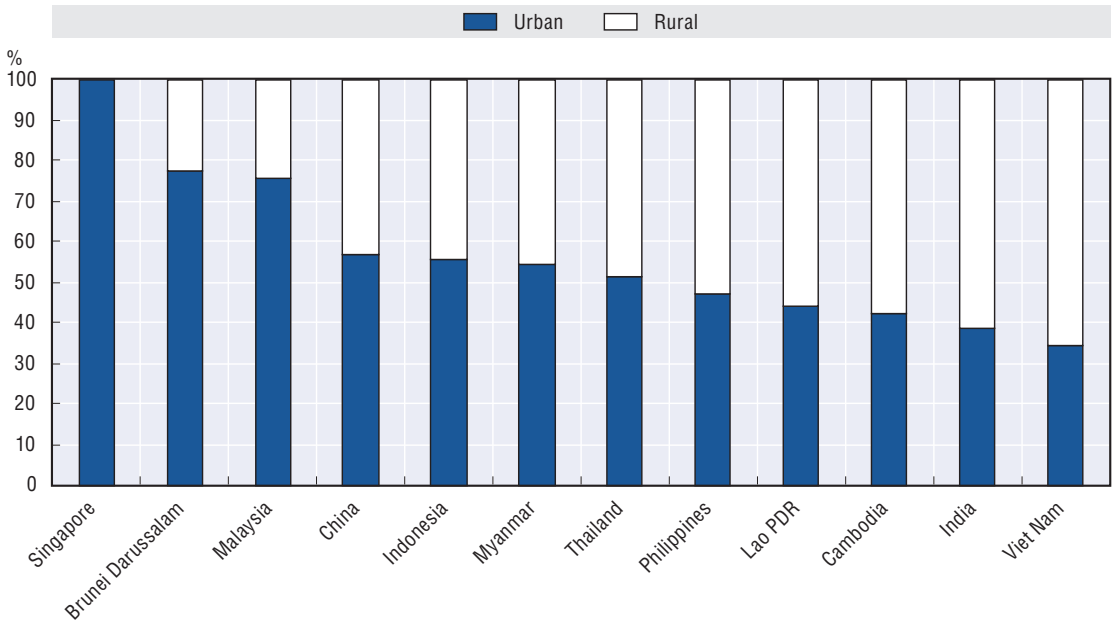


Source: World Bank (2014), Urban Transport Data Analysis Tool.
StatLink https://doi.org/10.1787/888933966523

Reducing power generation emissions

Cities account for a large share of energy consumption. That consumption is growing rapidly in the region. According to IEA estimates, total primary energy demand (TPED) in Southeast Asia alone will increase from 643 million tonnes of oil equivalent (Mtoe) in 2016 to 1 062 Mtoe in 2040, with power generation increasing from 215 Mtoe to 466 Mtoe over the same period (IEA, 2017b). Urban populations account for more than half of the population with electricity access in Singapore, Brunei Darussalam, Malaysia, China, Indonesia, Myanmar and Thailand (Figure 3.5).

Figure 3.5. **Share of population with electricity access by location, 2016**



Source: OECD Development Centre's calculations, using World Bank (2018), *World Development Indicators*.
StatLink https://doi.org/10.1787/888933966542

Electricity in the region is largely provided by burning fossil fuels, although differences in power generation mix remain within the region, with Lao PDR, Myanmar, Cambodia and Viet Nam less reliant on fossil fuels due to a more extensive use of hydroelectricity. Greater use of fossil fuels in power generation is expected in much of the region in the future. In Southeast Asia, coal and oil accounted for 39% of energy demand in power generation in 2016, a share that could increase to 44% by 2040 (IEA, 2017b).

Globally, power generation by plants using fossil fuels is a major source of anthropogenic air pollution, particularly of sulphur dioxide and nitrogen dioxide (Lelieveld et al., 2015). A study of coal plants in India, for example, found that in 2010-11, 111 plants generated an estimated 580 000 tons of fine particulate matter, 2.1 million tons of sulphur dioxides, 2.0 million tons of nitrogen oxides, 1.1 million tons of carbon monoxide, 100 000 tons of volatile organic compounds and 665 million tons of carbon dioxide (Guttikunda and Jawahar, 2014). A considerable number of fossil fuel power plants are located near large cities in Emerging Asia (Table 3.4). In terms of total annual generation, the 27 coal plants near Shanghai produce an estimated 161 519.1 GWh per year, while Bangkok is highly exposed to gas-fired generation; 17 plants near the city produce an estimated 83 039.9 GWh.

Many elements of the legal and regulatory framework needed to manage emissions from power plants have been established. The countries in the region with coal-fired power generation (i.e. all except Brunei Darussalam) have established emissions standards for particulate matter, nitrogen oxides and sulphur oxides. National legislation differs in kinds of actions that local authorities can take to deal with emissions from coal power plants. In Indonesia, local governments are allowed to set their own emission quality standards, while in Lao PDR local authorities provide recommendations in the preparation of power plant projects. Local governments in Thailand are allowed to establish their own emissions standards, although none have yet done so. Local governments also have the authority to suspend plant operations in Indonesia, Lao PDR, Malaysia, Myanmar and Thailand (ERIA, 2017).

Table 3.4. **Fossil fuel power plants near selected Emerging Asian cities**

Plants within 100 kilometres of city centres

	Number of plants			Total annual estimated generation (GWh)		
	Coal	Gas	Oil	Coal	Gas	Oil
Phnom Penh, Cambodia	-	-	2	-	-	296.5
Jakarta, Indonesia	6	14	1	34 626.4	29 136.5	931.4
Kuala Lumpur, Malaysia	1	6	-	8 513.9	33 550.2	-
Yangon, Myanmar	-	4	-	-	2 237.7	-
Manila, Philippines	6	3	5	9 511.5	8 821.7	3 997.6
Singapore, Singapore	3	8	3	26 126.0	47 042.0	345.0
Bangkok, Thailand	-	17	-	-	83 039.9	-
Ho Chi Minh City, Viet Nam	1	7	4	792.2	33 769.2	339.1
Shanghai, China	27	14	-	161 519.1	19 124.5	-
Mumbai, India	4	8	8	18 344.5	2 367.8	1 969.9

Notes: Plants are classified by their primary fuel source. Selected cities are the largest by population in their respective countries. The database does not include any plants using coal, gas or oil within 100 km of Bandar Seri Begawan, Brunei Darussalam or of Vientiane, Lao PDR. Annual estimated generation refers to actual electricity generated.

Source: OECD Development Centre's calculations, using Global Energy Observatory, Google, KTH Royal Institute of Technology in Stockholm, University of Groningen and WRI (2018), *Global Power Plant Database*.

Given the extent of fossil fuel use in the region's power sector, investments in reducing emissions from coal, gas and oil power plants could have a large impact in moderating urban air pollution. The ASEAN Clean Coal Technology (CCT) Handbook for Power Plant, Version 2 was released in December 2017 by the ASEAN Centre for Energy (ACE) and the Japan Coal Energy Center (JCOAL) in close co-operation with the ASEAN Forum on Coal (AFOC). In addition to outlining plans and actions being taken by ASEAN Member States, the study notes best practices in clean coal technology that may be suitable for the region, including integrated coal gasification combined cycle (IGCC), risk-based maintenance (RBM), and combustion optimisation and upgrading technologies (ACE, 2017). Financing options for investments in environmental facilities at power plants include increases as well as reforms to electricity pricing, with temporary subsidies or borrowing from domestic or international sources for capital expenditure (ERIA, 2017).

The expansion of renewables can also play an important role in reducing the power sector's contributions to urban air pollution. Electricity generation from renewable sources (hydro, geothermal, bioenergy, wind, solar PV and others) in Southeast Asia accounted for 21% of TPED in power generation in 2016 and is expected to increase to 31% by 2040 (IEA, 2017b). An aspirational target set by ASEAN's energy ministers calls for a 23% share of renewables in total primary energy supply (TPES) by 2025. Most countries in the region have also set national renewable energy targets. To achieve these, a range of policy support measures for renewable energy projects is being used in the region, including feed-in tariffs (FITs); tax relief; capital subsidies; public investment, loans and grants auction schemes; and others. Among the main obstacles remaining are challenges in grid access, administrative barriers and energy pricing (OECD, 2017).

As demand continues to increase, energy conservation efforts may also help to reduce pollution by slowing needed increases in power generation and other forms of energy. Across Emerging Asia, TPES in kilotonne of oil equivalent (ktoe) per unit of GDP fell by 29.8% between 2000 and 2015. Targets for further improvements in efficiency in electricity consumption have been set in Malaysia and Myanmar, and for energy consumption generally in other countries in the region. At the regional level, relative to GDP, the ASEAN Plan of Action for Energy Cooperation (APAEC) calls for a 20% reduction in ASEAN's energy intensity from 2005 levels by 2020.

Investment in reducing industrial pollution to drive greener growth

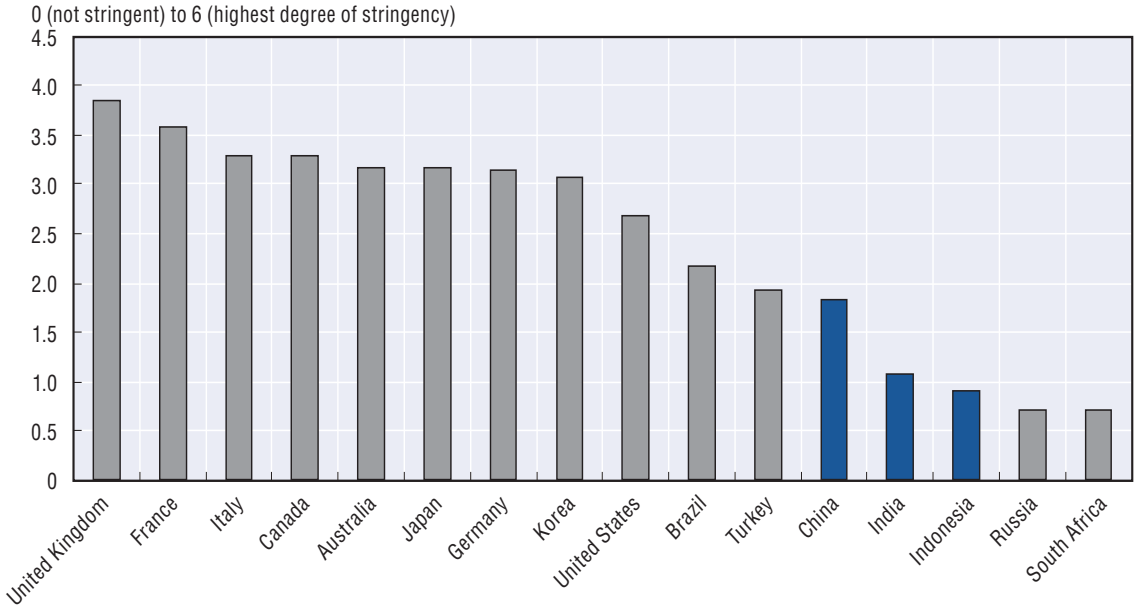
Along with power plants, heavy industry is a large contributor to air pollution from stationary sources. This occurs both indirectly because manufacturing makes intensive use of electricity generated at plants using fossil fuels, and directly because cement plants, iron and steel plants, and industrial boilers are major contributors to total emissions of nitrogen oxides, sulphur dioxides and particulate matter (Li et al., 2017). To some extent structural transformation generally and the continued growth of the services sector across the region in particular can reduce the share of economic activity in industry and associated contributions to pollution. In China, the reduction of excess capacity in key industries as required by the 12th Five-Year Plan, targeting outdated production capacity, led to the closure of many high-polluting sites and restrictions on the establishment of new production, including in steel, cement, electrolytic aluminium, flat glass and shipbuilding. However, industry remains a large and growing component of the Emerging Asian economy. Industry declined as a share of Emerging Asia's GDP from 42.6% in 2010 to 37.6% in 2016, but increased in Cambodia, Lao PDR and Myanmar over this period and grew in real terms in all countries but Brunei Darussalam. Policy solutions are therefore needed to encourage investments in pollution mitigation by industry.

Policy measures to reduce air pollution can help in developing synergies with other environmental, social and economic priorities, such as developing the green economy and combating climate change. Increasing integration between policy interventions has also increased cost efficiency. Across OECD member countries, a range of policies have been used in managing air pollution, including regulatory approaches (e.g. reporting requirements, industrial and automobile emissions standards), economic instruments (e.g. tradeable pollution permits, fuel and emissions taxes, and incentive programmes) and others (e.g. air quality reporting and monitoring and voluntary programmes) (OECD, 2012a).

Many of these policies are also being used in Emerging Asia, notably to deal with industrial air pollution. Firms in the Philippines are required to use the best available pollution control technologies. Some countries provide tax and subsidy schemes as incentives for industry to invest in pollution abatement. Capital allowance incentives for the installation of pollution control equipment are available in Malaysia, under the Income Tax Act of 1997; tax incentives are offered for the adoption of energy efficient or pollution control equipment in Singapore; incentives are offered by the national and lower-level governments under the Cleaner Production Promotion Law of 2002 in China; and small-scale industry has access to a credit-linked capital subsidy scheme for technology upgrades in India.

Despite the presence of such policies, polluters in general face relatively low costs in the region. Indonesia, China and India, the three Emerging Asian countries included in the OECD Environmental Policy Index, have relatively less stringent environmental policies (based on the degrees to which environmental policies place either explicit or implicit prices on polluting and other activities harmful to the environment) than most other countries evaluated (Figure 3.6). Considerable improvements have been made in these three countries in recent years, however; between 2000 and 2015, these results increased from 0.5 to 2.2 in China, from 0.6 to 1.8 in India and from 0.4 to 1.1 in Indonesia. The use of environmental taxes in particular varies to a large degree across the region. In 2013, environmentally-related taxes accounted for 13.7% of total tax revenue in India and 7.3% in China, but only 1.4% in Malaysia and 1.3% in the Philippines.[2] A new law in China that came into effect at the beginning of 2018 introduced new taxes on polluters. It will likely affect these rates in future, although its main purpose is not to raise revenue.

Figure 3.6. **OECD Environmental Policy Stringency Index, 2015**



Source: OECD (2018a), *OECD Environmental Policy Stringency Index*.
StatLink https://doi.org/10.1787/888933966561

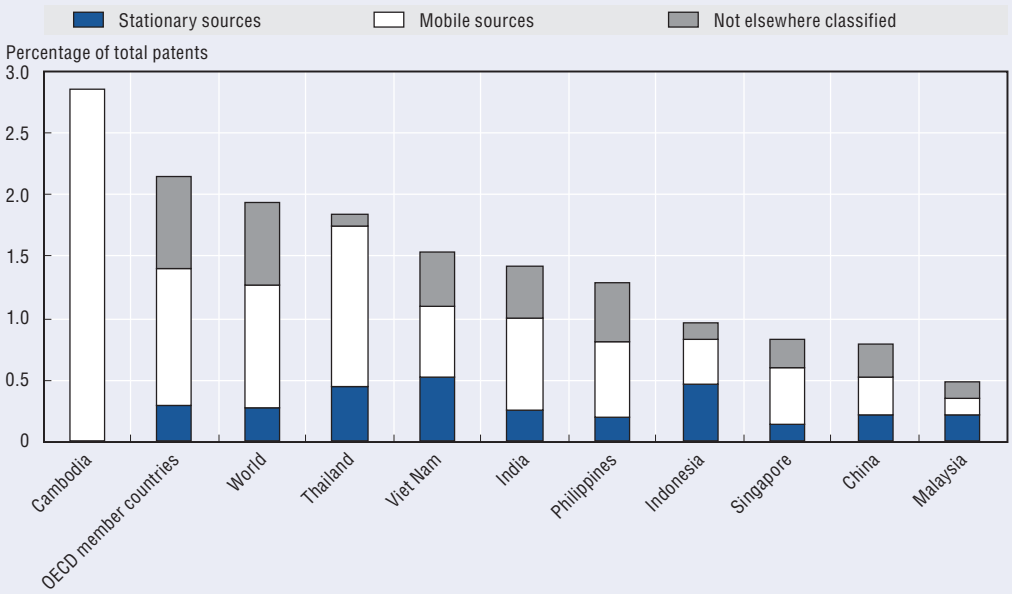
More generally, there is potential for reducing urban air pollution in the region alongside green growth, through green investments in a broad range of areas of economic activity and urban development. For example, the building sector – including space heating and cooling, water heating, lighting, appliances and cooking equipment in residential, commercial and industrial buildings – accounts for 55% of anthropogenic emissions of fine particulate matter, 5% of all nitrogen oxide emissions and 7% of sulphur dioxide emissions globally (IEA, 2016). Reducing emissions from this sector requires replacing kerosene lighting with electricity, and improving access to clean cooking facilities. Additional attention could also be paid to increasing innovation to improve air quality and other environmental problems (Box 3.4).

Box 3.4. **Innovation to improve air quality and the environment: More can be done**

Despite the high levels of air pollution in Emerging Asian cities, abatement technologies account for only a small share of total patenting in the region. Except for Cambodia, with its low total number of patents, all countries in the region had a smaller share of patents related to air pollution abatement over 2010-14 (the most recent five-year period for which data is available) than the OECD member countries (2.2%) or the world (1.9%) (Figure 3.7). No air pollution abatement patents were filed in this period in Brunei Darussalam, Lao PDR or Myanmar. As in OECD member countries and around the world, more of the region's air pollution abatement patents concerned mobile rather than stationary sources; only in Indonesia and Malaysia was the opposite case.

Box 3.4. **Innovation to improve air quality and the environment: More can be done** *(cont.)*

Figure 3.7. **Air pollution abatement technology patents, 2010-14**



Source: OECD (2018b), *Patents – Technology Development*.
StatLink https://doi.org/10.1787/888933966580

Green innovation depends on many of the same policies as innovation generally, but may be particularly affected by the presence of clear and stable market signals, such as the pricing of externalities; public investment in basic research; enhanced international co-operation; and interventions to overcome market failures associated with the dominance of existing technologies, systems and incumbent firms (OECD, 2011). The relative importance of these factors depends on country-specific factors. For example, the extent of international collaboration in all environment-related technology development – defined as the share of patents with at least two inventors in different countries – varied from an annual average over 2010-14 of 71% in China to 1% in Indonesia. Chinese inventors working on environmental management collaborated with those in the United States in particular; over 2010-14 there were 243 patents in this area by partners in these countries.

Conclusion

Environmental hazards – both anthropogenic and natural in origin – can create unique challenges in cities. Rapid urbanisation in Emerging Asia, which is expected to continue in the future, and climate change make it all the more important that policies are implemented to reduce air pollution and promote resilience against natural disaster risks. Efforts to reduce pollution in cities could target major sources of urban emissions: transportation, power generation and industry. Many of the actions needed will be taken at the local level. Central and other higher levels of government also have roles to play, particularly in setting the legislative and regulatory frameworks for policy. Regional co-operation is also important, since environmental hazards are often transborder issues. In addition, co-operation provides opportunities for the sharing of lessons learned and successes with others.

Annex 3.A1. Urban ambient air pollution cost estimation methodology

To maximise the scope of this analysis and improve the comparability of results between countries, data on estimated air pollution in 2016 were taken from the WHO's Data Integrated Model for Air Quality (DIMAQ), which provides modelled annual mean concentrations of outdoor fine particulate matter ($PM_{2.5}$) for 0.1° x 0.1° land areas using data from ground measurements and other sources (WHO, 2017). Using gridded global estimates of population counts and density for 2015 at a resolution of 2.5 minutes (CIESIN, 2017), areas with population densities of at least 1 500 people per square kilometre are defined as urban, following part of the definition of "urban high-density clusters" in OECD (2013). These locations were matched to the nearest estimated $PM_{2.5}$ values in the WHO database. As a result, all observations for Brunei Darussalam were removed from the analysis. A total of 5 279 unique estimates of fine particulate pollution were matched to 14 363 urban areas with a total population of 941.9 million (Table 3.A1.1). Estimated annual average concentrations of $PM_{2.5}$ µg/m³ in the region's urban areas range from 7.1 to 52.8, with the median urban individual in Emerging Asia exposed to 52.8 µg/m³.

Table 3.A1.1. **Estimated air pollution in Emerging Asian urban areas**

Annual average $PM_{2.5}$ (µg/m³)

	Number of unique estimates used	Lowest estimate	Median individual estimated exposure	Highest estimate
Cambodia	9	18.4	30.2	30.4
Indonesia	311	7.1	20.1	43.5
Lao PDR	5	19.9	33.8	33.8
Malaysia	65	9.8	19.0	23.8
Myanmar	21	24.6	31.7	58.2
Philippines	374	9.0	20.6	27.9
Singapore	6	15.6	16.9	20.8
Thailand	54	12.8	27.7	33.3
Viet Nam	124	13.8	33.5	47.2
China	2 847	14.4	53.6	152.2
India	1 463	9.8	84.6	343.4
Emerging Asia	5 279	7.1	52.8	343.4

Source: OECD Development Centre's calculations, using WHO (2017), *Data Integration Model for Air Quality* (database).

Due to data limitations on causes of death, all-cause mortality rates were estimated. Similarly, due to the limited available data on health and income factors at the city level in much of the region, this analysis focused on mortality effects and excluded morbidity effects of air pollution, although the associated costs of these effects tend to be smaller (Sander et al., 2015). EU data suggest, for example, that morbidity costs – including those associated with chronic bronchitis, restricted activity and lower respiratory symptoms – are approximately 10% of mortality costs (OECD, 2014c), although this was not applied here due to a lack of similar information on Emerging Asian countries. Other non-health costs caused by air pollution were also excluded. For these reasons, the costs estimated here are likely to understate the full economic costs associated with urban air pollution in Emerging Asia.

A concentration-response function was used in estimating additional mortality associated with elevated levels of ambient air pollution. It was assumed that excess risk of death by all causes increases by 6% per increase of 10 µg/m³ of $PM_{2.5}$, identified in a meta-analysis of studies of long-term air pollution exposure and mortality rates,

including recent studies in Asian countries (Hoek et al., 2013). Local-level relative risk (*RR*) associated with long-term exposure to pollution levels in excess of this amount was then calculated as:

$$RR_i = 1.06^{(c_i - c_0)/10},$$

where c_i is the concentration of fine particulate pollution in area *i* and c_0 is the comparison concentration of pollution. While there is no known level of safe exposure to fine particulate matter, the WHO guideline of 10 µg/m^3 annual mean was used as the counterfactual for all cases (WHO, 2005). The share of country and regional mortality associated with levels of air pollution above this guideline was then calculated using the population attributable fraction (*PAF*) formula:

$$PAF = \sum_{i=1}^{n} p_i \frac{RR_i - 1}{RR_i},$$

where p_i is the population share of area *i*. The number of deaths associated with air pollution in each country was calculated using these results and national crude death rates. Crude death rates were available for urban areas for Malaysia and India and for all areas for the remaining countries. Data on urban-rural differences in adult mortality is limited, but the experience of India suggests differences between these groups are limited for most age groups (Subramanian et al., 2006). Across Emerging Asia, an estimated 1.5 million residents of urban areas died in 2016 as a result of elevated levels of air pollution (Table 3.A1.2).

Table 3.A1.2. **Estimated additional urban mortality associated with elevated pollution levels**

Country	Additional deaths annually (thousands)
Cambodia	1.3
Indonesia	28.9
Lao PDR	0.3
Malaysia	2.5
Myanmar	7.4
Philippines	15.7
Singapore	1.2
Thailand	11.3
Viet Nam	17.4
China	767.8
India	614.5
Emerging Asia	1 468.1

Source: OECD Development Centre's calculations, using WHO (2017), *Data Integration Model for Air Quality* (database).

The economic costs of additional mortality associated with elevated levels of pollution were estimated using country-specific values of statistical life (VSLs), based in turn on estimates of individuals' willingness to pay for a marginal reduction in the risk of a premature death (OECD, 2012b). Premature deaths also create economic costs due to forgone labour output, though these tend to be smaller than welfare losses (World Bank, 2016). Country-level VSLs are taken from Viscusi and Masterman (2017), which estimated VSLs for countries lacking sufficient data were taken by transferring a base value for the United States using data on job-related mortality risks and relative income levels (Table 3.A1.3). In total,

the increased mortality caused by excessive levels of urban air pollution in Emerging Asia resulted in welfare costs totalling USD 1.28 trillion in 2015 dollars, with most of these costs (USD 1.05 trillion in 2015 dollars) originating in China.

Table 3.A1.3. **Estimated additional urban mortality associated with elevated pollution levels**

Country	VSL (2015 USD millions)	Welfare loss of pollution-related mortality (2015 USD millions)
Cambodia	0.184	237.6
Indonesia	0.592	17 094.3
Lao PDR	0.299	88.0
Malaysia	1.819	4 477.4
Myanmar	0.200	1 477.4
Philippines	0.611	9 585.5
Singapore	8.962	10 404.6
Thailand	0.984	11 129.4
Viet Nam	0.342	5 937.8
China	1.364	1 047 240.8
India	0.275	168 993.5
Emerging Asia	n/a	1 276 666.5

Sources: OECD Development Centre's calculations, using WHO (2017), *Data Integration Model for Air Quality* (database); Viscusi, K. and C. J. Masterman (2017), "Income elasticities and global values of a statistical life", *Journal of Benefit-Cost Analysis*, 8:2.

Notes

1. Data are not available for Cambodia, Lao PDR or Myanmar. Totals were calculated from country-level estimates for the remaining nine countries in the region using OICA (2018) estimates on international vehicle use.
2. The OECD compiles statistics on environmentally-related tax revenue for member countries and selected non-member countries, including from Emerging Asia, Malaysia, the Philippines, China and India.

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Statistical annex

Table A.1. **Real GDP growth of Southeast Asia, China and India**

Annual percentage change

Country	2017	2018	2019	2020
ASEAN-5				
Indonesia	5.1	5.2	5.1	5.1
Malaysia	5.7	4.7	4.4	4.6
Philippines	6.7	6.2	6.0	6.3
Thailand	4.0	4.1	3.5	3.6
Viet Nam	6.8	7.1	6.7	6.6
Brunei Darussalam and Singapore				
Brunei Darussalam	1.3	0.1	1.6	1.9
Singapore	3.7	3.1	2.4	2.5
CLM countries				
Cambodia	7.0	7.5	7.0	6.8
Lao PDR	6.9	6.4	6.6	6.7
Myanmar	6.8	6.2	6.9	6.9
China and India				
China	6.8	6.6	6.2	6.0
India	7.2	6.8	7.2	7.4
Average of ASEAN 10 countries	**5.3**	**5.1**	**4.9**	**5.0**
Average of Emerging Asia	**6.6**	**6.4**	**6.2**	**6.2**

Note: Data are as of 31 May 2019. Data of Cambodia and Myanmar in 2018 are preliminary estimates. Data of India and Myanmar relate to fiscal years. For Myanmar, the 2018 data are based on ADB (2019) and IMF (2019a) and refer to the interim period ending September 2018. Singapore and Thailand data are based on chain-linked volume measures. The projections for China, India and Indonesia are based on the OECD Economic Outlook No. 105 database.
Source: OECD Development Centre.

Table A.2. **Current account balances of Southeast Asia, China and India**

Percentage of GDP

Country	2017	2018	2019	2020
ASEAN-5				
Indonesia	-1.6	-3.0	-2.4	-2.3
Malaysia	2.8	2.1	2.3	2.3
Philippines	-0.7	-2.4	-2.2	-2.0
Thailand	11.0	7.0	7.0	6.8
Viet Nam	2.9	3.0	2.4	2.0
Brunei Darussalam and Singapore				
Brunei Darussalam	16.7	15.5	12.0	12.0
Singapore	16.4	17.9	18.1	18.3
CLM countries				
Cambodia	-7.9	-11.3	-10.1	-9.0
Lao PDR	-7.1	-8.0	-9.1	-11.2
Myanmar	-4.7	-2.0	-4.8	-6.0
China and India				
China	1.4	0.3	-0.1	-0.3
India	-1.8	-2.4	-2.4	-2.7
Average of ASEAN 10 countries	**2.5**	**1.1**	**1.2**	**1.1**
Average of Emerging Asia	**0.8**	**-0.2**	**-0.4**	**-0.6**

Note: Data are as of 31 May 2019. Data of Brunei Darussalam, Myanmar and Viet Nam in 2018 are estimates based on ADB (2019). Data of India and Myanmar relate to fiscal years. For Myanmar, the 2018 data refer to the interim period ending September 2018. The projections for China, India and Indonesia are based on the OECD Economic Outlook No. 105 database.
Source: OECD Development Centre.

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