

Annex: Summary

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Lao PDR's energy landscape is characterised by its vast renewable resources, particularly hydropower, which enables the country to serve as a net exporter of electricity in the ASEAN region. Despite this, Lao PDR remains heavily dependent on imported petroleum products for transport and residential use, leaving it exposed to global market volatility. While the potential for diversification through solar, wind, and biomass exists, these sectors are underdeveloped. Emerging technologies like green hydrogen and ammonia offer promising solutions for decarbonising the power sector, and regional power grid integration could further enhance energy and economic security.

However, Lao PDR faces several immediate and long-term challenges. Its reliance on imported oil, coupled with unsustainable electricity subsidies, strains the financial viability of the energy sector. Infrastructure inefficiencies, limited energy diversification, and the need to decarbonise coal-fired power plants add complexity to its pathway toward carbon neutrality. Additionally, developing infrastructure for electric vehicles (EVs) and securing financing for renewable projects present significant hurdles. To address these challenges, Lao PDR must invest in bioenergy, reform electricity tariffs, expand renewable energy, and develop EV infrastructure. Through these efforts, the country can strengthen its energy security while contributing to ASEAN's sustainable development goals.

1. Energy Landscape in Lao PDR

The energy landscape of Lao PDR is shaped by its vast renewable energy resources, particularly hydropower, which plays a key role in domestic energy supply and serves as a significant export to neighbouring ASEAN countries. Other renewable energy sources, such as solar, wind, and biomass, offer considerable potential but are currently underdeveloped.

- **Hydropower:** Lao PDR is rich in hydropower resources and has utilised this to become a net electricity exporter, contributing to ASEAN's energy security. Hydropower supplies most of the country's electricity, positioning it at the core of Lao PDR's domestic energy system and export earnings.
- **Renewable Energy Potential:** Beyond hydropower, Lao PDR has substantial solar, wind, and biomass potential. Biomass is particularly important in rural areas, where traditional biomass, such as wood, is still widely used for cooking and heating.
- **Electricity Export:** Lao PDR exports significant electricity to neighbouring countries, particularly Thailand and Viet Nam. This regional energy trade is expected to increase as ASEAN moves toward greater power grid connectivity.

- **Import Dependency:** Despite its strength in renewable electricity generation, Lao PDR remains highly dependent on imported petroleum products, such as gasoline, diesel, and LPG, for transport and residential use, making the country vulnerable to global market fluctuations and supply disruptions.
- **Emerging Technologies:** Lao PDR is exploring new technologies like green hydrogen and ammonia to decarbonise its power sector. Green hydrogen production from surplus renewable electricity could be used in transportation and industry.

2. Strengths of Energy-Related Issues in Lao PDR

Lao PDR's energy sector has multiple strengths, positioning the country as a potential leader in renewable energy within ASEAN:

2.1. Abundant Renewable Resources

- **Hydropower:** With substantial hydropower capacity, Lao PDR remains a net exporter of electricity, contributing energy to ASEAN neighbours and generating significant revenue. It is expected to export around 161 TWh of electricity by 2050.
- **Solar and Wind Potential:** While underdeveloped, solar and wind energy hold promise, especially as costs decrease and technologies advance.
- **Biomass Energy:** Biomass has great potential to enhance energy security, particularly in rural areas, and as a substitute for imported fossil fuels.

2.2. Regional Energy Integration

- **ASEAN Power Grid:** Lao PDR plays a critical role in the ASEAN Power Grid initiative, promoting multilateral power trading across the region. Strengthening Lao PDR's role as an electricity exporter through regional grid connectivity could provide both economic and energy security benefits.

2.3. Carbon Neutrality Potential

- **Decarbonisation:** Lao PDR is well-positioned to contribute to ASEAN's carbon neutrality goals by 2050 through its renewable energy resources. The country can decarbonise the regional grid by exporting renewable electricity and green hydrogen.

2.4. Electricity Access

- Growing Access: Electrification initiatives are expanding access to electricity, particularly in rural areas, a growing strength for Lao PDR.

2.5. Policy and Collaboration

- Policy Development: The government of Lao PDR is collaborating with international organisations like the Economic Research Institute for ASEAN and East Asia (ERIA) to develop policies supporting energy security and sustainable development.

3. Challenges Lao PDR Faces in the Near and Long-Term Future

Despite its strengths, Lao PDR faces several challenges in its energy sector:

3.1. Near-Term Challenges

- Dependence on Imported Oil: Lao PDR imports 100% of its gasoline, diesel, and LPG, leaving it vulnerable to global price fluctuations and supply disruptions. This poses a risk to energy security, particularly in the transport sector.
- Electricity Subsidies: The current electricity pricing structure relies on unsustainable subsidies, creating financial strain on Électricité du Laos (EDL) and limiting investment in energy infrastructure.
- Energy Infrastructure Inefficiencies: The electricity grid suffers from significant transmission losses, reducing efficiency and increasing costs. Modernising the grid is necessary to better integrate renewable energy.
- Limited Diversification: Heavy reliance on hydropower creates vulnerability, particularly during seasonal water shortages, due to a lack of diversification in the energy mix.

3.2. Long-Term Challenges

- Decarbonising Coal Power: Lao PDR faces the challenge of decarbonising coal-fired power plants like the Hongsa plant. Options such as co-firing with biomass or ammonia and deploying Carbon Capture, Utilisation, and Storage (CCUS) technologies are being explored but remain costly.

- **Electric Vehicle (EV) Infrastructure:** Although Lao PDR has a target of 30% EV market share by 2030, the infrastructure needed to support this goal, such as charging stations, is lacking. Policies and financing mechanisms for EV adoption also need development.
- **Financing the Energy Transition:** Attracting investment for renewable energy projects, grid modernisation, and clean technologies such as green hydrogen and CCUS presents a significant challenge.
- **Human Resource and Technical Capacity:** Lao PDR requires the development of technical expertise to manage smart grids, integrate renewable energy, and deploy advanced technologies like hydrogen and CCUS.

4. Recommendations to Tackle Energy Challenges

To address these challenges, the following recommendations are proposed:

4.1. Replacing Imported Oil with Bioenergy

- **Develop Biofuel Production:** Lao PDR should promote domestic biofuel production to reduce its reliance on imported petroleum products. Fiscal incentives and capacity-building initiatives could encourage private sector investment in biofuels.
- **Promote Biomass Use:** Lao PDR should incentivise biomass-based energy systems for residential and industrial use to reduce dependence on imported LPG and petroleum. Biomass can also be integrated into power generation, co-firing with existing coal plants.

4.2. Electricity Pricing Reform

- **Restructure Electricity Tariffs:** Electricity tariffs should move toward a market-based structure that reflects seasonal variations in hydropower supply and demand, reducing the financial burden on EDL and ensuring sustainable pricing.

4.3. Diversify Power Generation Mix

- Accelerate Solar and Wind Projects: The government should prioritise the development of solar and wind energy projects to diversify the energy mix and reduce reliance on hydropower.
- Expand Battery Storage: Deploy battery energy storage systems to manage the intermittency of solar and wind power. Pumped hydro energy storage could also be a viable solution for Lao PDR.

4.4. Develop EV Infrastructure

- Invest in Charging Networks: Lao PDR should prioritise building EV charging infrastructure to support the growth of electric vehicles. International partnerships could help finance this development.
- Incentivise EV Adoption: Fiscal incentives and policy frameworks should encourage EV adoption, particularly in public transportation.

4.5. Strengthen Energy Security

- Strategic Petroleum Reserves: Establishing a strategic petroleum reserve would mitigate risks from supply disruptions and price volatility.
- Enhance Grid Resilience: Upgrading the national grid to reduce transmission losses and improve renewable energy integration will bolster energy security. Investing in smart grids and advanced energy management systems is essential.

Conclusion

Lao PDR's energy sector is at a pivotal point. With abundant renewable resources, the country has the potential to play a leading role in ASEAN's decarbonisation efforts. However, challenges related to import dependency, infrastructure, financing, and policy reform must be addressed. By focusing on energy diversification, electricity pricing reform, and promoting bioenergy, Lao PDR can enhance its energy security and advance toward a sustainable, low-carbon future.

