



**Research**

## Deepening Economic Integration



### East Asian Integration: Analytical Approach

This study on ASEAN integration aims to:

- Analyse how trade gains differ across member countries and affect dimensions such as welfare, foreign direct investment (FDI), and domestic regulations in labour or investment, and find out how the ASEAN Economic Community may drive ASEAN countries to be more protectionist.
- Examine how regional trade agreements (RTAs) can drive unilateral reforms of small economies in a multilateral world. Through theoretical framework and empirical analyses, the study team will deeply examine how RTAs transform domestic trade, labour, or other economic policies.
- Link the theoretical and empirical work of regional integration to potential policy implications and options specifically on how to move forward the agenda of regional trade blocs towards multilateral blocs. The study presents an overview of recent trends, empirical analysis of underlying drivers and impacts of regional integration, and summarises potential policy options, drawing on the experiences of ASEAN and others.

Country case studies also provide greater depth and nuance to the quantitative results, which present evidence of trends and impacts of regional integration over time.

## **Economic Impact of TPP and RCEP on ASEAN and East Asia Countries**

The Trans-Pacific Partnership (TPP) and the Regional Comprehensive Economic Partnership (RCEP) are two substantial mega free trade agreements (FTAs) in which Asian economies are involved. TPP is said to be a US-led 21st-century economic partnership agreement that will set up new rules and global standards governing international trade and investment in order to facilitate international production sharing and to support sustainable development. TPP will enter into force in 2017 at the earliest. Hence, in the future, the new rules and standards of TPP are expected to have various and unequal economic impacts on Asian countries, both TPP and non-TPP member states. RCEP is an ASEAN-led arrangement participated in by Asia-Pacific countries. It tries to consolidate the five existing 'ASEAN-plus-one' FTAs with emphasis on ASEAN centrality in regional integration and the commitments on the compatibility with World Trade Organization rules. Ministers from 16 countries expressed their determination to conclude the RCEP negotiations in 2016. But no matter when it will be concluded, RCEP could be another milestone of institution building in Asian regionalism.

A shift from WTO-centred multilateral system to plurilateral governance, such as TPP and RCEP, could be a double-edged sword. On one side,

mega FTAs include trade and investment rules that meet the need of developing countries for global value chains; on the other, they may contain conflicting and inconsistent rules that go against developing countries. Therefore, ASEAN member states and other Asian countries need to respond to these changes promptly and properly.

This ERIA study aims to provide decision-making support to policymakers based on solid economic analyses that help ASEAN and East Asian countries formulate their trade policies in the new era. Whereas TPP and RCEP can potentially change the pattern of trade and foreign direct investment in the region, their impact on regional economic growth and development could be different. For that reason, this research intends to estimate the economic impact of these agreements on ASEAN and East Asia countries by utilising a computational general equilibrium model.

## **Globalisation, Structural Change, and Growth**

This study is eighth in the series of ERIA Microdata research conducted annually, under a different theme, to gauge the impact of globalisation on economic growth in the region using firm-level data. Despite the large number of studies on the effect of globalisation on economic growth, our understanding of this issue is far from satisfactory. Particularly when economic growth is defined as a sustained increase in per capita income

level, our knowledge on whether and how exactly globalisation affects economic growth remains quite limited. Although macroeconomic growth models exist, which show a positive effect of globalisation on long-term economic growth, there remains the controversy on the effect among cross-country empirical studies. Whereas the heterogeneous firm trade theories and empirical studies based on those theories have uncovered several new mechanisms of the aggregate welfare and productivity effect of trade, most, if not all, of the studies tend to focus on one-time level effect, not growth effect.

Meanwhile, sustained economic growth is almost always accompanied by structural changes: changes in the composition of industries, firms, and activities toward more capital-, skill-, and technology-intensive ones. Without structural changes defined in this way, an economy may not be able to achieve sustained improvement in living standards. In this vein, a better understanding whether and how globalisation affects structural change is expected to enrich our understanding of the effect of globalisation on economic growth and of its mechanisms.

Against this backdrop, this project raises the following key questions. Does globalisation in trade and foreign investment promote sustained economic growth? Can we find evidence that globalisation promotes structural changes? If

so, what are the specific mechanisms? How are globalisation, structural change, and economic growth linked? In answering these questions, does it matter to distinguish between the effects of trade and investment liberalisation policies and the effects of trade and investment activities?

### **India as an Economic Hub for Integrating East and Southeast Asia with the Rest of Asia**

India's recent economic dynamism, including its future prospects as the fastest growing economy in 2016, has been highlighted by various credible projections. This, coupled with emphasis of the country's policymaking on the Make in India initiative, suggests that India can emerge as an economic hub in integrating East Asia, ASEAN on one hand with South Asia, Central Asia, West Asia, and even the eastern coast of Africa, on the other. However, this proposition needs to be posited in a broader framework, building on the Comprehensive Asia Development Plan 2010.

The study aims to (i) provide analytical and empirical basis to make India an economic hub for integrating different parts of Asia, (ii) identify dimensions and sectors across sub-regions where India can play such a role, and (ii) suggest policy measures and modalities to create enabling conditions for the above. To achieve these objectives, some of the dimensions/themes that are being explored include (i) a conceptual



basis to regional value chains; (ii) potential trade and regional value chains in manufacturing and services; (iii) infrastructure and connectivity; (iv) India as an R&D hub; and (v) mapping, building, and harnessing skill complementarities. The study, expected to be completed by September 2016, would come up with policy recommendations on the subject of enquiry.

### **International Migration and Production Sharing in East Asia**

International migration is an important element of economic globalisation. The second unbundling of globalisation is associated with international fragmentation and offshoring of production. Now, competitiveness can be determined on the sub-stage activities rather than the whole production process. The characteristics and productivity of labour are now defined in varied details and in various categories. The expansion of global production sharing leads to a finer division of labour and a new pattern of international trade.

Liberalising the movement of people tends to further optimise the allocation of human resources in the region, which will enforce the gains from regional trade and investment liberalisation and sharpen the region's competitive edge in global value chains (GVCs). However, knowledge about the pros and cons of international migration and regional development is still limited, especially in

the context of GVCs and 21st century free trade governance.

This study aims to (i) better understand the patterns, causes, and consequences of international migration; and (ii) help to formulate better immigration policy in a perspective to increase the gain from trade and investment liberalisation.

In particular, the project will emphasise quantitative studies using micro-level data, especially first-hand data drawn from survey designed and conducted by the participants. The survey data will complement the available data released by statistical agencies. With the focus on migration issues in East Asian countries, the survey and the related analyses could either explore the general pattern and characteristics at the country level or investigate the specific features of the sector(s)/region(s).

The research team is composed of country teams from Japan, Thailand, Indonesia, Malaysia, and Viet Nam, each team consisting of two to four experts. The country reports will be based on the analyses of first-hand survey data in each country. The consequent empirical exercises will be done using careful descriptive analysis and robust econometric exercise.

### **Maritime Connectivity in Southeast Asia: Its Role and Challenges towards Integration**

One pressing issue regarding regional connectivity in East Asia is maritime development. Indeed, as acknowledged by the Master Plan on ASEAN Connectivity (MPAC), maritime transport is the most important mode in terms of the traffic volume in international trade. However, ASEAN still has a big task regarding its marine development. The MPAC identifies three key challenges:

- Port infrastructure. Many facilities needed for reliable and efficient shipping are still not available.
- Maritime services. Key services such as sea traffic control and navigation, as well as mechanisms to handle emergency situations and sea-environment-related issues, are still inadequate.
- Port performance needs improvement as most of the gateway ports of ASEAN member states are already fairly full in capacity. This means that investment to expand port capacity is needed to meet growth and deliveries expectation in the future.

This study focuses on maritime status and port development in Indonesia, Thailand, Malaysia, Singapore, Hong Kong, and Australia.

### **Non-tariff Measures in ASEAN**

Non-tariff measures (NTMs) in general are defined as policy measures, other than ordinary customs tariffs, that can have an economic effect on international trade. These thus include a wide and diverse array of policies having an economic effect on international trade in goods, changing the quantities traded, or prices, or both (UNCTAD, 2013). The number of NTMs recorded by the Global Trade Alert, a think tank, rose substantially between 2008 and 2011. However, such increase in NTM number across the globe is not necessarily a bad sign for the economy. As consumer wealth rises around the world, the demands on governments for health, safety, and environmental protection rise as well.

The latest official data on NTMs by HS-4 digit for ASEAN countries are available only in 2009, as released by the ASEAN Secretariat. A number of surveys have been conducted to fill the gap, but more work is needed. In this context, the project seeks a strong multi-agency collaboration between ERIA and UNCTAD supported by experts on NTMs to (i) collect, validate, and classify NTMs data from official sources issued by governments; (ii) improve the general understanding of these measures and their impact on world trade; and (iii) provide insights on policy recommendations for streamlining NTMs and trade regulation reforms. Once NTM data are collected according to the MAST NTM classification and UNCTAD's NTM data



collection approach, analyses can be prepared and policy options devised to appropriately assess the trade and development impacts of such barriers to trade.

The project aims to contribute to developing export capacities by improving NTM transparency and providing trading partners with access to NTM-related information. This project would provide impact assessment analyses of trade-related reforms by providing reliable and up-to-date NTM information, conducting rigorous analyses on NTMs and how these will affect trade policy and overall trade performance, comparing NTMs in the ASEAN region to those of other regions, and providing inputs in streamlining NTMs in this region.

### **Reducing Unnecessary Regulatory Burdens on Business and Engendering Informed Regulatory Conversations in Priority Integration Sectors in ASEAN**

Two critical challenges facing ASEAN member states (AMS) in an increasingly open and integrated ASEAN are promoting a conducive business and investment environment, and improving economic performance and productivity. To meet these challenges, AMS would need to focus on reducing the burden of government regulations on business, together with minimising border barriers and promoting greater investment in infrastructure

and people. An important means of enhancing investment attractiveness as well as productivity and competitiveness of industries in ASEAN is reducing the unnecessary regulatory burdens (RURB) on business, particularly in sectors with significant export potential.

Minimising unnecessary regulatory burdens maximises efficiency and effectiveness of regulations. RURB addresses unnecessary costs arising from poorly designed or excessive regulation, as well as from poor administration and enforcement of regulations.

Regulations in the region have not typically been crafted using established principles of good regulatory practice (GRP), and most regulators do not have established GRP principles to follow. Undertaking a thorough regulatory review of existing practices would identify the regulatory burdens that are of most concern to the sector. Through RURB, the sector then becomes more attractive to investments and more competitive in an increasingly integrated ASEAN.

With this in mind, ERIA and the Research Institutes Network, under the guidance of the Malaysia Productivity Corporation (MPC), has embarked on this research project. The project focuses on RURB, particularly in the trade-related activities of firms in a selected priority integration sector with significant export potential in each of the

nine AMS (excluding Singapore) covered in the study. It follows MPC's RURB approach that helps businesses identify regulatory burdens, suggest solutions, and then present these to regulators in a credible way.

The study team will review and analyse regulations and regulatory agencies to identify areas where regulation can be improved, consolidated, or simplified without compromising underlying policy objectives. They will identify any redundant, unnecessarily burdensome, and outdated regulation and propose options to reduce the unnecessary burdens in order to achieve a dynamic, modernised business ecosystem. Informed regulatory conversations between businesses and regulators will then be undertaken to discuss the policy options, help identify the best option(s), and build consensus in favour of the best option(s).

The project also incorporates a capacity building component for Cambodia, Lao PDR, and Myanmar teams. The assumption is that one best way to capacitate the bureaucracy is to bring government technical people in the research process itself.

The project officially started in August 2015 and is due for completion in November 2016.

## **Services Supply Chains – Implications and Opportunities for RCEP**

The key rationale of the supply chain is the ample opportunities for countries at various stages of growth to be able to participate in the production value chain from end to end of the supply chain. Thus, it might be important to examine the key fundamentals that might be needed for countries in various stages of growth and with services sector growth to participate effectively in the services supply chain.

Increasingly, supply chain activities in services are turning independent of their linkages to manufacturing supply chain activities. For example, the development of the services sector such education, business services, wholesale activities, and others is part of the supply chain that is independent of the manufacturing sector. In this respect, the current study intends to examine the development of services supply chain activities in the region.

This study attempts to extend the work on services from a supply chain perspective and a deeper assessment of the implications for the policy coverage and design of commitments in RCEP related to services. It is composed of 10 papers covering Japan, China, the Republic of Korea, Australia, Indonesia, Thailand, Malaysia, the Philippines, Cambodia, and Viet Nam. These papers examine various issues within the broader topic of the project, utilising the rich firm- or plant-level data set from all countries covered.

## Narrowing Development Gaps



### **ASEAN at 50: Retrospectives and Perspectives on the Making, Substance, Significance, and Future of ASEAN**

This research project is being undertaken upon the request of the Government of the Philippines as part of the commemorative events to celebrate ASEAN's 50th anniversary in 2017, when the Philippines assumes chairmanship of ASEAN.

The project will produce a commemorative publication that brings the (i) retrospectives and perspectives of key people who have been involved in the making and working of ASEAN; (ii) voices from the ASEAN people; and (iii) analytical insights, perspectives, and reflections of eminent

persons and experts on the evolution, substance, and future of ASEAN. The commemorative publication will consist of three volumes:

- Volume 1—'The Making and Working of Emergent ASEAN: Leaders' and Officials' Retrospectives and Perspectives'—features the retrospectives and insights of key figures, such as ASEAN Leaders, ASEAN Secretaries General, ASEAN senior officials, and Leaders of ASEAN dialogue partners, on the making and evolution of ASEAN over the past 50 years.
- Volume 2—'The Substance of ASEAN: The State, Challenges, and Impact of ASEAN Integration and Community Building'—addresses the questions on what (i) ASEAN

means to people; (ii) the status of the ASEAN 'project'; (iii) its impact on countries; (iv) the challenges in embedding ASEAN into the national consciousness, polity, policies, and programmes of ASEAN member states; and (iii) how it compares with other regional integration efforts in the world, especially the developing world.

- Volume 3—'Reflections on the Significance and Future of ASEAN'—brings the insights, perspectives, and reflections of eminent persons and experts on the significance of the ASEAN project on regional integration and East Asia, on implications of developments in East Asia and Asia-Pacific on the ASEAN project, and on the future of ASEAN. The essays would focus more on ASEAN moving forward.

The publication will be launched at a High-Level Symposium on 'ASEAN at 50: Reflections and Perspectives' in the run-up to the second ASEAN Summit in 2017.

### **Capturing Value-Added in Agricultural Value Chains: Challenges for Less-Developed Countries in Southeast Asia**

For less-developed countries, integration into the regional and global economy has offered both opportunities and challenges. Economic integration signifies expansion of the value chains—the steps of the production system and the linkages of various agents from producers to consumers—into less developed countries. Whereas economic integration has facilitated the transfer of technology to less-developed countries and their access to external markets, it has accompanied reorganisation of production units across borders, with less-developed countries potentially locked in low value-added production whereas high value-added activities remain elsewhere.

Benefits and risks of economic integration are observed in the agricultural sector of less developed countries in Southeast Asia. Foreign firms from China and Thailand have embarked on operations as buyers in contract farming or as investors in food processing such as rice milling. Also, China has emerged as the top destination of Myanmar's rice exports in recent years. The South–South trade could reduce less-developed countries to the suppliers of low value-added and less quality-standards-intensive commodities.



This study attempts to shed light on the agricultural value chains of Southeast Asian countries, and aims to identify channels where these countries can capitalise on economic integration, acquiring higher value added. This study consists of five papers on maize exports from Lao PDR to China and Myanmar's rice exports to China as examples of low value-added production, Thai exports of organic rice as a case study of high value-added production, an input–output table analysis of the agricultural sector in Southeast Asian countries, as well as an overview of the agricultural value chain analysis.

### **Economic Globalisation, Firms' Employment Policy, and Human Capital Formation in East Asia**

International production fragmentation has been a global trend for decades, becoming especially important in East Asia. Observers now widely believe that joining global production networks is crucial for a country's successful economic development. However, most firms find it difficult to participate in global production networks as only a tiny fraction of firms can export or import, for example. Also, workers are increasingly demanded to seek appropriate labour skills in the globalised economy because international production fragmentation accentuates international division of labour at the 'task' level.

Based on these observations, this project conducts the following two studies. The first study attempts to investigate the mechanism of internationalisation (i.e. participation in global production networks) through the lens of firms' management practices: (i) how firms change management practices to seize opportunities to start export or business transactions with foreign firms; and (ii) firms' employment practices because human resource management appears crucial in implementing other management practices, and affects job quality and human capital formation through various channels, such as training and performance pay.

The second study, from a macroeconomic perspective, investigates the relationship between work-related values of the population and output per worker growth of the economy. It is widely believed that 'motivated' labour is important for productivity improvement and economic development. However, empirical evidence is still limited to what (work-related) values may affect workers' decisions and support labour motivation. This study tests how five aspects of work-related values—importance of work, hard work and patience, independence and creativity, interpersonal relations, and rewards on productivity—affect economic growth in the standard framework of growth regression.

### **Industrial Deepening and Local Supplier Development in Southeast Asia: The Case of Thailand**

As often pointed out, local supplier bases in Southeast Asia are relatively weak compared with those in Northeast Asian countries, such as China, Korea, and Taiwan. Development of local supplier bases and the formation of industrial clusters are crucially important to strengthen the competitiveness of industries and to sustain economic growth. However, empirical evidence is still lacking.

This study focuses on the automobile industry of Thailand, which has developed rapidly and has become an indispensable part of global value chains. The government has played a critical role in establishing a basic policy and institutional framework, which has shifted from inward-looking to outward-looking strategy since the early 1990s.

The study examines the effectiveness of industrial policy in Thailand, particularly focusing on a policy framework that supports local supplier industry. Simultaneously, empirical research is conducted to measure the strength of spatial linkages, local supplier development, and formation of industrial clusters. The trend of industrial linkages and local supplier development is examined by employing the inter-country input-output data of the Organisation for Economic Co-operation and Development (OECD). Also, the automotive

industry directory is used to construct a data set on spatial location and business type of parts and vehicle makers in Thailand.

The study consists of two papers. One is a trade in value-added analysis of the Thai automotive industry. In particular, a new method of value chain mapping is developed and applied to OECD data. It is helpful to understand how the Thai automotive value chain has been shaped in both upstream and downstream transactions. The second paper focuses on the clustering process of the Thai automotive industry. The paper examines when local suppliers participated in the automotive supply chain, and specialised in which types of parts. It also examines how automotive clusters extended geographically, using the information on location of establishments.

### **Industrial Development along the Global Supply Chain: Organisational Evidences from Southeast Asia**

The central question of this project is how firms have achieved product and process innovations without a formal research and development (R&D) unit or personnel. This study examines innovation processes from several angles to address this question. It studies the organisational aspects of industrial development, domestic transactions, and cross-border trade for firms without a formal R&D



department or personnel, and attempts to find out what types of organisational changes are needed for these manufacturers to sustain technological and product changes.

A right understanding of innovation and production in firms and industries in emerging economies can contribute to these three important features of East Asian industrial and trade policies under an interconnected economy: (i) entering global production networks by specialising in qualified products, (ii) upgrading products and services in cooperation with production partners, and (iii) diversifying products and services at the firm level.

This research helps academia and policymakers in ASEAN and East Asia to get a deeper understanding of firm-level facts about industrial development where firm-level investment in R&D is not ubiquitous. It covers case studies in Indonesia, India, Lao PDR, Malaysia, Myanmar, Thailand, the Philippines, and Viet Nam and two micro-econometric papers which can cover several countries. The case study papers examine how different types of manufacturers without formal R&D units could achieve innovations even within narrowly defined industries in each country. These case studies describe the first stage, idea formation, to the last, when product innovation is out in the market or when process innovation is practically introduced, as well as how internal

departments in the firm and external parties worked together to overcome 'resistance to change'.

This study, the ninth in ERIA's innovation project series since 2007, attempts to shed light on how firms and industries in emerging economies in Southeast Asia could achieve upgrading. It attempts to get a clear understanding of whether and how internal capability and external linkages have affected the performance of local firms compared to foreign affiliates of multinational corporations or joint ventures. To continue to address this question, key variables of industrial upgrading should be identified for policy planners working towards sustainable economic development in East Asian economies.

### **International Mobility of Highly Skilled Professionals: Lessons for Developing Countries**

In the era of global competition for talent, the international mobility of highly skilled professionals is universal. Such type of mobility is significant both for firms and governments, and has been attracting much attention from scholars and policymakers. Earlier studies showed the mobility of highly skilled professionals has a lot of merits, such as technology transfer, productivity increase, innovation capability building, and others.

This study investigates how the international mobility of highly skilled professionals from developed countries to developing countries occurs. It focuses on cases where Japanese engineers were scouted by Korean and Taiwanese firms. The engineers were interviewed to develop a qualitative study which provides insights and policy implications about international mobility of highly skilled professionals from developed countries to developing countries.

Major policy findings revealed that highly skilled professionals (i) are likely to leave the country if its social system does not allow professionals to continue working after retirement, they are retired or are about to retire, and their job satisfaction drops significantly; (ii) are likely to be scouted by firms in developing countries if they have long work experience, are more 'visible' to other companies, and they know and/or are provided enough information about work and living overseas; (iv) are likely to take offers from firms in developing countries if the supporting system for work and daily life is efficient, which also aids their performance; (v) consider the stability and security of a developing country in deciding to go and work there.

### **Lao PDR at the Crossroads: Industrial Development Strategy 2016–2030**

This project was initiated upon the request of the Minister of Industry and Commerce of Lao PDR. The government has been concerned that despite economic growth increasing per capita income by more than seven times—from US\$235.2 in 1991 to nearly US\$1,800 in 2015—growth has been based on a few sectors that are dependent on exhaustible mineral resources, with energy and resource industries hardly generating sufficient jobs required for inclusive growth. Development gaps have also widened between and within regions.

This research aims to present potential inputs from different perspectives, particularly to medium- and long-term comprehensive industrial development strategies. It includes concrete policy recommendations likely to contribute to the realisation of further development and growth in Lao PDR. It also aims to pose policy measures that can turn the weakness of Lao PDR, its landlocked location, into its strength. Thus, the term 'crossroads' in the research title refers to the time the country needs to make a significant decision regarding its future path, as well as the place where it is centrally located at the Mekong region.

The unique viewpoints presented are based on geography and connectivity, and how they affect



industrialisation and economic development. Both connectivity and geography are analysed in the framework of ‘production networks’, ‘second unbundling’, and ‘new economic geography.’ In particular, this study demonstrates that the formation of midsize agglomeration, participation in production networks, and regional core cities and rural development are important. To go up to these development stages, the study lays out potential industrial strategies, such as hard/ soft infrastructure development, human capital development, nurturing efficient financial sectors, and others. A geographical simulation also estimates the impacts of the above-mentioned measures on the country’s economy.

This research is expected to assist the government to achieve (i) inclusive and sustainable economic growth, (ii) upgrading of its industrial structure, (iii) export diversification, (iv) tighter connectivity, and (v) the narrowing of geographical development gaps.

### **New Developments for Cross-border Transport Facilitation in the Inland ASEAN and Establishment of the ASEAN Economic Community**

The year 2015 was a milestone for ASEAN with the establishment of the ASEAN Economic Community. It was also the targeted year for the Master Plan on ASEAN Connectivity (MPAC).

Accordingly, this study surveyed some of the roads to be upgraded in the MPAC and the newly developed roads in Cambodia, Lao PDR, Myanmar, and Viet Nam. Many roads listed for upgrading in the MPAC did not appear to be justified for upgrading because their conditions were not so bad. Similarly, many completed roads did not appear to be in good condition. Regarding new roads, people expected the expressway to bring about many benefits of development along the road, such as increase in foreign direct investment and demand for agricultural products in metropolises, which also needed to be verified.

In conducting this study, technical requirements of vehicles such as height, width, length, and maximum weight of vehicles were checked. The standards of the technical requirements are similar to the criteria shown in the ASEAN Framework Agreement on Facilitation of Goods in Transit.

Road signs were checked because the difference in signage can cause serious accidents when the vehicles cross borders freely. Most road signs were found to be similar, with some differences such as signs against overtaking of other vehicles and facility signs of hospitals. Some signs are written only in the local language. A survey on the composition of road traffic laws and transportation laws was conducted as a preparation for a comparative study on transportation laws.

### **Rethinking Migration Governance in the Mekong Region: From the Perspective of the Migrant Workers and their Employers**

The labour market in the Mekong Subregion is integrated as a matter of practice, even though the free movement of unskilled workers is not mentioned in the ASEAN Economic Community. Thailand now receives more than 3 million unskilled workers from neighbouring countries—which include Cambodia, Lao PDR, and Myanmar—who support Thai industries. Workers' households in their home countries are supported by remittances from these migrant workers. The huge demand for migrant workers in Thailand is due to the recent chronic labour shortage in Thailand. The workers too are seeking better opportunities that cannot be found in their home countries.

The role of migrant workers in economic activities and regional industrial development is increasing each year. This study aims to understand the overall impact of migration on regional development and development strategies by examining migration governance, which includes the overall system and practice of legal and economic institutions in the Mekong Subregion. Workers decide whether to migrate and how they migrate, and employers decide whether to employ migrants under certain governmental rules and economic conditions. Specifically, an analysis of migration governance entails examining the

motivations and the consequences of both workers and employers and the government policy of Thailand.

### **SME Participation in ASEAN and East Asian Regional Economic Integration**

ASEAN and East Asian economies have become increasingly integrated. This process of regional economic integration has been driven by mutually reinforcing market forces and regional and preferential trade agreements. A major area of concern among policymakers has been the extent to which small and medium enterprises (SMEs) are participating and benefiting from regional economic integration, a valid concern given that about 95–99 percent of all firms in the region are SMEs. SMEs are also likely to be more resource constrained (compared to large firms) to take advantage of the benefits from trade and investment liberalisation. Despite their importance, systematic and comprehensive research on these issues is lacking.

This research project aims to undertake a systematic, comprehensive, and comparative analysis of SME participation in ASEAN and East Asian regional economic integration. It poses the following key research questions:

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- What is the state of SME participation in regional trade, production networks, and investment activities?
  - What are the enabling factors and obstacles to SME participation in regional trade, production networks, and investment activities?
  - How have regional and preferential trade agreements affected the activities and performance of SMEs?

- What are the policy imperatives at the national and regional levels to promote active participation of SMEs in regional trade, production networks, and investment?

The findings of this research would help governments and line ministries on trade and investment liberalisation draw out their policies

## Sustainable Economic Development



### **Developing Sustainable Collaboration Model for Implementing Integrated Space-Based/ Geospatial Disaster Management Infrastructure to Strengthen the Resilience in ASEAN Community**

Strengthening the resilience of social infrastructure has been an important issue for the economic development of East Asian and ASEAN countries. The ASEAN Agreement on Disaster Management and Emergency Response (AADMER) developed the AADMER Work Program 2010–2015 to cover all aspects of disaster management.

The ERIA study project, 'Applying Space-based Technology for Building Resilience in ASEAN

Region' conducted in 2014, concluded that geospatial and space technologies can potentially strengthen this resilience although sustainable mechanisms for integrating the technologies in practice for disaster risk management (DRM) is still not well established. The study pointed out the necessity of (i) transborder mechanisms to deliver the geospatial and space-based information from data providers to end users in disaster-affected areas with support of international activities; and (ii) financial schemes involving public–private partnerships (PPPs) to collaborate on integrating technologies in sustainable and practical manners.



To establish the transborder mechanism with PPP scheme, the study proposes to establish a transborder DRM platform as a DRM service infrastructure for public disaster management agencies and private companies in the ASEAN region. The platform comprises the following components: (i) data resources interoperable and expandable in regional and global scale; (ii) knowledge on how to apply DRM technologies in practice; and (iii) human network of stakeholders including national and local governments, technology providers, and financing partners. To ensure sustainable operation, the platform collects operation fees from DRM service providers while the latter develop businesses using the platform.

This study aims to (i) analyse the feasibility of the proposed platform in terms of technology and finance, (ii) design the platform based on the feasibility study, and (iii) lay out strategies to establish and operate the platform in a practical and sustainable manner.

### **Economic Policymaking in the Indonesian Economy**

With the new era of globalisation with lots of modernisation movements, many of Indonesia's economic policies still lack economic rationale. To contribute more to providing a rational

background for Indonesia's economic policies, ERIA and the Centre for Strategic and International Studies – Indonesia invited prominent experts on the most fundamental subjects on Indonesia's economic policies to share their thoughts, through policy briefs, on how such policies could take shape to provide maximum benefits to the country.

The issues covered in the policy briefs are related to investment and business climate, infrastructure, trade and market openness, service sector development, and social protection. On investment and business climate issues, emphasis was on discovering incentives for investment, revisiting the Negative Investment List, and evaluating the ease of doing business. Encompassing financing and regulatory issues is among the main points covered under infrastructure policy briefs. Opportunities arising from more participation in foreign trade agreements and other trade openness movements are captured in the policy briefs on trade and market openness. Addressing efficiency issues are the topics covered under services sector development in general and in financial services sector in particular. Finally, food security issues and investigating productivity improvement for food security are among the main points covered in the policy briefs.

#### **Industry 4.0: Empowering ASEAN for Circular Economy**

The emerging economies of Asia are experiencing strong growth, accompanied by increased production and consumption. Ample evidence suggests that the regional economic development experienced in ASEAN, China, and India is associated with industry 1.0 (through introduction of mechanical production facilities powered by water and fossil fuel energy). This slightly differs from industry 2.0, where mass production is based on the division of labour and renewable electrical energy, and industry 3.0, where electronics, information and communication technology (ICT), and robots played a key role in automating production. For the last several years, analysis of industries 1.0, 2.0, and 3.0 has been largely absent from the assessment of integrated economic and environmental policy formulations. Recent agreements on Intended Nationally Determined Contributions by major developing countries of the East Asia Summit (EAS) also highlight the importance of understanding the improvements in resource efficiency that will drive industrial revolution 4.0.

Industry 4.0, where a new economic model replaces the linear approach to industrialisation and which considers the resource constraints and application of product and process innovation, will become an economic and social imperative for the EAS region. Linking economic opportunities

within ecosystem boundaries of industrialisation requires a disruptive paradigm shift. In an effort to keep control over valuable natural resources, wisely using critical inputs such as energy, and reducing carbon emissions, some economies such as Japan, Korea, and Germany are finding innovative ways of 'disruptively shifting' towards a circular economy. Their success also provokes bolder questions to other rapidly growing ASEAN countries to leapfrog into industry 4.0. By evaluating the policies and practices available at different levels and their applicability to the emerging EAS economies, this study addresses the following: Will a circular economy and a new type of eco-industries deliver enough social and economic benefits during the transition? What is the role of ICT? How could competitive markets for a circular economy be developed through regulations? What are the uncertainties that may hinder the investment decision on circular economy at the firm, sector, and economy levels? If there are experiences on regional cooperation, how could the power of that architecture be leveraged?

#### **Reducing the Vulnerability of Supply Chains and Production Networks**

The global supply chain and production network is a paradigmatic example of an economic structure on which the impact of unexpected events propagate rapidly through the system.



Despite several studies oriented to investigating direct impacts on specific geographical areas or production networks, and to quantifying the cascading economic effects of extreme weather events and economic crisis on production networks, the great complexity of the global economic system, coupled with methodological and data gaps, makes it difficult to estimate the interrelated effects of unexpected events.

Recently supply chain vulnerability and supply chain risk management have received considerable attention from academics and policymakers. The impact of one entity on the global supply chain or failure of a particular component of the production network can affect a number of interrelated entities in the supply chain and, in some instances, disrupt the whole supply chain. The risk implications of the entwined regional and global marketplace that characterises Asian production networks and supply chains had been evidenced vividly in Japan's earthquake and Thailand floods. Incidents such as the seemingly unlikely volcanic eruption in Indonesia make companies and policymakers aware of how little control they have over many vulnerabilities. Still, some companies appear to be able to weather, and recover from, hazardous events more effectively than others.

The apparent ability of some supply chains to recover from inevitable vulnerabilities more effectively than others has triggered an important policy debate on supply chain resilience. Those supply chain risk studies provided normative guidelines based on single best-practice examples or vulnerability events which have implications for developing integrated response strategies. Since clearly understanding possible consequences is a fundamental step in building socio-economic resilience, this study aims to (i) define the conceptual and sectoral domains of supply chain risk management and resilience by examining the welfare effects of extreme weather events and other economic shocks on the selected global supply chain in East Asia Summit economies; (ii) conduct an in-depth analysis on the scope of public-private partnerships in tackling the risks by exploring empirically the effects of supply chain risks and information management, and the four formative supply chain capabilities of flexibility, velocity, visibility, and collaboration; and (iii) propose a regional cooperation framework in the context of major manifest supply chain vulnerability events, such as disasters and global financial crisis.

## Energy



### **Achieving Integrated, Trans-boundary Energy and Electricity Markets in Southeast Asia: Identifying, Analysing, and Offering Solutions to Overcoming the Economic, Technical, Institutional, and Geopolitical Barriers to Regional Energy Integration**

The research is divided into four interdependent research clusters, with each cluster drawing on a combination of quantitative and qualitative research methods. The project as a whole will be informed by a preliminary literature review covering:

- Analysis of the positive and negative experiences of energy and electricity market integration in Europe, particularly the recent interconnection of Hungary, Poland, and the Czech Republic to the West European system after decoupling from the East European (Russian) system.
- Compilation and assessment of the range of evaluations and recommendations provided from previous studies by ERIA, HAPUA (The Heads of ASEAN Power Utilities/Authorities), Asian Development Bank, and International Energy Agency.



While the scope of the project covers ASEAN as a whole, Clusters 1 and 2 use smaller case studies on the BIMP countries (Brunei Darussalam, Indonesia, Malaysia, and the Philippines) to gain sufficient depth of analysis to be useful in the time available. Cluster 3 focuses on the non-economic factors that influence the desirability and feasibility of greater integration, especially in relation to the geopolitical dimensions of massive infrastructure projects. Cluster 4 performs a benchmark study on successfully operating electricity pool models. It reviews papers and reports that analysed how and why a regional electricity pool operates successfully. It conducts structured interviews to exchanges, utilities, regulatory agencies, and individual power producers of the successfully operating regional electricity pool. It also compares the regional electricity pools and designs a feasible business model for a pan-ASEAN electricity pool.

A high level of interaction between the research clusters is anticipated to ensure that the insights and analysis from each cluster can be used to 'cross-fertilise' the others and for the researchers themselves to learn from one another and build capacity within and between the members of the Energy Research Institute Network.

### **A Two-Country CGE Model for Indonesia and Malaysia**

The energy subsidy in Indonesia started in 1967. With unrestricted purchase and retail of subsidised fuels and electricity, the distributional effects have been unequal and have favoured the rich who are more capable of consuming more. The energy subsidies appeared to drive for more inefficient use of fuels and electricity, distort the market signals for energy-related investments, and burden government as these limit the capability of fiscal policies to stimulate economic growth (Widodo et al., 2012).

Malaysia also subsidises petroleum fuels and electricity. Subsidies on electricity have two channels: (i) through the natural gas supplied to Tenaga Nasional Berhad, Malaysia's national power corporation; and (ii) through special rebates for low-income households. However, such subsidies were believed to incentivise the use of outdated and dirtier technologies with negative environmental impacts (Hamid and Rashid, 2012).

The impact of the removal of Indonesia's energy subsidy has been the subject of a few studies which arrived at controversial conclusions: (i) Hope and Sigh (1995), IEA (1999), and Mourougane (2010) estimated that gross domestic product (GDP) could be stimulated rather than depressed; (ii) Clement et al. (2007) estimated a two percent real output loss in the case of Indonesia; (iii) Widodo et al. (2012), using a social accounting matrix method,

show a negative impact of subsidy removal on GDP although reallocation of the subsidy to targeted sectors could offset the negative impacts to a large extent.

The Government of Malaysia is considering a 'rationalisation of subsidies', implying liberalisation of pricing to reflect the cost of supply while keeping the subsidies to targeted social groups. Hamid and Rashid (2012), studying the impact of Malaysia's energy subsidy removal, show painful effects on the economy, including declining wages and rising costs of production factors which could substitute for reduced use of fuels. However, they emphasise that such is healthy to Malaysia's long-term economic growth and boosts the competitiveness of its industries.

Indonesia and Malaysia are not just geographically close; they are also well linked. As the two countries share a lot in terms of culture, language, and economic structure, it makes sense to ask how energy subsidies on both sides have affected each other. Both countries are also massively reducing energy subsidies. It is also interesting to see what would be the cross-border impacts of such actions. Lastly, it would be interesting to know which sectors of the two economies would be affected most and how policies to reallocate the fund of energy subsidies as public transfer for investment and consumption in different sectors would affect real output and welfare of each sector.

### **Building a Network on Collaborating Towards a Social Acceptance of Nuclear and Coal Power in Asia**

The radioactive disaster at Fukushima Daiichi Nuclear Power Station on 11 March 2011 seriously impacted regional society. More than 100,000 local residents were forced to abandon their homes. People in emerging Asian economies were greatly shocked not only because it was one of the three severe nuclear accidents so far but also because it happened in Japan, one of the most advanced countries in technology and infrastructure.

Meanwhile, economic efficiency is an inevitable element that should be considered in developing power stations in Asia. In this light, coal-fired power stations become an appealing option because of their supply stability and economic efficiency. However, although there are technologies that allow the use of coal with lesser environmental burden, concern over their emission sometimes harms deployment of coal-fired power stations.

Therefore, cultivating mutual reliance and agreement among stakeholders—such as government, the licensee, and local municipalities—is crucial when a nuclear and coal facility would be built and operated. Intense and practical research on issues such as the specific feature of nuclear/coal power, its role on energy



security and on climate change, social influence, and disclosure of risk information would be highly appreciated. Collaboration towards social acceptance of nuclear/coal in Asia and taking practical action are of immediate necessity and would contribute greatly to the smooth development and utilisation of these types of energy in Asia.

### **Cost Assessment of Energy Security Improvement in EAS Region**

Energy security is a centre pillar of energy policy in all East Asia Summit countries. Self-sufficiency in energy supply forms the basis of energy security, and there are many policy options to improve it. Enhancing oil production, increasing use of domestically available renewable energy, and improving the efficiency of energy use are examples of effective policies.

Meanwhile, governments are requested to utilise their tax income economically and effectively. Since each policy option has different costs and effects, careful assessment is required before choosing a policy to gain maximum utility under a limited budget. This study attempts to assess and compare the costs and effects of different policy options to determine which is more economically effective. Such assessment is expected to help policymakers choose which policy option will improve self-sufficiency in energy supply, thus, the country's energy security.

### **Development of Eco Town Model in ASEAN Region through Adoption of Energy-Efficient Building Technologies, Smart Grid, and Transportation**

The East Asia region has experienced rapid rates of urbanisation in the last few years, and this trend is likely to continue for some time. Thus, the Eco Town Model (ETM) will largely contribute to green energy and energy efficiency. ETM in this study refers to a town, scalable to any size based on the geographical and socio-economic features of an ASEAN country, seeking to become low energy or low carbon with a quantitative reduction target for CO<sub>2</sub> emissions and a concrete low energy development plan irrespective of its size, characteristics, and type of development (greenfield or brownfield development).

The model aims to promote the development of eco towns in the region by providing a basic principle that can assist central and local government officials in planning effective low- and energy-efficient policies and formulating an appropriate combination of low-energy measures while taking into account socio-economic conditions and city or town specific characteristics. The study will look into three main areas: building technologies, smart grid system and design optimisation, and vehicle fuel economy regulation and fuel savings analysis.

### **Electricity Supply Mix and Role of Policy in ASEAN**

Increasing electricity demand and relatively lower income level are urging ASEAN countries to develop large-scale power generating capacity in an economically efficient way. In addition, mitigating environmental burden in this development is becoming important more than ever; that is, the simultaneous achievement of three elements, the so-called 3Es—energy supply security, economic efficiency, and environmental protection—in power development has become indispensable to the energy policy of ASEAN countries.

To this goal, each country has its policy/target for future power supply mix. The question is how to implement such policy into actual business. Without an appropriate implementation tool, a policy/plan will obviously not likely to be implemented.

In addition, the earlier ERIA study indicates the importance of having a pan-regional planning coordination function to maximise regional benefit in power development. Basically, the power development plan of each country does not consider regional benefit or effect for neighbouring countries. Thus, such coordination function can make it possible to implement a policy on regional power supply mix into a market.

This is not only for ASEAN. Many developed countries have also experienced challenges on this issue; thus, ASEAN could learn much from these experiences. In this light, the study aims at suggesting possible policy tools to achieve the appropriate power supply mix.

### **Energy Connectivity in Myanmar**

Myanmar has achieved a consistently high growth rate for the past several years, emanating from the need to find sustainable energy sources. In countries of the Mekong River Basin, the electricity and gas networks or grids were the symbol of progress itself, with increasing numbers of grid-connected people a measure of economic development. Nevertheless, more than half of the population in Myanmar does not have access to modern electricity. There are several limitations to the monolithic model of grid based development. Even with access, the grid in many regions is often unreliable, with power cuts being a common frustration. This study focuses on developing an energy road map for Myanmar, similar to other Mekong River Basin countries. The following four themes have been identified as significantly important in enhancing rural and national electrification in Myanmar: (i) comparison between mini-grids and national grid extension, (ii) possible financial mechanism to support rural electrification, (ii) potential of hydropower development focusing on small and

midsized hydropower projects, (iii) possible role of foreign investment, particularly from neighbouring countries.

These four core themes will be examined through the methodologies described below. A comparative analysis is also undertaken on common energy challenges of Mekong River Basin countries, such as rural electrification and connectivity. Human resource development and capacity building activities will likewise be conducted for government officials/researchers of Myanmar.

This study has three components:

- Simulation analysis that examines the economic rationale of the comparative advantage between mini-grids and the national grid extension to enhance the electrification in Myanmar
- Understanding the enabling conditions for the successful electricity development in the rural areas of Myanmar. Extensive fieldwork generated new data that filled the knowledge and information gaps.
- Stakeholder analysis to understand regional perspective on Myanmar's affluent energy and resources, such as natural gas and hydros.

### **Energy Efficiency Improvement in the Transport Sector through Transport Improvement and Smart Community Development in the Urban Area**

The study conducted in FY2012 and FY213 analysed how to improve traffic flow—thus, energy efficiency of the transport sector—in major cities of the East Asia Summit (EAS) region. Jakarta, Indonesia was the subject of the case study. One key finding was that appropriate forward-looking investment is required in the initial stages of urban development. For instance, traffic congestion in Jakarta has deteriorated considerably, and measures to improve the situation are limited. The situation also requires greater change in the existing system and massive short-term investment, which may cause negative side effects for the economy.

Meanwhile, the EAS region has many midsized to small cities that are about to launch or have just launched explosive urbanisation and motorisation. From the initial development stage, appropriate measures must be implemented in an ex ante manner to allow these cities to realise sound development.

In this light, as in the FY2014 study, the case study in FY2015 will target a midsized to small city, Da Nang of Viet Nam, in its initial development stage, and will analyse policy and infrastructural measures for improving traffic and, consequently,

energy efficiency. From this analysis, the study group aims to derive policy recommendations for many cities in the EAS region.

### **Energy Outlook and Analysis of Energy Saving Potential in East Asia Region**

Sustained population and economic growth in the East Asia Summit (EAS) region has significantly increased energy demand. The Total Final Energy Consumption (TFEC) is projected to double from 2012 to 2040. Demand in the transport sector, among others, is projected to grow most rapidly, followed by demand of the industry and commercial sectors, and finally, that of the residential sector. The increasing energy demand poses a threat to energy security in the EAS region. Thus, potential energy saving is key to reducing energy demand and CO<sub>2</sub> emissions.

This study will show the alternative policy scenario in the EAS region that could potentially save energy consumption by 2040 from the business-as-usual scenario. Finally, the study will provide recommendations based on the project trend of energy consumption in which energy efficiency policy and its target, together with investment, will be crucial to realise the hidden fuel, and contribute to sustain growth.

### **Globalisation of Low-Carbon Technologies**

In recent years, tremendous strides have been made to advance low-carbon energy systems—innovating, scaling up investment, bringing down system costs, implementing the right policy frameworks, and interconnecting large amounts of variable renewable energy supply into the grid. Reflecting this, many countries have put forward ambitious plans to increase low-carbon energy in power generation. Combined, the low-carbon renewable energy plans of China, India, and ASEAN will increase from approximately 9,000 TWh in 2012 to 20,000 TWh in 2030.

In addition, a number of promising initiatives currently being implemented will buttress the Intended Nationally Determined Contributions (INDCs). Some 40 implementing agreements in the areas of renewable energy, fossil fuels, fusion power, and energy efficiency are being carried out. To find solutions, the public and the private sectors must work together. Technology-focused alliances, such as the International Solar Alliance, Global Geothermal Alliance, and Mission Innovations, will play an important role in enabling countries to harness the full potential of low-carbon energy resources at their disposal. The movement on 100-percent low carbon is growing, with over 600 cities committing to this target and an increasing number of companies joining this initiative. Thus, INDCs can provide an important impetus to enhance and achieve global



efforts to mitigate carbon emissions, double the share of low-carbon energy in the supply mix, and accelerate green growth.

There is growing awareness of the urgent need to turn INDCs into analytical works and concrete actions. INDCs can and must change the current trends in energy supply and use that are patently unsustainable, but this will take a revolution and low-carbon energy technologies will have a crucial role. Yet policymakers, academics, and the business community perceive several barriers to diffusing these low-carbon technologies at the national and regional levels. This study is designed to identify the opportunities and barriers in INDCs for diffusion of low-carbon energy technology and to propose the incentive mechanisms at the local, national, and regional levels to the required scale.

### **Institutional Strategy and Economic Impacts by Energy Subsidy Removals in the EAS Region**

ERIA and the International Energy Agency (2013) estimated that fossil fuel subsidies amounted to US\$51 billion in Southeast Asia for 2012 alone. It is widely accepted that fossil fuel subsidies encourage wasteful energy use, burden government budgets, defer investment in energy infrastructure and efficient technology, and further undermine renewable energy uptakes. While some ASEAN countries have taken actions to remove subsidies, these must be accompanied by

careful strategy and steps to do so, as it is often a politically sensitive subject. On the other hand, energy subsidies incentivise consumption and can increase energy demand. When these subsidies are inefficient, they can lead to fiscal pressure, harmful emissions, and potentially undermine sustainable green growth in East Asia countries. In theory, reduced subsidies will encourage more energy-efficient consumption, leading to a positive impact on international energy prices and energy security, and will make renewable energy and technologies more competitive. Reducing local pollution and cutting down greenhouse gas emissions further benefit the environment and society.

### **Integrative Strategy and Policies for Promotion of Appropriate Renewable Energy Technologies in Lower Mekong Basin Region**

Cambodia, Lao PDR, Myanmar, Thailand, and Viet Nam are neighbouring countries in the Lower Mekong Basin Region with great potential and opportunity for cooperation and development. Exploitation of renewable energy (RE) sources is one appropriate option to meet the increasing electricity demand, and to increase energy security and economic competitiveness. That is why RE technologies in the region were researched and promoted in the past decades, though not large scale. It is found that Thailand has achieved early success in RE power development mainly by relying on important support measures, including

subsidies and feed-in tariffs. However, this success is based on RE capacity expansion and is lacking if measured against other indicators of success. Moreover, an integrated strategy on priority setting of RE technologies to be achieved is still lacking in Thailand. These experiences and the weaknesses of Thailand could be used as lessons learnt to be shared and could help advance the development and use of green energy throughout the region.

This study aims to set up the strategy and policies for RE development for countries in the Lower Mekong Basin River to foresee the prioritised RE technologies and the social, economic, and environmental benefits in a strategy for RE development. The prioritised RE technologies will be selected based on the major criteria on reduction potential of greenhouse gas; abatement cost; government's priorities; and sustainable development benefits on the economy, society, and the environment through cost-benefit analyses. The calculations of costs and benefits for each RE technology will be put in a long-term energy system, and outputs of calculations will be used as a base for selecting prioritised RE technologies and the appropriate future-installed capacity for each RE technology in the region. The calculations of cost-benefit for each RE technology and the impacts of RE technologies on low-carbon and sustainable development will be carried out for Viet Nam as a case study. To support these strategies and action plans, the RE

policy instruments applied effectively in other countries will also be reviewed and analysed based on the country-specific financial conditions to get the effective policies that could reduce the project costs of RE technologies.

### **Multilateral Joint Study for LNG Market**

Many East Asia Summit countries show an increase in energy demand. The role of natural gas in energy supply becomes increasingly important in various aspects, which include economic efficiency, diversification of energy, effective use of domestic resources, and reducing environmental burden arising from energy use.

Meanwhile, the global LNG (liquefied natural gas) market has seen big changes in recent years. In terms of supply and demand, while many new LNG importers are coming into the market, LNG demand for large importers such as Japan, China, and Europe is becoming uncertain. At the same time, new liquefaction capacities are coming into operation within the next few years. Yet, both oil-linked and spot prices are experiencing a downward trend. Importing countries may welcome this trend. But we should pay attention to the side effect for supply-side investment.

The Asian LNG market cannot be insulated from these changes in the global market. Although this recent price trend seems to indicate that the



Asian premium issue in LNG price has diminished, the essential problem has not been resolved. The Asian premium will easily come back again depending on crude oil price. Therefore, it is requested to pursue resolving substantive reform in the Asian premium to achieve sustainable and sound development of the global LNG market. With this background, this study aims at deriving policy recommendations for the global LNG market.

### **Possible Cooperation Framework for Oil Stockpiling and Emergency Response System of East Asia**

As ASEAN economies expand, energy demand has likewise shown remarkable growth in the last decade. While all sources of energy have increased, oil demand in particular has recorded the largest increase. Due to stagnant indigenous oil supply in ASEAN, the growth in oil demand has resulted in increased oil imports, making ASEAN countries more vulnerable to external supply disruption or highly volatile international oil prices.

As for sources of oil import for ASEAN countries, the share of Middle Eastern countries will continue to increase, suggesting that oil supply in ASEAN will contain more risk factors given the persistent political instability in the Middle East. Also, as the oil supply security system in ASEAN in general is still at the development stage, international

cooperation is needed to promote and invigorate oil supply security arrangements in the region. Given the global and integrated nature of the oil market, promoting regional cooperation for oil supply security arrangement in ASEAN benefits all East Asian countries.

Based on the above, this study aims to explore and evaluate potential cooperative actions among East Asian countries to promote their oil supply security.

The study has three components. Component 1 provides potential scenarios of oil supply disruption in ASEAN. Two scenarios are developed to describe the serious consequences for ASEAN countries in case of unexpected supply disruption, thus suggesting an urgent need for ASEAN to develop oil supply security measures, such as stockpiling. Component 2 explores the options of oil stockpiling. The chapter on component 2 provides an overview of traditional stockpiling types, such as onshore tank or underground tank. It also considers lower cost options to start stockpiling as many ASEAN countries have budgetary constraints. Component 3 discusses how government and industry can collaborate to attain oil supply security. This chapter reviews the experience of International Energy Agency member countries in this regard and draws policy implications. It will highlight an incentive system for private players in stockpiling development.

### **Preparation of Energy Statistics and Energy Balance Construction for Setting Up a Sustainable Energy Development Plan in Cambodia**

The lack of information and inadequate capacity to carry out comprehensive planning are identified as the main contributing factors to the current circumstances of the energy sector in Cambodia. The Ministry of Mines and Energy (MME) requested support to build capacity in developing a reliable energy balance on which energy development planning could be built. The MME requested ERIA's support in developing energy statistics and constructing energy balance for a sustainable energy development plan in Cambodia. The project aims to strengthen the MME to be capable of employing advanced techniques, methodologies, and modelling tools in institutionalising the collection, processing, and analysis of energy statistics in Cambodia and of establishing and managing an energy information system. Through this project, Cambodia is expected to establish the systematic collection of energy data from various energy supply companies and other government agencies/corporations with the objective of compiling accurate energy statistics for sustainable energy planning.

### **Sea Lane Security of Oil and LNG for Asia**

This is one of the energy studies selected at the September 2015 meeting of the Energy Research Institute Network in Jakarta. The study is conducted by ERIA in collaboration with the Institute of Energy Economics, Japan (IEEJ) and The Energy and Resources Institute (TERI), India. To add to the quality of this study, ERIA invited four experts on oil and LNG (liquefied natural gas) transport in Indonesia, the captain of Petronas LNG shipping company, a researcher from China on ocean issues, and a researcher from the Petroleum Institute, Thailand.

According to ERIA's energy outlook, oil and gas demand in the East Asia Summit (EAS) region will continuously increase in the future and majority of external oil and LNG supplies into Asia will cross the choke points of sea transportation. More imports mean that naval transportation from and to Asia would be more congested, and naval accidents would more likely happen in narrow passages, such as the Strait of Hormuz and Malacca Strait. Piracy issues will remain a large concern in the Straits and their near seas, too. These factors may seriously affect the trade flow of oil and LNG transportation to Asia, and thus seriously threaten regional energy security.

This study consists of three parts: (i) IEEJ forecasts oil and LNG trade flow up to year 2040, including future alternative routes such as North America

to Asia; (ii) TERI studies future congestion of the choke points based on the IEEJ forecasting results, and sea lane security issues from the Middle East to East Asia, such as accidents, terror attacks, piracy, natural disasters, and regional conflict and their countermeasures; (iii) experts' review of current sea lane security issues.

The final report of this study will be completed around June 2016.

### **Study of Renewable Energy Potential and its Effective Usage in EAS Countries**

East Asian Summit (EAS) countries increased their imports of crude oil and petroleum products in recent years to meet the corresponding increase in energy demand of the transport sector. Each country has promoted the introduction and uptake of biofuel produced from feedstock grown domestically. On the other hand, the fuel consumption of EAS countries predicted from the types of vehicle fleet is quite different from each other and does not always adjust to the national policies that promote biofuel utilisation. From the viewpoint of effective use of resources and solution to the problem of oil refinery capacity, it is important to balance biofuel demand and supply through international trade.

This study has the following components: (i) potential study of diversified transportation energy

mix, (ii) research of next generation biofuels, and (iii) biomethanol as an energy carrier. On component (i), the trend of energy consumption until 2030 is estimated using an original simulation method, and the possibility for achieving the energy policy target is examined based on detailed data (such as vehicle information, energy conservation, and others) supplied by each country. Then, the gap between energy consumption trend and policy target will be shown and measures to minimise the gap will be investigated. Based on the results, the study team will propose the policy that requires multilateral cooperation among ASEAN countries.

The production cost of biofuel is generally higher than that of petroleum fuel. Government usually gives financial support to promote biofuel use. According to the cost simulation, raw material cost accounts for the most part of fuel production. The use of low-grade and waste material seems to be effective in reducing raw material cost. In this study, the technical constraints to the next generation fuel production from low-grade material will be identified to propose solutions by investigating research articles and experimental works. In addition, utilisation of next generation fuel as a sustainable aviation fuel will be discussed. For component (iii), biomethanol production is being investigated and the role of methanol as an energy carrier will be discussed.

### **Study on the Advancement of Energy Management System (EMS) in the EAS Region**

The rapid economic growth in East Asia Summit (EAS) countries has driven the formation of new industrial and commercial facilities as well as energy supply infrastructure, and this trend is expected to continue. Therefore, concrete efforts for controlling energy consumption will be required to maintain sustainable economic development in these countries, which otherwise will have to increase the energy supply significantly in order to meet the demand.

Experiences in developed countries have shown that an important perspective for improving energy efficiency on the consumption side is to promote the diffusion of highly efficient energy equipment and to formulate an institutional framework for efficient energy use, such as an energy conservation law, at the initial stage of capital accumulation and the development of industrial/commercial facilities.

As a result of the 1970 oil crisis and the rise of climate change issues since the 1990s, developed countries have devised various political and technical approaches for energy management. In particular, the advancement of information and communication technology since the early 2000s has greatly helped the development of the energy management system (EMS), which is now widely called xEMS.

Furthermore, efforts have been accelerated to relate the load management functions of xEMS with the demand response. With economic growth, changes in industrial structure, and changes in energy consumption pattern in EAS countries, it is worth studying the prospects of the advancement of EMS that meet the specific needs of each country in the region. Conducting a study on this subject as an ERIA research project to identify the common policy challenges to advance EMS in the EAS region is expected to contribute to the sustainable economic growth of the region.

### **Sustainability Assessment of Utilising Conventional and New-Type Geothermal Resources in East Asia**

In an attempt to maximise the potential use of renewable energy sources, many Asian countries have been developing their geothermal resources, although the types of geothermal resources vary from country to country. Countries with rich high-temperature geothermal resources have utilised their potential by conventional steam power generation. Even in countries without volcanoes, heat extraction from the deeper underground using EGS (Enhanced/Engineered Geothermal System) techniques and/or from shallow underground for direct use have been studied and pilot-schemed.



Geothermal technologies, such as reservoir engineering, monitoring and scale-controlling techniques, and others, which are all essential for sustainable use of geothermal resources for both power generation and direct use, pose both challenges and opportunities.

This study aims at identifying those challenges, developing country-specific solutions, and sharing information to improve technology for sustainable geothermal utilisation in Asian countries.

This project envisages guidelines for sustainable use of geothermal energy. The guidelines will be formulated separately for (i) power generation and

direct heat use and (ii) ground source heat pump since the necessary technologies are different for these two categories. These guidelines shall be useful to practising engineers and managers with newly started geothermal business, or by researchers in related fields.

This project also provides recommendations to policymakers for more intensive utilisation of geothermal energy. It is strongly recommended that policymakers and high-level government officials refer to these recommendations for rapid and sound development and use of geothermal energy.

