Chapter 2

Energy Market Integration in East Asia: A Regional Public Goods Approach

Philip Andrews-Speed
Chatham House

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CHAPTER 2

Energy Market Integration in East Asia: A Regional Public Goods Approach

PHILIP ANDREWS-SPEED*

Chatham House, UK

This study applies a regional public goods approach to the study of energy market integration (EMI) in East Asia, with a view to clarifying the outlook for such integration and the likely obstacles to be encountered. In addition to drawing on theoretical ideas relating to regional public goods, the paper will also draw on the experience of the European Union in its attempts to develop a single energy market. The study shows that many services are needed in order to develop and sustain a regional integrated energy market that some of these services have characteristics of regional public goods, though some may also be trans-regional or global in nature as well. The study recommends that :EMI in East Asia should be pursued in an incremental manner and mainly at a sub-regional scale; and the specific steps taken towards EMI should be chosen on the basis of their likely positive economic impacts and their likely ease of delivery.

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1. Introduction

The integration of energy markets across the region is one of three major priorities for regional energy collaboration identified by the EAS Energy Ministers. The successful development of an integrated energy market across East Asia should yield significant economic benefits (ERIA, 2010). More specifically it would allow national governments to more easily address the four main energy policy challenges which face any country, namely:

- Security of energy supply and/or demand;
- Economic efficiency of the energy sector;
- Social equity, particularly access to affordable modern energy;
- Reduced emissions of pollutants from energy production and use.

Improvements in all these four aspects of energy management across the region through energy market integration (EMI) would yield both direct economic benefits in terms of economic growth as well as producing a number of positive externalities. These benefits have the character of public goods in that they are unlikely to be provided by private actors and, in the absence of government action, are liable to under-provision or over-use. Given that the intended market integration extends across a very wide region, the benefits of such market integration can be considered as regional public goods or even as trans-regional public goods.

The aim of this paper is to apply a regional public goods approach to the study of EMI in East Asia, with a view to clarifying the outlook for such integration and the likely obstacles to be encountered. This will provide a framework for prioritising the component tasks of EMI. In addition to drawing on theoretical ideas relating to regional public goods, the paper will also draw on the experience of the European Union in its attempts to develop a single energy market.

The report starts with a brief account of the energy challenges facing East Asia and the potential for an integrated energy market to address these challenges. This is followed by a short explanation of the distinctiveness of energy and energy policy, with reference to the public good elements of energy. The paper then provides an account of ideas relating to the provision of regional public goods and of their relevance to energy,

which forms the framework for the subsequent analysis. The experience of the European Union is then examined briefly before the framework of regional public goods is applied to EMI in East Asia.

2. Key Energy Challenges Facing East Asia

The EAS region accounts for about 25% of world GDP in nominal terms, but the population is some 45% of the total. The EAS also forms a significant part of the world's energy system. It accounts for more than one-third of global commercial energy consumption and about 40% of carbon dioxide emissions (Table 1). The production and consumption of coal and of natural gas are roughly in balance, but the region is a major net importer of oil. As remaining reserves of oil and natural gas become progressively concentrated in areas outside the EAS region (e.g. the Middle East and C.I.S.), a growing share of energy demand is likely to require imported energy. Thus long-term security of energy supply is a priority for most countries in this region, regardless of their level of development. The richest countries seek to maintain their level of wealth, the rapidly developing economies seek to sustain their rate of growth, whilst the poorest states need energy to support the first steps of modernisation and to supply their people with basic amenities.

Although security of supply and social equity are probably the main national and regional energy policy concerns, economic and technical efficiency are also important because inefficiency can undermine measures taken to address the former two objectives. Environmental objectives are also becoming increasingly important across the region. The high level of coal reserves and the consequent reliance on coal, especially in China and India, exacerbates the challenges these countries will face in constraining emissions of carbon dioxide, nitrogen oxides and sulphur oxides, as well as land and water pollution. The increasing exploitation of offshore oil and gas and the growing volume of energy transported across the seas of the region all enhance the risk of accidents and marine pollution. Though increased energy efficiency and the growing

use of renewable energy can both act to address many of these challenges, they require the appropriate technology to be available and appropriate economic incentives.

Table 1. EAS Share of World Commercial Energy Reserves, Production and Consumption, 2009

	Reserves	Production	Consumption
Oil	3%	10%	31%
Natural Gas	8%	12%	13%
Coal	31%	65%	65%
Energy consumption			36%
Electricity generation			36%
CO2 emissions		41%	

Source: BP Statistical Review of World Energy, 2010.
Note: Numbers are rounded.

In many respects, there is a very large degree of disparity between countries across the region, for example:

- The political and economic systems and ideologies, and in the legal systems;
- The state of development of the economy;
- The structure and rate of growth of the economy;
- The scale and mix of the primary energy resource;
- The scale, mix and rate of growth of energy supply and demand;
- The relative importance of net imports and net exports of energy;
- The structure and ownership of the energy industry, and the nature of energy markets, especially with respect to energy pricing;
- The state of the energy infrastructure and the proportion of the population with access to modern energy;
- The energy intensity and scale of carbon dioxide emissions.

For the purposes of this analysis, four groups of countries may be recognised on the basis of their stage of economic development, economic structure, energy consumption and carbon emissions (Table 2). The first group comprises OECD countries with advanced economies plus Brunei, with relatively high per capita energy consumption and carbon emissions, and with the capacity to invent, develop and deploy new technologies. Australia and Brunei are distinguished by their status as net energy exporters. The second group comprises the two large emerging economies in the

region, China and India, which have in common their large populations, high degree of dependence on coal and high energy intensity. Both countries have the capacity to develop and deploy new technologies.

The third group spans a variety of ASEAN countries which are at various stages of economic development between the richest and the least developed in the region. All members of the group are net importers of energy, with the exception of Malaysia. Energy intensities are relatively high, and per capita energy consumption is relatively low. Capacity to develop and deploy new technologies varies between these countries.

The final group comprises the three least developed members of ASEAN which are distinguished by their low level of industrialisation, of per capita energy consumption and of per capita carbon emissions.

This diversity is the source of many of the regional energy challenges and yet at the same time provides some of the opportunities. The over-arching objective of EMI in the EAS region is to bring net economic benefits to the region through increasing energy cost competitiveness, energy security and developing cleaner energy. At the heart of this vision lies the concept of economic efficiency, which has three aspects in this context (Bannister *et al.,* 2008):

- Productive efficiency, which relates to the cost of producing a certain amount of energy;
- Allocative efficiency which reflects the overall benefit to society from the supply of energy, and is determined by the pricing system that provides signals to energy users;
- Dynamic efficiency is achieved by an appropriate balance between short-term and long-term concerns, and this particularly relies on encouraging investment in the extraction of energy resources, in the construction of new energy infrastructure and in the installation of new energy-using appliances.

Table 2. Selected Features of Population, Economy and the Energy Sector

	Population	GDP	GDP/ Capita	Share of Industry in GDP	Energy Consumption	Energy Consumption Per capita	Share of Coal	Energy Intensity	CO2 Emissions	CO2 Emissions Per capita
	Millions	Billion 2000 US$	US$	%	Mtoe	toe	%	toe/million 2000 US$	Mt-C	
	2007	2007	2007	2007	2007	2007	2005	2005	2005	
Australia	21	503	23,936	27	122	5.8	44.5	260	103.4	4.9
Brunei	0.4	7	17,944	71	2.4	6.3	0	366	1.4	3.5
Japan	128	5,206	40,745	30	526	4.1	21.1	106	342	2.7
Korea	48	734	15,158	37	218	4.5	23.8	342	136	2.8
New Zealand	4	64	15,178	25	17	4.1	11.6	277	8.7	2.2
Singapore	4.5	134	29,185	30	31	6.7	0	272	18.7	4.1
China	1,318	2,387	1,811	48	1,497	1.1	72.6	791	1,386	1.05
India	1,124	771	686	29	380	0.3	54.8	578	329	0.29
Indonesia	225	233	1,033	27	135	0.6	18.8	650	90.6	0.40
Malaysia	26	133	5,009	48	59	2.2	10.5	576	42.4	1.63
Philippines	89	107	1,202	32	37	0.4	15.3	392	20.4	0.23
Thailand	67	174	2,594	45	90	1.3	11.8	573	52.1	0.78
Vietnam	85	53	617	42	27	0.3	29.8	609	22.9	0.27
Cambodia	14.4	7	495	27	1.3	0.09	18.2	225	1.0	0.07
Lao	6	2.7	450	31	0.6	0.09	5.8	219	0.3	0.05
Myanmar	49	17	347	16	4	0.1	7.8	343	2.9	0.06

Source: Kimura, 2009.

Note: Statistics have been rounded for simplification, and are for illustrative purposes only.

Efficiency may be the concept which underpins the drive for EMI, but investment and trade are the key activities within the energy market which should lead to the realisation of the desired benefits. Investment is needed to exploit energy resources, to build infrastructure, and to develop and deploy new technologies. Trade which takes energy from exporters to importers enhances the energy security of the importers and can underpin economic development of both importing and exporting states. In certain circumstances, energy trade can reduce the environmental impact of energy production and use, and can lower the cost of energy supply (World Bank, 2008).

A recent study has shown that the liberalization of regional trade and investment and of national energy markets should yield substantial positive gains for the EAS region as a whole, in terms of GDP growth and carbon dioxide emission reduction (ERIA, 2010). This analysis showed that all the EAS countries should see positive GDP benefits, though many countries experience an overall growth of carbon dioxide emissions resulting from the economic growth. The study also argued that an integrated energy market requires not only trade and investment liberalisation, but also linkage of energy infrastructure, reform of domestic pricing systems for energy and liberalisation of national energy markets. However, such is the highly politicised nature of energy that these steps towards EMI, and their component tasks, are likely to prove very challenging to implement.

3. The Distinctiveness of Energy and Energy Policy

The energy industry is distinct from any other sector of the economy. It is a key input to all economic activity, especially in a modern economy, and is a key determinant of the standard of living in all societies. Its distinctiveness as a commercial activity arises from the large capital costs, the long-lead times, the economies of scale, the technical sophistication and the relatively high degree of risk involved. The energy sector may play a very important role in the economy of a nation with respect to the gross domestic product, to the balance of trade, to the availability of foreign exchange, and to the alleviation of poverty.

As a consequence of the distinctiveness and importance of the energy sector, a responsible government cannot avoid becoming involved in the governance of the energy sector, regardless of the nature of the economy and of the system of national governance. Markets alone cannot satisfactorily address a number of key challenges, for example:

- The difficulties of promoting competition on account of the natural monopoly characteristics of energy networks, the role of potential monopolists and cartels, and the high barriers to entry.
- The potential for the production and use of energy to cause harm to wider society and to the environment ('negative externalities').
- The need to manage finite, national natural resources, and to gather and provide market information.

The need to manage those elements of energy which have aspects of a 'public good', such as security of supply, access to basic energy services, and energy efficiency.

Though the effective governance of energy at a national level continues to be of crucial importance, it is no longer sufficient; for the energy industry, the energy markets and the impacts of energy production and use have become transnational, regional and even global in scale. Energy companies are internationalising, oil markets are global, gas markets are regional and growing in scale, energy supply networks span great distances, and environmental damage affects whole regions and even the entire globe. Therefore the governance of energy must also take place at levels above the nation, at regional, trans-regional and global scales.

For East Asia to develop an integrated energy market across the region, new systems of governance must be established which span the region. This then raises a number of questions concerning which aspects of energy should be governed at regional level and concerning the nature of the governing institutions and instruments. Of particular relevance is the number of aspects of energy which have the character of a public good, at least in part. These include (Hunt and Peralta, 2004; United Nations, 2005; Asian Development Bank, 2007; Wright, 2008; Cantore, 2009; Economic Commission for Latin America and the Caribbean, 2009; Goldthau, 2010):

- Security of energy supply;
- Emergency response;
- The prevention of environmental damage;
- The supply of energy to the poor;
- The effective management of primary resources;
- The efficient supply and use of energy services;
- The governance of the energy sector;
- Research and development;
- Capacity building;
- The provision of information.

Although most of these energy policy priorities are normally considered as *national* public goods, they also play an important role in any regional energy market. It is for these reasons that this paper explores the relevance of a regional public goods approach to EMI in East Asia.

4. Regional Public Goods: The Principles

The aim of this section is to provide insight into the main attributes of regional public goods, under five headings:

- Fundamental features of regional public goods
- Aggregation technologies
- Incentives for supply
- Regional organisations
- Supports and constraints for regional collaboration

4.1. Fundamental Features of Regional Public Goods

A public good is a service or a resource which provides benefits which are non-excludable and non-rival. Non-excludability arises from the impossibility or impracticability of excluding users. This results in over-use, especially by 'free-riders who have not contributed to the production of the public good. Non-rivalry arises from

the marginal cost of supplying another user being zero. Additional users do not reduce the quantity of the good available to other users, and thus it is not worth spending the money excluding these users. The combination of non-excludability and non-rivalry generally results in over-use and under-supply of a public good. In contrast a private good is fully excludable and fully rival, and supply will, in theory, be efficient.

A range of goods exist which are intermediate between purely public and purely private (Table 3). Common goods are rival and non-excludable, and these are greatly prone to over-use. Impure public goods may be partially rival or partially excludable. They can take different forms and, like pure public goods, are liable to suffer from under-supply and over-use. Club goods are fully excludable, with a membership fee, and are often supplied efficiently. Though they are usually intended to be non-rival, they can easily become partially rival if the fee is not set sufficiently high or if too many parties are allowed to participate. A joint product is an activity which produces more than one benefit, of which at least one is a public good (Sandler, 2006).

Table 3. Classification of Public Goods, with Examples

	Rival	Partially rival	Non-rival
Excludable	**Pure private goods** Food Cars Fuel	**Club goods** Intelsat Canals International space station	Weather stations
Partially excludable	**Impure public goods** Information dissemination Extension services		
Non-excludable	**Common goods** Free access pasture Open pathways Hunting grounds Air corridors	**Impure public goods** Ocean fisheries Pest control	**Pure public goods** Pollution control Disease eradication Strategic weapons Sound financial practices Basic research

Source: UNIDO (2008).

The concept of a public good was originally formulated in the context of an individual nation, in order to show which services and resources should be provided by national governments. Transnational public goods also exist and can be delivered above the regional level, at trans-regional and global levels. The key distinctive feature of all transnational public goods is that, unlike for national public goods, no single body with

the authority of a state exists to ensure the supply of the good. This therefore raises the challenge of collective action, through public or private parties, or both (Barrett, 2006; UNIDO, 2008).

A regional public good is one which can be provided by and shared by the countries of a region, and which provides benefits to individual countries and to the region as a whole (Ferroni, 2002; Hettne and Soderbaum, 2006). In principle, collective action by governments in the region should create positive spill-over effects across the region which are greater than those which could be generated by individual governments acting alone (Ferroni, 2002; Sandler, 2007). Certain of these public goods may be quite limited in their geographic extent, and may be better referred to as 'cross-border' public goods (UNIDO, 2008). Trans-regional public goods, as the term implies, benefit two or more contiguous regions, and global public goods, such as the reduction of carbon emissions, benefit the whole world (Sandler, 2007).

One of the key difficulties in the field of transnational public goods is deciding which level of governance or what size of region is most suited to providing the good. This is the issue of 'subsidiarity'. From the economic perspective, the scope of the regional institutions established to deliver the good should match the region benefitting from the spill-over, and the number of countries should be as small as possible in order to reduce transaction costs. This ideal may not be achievable or even desirable in many cases, for two main reasons: first, economies of scale may be better achieved by using an institution which already exists and which has a larger geographic scope than the specific public good under consideration; and, second, economies of scope may be enhanced by having one institution deliver a range of public goods (Hettne and Soderbaum, 2006; Sandler, 2007; UNIDO, 2008).

Most regional public goods fall under one or more of these six headings, though a degree of overlap exists between them:

1. Knowledge: for example, the provision of information, the publication of analyses of that information, scientific research and development, education and training, and dialogue.
2. Infrastructure: for example, the construction and operation of cross-border infrastructure to deliver services, and joint investment in infrastructure to gain

economies of scale. Infrastructure is not in itself a public good, but rather it provides services which have elements of a public good (Rufin, 2004).

3. Environment: for example, measures to prevent pollution, to reduce levels of pollution and to clean-up pollution.
4. Health: for example, preventing or eradicating disease, and stopping the spread of epidemics.
5. Peace and security: for example, shared responsibility for providing security in areas of common security concern.
6. Governance: for example, establishing and implementing shared standards, best practises and policy regimes, setting up regimes to address cross-border problems, and creating networks of regulatory agencies. Governance is an intermediate public good which is essential in order to generate the desired final public goods.

4.2. Aggregation Technologies

For any public good, the key to designing effective delivery of the good is to understand the 'aggregation technology'. The aggregation technology encapsulates the general nature of the institutions and instruments which must be created in order to deliver the public good, and the nature of the aggregator depends on the nature of the good to be delivered. The purpose of the aggregation technology is to provide the incentives for collective action to ensure sufficient supply of the public good. The challenge for policy-makers is to design the institutions and instruments so as to address the weaknesses of the aggregation technology or to manipulate the technology (Barrett, 2006; Sandler, 2004, 2006, 2007; UNIDO, 2008).

Seven types of aggregation technology may be identified for regional public goods (Table 4). The most basic one is 'summation', by which the total supply of the good is the sum of the contributions regardless of how much each party contributes. All contributions are perfectly substitutable. 'Weighted summation' resembles summation, except that in this case the relative importance or weight of the different contributions is variable. For such types of public good, it is very difficult to ensure that all parties contribute. The likelihood of under-provision is high, not least because marginal costs tend to rise as the amount provided by a particular party grows.

Table 4. Typology of Regional Public Goods, with Prognosis for Supply

Aggregation Technology	Pure Public Good	Impure Public Good	Club Good	Joint Products
Summation	*Undersupplied* Cleansing an ecosystem	*Partly undersupplied* Treating diseased patients. Deterring terrorism	*Efficient supply* Regional park. Regional waterway	Preserving rainforests
Weighted sum	*Partly undersupplied* Curbing spread of disease	*Overuse/undersupply* Reducing acid rain	*Efficient supply* Power network. Intelsat	Eliminating insurgency
Weakest link	*Supply may be efficient* Maintaining network integrity. Containing disease	*Overuse/undersupply* Monitoring disease outbreak	*Undersupply* Air traffic control	Security intelligence
Weaker link	*Efficient supply expected/possible* Maintaining financial stability	*Overuse/undersupply* Preventing spread of pest	*Undersupply* Transportation infrastructure	Internet connectivity
Best shot	*Undersupply or efficient supply* Developing a vaccine	*Undersupply or efficient supply* Gathering intelligence on terrorists. Disseminating research findings on climate change	*Efficient supply* Rapid reaction force. Satellite launch facility	Remote sensing of hurricanes
Better shot	*Undersupply or efficient supply* Quality control of food exports	*Overuse/some undersupply* Database Cleaning up oil spill	*Efficient supply* Biohazard facility	Bioprospecting
Threshold	*Limited undersupply* Regional flood control	*Limited undersupply* Forest fire suppression	*Efficient supply* Crisis management team	Regional peacekeeping

Sources: Sandler (2006, 2007), UNIDO (2008).

The supply of a good with 'weakest link' aggregation technology depends on the supply of the smallest contributor, just like the weakest link in a chain. Every contribution is important, but the failure by just one country to supply an adequate quantity of the good undermines the collective effort and renders the efforts of others wasted. 'Weaker link' technology is similar but implies that there is a gradation of 'weakness' among contributors. The risk exists that every country contributes only as much as the weakest country or countries, and that greater effort is expended on addressing the anticipated failure to provide the public good than on providing the good. This outcome can be avoided if the parties share common interests and goals, and if the

wealthier or more competent countries help the weaker states through the provision of money, skills or other resources.

At the other extreme is 'best shot' technology, through which the total supply of the public good is determined by the success or actions of just one country. 'Better shot' technology is similar to best shot, except that the impact of each contribution is proportional to the size of that contribution. In principle, such aggregators avoid many of the challenges facing other technologies, but require coordination among the countries in the region to ensure that resources are not wasted by those countries which are unlikely to make the best shot contribution. Problems may arise if no country is willing or able to deliver the good, if a country fails to deliver on a promise to deliver to good, or if two or more countries are vying to be the provider.

The final type of aggregation technology is 'threshold' which requires a certain level of contribution to be made from the parties collectively before any benefit is realised. If the total contribution falls below this threshold, no benefit accrues to any party, only costs. Free-riding can only occur once the threshold has been reached. Examples include many forms of emergency response teams and facilities.

4.3. Incentives for Supply

The provision of regional public goods requires incentives. Collaboration which requires substantial and sustained commitments is likely to require a formal treaty with rewards and sanctions (Devlin and Mulder, 2006). This is especially the case for most summation technologies which require formal institutions in order to share costs or allocate (tradable) property rights, and to provide for credible and substantial penalties in the case of failure to adhere to the terms of the agreement (UNIDO, 2008).

Clearly one of the easiest types of regional good to supply is the club good, the provision of which will require a toll with possibly both a capacity charge and a variable charge. Cross-subsidies may be needed for goods with weakest link aggregators. For impure and pure public goods, most aggregation technologies present challenges, with the possible exception of best shot goods which can be effective as long as the single actor is able and willing to supply, and provided coordination is adequate. Avoiding under-supply or over-use with other types of technology requires measures which vary according to the aggregation technology. Even if a formal treaty and organisation is not

necessary, a degree of coordination and cooperation will be required in order to deliver any type of regional public good efficiently (Barrett, 2006).

4.4. Regional Organisations

No regional organisation will have the authority of a national government because sovereignty lies with individual nations (Matthews, 2003). A supra-national approach to regional governance in which the regional body has real authority over member states is only possible if the individual states are willing to cede a significant amount of sovereignty to this body, as is the case with the European Union. This is rarely acceptable in other parts of the world. Rather, most regional cooperation is inter-governmental, with each state retaining veto power and with a secretariat which coordinates but has no authority.

The approach taken in building regional collaboration also depends on the extent of integration envisaged. At one end of the spectrum lies full market integration which will require a sophisticated system of rules and incentives in order to break down trade barriers and to ensure the free flow of goods and services. At the other extreme, states can agree to cooperate in certain sectors to deliver specific regional public goods. In between these two extreme lies policy coordination, or even policy harmonisation, which may accompany either market integration or sectoral cooperation (Matthews, 2003).

Global cooperation organisations tend to fall into one of three categories: standard setters, operational managers, and service providers. Regional cooperation organisations tend to embody all three characteristics. They may be formal organisations or networks, and they may be uni-dimensional or multi-dimensional. Thus regional organisation structures can be grouped into one of four categories (Hettne and Soderbaum, 2006):

- Uni-dimensional organisations which may focus on regional economic integration or regional finance (the regional development banks) or which may be limited to a single sector such as health, security, education or communications.
- Multi-dimensional organisations which may drive regional cooperation (such as ASEAN), those which enhance collaboration in a river basin, and certain UN organisations such as UNESCAP.

- Uni-dimensional networks promote cooperation and coordination in such activities as research and development, and may draw on civil society and private commercial parties as well as on public bodies. A regional electrical power pool, such as the Nordpool, is a more technically sophisticated example. A particular type of organisation which can be of great value in establishing a regional market is the regulatory network (Matthews, 2003; Berg and Horrall, 2008).
- Multi-dimensional networks are less common, and include growth triangles, development corridors and other micro-regional economic organisations.

The final organisation of relevance is the research institute, for research underpins the improved provision of many types of transnational public good (Hettne and Soderbaum, 2006).

Whatever combination of organisations are developed to promote the supply of public goods across a region, a number of general principles should be held in mind. First, policy research and operational management should not be considered as separate activities, but should be integrated in the same organisations. Second, the long-term aim of the regional organisations and institutions should be to encourage the emergence of new behavioural norms that support the delivery of regional public goods, not just to enforce them through rules. Finally, all regional organisations should be linked effectively both horizontally to other regional organisations in the same geographical area, and vertically to global and national organisations providing public goods. It may also be desirable to build links to regional organisations in adjacent regions in order to deliver trans-regional public goods (Hettne and Soderbaum, 2006; Sandler, 2007; UNIDO, 2008).

4.5. Supports for and Constraints to Regional Collaboration

As mentioned above, the main constraint to the effectiveness of international law and to the provision of transnational public goods is sovereignty (Barrett, 2006). Unwillingness to cede any degree of sovereignty to a supranational, regional organisation was widespread throughout much of the twentieth century. Though attempts were made by states to collaborate and even to integrate their economies across a region, the level of success was modest. Most of these efforts were defensive in nature, seeking to promote economic development through state-centred, protectionist

approaches with formal rules and exclusive membership. With the exception of the European Union, most of these efforts failed in attaining their objectives for a range of economic and political reasons. The cost of integration was too high, the economic diversity among the participating states was too great, and governments lacked both political commitment and a willingness to yield sovereignty (Matthews, 2003; Hettne and Soderbaum, 2006).

This 'old regionalism' contrasts with the 'new regionalism' which takes a more open, informal and flexible approach to cooperation. Membership tends to be open to new parties, structures and systems are more heterogeneous and both formal rules and binding commitments with penalties for failure are rare. The typical new regionalism seeks to promote market reforms within the region in order to promote trade and integration, at the same time as seeking integration with global economic systems. From one perspective, the 'new regionalism' is to be welcomed as it engenders a higher degree of willingness to collaborate (Matthews, 2003; Hettne and Soderbaum, 2006; Devlin and Mulder, 2006; Sandler, 2007). On the other hand, such informal and flexible arrangements may be less able to deliver outcomes which require a high degree of commitment and contribution from all the parties.

In addition to these general forces which appear to be providing support for the provision of regional public goods, a number of other specific supporting factors can be identified which will tend to promote collaboration with a region, for example (Barrett, 2006; Devlin and Mulder, 2006; Sandler, 2007):

- A common history or cultural heritage;
- A common world view, especially with respect to economic and political issues;
- A perceived common threat;
- Leadership by one or more nations;
- A high degree of political will from all or most of the participating states;
- The participation of private actors, both commercial and civil society.

Conversely, regional collaboration can be inhibited or delayed by a wide range of factors, for example (Ferroni, 2002; Barrett, 2006; Devlin and Mulder, 2006; Sandler, 2007; UNIDO, 2008):

- The length of time needed to achieve noticeable benefits;

- The need for individual governments to amend national laws, structures and systems in order to adhere to the requirements of the collaborative initiatives;
- The need to compensate those states which either lose from the proposed arrangements or which need assistance to meet the required standards;
- Long-standing rivalries between nations within the region which may undermine the emergence of a regional leadership;
- Unwillingness by one or more nations to cede any degree of sovereignty;
- A lack of capacity in the regional organisations to support the delivery of the public goods;
- A lack of finance or of a regional body which can provide or transfer finance;
- A lack of confidence in the willingness of others to deliver on the commitments;
- The presence of economies with a high degree of state control and ownership.

The challenge for governments seeking to work together to deliver regional public goods is to recognise these constraints and to address them through a combination of (1) taking measures to tackle them directly, (2) directing efforts at delivering those goods which bring obvious benefits to the greatest number of states, and (3) designing the incentives in such a way as to overcome these constraints.

5. Regional Public Goods: Application to the Energy Sector

Section 3 of this report listed a number of elements of the energy system which have been identified by others as having characteristics of a public good, namely:

- Security of energy supply;
- Emergency response;
- The prevention of environmental damage;
- The supply of energy to the poor;
- The effective management of primary resources;
- The efficient supply and use of energy services;
- The governance of the energy sector;
- Research and development;

- Capacity building;
- The provision of information.

The aim of this section is to apply the ideas explored in Section 4 to the energy sector in order to more explicitly identify which features of the energy sector may be considered as regional public goods and how they may be classified and understood in this context.

The first step in this process involves recognising that although many 'high level' regional policy goals may have features which resemble a public good, they themselves comprise a large number of elements which require individual examination. Such 'high level' regional policy goals include:

- Security of energy supply;
- Economic development;
- Poverty alleviation;
- Economic and technical efficiency;
- Environmental protection.

The public good character of these policy priorities is taken for granted in this study, and, indeed, they are the over-arching policy objectives for EAS in the energy sector. Instead, this study focuses on the more specific services or actions which need to be delivered in order to achieve these broader goals. These will be considered under the five heading listed in Section 4.1, namely knowledge, infrastructure, environment, health, and security. Governance, as an intermediate public good, will be examined separately.

5.1. Identifying Regional Public Goods in the Energy Sector

A preliminary identification and classification of potential services which have features of a regional public good and which are required to be delivered in order to build an integrated energy market is shown in Tables 5 and 6. The aim of these tables is to be illustrative rather than exhaustive, and to show how the concept of regional public goods may be applied.

5.1.1. Knowledge

Knowledge in the broadest sense may be the most important public good required to support the development of a regional integrated energy market, because a market cannot operate without knowledge. A large number of types of knowledge have been listed in Tables 5 and 6 with the aim of illustrating the range of knowledge that is required and the variation in the characteristics of different types of knowledge which in turn are likely to affect the provision of the good.

Table 5. Selected Services which have Features of Regional Public Goods for A Regional Integrated Energy Market, Grouped by Field of Activity

Category	Service	Type of Good	Aggregator
Knowledge	Dissemination of research results	Pure PG	Weighted sum
	Joint public pronouncements	Pure PG	Weaker link
	Best practice laws, procedures and rules	Pure PG	Better shot
	Early warning systems	Pure PG	Best shot
	Market and reserves data	Impure PG	Weaker link
	Analysis of data	Impure PG	Better shot
	Technological research and development	Impure PG	Better shot
	Benchmarking data	Impure PG	Threshold
	Capacity building and training	Club G	Better shot
	Events and meetings	Club G	Weighted sum
Infrastructure	Network construction	Club good	Weighted sum
	Construction of shared infrastructure	Club good	Weighted sum
	Maintaining network integrity, security and access	Pure PG	Weakest link
Environment, natural resources, and health	Providing clean energy to cities and households	Pure PG	Weighted sum
	Effective husbanding of natural resources	Pure PG	Weaker link
	Reducing acid rain	Impure PG	Weighted sum
	Cleaning up after polluting event	Impure PG	Better shot
Peace and security	Construction of emergency stocks	Pure PG	Better shot
	Emergency stock sharing system	Club G	Weighted sum
	Sea-lane security	Pure PG	Better shot
	Network security	Pure PG	Weakest link
	Emergency response team	Club G	Threshold

Pure public goods include the public dissemination of research results, joint public pronouncements, the development and dissemination of best practices, and certain types of regional early warning systems. Most of the other types of knowledge are impure

public gods, mainly on account of the potential for partial excludability. Capacity building, training, events and meetings are generally club goods.

With respect to the aggregation technology, the key distinction is between those goods which are best or better shot and those which are weakest or weaker link. Best or better shot goods include technological research and development, data analysis, capacity building and training, the development of best practices, and regional early warning systems. In a region which has one or more countries with the wealth, skills and technology, the likelihood of provision of these goods is relatively high, provided the leading nations wish to provide them. In contrast, those goods which are weakest or weaker link are more susceptible to the performance of the weaker or more reluctant members in the region. Examples include joint public pronouncements, and the provision of data on national energy markets and energy reserves. The second of these, data, is crucial for the effective operation of a regional energy market.

Two other groups of knowledge-related public good can be recognised. Dissemination of research results and events and meetings involve weighted sum aggregation, and the provision of benchmarking data requires threshold aggregation.

Table 6. Selected Regional Public Goods for a Regional Integrated Energy Market, Grouped by Type of Service and Aggregator

Aggregation Technology	Pure Public Good	Impure Public Good	Club Good
Summation			
Weighted sum	Dissemination of research results. Providing clean energy to cities.	Reducing acid rain	Network construction. Events and meetings. Emergency stock sharing system.
Weakest link	Maintaining network integrity, security and access.		
Weaker link	Joint public pronouncements. Husbanding of natural resources.	Market and reserves data.	
Threshold		Benchmarking data.	Emergency response team
Best shot	Early warning systems		
Better shot	Technology R & D . Best practice laws, procedures and rules. Emergency stock construction. Sea-lane security.	Cleaning up after pollution event. Analysis of data	Capacity building & training.

With respect to the aggregation technology, the key distinction is between those goods which are best or better shot and those which are weakest or weaker link. Best or better shot goods include technological research and development, data analysis, capacity building and training, the development of best practices, and regional early warning systems. In a region which has one or more countries with the wealth, skills and technology, the likelihood of provision of these goods is relatively high, provided the leading nations wish to provide them. In contrast, those goods which are weakest or weaker link are more susceptible to the performance of the weaker or more reluctant members in the region. Examples include joint public pronouncements, and the provision of data on national energy markets and energy reserves. The second of these, data, is crucial for the effective operation of a regional energy market.

Two other groups of knowledge-related public good can be recognised. Dissemination of research results and events and meetings involve weighted sum aggregation, and the provision of benchmarking data requires threshold aggregation.

5.1.2. Infrastructure

The construction and operation of infrastructure to transport energy across a region is one of the most fundamental requirements for an integrated energy market. Such infrastructure is required to transport oil, gas, coal and electricity. Although pipelines and electricity grids form the heart of a modern energy transport system, roads, canals, and railways also play an important role.

Trans-boundary infrastructure other than networks may also play an important role in the development of a regional energy market. Single infrastructure projects may be developed by two (or possibly three) neighbouring states along their shared borders. Examples include power plants, dams, oil refineries, LNG terminals, ports, or production facilities for an oil or gas field. Such shared projects are especially relevant in cases where resources straddle national boundaries or where individual states lack the resources or the requirement to develop the project on their own.

The construction of trans-boundary infrastructure and regional energy networks is usually a club good, from which actors can be excluded, and has features of a weighted sum aggregator, as different parties usually make different scales of contribution to the project. In contrast, maintaining the integrity of the network is a pure public good on

account of the wide benefits this brings to society across the region in terms of economic development and poverty alleviation. However infrastructure integrity is often vulnerable to the actions or inactions of the least competent party and therefore has a weakest link aggregator. As a consequence, maintaining the integrity of a regional energy network will be much more challenging than constructing it in the first instance.

5.1.3. Environment, Natural Resources and Health

For the purposes of an analysis of the public good aspects of energy, it is appropriate to combine the environmental and health dimensions of energy, for the health impacts of energy production and use mainly arise from pollution of different types.

Two examples of energy services which yield pure public goods include the provision of clean energy in cities and households, and the effective husbanding or management of primary energy resources. The first involves removing local sources of atmospheric pollution produces by vehicles, power stations and industry, and providing gas or electricity to households instead of coal or biomass. This may require the provision of clean energy by other countries depending on their ability to supply clean energy. This involves weighted sum aggregation. The effective management of primary energy resources can be considered as a regional or even as a global public good, because once they have been wasted then they can usually never be recovered. Rather like maintaining the integrity of a network, the management of regional primary energy resources has features of a weaker link public good.

The reduction of greenhouse gas emissions is not addressed here, as that self-evidently a global public good, though regional approaches may be developed to address this challenge. In contrast, the reduction of acid rain through controlling sulphur dioxide emissions from power stations and other industries is certainly a regional public good, though impure in nature. The weighted sum aggregator arises from the dependence on the amount of emissions produced by different countries and the direction of prevailing winds with respect to the source of pollution and to potential areas of damage. In contrast, cleaning up after a polluting event, such as an oil or chemical spill, requires a best shot or better shot aggregator.

5.1.4. Security

For reasons discussed above, wider issues relating to security of energy supply are not examined here. Rather the focus is on a number of specific services which have a security dimension and which have elements of a regional public good.

The first two items relate to the ability to manage short-term disruptions in the international energy markets. They involve the construction and filling of emergency stocks of an energy commodity such as oil, gas or coal, and systems for sharing these stocks in the event of a market disruption. The construction and filling of emergency stocks is a pure public good, as the existence of such stocks acts to stabilise the market, and just a few countries in the region are needed to undertake this task, making it a better shot aggregator. Indeed, given the global nature of the oil market, the construction of oil stocks may better be considered as a global public good. In contrast, any system for sharing the stocks in the case of an emergency is a club good, and is subject to a weighted sum aggregator as different players will have different capacities and willingness to share.

The provision of physical security to energy transport routes is an important pure regional public good that all parties benefit from. Sea-lane security can be provided by one or more powerful states, making the aggregator best or better shot, whilst the security of onshore networks more closely resembles a weaker link good as a network is only as secure as its most vulnerable point.

The final example is the emergency response team created, trained and resourced to provide the initial response to an accident or natural disaster which affects an energy system, for example an explosion in a production or transportation facility. Unlike the clean-up operation which is an impure public good, the emergency response team is most likely a club good to which only certain countries contribute and from which only these countries benefit. The ability of the response team to react to emergencies in countries outside the 'club' may be constrained not only by the rules of the 'club' but also by the physical distance to other countries. The aggregator is of the threshold type, as an inadequate emergency response capability is usually unable to effect any meaningful action.

5.2. Governance for the Provision Regional Public Goods in the Energy Sector

As was noted above, the collective action required to deliver public goods at regional or trans-regional scales requires governance. The word 'governance' can be interpreted and applied in different ways. For international economic organisations, governance involves the management of economic and social affairs by government; for example through the allocation of public resources and the resolution of conflicts between actors, through the exercise of political authority, through the establishment and operation of institutions, and through the formulation and implementation of policies (World Bank, 1992). Measures of governance quality include accountability, participation, predictability, transparency, efficiency and effectiveness (Asian Development Bank, 1995).

In contrast, transaction cost economics and new institutional economics express the concept of governance in much more general terms. In the words of Oliver Williamson "Governance is an effort to craft order, mitigate conflict and realise mutual gains" (Williamson, 2000). This approach focuses on the governance of economic transactions where a transaction is defined as the transfer of a physical good, a commodity, a legal right or a natural resource between actors (Williamson, 2000; Hagedoorn 2009). In this context a governance structure may be "thought of as an institutional framework in which the integrity of a transaction, or related set of transactions, is decided" (Williamson, 1996, p.11).

Both definitions are relevant to this study, because effective governance is required at supra-national and national levels and at the level of the individual economic transaction. In order to determine the most appropriate form of governance for the provision of energy public goods across a region, a number of questions need to be addressed, as already indicated in the previous section:

- What are the overall objectives of the programme for energy cooperation?
- What incentives are needed to deliver the required public goods?
- What are the main supporting and constraining factors?
- Over what region or regions should this cooperation take place?
- What organisations of governance may be suited to these circumstances?

The first question to be addressed by the parties relates to the degree to which they seek to integrate their national energy markets. At one extreme, they might wish to embark on an ambitious programme to create a seamless regional energy market across which capital, commodities and services would flow freely, in the manner of the European Union's intended "single energy market". At the other extreme, the parties might prefer to restrict their cooperation to a few of the most needed energy services. In between these two extreme lie a range of options involving policy coordination and harmonisation, collaboration in the provision of selected public goods, and partial market integration between certain groups of countries in the region. Which approach is preferable or even feasible will to a great extent be determined by the other factors being examined in this section.

The nature of the incentives which will be required to provide the public goods will depend on the nature of the service and of the aggregator. Coordination and cooperation between nation states is a prerequisite for the provision of all regional public goods. What will vary is the extent to which rights, obligations and sanctions must be embodied in a formal treaty. Certain goods with summation or weighted sum aggregators are likely to require treaties, for example the construction of networks, a sharing system for emergency stocks, and the reduction of acid rain. In the case of club goods, those parties who do not wish to participate can easily be excluded and the agreement can be concluded without excessive difficulty. The provision of best shot or better shot goods such as early warning systems, research and development, pollution clean-up and the construction of emergency stocks only needs key parties to be willing to provide the service and to cooperate in its provision.

Weakest and weaker link goods are constrained by the inability or unwillingness of parties to collaborate in supply the good. Inability can be addressed through financial or technical support, for example in maintaining network integrity. But unwillingness to provide may be rooted in the political culture or in national attitudes towards sovereignty. The provision of data on national energy markets and energy reserves, and the management of primary energy resources are likely to be liable to such a constraint. Of more fundamental importance will be the inability or unwillingness of certain governments to open their energy sectors to foreign investment, to reform their systems for energy pricing, to remove the monopoly rights of the national energy champions,

and to provide third-party access to energy infrastructure. These constraints to EMI are illustrated in the case of the European Union, as will be shown in the next section.

The supports for and constraints to regional collaboration elaborated in Section 4.5 are all applicable to the energy sector. Of particular relevance is the need for leadership from one or more nations and for a common world view relating to economics and politics. This arises from the profound relationship between energy, on the one hand, and national sovereignty and national security, on the other. The full integration of energy markets requires governments to cede ownership over their state-owned energy enterprises, to promote inward investment in the exploitation of primary energy resources, and to relax their control over domestic energy markets. Even less ambitious collaboration will require changes to national laws, structures and systems relating to energy. Rivalry between those nations which should be providing regional leadership and the need for cross-subsidies between nations may also prove important barriers to progress.

The geographic extent of collaboration in the provision of energy public goods will depend on (1) the geographic extent of the spill-over benefits from this collaboration and (2) economies of scale and of scope. The extent of the spill-over from the provision of energy public goods is highly variable. Some goods may have spill-overs which are very wide and may even extend beyond the region. Examples include the construction and filling of emergency stocks, research and development, and sea-lane security. Others, such as the construction and operation of an energy network, yield benefits mainly to those connected to the grid. Emergency response teams and pollution clean-up capacity will also have geographic limitations.

For a large region in which the countries seek to collaborate in a number of energy activities, the geographic extent of the spill-over from each activity is likely to be highly variable depending on such factors as the physical geography, the nature and location of energy resources, the location of centres of energy demand, and the degree of economic development. As a consequence it may be necessary to group activities into two or more levels of geographic spill-over, creating a hierarchy in which activities which cover the entire region are managed at the highest level; whereas those activities which most appropriately involve a sub-set of the parties are managed at lower levels, with the higher level of governance providing coordination. In other words, the larger ‘region’

could be divided into smaller 'sub-regions' for the provision of certain goods with a more limited spill-over. In this respect, the coordination between the 'sub-regions' would resemble the provision of trans-regional public goods mentioned in Section 4.

The type of organisation or organisations which are required will depend on three main factors:

- The overall goal of the regional energy cooperation;
- The nature of the regionalism;
- The nature of the specific activities to be coordinated.

As noted in Section 4.4, full regional integration which is intended to lead to a single regional energy market with free movement of commodities, capital and services will require a sophisticated system of rules and incentives. This may, in turn, require a formal supra-national organisation with powers of enforcement as is exemplified by the European Union, or at least formal and wide-ranging treaty such as the Energy Charter Treaty. Whether this is necessary, desirable or even feasible will depend on the nature of the emerging regionalism. Whilst formal supranational governance structures may be desirable in principle, such an approach is characteristic of the 'old regionalism'. In contrast, 'new regionalism' prefers arrangements which are less formal and which lack binding commitments and enforceable sanctions. In these circumstances, it might prove difficult to move ahead with certain initiatives which involve substantial commitments from a large numbers of countries in the region.

Instead, effort may be best directed at making progress incrementally by focusing on a limited number of activities involving countries which are clearly able and willing to participate. Different organisations could then be created to manage defined sets of activities over certain 'sub-regions', under the overall coordination of the high-level regional organisation. The sub-ordinate entities could be structured in a manner so as to take advantage of potential economies of scale and scope, and to prevent a proliferation of entities. Some of these entities will be formal organisations with specific responsibilities for overseeing the implementation of certain activities such as cross-border energy transport or environmental protection, others may take the form of informal networks addressing research, development, information and even regulation.

6. Lessons from the European Experience

Whilst the European Union (EU) may seem remote from East Asia in physical, cultural, political and economic respects, its experience in attempting to develop an integrated energy market has relevance to the EAS, if only on account of the length of time this process of EMI has been running in the EU. The aim of this section is to briefly identify some lessons from the European experience which may be relevant to East Asia.

Formal collaboration between European countries in the field of energy began in the early 1950s with the establishment of the European Coal and Steel Community and the European Atomic Energy community. The first of these was created with the express ambition of building a common market for coal, then the most important source of energy. The next significant step taken was progressive development from 1968 onwards of emergency response mechanisms to react to disruptions to oil supplies, including the construction of oil stocks (Matlary, 1997).

A key feature of the EU is that the member states cede partial sovereignty to the institutions of the EU: to the Council of Europe which comprises the heads of government of each member state, to the European Commission which is a large and powerful civil service, and to the European Parliament which has members directly elected from the member states. Of these three bodies, it has been the Commission which has been the most active in promoting the single European energy market.

It was in 1986 that the Council of Europe first agreed on the need for greater integration of national energy markets and in 1988 it was resolved to introduce single internal energy market. A decade of proposals, drafting and negotiating then took place. The most significant measure to emerge was the Directive on Hydrocarbons Licensing which was issued in 1994 (Cross *et al.*, 2001). Though not obliging member states to open their territories for hydrocarbon exploration and production, the Directive did lay down procedures to be followed once such a decision had been made in order to minimise discrimination against companies from other member states. Legally-binding Directives relating to price transparency and to electricity and gas transit were issued,

and Common Rules covering the removal of monopoly rights, the unbundling of vertically-integrated utilities and third-party access to transmission infrastructure were drafted (Lyons, 1996; Cameron, 2002).

Despite all these formal measures, little was achieved towards building a single energy market until 1996 and 1998 when the Electricity and Gas Directives respectively were adopted. This breakthrough was assisted by the progressive emergence of competitive energy markets at national level, for example in the United Kingdom, Germany, the Nordic countries, the Netherlands and Spain (Egenhofer, 1997). Despite this positive influence, the level of opposition to the Commission's core ideas remained high. As a consequence these Directives reflected compromise solutions to many key issues including third-party access to energy infrastructure and unbundling of utilities. Further, these Directives focused on the liberalisation of national markets and they failed to address key obstacles to the promotion of cross-border energy trade. One significant step towards addressing this deficiency was the establishment in 1998 and 1999 of Forums for the national electricity and gas regulators respectively (Cameron, 2002). These soon merged to form the Council of European Energy Regulators, an independent body which seeks to promote the development of the single energy market through providing coordination between national regulators and between these regulators and the European Commission.

Further Directives concerning the development of Europe-wide electricity and gas markets were adopted in 2003, but little progress was being made towards the creation of a single energy market. In 2007, the Council of Europe issued an "Energy Policy for Europe" which showed renewed political commitment at the highest level to the single European energy market, with three objectives: security of energy supply, a competitive energy market, and the environment, particularly climate change (de Jong, 2008). New measures were required to push forward EMI, and specifically to address continuing obstacles, for example (Nowak, 2010):

- The dominant position in markets of certain national energy companies and the high degree of vertical integration of many of these companies, features which provide high barriers to entry for competitors and prevent access to transmission grids;
- The distortion of competition through inappropriate price regulation;

- The insufficient independence of national energy regulators;
- A shortage of cross-border transmission capacity and high prices for access to such capacity.

A so-called 'Third Energy Package' of proposed measures was published in 2009 and took effect from March 2011. The main components are (Stanic, 2011):

- Unbundling of transmission from production and supply activities;
- Stronger powers and independence of national regulators;
- New rules to harmonise market and network operations across Europe,
- Higher standards of public service obligations and consumer protection;
- New institutions to promote cooperation between regulators and between transmission system operators.

The centrepiece of this new legislation was to have been the mandatory ownership unbundling of vertically-integrated energy utilities. The aim was to radically reduce the ability of energy companies to act in an anti-competitive fashion, in particular by restricting third-party access to transmission networks and by constraining investment in new network capacity. This proposal was over-ruled by two powerful member states, Germany and France (Nowak, 2010). As a result, countries may choose one of three forms of unbundling:

- Ownership unbundling;
- The creation of a independent system operator which leases the network from the utility;
- The creation of an independent transmission system operator which remains within the utility.

It is too early to say how well these new measures will succeed. But this brief history shows that much remains to be achieved twenty three years after the first formal declaration of the need to develop a single energy market in 1988. National interests relating to the support of national champions and the management of domestic energy markets still act to constrain progress on key issues. A small number of powerful interests have colluded to block progress for many years, and great determination and persistence has been required on the part of the Commission to sustain forward movement. In the field of energy, national interests appear to over-ride the collective

interest (Eikeland, 2004), despite the relatively high degree of commonality in customs, norms and values across the member states with respect to culture, politics and economics.

This pessimistic evaluation of European energy policy has to be set alongside real progress in many respects. Of particular relevance to the theme of the single European energy market has been the gradual development of smaller regional energy markets *within* the EU which has been supported by the Commission and by the regulators since 2004. These markets take advantage of proximity between nations and of existing network links. These sub-regional networks have allowed local economic benefit to be realised by the participating states and can provide the building blocks for later integration to form a Europe-wide market once the necessary infrastructure has been built (de Jong, 2008). This suggests that EMI requires bottom-up initiatives as well as top down persuasion and enforcement.

7. Application to Energy Market Integration East Asia

The development of a fully integrated energy market across the East Asian region will prove to be an ambitious undertaking and could take several decades to accomplish. Achieving even the more modest objective of gradual and partial market integration will require sustained effort, determination and leadership. A very wide range of tasks need to be undertaken, some of which will be straightforward and others of which will be much more difficult. The application of regional public goods theory to EMI allows us to identify features in the region which may support and which may constrain EMI. It also provides a framework for assessing the type and geographic scope of governance required. The experience of the EU further illustrates the difficulties involved and highlights certain key obstacles to progress.

EMI requires a number of regional actions to be taken and services to be provided which have features of a regional public good. Some of these are illustrated in Tables 5 and 6. Governance has not been included in these tables for it is considered as an intermediate public good – that is to say, appropriate governance is the service which

has to be provided in order that these other public goods can be delivered. Given the special nature of energy, its importance to national economic development, to national security and to national sovereignty, governance is the most critical public good required to deliver a regional energy market.

East Asia has a number of factors which tend to support steps to EMI. These include:

- Geographic contiguity, albeit over a vast distance;
- Certain commonalities of outlook and a general willingness to cooperate on economic issues (Dent, 2008);
- Complementarity across the region in terms of energy supply and demand, and energy mix;
- A number of countries with advanced economies and technological expertise which can act as best shot or better shot suppliers of public goods (for example, the first group in Table 2);
- A number of countries which can, in principle, act as political leaders in the integration process (a number of countries from the first and second groups in Table 2);

Set against these supporting factors are a number of potential constraints which include:

- The large geographic size of the East Asian region, along with the significant physical barriers across the region such as oceans and mountain ranges;
- A high degree of divergence with respect to history, culture, economics, and politics;
- Long-standing rivalries between key nations which potentially could provide leadership, as well as major unresolved security challenges and a strong emphasis on national sovereignty (Gurtov, 2002; Lincoln, 2004; Rozman, 2004);
- A number of very poor countries in a key location in the region which could prove to be weaker link actors in the management of regional infrastructure (for example, the fourth group in Table 2);
- A high degree of variability between the national energy sectors with respect to degree of development, ownership, market structure, and policy priorities.

These constraining factors will affect not only the provision of specific services, such as those listed in Tables 5 and 6, but will also restrict the rate at which effective governance systems which span the region can be developed. Of particular significance are issues relating to perceptions of national security, national sovereignty and state control of the energy industry. These concerns are likely to impede the reduction of market barriers, especially those relating to third-party access to energy infrastructure and to the monopoly power of national energy companies.

The experience of the EU shows that decades may be needed to make significant progress on some of these governance issues. The EU has many advantages over the East Asian region in terms of geographical size and contiguity, political and economic outlook, and the success in integrating markets for other goods and services. The key lesson from the EU experience is that full EMI can only proceed as rapidly as the slowest nation, or at least as the slowest nation with a key role to play in the market. The progress in developing the single European energy market has, in simple terms, followed the degree of acceptance of the *idea* of energy market liberalisation. During those periods in which the European public have increased their acceptance of the idea, there has been subsequent progress in integration. When the idea of energy market liberalisation is called into question, so is the ambition of EMI.

Despite the slow progress of EMI in Europe, a number of regional public goods in the energy sector are being delivered at a Europe-wide scale, and sub-regional market integration is moving ahead. The implications for the East Asian region are two-fold. Firstly, EMI should be pursued initially at sub-regional level. Secondly, the delivery of specific services at sub-regional level will support the eventual development of an integrated energy market. The specific energy services which could be delivered are best considered according to their degree of 'publicness' and to their aggregation technology.

The construction of trans-boundary infrastructure is in many respects a club good (though the operation of it has wider public goods benefits) and can therefore be delivered with a discrete number of willing and competent states. Given that oil and, to a lesser extent, coal are fungible commodities traded across global markets, the development of an integrated energy market mainly involves electricity and gas which in turn requires the construction and operation of transmission infrastructure. These are

best constructed and operated at sub-regional level, in south-east and north-east Asia, but such markets will still face the operational challenges common to weaker and weakest link goods.

Trans-boundary infrastructure can also include projects that occupy a single location straddling an international boundary. These include power plants, dams, oil refineries, LNG terminals, ports, or production facilities for an oil or gas field. Given their weighted sum character, the delivery these infrastructure projects, as well as other club goods such as acid rain reduction and emergency stock sharing systems, will require very close collaboration between the participating states and, probably, formal legally-binding commitments from the parties.

A number of services or facilities which resemble best shot or better shot goods can be, or are already being delivered through the efforts of a small number of leading nations, for example:

- Early warning systems;
- Technological research and development;
- Best practice laws, regulations procedures and rules;
- Emergency stock construction
- Sea-lane security;
- Cleaning up after a pollution event;
- Analysis of data;
- Capacity building and training.

Except in the case of best shot goods which are delivered by a single nation, the effective delivery of these goods requires not only that the leading nations be prepared to deliver the good but also that they work together in a coordinated manner. This in turn raises the question of the geographical extent over which such coordination and delivery should take place. Many of the goods on this list could indeed be delivered across the East Asian region, but sea-lane security and cleaning up after a pollution event may better be provided at sub-regional level.

Services with weakest and weaker link features arguably provide the greatest challenge. Not only is delivery dependent on the ability and willingness of ‘weak’

states to participate effectively, but certain of these services are critical to the effective functioning of a regional energy market, for example:

- The availability of market and reserves data;
- The maintenance of network integrity and security;
- The effective husbanding of natural resources.

Each of these services is closely dependent on the nature of national systems of energy governance and on perceptions of national security. If nations which are vital in terms of energy supply or demand or in terms of location along network infrastructure are unable or unwilling to provide these goods, then the regional energy market is seriously undermined. In the case of East Asia, a number of countries which currently would be unable or unwilling to provide these public goods may be identified. As a consequence, progress towards an integrated energy market will have to be selective in terms of geographical area and in terms of the component goods to be delivered.

The design of the institutions of governance will depend on the nature of the governance required and on the geographic extent of the spill-over, taking into account economies of scale and scope, as discussed in Sections 4 and 5. Given the current state of development of the energy market in the East Asian region and the range of goods to be provided, these considerations suggest that a hierarchy of institutions be created, building on those which already exist.

At the highest level, an organisation could be established to provide *coordination* across the East Asian region:

- coordination of certain goods which are being delivered across the whole region, for example best shot and better shot goods, and any summation or weighted sum goods being delivered at regional level;
- coordination between sub-regional initiatives of different types.

At sub-regional level, a number of institutions may evolve depending on the region across which different goods are being developed and the nature of the governance required, for example coordination, treaty or governing body. In the case of the East Asian region, the challenge will be to design such institutions in a way which achieves economies of scale and scope. Whilst ASEAN and the countries of north-east Asia

form natural geographic groupings, the effective inclusion of other states in sub-regional governing institutions may prove more problematic.

8. Policy Implications for the East Asian Summit

EMI has the potential to yield widespread economic benefits across East Asia, and some of these benefits have features of a public good. Whilst full EMI to form a single energy market is a task requiring decades of work, certain steps can be taken to move towards integration.

EMI in East Asia faces a number of obstacles, geographic, political and economic. The most intractable of these relate to issues relating to national security, national sovereignty and state control of the energy sector. The implications are two-fold:

1. EMI should proceed initially at sub-regional level, rather than across the entire East Asian region;
2. The specific steps taken towards EMI should be chosen on the basis of their likely positive economic impacts and their likely ease of delivery.

In this respect, initiatives such as the Trans-ASEAN Gas Pipeline and the ASEAN Power Grid, and proposals for sub-regional energy networks in Northeast Asia are to be encouraged and actively pursued. Given the geographic size of East Asia, these networks are likely to be restricted in scale to sub-regions rather than spanning the entire region, though the progressive development of national networks and trans-boundary interconnections may eventually allow some of these networks to span a large part of the region. The construction of such infrastructure projects can be undertaken by 'coalitions of the willing', and those states which do not wish to or are unable to participate can be excluded. If necessary, certain participating states can bear a disproportionate share of the costs, though raising finance from private sources may be difficult if key issues relating to the operation of these projects are not satisfactorily addressed.

Legally binding agreements will almost certainly be required for most of major, trans-boundary infrastructure projects to proceed, on account of the costs and risks

involved. In the early years of EMI, it is likely that most legally binding agreements will be concluded at sub-regional, bi-lateral or tri-lateral levels, rather than across the entire region.

Whilst the costs and risks relating to the construction of transnational infrastructure projects are relatively easily managed, the real challenges emerge once they are commissioned, even if formal agreements are in place. On the one hand, they are open to deficient behaviour on the part of weakest link actors with respect to the operational integrity and security of the network. On the other hand, they are vulnerable to unilateral actions by one or more parties seeking to protect corporate or national interests, for example by denying access to the network. These difficulties can only be alleviated by the progressive convergence over time between the participating nations in respect of their improved competence in national governance and the openness of their national energy markets.

Indeed, openness and governance at *national level* (as well as at supra-national level) are key pre-requisites for EMI to proceed and to deliver significant regional benefits. States need to be open in their provision of information on energy resources and energy markets, and they need to be open in their provision of investment opportunities in their energy sectors. Effective and appropriate governance is needed in two respects. First, the domestic energy resources and industries should be regulated so as to use the available resources in as efficient and clean a manner as possible. Second, the structure and nature of the national energy industries and energy markets should be amenable to effective and efficient EMI. In many of the nations of East Asia, these attributes will require substantial domestic reforms (see also ERIA, 2010). Without such reforms, the progress of EMI will be severely constrained.

For these reasons, further analysis is necessary on the governance of the trans-boundary energy infrastructure and on the need for improved governance and openness in national energy sectors in the EAS region.

Other initiatives which should be pursued at a sub-regional scale, provided appropriate nations emerge to take the lead, include: sea-lane security, emergency response teams and pollution clean-up capacity.

A number of less tangible actions are already being taken in the East Asia region and these will provide long-term support to the progressive EMI. They include:

- technological research and development;
- the establishment and harmonisation of technical standards, such as the EAS-ERIA biodiesel fuel standards;
- the development and dissemination of best practices, for example in energy efficiency or in nuclear energy safety;
- data analysis and dissemination, for example on issues such oil stocks, and biofuels;
- capacity building and training in a range of fields including technology, management, policy and governance fields.

The relative degree of success of such programmes arises from the fact that much of the cost can be borne by a limited number of nations, whereas the benefits are widespread. Efforts should be made to enhance these programmes, and to ensure that their scope and impact is regional not just sub-regional.

The construction of gas stocks should be promoted. The issue of emergency stocks has a number of dimensions. In the case of oil, it could be argued that the IEA member states in the EAS region already hold sufficient stocks and that non-member states should just free-ride, unless a non-member state chooses to build its own stocks in order to use the stock in a different manner from the IEA member states. The case of natural gas is different. Gas markets which depend on trans-boundary pipelines are, by their nature, regional. It is therefore incumbent on the parties involved in that regional market to construct suitable stocks, to agree how such stocks should be used, and to abide by this agreement. Whilst the construction of these stocks can be carried out by a small number of more competent states, the effective use of these stocks is a potential a source of tension as a consequence of different national priorities. This issue is of immediate relevance to the Trans-ASEAN Gas Pipeline.

Because of the special nature of energy, the development of an integrated energy market requires relatively sophisticated systems of energy governance, some of which will need to be legally-binding and will require states to yield a certain degree of authority to a supra-national institution. Given the geographic extent and heterogeneity of the East Asian region, this study proposes that a single high level organisation spanning the entire region is formed with the task of coordinating (1) the delivery of

certain services and activities which are delivered across the whole region and (2) the various sub-regional initiatives.

If not already in existence, organisations can be established at sub-regional level to oversee the delivery of services at this level. Given the well-established nature of ASEAN, it should form the basis of those organisations overseeing or regulating activities in Southeast Asia. This would achieve economies of scale and scope. Other types of organisation are likely to prove useful at local levels, for example the Mekong River Basin Commission.

Steps should be taken to develop a formal organisation for multi-lateral energy cooperation in Northeast Asia. In contrast to Southeast Asia, Northeast Asia lacks an established multi-lateral organisation which can provide support for sub-regional energy integration. The Tumen River Area Development Programme which involved China, South Korea, Mongolia and Russia is long defunct, the Shanghai Cooperation Organisation is built around Central Asia not East Asia, and the Six-Party Talks (which includes all the key players in Northeast Asia) is directed purely at security threats on the Korean Peninsula.

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