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天津外国语大学(天外) Tianjin Foreign Studies University (TFSU)

Geoeconomics & Regional Development

Online class starts at 08:00
(Beijing Time, GMT+8)

Ivan Monich, PhD
April 17, 2023

Case study 12 in the PDF file: Tax on companies to support public transport and mobility: The Versement Mobilité in France

Category: Tax revenues



Case study 12: Tax on companies to support public transport and mobility: The Versement Mobilité in France

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Background: The just transition will require supporting a transition away from high-carbon emissions activities, while ensuring that alternative low-carbon solutions are equitably available to citizens. In France, the transportation sector accounts for 30% of the greenhouse gas emissions and more than 75% of employees in the country use cars to commute. This is particularly true in rural areas with a high dependency on cars, partly due to the limited public transport networks. Introducing policies and measures to develop public transport infrastructure in order to limit the dependency on private cars and reduce emissions in the transport sector is critical for the green transition, but it also needs to take into account affordability and equity.

Approach: To address the mobility challenges and make everyday transport more accessible, better adapted to the diversity of needs and cleaner, France passed a Mobility Orientation Law (*Loi d'orientation des mobilités*, LOM) in December 2019. The Law aims to reduce the dependence on individual cars, promote alternative mobility solutions, reduce greenhouse gas emissions and enhance transport infrastructure planning.

The Law replaced the transport payment tax (*versement transport*) with a mobility payment tax (*versement mobilité*). Similar to the previous transport payment tax, the mobility payment tax is levied on public and private employers with more than 11 employees, charged on the total gross salaries of all employees in a company or institution. This 11-employee threshold was chosen to exclude the smallest businesses deemed economically fragile. Such a tax underpins the idea that transport networks should not only be funded by users, but also by employers (enterprises and administrative services) who directly or indirectly benefit from the transport network, which also allows the employers to increase their recruiting opportunities and connections with employees and customers. Revenue from the mobility payment funds mobility services and part of the associated infrastructure (e.g. building new tram lines, replacing rolling stock, etc.), as well as actions contributing to the development of active or collective mobility (e.g., cycle paths, carpooling areas, carpooling platform, etc.).

Mobility payment tax revenue funds authorities who organise mobility (*Autorité Organisatrice de la Mobilité*, AOMs) in France to help them undertake investment and/or operation and maintenance of public transport services within their territorial scope. AOMs are entities responsible for organising at least one regular public transport and mobility services in territories (for example, a bus or metro line). In the majority of cases, it is the agglomeration communities, urban communities and metropolises that exercise the role of AOM in their territories. The Île-de-France region with Île-de-France Mobilités

is the exception, exercising the role of regional transport organizing authority and also the role of AOM for urban transportation. AOMs can decide the tax rates in their territory and can adjust it twice a year, within the ceilings set by the Law. The level of tax rate usually takes into consideration the population and level of urbanisation. Outside Île-de-France, the mobility payment rate is between 0% and 2.5% (depending on the size of the territory comprised by an AOM). In Île-de-France, the rate is between 1.6% and 2.95%. The rates are reassessed twice a year: (i) on January 1st and (ii) on July 1st. In practice, this tax is collected by the Unions for the Collection of Social Security Contributions and Family Allowances (URSSAF) and the *Caisses de la Mutualité Sociale Agricole* (CMSA), on behalf of AOMs.

Success / Impact: This type of tax was first established in the Paris metropolitan region, financing the Île-de-France public transportation infrastructure. The tax was then gradually extended to smaller municipalities across the rest of the country to support increased transport investment. In 2017, EUR 4.3 billion euros was collected in regions other than Paris metropolitan region, which represented up to 47% to their public funding for transport (investment and operations). In 2020, over 250 AOMs in France had set up the mobility payment tax within their geographical boundaries. As of today, the mobility payment represents more than 60% of the Île-de-France Mobilités (the AOM for Paris metropolitan region) budget.

Sources:

Group of Authorities Responsible for Transportation (2021), Mobility orientation law: decryption of the main provisions, Guide for authorities organizing mobility, <https://www.gart.org/wp-content/uploads/2020/01/Guide-de-d%C3%A9cryptage-de-la-LOM-Documents-GART-V1-Janvier-2020.pdf>
 French Mobility (n.d.), Le Versement Mobilité, <https://www.francemobilités.fr/loi-mobilités/faq/versement-mobilité>
 Bercy Infos (2022), Ministère de l'économie, des finances et de la souveraineté industrielle et numérique : Le versement mobilité, ça vous concerne ?, <https://www.economie.gouv.fr/entreprises/versement-mobilité-transport>
 Île-de-France Mobilités (2022.), Versement mobilité, <https://www.iledefrance-mobilités.fr/decouvrir/versement-mobilité>
 Minster. C and Desclos. T (2020), Alternative revenue sources for urban transport: presentation and discussion on the French mobility tax, <https://www.codatu.org/actualites/alternative-revenue-sources-for-urban-transport-presentation-and-discussion-on-the-french-mobility-tax-by-thierry-desclos-clotilde-minster-world-bank/>
 Think Smart Grids (2019), The French mobility orientation law, <https://www.thinksmartgrids.fr/en/actualites/french-mobility-orientation-law>
 République Française (2021), Versement mobilité, <https://entreprendre.service-public.fr/vosdroits/F31031>



Case study 12: Tax on companies to support public transport and mobility: The Versement Mobilité in France

Category: Tax revenues



[JianingWang](#)

The mobility payment tax was implied to reduce the dependence on individual cars, promote alternative mobility solutions, reduce greenhouse gas emissions and enhance transport infrastructure planning. As for its successful impact, It financed the lie-de-France public transportation infrastructures, which took more than 60% of the infrastructure budget.

[2107574036Xinke Jiao](#)

To reduce the dependence of public on cars which can alleviate the carbon emissions, Paris government innovates to gain tax not only from users but also those who get interest. This way can expand the fund source and have more money to support the infrastructure development which is useful for both public and government. Because the public can get easier access to public transport and government will have less burden on infrastructure construction.

[Chenyang Wu 2107574011](#)

The mobility payment tax was set to finance the construction of transportation, which was not only levied on employee but also on employers who also benefit from the positive externalities of the transport invest. Besides, different regions can select respective mobility payments tax rate. These proactive measures exert a great impact of the revenue of the government transportation revenue.

[Tianzi Mao2107574005](#)

In order to reduce the dependence on individual cars and greenhouse gas emissions, France passed a Mobility Orientation Law. The mobility payment tax is charged on the total gross salaries of all employees in a company or institution. It allows the employers to increase their recruiting opportunities and connections with employees and customers. It also contributes to the development of active or collective mobility. This tax will gradually benefit smaller municipalities across the rest of the country to support increased transport investment.

[Heyi Sun2107574037](#)

In France, the transportation sector accounts for too much greenhouse gas emissions. In order to reduce the dependence on private cars and develop public transportation infrastructure, France formulated the Mobility Orientation Law, which replaced the transport payment tax with the mobility payment tax to provide funds for public infrastructure.



Case study 16 in the PDF file: Reducing land acquisition costs for infrastructure projects: The use of Transferable Development Rights in Hyderabad, India

Category: land Value Capture



Case study 16: Reducing land acquisition costs for infrastructure projects: The use of Transferable Development Rights in Hyderabad, India

Category: Land value capture

Background: In 2015, the Greater Hyderabad Municipal Corporation (GHMC) with a population of 10.5 million, announced the first phase of the Strategic Road Development Plan. One of the key projects in the Plan are highway corridor developments (road widening) and nala (a type of drain) widening, which required over 300 properties to be acquired. The cost of property acquisition was estimated at USD 252 million by 2017, which would have represented a large portion of the overall budget for the Development Plan.

Approach: To reduce the land acquisition costs, the GHMC adopted the use of Transferable Development Rights (TDRs). Through the issuance of Development Right Certificates (DRCs), the owner of land in a defined area is compensated for every square metre surrendered to an Urban Local Body (ULB) or other relevant authority. In compensation, DRCs are provided based on a percentage defined by the amount and type of land surrendered. DRCs can then be used to build in other 'receiving' areas beyond what would otherwise be permitted. While areas granted DRCs usually have environmental or heritage values, receiving areas ("buyer" or recipient of the TDR) are generally more suited for higher density developments.

In Hyderabad, land transferred for road widening was compensated by providing an extra 150% worth of development rights. In other words, for every square metre lost, 2.5 metres were made available to build elsewhere. Later on, in order to make the TDR contracts more attractive and support land acquisition, the GHMC increased the percentages – and the compensation for

road widening was increased to 400%, 200% for lakes and water bodies, and 100% for heritage buildings.

The GHMC has also created an online 'TDR bank' so that buyers and sellers can more easily and transparently exchange their development rights. This innovation has been recognised by the Central Government as one of the best practices in the country.

Impact: By April 2021, the total number of TDRs issued by the GHMC reached 807 with a total value of USD 143.5 million. This has resulted in savings of USD 190 million as compared to traditional land acquisition framework. In 2017, the federal Ministry of Housing and Urban Affairs announced a 'Value Capture Finance Policy Framework', recognising TDR as one of the ten methods which can be adopted by the federal government, states and ULBs. This method is also being used in Mumbai, Ahmedabad, and other cities in India for various purposes including heritage conservation, lake and water body conservation, slum improvement, development of public housing and road widening.

Sources:

NITI Aayog (2021), Transferable Development Rights: Guidelines for Implementation of TDRs for Achieving Urban Infrastructure Transition in India, <https://www.niti.gov.in/sites/default/files/2021-09/TDRguidelines.pdf>
Financial Express (2020), Transferable development rights: A win-win deal, <https://www.financialexpress.com/opinion/transferable-development-rights-a-win-win/1deal/2129753/>
Hans, A. (2020), Transferable development rights: A robust policy tool to address India's urban infrastructure voids, World Bank Blogs, <https://blogs.worldbank.org/ppps/transferable-development-rights-robust-policy-tool-address-indias-urban-infrastructure-voids>
Proptiger (2017), Hyderabad Gears Up For An Ambitious Road Development Project, <https://www.proptiger.com/guide/post/hyderabad-gears-up-for-an-ambitious-road-development-project>
The Hindu (2021), Record TDRs issued by civic body, <https://www.thehindu.com/news/national/tehranana/record-tdrs-issued-by-civic-body/article34286191.ece>
The Times of India (2021), Pandemic cloud: TDR turns lifeline for major projects, <https://timesofindia.indiatimes.com/city/hyderabad/pandemic-cloud-tdr-turns-lifeline-for-major-projects/articleshow/81994979.cms>
World Population Review, (2022), Hyderabad Population 2022, <https://worldpopulationreview.com/world-cities/hyderabad-population>



Case study 16:

Reducing land acquisition costs for infrastructure projects: The use of Transferable Development Rights in Hyderabad, India

Category: land Value Capture



[Chenyang Wu 2107574011](#)

In order to reduce the costs of land acquisition, the GHMC issued the DRCs, which can be transferred between the owners and the recipients. The owner can enjoy a high value from the land while the recipe can even have higher gains from the acquisitions and development of these areas. At the same time, the government will compensate for the owners of land according to the sizes and scale of the land. As a result, these DRCs have helped government to save a great amount of money for constructing the infrastructure like widening the roads and drains.

10:59

[Chenyang Wu 2107574011](#)

I propose the fifth case to be the "6" on the list because altogether 56 is a lucky one:)

[Chenyang Wu 2107574011](#)

in Chinese

[Ivan](#)

I propose to have one more case-study to have five examples of the attracting funds to the public infrastructure. 五 is a better number then 四 :-)

11:04

[Zhixuan Gong](#)

To reduce the cost of land acquisition for infrastructure projects, GHMC uses TDRs and TDR bank to build a trading platform between owners and developers. Owners can benefit from the land, and developers can continue to develop the land. In the middle, the government will compensate landowners according to the size and scale of the land. This model has helped other Indian cities develop cultural heritage conservation, environmental protection, slum development and so on

[2107574036Xinke Jiao](#)

To reduce the land acquisition cost, the GHMC adopted the TDRs, throughout DRCs, which is useful. Also, it compensated farmers according to their land size, which is The owner can enjoy a high value from the land while the recipe can even have higher gains from the acquisitions and development of these areas. At the same time, the government will compensate for the owners of land according to the sizes and scale of the land. As a result, these DRCs have helped government to save a great amount of money for constructing the infrastructure like widening the roads and drains.



6 5-minute break

Case study 06 in the PDF file:

Collective risk pooling for city disaster risk reduction and management: The City Disaster Insurance Pool in the Philippines

Category: Co-ordination, cooperation and stakeholder engagement



Source: Manila, Philippines 2023: Best Places to Visit Tripadvisor
https://www.tripadvisor.com/Tourism-g298573-Manila_Metro_Manila_Luzon-Vacations.html Accessed: 2023-04-17

Case study 6: Collective risk pooling for city disaster risk reduction and management: The City Disaster Insurance Pool in the Philippines

Category: Co-ordination, cooperation and stakeholder engagement

Background: The Philippines is located in one of the world's most disaster-prone regions in the world. The country is exposed to earthquakes, volcanic eruptions, typhoons as well as floods, droughts, and landslides. Although the risk of each of these natural disasters varies across the country, cities typically face particularly high disaster risk due to their density of people and infrastructure. Cities are obliged by law to budget for disaster risk management, which allows them to later access funding from the Local Disaster Risk Reduction and Management Funds in the event of a disaster to repair or rebuild essential infrastructure. Nonetheless, securing adequate resources for post-disaster recovery actions is not always simple. Cities often confront delays when seeking to access to funding to support early recovery measures. This can increase the negative impact of disasters on local economies as well as on the welfare of those affected.

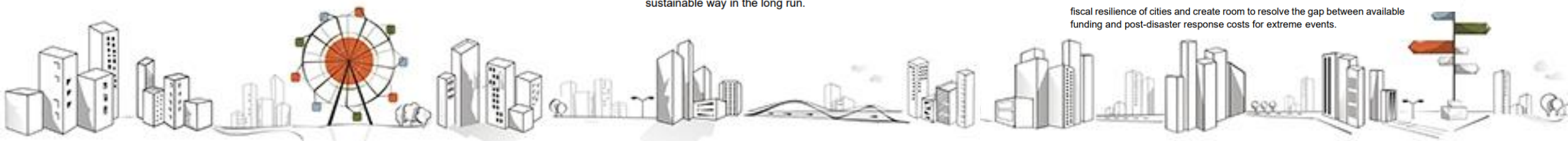
Approach: With the technical assistance of the ADB, the Philippine Department of Finance developed the Philippine City Disaster Insurance Pool (PCDIP) to provide rapid post-disaster access to pay-outs for local tiers of government under the government's 2015 Disaster Risk Financing and Insurance Strategy. Its primary objective is to create a structure under which city governments can jointly buy insurance through a single platform, thereby reducing the price of premiums and increasing the speed of payment disbursements. The PCDIP was created as a Special Purpose Vehicle (SPV) within the Government Service Insurance System in Philippine. The PCDIP assets will be ring-fenced from GSIS's assets. The management board of PCDIP is composed of representatives of cities and national government agencies. The initial pool capital is to come from a sovereign loan from ADB secured by the national government. The PCDIP's design has taken into account the different needs and fiscal capacities of city governments so that the pool is ultimately able to honour pay-outs in a timely and financially sustainable way in the long run.

As a pilot project, ten cities were selected on the basis of disaster risk incidence, demographic factors, and socio-economic indicators to collectively participate in the design of the pool. The insurance under the pool works as follows:

- Risk modelling services will be provided by an external provider to set premium levels for individual cities;
- City governments buy parametric insurance from GSIS based on the type of natural hazards they perceive as a threat, and select the frequency and size of pay-outs they would like to receive, as well as the funding available for premium payments. Parametric insurance pay-outs are determined based on the physical features of a natural hazard event (e.g. wind speed of typhoons), rather than on the actual losses suffered by a policyholder.
- GSIS will pass the premium through to the PCDIP and GSIS will take a small fee (known as a fronting fee) to perform the service of providing the city insurance policies and handling pay-outs, and the PCDIP will reinsure with reinsurance markets.
- Once a disaster strikes, an independent scientific agency verifies the parameters driving pay-outs. Since the PCDIP bypasses the lengthy loss assessment required by traditional insurance, pay-outs can thus be expected in no more than 15 business days of qualifying disaster events.

Impact: The pilot scheme is still underway and will be unique in the Southeast Asia region. Its design as a collective risk pooling arrangement is expected to reduce the price of premiums via numerous mechanisms. First, it combines risk across multiple city governments to reduce the volatility of potential total losses by the group, thereby providing increased stability in the group's funding requirements, as well as diminished capitalisation and reinsurance costs. Second, cities are expected to benefit from economies of scale by sharing inherent setting-up costs of any insurance products. Third, city governments can retain profits made by the pool during periods when disasters happen less frequently, as compared to paying them to insurance companies. Finally, a collective risk pool constitutes a platform to enhance disaster risk management knowledge and capacity, share experiences, and conduct capacity-building activities. Overall, given that the size of pay-outs should become easier to predict, it is expected that the PCDIP will bolster the

fiscal resilience of cities and create room to resolve the gap between available funding and post-disaster response costs for extreme events.



Case study 06 in the PDF file: Case study 6: Collective risk pooling for city disaster risk reduction and management: The City Disaster Insurance Pool in the Philippines

Category: Co-ordination, cooperation and stakeholder engagement



[2107574016Jiaxin Wang](#)

For disaster-prone countries, such a rapid compensation mechanism is no different from very beneficial. The reduction of insurance premiums and risk allocation obtained through multi-party cooperation benefit the group in the case of low disaster frequency, and can quickly help victims rebuild their homes and restore their lives in the case of frequent disasters. The whole case has certain reference significance for disaster-prone countries.

11:34

[2107574036Xinke Jiao](#)

To reduce the negative impact of disaster and raise more money for the reconstruction of infrastructure, government innovated the PCDIP, where government will purchase insurance mutually through one single platform. What's more, after the disaster, this institution includes successive procedures, from an objective evaluation to finally get the money in no more than 15 days. It is based on scientific evidence, thus reducing extra immoral asks for money. This means not only alleviates government's budget deficits for disaster, but also reduces the time to wait for money help, which is beneficial to both public and government.

[2107574016Jiaxin Wang](#)

For disaster-prone countries, such a rapid compensation mechanism is no different from very beneficial. The reduction of insurance premiums and risk allocation obtained through multi-party cooperation benefit the group in the case of low disaster frequency, and can quickly help victims rebuild their homes and restore their lives in the case of frequent disasters. The whole case has certain reference significance for disaster-prone countries.

11:34

[Chenyang Wu 2107574011](#)

First of all, Philippines is a country that is prone to be affected by natural disasters, during which the recovery funds may not be collected in time, causing even larger disasters. As for that, the PCDIP, as a part of the GSIS, pool the fund of different regions to hedge the risks and reduce the time lag for attaining funds after the natural disaster.

[210710wenye guo郭文烨](#)

The Philippines has established a risk insurance pool and transferred risks to the private reinsurance market, with GSIS acting as an intermediary agency responsible for transferring the agency's risks to private insurance companies. This has strengthened central and local management and disaster response capabilities, reduced the impact on humanitarian assistance, and saved funds by quickly initiating crisis response and disaster relief work.





22



23

24

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26

Southeast Asia is a major engine of global economic growth and energy demand

Southeast Asia's growing population and economy put its energy sector outlook firmly in the global spotlight. Its population has expanded by around 10% over the past 10 years and today there are around 660 million people across the region. Southeast Asia's economy grew by around 4.2% on average each year between 2010 and 2019.

Each of the 10 countries in ASEAN is distinctive in terms of its stage of development, industrial output, politics, history and geography. For example, energy demand per capita in Myanmar or Cambodia is about one quarter of the world average, while in Singapore it is about three times larger than the world average. Increases in manufacturing have been the driving force behind the economic development in Thailand and Malaysia, while the Philippines has seen much more growth in its service industry. Energy policy priorities also differ from country to country, with different approaches to securing new energy supplies to meet expanding energy demand, achieving climate goals and ensuring access to affordable, reliable and modern energy for all. Nonetheless, a common denominator is a commitment to regional cooperation as a way to secure future prosperity and security.

Much has changed since our last regional energy outlook was published in 2019. In many countries, the level of policy ambition for energy has stepped up considerably. Southeast Asia has been hit

hard by the pandemic, resulting in a 4% fall in GDP and a 3% drop in energy demand in 2020 (followed by a smaller rebound in 2021). The major rise in oil and gas prices in the second half of 2021, intensified by Russian Ukrainian case in early 2022, has underscored risks to energy security and affordability and the region's rising reliance on imported oil.

Increased vulnerability to climate change is also [a serious threat to countries in Southeast Asia](#). Typhoons and floods are predicted to become increasingly violent and frequent. The Intergovernmental Panel on Climate Change (IPCC) highlights that Southeast Asia is one of the planet's most vulnerable regions to climate change.

This chapter explores the current energy landscape in Southeast Asia. Total primary energy demand in the region has increased rapidly over the past two decades, with large increases in coal, oil and natural gas use, as well as in renewable energy use. Industry has seen the largest level of growth of any sector, fuelled mainly by the cement and iron and steel sectors; power generation has almost tripled since 2000, with the largest increase coming from coal-fired power plants. In buildings, the traditional use of biomass has been displaced, mainly by electricity, as a result of economic development and urbanisation.

Part 2

Energy Outlook

Southeast Asia Energy Outlook 2022

iea



INTERNATIONAL ENERGY AGENCY

The IEA examines the full spectrum of energy issues including oil, gas and coal supply and demand, renewable energy technologies, electricity markets, energy efficiency, access to energy, demand side management and much more. Through its work, the IEA advocates policies that will enhance the reliability, affordability and sustainability of energy in its 31 member countries, 10 association countries and beyond.

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Foreword

This fifth edition of the Southeast Asia Energy Outlook underscores the close relationship that the International Energy Agency (IEA) enjoys with the countries of the Association of Southeast Asian Nations (ASEAN).

This work is the first region-focused energy outlook to be published by the IEA since the onset of the Covid-19 pandemic and the 26th Conference of the Parties in Glasgow, where participants reaffirmed their commitments to tackle climate change. The challenges facing energy policy makers – to provide clean, secure and affordable energy to all – have been made even more urgent by Russia. This report highlights how countries in Southeast Asia can respond to the current energy crisis in ways that improve their energy security and also advance worldwide efforts to mitigate climate change.

The IEA and ASEAN began formal cooperation in energy-related activities in 2011. In 2019, the IEA was named a “key strategic partner” to ASEAN in recognition of its extensive support in all aspects of Southeast Asia’s energy priorities under the ASEAN Plan of Action on Energy Cooperation. At last year’s ASEAN Energy

Ministers Meeting, we commemorated ten years of excellent IEA-ASEAN collaboration. As I have long said, Southeast Asia is an emerging heavyweight in global energy. As such, supporting the region in tackling key energy challenges will continue to be a central part of the IEA’s mission, both by working with individual countries and at the ASEAN level. Indeed, the findings and insights contained in this report have been underpinned by and are a reflection of the strength of our partnerships with all of the countries in Southeast Asia.

This report was a collaborative effort across the IEA under the outstanding direction of Tim Gould and the World Energy Outlook team. I take this opportunity to thank everyone, inside and outside of the IEA, whose support and expertise helped make it possible.

Dr. Fatih Birol

Executive Director

International Energy Agency

Table of Contents

Key findings	4
Energy in Southeast Asia	20
Today's energy trends.....	21
Factors shaping the energy outlook	34
Southeast Asia's Energy Prospects	47
Scenarios to 2050	48
Implications	84
Southeast Asia's Energy Perspectives	91
Investment for clean energy transitions	92
Low emissions fuels in Southeast Asia's transition	103
The role of flexibility in boosting power sector decarbonisation	114
Critical minerals in Southeast Asia	125
Annex.....	137

Introduction

The *Southeast Asia Energy Outlook 2022* is the fifth edition of this World Energy Outlook Special Report. Building on its important partnership with Southeast Asia, the International Energy Agency (IEA) has published these studies on a regular basis since 2013. The studies offer insightful prospects for the ten member countries of the Association of Southeast Asian Nations (ASEAN) – Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic (Lao PDR), Malaysia, Myanmar, the Philippines, Singapore, Thailand and Viet Nam.

Since the last edition of this report, the energy prospects for Southeast Asia have been affected by the Covid-19 pandemic, new energy and climate policy commitments and, most recently, high and volatile prices exacerbated by the Russian Federation. Covid-19 led to a major economic shock for countries in Southeast Asia and the economic recovery now risks being slowed by higher energy prices. In the run up to the UN Climate Change Conference (COP26) in November 2021, several governments in Southeast Asia announced ambitious targets for reaching neutrality and curbing reliance on coal-fired power.

Against this backdrop of new uncertainties and ambitions, this IEA report explores possible trajectories for Southeast Asia's energy sector, differentiated primarily by the policies pursued by governments across the region. It relies on the scenarios included in the latest edition of World Energy Outlook, namely:

The **Stated Policies Scenario (STEPS)**, which reflects the countries' current policy settings based on a sector-by-sector assessment of the specific policies that are in place or have been announced.

The **Sustainable Development Scenario (SDS)**, which delivers on the Paris Agreement goal to limit the temperature to “well below 2°C”, alongside the goals on energy access and air pollution. This scenario is consistent with Southeast Asia's current announced climate aspirations.

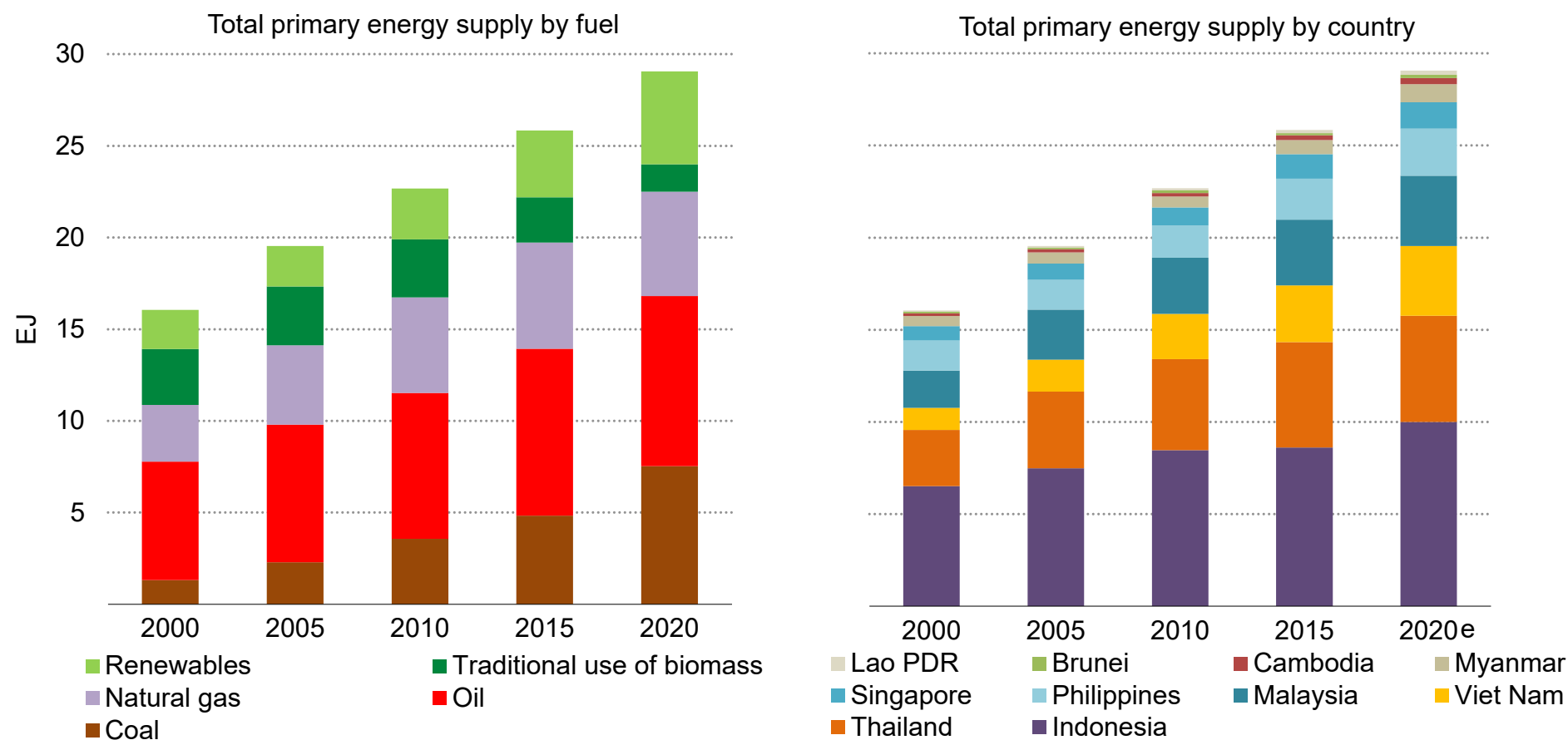
The **Net Zero Emissions by 2050 Scenario (NZE Scenario)**, which sets out a pathway for the energy sector to achieve net zero CO₂ emissions in 2050. It also achieves universal access to modern energy by 2030 and reduces energy-related air pollution significantly. The NZE Scenario provides a global benchmark against which changes at the regional level can be assessed. The NZE Scenario would limit the rise in global average temperatures to 1.5°C (with a 50% probability).

After a scene-setting discussion in the first chapter, the second chapter describes scenario projections across all fuels and technologies. The third chapter analyses four key areas in depth: investment for the clean energy transition, power sector decarbonisation focusing on system flexibility, low-carbon fuels, and the supply and demand of critical minerals.

Key findings

Southeast Asia has developed rapidly over the past two decades and the region is a major engine of global economic growth, but there are strong country-by-country variations

Total primary energy supply by country, by fuel, in Southeast Asia, 2000-2020

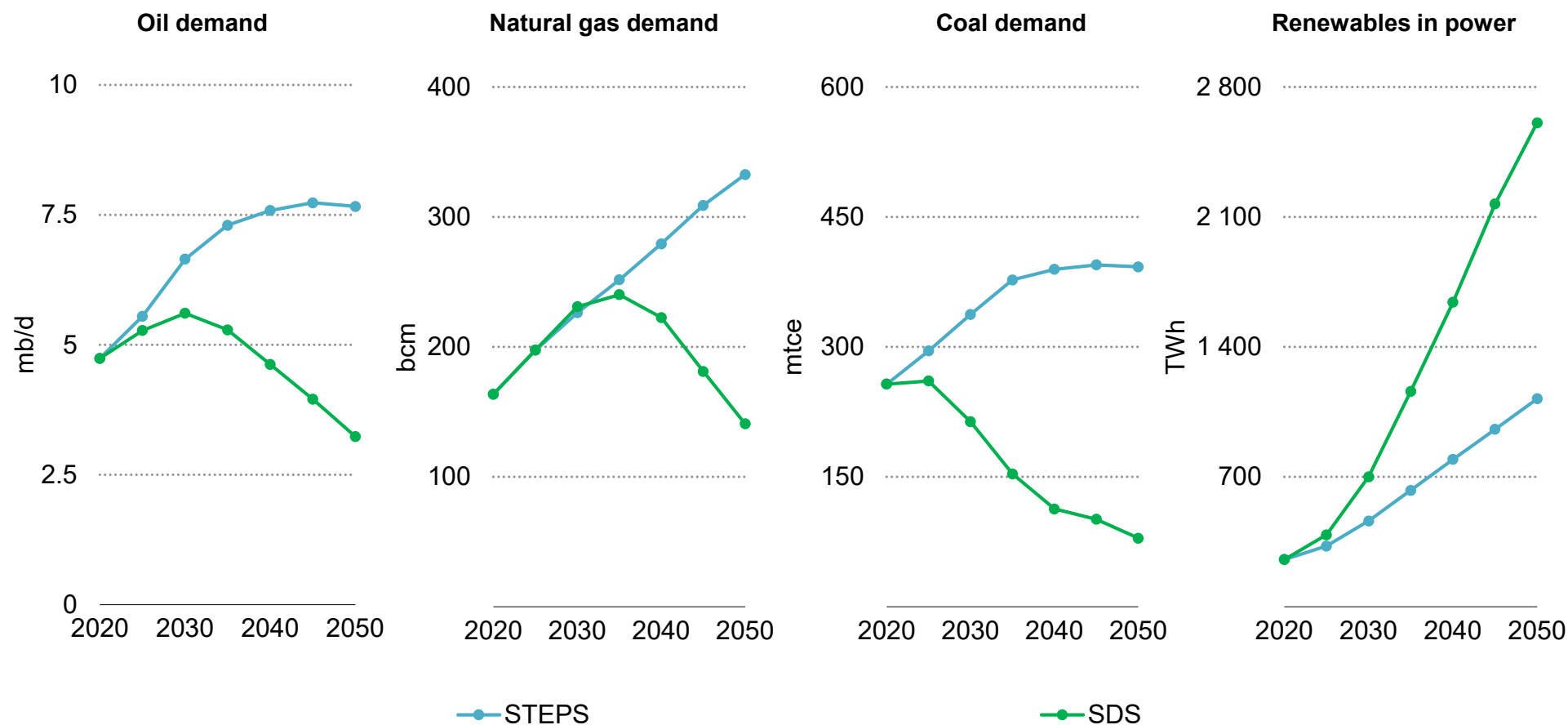


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Note: EJ = exajoule; 2020e = estimated values for 2020.

Southeast Asia's policy choices will have huge implications for its future energy mix

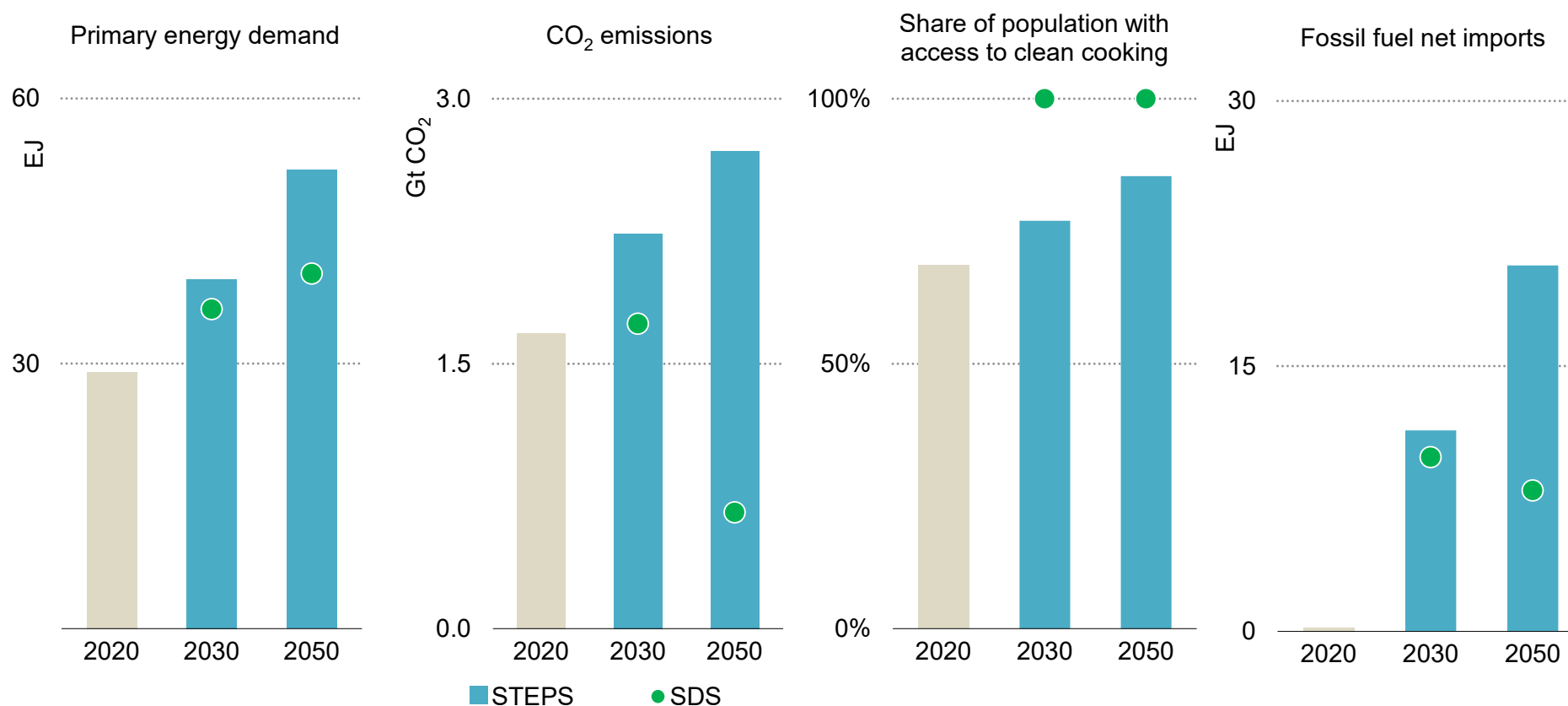
Energy demand trends in Southeast Asia by scenario, 2020-2050



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With today's policies, energy demand, fossil fuel imports and emissions are set to increase; the region would also fall short on its target to provide access to clean cooking for all by 2030

Key energy indicators in Southeast Asia in the Stated Policies and Sustainable Development scenarios, 2020-2050



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Note: Fossil fuel imports are net imports of coal, oil and natural gas.



Governments can introduce policies and measures to boost energy security and affordability, reduce emissions and ensure energy access for all

Energy demand in Southeast Asia has increased on average by around 3% a year over the past two decades, and this trend continues to 2030 under today's policy settings in the STEPS. Southeast Asian countries are in different stages of their development, but almost all of their economies have more than doubled in size since 2000. The Covid-19 pandemic disrupted these trends but economic growth is set to return: the region's economy expands in all our scenarios by 5% a year on average until 2030 before slowing to an average of 3% between 2030 and 2050.

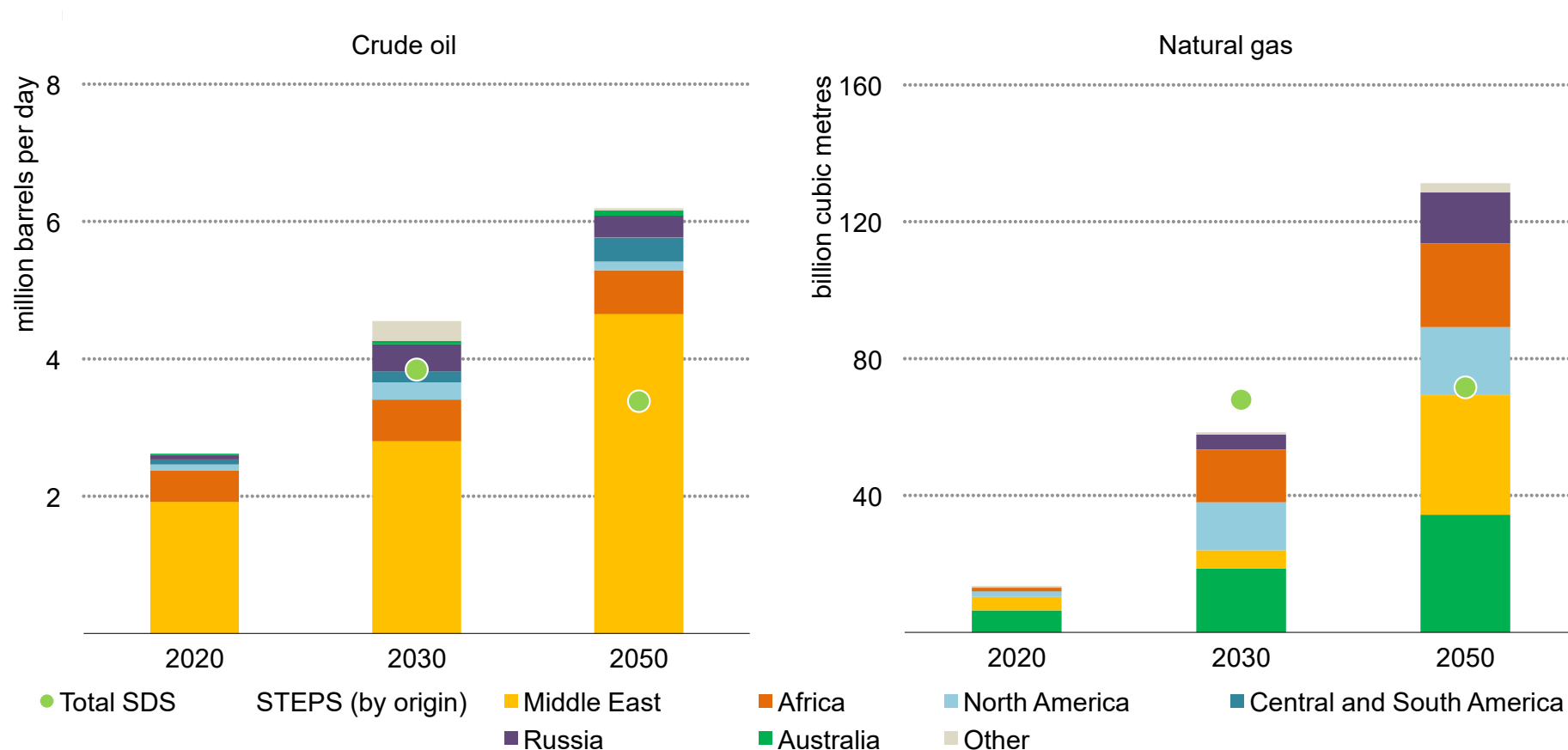
Three-quarters of the increase in energy demand to 2030 in the STEPS is met by fossil fuels, leading to a near 35% increase in CO₂ emissions. Energy access has been improving in Southeast Asia in recent years: around 95% of households today have electricity and 70% have clean cooking solutions such as liquefied petroleum gas and improved cook stoves. However, these shares remain very low in Cambodia and Myanmar, and the recent surge in commodity prices threatens to set back progress. In the STEPS, universal access to electricity is achieved around 2030, but even by 2050, more than 100 million people in the region do not have access to clean cooking. The region also sees a steady worsening in its energy trade balance as fossil fuel demand outpaces local production.

Governments across Southeast Asia have set out long-term plans for a more secure and sustainable future. For example, six Southeast Asian countries have already announced net zero emissions and carbon neutrality targets. The SDS maps out a way to achieve these goals in full, and also sees enhanced efforts to achieve universal access to energy in 2030. Fossil fuel subsidies are phased out, efficiency improvements temper the growth in overall demand, and there are concerted efforts to boost clean energy technology deployment in power generation and end-use sectors. For example, in the SDS, 21 GW of renewable capacity are added on average each year to 2030 (triple the level of recent years) and nearly 25% of the cars sold in the region by 2030 are electric. These efforts also help reduce the region's fossil fuel import bill. Delivering electricity and clean cooking access to all by 2030 is achieved with an investment of USD 2.8 billion a year (about 2% of average annual energy sector investment in the region to 2030).

Each country has its own pathway, and the range and diversity of countries and situations in Southeast Asia mean that delivering on these interrelated goals will be a challenge. Intraregional co-operation and international support will be critical, especially to boost innovation and support the development of related infrastructure.

The region's fuel import needs and energy security vulnerabilities will rise sharply in the decades to come without a strong effort to accelerate transitions

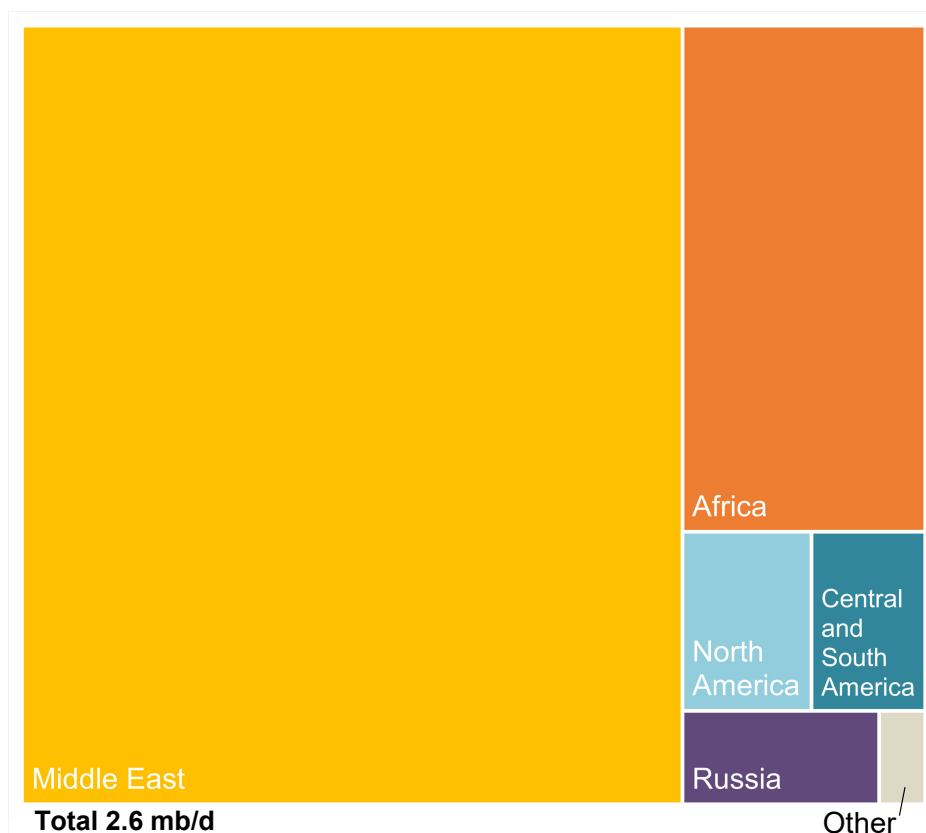
Crude oil and natural gas trade to Southeast Asia by scenario and origin (for STEPS), 2020-2050



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Russia highlights the importance of mechanisms to safeguard the region's security of supply, alongside policies to reduce energy security risks over time

Seaborne crude oil trade to Southeast Asia from around the world, 2020



Oil stockpiles required by companies and refineries operating in Southeast Asia

Country	Mandatory operational oil stockpiles
Brunei	31 days for refineries
Cambodia	30 days for companies importing oil
Indonesia	14 days (crude oil) and 23 days (oil products) by the national oil company
Lao PDR	21 days for companies importing oil and 10 days for distributors
Malaysia	30 days by the national oil company
Myanmar	6 days for oil companies
Philippines	30 days for refineries (crude) and 15 days (oil products) for companies importing oil
Singapore	90 days (oil products) for power companies
Thailand	21.5 days (oil crude) and 3.5 days (oil products) for refineries and traders
Viet Nam	10 days (oil crude) and 40 days (oil products) for oil companies

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Note: "Mandatory operational oil stockpiles" in the table are as of March 2019 and exclude LPG.

Source: IEA analysis; [IEEJ \(2020\)](#).

Well-managed energy transitions will shield Southeast Asia from the impacts of volatile international markets, but energy security during transitions does not come for free

EU energy market has had profound consequences for energy markets, leading to high and volatile prices for fossil fuels and greater near-term competition for non-Russian supplies. The market turbulence has shone a spotlight on the energy security vulnerabilities of Southeast Asian countries and their mechanisms in place to weather supply disruptions.

The region has been an aggregate oil importer since the mid-1990s and high oil prices put significant strains on consumers and the broader economy. In 2020, the region imported around 2.6 mb/d of oil (Thailand and the Philippines accounted for 40% of total oil imports to the region), mainly from the Middle East and Africa. In the STEPS, oil imports continue to rise to 4.6 mb/d in 2030 and 6.2 mb/d in 2050. Based on today's policies, the region becomes a net natural gas importer by 2025, importing more than 130 bcm per year by 2050. However, the 2021 price increases – further accentuated by the EU energy crisis – may have long-term repercussions for the role of natural gas in the region, by changing perceptions on affordability and policy attitudes towards investments in gas import infrastructure.

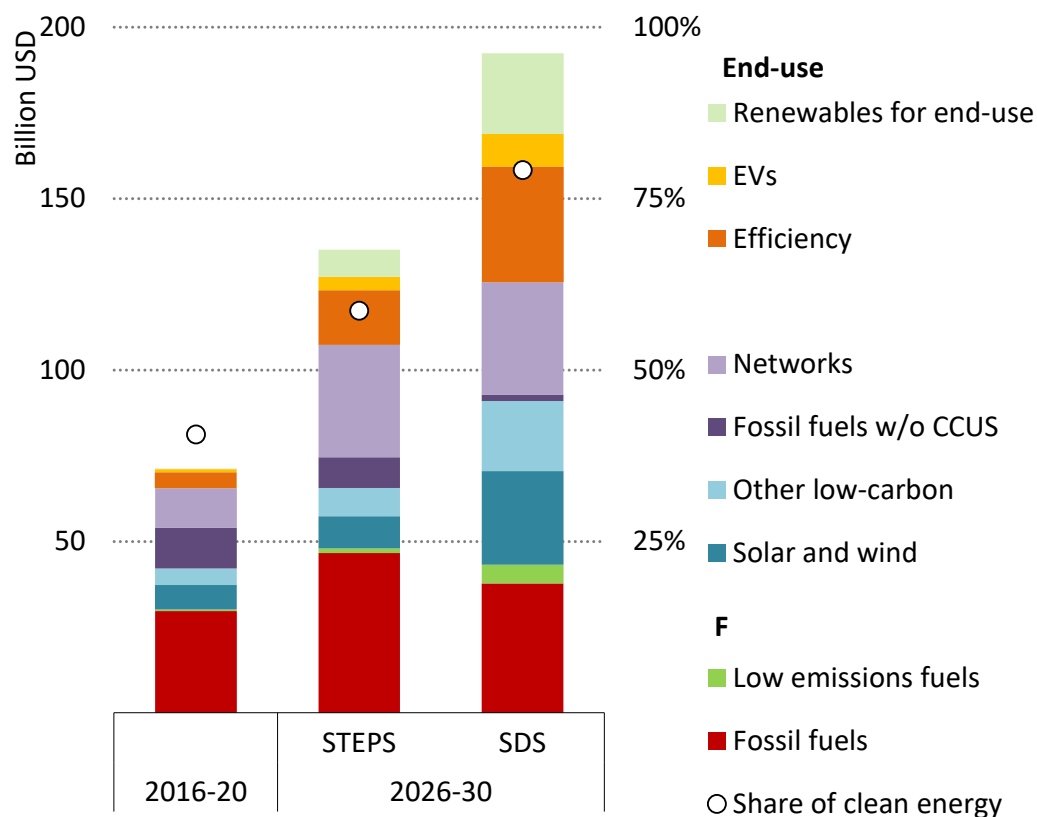
Accelerating clean energy transitions is the key way to reduce today's energy security vulnerabilities. In the SDS, for example, both oil and

gas imports in 2050 are 50% lower than in the STEPS. This occurs because of the enhanced efficiency measures that are deployed in the SDS.

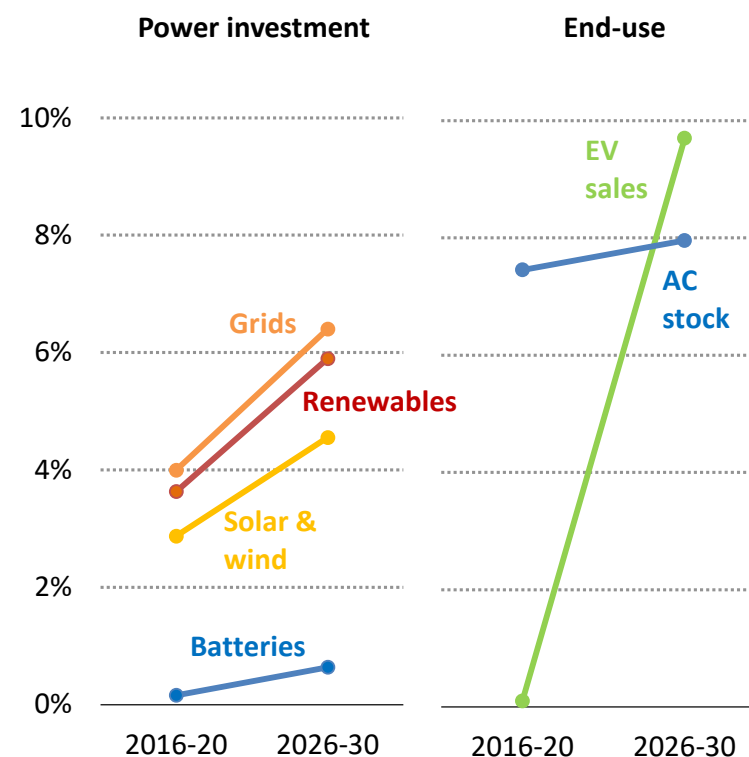
Targeted investments in energy security remain critical throughout energy transitions. Electricity demand rises rapidly in all our scenarios, as does output from variable renewables (wind and solar PV). Ensuring electricity security under these circumstances requires large-scale investments in networks, demand side management, digitalisation, enhanced cyber resilience as well as inter-regional planning. Even as the region takes policy steps to move away from oil, oil stockpiles remain an important mechanism to protect against supply disruptions. There are a number of mandatory operational oil stockpile regimes for companies operating in Southeast Asia. These are generally equivalent to fewer than 40 days of oil use (and in some cases as few as 6 days). Many countries in Southeast Asia have studied or discussed establishing strategic reserves, and a reserve in Viet Nam has already started operation. International cooperation can also play a role by helping to build oil-sharing arrangements with neighbouring countries.

Southeast Asia must attract much higher levels of energy sector investment to accelerate its clean energy transition and meet the rising demand for energy services

Average annual energy investment in Southeast Asia, 2016-2030

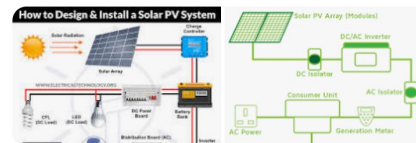


Share of Southeast Asia in the global market, 2016-2030



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Note: Fossil fuels w/o CCUS = power generation from fossil fuels without carbon capture, utilisation and storage.



Energy investment: attracting finance requires upgrading clean energy policy and regulatory frameworks and addressing a wide range of financial hurdles across the sectors

Southeast Asia faces the twin challenges of increasing total investment in the energy sector while increasing the share of this investment going to clean energy technologies. Between 2016 and 2020, annual average energy investment in Southeast Asia was around USD 70 billion, of which around 40% went to clean energy technologies – mostly solar PV, wind and grids. Energy investment in the STEPS reaches an annual average of USD 130 billion by 2030 and in the SDS it reaches USD 190 billion.

Improving regulatory and financing frameworks would help Southeast Asia reduce the costs of clean energy projects. For example, the levelised cost of energy (LCOE) of solar PV in Indonesia could be around 40% lower if its investment and financing risks were comparable to advanced economies. Boosting investment in clean energy technologies requires strengthening clean energy policy and regulatory frameworks and addressing a wide range of financial hurdles.

Well-designed frameworks – including clear policy targets, independent regulation, least-cost system planning and cost recovery tariffs – are crucial to attract investors. There has been progress on policy and regulation in many parts of Southeast Asia, including more ambitious climate targets announced by Indonesia, Malaysia, Thailand and Viet Nam, updated expansion plans for renewables, and changes in power purchasing agreements (PPAs). However, uncertainties remain in many countries over remuneration

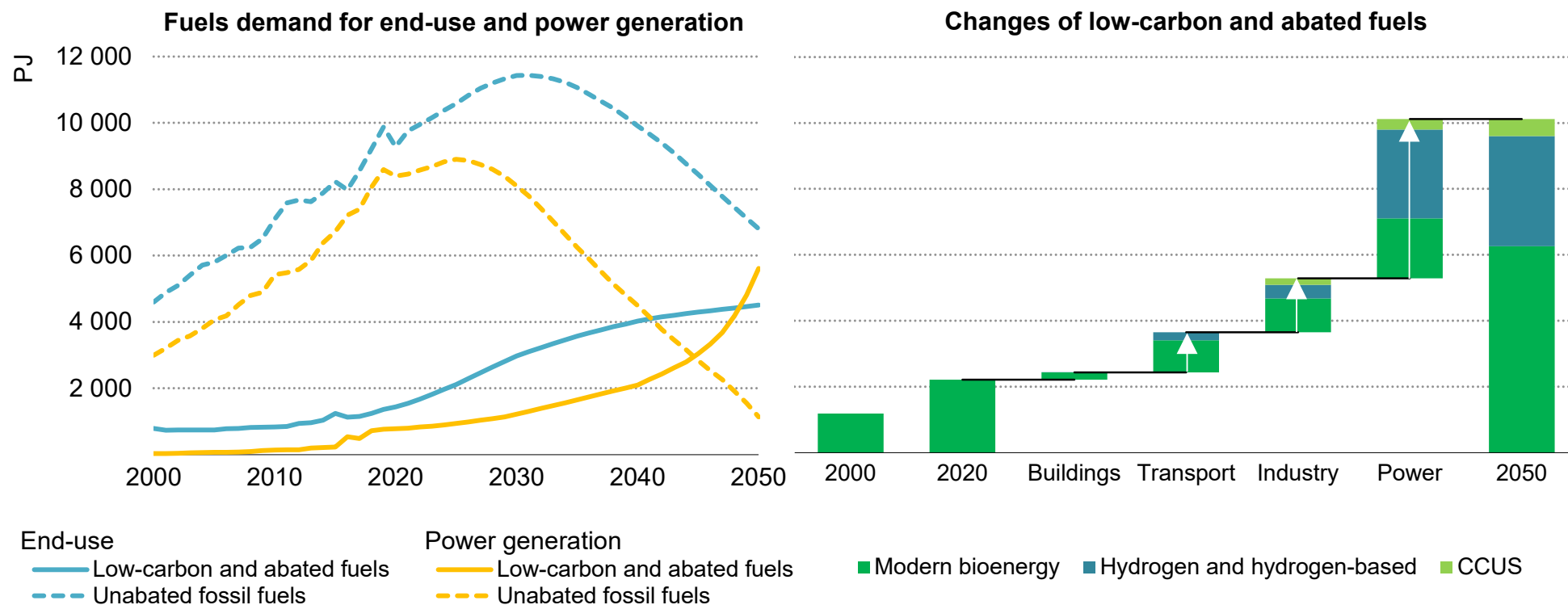
mechanisms and tariff levels for renewable output, which affect risk perceptions and the cost of capital for clean energy projects. Commitments and policies to phase out unabated coal plants and deploy low-carbon fuels would send important long-term signals to investors.

Cross-cutting issues such as unpredictable regulatory frameworks, restrictions on foreign direct investment and currency risks all hamper investment flows. Many countries have shallow financial and capital markets, and domestic banks have limited experience in financing clean energy assets. Long-term, low-cost debt is often not available and access to international private capital can be a challenge. Sustainable debt issuance by countries in Southeast Asia comprises around 3% of the global total, less than half the region's share of global GDP (more than 80% of sustainable debt is issued in advanced economies).

International development finance has a key role to play in catalysing private funds, especially for projects at early stages of development, new technologies (e.g. CCUS, or carbon capture, utilisation and storage), and technologies with specific risks (e.g. exploration risk in geothermal). Improving access to finance would enhance investment by households and small-and-medium enterprises (e.g. establishing credit ratings for end-users and bundling small transactions).

Low emissions fuels: a key part of transitions in Southeast Asia...

Total demand for unabated fossil fuels, and low-emission and abated fossil fuels in Southeast Asia in the SDS, 2000-2050



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Note: Low emissions fuels include modern solid, liquid and gaseous bioenergy, low-carbon hydrogen and hydrogen-based fuels such as ammonia or synthetic hydrocarbons. Abated fossil fuels include inputs to industry or power generation where the resulting CO₂ emissions from fuel combustion are captured, utilised and/or stored. Hydrogen production involving the use of CCUS is included in the hydrogen category. PJ = petajoule.

...as the region is well-placed to tap into significant resources of bioenergy and hydrogen as well as CO₂ storage potential

Southeast Asia's energy transition depends primarily on the rollout of renewables, improvements in efficiency and the electrification of end uses; together, these close well over 50% of the emissions gap between the STEPS and SDS in 2050. There is also a significant role for low emissions fuels, such as modern bioenergy, hydrogen, hydrogen-based fuels, and CCUS. Including natural gas – when it replaces coal and oil – low emissions fuels close 30% of the emissions gap between the STEPS and SDS in 2050.

Modern forms of bioenergy can displace fossil fuels in transport, industry, clean cooking and power generation. Several countries in Southeast Asia have robust mandates to blend transport biofuels and policies to support co-firing, biogas and biomethane, as well as modern cookstoves. To ensure the environmental benefits of bioenergy, feedstocks need to be sustainable, and avoid competition with food production and negative impacts on biodiversity.

Low-carbon hydrogen and hydrogen-based fuels such as **ammonia** and **synthetic hydrocarbons** can help reduce emissions from long-distance transport and heavy industry. Co-firing ammonia in thermal power generation can also help provide a dispatchable low-carbon generation fuel. Brunei Darussalam has started exporting small quantities of hydrogen to Japan, while Indonesia, Malaysia, the Philippines and Thailand are piloting green hydrogen and fuel cell systems for power provision. Malaysia and Indonesia are conducting

feasibility studies to co-fire ammonia in coal power plants, and there are plans to do so in Singapore, Thailand and Viet Nam.

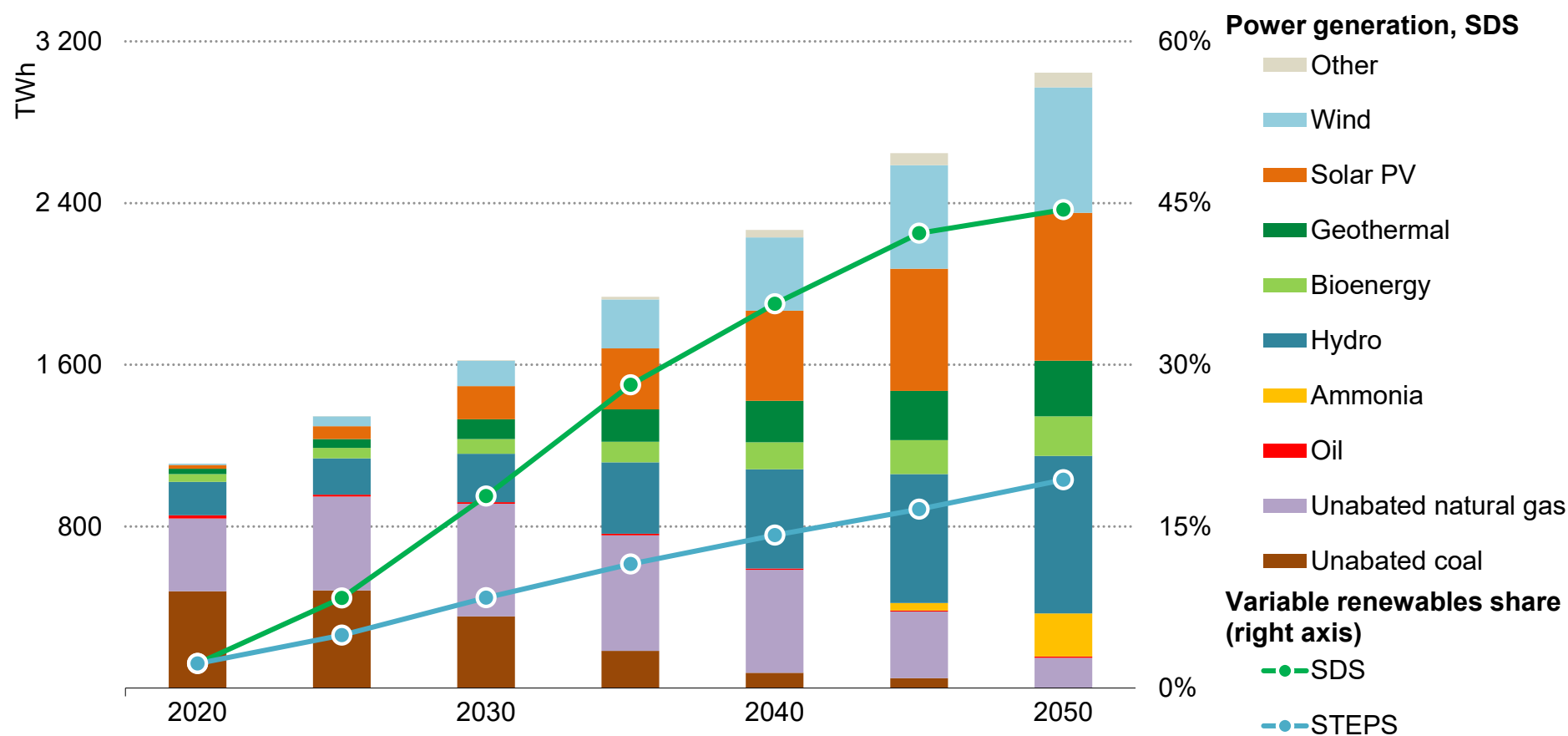
CCUS can reduce CO₂ emissions from the production of low-carbon hydrogen from natural gas and during fuel production or combustion. At least seven large-scale [CCUS](#) projects are in planning in Southeast Asia, including several linked to enhanced oil recovery and natural gas processing with offshore storage.

In the SDS, the share of low emissions and abated fuels reaches 50% of total liquid, solid and gaseous fuel demand by 2050. Investment in these fuels averages around USD 10 billion per year to 2050, around half of the level of today's investments in fossil fuels.

Several regulatory hurdles and market risks must be addressed in order to scale up the deployment of low-carbon fuels in Southeast Asia. Even with higher fossil fuel prices, affordability remains a concern and several low emissions technologies and fuels are not yet mature or cost competitive. International collaboration and support are crucial to encourage investment and mitigate financial risks. Indonesia and Malaysia are cooperating with Japan to develop hydrogen, ammonia and CCUS supply chains. Similar initiatives are underway in Thailand and Singapore. Some major oil and gas players, such as Petronas, Pertamina and PTT have formulated plans to invest in hydrogen supply chains and carbon capture projects, often in partnership with international oil companies.

Power flexibility: growing deployment of wind and solar will require a more flexible power system – this must be a higher priority for governments and regulators

Power generation and shares of variable renewables in Southeast Asia, SDS, 2020-2050



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Note: Other includes coal with CCUS, nuclear and marine energy.

Power flexibility: less rigid contracts for power generation and fuel supply can play a vital role, alongside strengthened and more integrated regional grids

Electricity demand is set to grow rapidly in the coming decades in Southeast Asia and an increasing share will be met by variable renewable sources. In the SDS, for example, the generation share of variable renewables increases from 2% in 2020 to 18% in 2030. The need for flexibility outpaces electricity demand growth.

Coal and gas-fired power plants are the region's main sources of electricity today but they can also play key roles in providing flexibility. Achieving this role change requires changing existing contracts. There is a heavy reliance on physical PPAs in Southeast Asia, especially in vertically integrated power systems such as Indonesia and Thailand, where many plants were financed with physical PPAs with large capacity payments and/or take-or-pay obligations. If assets or entities have a contract that ensures operators a minimum daily load, the assets have no incentives to act flexibly.

Most of these PPA contracts extend beyond 2030. In Thailand, for example, minimum-take capacity in all contracts decreases by only 10% to 2030. Without any changes, it will not be easy to repurpose existing assets to offer flexibility, even as the share of variable

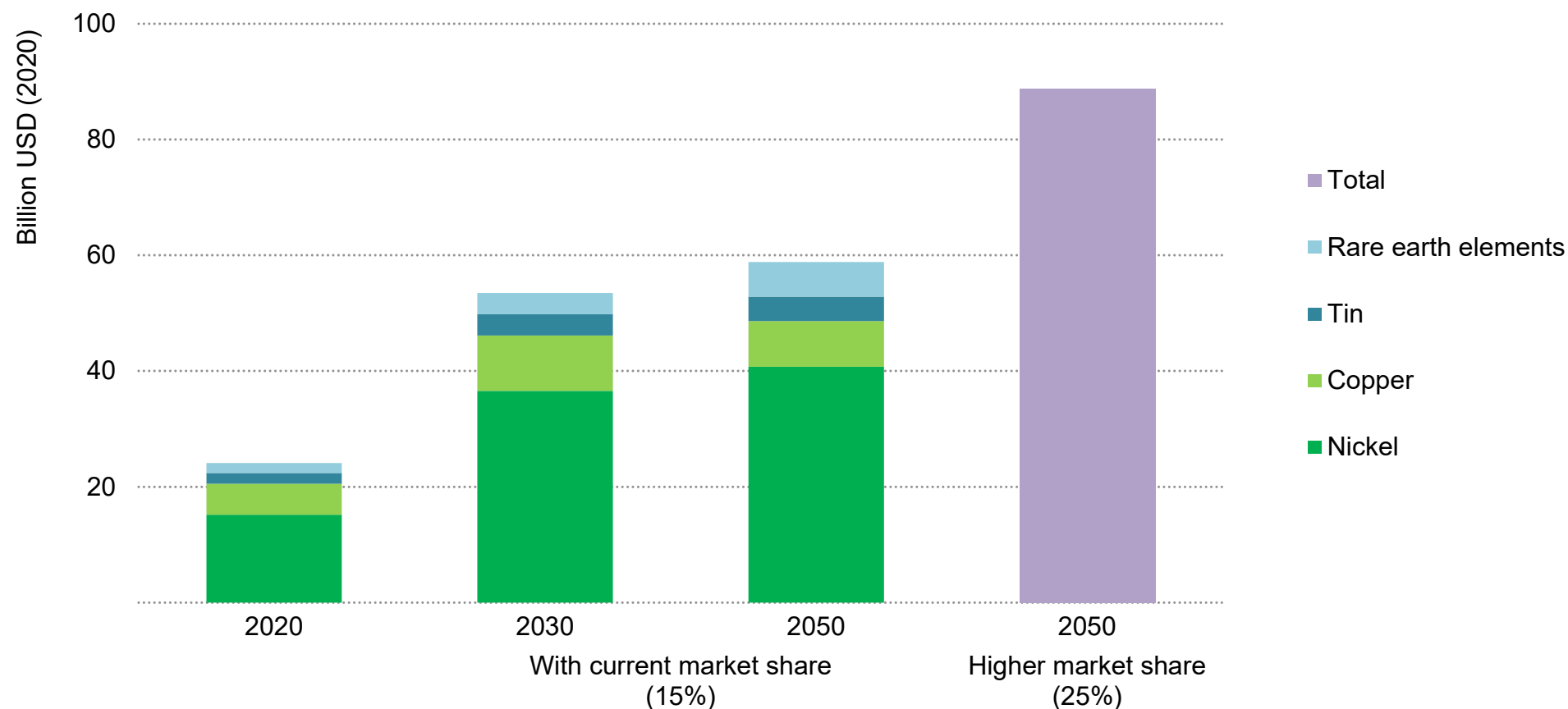
renewable capacity increases. Further policy efforts to increase the flexibility of PPAs and fuel contracts are needed, for example through voluntary auctions.

The IEA analysed **contractual flexibility issues** in Thailand and found that cost savings from shifting towards more flexible PPAs and fuel contracts could be significantly greater than the savings from investing in technical flexibility resources. Designing contracts with sufficient flexibility leaves headroom for lower operational-cost variable renewables, and technical assets that provide critical system services to participate in the market, resulting in overall cost savings.

Regional integration and multilateral power trading can also help increase power system flexibility in Southeast Asia. This would expand balancing areas, allowing for efficient resource sharing, particularly for renewable resources. ASEAN has a major programme devoted to developing multilateral power trade – the ASEAN Power Grid (APG) – encompassing both building physical infrastructure and creating markets for multilateral power trade.

Global demand for critical minerals in clean energy technologies is set to grow rapidly, providing a big opportunity for Southeast Asia to make the most of its large mineral resources

Potential revenue from selected minerals in Southeast Asia, SDS, 2020-2050



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Note: Revenue is potential value of metal products made from mined output in Southeast Asia. We used 2021 average prices for prices in 2030 and 2050.

Critical mineral resources can be successfully and sustainably exploited by enhancing capacity building across the region and attracting investment in a wide range of projects

Southeast Asia is set to play a major role in clean energy supply chains, both as a consumer of low-carbon technologies and as a key supplier of critical minerals. Today, Indonesia and the Philippines are the two largest nickel producers in the world; Indonesia and Myanmar are the second and third largest tin producers; Myanmar accounts for 13% of global rare earth elements production; and Southeast Asia provides 6% of global bauxite production.

The mining sector has historically been an important contributor to government revenues, GDP and employment in Southeast Asia. Yet investment in mineral exploration has declined in recent years: the region's share of the global mineral exploration budget has halved since 2012. This trend will need to be reversed if Southeast Asia is to realise its potential in the critical minerals sector, and offset likely future declines in coal mining jobs.

Investment in **processing and manufacturing** to develop critical-mineral based industries can help extract additional value from Southeast Asia's natural resources. Malaysia and Viet Nam are the world's second and third largest manufacturers of solar PV modules. Thailand is the 11th largest vehicle manufacturer in the world and could also become a key hub for the manufacturing of EVs. Indonesia is implementing policies to attract mid to downstream battery

industries. If the region can develop domestic value chains for multiple industries, the revenue from the production of nickel, tin, copper and rare earth elements in Southeast Asia could grow by almost 2.5-times to nearly USD 60 billion by 2050 in the SDS.

Ensuring high **environmental, social and governance (ESG)** standards is crucial for the region as consumers and investors increasingly demand that manufacturers use minerals that are sustainably and responsibly produced. For example, high-pressure acid leaching (HPAL) projects are expected to supply battery-grade nickel products in this region, but these projects need to resolve concerns over their high levels of emissions and water consumption. In the downstream sector, encouraging recycling is key: secondary production of aluminium accounts for just 2.5% of total refined consumption in the region, compared with 25% globally.

Enhancing capacity building efforts across the region is central to ensure the sustainable development of mining industries and to attract investment in a wide range of projects. This includes technical capacity building (e.g. geological surveys, reserve estimation, sustainable mining practices) and institutional capacity building (e.g. regular ESG assessments) for sound governance and transparent regulations.