



In this publication, "\$" refers to US dollars.

# Building a Sustainable Energy Future

## Discussion Draft Energy Strategy for the Greater Mekong Subregion

### The Setting

The Greater Mekong Subregion (GMS) Economic Cooperation Program is the driving force in bringing together the six countries that share the Mekong River: Cambodia, the People's Republic of China (PRC), Lao People's Democratic Republic (Lao PDR), Myanmar, Thailand, and Viet Nam. Within the subregion, the PRC is represented by the Guangxi Zhuang Autonomous Region (Guangxi) and Yunnan Province (Yunnan). Since 1992, these countries have embarked on this program with a vision of a GMS that is well-integrated, prosperous, and equitable—free of poverty and committed to protecting the environment that is vital to its future well-being.

To achieve this vision, efforts have been focused on five strategic thrusts:

- strengthening infrastructure linkages through a multisectoral approach,

- facilitating cross-border trade and investment,
- enhancing private sector participation and improving its competitiveness,
- developing human resources and skills competencies, and
- protecting the environment and promoting sustainable use of shared natural resources.

Energy services are crucial to achieving this vision of economic development and improved quality of life. In 2005, overall energy consumption in the GMS was about 190 million tons of oil equivalent. Though this level of energy consumption represents only 2.4% of the total global energy consumption, demand for energy has been growing very rapidly in the region.

GMS energy consumption has grown at a rate of over 8% during 1990–2005, compared to the global average rate of 2.7% during the same period. Given that nearly one fifth of the GMS population still lack access to modern forms of energy and that biomass and noncommercial fuels dominate household consumption in rural areas, energy demand is expected to grow at high rates in the coming years.

## Major Drivers of the Strategy

The GMS economies are undergoing transitions in multiple dimensions. Some are moving from state-dominated to market-based economies. Others are shifting from subsistence agriculture to commercial agriculture, or from economies dominated by agriculture to those in which industry and services account for a significant share of gross domestic product (GDP). Most of the GMS economies are also experiencing rapid rural-to-urban migration. Successfully managing these transitions poses major challenges to the leadership of the GMS economies. Regardless of the

dimension in which they occur, all of the above transitions have a major impact on energy use patterns.

**Demand for energy is rising very rapidly.** The rapid economic growth in the GMS has fueled a significant expansion in energy demand, which has grown at over 8% per annum during 1993–2005. A major challenge facing the GMS economies is sustaining the rapid growth rates of both GDP and industrialization achieved over the past two decades, while maintaining international competitiveness by ensuring reliable energy supplies. Most member-economy energy demand growth forecasts foresee annual increases in the range of 7% to 16%. Such rates significantly exceed the rate of growth in economic activity forecast for the coming decade. At present, the GMS energy sector continues to be dominated by large utilities directly or indirectly owned by governments. As a result, energy prices do not always reflect market conditions or the true scarcity value of energy to society. This is an important barrier to managing energy demand growth in the future.

**Energy poverty is widespread.** Access to modern energy is uneven across GMS economies, and between urban and rural areas. Nearly a quarter of the GMS population, or about 74 million people, still do not have access to electricity. A large share of its population still depends heavily on traditional energy sources. Unless appropriate steps are taken, the absolute number of GMS inhabitants relying on biomass will increase, which would add greatly to existing environmental pressures.

**The region is highly dependent on fossil fuel imports.** In 2005, 21% of the total energy consumed by the region was imported. Thailand is the largest importer of energy and has to import nearly 40% of its energy in the form of electricity, natural gas, and oil products. Countries like Cambodia, Lao PDR, and Viet Nam import 100% of their transport and other petroleum-based fuels. The subregion's

oil dependence is expected to increase dramatically over the next two decades. Poor production prospects, weak demand management, insignificant penetration rates for alternative energy sources, and volatile global oil prices increase the subregion's vulnerability with respect to energy security. One way to reduce this vulnerability would be a GMS-wide program aimed at diversifying the sources from which it imports crude oil, both from within and outside the subregion, and reduce overall demand for these fuels.

**Environmental and social issues need to be integrated in energy planning.** The GMS has significant hydropower potential. Sustainable development of this potential requires integrating environmental and social costs into future plans and addressing issues, such as cross-border externalities, beginning at the planning phase.

**Improving energy productivity will have to be a priority.** The present level of energy efficiency is low in the GMS. Large opportunities exist for improving energy productivity in the industry and transport sector as well as in shifting from noncommercial to commercial energy sources. However, some existing policy regimes in the GMS are proving to be barriers to the improvement of energy efficiency in the subregion, such as fuel subsidies in the household and transport sectors.

**Institutions and policy regimes have to be aligned.** Existing market structures in the energy sector and the relevant policy regimes present important challenges to the subregion. Weak and often inappropriate financial incentives, lack of competitive pressure facing suppliers of energy, and weak policy regimes will need to change drastically if current energy challenges facing the subregion are to be dealt with effectively.

In 2006, at the request of the GMS countries, the Asian Development Bank (ADB) initiated a regional technical

assistance project (RETA 6301) to define a regional energy strategy until 2025 and identify the scope for regional cooperation in all energy subsectors. A series of participatory regional consultation workshops were held with representatives from the GMS governments, civil society groups, the private sector, multilateral and international development organizations, the academe, and energy specialists. Background studies were also commissioned to develop a least-cost energy planning model for the subregion, assess public- and private-sector environment in the GMS and the environmental impacts and costs of energy use. The output of this technical assistance and the associated technical background paper, *Building a Sustainable Energy Future: The Greater Mekong Subregion*, has been the basis for drawing up this draft GMS energy strategy.

## The GMS Energy Vision

A sustainable energy future based on efficient, secure, and affordable energy supplies for all citizens of the GMS.

## Strategic Goals

### Integrated Energy System in the GMS

Integration saves a huge amount of money. The energy modeling exercise indicates that when the subregion is integrated completely, it will help save at least 19% of total energy costs or \$200 billion over the next two decades. These benefits are significant when compared to the current GDP of the GMS economies, which range from \$3.4 billion for Lao PDR to \$206 billion for Thailand. Such large gains are possible for three reasons: the GMS is facing

large increases in energy demand over the coming years; natural resource endowments across the subregion are diverse and complementary; and given the economies of scale relevant to the GMS, as the subregion develops its energy infrastructure, the least-cost means of meeting one member economy's energy demand will often be to import from a neighbor. In reality, these savings will be even higher than macro estimates from the model since it will be possible to save on new capacity generation due to optimizing peak coincidence and margins for reserves.

Since the inception of the GMS Economic Cooperation Program, several institutional arrangements have been put into place for cooperation within the power sector. In addition, there is a robust program of investment, power trading, and interconnection of transmission networks that is coordinated through the Regional Power Trading Coordination Committee and supported by partnerships with ADB and other development partners. This cooperation can now be expanded to include natural gas and other energy sources. It will also require the harmonization of relevant institutional and policy regimes, including the adoption of common standards as well as an effective and efficient regulatory system.

## Enhanced Energy Security for the Subregion

Integration increases energy security. By integrating the GMS energy sector, it is possible to reduce overall energy dependence vis-à-vis the rest of the world by as much as 5.5% of total energy consumption. In the case of individual fuels, the gains are much more substantial, with the most significant impacts occurring in oil dependence.

The abundance of natural resources within the subregion allows access to a diverse range of energy sources, such as natural gas, hydroelectric power, biofuel, oil, and other

alternative renewable technologies. Given the appropriate support to develop these energy sources and the removal of barriers to their trade, it is possible for GMS to reap the benefits of having a diversified energy supply that is less prone to the effects of an unpredictable world oil market.

## A Sustainable Path to Energy Development

Sustainable energy development in the GMS must first address the issue of accessibility, given the widespread nature of energy poverty in the subregion. As the modeling exercise has shown, off-grid technologies offer promising solutions to address this electricity availability gap, particularly in the subregion's more remote areas. The high dependence on noncommercial sources of energy must be replaced with the extensive use of renewable energy sources. This will require developing a policy framework that attracts innovation and encourages the participation of the private sector in rural electricity service delivery.

The results of the energy optimization exercise also indicated that integrating environmental and social costs improve overall outcomes in terms of a 40% lower coal-based power generation capacity and greater reliance on renewable energy sources and other off-grid solutions by as much as 11 gigawatts. By integrating environmental and social costs in the planning phase, investments in decentralized photovoltaic technology are doubled as compared to a scenario that does not, and smaller hydropower plants come up as least-cost options. Emissions in the GMS are also expected to grow more slowly on the average than both GDP (6.3% per year) and total useful-energy demand (6.0%) by integrating the subregion's energy sector.

Improving energy efficiency and productivity in the GMS will also have a significant impact in improving energy

security and reducing carbon emissions. Energy efficiency produces significant savings and reduces demand for energy.

## Priority Areas of Action

In the past, the approach to integration has focused on individual cross-border projects. Given the maturity of the GMS cooperation in the energy sector, time has come to move beyond cross-border projects to developing an integrated project and policy planning framework. This requires moving to a programmatic framework that requires a comprehensive action plan to deal with the policy and institutional barriers to energy integration. It is important to ensure that such a strategic plan provides linkages between objectives, policy actions, programs, and inputs required for the process.

**Action 1. The political and technical leadership for cross-border trade and future energy integration needs to guide collective actions beyond the power sector into natural gas and refining.**

As the overall demand for energy is expected to grow to over 238 gigawatts by 2025, opportunities in the natural gas and refined petroleum products need to be explored. This includes formulating a regional master plan for natural gas, which takes into account the identification of resources, potential for trade within and outside the region, utilization of gas in other sectors, pricing and other policies, and identification of projects and investment needs. Discovery of oil resources in the region is also an opportunity that needs to be examined to determine its viability and sustainability for utilization in the GMS.

**Action 1. Mobilize political will for cooperation in all energy sectors.**

Time Frame	Level of Initiative	Specific Action
Short Term	GMS	<ul style="list-style-type: none"> <li>Adopt a resolution at the Energy Forum to prepare subregional plans for natural gas, energy efficiency, and energy for all.</li> </ul>
	Country	
	ADB and Other Development Partners	<ul style="list-style-type: none"> <li>Design a technical assistance for establishing a regional project preparation facility that supports GMS-wide energy integration.</li> </ul>
Medium Term	GMS	<ul style="list-style-type: none"> <li>Explore possibilities to expand GMS trade in natural gas; coordinate with other regional programs such as Association of Southeast Asian Nations (ASEAN).</li> </ul>
	Country	<ul style="list-style-type: none"> <li>Prepare national sector plans for natural gas for Cambodia, Myanmar, and Viet Nam.</li> </ul>
	ADB and Other Development Partners	<ul style="list-style-type: none"> <li>Support the preparation of a GMS natural gas master plan.</li> <li>Explore possibilities for innovative financing and further refine the project concept to increase support to private refineries.</li> </ul>

**Action 2. There is a short window of opportunity when global support is available to enhance the energy productivity of the region. Investing in energy productivity now will help to increase energy security in the era of high and rising energy prices.**

There are economically attractive opportunities to leapfrog to more efficient technologies, especially in sectors that are expected to experience higher levels of energy growth. As a substantial share of the energy consuming assets in the GMS has yet to be built, this is an opportunity to bring in and adopt higher productivity solutions in building and capital assets. Combined power plants, cogeneration, waste-to-energy possibilities, and mass transport services are alternatives that can help new energy systems be more efficient.

## Action 2. Improve energy efficiency.

Time Frame	Level of Initiative	Specific Action
Short Term	GMS	<ul style="list-style-type: none"> <li>Identify quick wins at the GMS level that support energy efficiency programs, including initiatives for knowledge sharing.</li> </ul>
	Country	<ul style="list-style-type: none"> <li>Review existing levels of energy subsidies and prepare a time-bound program for using prices effectively to guide sustainable energy use.</li> </ul>
	ADB and Other Development Partners	<ul style="list-style-type: none"> <li>Support a technical assistance initiative for the preparation of a GMS energy efficiency program.</li> </ul>
Medium Term	GMS	<ul style="list-style-type: none"> <li>Prepare a GMS action plan to enhance energy productivity by improving efficiency on both the demand side and the energy supply side.</li> </ul>
	Country	<ul style="list-style-type: none"> <li>Prepare a strategic plan to remove barriers to increased energy productivity.</li> <li>Examine and formulate policy instruments for energy efficiency, such as programs for the labeling of appliances and energy-consuming products, building construction standards, and promoting the use of energy audits and energy service companies.</li> <li>Review existing levels of energy subsidies and prepare a time-bound program for using prices effectively to guide sustainable energy use.</li> <li>Promote education and energy conservation campaigns.</li> </ul>
	ADB and Other Development Partners	<ul style="list-style-type: none"> <li>Assist countries to prepare national action plans for enhancing energy productivity. Prepare a GMS-wide program to enhance energy efficiency both from the perspective of energy users and energy suppliers. Assist in resource mobilization and knowledge sharing.</li> <li>Establish smart subsidies to promote sustainable energy use on a pilot basis; promote collaboration with other development partners in putting into place output-based subsidies on a pilot basis.</li> <li>Prepare a project feasibility study and mobilize funding for developing a financing facility for packaging energy efficiency projects on a GMS-wide basis.</li> </ul>

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*Action 2: continued*

Time Frame	Level of Initiative	Specific Action
Long Term	GMS	<ul style="list-style-type: none"> <li>Mobilize resources to implement an action plan that promotes investment and knowledge sharing; remove existing barriers to energy efficiency.</li> </ul>
	Country	<ul style="list-style-type: none"> <li>Establish time-bound targets to achieve energy efficiency both at the macroeconomic level, and by all major energy suppliers.</li> </ul>
	ADB and Other Development Partners	<ul style="list-style-type: none"> <li>Invest in energy efficiency projects across the subregion.</li> </ul>

**Action 3. Improvements in policy regimes and sector reforms are often easier to effect in a regional context and need to be pursued in a time-bound fashion.**

The region is at varying levels of sector restructuring—moving from vertically integrated monopolistic structures to market-based energy entities. Sector liberalization, modernization of monopolistic utilities to competitive market structures, rationalization of the role of government, trade and regional harmonization of energy carriers will go a long way in improving sector efficiency and must be pursued through a coordinated set of actions over the next two decades.

**Action 3. Pursue a time-bound program of sector reform on a GMS-wide basis.**

Time Frame	Level of Initiative	Specific Action
Medium to Long Term	GMS	<ul style="list-style-type: none"> <li>Review experience of other regional energy integration initiatives for promoting sector reform and market competition.</li> <li>Prepare a GMS-wide plan to introduce competition into the power sector.</li> </ul>
	Country	<ul style="list-style-type: none"> <li>Prepare a time-bound program for introducing competition into the electricity and natural gas sectors.</li> <li>Reduce market power of state-owned utilities by unbundling the power sector.</li> <li>Strengthen the energy-sector legal and regulatory framework for promoting competition.</li> <li>Evaluate country-level barriers to cross-border trade in energy products and services and prepare a time-bound program for removing these.</li> </ul>
	ADB and Other Development Partners	<ul style="list-style-type: none"> <li>Assist countries in developing a financing facility for the GMS-wide integration of electric power transmission.</li> <li>Assist GMS efforts in preparing reform programs for the energy sector.</li> </ul>

**Action 4. The region depends highly on oil imports from outside the region. Oil consumption must be reduced, and existing approaches to backstop technological options, such as coal liquefaction and biofuels, should be reviewed.**

Exploring the options for converting coal into liquid fuels, such as gasoline or diesel, by several different processes need to be continued, including the full implications of such backstop technologies. The merits of biofuel programs within each economy should also be examined before regulations or targets are put in place—particularly vis-à-vis its impact on the food supply.

#### Action 4. Reduce oil dependency.

Time Frame	Level of Initiative	Specific Action
Medium to Long Term	GMS	<ul style="list-style-type: none"> <li>• Support regional integration of the entire energy sector to reduce oil dependence.</li> <li>• Propose an emergency oil support system.</li> <li>• Promote the use of renewable energy sources.</li> </ul>
	Country	<ul style="list-style-type: none"> <li>• Review oil price structure and remove subsidies.</li> <li>• Explore local oil and natural gas resources in Cambodia, Myanmar, Thailand, and Viet Nam.</li> </ul>
	ADB and Other Development Partners	<ul style="list-style-type: none"> <li>• Formulate a technical assistance initiative to undertake a comprehensive review of the GMS alternative fuels program, including biofuels.</li> <li>• Formulate a technical assistance initiative for coal liquefaction and carbon neutrality.</li> <li>• Formulate a technical assistance initiative for a fund in support of small-scale clean electric power generation and clean coal power generation in Viet Nam.</li> </ul>

**Action 5. Given the region’s high oil dependence, growth in the transport sector poses a major threat and at current prices seem unsustainable, both in terms of its impact on overall oil demand and environmental implications. The long-term trends in transport modal-mix should be reviewed.**

National sector policies should be designed to move toward a sustainable, energy-efficient transport future. The region also needs to invest in capital-intensive options that can ensure its global competitiveness, particularly in freight logistics.

### Action 5. Review transport modal mix.

Time Frame	Level of Initiative	Specific Action
Medium to Long Term	GMS	<ul style="list-style-type: none"> <li>• Generate collective support (financial and otherwise) to review the GMS' long-term logistics system for freight and passenger transport.</li> </ul>
	Country	<ul style="list-style-type: none"> <li>• Review levels of diesel prices and road taxes.</li> <li>• Explore possibilities for pipeline transportation of natural gas and petroleum products.</li> </ul>
	ADB and Other Development Partners	<ul style="list-style-type: none"> <li>• Assist the GMS' move toward a sustainable transport sector in which energy and environmental costs are minimized.</li> <li>• Support a midterm review of the GMS transport strategy.</li> </ul>
Long Term	Country	<ul style="list-style-type: none"> <li>• Review plans to develop large and growing urban areas and promote the use of environmentally benign public transport modes in Cambodia, Guangxi, Viet Nam, and Yunnan.</li> <li>• Review road tax structure and programs to finance road maintenance.</li> </ul>
	ADB and Other Development Partners	<ul style="list-style-type: none"> <li>• Support and promote knowledge sharing.</li> </ul>

**Action 6. Given the large resource requirements for regional energy development, collective action is required to promote private sector participation and innovative solutions. The current policy environment needs to facilitate private investment.**

The energy investments in the region are seen as attractive destinations for the private sector but a long-term and stable policy framework is essential to convince them to take greater risks. The GMS governments can capitalize on investors' interest in clean and low-carbon technology by forging strong strategic alliances with the private sector.

**Action 6. Promote regional private sector participation.**

Time Frame	Level of Initiative	Specific Action
Short to Medium Term	GMS	<ul style="list-style-type: none"> <li>• Prepare a subregional strategy to market the GMS as an attractive destination for private sector investment in energy.</li> </ul>
	Country	<ul style="list-style-type: none"> <li>• Identify country-level barriers to trade and private sector investment in the energy sector.</li> <li>• Promote development of GMS natural gas resources and GMS trade in natural gas.</li> </ul>
	ADB and Other Development Partners	<ul style="list-style-type: none"> <li>• Mobilize financial resources to support an electricity transmission development program in partnership with the private sector.</li> </ul>

**Action 7. Finally, the region’s energy sector is changing in multiple levels. Convergence to a sustainable path for the future will require financial and other resources, strategic planning at both the institution and energy system levels, ownership of the concept of a sustainable and integrated energy future, and various partnerships. Creating institutional capital and matching human capability will perhaps be the biggest challenge that needs to be met effectively for a cleaner and brighter energy future.**

The policy and institutional development agenda will have to include detailed actions to moderate energy demand growth, provide adequate financial and other resources to meet the goal of energy for all, and to ensure that the future is sustainable. The numerous national and regional actions will need to be supplemented with global initiatives.

**Action 7. Create institutional capital and human capability for a cleaner and brighter energy future.**

<b>Time Frame</b>	<b>Level of Initiative</b>	<b>Specific Action</b>
Short to Medium Term	GMS	<ul style="list-style-type: none"> <li>• Create an institutional base to integrate the GMS energy market.</li> <li>• Generate political and technical-level ownership in promoting a sustainable energy future for the GMS.</li> </ul>
	Country	<ul style="list-style-type: none"> <li>• Strengthen country-level energy planning capabilities for Cambodia, Lao PDR, Myanmar, and Viet Nam.</li> </ul>
	ADB and Other Development Partners	<ul style="list-style-type: none"> <li>• Determine the feasibility of creating a subregional institution to promote cooperation in the GMS energy sector, using similar initiatives of other regions as a model.</li> </ul>

## **Building a Sustainable Energy Future: Discussion Draft Energy Strategy for the Greater Mekong Subregion**

The Greater Mekong Subregion (GMS) holds huge promise for Asia. Energy services are crucial in achieving economic development and improving the quality of life. At the request of the GMS governments, and with the participation of stakeholders, this discussion draft was prepared.

### **About the Asian Development Bank**

ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries substantially reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to two thirds of the world's poor: 1.8 billion people who live on less than \$2 a day, with 903 million struggling on less than \$1.25 a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.