



LAO PDR

ACCELERATING STRUCTURAL TRANSFORMATION FOR INCLUSIVE GROWTH

Country Diagnostic Study

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Foreword

The Lao People's Democratic Republic (Lao PDR) has made substantial progress since its transition from a centrally-planned to a market-oriented economy in 1986. With the inception of the New Economic Mechanism (NEM) in 1986, the Government of the Lao PDR came up with various economic and structural reforms that laid the foundation for transitioning to a market-oriented economy. Since then, the Lao PDR has seen remarkable progress by consistently building itself into a market-oriented economy and moving forward with broad-based reforms across many fronts. More importantly, the country has sustained the higher economic growth in the last 2 decades, transforming its economy in many ways and making it more open and integrated into the region and the world. Gross domestic product (GDP) during 1986–2016 grew at 6.5% per annum resulting in increased per capita income of \$2,352 in 2016 (from \$170 in 1986).

However, as the study rightly points out, despite achieving a higher growth trajectory, the pace of structural transformation from primary to modern sectors of the economy has remained sluggish. We appreciate the findings of the study, which reveals clearly that future economic growth should be inclusive in nature and supported by new drivers of growth. The study highlights the importance of relocating resources from low productivity to high productivity sectors. In this context, the report stresses the improvement of agriculture productivity, which would eventually release the excess labor that could be absorbed in more productive services and manufacturing sectors.

The study also highlights the importance of “low hanging fruits,” that is, the high value-added products that are relatively close to the Lao PDR's productive knowledge. To promote these high-value products, meaningful dialogues between the public and private sectors are essential to help identify product-specific constraints. By addressing these constraints, the government can encourage the private sector to venture into investing in nontraditional products and thus accelerate the speed of structural transformation.

This country diagnostic study complements the strategies of the Lao PDR's 8th National Social Economic Development Plan 2016–2020, which articulates the government approach to help achieve sustainable development. We believe that the findings of the study would facilitate wider dialogue among key development stakeholders and benefit us in implementing the strategies and policies to achieve sustained and inclusive growth.

We also envision to graduate from the status of a least developed country by 2020. While growth performance in the last decade indicates that the country can achieve that target by meeting the gross national income threshold, our performance, in the other two criteria—human assets index and economic vulnerability index—is lagging far behind. The findings and key recommendations of this country diagnostic study, which emphasizes the need to diversify the production structure and find new drivers of growth, would help reduce the country's vulnerability from economic shocks and achieve our aspirations.

The Government of the Lao PDR welcomes this report and its key findings. We appreciate the analysis and policy suggestions to help realize our goals of sustained higher growth and better employment outcomes for the prosperity of Laotian.



Mr. Souphanh Keomixay, Ph.D.
Minister of Planning and Investment

Preface

The Lao People's Democratic Republic (Lao PDR) has shown robust economic growth of 6.5% during 1986–2016. In sustaining the higher growth trajectory, resource-based products and the increasing volume of foreign direct investment have played a vital role. While this rapid and sustained growth has changed the structure of outputs, it has had little impact in altering the composition of employment. Although industry and services have become the major drivers of growth, their contribution to job creation remains limited. In terms of employment, the economy is still agrarian in nature as the agriculture sector employs about 65% of the labor force. Thus, majority of the workers remain in low-productivity jobs, threatening the sustainability of high and inclusive growth in the medium term.

To address the lack of employment opportunities in high productivity sectors and accelerate the process of structural transformation, the Lao PDR country diagnostic study highlights the need to diversify the production structure toward more high value-added products and emphasizes the need to develop new drivers of growth. The study provides a comprehensive analysis and identifies the promising venues for upgrading the production structure of the economy. One such area is diversification of exports to help create higher-productivity jobs and modernize the economy. Unexploited opportunities exist in food processing, textiles, garments, crop farming, and food and beverage products.

The services sector has been and can be an even bigger driver of growth. In fact, the tourism industry has been growing and can be a highly viable source of growth and employment. Improvement in infrastructure, logistics, and information and communication technology (ICT) will be important to tourism. The eighth National Socioeconomic Development Five-Year Plan and vision for 2030 rightly give considerable attention to the development of the ICT sector.

The agriculture sector has plenty of untapped potential. Improving the sector's productivity is particularly important to raise the standard of living of the majority of the Laotian workforce. A way to do this is through increasing investments in irrigation, roads, research and extension, and securing land-use rights. Empirical evaluations of these interventions show that investments in these areas can effectively boost agricultural growth and improve the inclusivity of the country's development outcomes. Investing in knowledge infrastructure and statistical systems to inform policy can make these investments more effective.

Other cross-cutting challenges to accelerate structural transformation are (i) weak governance and inefficient public management, (ii) low level of human capital and quality of education, and (iii) inadequate and poor infrastructure. The report discusses these challenges and gives recommendations on how to tackle them.

We highly appreciate the cooperation and support extended by the Government of the Lao PDR to ADB staff in accessing useful data and materials. We, at ADB, look forward to continued productive dialogue and engagement with the government to help the country achieve inclusive growth and graduate from the list of least developed countries by 2020.



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This study was undertaken by the Economic Analysis and Operational Support Division (EREA) of ADB's Economic Research and Regional Cooperation Department, under the supervision of EREA Director Edimon Ginting. The overall report was led by Kaukab Naqvi, with the following teams authoring each chapter: Kaukab Naqvi (Chapters 1 and 2); David Raitzer, Jindra Samson, and Marie Anne Cagas (Chapter 3); Edimon Ginting, Kaukab Naqvi, and Raja Mitra (Chapter 4); and Kee-Yung Nam, Maria Rowena Cham, and Lotis Quiao (Chapter 5). Alexander Joseph Julian provided valuable inputs for Chapter 1. Lakshman N. Rao, Mahinthan J. Mariasingham, and Eileen Capilit provided inputs, including text boxes and selected data sources for Chapter 3. Viriyasack Sisouphanthong also provided analysis that helped to underpin Chapter 3. Comments and suggestions from Hal Hill improved the quality of the study substantially. Lilibeth Poot was responsible for coordinating the production process and ensuring the overall coherence of the study.

Amador Foronda, Reneli Anne Gloria, and Angelica Maddawin assisted with research. Ricasol Cruz-Calaluan provided administrative and secretarial support. Tuesday Soriano copyedited the report, while Michael Cortes did the layout, cover design, and typesetting.

Valuable insights were obtained from a series of extensive consultations with the Government of the Lao PDR and other key stakeholders including the private sector and development partners. Deputy Minister Phouang Parisak Pravongviengkham of Agriculture and Forestry provided detailed insights and suggestions that helped to guide Chapter 3. The study team highly appreciates the insight and guidance provided by Director General Bounleua Sinxayvoravong of the Fiscal Department and Director General Sisomboun Ounnavong of the Department of International Cooperation, Ministry of Planning and Investment. Director General Sousath Sayakoummane of Forestry shared updated forest cover statistics. The Center for Agricultural Statistics of the Ministry of Agriculture and Forestry provided valuable assistance in access and utilization of the Lao Census of Agriculture microdata. Useful suggestions were also received from Director General Sirisamphanh Vorachith of the Ministry of Industry and Commerce, Department of Planning and Cooperation. This study would not have been possible without the government's collaboration in providing information in a timely manner and the helpful comments that improved the relevance and quality of the report.

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Abbreviations

ADS	Agricultural Development Strategy	LHSE	Lao Holding State Enterprise
APB	Agricultural Promotion Bank	LSB	Lao Statistics Bureau
APEC	Asia-Pacific Economic Cooperation	MEM	Ministry of Energy and Mines
ASEAN	Association of Southeast Asian Nations	mm	millimeter
BFSI	banking, financial services, and insurance	MSMEs	micro, small, and medium-sized enterprises
BOL	Bank of the Lao People's Democratic Republic	mtoe	million tons of oil equivalent
BRI	Belt and Road Initiative	MW	megawatt
ECI	economic complexity index	NEER	nominal effective exchange rate
EDL	Electricité du Laos	NEM	New Economic Mechanism
EDL-GEN	EDL-Generation Public Company	NSEDP	national socioeconomic development plan
EEC	Energy Efficiency and Conservation	PCI	product complexity index
EGAT	Electricity Generating Authority of Thailand	PDP	Power Development Plan
EPZ	export processing zone	PPP	purchasing power parity
EVI	economic vulnerability index	PRC	People's Republic of China
FDI	foreign direct investment	RCA	revealed comparative advantage
GDP	gross domestic product	REER	real effective exchange rate
GNI	gross national income	SEZ	special economic zone
GVC	global value chain	SITC	Standard International Trade Classification
GWh	gigawatt-hour	SMEs	small and medium-sized enterprises
ha	hectare	SOE	state-owned enterprise
HAI	human assets index	SPP	small power producer
HPP	hydropower plant	TLUC	temporary land use certificate
ICT	information and communication technology	TVET	technical and vocational education and training
IPP	independent power producer	US	United States
km	kilometer	USDA	United States Department of Agriculture
kV	kilovolt	WTO	World Trade Organization
kWh	kilowatt-hour	WUA	water user association
Lao PDR	Lao People's Democratic Republic	WUG	water user group
LCA	Lao Census of Agriculture		
LDC	least developed country		
LECS	Lao Expenditure and Consumption Survey		

Executive Summary

Since the inception of the New Economic Mechanism (NEM) in 1986, the Lao People's Democratic Republic (Lao PDR) has shown impressive economic growth, building itself consistently from a centrally planned economy into a market-oriented economy. From 1986 to 2015, economic growth averaged around 6.5% per annum and gross domestic product (GDP) increased sixfold. This strong growth led to a rise in per capita income from \$170 in 1986 to \$1,818 in 2015. Poverty incidence based on the national poverty line declined substantially from 46% in 1992 to 23.2% in 2011–2012. The reforms introduced under NEM helped the domestic economy integrate gradually into the world, thus improving the Lao PDR's status in the international arena.

Structural transformation is necessary for sustained and inclusive growth

To support economic growth, the government relied heavily on resource-based sectors, foreign direct investment, and concessionary aid inflows, but, job creation outside the agriculture sector has remained limited. Rapid and sustained growth has had little impact in altering the composition of employment. Most of the population remain in agriculture, but agricultural productivity growth has trailed far behind other sectors. While industry's contribution to economic growth has increased, job opportunities in high value-added sectors did not accompany that growth. The industry sector remains dominated by resource-based products, and its share in total employment has declined over time. Meanwhile, the services sector has helped to increase employment, although its contribution remains low. Private investment and productive capacity remained low. More importantly, the Lao PDR's inability to move from resource-based exports to more high value-added products has impeded the process of structural transformation.

Major challenges in accelerating structural transformation and achieving inclusive growth over the longer term can be summed up as follows: (i) low productive capacity with highly concentrated production and export structure, (ii) weak governance and inefficient public management, (iii) low level of human capital and quality of education, (iv) inadequate and poor infrastructure, and (v) limited public services. Targeted reforms and investments can effectively address these challenges.

Export diversification can help create jobs in high productivity sectors

To modernize its economy, the Lao PDR needs to diversify exports and its production structure, which will subsequently help provide decent job opportunities outside agriculture as well as reduce inequality in the region. This study lists the potential high value-added products, which the Lao PDR can invest on to advance the transition of the economy from low-productivity to high-productivity activities. Empirical analysis also highlights the need to explore new opportunities beyond the existing drivers of growth. The study identifies the main exports that are in high demand in the region and areas of investments for Laotian entrepreneurs. Attractive opportunities in agriculture and manufacturing remain unexploited, such as in textile and garments, food processing, crop and animal farming, and chemicals.

Accumulating productive capabilities is vital

The analysis has shown that the Lao PDR's current export basket comprises mainly low value-added products that have little prospect for enhancing structural transformation. There are numerous attractive and high value-added products close enough to the Lao PDR's existing capabilities. However, currently only a few entrepreneurs export these products, despite their high regional and global demand. The public sector, as a first step, may adopt a parsimonious approach in selecting “low hanging fruits,” i.e., products that require similar kind of inputs and productive knowledge which Laotian entrepreneurs already possess, and foster their development. The approach is not about “picking winners,” but rather opening dialogue with the private sector to help identify new economic opportunities for structural transformation.

Expansion from traditional to modern products does not happen solely through market forces. The public sector must play an active role in removing obstacles to private sector investment in nontraditional products by first initiating public–private dialogue, then providing the necessary infrastructure and missing public input and removing the identified obstacles.

Agriculture development is essential for structural transformation and inclusive growth

A lack of productivity growth of the agriculture sector explains much of the stalled structural transformation of the Lao PDR. The global experience is that agricultural growth is a necessary precedent for the structural transformation process, and that agricultural growth has two to three times the poverty-reducing effect of nonagricultural growth. This is especially so when agriculture employs a large share of the population.

In the Lao PDR, agriculture accounts for 65% of national employment, 59% of expenditure of low-income groups, and it provides the livelihoods for the vast majority of the poor. A substantial share of the agricultural population remains at the subsistence level, with no substantial sales. Reducing poverty depends on helping this population to become commercially oriented and connected to the market economy.

Agricultural potential is high, but remains untapped

With extensive land area relative to its rural population, abundant water resources, and close proximity to growing food markets, the Lao PDR could have large potential for agricultural development. By many measures, agro-ecological conditions in the Lao PDR are among the most favorable in Asia. However, the investments necessary to make use of this potential have largely not yet occurred. Agriculture has not received a proportionate share of public investment, and the vast majority of agricultural investment has been development assistance.

This means that agricultural performance has remained limited. According to available statistics, the Lao PDR has a large negative trade balance in food, and is becoming a substantial rice importer. Household survey data indicate that rice yields trail the rest of developing Asia, and that production growth is driven by unsustainable area expansion. Livestock and other crop production growth have remained mixed. As a result, progress on food security and poverty alleviation have stalled.

Clear constraints explain the low performance of agriculture to date

Although the Lao PDR has the highest level of renewable water resources available per unit of agricultural land in Asia, irrigation coverage remains among the lowest in the region. Input and output markets remain fragmented and underdeveloped, and credit is highly constrained. Road infrastructure and logistics performance trail most of Asia. Investment in research and extension to underpin innovation are at low levels. Most farmers also operate without legally recognized land-use rights, which makes the investment climate for agriculture unfavorable.

Targeted public investments in the agriculture sector can make a difference to development outcomes

Where actions have been taken to address agricultural constraints, the results are encouraging. A majority of the agricultural interventions empirically evaluated in this study are found to have significant effects on one or more intended outcomes. This indicates that agricultural investment can be effective in boosting inclusive growth, if well targeted.

Priority investments can enable productivity growth and commercialization. Irrigation improvement, particularly through small-scale and community-managed irrigation, is essential to make use of the Lao PDR's abundant water resources. Rural road infrastructure and credit are found to be essential to achieving agricultural diversification outcomes. Secure land-use rights and land-use planning also are found to reduce agricultural encroachment into natural ecosystems and support crop diversification. New technologies are found to contribute to productivity, but extension system reforms are needed to backstop this process. The effectiveness of these investments can be further enhanced by investing in knowledge infrastructure, statistical systems to inform policy, and policies that facilitate, rather than restrict, trade.

The services sector can become a more effective driver of growth

The services sector has played a vital role in economic growth in the Lao PDR. Its share in GDP has increased over time, making it the largest contributor to growth. However, the Lao PDR's services sector is still in its early stage of development. The Lao PDR still needs to develop modern services as well as upgrade traditional services. Low purchasing power and weakness in infrastructure and logistics (such as poor quality and high costs), finance, governance, and other factors hinder the development of domestic market-oriented services. Linkages within and between many services subsectors, agriculture, mining, manufacturing, and other industries tend to be weak. Also, the domestic market in different parts of the country is highly fragmented. The services sector is expected to expand further as the ease of doing business in the Lao PDR improves through developing infrastructure and improving the education and training system.

The Lao PDR has substantial potential for growing its tourism industry

The Lao PDR ranks in the middle among neighboring member countries of the Association of Southeast Asian Nations (ASEAN) in tourism growth. However, tourism development will depend on the improvement of physical and other forms of connectivity to regional and global markets, information and communication technology (ICT)-related development, visa procedures, and other legal and regulatory frameworks.

Plans of the government and other entities to invest in transport and other infrastructure, such as the Belt and Road Initiative (BRI), will likely boost tourism and travel to other ASEAN countries and the People's Republic of China (PRC).

Economic corridors can emerge to support new industries

Although traditional services such as wholesale, retail trade, and real estate service developments have provided job opportunities, most of these are low paying and located in Vientiane and other major cities. In addition, significant development can be seen around special economic zones, in border towns, and in some rural areas.

The Lao PDR is a latecomer in developing export processing zones (EPZs) and other forms of industrial agglomeration—which very much rely on growth in education, transport, logistics, and other services sector. Weak infrastructure, education, and training in addition to strong competition from neighboring countries limit the scale and scope of ongoing industrial estate development. Construction of EPZs and other such developments only

began in 2009, and economic corridors are largely limited to cross-border development with Thailand, Viet Nam, and the PRC. Such developments require, among others, major investment in infrastructure, for which the Lao PDR has lower financial and other resources than its neighbors.

To support economic corridor development, the Lao PDR will need to invest further in infrastructure and logistics, develop education and skills, and improve overall in the doing business environment for services and other sectors, especially promoting private–public partnerships and foreign investment. EPZs and economic corridors must also be aligned with international developments, particularly in the PRC (including the BRI) and ASEAN members such as Thailand and Viet Nam.

Use of information and communication technology is imperative to developing tourism

The Lao PDR can leapfrog over others in developing ICT infrastructure and applying new technologies and business models in all economic sectors. In the near term, it can promote the greater use of ICT devices and improve access to broadband and related applications. These initial actions will have a broad positive impact on many institutions, social groups, and regions.

Policies need to maximize the potential for gains in income and employment in the tourism industry and intersector linkages while minimizing risks associated with environmental degradation and other pitfalls. Better air connectivity, land transport, hotels and other facilities, and the application of ICT can greatly increase tourism-related income. The government’s multidimensional initiatives as indicated in its tourism-related plans will require extensive but unified efforts of stakeholders at all levels of government and the private sector, including foreign investors as well as local small enterprises.

Improvement of infrastructure is vital for economic development

Infrastructure development and better connectivity are crucial for economic development and for reducing poverty and inequality. The existing infrastructure will need to be improved substantially to diversify the economy and make it more vibrant. Improvement in the business environment through reducing transport and logistics costs and regulatory burden can help upscale investments in high value-added products. The study specifically highlights the importance of the power sector as a strategic factor in achieving sustainable economic growth, both in the short and longer term. Development of the sector is central to modernization and industrialization. It is also vital to basic social services such as education, health care, clean water supply, and sanitation. As such, access to reliable and affordable electricity can help a developing country such as the Lao PDR to meet its development goals.

Better governance and efficient public service delivery are essential

To reduce inequality and disparity among different regions and ethnic groups, the quality and coverage of health facilities and education should be expanded, particularly for the people living in rural and upland areas. Public goods and services for agriculture, such as roads, extension, irrigation, and market infrastructure are essential to engage marginalized populations in the market economy. Governance of public resources, such as land, needs to be improved to offer most people security for their main productive asset.

The Lao PDR can make its economic growth more inclusive and sustainable. It has tremendous overall potential for developing its agriculture and services sectors, upgrading traditional services, improving productivity, and strengthening synergies across various sectors while overcoming the challenges in accelerating structural transformation and achieving inclusive growth over the longer term.

Chapter 1

Economic Performance and Key Development Challenges

1.1 Introduction

The Lao People's Democratic Republic (Lao PDR) is a small landlocked economy endowed with natural resources, such as minerals, hydropower, and forest products, which have all been instrumental in sustaining higher economic growth in the last decade. After the Communist revolution in 1975, the country had a centrally planned economic system. However, economic performance during this era remained subdued and by the beginning of 1986, the state-led development strategy virtually collapsed. With the inception of the New Economic Mechanism (NEM) in 1986 the government came up with various economic and structural reforms that laid the foundation for transition to a market-oriented economy. Since then, the Lao PDR has shown remarkable progress in consistently building itself into a market-oriented economy. Economic growth during 1986–2016 averaged around 6.5% per annum and the size of its gross domestic product (GDP) increased by six times. The strong growth led to a rise in the per capita income from \$170 in 1986 to \$2,353 in 2016. Poverty incidence based on the national poverty line declined substantially from 46% in 1992 to 23.2% in 2011–2012.

In sustaining the high growth trajectory, resource-based products and increasing volumes of foreign direct investment (FDI) have played a crucial role. The reliance on resource-based products as an engine of growth has no doubt maintained higher growth; however, job opportunities were insufficient because of these products' capital-intensive nature. At the same time, the high economic growth has not attracted private investments that are large enough to expand job opportunities in other sectors, thus posing a threat to inclusiveness of growth in the medium to long run. Despite higher GDP growth, the Lao PDR in 2017 is still classified as a least developed country (LDC). The challenges ahead would, therefore, be to keep the momentum of high economic growth, attract larger private investment, while also provide decent job opportunities in the manufacturing and more productive services sectors.

The rapid and sustained growth has changed the structure of the output—the share of agriculture in GDP declined while that of services and industry increased. However, this structural change has had little impact in changing the composition of employment. While the industry sector's contribution to economic

growth has increased, it remains dominated by resource-based products and unable to provide job opportunities. As a matter of fact, the share of industry in total employment has rather declined over time. On the other hand, while the services sector has helped increased jobs, its contribution remains low while most of the jobs fall under low value-added services. With only limited jobs created by the industry and services sectors, the low-productivity agriculture sector is left to absorb the majority of the labor force. Overall, there has been little movement from low-productivity to high-productivity sectors and, consequently, most of the labor force is employed in low-productivity sectors.

In 1986, the Government of the Lao PDR embarked upon the NEM. With the implementation of the NEM, the Lao PDR's economy transformed gradually from being centrally planned to being market-oriented. The reforms introduced under NEM resulted in a domestic economy that was able to integrate gradually into the world. Overall, the opening of the economy has helped achieve higher economic growth and improve the status of the Lao PDR in the international arena. Since the inception of market-oriented policies and economic reforms, the Lao PDR has shown significant progress and has maintained robust economic growth.

From an analytical point of view, the economic and structural reforms introduced under NEM can be categorized into two stages: a preparatory stage in 1986–2000, and a period of high economic growth in 2000–2016. During the preparatory stage, the reforms aimed to transform the economy gradually into a market-based economic system. To this end, the government introduced various economic and structural reforms, which focused on establishing a legal and institutional framework and maintaining price stability. Prices and production control were deregulated and various incentives provided to develop a vibrant private sector. The government allowed private investment and took measures to attract FDI. In this regard, a law on foreign investment promotion and management in 1988 was passed, allowing 100% foreign ownership of investments. The law was subsequently revised in 1994. Other areas of reforms included improving the agriculture sector, revitalizing

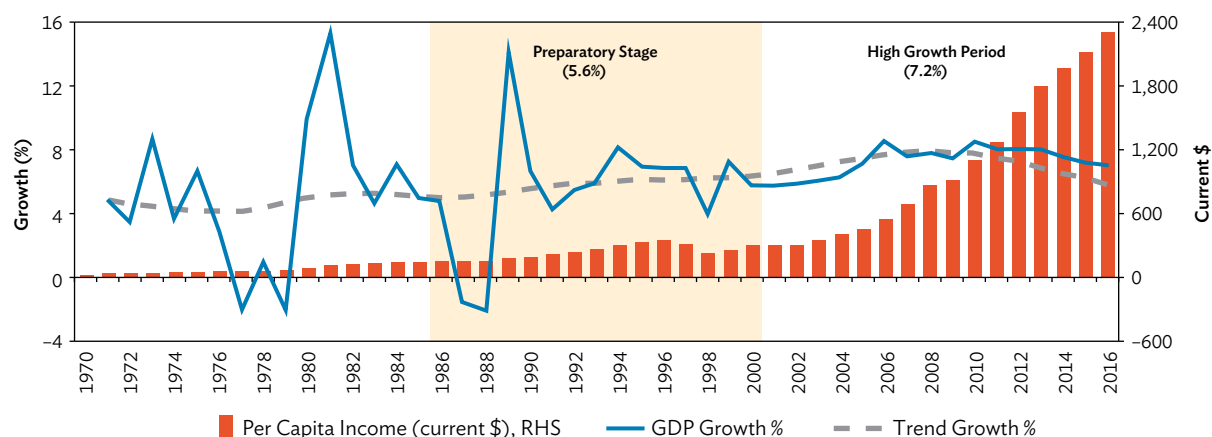
state-owned enterprises (SOEs), and enhancing the efficiency of the banking and finance sectors. The government also introduced reforms to replace the multiple exchange rates system with a unified exchange rate. In addition, it took significant measures to improve the banking sector, and it established the Bank of the Lao PDR (BOL) in 1990 (Oraboune 2012). Economic growth during 1986–2000 remained around 5.6% per annum.

From the early 2000s onward, during the period of high economic growth in 2000–2016, five-year national socioeconomic development plans (NSED), have played a central role in transforming the national strategic goals and the priority development programs into action plans. In 2002, the Industrialization and Modernization Strategy (2001–2020)—which was part of the government's 2020 development vision—was introduced to help develop the industry sector. In addition, the government focused its efforts on hydropower, mining, agricultural production, tourism, and construction material (Jajri 2015). These reforms created favorable conditions for industrialization, which was supported initially by growth in manufacturing, particularly textiles and garments. From 2000 onward, resource-based sectors made up the bulk of industrial value added. GDP growth increased further and the economy grew at 7.2% per annum during 2000–2016 (Figure 1.1).¹

From the supply side, industry and services became the major drivers of growth. On the other hand, the contribution of agriculture declined over time. The contribution of industry to GDP growth surged from 25.6% during 1986–2000 to 37.6% in 2000–2005. It rose further to 46.9% in 2005–2010 and reached 52.0% during 2010–2016. Overall, during the period of high economic growth in 2000–2016 industry contributed 46.0% to GDP growth. As mentioned, resource-based products dominated the industry sector, and the share of resource-based industry (mining and electricity) in industrial value added surged from 25.4% in 2000 to 54.1% by 2015 (Figure 1.2).

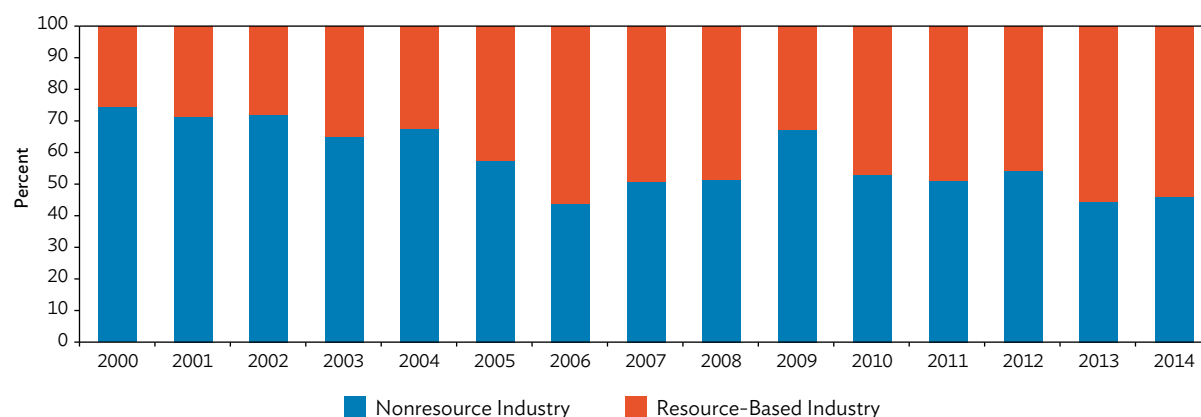
The reliance on resource-based products, such as hydropower and mining, contributed significantly

¹ Resource-based sectors comprise largely mining and electricity production.

Figure 1.1: GDP Growth Rate and per Capita Income, 1970–2016

GDP = gross domestic product, RHS = right-hand side.

Source: United Nations Statistics Division. <http://unstats.un.org/unsd/default.htm> (accessed August 2017).

Figure 1.2: Share of Resource-Based Industry in Industrial Value Added, 2000–2014

Note: Nonresource industry = manufacturing and construction, resource-based industry = mining and electricity.

Source: Computations based on ADB. 2016. *Key Indicators for Asia and the Pacific 2016*. Manila.

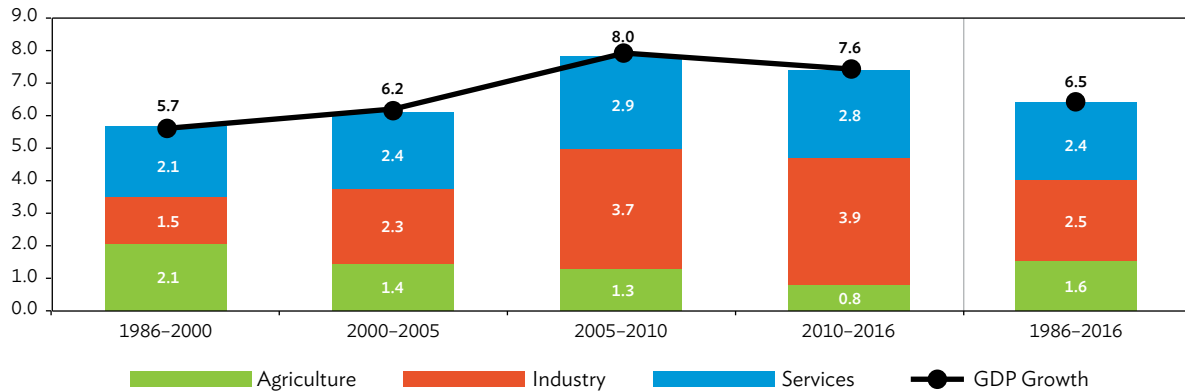
toward economic growth. However, because these sectors were capital intensive in nature, they were not a significant source of employment. Consequently, industry's employment share declined from 8.7% in 2001 to 8.1% by 2010.

In 1986–2000, the services sector's contribution toward economic growth was 37.1%, which rose to 39.1% in 2000–2005 and remained around 36.2% in 2005–2010. During the high-growth period of 2000–2016, the overall contribution of services remained on average at 37.1%. Within the subsectors of services,

the growth rate of wholesale and retail trading, public services, and transport and communication remained strong.

The contribution of agriculture to GDP growth declined substantially—from 37.0% during the preparatory stage in 1986–2000 to 17.0% during the high-growth period in 2000–2016. An examination of the different subperiods indicates that agriculture contributed about 23.3% toward GDP growth in 2000–2005, 16.8% in 2005–2010, and 10.4% in 2010–2016 (Figure 1.3).

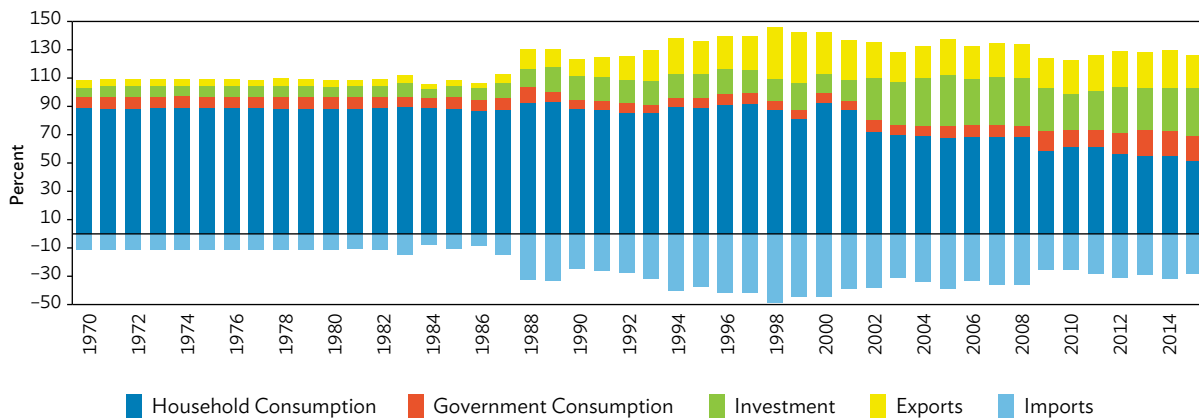
Figure 1.3: Contribution to GDP Growth, 1986–2016 (percentage points)



GDP = gross domestic product.

Source: Computations based on World Bank, World Development Indicators. <http://data.worldbank.org/data-catalog/world-development-indicators> (accessed August 2017).

Figure 1.4: Sectoral Share in GDP, 1970–2015



GDP = gross domestic product.

Source: United Nations Statistics Division. <http://unstats.un.org/unsd/default.htm> (accessed January 2017).

From the demand side, household consumption continued to dominate contribution to GDP growth. The share of household consumption in GDP remained around 90% during 1970–2000. However, from 2001 onward it started declining and in 2001–2015 averaged around 66%. During the same period, the share of investment in GDP increased from 11.4% to 31%. The share of exports, which was 11.8% in 1970–2000, increased further to 23.8% during 2001–2015. Against the backdrop of higher economic growth and to meet the growing consumption and investment demand, imports also surged from 21% to 32% (Figure 1.4).

1.2 Major Economic Developments: 1975–2016

1.2.1 Background and Centrally Planned Economy (1975–1985)

The Kingdom of Laos was a constitutional monarchy that ruled from 1953 until 1975. However, against the backdrop of political changes in Viet Nam and Cambodia in April 1975, the monarchical government was abolished. Subsequently, in December 1975, the Lao People’s Democratic Republic was proclaimed, which then adopted a centrally planned economic system.

Historically, the Lao PDR has a lot in common with Viet Nam and Cambodia. As former French colonies, they shared a common currency under the colonial rule. They also adopted a Soviet-style central planning system in the 1970s. However, with the collapse of the Soviet Union and the subsequent loss of Soviet aid in the early 1990s, they began the process of economic and political reforms, paving the way for their transition from a centrally planned to a market-oriented economic system. The pace of reforms in all the three economies was quite different with regard to the degree of openness, international integration, and economic performance. Initially, these economies spent considerable time conducting reforms within the framework of a centrally planned economic system before transitioning into a market economy. For example, in Viet Nam, the “Doi Moi” movement in 1986 signaled the end of the centrally planned economic system. This coincided with the introduction also in 1986 of the NEM in the Lao PDR, which ushered its transition toward a market economy (Shimomura et al. 1994).

As a landlocked economy and the least open of the three economies, the Lao PDR gradually started introducing reforms. During its economic transformation, the government pursued an annual plan covering 1976–1977, a three-year plan for 1978–1980, and a series of five-year plans for 1981–2015. In 1975–1985, the Lao PDR pursued a centrally planned economic system. Under this regime, prices and exchange rates were determined by the government and all the industry and foreign trade sectors were nationalized. However, in the initial years of the centrally planned economic system, the country faced remarkable difficulties, and economic management during this era remained weak. At the end of 1976, socialism was introduced and relations with the West and with Thailand were abandoned, resulting in massive urban unemployment and hyperinflation to the tune of 400%.

A large amount of the assistance from Western countries was interrupted, and the foreign exchange operating fund of the International Monetary Fund, which supported budget deficit and helped settle balance of payments, was also halted. During that time, both the budget and balance of payment deficits

were financed with assistance from the former Soviet Union. The subsequent droughts in 1976–1977 and the floods in 1978 made matters even worse. Moreover, sudden termination of aid from the United States (US), disruption of cross-border trade from Thailand’s economic blockade, and the peasants’ resistance to the introduction of taxation and collectivization of agriculture aggravated economic difficulties further. Increased regulations from the government also reduced the number of traders and entrepreneurs (Shimomura et al. 1994). These series of events had an adverse impact on the economy, causing it to remain stagnant with GDP growth in 1976–1979 reaching almost zero. There was a little increase in per capita income from \$72 in 1976 to \$83 in 1979 and standard of living remained low.

To avert the situation, the Central Committee of the Lao People’s Revolutionary Party in 1979 announced economic reforms. Both individuals and private enterprises were allowed to engage in commercial activities. The government also took steps to reduce the number of constraints on domestic and international trade. Subsequently, with the launch of the first Five-Year Plan in 1981–1985, these reforms gained momentum. The plan emphasized the self-supply of food, establishment of transportation and telecommunication networks, promotion of industrialization, and improvement of human resources development. Since the Lao PDR had a low starting base, economic growth during 1981–1985 remained strong and the economy grew at 7.9% per annum. Per capita income increased from \$122 in 1981 to \$163 in 1985. Despite higher economic growth, however, the major objectives of the plan, such as attaining self-sufficiency and a balanced and diversified agriculture structure, could not be achieved. Consequently, the economy continued to face high budget and trade deficits and little progress in human resources development (Shimomura et al. 1994).

1.2.2 Transition to the Market Economy (1986)

By the beginning of the 1980s, the centrally planned economic system virtually collapsed, bringing about the Lao PDR’s transition toward a more open and

market-oriented economy. In 1986, the government introduced various economic reforms and introduced market-oriented economic policies under the NEM, with the aim of setting up the legal and institutional framework and restoring price stability. Other areas of reforms focused on improving the agriculture sector, revitalizing SOEs, and enhancing the efficiency of the banking and finance sectors. The main objective of the NEM was to establish an economic system that is open to international trade and foreign investment. In this context, the government decentralized the economic system and promoted the development of the private sector, deregulating prices and introducing production controls. Managerial and financial autonomy was also granted to SOEs. The multiple exchange rate system was also unified and the fiscal and banking sectors improved. These reforms created a more favorable environment for private sector development and helped the Lao PDR actively participate in the global economy (Phimphanthavong 2012).

To support its transition toward a market-oriented economy, the government introduced additional reforms under the second Five-Year Plan (1986–1990), which elaborated the policies and guidelines for a smooth transition. One of the major areas of reforms was to bring the multi-exchange rate system into one unified exchange rate in 1988. Most of the restrictions on domestic and external trade were relaxed. The banking and finance sector reforms were milestones that were initiated in 1988 when the mono-banking system was replaced with a two-tier banking system. The BOL was established in 1990, while the commercial banking activities were separated from the central banking functions. The government also gave considerable operational and financial autonomy to all SOEs (Kyophilavong 2009).

With the advent of the investment promotion law in 1988, both foreign and domestic investors could start doing business in the Lao PDR. The reforms created favorable conditions for developing the private sector and moving toward a market-based economic system. The plan also suggested measures in creating the necessary conditions for growth in the agriculture, forestry, industry, and services sectors. Economic growth during the plan period, however, was disrupted by severe droughts, which resulted in a decline in the

value added in agriculture by 1.2% in 1987 and 4.5% in 1988. Industrial production dropped to 16% in 1987 and further to 2.4% in 1988. GDP growth slowed down, but the economy grew at 4.5% per annum in 1986–1990 (Shimomura et al. 1994).

To continue the economic and structural reforms and improve the infrastructure for socioeconomic development, the third Five-Year Plan 1991–1995 introduced additional measures to transform the natural economy into a commodity-producing economy, improve the infrastructure for socioeconomic development, promote foreign cooperation and foreign direct investment, and improve the standard of living of the masses. The government focused specifically on attracting FDI inflows. The law on foreign investment was revised in 1994, which allowed foreign investors to invest in the Lao PDR as partners in joint ventures with domestic investors or as a wholly foreign-owned enterprise. Exemptions were also granted on import duties on raw material and intermediate imports, which encouraged the private sector, SOEs, and joint venture enterprises to come forward and invest in various sectors of the economy. FDI inflows increased sharply from \$6.9 million (0.7% of GDP) in 1991 to \$95.1 million (5.4% of GDP) by 1995. The hydropower and mining sectors made up the bulk of these inflows. Economic activity surged as all the major economic sectors responded to reforms positively. The agriculture value added during 1991–1995 grew at 4.1% per annum, while industry registered a growth of 12.3% and services at 6.1%. During this period, GDP increased by 6.2% per annum while per capita income rose from \$235 in 1991 to \$363 by 1995.

In the spirit of reforms toward a more open and market-oriented economy, the government decided to promote international cooperation further and pursued an open-door policy. This was one of the major features of the fourth Five-Year Plan 1996–2000. Other important areas included raising the savings rate and attaining self-reliance, providing social welfare, improving and upgrading the management and state laws, and encouraging economic growth to average 8.0%–8.5% per annum. The plan also aimed to maintain exchange rate stability and an inflation target of less than 10% by 2000. The growth rate of

agriculture remained at 5.2%, industry at 10.2%, and services at 6.7%. The composition of output changed as the share of agriculture in GDP declined from 53.3% in 1996 to 45.2% in 2000 while that of services increased from 25.6% to 38.2%. In 1998, the Asian financial crisis hit the economy. GDP growth was partly disrupted and slackened from 6.9% in 1997 to 3.9% in 1998. The decline in GDP growth along with the reduction in prices by 6.8% in 1997 and 26.7% in 1998 lowered per capita income from \$363 in 1995 to \$320 by 2000. With the subsequent recovery in economic growth, per capita income could only reach its 1995 level in 2003. Economic growth in 1996–2000 averaged around 6.2%.

The government continued to prioritize higher economic growth to attain the per capita income threshold needed to graduate from being a least developed country by 2020. In this regard, sectors such as infrastructure development, hydroelectricity, and mining were given priority and identified as one of the major areas of focus in the fifth Five-Year Plan (2001–2005). To attract FDI to the aforesaid priority sectors, special economic zones were established and incentives granted under the investment promotion laws. GDP growth during 2001–2005 was largely attributed to industry growth, which was duly supported by FDI inflows to resource-based sectors. Both hydropower and mining sectors were instrumental in maintaining economic growth. The share of industry in GDP increased from 17.1% in 2001 to 24.6% by 2005. However, resource-based sectors continued to dominate industry. The share of manufacturing in GDP increased from 6.2% to 9.9%. The share of services in GDP also rose marginally from 38.9% to 39.2%. The sectoral growth rates of agriculture remained at 3.0%, industry at 11.8%, and services at 6.9%, during the plan period. Economic growth during 2001–2005 averaged around 6.2%, but it was lower than the plan target of 7%. While per capita income increased further to \$476 by 2005, it fell short of the plan's target of \$500–\$550.

During the sixth Five-Year Plan (2006–2010), the government aimed to increase per capita income to \$827 and targeted economic growth in the range of 7.5%–8.0% per annum. In 2006–2010, the economy indeed grew at an average of 8.0% per annum. The sectoral growth rates of agriculture, industry, and services remained robust, growing at 4.1%, 14.5%, and 7.2%, respectively. The growth rate of the industry

sector remained strong and its share in GDP rose further from 27.7% in 2006 to 32.3% by 2010. Most importantly, the economy achieved macroeconomic stability and was able to safeguard itself from the global financial crisis in 2008.

The Lao PDR has had limited financial linkages with industrial countries and the high demand of neighboring economies for its key exports continued. The government also increased its spending, thus insulating the economy from adverse impacts of the global economic crisis, which resulted in a growth of 7.5% in 2009 and 8.5% in 2010. Against the backdrop of higher economic growth, per capita income increased from \$569 in 2006 to \$1,077 by 2010 and exceeded the plan's target of \$827. Poverty incidence declined from 33.5% in 2002–2003 to about 26% during 2009–2010. However, rising income inequalities in rural and urban areas and limited jobs in industry and services continued to pose a major challenge in achieving inclusive growth (Shimomura et. al. 1994).

The seventh NSEDP (2011–2015) envisaged to maintain higher economic growth at 8.0% per annum and increase per capita to \$1,700 by 2015. The government focused on providing basic infrastructure particularly in rural areas and enhancing connectivity to integrate the economy into the region and the rest of the world. The plan also emphasized the importance of effective public administration and public service delivery and underscored as milestones the industrialization and modernization of the economy by promoting the use of science and technology. Economic growth during 2011–2015 remained on average at 7.9% per annum. While all the sectors contributed to this higher growth, growth in the agriculture sector slackened. Droughts and floods during 2011 and 2013 reduced agriculture's value added. On the other hand, the services sector's growth remained strong. Economic recovery in major economies after the global financial crisis led to an increase in the number of tourists to the Lao PDR, stimulating growth in the hotel industry. Likewise, expansion in the wholesale and retail trade and in financial services contributed positively to robust growth in the services sector. The sectoral growth rates of agriculture remained at 3.7%, industry at 12.0%, and services at 7.5%.

To support economic growth, the government also made use of expansionary fiscal and monetary policies. However, with the rise in fiscal deficit, the government found it difficult to pay the arrears in payments for wages and utilities, which were estimated to be 2.5% of GDP in 2013. Thus, the government postponed a large number of public investment projects and canceled the cost of living allowance for public sector employees. To contain the increase in money supply (M2), which was growing at 22.7%, and the credit growth of 36.1% in 2013 along with dwindling foreign exchange reserves, the central bank directed the commercial banks to curb lending in foreign currencies and restricted the sale of foreign currencies to the public. However, higher domestic inflation rates resulted in the appreciation of the kip in real terms, thereby eroding export competitiveness. In addition, weakening global commodity prices adversely affected the export receipts. Imports, on the other hand, in the context of strong domestic demand, continued to increase, which led to higher trade and a current account deficit.

1.2.3 Key Issues and Graduation from Least Developed Country Status

The transition from a centrally planned to a market-oriented economic system, in general, brought about

macroeconomic stability and higher economic growth. However, the financial crisis in 1997–1998 caused the macroeconomic situation to deteriorate. As a result of this external shock, the kip depreciated by 82.4% between 1999 and 1997 against the US dollar, and inflation accelerated to 129.1% in 1999. The crisis also affected FDI, which declined by 40.2% between 1999 and 1997. However, large volumes of FDI inflows to mining and hydropower, which have started increasing since 2001 coupled with a generally weak US dollar against other Asian currencies, helped stabilize the domestic currency. The BOL also intervened, helping to strengthen the domestic currency. During 2006–2015, the kip strengthened against the US dollar by 26.2%. With the stronger exchange rate, inflation rate started declining from 23.1% in 2000, to 7.2% in 2005, 6.0% in 2010, and further down to 1.3% in 2015. The average inflation rate during 2000–2015 remained at 8.2% per annum. Trade deficit as a percentage of GDP remained on average at around 12.1% during 1996–2000, which only slightly dropped to 10.1% during 2001–2005. In 2000–2010, this was reduced to 5.2% of GDP; however, with the rise in GDP growth and higher import demand during 2011–2015, the trade deficit surged again and rose to 20% of GDP by 2015. The average trade deficit during 2011–2015 was at 10.5% of GDP. Table 1.1 gives a summary of the major trends in macro variables during 1981–2016.

Table 1.1: Macroeconomic Indicators, 1981–2016

	1981–1985	1986–1990	1991–1995	1996–2000	2001–2005	2006–2010	2011–2016
Growth Rates (%)							
GDP	5.1	4.5	6.4	6.2	6.3	8.0	7.7
Agriculture	11.0	3.7	4.1	5.2	1.6	4.2	2.8
Industry	5.5	9.7	12.3	10.2	8.6	13.1	10.6
(Manufacturing)	15.0	11.3	14.3	10.3	11.2	9.2	6.9
Services	(2.6)	4.3	6.8	6.6	10.3	8.3	7.6
As a Percentage of GDP							
Budget deficit	(15.9)	(12.5)	(9.3)	(4.9)	(4.1)	(2.7)	(3.2)
Trade deficit	(0.5)	(0.1)	(0.02)	(12.1)	(10.6)	(5.2)	(10.5)
Current account deficit/surplus	(5.9)	(9.9)	(6.7)	(5.2)	(3.7)	1.3	(6.9)
Inflation (%)							
CPI inflation	64.8*	36.9	11.1	55.4	10.3	5.0	4.7
Food inflation				62.2	9.9	6.9	7.8
Nonfood inflation				40.1	10.7	2.0	2.3

() = negative, CPI = consumer price index, GDP = gross domestic product.

Note: Inflation rate for 1981–1985, 1986–1990 is based on GDP deflator series from the World Development Indicators (accessed August 2017).

* = Inflation rate indicated under 1981–1985 is for the year 1985 only. For other years data are not available.

Sources: ADB. 2016. *Key Indicators for Asia and the Pacific 2016*. Manila; and World Bank. World Development Indicators (accessed July 2017).

In its eighth Socio-Economic Development Plan (NSED) 2016–2020, the Lao PDR is targeting a GDP growth of 7.5% per annum to qualify for graduation from LDC status by 2020. This is emphasized in the overall objective of the country's eighth NSDEP (2016–2020), in which the government continues to prioritize sustained and inclusive growth. To graduate from the list of LDCs by 2020, the Lao PDR must meet the threshold for at least two of the three socioeconomic criteria set by the United Nations: per capita gross national income (GNI), human assets index (HAI), and economic vulnerability index (EVI). While growth performance in the last decade indicates that the country can achieve that target by meeting the GNI threshold, however, its performance in other two criteria, namely, human assets index and economic vulnerability index is lagging far behind. Every 3 years, a United Nations committee reviews these criteria to determine a country's eligibility for graduation from LDC status. The latest review for the Lao PDR, in 2015, suggested that it scored \$1,232 against the GNI threshold of \$1,242; 60.8 under the HAI threshold value of 66 or above; and 36.2 over the EVI threshold value of 32, indicating that the country is still highly vulnerable to external shocks. The next LDC reviews will take place in 2018 and 2021. If at least two of the criteria are met for both reviews, the Lao PDR can expect to fully graduate in 2024 following a 3-year grace period. To this end, the eighth NSED (2016–2020) emphasized sustained, inclusive economic growth with the EVI reduced to levels required to support growth. The plan also aims to improve the capacity of human resources in the public and private sectors, cope with natural disasters, and mitigate the impacts of climate changes on the economy.

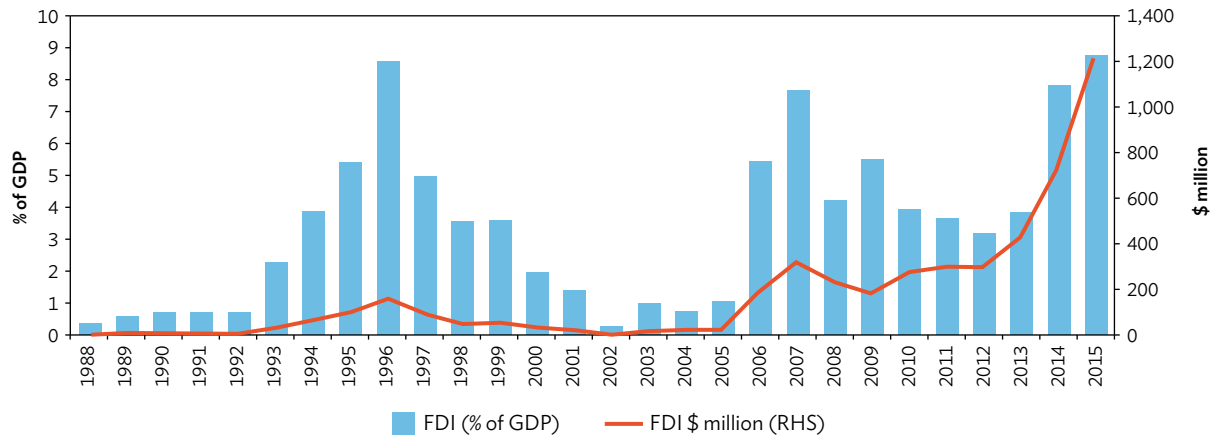
1.3 Foreign Direct Investment and Dollarization

Foreign direct investment inflows started increasing significantly from the mid-1990s. The reforms envisaged under the umbrella of NEM have sought to strengthen international cooperation and regional development. Since the adoption of market-based reforms during 1986–2015, international trade and FDI have increased significantly, helping

sustain higher economic growth. The government has pursued various reforms to attract FDI in efforts to industrialize the economy. After transitioning toward a market-oriented economy, the Lao PDR expanded its cooperation with many countries and built the necessary conditions to attract investments from around the world. In this regard, the Lao PDR's membership to the Association of Southeast Asian Nations (ASEAN) is an important milestone and the country has started receiving funding from many developed countries and international organizations. Not only has this helped the Lao PDR integrate into regional economies, it also increased the volume of FDI into the country. Similarly, the creation of special economic zones and the introduction of investment laws have been instrumental in accelerating FDI inflows. Initially, the government allowed private investors to transact business in 1988 and thereafter, in 1994, the investment law was revised, allowing investors in as partners in joint ventures with domestic investors and as wholly foreign-owned enterprises.

In 2004, the government also allowed foreign investors to invest in three types of business entities: as a business cooperation by contract, a joint venture between foreign and domestic investors, and as a 100% foreign-owned enterprise. To encourage investors, the government provided various incentives including an investment term for foreign investors of up to a maximum period of 75 years, and a profit tax maintained at 20% for all sectors. The investment promotion law was revised further in 2009. Foreign investors could then invest either as a general business, a concession business, or for developing special economic zones and specific economic zones, thus allowing them to import duty-free products—such as raw material, equipment, spare parts, and vehicles—for use in supporting production activities (Phommahaxay and Vanhnalat 2015). As a result, FDI inflows surged sharply. The rise in FDI was also linked to the global economic boom that was disrupted in 1997 by the Asian financial crisis and again in 2008 by the global financial crisis. In the beginning of economic reforms, inward FDI inflows to the Lao PDR amounted to merely \$2 million (0.3% of GDP) in 1988, but it rose sharply and reached \$1.2 billion (8.7% of GDP) in 2015 (Figure 1.5).

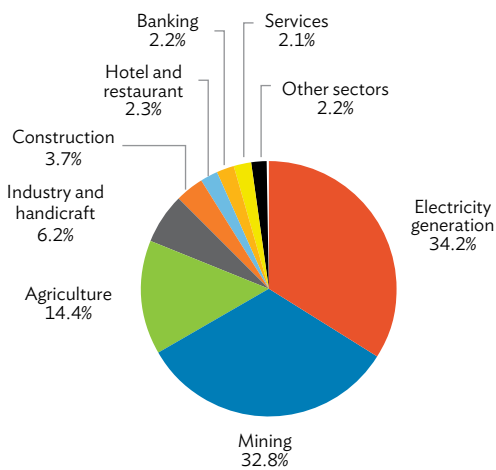
Figure 1.5: Foreign Direct Investment Inflows, 1988–2015



FDI = foreign direct investment, GDP = gross domestic product, RHS = right-hand scale.
 Source: World Bank. World Development Indicators. <http://data.worldbank.org/data-catalog/world-development-indicators> (accessed February 2017).

An examination of the FDI inflows in 2011–2015 suggests that the bulk of it comprised the electricity, mining, and agriculture sectors. During this period, the share of electricity in total FDI remained at 34.2%, mining at 32.8%, and agriculture at 14.4%, followed by the industry and handicraft sector with a share of 6.2%, and construction staying at 3.7%, and the hoteling, banking, and services sectors remaining around 2.2% (Figure 1.6).

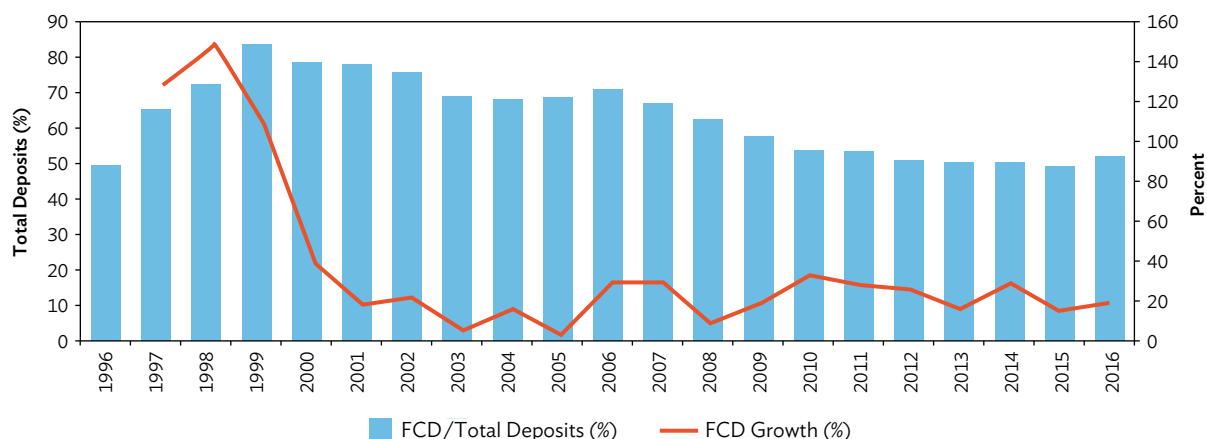
Figure 1.6: Approved Foreign Direct Investment by Sectors, 2011–2015 (\$ million)



Source: Government of the Lao PDR. Ministry of Planning and Investment. Investment Promotion Department database (accessed 9 January 2017).

The high level of dollarization continues to impair the ability of the BOL to conduct an independent monetary policy.² Besides the kip, both the Thai baht and the US dollar are widely used in the domestic economy, while the domestic financial structure remains weak. The presence of multiple currencies allows capital inflows to become part of the money stock while bypassing the financial system. Hence, capital inflows and outflows would automatically change the money supply in the domestic economy, limiting the optimal use of monetary and exchange rate policies and constraining the ability of the central bank to manipulate the money supply at its desired level. Moreover, this also reduces the capacity of the central bank to print money which the public is willing to hold and limits its role as a lender of last resort (Capannelli and Menon 2010). The extent of dollarization, defined as the ratio of total foreign currency deposits to total deposits, peaked at 84% in 1999. In the last decade, the Lao PDR has made significant improvement in macroeconomic stability and in de-dollarization of the economy. The government has taken measures to promote the kip’s usage and restoring public confidence in the domestic currency. Thus, inflation rate has declined substantially from its peak of 128% in 1999 to around 5% during 2005–2012 (IMF 2016). With the rise in public confidence in the kip, the dollarization rate has decreased to a certain degree but remained about 52% by 2016 (Figure 1.7).

² Dollarization can be defined as the holding by residents of a significant share of their assets in foreign currency-denominated instruments. Hence, dollarization represents a situation in which a foreign currency is used alongside the domestic currency as a means of exchange or as a means of savings in hard currency.

Figure 1.7: Degree of Dollarization in the Lao PDR, 1996–2016

FCD = foreign currency deposit.

Note: Dollarization is captured in the ratio of total foreign currency deposits to total deposits.

Source: Bank of the Lao PDR. Annual Report. various issues. <http://www.bol.gov.la/english/annualreports1.html> (accessed August 2017).

With a highly dollarized economy the central bank lost the flexibility to control interest rates, making its interest rate policy ineffective as a monetary instrument. The central bank lacked the tools to enforce the monetary and exchange rate policy, and found it hard to manipulate the exchange rate adjustments in response to external shocks. Consequently, increased capital inflows continued to exert pressure on the domestic currency to appreciate, making it difficult to implement exchange rate policies. Moreover, the higher proportion of foreign currencies in the domestic economy combined with lending directed to SOEs further undermined the proper and effective use of monetary policy. The heavy presence of the state, particularly in the banking sector, implies low interest loans to SOEs that led to a widening budgetary deficit and a rise in the number of nonperforming loans. The latest estimates indicate that nonperforming loans in the public banks have risen from 2% to 8% (IMF 2016). The rise in nonperforming loans limits the monetary policy's effectiveness. Although over time the size of the banking sector has improved, its regulatory framework remains weak and state-owned commercial banks are mostly undercapitalized (Table 1.2).

In 1991, there were a total of only 7 banks in the Lao PDR, but by 2016, the number of banks rose to 42. Meanwhile, the number of foreign banks

Table 1.2: Banks in the Lao PDR, 1991–2016

	1991	1996	2007	2010	2015	2016
State-owned commercial banks	7	8	4	3	3	3
Specialized banks				1	1	1
Joint venture banks		2	2	2	3	3
Private banks			2	5	7	7
Affiliated banks				3		
Subsidiary bank					9	9
Foreign branches		7	6	11	18	19
Representative Office			1	1		
Total number of banks	7	17	15	26	41	42

Note: Data are end of year.

Source: Bank of the Lao PDR.

increased from 7 in 1996 to 19 in 2016, and that of private banks from 2 in 2007 to 7 in 2012. Despite these improvements, state-owned banks (including specialized banks) still constitute about 55.6% of all assets, 64.3% of all deposits, and 64.6% of all loans during 2012. However, the regulatory and supervisory capacity of state-owned banks remained weak and, if not resolved, may threaten fiscal solvency (World Bank 2017a).

1.4 External Sector Performance

The external sector has made some progress but remain vulnerable to external demand shocks. Exports responded positively to reforms and the opening of the economy and thus increased significantly from \$43 million in 1984 to \$2.7 billion by 2015. In percentage to GDP, exports rose from merely 2.4% during 1984 to as high as 22.4% by 2015 (Figure 1.8).

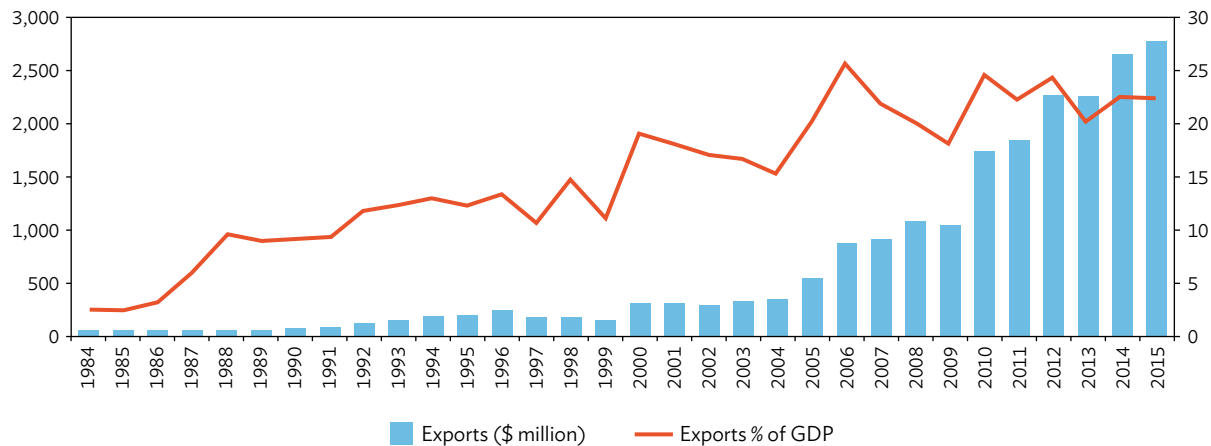
Although total exports between 1984 and 2015 increased at an annual average of 7.4% per annum, the composition of exports did not change much and remains concentrated on resource-based products. Similarly, the Lao PDR’s top trading partners have not changed significantly over time. The top export destinations during 2015 were Thailand, the People’s Republic of China, and Viet Nam, which collectively captured about 75% of the Lao PDR’s total exports. Thailand’s share in the Lao PDR’s total exports in 2015 stood at 31%, followed by the People’s Republic of China at 27%, and Viet Nam at 17.6%, implying that demand for the Lao PDR’s exports depends largely on the prospectus and economic development of these three economies. Lack of export diversification and

dependency on few markets has made the country vulnerable to external demand shocks.

Higher economic growth and the growing consumption demand led to imports rising from \$647 million in 1997 to \$5.2 billion by 2015, surging current account deficit from 9.5% of GDP in 1997 to 18.4% of GDP in 2015. Gross international reserves remained low and averaged around 2.2 months of imports during 2015, not adequate to maintain macroeconomic stability and offering little hope to mitigate the external demand shocks. On the other hand, public and publicly guaranteed debt stock increased from \$2.2 billion in 1997 to \$6.7 billion in 2015 (Table 1.3).

Since about 80% of public and publicly guaranteed debt is denominated in foreign currency, a depreciation of the exchange rate can adversely affect the government’s balance sheet. The rise in public debt also carries negative implications for fiscal space. Therefore, the government needs to watch the trend in external debt closely and take steps to strengthen its debt management capacity as otherwise additional external borrowing and a further rise in debt will potentially jeopardize debt sustainability.

Figure 1.8: Trends in Exports, 1984–2015



GDP = gross domestic product.

Source: World Bank. World Development Indicators. <http://data.worldbank.org/data-catalog/world-development-indicators> (accessed August 2017).

Table 1.3: Performance of the External Sector, 1997–2015 (\$ million)

	1997	2000	2005	2010	2015
Exports (fob)	312.7	330.3	553.1	1,746.4	2,769.0
Imports (cif)	647.9	535.3	882.0	2,060.4	5,232.8
Trade balance	(335.3)	(205.0)	(328.9)	(314.0)	(2,463.8)
(% of GDP)	(18.3)	(12.5)	(12.1)	(4.7)	(20.0)
Current account balance	(174.1)	(5.3)	(192.5)	29.3	(2,264.5)
(% of GDP)	(9.5)	(0.3)	(7.1)	0.4	(18.4)
External PPG debt ^a	2,259.8	2,474.1	2,353.8	3,770.8	6,656.6
(% of GDP)	123.3	151.1	86.6	55.9	54.0
Exchange rate (kip per \$)	1260	7888	10655	8259	8148
Gross international reserves ^b	112.8	139.6	239.4	713.3	1,057.6
(in months of imports)	1.9	2.9	3.1	3.7	2.2

(-) = negative; cif = cost, insurance, and freight; fob = free on board; GDP = gross domestic product; PPG = public and publicly guaranteed.

^a External PPG, long-term debt.

^b Total reserves including gold based on national valuation.

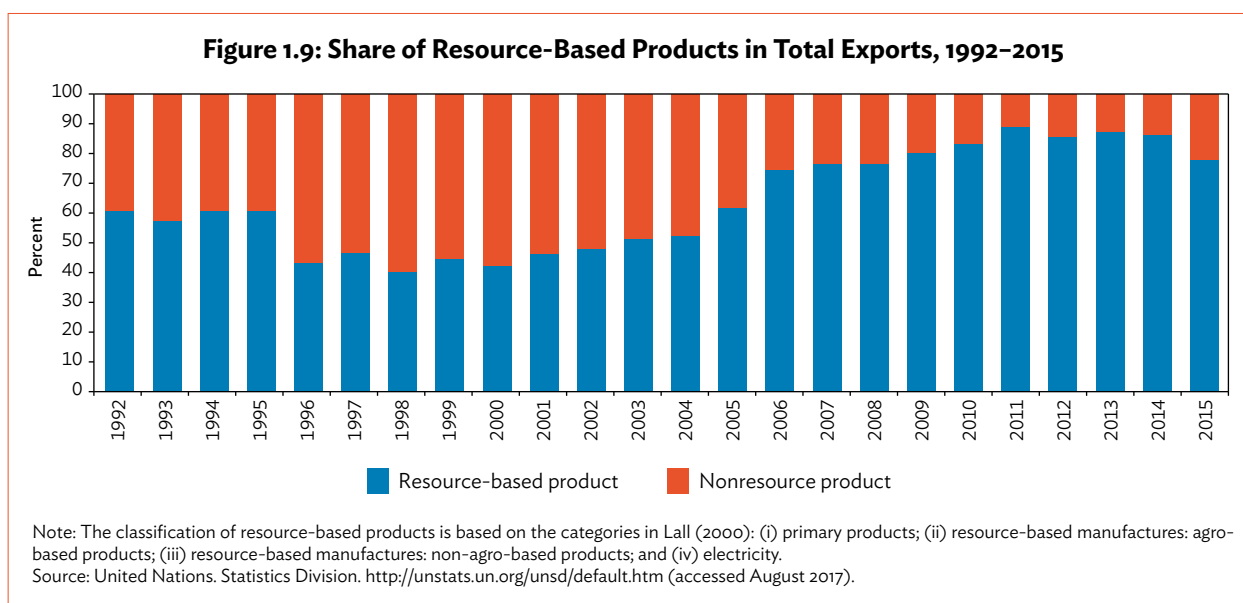
Sources: For external PPG debt: World Bank. International Debt Statistics (accessed January 2017); and for all others: ADB. *Key Indicators for Asia and the Pacific* 2016. Manila.

1.5 Dutch Disease and the Lao PDR Economy

The continuing reliance on resource-based products and increasing volumes of capital investment inflows created Dutch disease type impacts for the rest of the economy. To achieve the national development goal of graduating from the group of LDCs by 2020, the government actively followed development strategy, which relied on the export receipts of resource-based products and FDI inflows. The share of resource-based exports in total

exports increased from 60.9% in 1992 to as high as 78.2% by 2015 (Figure 1.9).

Similarly, with a view to overcome its poor infrastructure and inadequate human capital stock, the Lao PDR also promoted FDI inflows to domestic economy, which became another important source of finance. However, continuing reliance on resource-based products, to some extent, also created Dutch disease type of impacts. For example, the manufacturing sector could not be developed and the growth of tradable sectors slowed down while exports



remained less diversified and comprising only low value-added products.

Both FDI inflows and the export receipts of natural resource revenues played a vital role in sustaining higher economic growth. Resource revenues have become an important source of financing for the government. But given the fact that the bulk of resource

revenues are concentrated in a few sectors, a resource boom and higher FDI inflows into these sectors will lead a surge in government revenues, as well as have negative impacts for the rest of the economy. These negative effects occur when huge capital inflows lead to appreciation of the real exchange rate, which erodes the competitiveness of tradable goods (Box 1.1).

Box 1.1: Natural Resource Boom and Dutch Disease

The term Dutch disease refers to the phenomena of changes in the production structure of an economy that happen against the backdrop of a booming resource sector. For example, the discovery of a large natural resource or an increase in the international price of an exportable commodity brings with it huge inflows of foreign exchange. Such inflows exert pressure and result in appreciating the local currency in real terms thereby eroding the competitiveness of the tradable sector. The changes in the production structure may also include contraction or stagnation of other tradable sectors such as agriculture and manufacturing in particular. In studying the Dutch disease phenomena, researchers normally analyze the economy by dividing it into three distinct sectors: natural resources sector, the tradable sector that includes both agriculture and manufacturing, and the nontradable sector that consists of nontradable services and construction. In this context, while the price of the nontradable sector is determined in the domestic economy, the prices of both the resource-based sector and the tradable sector are determined in the world market.

In the context of a booming natural resources sector, the symptoms of Dutch disease can be traced by examining the “spending effect” and the “resource movement effect.” The spending effect results in appreciating the real exchange rate and decline in the profitability of the tradable sector. As a result of a booming natural resources sector, the resulting increase in domestic income would lead to increased spending by the public and the private sector. This would increase the demand for nontradable products and a rise in the price of nontradable sector relative to the tradable sector. The real exchange rate can then be defined as the ratio of the prices of nontradable to tradable. Since the prices of the tradable sector in the domestic economy are fixed and are determined in the international market, the rise in prices level and wages squeezes the profit margin of the tradable sector, particularly the manufacturing sector.

Resource movement effect, on the other hand, is attributed to the fact that a boom in the natural resources sector also attracts capital and labor from other sectors, which reduces the output in the rest of the economy. More importantly, the reduction in the output of the nontradable sector results in increasing the prices of the nontradable relative to the tradable, thereby appreciating the real exchange rate. While real exchange rate appreciation may also be attributed in part to changes in underlying equilibrium, a substantial exchange rate overvaluation carries negative implications for overall economic growth.

Another aspect of the Dutch disease relates to a high concentration of export products largely consisting of natural resources products. The prices of the resource-based products are generally more volatile than the nonresource tradable products. When government revenues rely on resource revenues, government spending would also become more volatile. This may in turn, through the spending effect, carry implications for high volatility in the real exchange rate. The volatility in the real exchange rate may also have an impact on investment and ultimately gross domestic product growth.

While the natural resources boom has positive impact on growth, in the long run it may have negative consequences as well. For example, when the government’s institutional capacity to manage these resource revenues is weak, the rise in resource boom may even induce deterioration in governance, for example, by stimulating corruption and control and redistribution of revenues. Research also shows that in countries that tend to rely on the natural resources boom, excessive spending by government may also lead to a shift from productive activities to unproductive and rent-seeking activities. Higher natural resource prices quite often also lead the government to use their resources as collateral to borrow from abroad to finance large investment projects and high public consumption. However, once prices of the resource-based products are reduced, the country that depends on resource revenues becomes vulnerable with balance of payments difficulties and high and unsustainable external debts.

Source: M. Brahmhatt, O. Canuto, and E. Vostroknutova. 2010. Dealing with Dutch Disease. Economic Premise. No. 16. Washington, DC: World Bank.

To sustain the higher GDP growth trajectory, the government has prioritized the electricity, agro-forestry, tourism, mining, and construction sectors. As mentioned, special economic zones were created to attract FDI into these sectors and considerable attention paid to promoting infrastructure development. Both FDI inflows and export revenues from hydroelectricity and mining contributed significantly to GDP growth. However, the continued reliance on resource-based exports, FDI, and concessionary aid inflows has created Dutch disease-type impacts for the manufacturing sector. More importantly, resource-based industry has weak and insignificant productive linkages with the rest of the economy and its contribution toward job creation limited. In addition, the large inflows of capital resulted in the appreciation of the real effective exchange rate, carrying negative implications for developing a competitive manufacturing and tradable sector (Figure 1.10).

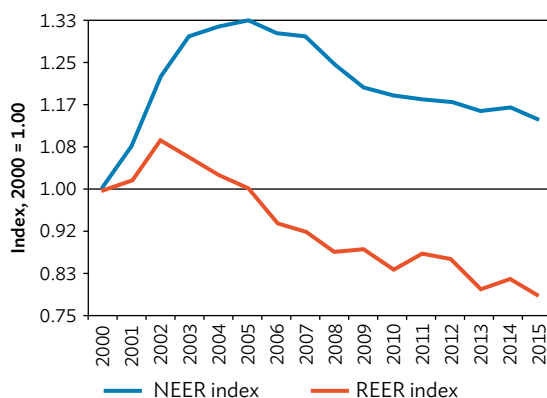
The Lao PDR has received quite significant inflows of foreign exchange from FDI, official development assistance, and from the export receipts of resource-

based products. Official development assistance has increased from \$281 million in 2000 to \$471 million by 2015 while export receipts from resource-based products³ surged from \$151 million in 2000 to \$3.2 billion by 2015. FDI inflows have also surged from \$33.9 million in 2000 to \$1,219.8 million by 2015. These inflows have helped sustain significantly higher GDP growth in the past decade. However, this has also resulted in appreciating the real effective exchange rate, which has partly been responsible for eroding export competitiveness. The empirical evidence suggests that while the nominal effective exchange rate (NEER) in 2000–2015 depreciated by about 11.9%, real effective exchange rate (REER) at the same time in fact appreciated by 26.5%.⁴ Because the government has also made efforts to improve macroeconomic stability, such as de-dollarization of the economy, the appreciation in the REER may partly be attributed to the boom in the natural resources sector and partly to government's efforts to stabilize the exchange rate.

The symptom of the Dutch disease could be traced by examining the changing production structure in the context of booming resource sector. An examination of the REER index indicates that while the REER appreciated between 2000 and 2015 with the rise in household consumption, demand for nontradable goods and services rose rapidly, widening the gap between tradable and nontradable production. The empirical evidence suggests that the ratio of nontradable to tradable sector has increased from 1.0 in 2000 to 1.84 by 2014 (Figure 1.11), which may be explained by the spending effect (see Box 1.1 for details) of the Dutch disease.

Empirical evidence suggests that countries rich in resources find it more difficult to diversify and to advance up to high value-added exports (Bahar and Santos 2016). The Lao PDR has pursued various reforms to attract FDI to industrialize the economy. In the context of large volumes of FDI inflows to resource sectors, the strengthening of the kip has eroded the competitiveness of the tradable sector resulting in a

Figure 1.10: Changes in Real Effective Exchange Rate, 2000–2015



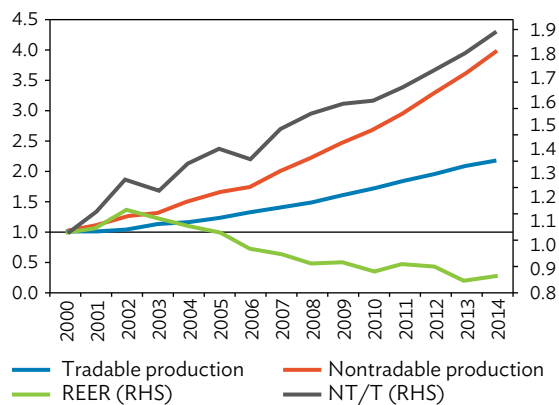
NEER = nominal effective exchange rate, REER = real effective exchange rate.

Source: Computations based on World Bank. World Development Indicators. <http://data.worldbank.org/data-catalog/world-development-indicators> (accessed August 2017).

³ The classification of resource-based products is based on the categories in Lall (2000): (i) primary products; (ii) resource-based manufactures: agro-based products; (iii) resource-based manufactures: others non-agro-based products; and (iv) electricity.

⁴ REER is the weighted average of the nominal exchange rate of the Lao PDR vis-à-vis the currencies of its major trading partners, adjusted for the change in prices in the domestic economy with respect to prices in its trading partners weighted by trade shares. The combined share of these trading partners in the Lao PDR's exports during 2015 was about 82%. An upward trend in the REER indicates depreciation of the domestic currency against the basket of currencies of the Lao PDR's major trading partners in the real term.

Figure 1.11: Tradable and Nontradable Production, 2000–2015



NT/T = Nontradable to tradable ratio, REER = real effective exchange rate, RHS = right-hand side.

Note: Tradable production = value added in agriculture, mining, manufacturing, and electricity sectors; nontradable production = value added in construction and in services sectors.

Sources: Computations based on ADB. *Key Indicators for Asia and the Pacific 2016*. <https://www.adb.org/publications/series/key-indicators-for-asia-and-the-pacific> and World Bank. World Development Indicators. <http://data.worldbank.org/data-catalog/world-development-indicators> (accessed August 2017).

highly concentrated exports and manufacturing sector. Empirical analysis also corroborates it as the share of nonresource-based exports has declined from 57.3% in 2000 to 21.8% in 2015; while the share of resource-based exports has risen sharply from 42.7% in 2000 to as high as 78.2% by 2015. However, while the booming resource sector has contributed significantly to higher economic growth, its contribution to employment generation has remained minimal. This shows that despite higher economic growth, the Lao PDR has not yet experienced rapid and intense structural transformation in which resources have moved from low-productivity to higher-productivity sectors. Without decent job opportunities in the modern, high-productivity sectors, agriculture is the only sector that can absorb the bulk of the labor force; however, labor productivity in agriculture is quite low.

From this analysis, it can be inferred that the resource boom and the resulting appreciation of the real exchange rate might partly be attributed to the Dutch disease phenomena. Similarly, the analysis also reveals that the share of nontradable production relative to tradable has increased significantly and movement of labor from low-productivity to high-productivity sectors has been negligible. Collectively,

these could be considered symptoms of Dutch disease. It is important to note that while the Lao PDR economy has experienced the Dutch disease and loss in competitiveness, it may only partly be attributed to the appreciation of the real exchange rate. Low competitiveness in manufacturing and in tradable sectors is mainly due to the fundamental problem of a poor business environment such as the inadequate infrastructure, long approval procedures, nonavailability of skilled labor, and uncertainty in the continuity of policies. Likewise, the competitiveness of the export sector is hampered by high transport costs and delays in the transport of goods. For example, it takes 23 days to comply with all the procedures required to export and 26 days to import. The cost to export and import a container in 2014 has been estimated to be \$1,910 and \$1,950, respectively. For broad-based and more inclusive growth, the government needs to concentrate on improving its institutional and governance capacity while managing resource sector revenues. This would require managing the sustainable use of natural resources and ensuring that the wealth emanating from these resources translates into sustainable and inclusive growth in the long run. To maximize the positive impacts of the natural resources projects, the government should adopt a comprehensive strategy for hydropower and mining development. This can lessen the negative effects of resource extraction (World Bank 2010).

1.6 Economic Growth and Structural Transformation

The Lao PDR has been unsuccessful in shifting labor from agriculture to the industry and services sectors. There is no doubt that the Lao PDR has succeeded in generating high economic growth; however, an increase in job opportunities in high value-added sectors has not accompanied that growth. More importantly, despite the country's strong economic performance, its private investment and productive capacity remain low. Consequently, the Lao PDR has not achieved the needed structural transformation to move resources from lower to higher productivity sectors. This study posits that for the Lao PDR to sustain high and inclusive growth in the long run, it needs to enhance the structural transformation of the economy.

An examination of successful economies in Asia suggests that structural transformation has three main characteristics. First, resources have moved from primary sectors to industry. Second, their outputs shifted from low-productivity goods to high-value-added goods, particularly manufacturing. Third, as their export baskets diversified, they comprised increasingly more sophisticated products. The Lao PDR has yet to experience such a structural change in the composition of output and employment. As of 2015, agriculture accounted for 65.2% of employment while industry's share was 11.4%, and services at 23.4%. In 2001, the employment share of agriculture was 82.7%, industry at 8.7%, and services at 8.6%. Between 2001 and 2015 while the employment share of services has increased, it remains characterized by low-skilled and low-productivity jobs. This suggests that the Lao PDR has not yet experienced the structural transformation characterized in the successful economies in Asia. In fact, despite high economic growth, it has remained unable to create nonfarm jobs (Table 1.4).

The current trajectory of high economic growth has mainly been driven by resource-based sectors while the manufacturing sector has not generated many well-paid jobs, leaving the economy with a highly concentrated production and export structure

comprising mostly low value-added products. Although industry and services have become the major drivers of growth, their contribution to job creation remains limited. Furthermore, because domestic private investment has remained low and the productive capacity of the economy has not expanded, majority of the workers remain in low-productivity jobs. These structural weaknesses make rapid structural transformation challenging and threaten the sustainability of high and inclusive growth. Yet, experience around the world has shown that industry and manufacturing play crucial roles in the process of a nation's structural transformation.

The Lao PDR's inability to move from resource-based exports to more high value-added products has impeded the process of structural transformation and is a major constraint to inclusive growth. Economies that have succeeded in structural transformation, as already mentioned, have done so after having started to produce and export more diversified and high value-added products. Structural change therefore appears to be reflected in the mix of products a country produces and exports. Empirical research links production complexity to economic development and suggests that rich countries make various high value-added⁵ products, while poor countries generally

Table 1.4: Composition of Output and Employment, Selected Countries

	Lao PDR		PRC			Korea, Republic of			Malaysia			Thailand		
	1990	2015	1980	1990	2016	1980	1990	2016	1980	1990	2016	1980	1990	2016
Output Structure (% of GDP)														
Agriculture	61.2	19.5	29.9	26.7	8.6	15.1	8.2	2.2	23.0	15.2	8.6	23.2	12.5	8.3
Industry	14.5	32.5	47.9	40.9	39.8	34.2	38.2	38.6	41.8	42.2	35.7	28.7	37.2	35.8
(Manufacturing)	10.0	8.8	40.2	32.5	29.7	22.8	25.0	29.3	21.9	24.2	20.1	21.5	27.2	27.4
Services	24.3	48.0	22.2	32.4	51.6	50.7	53.6	59.2	35.2	42.6	55.7	48.1	50.3	55.8
Employment Structure (% of total employment)														
Agriculture	82.7	65.2	68.7	60.1	28.3	34.0	17.9	5.2	37.2	26.0	12.5	70.8	63.3	32.3
Industry	8.7	11.4	18.2	21.4	29.3	29.0	35.4	25.1	24.1	27.5	27.5	10.3	13.6	23.7
(Manufacturing)	...	7.0	13.9	13.5	23.3	21.6	27.2	17.3	16.1	19.9	16.5	7.9	10.2	17.0
Services	8.6	23.4	13.1	18.5	42.4	37.0	46.7	69.7	38.7	46.5	60.0	18.9	23.0	44.0

... = data not available, GDP = gross domestic product, Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.

Note: Output structure is defined as the sectoral shares in total gross value added. Employment structure is the sectoral employment shares in total employment. Employment data for the Lao PDR are for 2001 and 2015, the data for 2015 are based on the eighth Five-Year NSEDP (2016-2020). The latest manufacturing employment data for the Lao PDR are for 2013 and are based on the World Bank's Lao PDR Economic Monitor FY15-16. While the employment data for all other countries are for the year 2015. Similarly, the manufacturing share in GDP reflected under 2016 for the PRC is for the year 2013.

Sources: World Bank. World Development Indicators. <http://data.worldbank.org/data-catalog/world-development-indicators> (accessed August 2017); World Bank 2016. Lao Economic Monitor FY15-16. Vientiane; Ministry of Planning and Investment. 2016. *8th Five-Year National Socio-Economic Development Plan (2016-2020)*. Vientiane; China Statistics Press. China Statistical Yearbook 2016. <http://www.stats.gov.cn/tjsj/ndsj/2016/indexeh.htm> (accessed August 2017); and ADB. *Key Indicators for Asia and the Pacific 2016*. Manila.

⁵ Value added is the amount by which the value of goods or services are increased by each stage in its production. It is the difference between the value of all the inputs (raw materials, purchased services) and the price at which the product is sold.

make fewer and rudimentary products (Hausmann et al. 2011). Structural transformation is quicker in economies that have successfully diversified exports toward high value-added products (Hausmann and Klinger 2010).

The government needs to overcome significant challenges to accelerate structural transformation and make growth more inclusive in the medium to long run. The major challenge would be to raise the low level of domestic private investment, which is key to diversify and upgrade production and provide decent job opportunities in modern sectors of the economy. To achieve this, the Lao PDR will need to address the constraints and provide a business-enabling environment that will help upgrade the low level of domestic private investment. While resource-based sectors will continue to play an important role in the economy, the government should place more emphasis in improving the business environment and facilitating private investment to provide jobs over the long term particularly in the high value-added manufacturing and services sectors.

1.7 Economic Growth and Inclusiveness

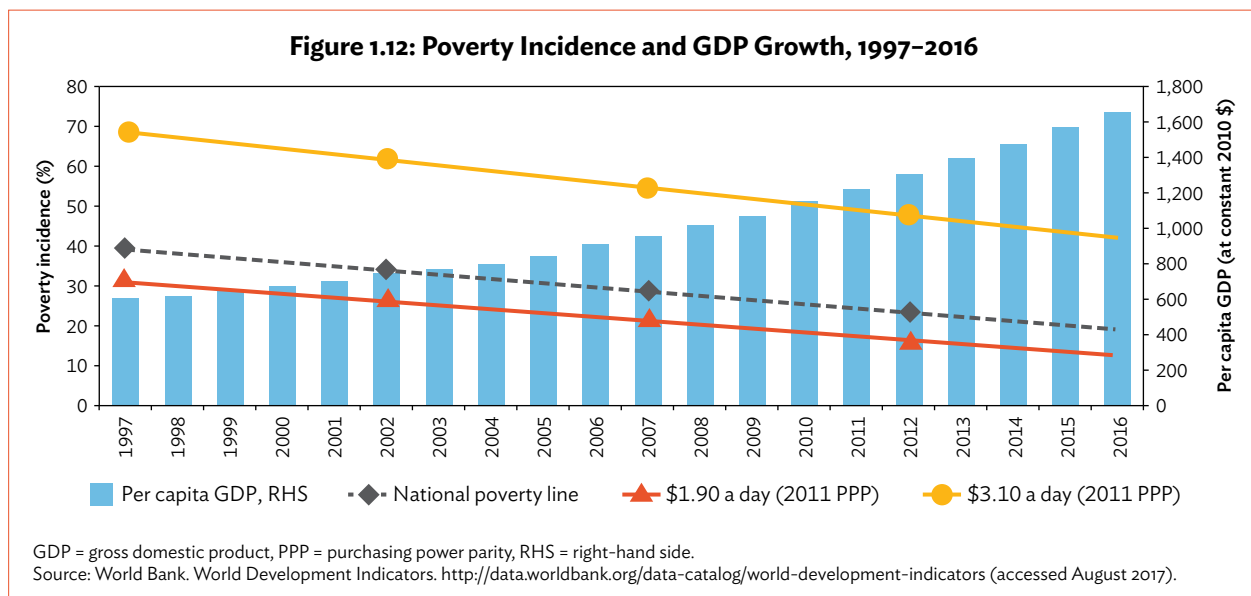
While the Lao PDR has achieved robust growth, this growth has not been inclusive. Inclusiveness covers not only geographic and regional differences

but also disparities in poverty, gender, age, education, and income. Inclusive growth implies growth with equal opportunities and focuses on creating job opportunities and making these opportunities accessible to all. Growth is inclusive when it allows all members of a society to participate in, and contribute to, the growth process on an equal footing regardless of their individual circumstances (Ali and Zhuang 2007). The following sections look at various dimensions of inclusiveness and compare these with the progress made by the Lao PDR.

1.7.1 Poverty and Inequality

With the rise in per capita income, poverty incidence has declined but inequality has increased. The poverty incidence measured at the national poverty line dropped by 15.9 percentage points from 39.1% in 1997 to 23.2% during 2012. Based on the World Bank’s \$1.90 a day (2011 purchasing power parity [PPP]) poverty line, a similar trend in poverty reduction is seen, with poverty incidence falling from 30.7% in 1997 to 16.7% in 2012. However, if the poverty threshold of \$3.10 a day (2011 PPP) is used, poverty incidence remains high at 46.9% in 2012 even though poverty has declined (Figure 1.12).

Despite rapid reduction in poverty, income inequality has widened. Declining poverty incidence masks the persistent and widening underlying geographic



and ethnic disparities. While urban areas near the Thailand border have lower poverty, the incidence is much higher in the northern part of the country. For example, the poverty incidence in northern Bokeo in 2013 was 44.4%, in Houaphanh 39.2%, in southern Sekong 42.7%, and in Saravane 49.8%. Overall poverty incidence has declined between 2003 and 2008 in all the provinces, however, the pace of reduction is uneven and there are certain exceptions to the overall trends. For example, while the poverty incidence in Phongsaly province has declined from 50.8% in 2003 to 12.3% in 2013, it has sharply increased in Bokeo from 21.1% in 2003 to 44.4% in 2013 (Figure 1.13). The estimated Gini coefficient of expenditure inequality in Phongsaly has increased from 0.22 in 2003 to 0.27 in 2013. In Bokeo, while the Gini coefficient has remained at 0.29 poverty incidence has increased. On the other hand, poverty incidence in Vientiane Municipality was only 5.9%. This again points to the lack of employment opportunities for majority of the people except for those living in Vientiane. The benefits of growth and poverty reduction are not evenly distributed.

Poverty incidence also varies significantly across the ethnic lines and it is more pronounced in the northern, central, and southern regions where majority of the ethnic minorities reside. Poverty incidence in these areas is more than 40% compared with less than 20%

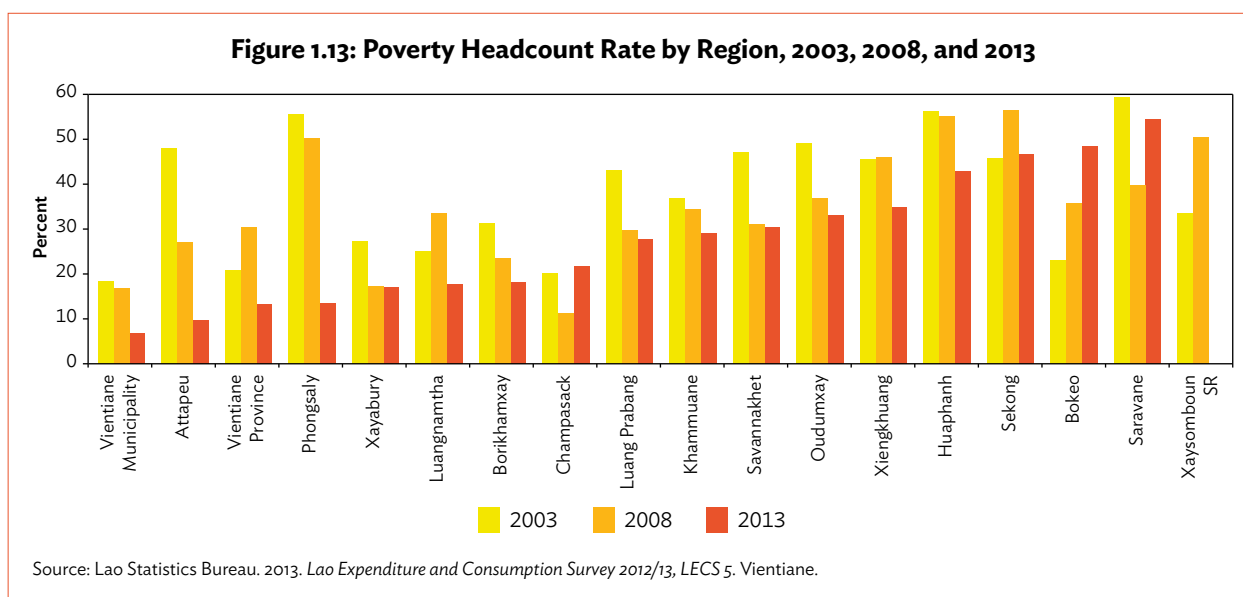
among the Lao Tai majority who live in the rural areas of the country. The results of the Lao expenditure and consumption surveys indicate that over the 20-year period, between 1992–1993 and 2012–2013, inequality has increased. The Gini coefficient, at the national level rose from 0.31 to 0.37.⁶ Inequality also increased in all the regions and within rural and urban areas (Table 1.5). The rising inequality alongside poverty reduction implies that the rich have benefited more both in absolute and proportionate terms.

The problem of high poverty in remote, backward, rural, and ethnic minority areas has negative

Table 1.5: Gini Coefficient by Region and Rural-Urban Location, 1992–2013

	1992–1993	1997–1998	2002–2003	2007–2008	2012–2013
Vientiane	0.30	0.37	0.36	0.38	0.38
North	0.27	0.35	0.31	0.35	0.32
Center	0.32	0.33	0.31	0.34	0.34
South	0.32	0.32	0.31	0.32	0.37
Rural	0.29	0.32	0.31	0.33	0.33
Urban	0.31	0.38	0.35	0.36	0.38
National	0.31	0.35	0.33	0.36	0.37

Source: P. Warr, S. Rasphone, and J. Menon. 2015. Two Decades of Rising Inequality and Declining Poverty in the Lao PDR. *ADB Economics Working Paper Series*, No. 461. Manila: ADB.



⁶ The Gini coefficient varies from 0 to 1, higher values indicating greater inequality.

implications for hunger and malnutrition. According to a household survey conducted in 2010, the incidence of child malnutrition is much higher in upland and rural areas and especially among non-Lao-Tai ethnic groups. Infectious diseases, poor water sanitation, food insecurity, and poor maternal health also contribute to the stunting of young children. There is growing concern about the proportion of children under five who suffer from stunting (height-for-age) at 44% and wasting (weight-for-height), while 27% are underweight (weight-for-age). In the upland areas where mothers lack education, child stunting is as high as 60%.

The Global Hunger Index in 2014 shows that more than one-fifth of the population consumes less than the minimum dietary requirements and the Lao PDR has failed to achieve the Millennium Development Goal of reducing underweight and stunted children. In the country's latest progress report, the trends suggest that while it would be able to meet its target of reducing under-five mortality to 70 per 1,000 by 2015, much more effort is needed to achieve the international targets of reducing under-five mortality and infant mortality to one-third of the 1990 level. This would require the Lao PDR to reduce under-five mortality to 57 per 1,000 and infant mortality to 38 per 1,000 by 2015 (Lao PDR and UN 2015).

The Lao PDR has made some progress in treating tuberculosis (TB) and HIV cases—between 2010 and 2012, the number of people receiving treatment for both TB and HIV increased from 49.2% to 55.9% (Ministry of Health 2014). However, the TB prevalence rate is still high. The first National TB Prevalence Survey 2010–2011 found that the prevalence rate is 130 per 100,000, with the greatest burden in the older population (Ministry of Health, Department of Hygiene & Prevention 2012). Also, the Lao PDR is having difficulty dealing with the rise in noncommunicable diseases,⁷ which accounted for 40.1% of total deaths in 2010 and rose to 48.1% in 2012 (World Bank, World Development Indicators).

⁷ Noncommunicable diseases include cancer, diabetes mellitus, cardiovascular diseases, digestive diseases, skin diseases, musculoskeletal diseases, and congenital anomalies.

1.7.2 Gender Inequality

The Lao PDR has made progress in bridging the gender gap. Although women's status especially in urban areas has improved, gender imbalances persist across geographic areas and among ethnic groups. Gender parity especially in the enrollment rates at the primary level may have improved, but disparities persist in achieving higher education levels, making it increasingly difficult for girls to complete secondary school (Lao PDR and UN 2015). More importantly, women still lag behind men in educational attainment and literacy. Only about 61.6% of employed women have completed primary while 51.1% completed below primary education. The share of women in the employed labor force with secondary education amounts to 42.9%, technical training 39.3%, and college/university level education only 35.6%. Since men are better educated, they get the higher-paying jobs while women are generally absorbed in lower-paying jobs with the bulk of them employed in the informal sector (LSB 2010).

Access to health service facilities is limited for men and women, varying widely between rural and urban areas. Generally, health facilities in urban areas are better than those in the rural areas. However, women have problems accessing health care facilities because they are heavily involved in domestic work, thus limiting their mobility. According to the household survey conducted in 2010, 45% of women reported “getting money for treatment,” which was a major constraint to having access to medical treatment, while 13% reported that language and communication were major obstacles in accessing health care facilities (World Bank 2012). Lack of trained health workers is another concern. During 2011–2012, while trained health workers assisted 42% of births, facility-based delivery rate was only 38%. Women belonging to the poorest quintile are among the most deprived with only 11% of their births assisted by trained health personnel.

Gender disparity is also visible in malnutrition with males affected the most—35% of males and 27% of females are underweight while 40% of males and 27% of females appear to suffer from stunting. Overall, the maternal mortality ratio declined from 410 (per 100,000 live births) to 360 (per 100,000 live births) from 2005 to 2012. Despite the progress, it still falls short in achieving the 2015 Millennium Development Goal target of a maternal mortality ratio of 300 (per 100,000 live births). Women in urban areas are more privileged with regard to antenatal care. By 2005, about 84% of pregnant women in the urban areas had antenatal coverage. Meanwhile, access to roads is essential to women needing antenatal care—only 29% of women in rural areas with road access have antenatal coverage, while antenatal coverage drops to 9% in rural areas where there are no roads.

The 2005 Lao PDR Population Census suggests that there is no significant difference in the labor force participation rate between men and women, which stands at 81% and 79.5%, respectively. However, unpaid work is much more common among women than men—64% of women work as unpaid family workers compared with 27% of men. Although the proportion of women in wage employment increased from 38% in 1995 to 44% in 2005, the wage gap has widened between males and females. Female workers on average earn lower salaries and other kinds of remuneration than male workers. The average monthly wage of female workers in 2006 was about two-thirds that of their male counterparts (World Bank 2012). Gender disparity is much higher in management and administrative positions than in technical positions. Gender discrimination also exists in job security, type of work, and working conditions, posing a big challenge in achieving inclusive and sustainable growth. In general, even after controlling for education, household composition, and other factors both in urban and rural areas, female-headed households are poorer than male-headed households.

⁸ Productive knowledge or know-how refers to the knowledge that goes into the making products. Countries accumulate productive knowledge by developing the capability to make a larger variety of products of increasing complexity.

1.8 Major Challenges to Inclusive Growth

To achieve sustained and inclusive growth, the Lao PDR will have to find ways to upgrade its production structure toward high value-added products. As discussed above, the product mix a country produces and exports provides an important clue about its capabilities and productive knowledge,⁸ the know-how workers and organizations acquire over time and use in the production process. The research work suggests that improvement in a country's productive knowledge can be measured through the export mix a country produces (Hausmann et al. 2011). This discussion corroborates that the productive structure does matter for inclusive growth and structural transformation. The Lao PDR, on the other hand, has a highly concentrated export basket and it has not succeeded in expanding its productive capacity, which is necessary to produce diversified and high value-added products. Major challenges to accelerate structural transformation and to have inclusive growth in the medium to long run, can be consolidated into four key issues: (i) low productive capacity with highly concentrated production and export structure, (ii) weak governance and inefficient public management, (iii) low level of human capital and quality of education, and (iv) inadequate and poor infrastructure. By overcoming these challenges, the government can help accelerate structural transformation and in doing so, generate decent job opportunities outside agriculture and reduce income and social inequality.

The following section discusses each of these challenges and the implications for sustained and inclusive growth in the long run.

(i) Low productive capacity with highly concentrated production and export structure

The Lao PDR’s export basket has remained concentrated of low value-added products while private investment has not been expanded potentially limiting the scope for expansion in the productive capacity of the economy. Empirical evidence suggests that what a country exports matters for its future economic growth. It also shows that a country’s development path is determined by its capacity to accumulate the capabilities required to produce varied and high value-added products (Hausmann, Hwang, and Rodrik 2007). However, the fact that the Lao PDR despite higher economic growth has not succeeded in diversifying and upgrading its export basket carries negative implications in achieving sustained and inclusive growth in the years to come. Its inability to transfer labor from low-productivity to higher-productivity sectors has impeded the process of structural transformation. The Lao PDR’s exports are highly concentrated on low value-added products, the resource exports have dominated the country’s exports in 1990 and 2015 (Figure 1.14).

This discussion suggests that lack of industrial upgrading and diversification has left the country with highly concentrated exports, thus preventing the Lao PDR from transferring resources from low to high value-added products. This appears to be a major challenge toward achieving sustainable and inclusive growth in the long run.

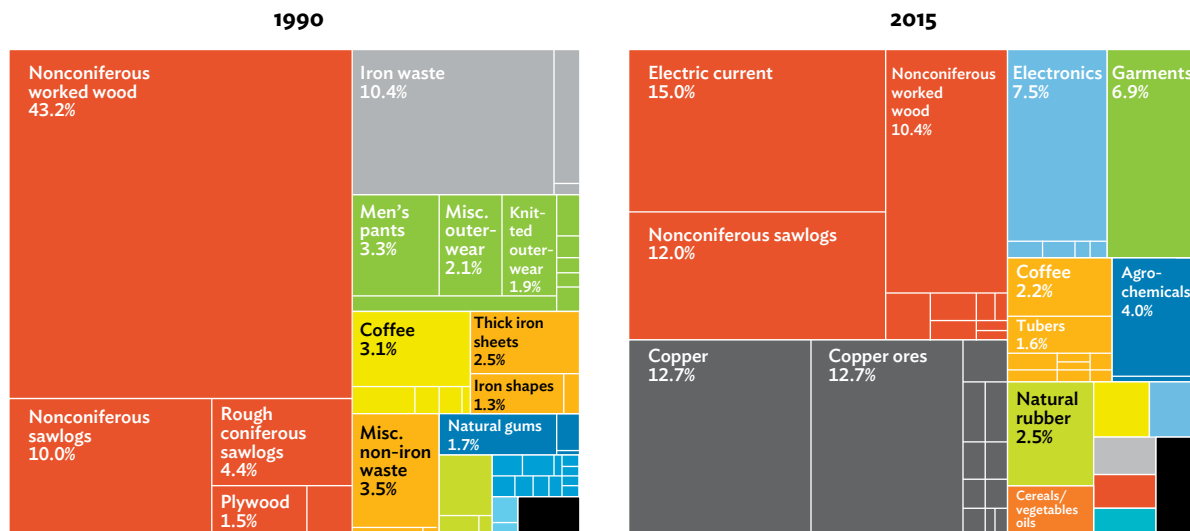
(ii) Weak governance and inefficient public management

The Lao PDR has shown some improvement in the quality of services delivery; however, more effort is needed to enhance the coverage and quality of public service delivery. With respect to the general category of providing property rights to citizens, the Lao PDR ranks 112th out of 138 countries, whereas in improving transparency toward government policy making, it ranks 95th (World Economic Forum 2016a). Poor public management is also reflected in the time it takes to start a business in the country. According to World Bank (2017a), starting a business requires eight procedures, which takes 67 days and costs 4.6% of income per capita.

The Lao PDR, alongside Cambodia and Myanmar, are at the lower end in terms of most governance indicators in the ASEAN region. While its score is rather favorable in terms of political stability and absence of violence/terrorism its score is comparatively weak in terms of voice and accountability, government effectiveness, regulatory quality, rule of law, and control of corruption (Table 1.6).

The poor quality of public service and low coverage of public services such as education and health facilities negatively affect specifically the masses living in rural

Figure 1.14: Composition of Exports, 1990 and 2015



Source: Computations based on United Nations Comtrade Database. <https://comtrade.un.org/>

Table 1.6: Governance Indicators for ASEAN Countries, 2015

Indicators	Voice and Accountability	Political Stability and Absence of Violence/Terrorism	Government Effectiveness	Regulatory Quality	Rule of Law	Control of Corruption
Indonesia	52.2	24.8	46.2	47.1	39.9	38.5
Philippines	51.7	21	57.7	52.9	42.3	41.8
Singapore	42.9	93.3	100	100	96.6	97.1
Malaysia	36.5	54.3	76.9	74.5	71.6	65.9
Brunei Darussalam	26.1	92.4	82.2	76.9	67.3	73.1
Thailand	23.6	15.7	65.9	63.5	53.8	43.8
Cambodia	18.7	43.8	25.5	35.1	17.3	12.5
Myanmar	13.3	10.5	10.1	7.2	7.7	16.8
Viet Nam	10.8	48.6	55.3	33.7	46.2	39.4
Lao PDR	4.4	60.5	36.5	23.6	25.5	19.7

ASEAN = Association of Southeast Asian Nations, Lao PDR = Lao People's Democratic Republic.

Note: High number = high performance.

Source: World Bank. Worldwide Governance Indicators. <http://info.worldbank.org/governance/wgi/#home> (accessed July 2017).

and upland areas where poverty incidence and child malnutrition are high. In other social indicators, those living in lowland and urban areas also lag behind, thus widening inequality and gender disparity. The weak and inefficient public sector management appears to be a critical constraint to inclusive growth.

(iii) Low level of human capital and quality of education

The quality of the existing human capital in the Lao PDR cannot support sustained and inclusive growth. The country has lagged behind in acquiring the capabilities necessary for speedy structural transformation. The majority of entrepreneurs have cited an inadequately educated workforce as the top constraint in expanding business (World Economic Forum 2016). Overall, the Lao PDR ranks 106th out of 130 countries with respect to human capital for workers in the age range of 24–64 years. This rank is even lower in the case of the ease of finding skilled employees, which stands at 113rd (World Economic Forum 2016).

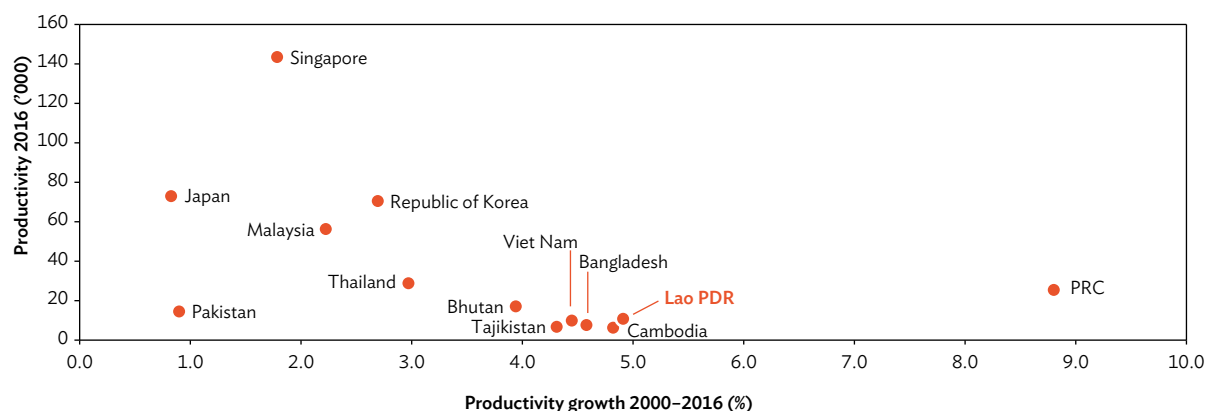
Most of the workers have low levels of education and lack the skills needed to produce high value-added and diverse products. The computations based on the Lao PDR Expenditure and Consumption Survey 2012–2013 point out that 44% of the population did not complete primary school. Similarly, more than 50% of women and the population living in northern and southern parts did not finish primary education. The completion rate of secondary education portrays an even more dismal picture—at the national level, 88%

of the population did not finish secondary school, while more than 90% of women and the population in rural areas did not complete secondary education. The low level of education and poor quality of human capital stock are also manifested in low labor productivity. Available estimates of labor productivity in the Lao PDR are much lower compared with other countries. Meanwhile, successful economies, such as the People's Republic of China, the Republic of Korea, Malaysia, Japan, and Singapore, have experienced high labor productivity growth and could shift their labor toward high-productivity sectors. This has not yet happened in the case of the Lao PDR (Figure 1.15).

The foregoing discussion suggests that the quality of human capital and productive knowledge is inadequate for achieving sustained and inclusive growth in the long run. This has hindered entrepreneurs from introducing innovations, hence, causing the country to stick to producing low value-added products.

(iv) Inadequate and poor infrastructure

Infrastructure development and better connectivity is particularly crucial for economic development and in reducing poverty and inequality. Current infrastructure, particularly land transportation and electricity, is not adequate. The Global Competitiveness Report 2016–2017 shows that the fifth most problematic factor for doing business in the Lao PDR is poor infrastructure (7.8%), which also impacts the competitiveness of exports. The World

Figure 1.15: Average Labor Productivity (at constant 2011 PPP \$)

Lao PDR = Lao People's Democratic Republic, PPP = purchasing power parity, PRC = People's Republic of China.

Sources: Computations based on World Bank. World Development Indicators. <http://data.worldbank.org/data-catalog/world-development-indicators> (accessed August 2017).

Bank's Logistics Performance Index,⁹ a summary measure of the quality of trade and transport-related infrastructure, ranks the Lao PDR 152nd out of 160 countries in the world in 2016 (World Bank 2016e). Sustained long-term growth and structural transformation would also need improvements in the public sector services delivery, physical infrastructure, legal and regulatory frameworks as well as other aspects impacting competitiveness, governance, and overall business environment. However, the Lao PDR ranks 139th out of 190 in the World Bank's Ease of Doing Business indicators, 2016 (Table 1.7).

Road transport

Even though the road network in the last 2 decades has expanded significantly from 14,000 kilometers (km) in 1990 to 44,005 km by 2012, many areas in remote parts of the country still have no dry or wet season access. About 56% of national roads are paved with a bitumen surface, while 30% of rural areas remain inaccessible with 48% earthen roads becoming almost impassable particularly during the wet season (Kyophilavong and Lamphayphan 2014). Overall access to roads is uneven in the country, with more than 10% of the

Table 1.7: Ease of Doing Business Ranking for ASEAN Countries, 2016

Country	Ease of doing business	Starting a business	Dealing with construction permits	Getting electricity	Registering property	Getting credit	Protecting minority investors	Paying taxes	Trading across borders	Enforcing contracts	Resolving insolvency
Singapore	2	6	10	10	19	20	1	8	41	2	29
Malaysia	23	112	13	8	40	20	3	61	60	42	46
Thailand	46	78	42	37	68	82	27	109	56	51	23
Brunei Darussalam	72	84	37	21	134	62	102	89	142	93	57
Viet Nam	82	121	24	96	59	32	87	167	93	69	125
Indonesia	91	151	116	49	118	62	70	104	108	166	76
Philippines	99	171	85	22	112	118	137	115	95	136	56
Cambodia	131	180	183	136	120	7	114	124	102	178	72
Lao PDR	139	160	47	155	65	75	165	146	120	88	169
Myanmar	170	146	66	149	143	175	179	119	159	188	164

Notes: Ranking is based on a sample of 190 countries. High ranking number = high performance. A = total ranking for all parameters.

Source: World Bank. 2017. *Doing Business: Equal Opportunity for All*. Washington, DC.

⁹ The World Bank's Logistics Performance Index (LPI) reflects perceptions of a country's logistics based on efficiency of customs clearance process, quality of trade- and transport-related infrastructure, ease of arranging competitively priced shipments, quality of logistics services, ability to track and trace consignments, and frequency with which shipments reach the consignee within the scheduled time. The index ranges from 1 to 5, with a higher score representing better performance.

population in the northern and southern regions having no access to roads in 2012–2013. Similarly, more than 20% of the population in Luang Prabang in the north and Champasak in the south have no access to roads, while more than 30% of the population in Phongsaly Province in the north does not have access to roads (LSB 2013). The Enterprise Survey 2012 indicates that 8.8% of firms have attributed poor transportation as a key constraint to their business (World Bank and IFC 2012). Poor infrastructure affects both men and women. Yet the weight of the time burden falls heaviest on women because they tend to be responsible for more household tasks. This is true for the Lao PDR where poor transportation has constrained the mobility of women and girls in rural areas and thus they have difficulty accessing health facilities.

Electricity

The Enterprise Survey 2013 suggests that 23.3% of firms describe lack of uninterrupted electricity as a major constraint in expanding businesses. Although electrification in the Lao PDR has improved over time, however, the capacity of the national grid is insufficient to meet the demand for peak periods in urban areas, resulting in unreliable electricity supply. About 14% of electricity supply is lost due mainly to poor and inefficient transmission and distribution networks.¹⁰ During 2016, 91% of the total population has had access to electricity, a huge improvement from 70% in 2009. However, access to electricity is not widely available in all the regions. For urban areas, access to electricity in 2014 was 95%, but this dropped to 68% for rural and upland areas. Increasing the electrification of the rural and upland areas is a big challenge. The lack of electricity in rural areas creates problems particularly for women and girls as they have to spend extra time on domestic work. Majority of the poor female-headed households have reported high cost of connection fees as a key constraint to having access to electricity and being connected to the grid (World Bank and ADB 2012).

¹⁰ Data on transmission and distribution loss are calculated based on data from *Electricité du Laos* (2017).

Information and communication technology

Telecommunications and the internet infrastructure needed for knowledge economy are also weak and would require substantial improvement to meet the goal of inclusive growth. Access to internet servers and the number of cellular subscribers are low; in 2015, there were only 2.6 secure internet servers per 1 million people and 53 mobile phone subscribers per 100 people (World Bank World Development Indicators). Out of 139 countries, the Lao PDR ranks 117th in availability to latest technologies, 123rd in fixed broadband internet subscribers per 100 people, 129th both in internet bandwidth and cellular phone subscriptions per 100 people (World Economic Forum 2016c). The poor quality of internet access makes it difficult to have easy access to knowledge economy and to reap the benefits of increasing returns to scale necessary to catch up with global production networks.

The foregoing discussion suggests that the quality and availability of the necessary infrastructure are critical to achieving inclusive growth. The existing infrastructure will need to be improved substantially to diversify the economy and make it more vibrant. Improvement in the business environment by reducing transport and logistics costs and regulatory burden can help upscale investments in high value-added products. The lack of appropriate infrastructure is yet another obstacle in achieving inclusive growth in the medium to long run. The government, by addressing the infrastructure constraints, can induce investors to diversify the production structure, improve productivity, and enhance structural transformation.

1.9 Conclusions

To achieve inclusive and sustainable growth in the medium to long run, the Lao PDR must look for new drivers of growth. Its exports need to be diversified and upgraded to modernize the economy. A strong and vibrant export sector is the key to maintain healthy

foreign exchange and macroeconomic stability, and mitigate external demand shocks. Providing decent nonagricultural jobs is equally important. Inclusive growth can only be sustained if the production structure is transformed and its exports diversified. However, export diversification and upgradation will require not only addressing market failures but also improving the capabilities of the economy.

The Lao PDR should develop capabilities that can be easily redeployed in creating more high value-added products as its existing set of capabilities and productive knowledge are inadequate. Therefore, to shift resources from low to high value-added sectors, it must address the constraints of low quality of human capital and skills.

Furthermore, infrastructure needs to be upgraded and made more efficient to expand access to vital services and make economic opportunities available to a wider segment of society. To reduce inequality and disparity among different regions and ethnic groups, the government must direct efforts toward improving the quality and coverage of governance and public service

delivery. Better public service delivery is important in providing health facilities and in expanding education particularly for the people living in rural and upland areas. Similarly, a more accessible supply of electricity reduces the time spent on labor-intensive domestic work and allows women and girls to engage in other productive and income-generating activities. This can also help reduce regional and gender inequality.

The Lao PDR's future growth rate depends on the revival of industry and attainment of sufficient export dynamism. More high value-added exports are needed to create jobs in industry and services. As discussed, while the agriculture sector is still the main job provider, there is still great potential to improve output and productivity. However, this would squeeze the demand for labor, an outcome that points to the need for more job opportunities in nonfarm sectors. Indeed, the real challenge ahead would be to create jobs in industry and services to absorb labor released from agriculture and generated by population growth. The achievement of inclusive and sustained growth hinges critically upon the diversification and upgrading of the industry and export sector.

Chapter 2

Structural Transformation and Diversification

2.1 Introduction

The Lao People's Democratic Republic (Lao PDR) has shown impressive growth performance since the implementation of market-oriented reforms introduced in 1986. However, it has not done equally well in structural transformation, the transfer of workers from low-productivity to high-productivity sectors. Despite robust economic growth, job creation in the modern sectors of the economy has remained limited. More importantly, the absorptive capacity of the industry has declined while that of services has expanded marginally. Meanwhile, subsistence agriculture is still the primary economic activity of nearly 65% of the labor force.

In the decades that followed economic reforms, little has changed in the economy. To support economic growth, the government relied on resource-based sectors, foreign direct investment (FDI), and concessionary aid inflows. While the resource-based sectors supported economic growth, jobs outside agriculture have remained limited. Heavy reliance on resource revenues combined with increasing volumes of FDI and aid inflows brought about a Dutch-disease effect on the rest of the economy. More importantly, the resulting appreciation of real effective exchange rate affected the production of tradable goods

adversely. As a result, the Lao PDR's export basket remained concentrated on low value-added products. On the other hand, nontradable production increased significantly. But the Lao PDR's inability to move from resource-based exports to more high value-added products has impeded the process of structural transformation.

The Lao PDR must sustain high economic growth, achieve inclusive growth, and address widening regional disparities, particularly if it wishes to succeed in graduating from the list of least developed countries by 2020. To accelerate structural transformation, it will need to modernize the economy by diversifying exports and the production structure, which will subsequently help provide decent job opportunities outside agriculture as well as reduce regional inequality.

This chapter examines why rapid structural transformation has not accompanied the Lao PDR's economic growth. It provides a comprehensive analysis of the composition of exports and suggests measures to accelerate structural change. The main emphasis is that the achievement of sustained and inclusive growth hinges critically on the successful diversification and upgrading of exports. This chapter then lists the potential high value-added products on which the Lao PDR can invest to subsequently help

transfer resources from low-productivity to high-productivity activities.

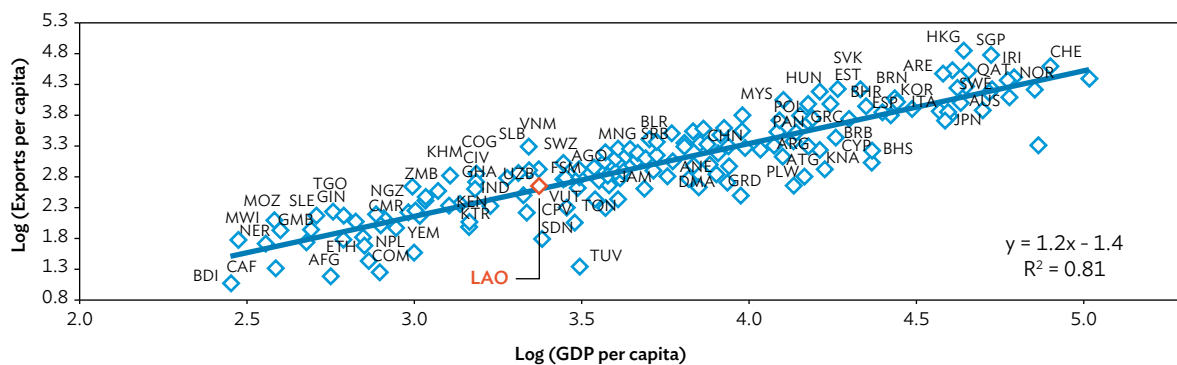
A closer look at the newly industrialized economies of Asia¹¹ suggests that they were successful in generating new activities that are characterized by high productivity and increasing returns to scale. This enabled them to shift resources from primary to modern sectors (Felipe 2007). Rapid and intense structural transformation accompanied the economic growth in these economies. They were not only successful in sustaining growth, but also in moving resources from low-productivity to high-productivity sectors. They created new investment opportunities in products that offered higher returns than traditional products, thus contributing to productivity growth economy-wide (Agosin, Fernandez-Arias, and Jaramillo 2009). The Lao PDR, on the contrary, has not had such structural transformation despite its high economic growth. To achieve and sustain inclusive growth in the long run, it is crucial for the Lao PDR to grow and diversify its manufacturing base.

As a country develops, it experiences structural transformation and starts producing more diversified and high value-added products. Structural change therefore appears to be reflected in the product mix that a country exports. The composition of exports provides important insight about the technical knowledge embedded in it and highlights the potential to produce diverse and high value-added products

(Hausmann, Hwang, Rodrik 2007). The product mix that a country exports therefore provides important information about its prospects for speedy structural transformation. The benefits of export diversification emanate mainly from avoiding the potential real exchange rate appreciation driven by natural resource exports. The promotion of tradable export activities, particularly in the manufacturing sector reduces reliance on resource-based exports, generates employment, and induces structural transformation. The creation of jobs outside agriculture is necessary to achieve sustained and inclusive growth. This is also important because as the agriculture sector develops and productivity improves, the excess labor force needs to be absorbed in other sectors. Sustained and inclusive growth requires a dynamic industrial base, manufacturing plays the crucial role in improving the labor productivity in the economy. Hence, the pace of structural transformation and achievement of inclusive growth depend on the success of the export diversification and the development of a vibrant manufacturing sector.

The Lao PDR needs to upgrade its production and export structure to maintain a sufficient level of foreign exchange reserves to mitigate the external shocks. Despite the high economic growth rate envisaged in the last 2 decades, little progress was made as of 2016 in diversifying exports away from the basic commodities. Indeed, exports per capita are among the lowest in the world (Figure 2.1).

Figure 2.1: Exports per Capita, 2016



GDP = gross domestic product, LAO = Lao People’s Democratic Republic.
 Source: Computations are based on World Bank. World Development Indicators. <http://data.worldbank.org/data-catalog/world-development-indicators> (accessed August 2017).

¹¹ The newly industrialized economies are Hong Kong, China; the Republic of Korea; Singapore; and Taipei, China.

The Lao PDR's failure to improve its export basket has negative implications for accelerating structural transformation. From the mid-2000s onward, the Lao PDR's reliance on resource-based exports further intensified as their share in total exports increased from about 52% in 2005 to more than 81% by 2014 (Table 2.1).

Composition of exports did not change much and low value-added products still made up the bulk of exports. Empirical research links production complexity to economic development and suggests that rich countries make various complex, i.e., high value-added¹² products, while poor countries generally make fewer and rudimentary products (Hausmann et al. 2011). This research also suggests that a country's productive knowledge,¹³ the know-how workers and organizations

acquire over time and use in the production process, can be measured through the export mix a country produces. It is based on the intuition that a country's technology is reflected in the products it makes and a product reflects the technologies of the economies making it. The production process is the outcome of the skills and technical knowledge or know-how to transform raw materials into valuable products. The product complexity index (PCI)¹⁴ is one such measure that captures the amount of know-how involved in the production of a product. The complexity of an economy is based on the total complexity of its products. An analysis of the Lao PDR's exports indicates that most of the products rank low in terms of product complexity index. These products have limited productive linkages with other sectors, implying that the productive knowledge acquired from their

Table 2.1: Share of the Lao PDR's Top 20 Exports (selected years)

No.	SITC	Commodity	PCI Rank	Export Share (%)				
				1995	2000	2005	2010	2014
1	2472	Sawlogs of nonconiferous	753	2.7	...	5.9	5.0	20.5
2	2483	Wood, nonconiferous, prepared	705	...	...	19.3	9.9	15.4
3	6821	Copper and copper alloys	704	4.1	-	12.1	22.4	13.5
4	3510	Electric current	538	-	-	10.5	13.2	12.5
5	2871	Copper ore and concentrates	743	...	...	0.0	20.2	9.3
6	7649	Parts and accessories, electronics	319	0.0	0.1	0.0	0.0	3.1
7	2320	Natural rubber latex	767	0.0	0.0	0.7	1.2	2.4
8	0711	Coffee green, roasted	733	10.0	5.3	2.7	2.2	2.1
9	8423	Men's and boys' trousers, etc.	681	...	...	...	...	2.0
10	2815	Iron ore and concentrates	766	...	...	-	-	1.7
11	5623	Mineral or chemical fertilizer, potassic	527	-	-	-	-	1.4
12	0548	Vegetable roots and tubers	748	...	0.0	0.3	0.6	1.1
13	1223	Tobacco, manufactured	537	-	-	0.0	0.0	0.9
14	0440	Maize, unmilled	641	0.0	0.0	0.5	1.6	0.8
15	2450	Fuelwood and wood charcoal	669	...	...	...	0.2	0.8
16	8462	Undergarments, of cotton	711	...	4.5	3.9	2.0	0.7
17	8459	Outerwear, other clothing accessories	677	...	...	...	...	0.7
18	2876	Tin ores and concentrates	772	1.2	0.7	0.4	0.2	0.7
19	8441	Undergarments, men's and boys' shirts	672	4.7	3.7	4.3	1.7	0.6
20	0611	Sugars, beet and cane, raw, solid	740	-	-	-	0.9	0.6

-- = zero, ... = not available, Lao PDR = Lao People's Democratic Republic, PCI = product complexity index, SITC = Standard International Trade Classification. Note: PCI rank is out of 773 products.

Source: ADB estimates based on the United Nations Commodity Trade Statistics Database. <http://comtrade.un.org/db/default.aspx> (accessed February 2017).

¹² Value added is the amount by which the value of goods or services are increased by each stage in its production. It is the difference between the value of all the inputs (raw materials, purchased services) and the price at which the product is sold.

¹³ Productive knowledge or know-how refers to the knowledge that goes into making products. Countries accumulate productive knowledge by developing the capability to make a larger variety of products of increasing complexity.

¹⁴ The product complexity index (PCI) ranks products by the amount of capabilities or know-how necessary to manufacture them. It therefore measures the technological sophistication of a product by the amount of know-how involved in its production. The concept of the PCI is based on the idea that an economy's technology is reflected in the products it produces.

production could hardly be redeployed to produce more diversified products. This again signifies the importance of diversifying the production structure. Moreover, the Lao PDR has not seen an improvement in the number of products exported with comparative advantage.¹⁵ It exported 62 products with comparative advantage during 1980, which declined to 39 in 1990, and later increased to 51 in 2000 and to 60 in 2014 (Table 2.2).

The characteristics of a country's export basket matter for subsequent economic growth and structural transformation (Hausmann, Hwang, and

Rodrik 2007). Empirical evidence shows that the composition of exports and income per capita are highly correlated—what a country produces today affects what it could produce tomorrow. Structural transformation is quicker in economies that have successfully diversified exports toward high value-added products (Hausmann and Klinger 2010). Therefore, the Lao PDR needs to upgrade and diversify exports to expand job opportunities outside agriculture and to subsequently shift resources from primary to modern sectors. Merely producing the same products in larger quantities does not necessarily boost the economy's capability. Countries seldom become rich

Table 2.2: Number of Products with Revealed Comparative Advantage, 1980–2014

SITC	Description	1980		1990		2000		2014	
		No.	Share (%)	No.	Share (%)	No.	Share (%)	No.	Share (%)
0	Food	10	12.2	2	5.4	6	7.7	12	5.8
	Coffee and spices	2	9.1	1	2.0	2	5.4	2	2.2
1	Beverages and Tobacco	1	0.1	0	0.1	0	0.1	5	1.7
	Tobacco products	1	0.1	0	0.0	0	0.0	5	1.7
2	Crude Materials	12	46.4	19	52.9	17	33.6	18	51.7
	Sawlogs and woods	4	38.8	6	37.1	7	31.3	3	36.7
	Metalliferous ores	2	4.1	3	9.0	1	0.7	3	11.7
	Natural rubber	0	0.0	1	0.1	0	0.0	1	2.4
3	Mineral Fuels	0	0.0	1	0.2	1	0.4	1	12.5
	Electric current	0	0.0	0	0.0	0	0.0	1	12.5
4	Animal and Vegetable Oils	1	0.1	0	0.0	0	0.0	0	0.0
5	Chemical and Chemical Products	1	1.0	0	0.2	1	0.2	5	2.6
	Fertilizer	0	0.0	0	0.0	0	0.0	2	1.6
6	Manufactured Goods	23	23.9	10	3.0	6	1.3	7	14.6
	Nonferrous metals	0	0.0	0	0.0	0	0.0	3	13.7
	Wood products	3	1.3	5	1.2	4	0.9	2	0.3
	Textiles and fabrics	9	2.0	0	0.1	1	0.1	0	0.1
	Iron and steel	4	18.5	2	2.8	0	0.0	0	0.0
7	Machinery and Transport	0	0.7	2	0.7	2	18.0	1	3.8
	Communication equipment	0	0.2	0	0.0	0	0.1	1	3.1
8	Miscellaneous Manufactured Articles	12	7.4	5	37.0	18	36.8	10	7.2
	Garments	6	3.0	5	6.0	16	35.6	10	6.0
9	Other Manufactured Articles	2	8.1	0	0.4	0	2.0	1	0.1
TOTAL		62	100	39	100	51	100	60	100

No. = Number of products, SITC = Standard International Trade Classification.

Note: Number of products refers to those exported with revealed comparative advantage of > 1.0.

Source: Computations based on data set from the United Nations Commodity Trade Statistics Database. <http://comtrade.un.org/db/default.aspx> (accessed August 2017).

¹⁵ Hidalgo et al. (2007) propose using the number of products exported with revealed comparative advantage (RCA) as a measure of diversification. RCA is defined, based on Balassa (1965), as:

$$RCA_{ci} = \frac{xval_{ci} / \sum_i xval_{ci}}{\sum_c xval_{ci} / \sum_{i,c} xval_{ci}}$$

where $xval_{ci}$ is the value of the exports of country c in the product i . A country with RCA larger than 1 has revealed comparative advantage in that commodity.

by producing more of the same products, but rather they grow by moving into new and more complex (high value added) products (Hausmann, Hwang, and Rodrik 2007).

The analysis further reveals that about 76% of the Lao PDR's exports belong mainly to products with the lowest product complexity—which means that these products have generally low to weak productive linkage with other sectors. This suggests that diversifying and upgrading exports would be challenging and difficult (Table 2.3).

The evidence suggests that a country's development path is determined by its capacity to accumulate the capabilities¹⁶ required to produce varied and high value-added products. As countries grow, they diversify their export basket (Hausmann, Hwang, and Rodrik 2007). In general, developed economies export a wide range of products while developing countries

export only a few. This research also points out that developed countries tend to export products that are relatively complex and made by a few other countries. On the other hand, developing countries tend to export products that are relatively simple and made by many countries (Hausmann et al. 2011).

However, diversifying exports and moving to high value-added products also require improvement in productive knowledge which is crucial in improving the economy's production frontier. Although difficult to measure directly, the product mix of a country's products and exports offers important clues about productive knowledge. Products differ considerably by the amount of productive knowledge involved in their production. Hence, the composition of exports can be used to capture the economy's productive knowledge (Hausmann et al. 2011). To measure empirically the productive knowledge embedded in the product mix, Hausmann et al. (2011) proposed the economic

Table 2.3: Distribution of Product Complexity and Export Share, 2014 (%)

SITC Product Category	Average PCI rank	Product Complexity Level (1 = highest, 6 = lowest)						Total
		1	2	3	4	5	6	
0 Food	551	–	–	0.00	0.21	0.07	5.52	5.79
Roasted coffee	750						2.13	
1 Beverages and Tobacco	528	–	–	–	0.05	1.25	0.42	1.72
2 Crude Materials	628	–	0.00	0.05	0.12	0.49	51.01	51.68
Wood products	518						36.64	
Metal ores (copper, iron, etc.)	699						11.66	
Natural rubber	770						2.38	
3 Mineral Fuels	729	0.00	–	0.00	12.53	0.01	0.01	12.55
Electric current	485				12.53			
4 Animal and Vegetable Oils	604	–	–	–	–	–	0.00	0.00
5 Chemical and Chemical Products	232	0.03	0.01	0.03	0.87	1.67	–	2.61
6 Manufactured Goods	373	0.14	0.06	0.02	0.05	0.64	13.66	14.58
Copper alloys	667						13.48	
7 Machinery and Transport Equipment	160	3.22	0.14	0.08	0.32	0.00	–	3.76
Electronic parts	103	3.05					–	
8 Misc. Manufactured Articles	346	0.12	0.05	0.30	0.31	1.24	5.15	7.16
Garments	643						5.12	
9 Misc. Manufactured Articles, nes	421	–	–	0.09	–	0.00	0.06	0.15
TOTAL		3.52	0.27	0.57	14.5	5.4	75.8	100

– = zero, Misc. = miscellaneous, nes = not elsewhere specified, PCI = product complexity index, SITC = Standard International Trade Classification.

Note: Product complexity level is based on PCI ranking and products are regrouped into 6 levels. Level 1 consists of products with PCI rank 1–129, level 2 (130–258), level 3 (259–387), level 4 (388–516), level 5 (517–645), and level 6 (646–773). Therefore, level 1 represents high value-added products while level 6 comprises low value-added products.

Source: Computations based on United Nations Commodity Trade Statistics Database. <http://comtrade.un.org/db/default.aspx> (accessed February 2017).

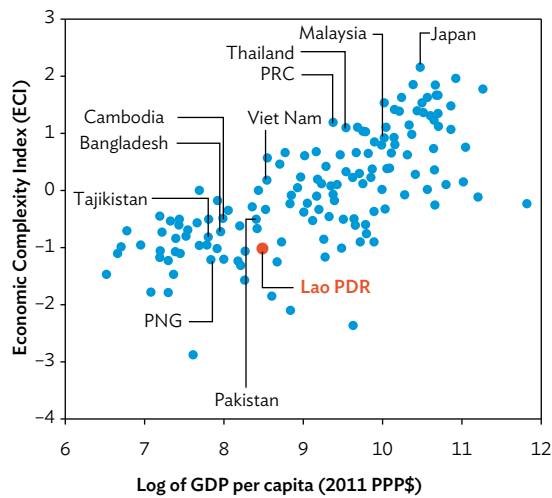
¹⁶ Capabilities are typically thought of as skills, know-how, or tacit knowledge, but can also include physical inputs, and other localized attributes such as institutions, culture, and natural amenities. It is hypothesized that countries grow as they acquire new capabilities, and learn to combine these capabilities to make increasingly high value-added (more complex) products requiring many complementary skills and inputs.

complexity index (ECI).¹⁷ This index summarizes, on average, the complexity of a country’s product mix. Countries with a high ECI value produce high value-added and wide-ranging products while countries with a low ECI value generally produce rudimentary products. The ECI indicates how many high value-added products a country makes and how many other countries make the same products as well. The ECI therefore gives an insight on the country’s productive knowledge and has implications for economic growth in the subsequent years. Countries with a higher ECI are well diversified and export, on average, high value-added products. Empirical evidence suggests a positive and significant correlation between the ECI and gross domestic product (GDP) per capita (Figure 2.2).

Economic complexity reflects the amount of knowledge embedded in the productive structure of an economy. Generally, developed countries export more diverse and high value-added (complex) products while developing countries export poorly diversified

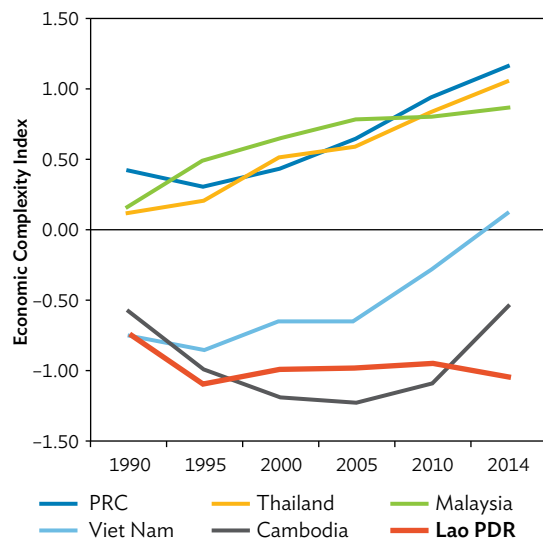
and low value-added (less complex) products. An analysis of the Lao PDR’s ECI over a long period shows that its level of economic complexity has not improved. Rather, the value of ECI has declined over time, indicating that the country has not been successful in moving its productive structure toward high value-added products. The Lao PDR’s low and declining ECI value indicates that (i) its export basket has continually comprised rudimentary products, (ii) the country has not developed the necessary capabilities for moving into new and diversified products, and (iii) many other developing countries also export similar products. Without export diversification and with highly concentrated exports, the Lao PDR is left with a few available unexploited opportunities for upgrading its export basket. Furthermore, the capabilities to produce such products cannot be easily redeployed to produce more varied and high value-added products, thus slowing down and hindering structural transformation (Figure 2.3).

Figure 2.2: Economic Complexity and GDP per Capita



GDP = gross domestic product, Lao PDR = Lao People’s Democratic Republic, PNG = Papua New Guinea, PRC = People’s Republic of China. Sources: Estimates based on World Bank. World Development Indicators. <http://data.worldbank.org/data-catalog/world-development-indicators>; and United Nations Commodity Trade Statistics Database. <http://comtrade.un.org/db/default.aspx> (accessed February 2017).

Figure 2.3: Economic Complexity Indexes for Selected Countries, 1990–2014



Lao PDR = Lao People’s Democratic Republic, PRC = People’s Republic of China. Source: Estimates based on data set from the United Nations Commodity Trade Statistics Database. <http://comtrade.un.org/db/default.aspx> (accessed December 2015).

¹⁷ The ECI measures how diversified and complex a country’s export basket is. It ranks countries according to their level of complexity. When a country produces complex goods in addition to a high number of products, it is typically more economically developed or can be expected to experience fast economic growth in the near future. The construction of the measures of complexity is based on the method of reflections developed by Hausmann and Hidalgo (2009a) and uses information on (i) the number of products exported with $RCA \geq 1$, and (ii) the number of countries exporting a product with $RCA \geq 1$.

The development of a vibrant export sector is important to industrialize the economy as well as to achieve sustained and inclusive growth in the long run. Economic development involves not only continuously improving the production of the same set of goods, but also, more importantly, acquiring the more complex set of capabilities required to move toward activities that are associated with higher levels of productivity. It follows, therefore, that a country whose production structure is oriented to high-productivity activities will likely experience rapid development. The discussion above suggests that the productive structure does matter for growth and structural transformation. Section 2.2 examines this in detail and compares the evolution of structural transformation in the Lao PDR between 1980 and 2014.

2.2 Structural Transformation and Product Space Analysis

To learn more about the evolution of the productive structure and structural transformation, this study employs product space methodology (Box 2.1). The product space is a graphic depiction of the network of connecting products and shows all the products exported in the world and how close they are to each other (Hidalgo et al. 2007). The central idea behind the construction of the product space is that a country's ability to export a new product is dependent on its ability to export similar products. Hence, products requiring similar capabilities are more likely to be exported together (Felipe and Abdon 2011).

The production of each product requires very specific inputs that may include knowledge, physical assets, intermediate inputs, labor training, infrastructure, regulatory requirements, and other complementary inputs best provided by the public sector. Input requirements vary for different products, although some commonalities may exist, particularly when products are similar (Hausmann and Klinger 2008). Product space thus provides a glimpse into the embedded knowledge of countries by highlighting their productive capabilities and the opportunities these imply.

The product space is highly heterogeneous and is composed of peripheral products that are only weakly connected, while products that are at the center of the product space are strongly connected. The product space map gets denser toward the center and is sparse at the periphery. By construction, the nature of product space is such that products on the periphery are agricultural commodities, vegetables and natural resources, while chemicals, machinery, electronics, and transformed metals are found in the dense part of the product space. More specifically, least complex products such as primary agriculture and commodities typically found on the right-hand side, while more complex products such as machinery, chemicals and electronics typically inhabit densely connected central regions and the left-hand side of the product space. Developing countries typically diversify and grow their export base from the center/right region toward the more complex left-hand side.

The commodities that require similar capabilities group naturally into highly connected communities of products. Products within a community are more closely connected to each other than to products outside of the community. Moreover, the position of the different communities in the product space matters for structural transformation. The communities that are in the dense part of the product space would generally have more complex (high value added) set of products. On the other hand, communities that are not well connected would tend to have less complex products. For example, products belonging to the machinery community are highly complex and strongly connected. This contrasts sharply with poorly connected communities such as cotton, rice, and petroleum, which tend to be low in complexity. Garments, textiles, and food processing communities are in an intermediate position and hence are strongly connected but not very sophisticated. On the other hand, electronics and health-related chemicals are highly complex but not as connected as machinery. This implies that the capabilities used in their production are product specific, which are relevant within their communities but not outside of them (Hausmann et al. 2011).

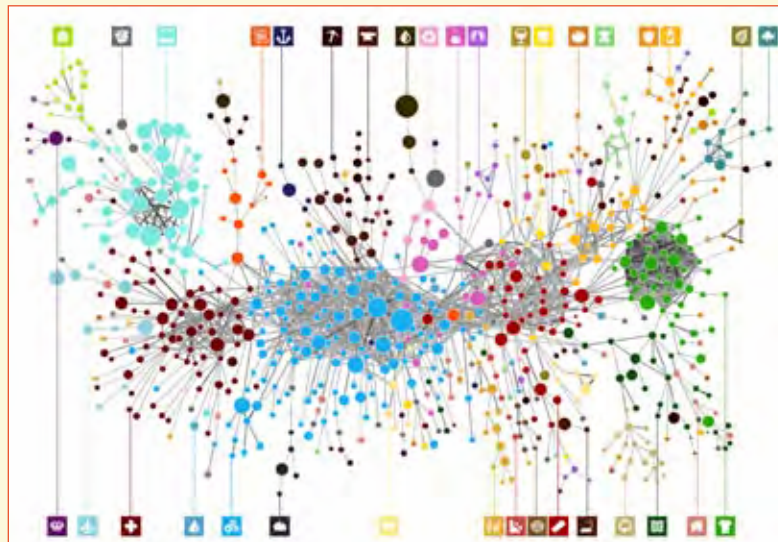
Box 2.1: Product Space Analysis

Hausmann and Klinger (2006a and 2006b) pioneered product space analysis to analyze structural transformation in an economy. They specifically analyzed a key aspect of structural transformation—product diversification. Further, Hidalgo et al. (2007) mapped products across global economies (Figure B2.1.1). This accounts for proximity by computing the probability of a country having a comparative advantage in one product given its comparative advantage in another. Proximity measures capabilities that are used to produce one product and can be used to produce another. (Capabilities could include knowledge about the product, physical assets, intermediate inputs, labor relations, labor training requirements, technology, marketing, infrastructure, property rights, regulatory requirements, and other public goods).

Hidalgo et al. (2007) elaborate using the analogy that the product space is a forest, with trees as the products and monkeys as companies. A monkey can easily jump to “nearby” (proximate) trees, but it needs to exert a gargantuan effort to transfer to “far-away” trees. If the monkey is in the clustered portion of the forest, the monkey has more opportunity to jump from one tree to another. The stock of capabilities accumulated jumping from tree to tree will serve the monkey well. In summary, the capabilities that firms learned in producing several products (diversification) can lead to the development of more high-end products (sophistication).

Hidalgo et al. (2007) measured the distance (proximity) of each pair of products and developed the concept of product space. They applied the network theory to visualize the distance between products by their relative similarities in needed capabilities. Their analysis used an international trade data set based primarily on the Standard International Trade Classification Revision 2, disaggregated at the four-digit level. Data were available for 773 products. The different nodes represent products, and their colors correspond to their product groups based on the Leamer’s classification,^a and the node size is in proportion to world trade values. The colors of the lines that connect the nodes represent the distance between a pair of products. The map is highly heterogeneous, with the dense part representing many products that are closely connected—particularly machinery, chemicals, and capital-intensive products. This indicates the ease with which companies can move from one commodity to another. In the periphery, products such as natural resources, primary products, and agricultural products are weakly connected to others. This indicates the difficulty of moving from these products to other products.

Figure B2.1.1: Product Space



CONSTRUCTION MATERIALS & EQUIP ^T	METAL PRODUCTS	PULP & PAPER	COTTON, RICE, SOY BEANS & OTHERS	GARMENTS	AIRCRAFT	PRECIOUS STONES
CHEMICALS & HEALTH RELATED PRODUCTS	PROCESSED MINERALS	CEREALS & VEGETABLE OILS	BEER, SPIRITS & CIGARETTES	LEATHER	MACHINERY	PETROCHEMICALS
MINING	MISCELLANEOUS AGRICULTURE	FOOD PROCESSING	MILK & CHEESE	TEXTILE & FABRICS	BOILERS	OTHER CHEMICALS
INORGANIC SALTS & ACID	ANIMAL FIBERS	OIL	TOBACCO	ELECTRONICS	SHIPS	COAL
HOME & OFFICE PRODUCTS	FRUIT	MEAT & EGGS	TROPICAL TREECROPS & FLOWERS	FISH & SEAFOOD	AGROCHEMICALS	NOT CLASSIFIED

^a The product classification introduced by Leamer (1984) is based on relative factor intensities, that is, the relative amount of capital, labor, land, or skills required to produce each product.

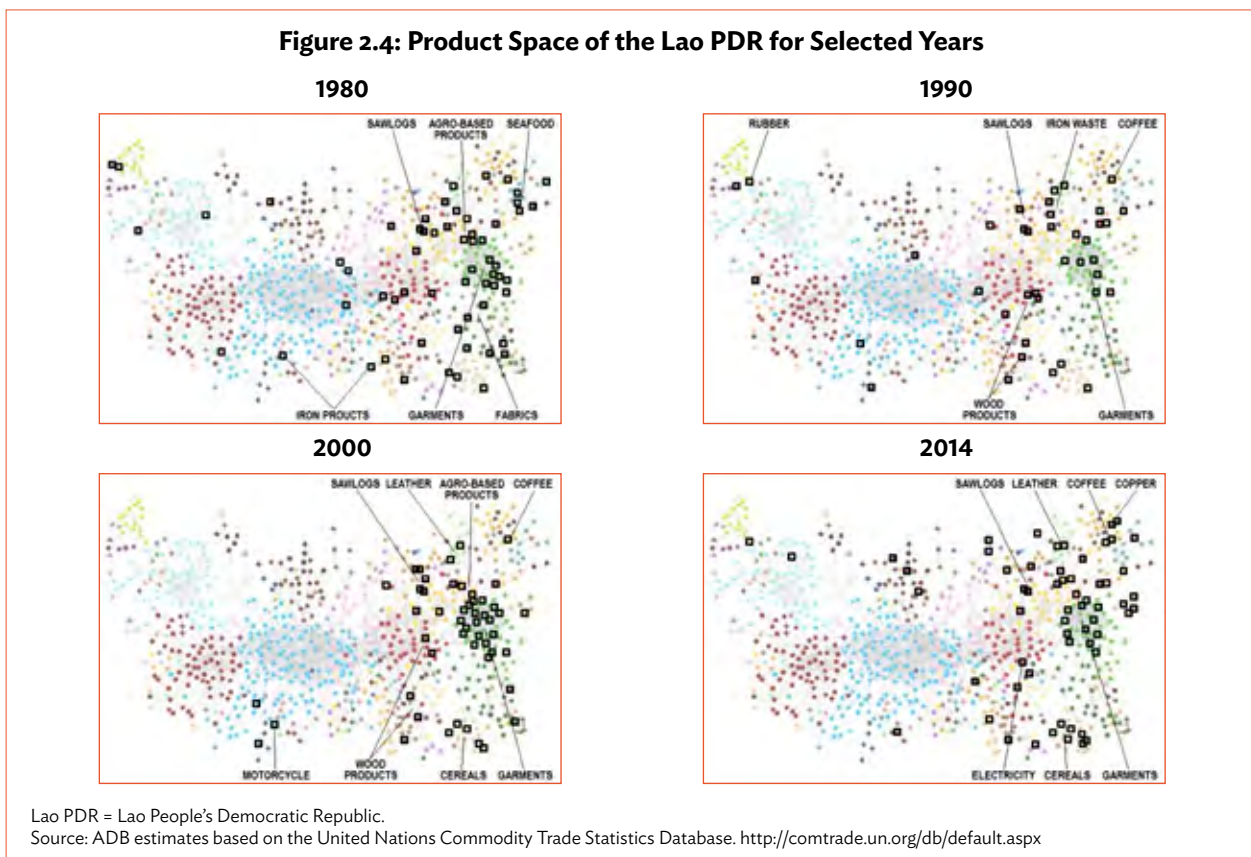
Source: R. Hausmann et al. 2011. *The Atlas of Economic Complexity, Mapping Paths to Prosperity*. Cambridge, MA: Center for International Development and Harvard Kennedy School, Harvard University.

The capabilities acquired from the production of peripheral products have limited applicability to produce other nearby products.¹⁸ Therefore, if a country specializes largely in such products, the redeployment of its existing capabilities to other products becomes very challenging, which makes the process of structural transformation slow and difficult. On the other hand, if a country is producing goods that are strongly connected and are more complex in nature, the capabilities acquired from producing these can also be used to produce more diverse products. In this manner, structural transformation becomes relatively easy. Hence, a country's development path is determined by its capacity to accumulate the capabilities required to produce diverse and high value-added products. The position of a country in the product space determines its opportunities to diversify and expand production toward high value-added products. Developing countries generally export goods that are found on the periphery of the product space, while developed economies export goods that are strongly connected and found in the dense part of the product space.

The discussion suggests that a country whose exports are largely found in the sparse part of the product space would find it hard to move toward the dense part of the product space, as only a few of its capabilities can be redeployed. Hence, a highly connected product space makes the problem of growing the economy's complexity easier, while a sparsely connected product space makes it harder. The speed of structural transformation therefore depends on the position of the country in the product space. Product space analysis can help us understand why the Lao PDR continues to produce low value-added products and why it has made little progress in shifting resources from primary to high-productivity sectors.

2.2.1 Product Space of the Lao PDR

Figure 2.4 illustrates the product space of the Lao PDR's exports. The black squares mark the products in which the Lao PDR has revealed comparative advantage ($RCA > 1$).



¹⁸ If the goods require similar inputs and endowments, then they are "nearby." If they require totally different capabilities, they are "far away."

The product space analysis for the Lao PDR suggests that between 1980 and 2014, it exported almost the same number of products with comparative advantage ($RCA > 1$). During 1980, there were 62 such products with $RCA > 1$, which lessened to 60 by 2014. Most of its exports are found on the periphery and in isolated parts of the product space. This suggests that the capabilities used in their production are not easily transferable. The product space has not changed much either. The Lao PDR's failure to improve the capabilities required to produce more diverse and high value-added products appears to be a major constraint on structural transformation. The evolution of structural transformation indicates a marginal increase in the number of garment products from 9 in 1980 to 12 in 2014, while mining products increased from 4 to 10. Other exports that have emerged and occupied the product space during 2014 included construction materials, food processing materials, tobacco, and cereals and vegetable oils. It is important to note that most of these communities consist of low value-added products, i.e., the capabilities acquired from producing such products are not easily transferable. The product space analysis also suggests that the Lao PDR has not succeeded in expanding its productive knowledge, which is necessary to produce diversified and high value-added products. It is therefore stuck in producing low value-added products. Consequently, the majority of the labor force has remained engaged in

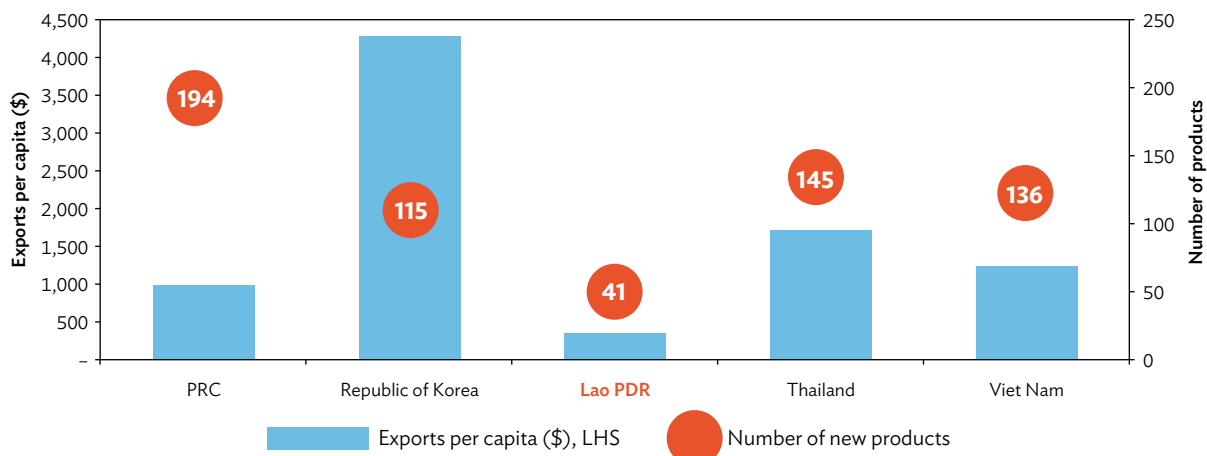
low-productivity activities, thus impeding the process of structural change.

2.2.2 The Lao PDR has not been so successful in moving toward high value-added products

As discussed, the Lao PDR was exporting 60 products with $RCA > 1$ during 2014. Between 1980 and 2014, it added 41 new products with $RCA > 1$. However, majority of the new products had low value added with an export per capita value of \$368 in 2014. On the other hand, the Republic of Korea added 115 new products with an export per capita of \$4,293, while the PRC successfully added 194 new products, with an export per capita of \$1,018. Thailand and Viet Nam added 145 and 136 new products with export per capita at \$1,722 and \$576, respectively (Figure 2.5).

Further disaggregation reveals that while the Lao PDR added 41 new products between 1980 and 2014, most of them are low value added. The average ranking for these new products in terms of product complexity is 589 out of 773. The remaining 19 products (out of 60 products exported with $RCA > 1$ in 2014) are those through which the country had comparative advantage in 1980 and in 2014. These are called “classic products” (Part A of Table 2.4). The product complexity ranking

Figure 2.5: Number of New Products and Exports per Capita



Lao PDR = Lao People's Democratic Republic, LHS = left-hand scale, PRC = People's Republic of China.

Note: The number of new products is the difference between the number of products exported with comparative advantage in 2014 and products without comparative advantage in 1980.

Source: Estimates based on the United Nations Commodity Trade Statistics. <http://comtrade.un.org/db/default.aspx> (accessed March 2017).

for classic products is 690, reiterating that these are largely low value-added products. The analysis also shows that in certain communities the number of products with $RCA > 1$ has further increased. These communities include garments; mining; tobacco; and cotton, rice, soybeans, and others. However, majority of the products belonging to these communities are low value added and have lower product complexity ranking (Table 2.4). The Lao PDR has also been able to add some new communities in the product mix such as agrochemicals, inorganic salts and acids, tropical agriculture, chemicals and health-related products, and electronics. Among the new communities, chemicals and health-related products, electronics,

agrochemicals, and inorganic salts and acids have relatively better product complexity ranking. Part B of Table 2.4 lists the details of these new products, their product complexity ranking, current export value, and the demand for them in the world market.

In sum, the Lao PDR has been unsuccessful in exporting nontraditional and diverse products. It produces largely peripheral products in the product space. It needs to find ways to improve its productive knowledge. Developing such activities will require a more advanced set of capabilities and the necessary institutions.

Table 2.4: Communities of Products of the Lao PDR, 2014

Community	No. of Products	PCI Rank (average)	Lao PDR Exports (\$ million)	World Exports (\$ million)
A. Classic Products				
Garments	5	688	103	130,552
Construction Materials and Equipment	4	708	1,709	30,781
Miscellaneous Agriculture	3	713	104	38,384
Mining	1	772	31	929
Cotton, Rice, Soybeans, and Others	1	765	3	782
Tobacco	1	724	3	9,939
Cereals and Vegetable Oils	1	641	39	31,858
Food Processing	1	688	11	28,287
Leather	1	741	0	714
Not Classified	1	697	1	1,200
Subtotal (A)	19	690	2,005	273,425
B. New Products				
(i) Expanding comparative advantage in existing communities				
Mining	9	731	1,173	276,461
Garments	7	666	162	121,153
Cotton, Rice, Soybeans, and Others	6	732	24	27,064
Tobacco	4	578	74	26,774
Miscellaneous Agriculture	3	616	58	11,490
Construction Materials and Equipment	1	538	581	30,948
Cereals and Vegetable Oils	1	681	1	1,606
Food Processing	1	663	3	1,125
Leather	1	761	1	2,339
(ii) Comparative advantage in new communities				
Agrochemicals	2	526	65	23,224
Inorganic Salts and Acids	2	562	37	41,450
Tropical Agriculture	2	756	138	31,024
Chemicals and Health-Related Products	1	384	1	1,291
Electronic	1	319	141	198,434
Subtotal (B)	41	589	2,459	794,384
Total (A+B)	60	615	4,465	1,067,809

Source: Estimates based on the United Nations Commodity Trade statistics. <http://comtrade.un.org/db/default.aspx> (accessed March 2017).

2.3 How the Lao PDR Can Diversify and Upgrade Its Exports

In the context of product space analysis, countries are more likely to produce products that make use of already available capabilities. It becomes relatively easy for an economy to diversify by moving from the products they already produce to others that require a similar set of embedded knowledge. An evaluation of the Lao PDR's position in the product space may provide insights into how far it is to alternative products and how complex (high value added) these products are. Products differ not only in complexity but also in how highly connected they are in the product space. As an economy shifts production to unexploited and high value-added products, these new products also carry with themselves spillover benefits to the economy. These spillover impacts are captured through an index of “opportunity gain” that quantifies the contribution of a new product in terms of opening up the doors to more diverse and high value added products (Hausmann et al. 2011). See Appendix 2.1 for more details on the technical concepts.

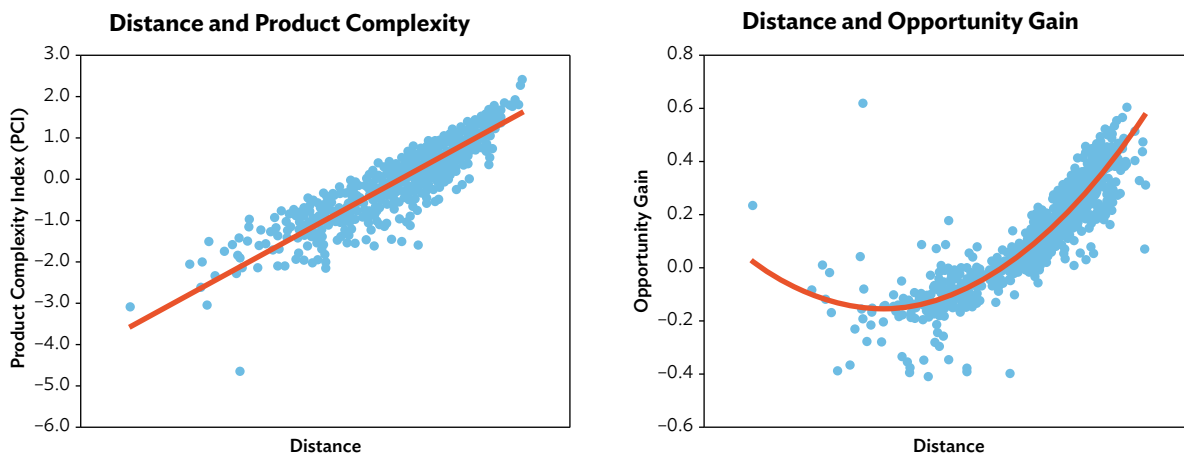
To diversify successfully, the Lao PDR should expand production to products that have the (i) highest product complexity, (ii) shorter distance in needed capabilities, and (iii) highest opportunity gain. However, not all products offer the best venue for diversifying and upgrading the export basket and often there is a trade-off between these three desired properties.

Products that are more complex in nature also require a large variety of capabilities. Typically, such products are farthest away in terms of distance from existing productive knowledge. Similarly, products that have higher opportunity gain and offer the best prospects for diversification also tend to lie farther away.

Next, we analyze what attractive opportunities are available to the Lao PDR that would help diversify and upgrade its export basket, given the existing amount of productive knowledge. With a view to identify the “unexploited products” that would increase the complexity of the economy and therefore create a more diverse and attractive product mix, we consider the total number of products exported by all the countries in the world. We use an international trade data set based primarily on the Standard International Trade Classification (SITC) Revision 2, disaggregated at the four-digit level. Of the 773 suggested products, we eliminate the 60 products in which the Lao PDR has had comparative advantage during 2014, leaving 713 products remaining. These remaining products are treated as the “unexploited products.” We then map these “unexploited products” in terms of their distance and product complexity, and distance and opportunity gain (Figure 2.6).

As mentioned, products that are more complex in nature also lie at greater distances. Similarly, products that open paths to future diversification and have higher opportunity gain tend to be farther away and

Figure 2.6: The Basic Trade-Off between Distance, Product Complexity Index, and Opportunity Gain



Source: Based on the United Nations Commodity Trade Statistics as of December 2015. <http://comtrade.un.org/db/default.aspx>

require a more advanced set of productive knowledge. It is important to note that not all unexploited products would lead to an increase in economic complexity. To improve its current export basket, the Lao PDR should venture into investments in products that not only offer higher complexity but also have higher opportunity gain. Investing in such products opens the paths for future diversification.

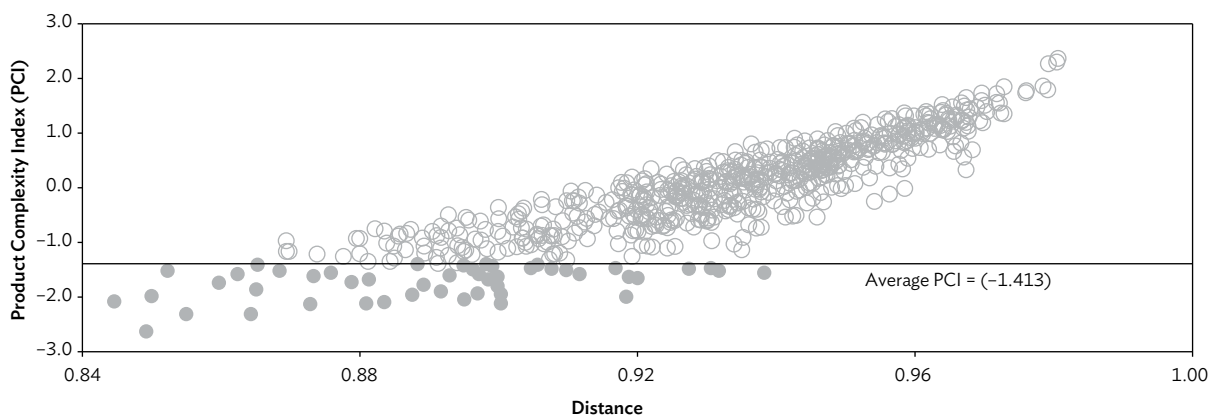
Next, we map these unexploited products by arranging them in terms of their distance, complexity, and opportunity gain. In Figure 2.7, the horizontal line shows the average complexity of the Lao PDR. To diversify its exports and improve its current export basket, the Lao PDR should consider only those products that lie above the horizontal line—these products would have higher complexity than those in the Lao PDR’s current export basket and including these products hence improves the export basket. In Figure 2.7, dark gray circles represent the highly attractive products while the light gray dots are products with lower complexity.

As discussed, product complexity and the characteristics of a country’s export basket matter for subsequent economic growth and structural transformation. From a long-term perspective, including high value-added products in the export basket would not only help the Lao PDR maintain higher economic growth but also offers promising venues for export diversification.

To gain deeper insights, the unexploited products are classified further into nearby, middle-distant, and far-away categories. “Nearby” products or “low-hanging fruits” are those that require similar inputs and endowment. Products requiring somewhat different capabilities but are at a medium distance from the country’s current capabilities are “middle distant,” while products requiring a more advanced set of knowledge in their production are labeled “far away.” It is important to note that not all the unexploited products offer similar opportunities for rapid structural transformation. While considering low-hanging fruits, it should be noted that since most of these products are found in isolated parts of the product space they have very limited prospects for speedy structural transformation. Overall, products located farther from the current capability set have a higher value addition and thus are more valuable from the point of view of structural transformation. Products on the upper-right corner are particularly important—they offer ideal and valuable future opportunities for successful and speedy structural change, but they are all far from the current capability set.

The analysis reveals that while it is relatively easy to venture into investing in low-hanging fruits, doing so will only result in a modest improvement in the export basket. These nearby products have limited spillover impacts and are insufficient to accelerate structural transformation. In the long run, it is more worthwhile to consider some of the middle-distance and far-

Figure 2.7: Unexploited Export Products of the Lao PDR



Lao PDR = Lao People’s Democratic Republic.

Sources: Estimates based on World Bank. World Development Indicators. <http://data.worldbank.org/data-catalog/world-development-indicators> (accessed March 2017); and United Nations Commodity Trade Statistics Database. <http://comtrade.un.org/db/default.aspx>

away products as well. Furthermore, the capabilities in the production of these high value-added products can also be redeployed to other similar products, thereby creating the necessary spillover impacts that can draw entrepreneurs to invest in these promising but unexploited products. The move from current capabilities to middle-distant and far-away products considered as “strategic bets” will succeed only if the government is involved and can provide the missing public inputs and complementary infrastructure needed to develop new activities. In such manner, the government can encourage and engage private entrepreneurs to invest in these attractive opportunities and thus help accelerate structural transformation.

The next section discusses the realistic opportunities available to the Lao PDR, given its existing productive knowledge, to diversify and upgrade exports. This gives a picture of the nature of challenges facing the Lao PDR as it improves its export basket.

2.4 Identification of “Frontier Products” for Structural Transformation

The Lao PDR must find ways to upgrade its production structure and develop capabilities that are easily redeployed in other sectors. As noted above, its position in the product space determines its opportunities to expand the productive knowledge and accelerate structural transformation. Product space analysis implies that countries diversify by moving from the products they already produce to others that require similar productive knowledge. A highly connected patch of the product space, therefore, makes it easier to grow the economy’s complexity. Conversely, a sparsely connected patch of the product space makes it harder (Hausmann and Klinger 2006a). The Lao PDR’s position in the product space indicates that its exports are intensive in capabilities that are not easily redeployed to alternative products. Hence, to upgrade and diversify exports, it has to target not only the low-hanging fruits but also some of the medium-distant and far-away products. The next section shows how the Lao PDR can select these high potential products.

Initially, the Lao PDR can start producing products that have relatively close capabilities to those in its export basket. It can then move gradually toward producing more high value-added products. As discussed, there is always a trade-off between product complexity, distance, and opportunity gain. However, there is an efficient frontier in this trade-off, as some unexploited products are both closer to existing capabilities and have higher opportunity gain. We analyzed the Lao PDR’s efficient frontier by identifying the “frontier products,” by first selecting them based on the following criteria: (i) these new products are more complex and higher in value addition than those in the Lao PDR’s current product mix; (ii) the products are feasible given the Lao PDR’s productive knowledge; and (iii) they open paths to future diversification. Once selection is made, we follow these four consecutive steps:

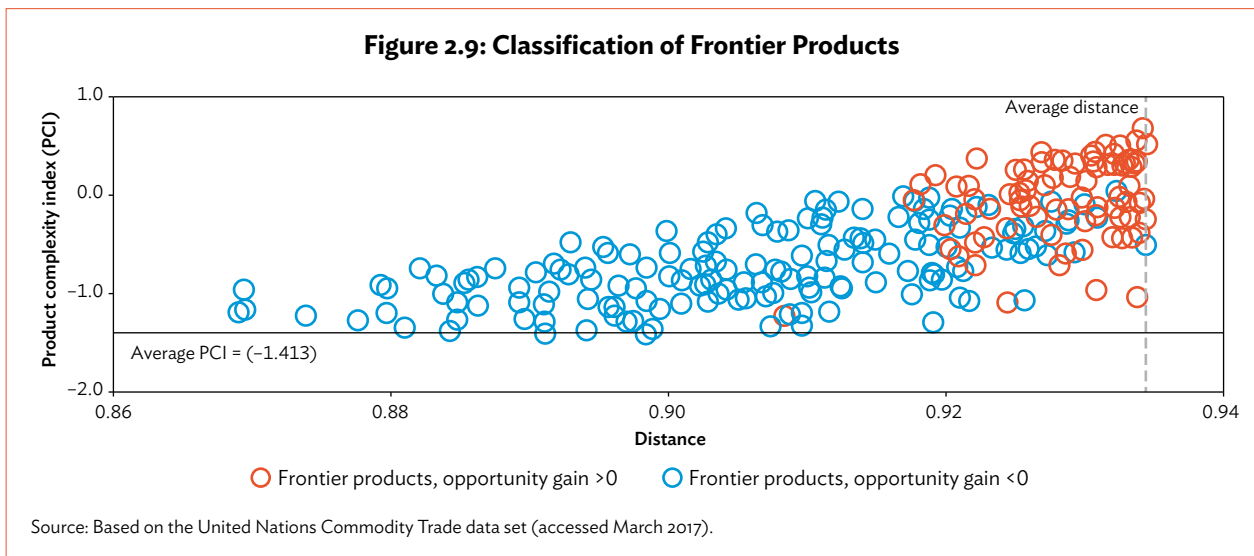
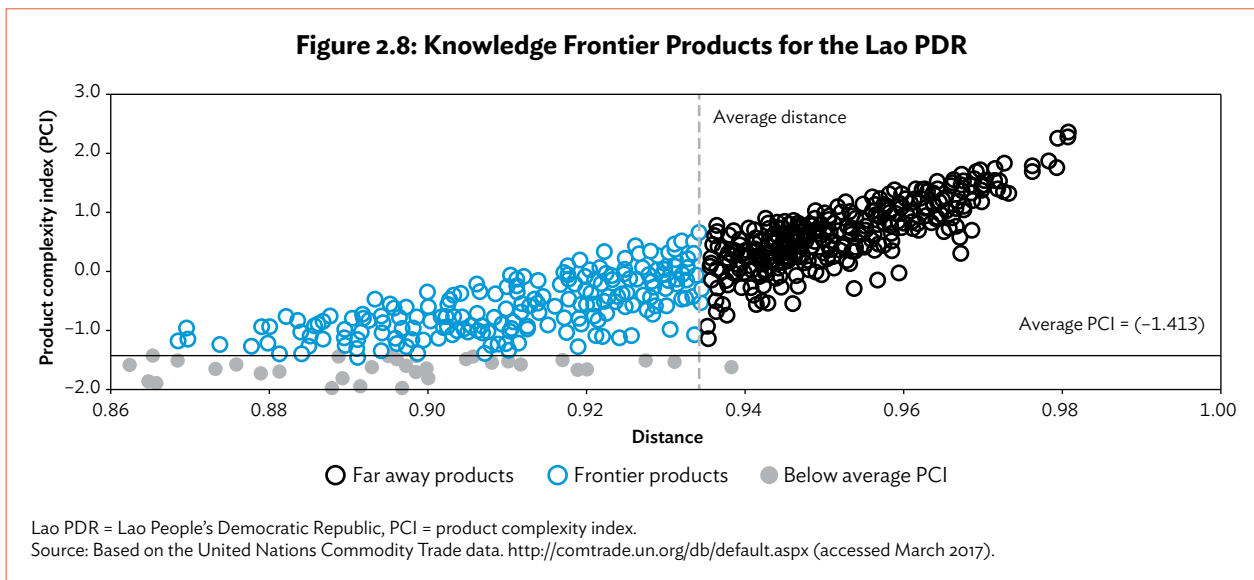
- 1) Eliminate all the products with $RCA > 1$. From the 773 distinct products featured in the United Nations SITC 4 trade data, this eliminates 60 products, leaving 713 unexploited products.
- 2) Eliminate all products with a product complexity index (PCI) below the existing average PCI (weighted) of the products the Lao PDR exports (which is -1.413 , meaning that, on average, products exported by the Lao PDR are roughly one standard deviation below the average PCI of all products exported by countries in the world). Thus, each of the remaining products, if developed, would increase the complexity of the Lao PDR’s export basket. This exercise eliminates an additional 51 products that have low PCI, leaving only 662 products.
- 3) Use distance to identify products that are more feasible given the Lao PDR’s current position in the product space. While there is no clear cutoff to what distance is feasible or not (with sufficient investment even large distances can be overcome), we use as cutoff the “average distance” of products in which the Lao PDR does not already have revealed comparative advantage. This filters out 423 products that are distant from the Lao PDR’s current capabilities, leaving 239 products that are closer to the Lao PDR’s current productive knowledge, i.e., these products are closer to its knowledge

frontier. These 239 products are then classified as “frontier products.”

Investing in these 239 frontier products increases the overall complexity of the Lao PDR’s economy, which helps to accelerate structural transformation. We then plot these frontier products according to those that offer the best combination of product complexity, distance from the existing productive knowledge, and opportunity gain. In Figure 2.8, the vertical line represents the average distance from the existing productive knowledge. The frontier products that are below the average distance are colored blue, while the products at larger distances (far-away products) are in black.

As mentioned earlier, one should look not only at product complexity but also at the value of opportunity gain when selecting frontier products. Products with positive opportunity gain in particular are instrumental in accelerating structural transformation. These products can be divided further based on their opportunity gain.

In Figure 2.9, products with positive opportunity gain are represented by red circles. There are 77 such products in the case of the Lao PDR. Investing in these products creates higher economy-wide spillover impacts that attract other entrepreneurs to venture into investing in these new products. In this way, the process of structural transformation becomes



relatively easy. In contrast, the remaining 162 products with negative opportunity gain are represented in green circles; investing in these products increases only modestly the process of structural transformation. Hence, from the long-term perspective, products with higher complexity and of the highest opportunity gain are the best candidates for bringing about rapid economic transformation.

Next, we summarize the frontier products with positive opportunity gain and list them along with the Lao PDR's current level of exports and the regional and global demand for these products, which would signify

the potential of these products in the international market. As noted, most of these products offer the best combination of product complexity and distance from the current capabilities. The analysis points out that currently only a handful of the Lao PDR's entrepreneurs are exporting these products, and in many of these products, the private sector is not involved. Table 2.5 lists the frontier products with positive opportunity gain.

We also summarize the frontier products with negative opportunity gain (Table 2.6). As discussed above, investing in these unexploited products

Table 2.5: Frontier Products with Positive Opportunity Gain, 2014

Community of Products	Number of Products	PCI Rank (average)	Global Growth, 2005–2014 (%)	Lao PDR Exports (\$ '000)	Regional Imports (\$ million)	World Exports (\$ billion)
1 Agro-Based Products						
Meat and Eggs	5	421	9.4	—	1,127	35,583
Cereals and Vegetable Oils	4	454	15.6	—	148	22,811
Beer, Spirits, and Cigarettes	3	517	6.1	2,440	2,775	41,949
Food Processing	2	417	9.6	7	5,254	53,575
Milk and Cheese	2	413	7.5	—	1,053	45,614
Animal Fibers	1	640	5.9	—	11	385
Miscellaneous Agriculture	1	563	9.7	—	4	529
2 Construction Materials, Metal, and Wood Products						
Metal Products	9	364	6.3	417	7,636	108,709
Wood Products	4	361	4.5	1,541	1,994	56,990
Construction Materials	2	405	4.4	—	321	8,439
3 Chemical Products						
Other Chemicals	4	338	4.0	2,758	4,206	75,619
Agrochemicals	2	406	9.1	—	1,506	32,932
Inorganic Salts and Acids	2	517	6.1	0	1,835	19,775
Petrochemicals	1	391	7.7	260	7,150	83,672
4 Machinery and Electronics						
Machinery	5	373	5.8	2,156	2,846	51,880
Electronics	1	451	6.1	274	3,303	42,132
5 Other Products						
Textile and Fabrics	6	357	2.5	26	5,886	52,077
Home and Office Products	5	425	5.2	16,481	8,729	235,984
Garments	4	535	7.1	3,060	2,455	68,773
Processed Minerals	3	347	5.5	14	893	18,315
Minerals	2	522	6.0	59	395	6,908
Leather	1	466	(1.1)	—	18	724
Mining	1	628	3.8	—	87	14,697
Pulp and Paper	1	438	6.2	—	153	2,647
Rubber Products	1	576	4.0	—	1	317
Ships	1	434	0.2	32	2,025	30,420
Not Classified	4	444	9.2	549	2,933	37,824
TOTAL	77	417	5.9	30,073	64,746	1,149,280

(-) = negative, — = zero, Lao PDR = Lao People's Democratic Republic, PCI = product complexity index.
Source: Computations based on the United Nations Commodity Trade data set (accessed March 2017).

Table 2.6: Frontier Products with Negative Opportunity Gain, 2014

Community of Products	Number of Products	PCI Rank (average)	Global Growth, 2005-2014 (%)	Lao PDR Exports (\$ '000)	Regional Imports (\$ million)	World Exports (\$ billion)
1 Agro-Based Products						
Food Processing	16	521	6.8	4,571	9,520	240,858
Cereals and Vegetable Oils	9	528	8.4	215	5,833	72,638
Fish and Seafood	9	674	6.2	22	5,681	100,743
Miscellaneous Agriculture	7	551	7.5	33	3,029	44,272
Meat and Eggs	5	567	7.3	—	3,036	57,775
Fruit	4	614	6.1	49	1,707	29,810
Tropical Agriculture	3	634	4.5	289	284	25,460
Cotton, Rice, Soybeans, and Others	3	664	7.7	—	137	3,605
Raw Hides and Wool	2	591	6.8	—	282	7,129
Animal Fibers	2	676	1.6	—	95	1,224
2 Garments, Textiles, and Leather						
Garments	23	604	4.9	40,572	14,052	343,110
Textile and Fabrics	13	619	1.4	5,499	7,340	67,169
Leather	3	636	4.5	136	3,349	32,468
3 Construction Materials, Metal, and Wood Products						
Construction Materials	4	494	3.2	2	2,016	42,446
Wood Products	6	492	2.9	2,639	1,034	57,066
Metal Products	11	544	4.8	14,185	22,115	297,824
4 Mining and Minerals						
Processed Minerals	8	647	9.6	1,221	1,812	76,614
Mining	5	637	6.7	4,957	2,601	52,229
Coal	3	678	8.1	845	4,384	110,208
5 Chemical Products						
Inorganic Salts and Acids	3	496	6.6	—	2,050	18,372
Agrochemicals	3	618	8.3	18	3,188	41,665
Other Chemicals	2	502	7.8	157	268	4,507
Petrochemicals	1	437	7.1	1,246	4,289	38,580
Chemicals and Health-Related Products	1	571	8.1	—	64	1,636
6 Other Products						
Home and Office Products	3	477	5.3	199	1,367	41,399
Oil	1	557	12.6	—	1,411	23,037
Rubber Products	1	444	9.4	—	77	568
Ships	1	646	17.0	—	1	1,934
Beer, Spirits, and Cigarettes	1	633	7.6	—	4,032	49,545
Not Classified	9	457	14.5	11,656	175,492	1,598,910
TOTAL	162	522	5.9	88,510	280,544	3,482,799

— = zero, Lao PDR = Lao People's Democratic Republic, PCI = product complexity index.

Source: Computations based on the United Nations Commodity Trade data set (accessed March 2017).

would result in only a modest increase in the speed of structural transformation.

2.4.1 Selection of Priority Products

To select the Lao PDR's priority products from the list of frontier products, it is important to consider product complexity, distance from the current capabilities, and

the opportunity gain. These characteristics should also be combined with information about the demand for these products in the regional and world market. To do this, we first concentrate on low-hanging fruits and take all the products beyond a certain threshold based on their standard deviation from the mean for all unexploited products. We also limit the list to frontier products that are already being exported by the Lao PDR entrepreneurs. This basically means

that the private sector has already acquired certain important capabilities; hence, further investment in these potential areas may help accelerate structural transformation.

First, we pick all the frontier products with a 1.5-standard deviation below the mean, listing them along with their complexity level, the current export value, and the demand for these in the regional and global market. These products have higher complexity and also offer good possibilities for future diversification. It must be emphasized that the data-driven approach is not meant for “picking winners,” but should rather be treated as an initial step in identifying potential areas for investments. This may provide the government with a platform to engage private entrepreneurs in meaningful dialogue and get insights on product-specific constraints. Addressing the

identified constraints helps the government to engage the private sector and boost structural transformation. Table 2.7 lists the nearby frontier products.

Besides being relatively close to the Lao PDR’s current capabilities, the selected frontier products also represent valuable investments and have large market potential. Grouped according to the International Standard Industrial Classification, the top nearby products or “low-hanging fruits” include several products within textile and garments. There are also attractive investment opportunities available in the food processing products. Similarly, chemical products also offer promising opportunities for export diversification. All of these products have a large regional and global demand. Listed below are the major themes that emerged from this analysis and offer opportunities to expand investments:

Table 2.7: Option 1, Nearby Frontier Products, 2014 (1.5 standard deviation below mean)

	ISIC	ISIC Description	SITC	Description	PCI Rank	Opportunity Gain Rank	Lao PDR Exports (\$'000)	World Exports (\$ billion)	Regional Imports (\$ million)	
1	151	Food Processing	1	0565	Vegetables	603	688	0.1	15.4	272.2
			2	0589	Prepared fruit	578	689	2,462.7	13.0	349.1
			3	0814	Inedible flours of meat and fish	685	655	0.9	6.4	947.7
3	172	Other Textiles	4	6584	Linens	678	629	461.5	22.4	251.5
			5	6589	Misc. textile articles	671	665	3,541.9	14.9	284.3
4	181	Garments	6	8421	Men’s coats	598	642	106.4	3.0	13.4
			7	8431	Women’s coats	589	638	404.0	12.7	93.8
			8	8433	Dresses	585	657	427.5	12.5	201.7
			9	8434	Skirts	630	672	223.9	3.9	51.8
			10	8435	Blouses	665	667	1,172.2	14.4	247.8
			11	8442	Men’s underwear	657	681	125.5	1.0	13.8
			12	8451	Knitted outerwear	666	675	13,584.2	53.8	331.6
			13	8452	Women’s knitted outerwear	622	687	1,222.7	11.5	119.2
			14	8464	Undergarments of other fibers	610	691	120.6	0.5	60.3
			15	8465	Lingerie	601	619	2,446.4	10.9	233.3
6	242	Other Chemical Products	16	8472	Knit clothing accessories	591	668	2,040.9	13.6	151.2
			17	5513	Essential oils	624	690	214.7	3.9	314.9
7	313	Insulated Wire and Cable	18	7731	Electric wire	532	625	14,124.0	105.5	5,507.5

ISIC = International Standard Industrial Classification, Lao PDR = Lao People’s Democratic Republic, PCI = product complexity index, SITC = Standard International Trade Classification.

Note: The table shows all unexploited products ($RCA < 1$) by the Lao PDR in 2014, excluding those (i) for which the PCI is less than the average PCI; (ii) forestry products, mining and quarrying products, and special transactions; (iii) that have no export value; and (iv) products with a distance that is not at most 1.5 standard deviation above the mean for all unexploited products. The remaining products meeting the above criteria were combined into ISIC Revision 3 sectors, weighted by 2014 world exports.

Sources: Estimates based on United Nations Commodity Trade Statistics Database. <http://comtrade.un.org/db/default.aspx> (accessed December 2015); and United Nations Statistics Division. Correspondence between ISIC Rev. 2 and ISIC Rev. 3. <http://unstats.un.org/unsd/cr/registry/regso.asp?Ci=1&Lg=1>

1. Textile and garments (172, 181)¹⁹
2. Food processing (151)
3. Chemicals (241, 242)
4. Insulated wire and cable (313)

These products are nearby the Lao PDR's existing capabilities. More importantly, private entrepreneurs are already engaged in exporting these products. The last two columns of Table 2.7 provide information on their global and regional demand, which suggests that the Lao PDR has good prospects in improving economic complexity by expanding investments in these products.

However, as noted, the nearest products do not necessarily lead to the development of new and enhanced capabilities that result in speedy structural transformation. Therefore, the government can also opt to choose from the more distant products. To explore more high value-added products that are farthest away from the Lao PDR's current capabilities, we repeat the analysis by decreasing the minimum distance from 1.5 to 1.0 standard deviation. This helps to pick more products in addition to those already identified. Table 2.8 lists these additional frontier products.

Table 2.8: Option 2, Middle-Distance Products, 2014 (1.0 standard deviations from mean distance)

ISIC	ISIC Description	SITC	Description	PCI Rank	Opportunity Gain Rank	Lao PDR Exports (\$ '000)	World Exports (\$ billion)	Regional Imports (\$ million)
1 011	Crop Farming	0571	Oranges	655	694	12.7	8.9	545.0
		0572	Misc. citrus	611	661	35.2	4.0	58.8
		2926	Live plants	614	592	45.3	9.4	110.5
		2927	Flowers	689	622	207.3	9.4	78.0
2 151	Food Processing	0371	Misc. fish	660	673	1.1	14.6	373.9
		0561	Dried vegetables	576	624	112.5	2.7	228.5
		0583	Fruit jams	504	645	65.8	2.6	72.1
		0585	Fruit or vegetable juices	567	682	84.6	15.7	298.8
		0586	Temporarily preserved fruit	561	685	0.1	4.6	40.0
4 154	Other Food Products	0620	Confectionary sugar	510	621	8.8	9.9	369.0
5 155	Beverages	1110	Misc. beverages	511	594	25.1	19.2	705.0
6 171	Textiles	6522	Finished cotton fabrics	635	631	113.4	15.4	2,617.9
		8443	Women's underwear	626	648	2.5	1.0	17.1
7 181	Garments	8461	Wool undergarments	619	579	1.3	0.6	8.3
		8471	Textile fabrics clothing accessories	642	559	406.5	8.0	605.5
		8510	Footwear	581	586	17,612.3	115.3	1,772.7
8 192	Footwear	6575	Ropes and cables	544	662	8.6	3.6	348.0
		6597	Plaited products	680	613	4.0	0.5	6.1
9 210	Paper Products	6423	Notebooks	530	653	10.3	4.0	91.0
10 222	Printing Services	5541	Soaps	621	702	12.0	5.6	327.5
11 242	Other Chemical Products	8931	Plastic storage containers	473	582	4,799.3	49.2	2,508.5
12 252	Plastics Products	6651	Glass bottles	514	606	33.7	8.9	286.4
13 261	Glass Products	6611	Lime	566	630	0.9	1.0	53.9
		6613	Worked building stone	605	664	1.9	11.4	310.8
14 269	Nonmetallic Mineral Products, nec	2690	Rags	553	536	72.5	3.7	313.2
15 369	Other Manufacturing							

ISIC = International Standard Industrial Classification, Lao PDR = Lao People's Democratic Republic, nec = not elsewhere classified, PCI = product complexity index, RCA = revealed comparative advantage, SITC = Standard International Trade Classification.

Note: Table shows all unexploited products (RCA < 1) by the Lao PDR in 2014, excluding those (i) for which the PCI is less than the average PCI; (ii) forestry products, mining and quarrying products, and special transactions; (iii) that have no export value; and (iv) products with a distance that is not at most 1.0 standard deviation above the mean for all unexploited products. The remaining products meeting the above criteria were combined into ISIC Revision 3 sectors, weighted by 2014 world exports.

Sources: Estimates based on the United Nations Commodity Trade Statistics Database. <http://comtrade.un.org/db/default.aspx> (accessed December 2015); and United Nations Statistics Division. Correspondence between ISIC Rev. 2 and ISIC Rev. 3. <http://unstats.un.org/unsd/cr/registry/regso.asp?Ci=1&Lg=1>

¹⁹ The figures in parentheses represent the international standard industrial classification codes of high-potential sectors.

The additional high broad areas that emerged out of this analysis are listed below:

1. Plastics products (252)
2. Additional food and beverages (151,154, 155)
3. Additional garments and textile products (171, 181)
4. Crop and animal farming (011)
5. Nonmetallic minerals and glass products (261, 269)
6. Printing services (222)
7. Insulated wire and cable (313)
8. Other manufacturing (369)

As we decrease the distance further and move closer to the mean distance, additional high frontier products are added to the export basket. We repeat the analysis once more and reduce the distance from 1.0 to 0.5 standard deviation from the mean. This enables us to add more high value-added products, which would further improve economic complexity. These products have even higher spillover impacts, which are particularly instrumental in enhancing structural transformation (Table 2.9).

In reducing the minimum distance approach toward the mean distance, we are able to add more high

Table 2.9: Option 3, More Advanced Middle-Distance Products, 2014
(0.5 standard deviation from mean distance)

ISIC	ISIC Description	SITC	Description	PCI Rank	Opportunity Gain Rank	Lao PDR Exports (\$'000)	World Exports (\$ billion)	Regional Imports (\$ million)	
1	011	Crop Farming	1 0575	Grapes and raisins	625	666	1.1	10.1	464.1
			2 2925	Planting seeds and spores	584	607	36.4	6.7	95.6
2	151	Food Processing	3 0546	Frozen vegetables	600	647	333.3	13.5	337.8
3	153	Grain Mill Products	4 0819	Food waste and animal feed	439	483	529.8	31.9	2,736.4
4	154	Other Food Products	5 0484	Baked goods	441	574	26.2	29.1	779.4
			6 0980	Misc. edibles	434	591	1,451.4	60.6	4,539.9
5	155	Beverages	7 1124	Liquor	545	503	119.6	27.8	2,425.6
6	171	Textiles	8 6521	Unbleached cotton woven fabrics	609	649	71.5	3.7	758.9
			9 6534	Woven <85% discon. synthetic fibers	477	534	1,714.1	6.7	2,577.2
7	172	Other Textiles	10 6560	Embroidery	479	555	64.7	6.9	1,117.8
			11 6582	Textile camping goods	606	560	0.3	3.2	63.2
			12 6592	Knotted carpets	643	580	11.6	1.1	17.0
8	181	Garments	13 8481	Leather accessories	575	601	22.5	9.5	222.3
			14 8484	Headgear	673	440	18.8	8.1	116.7
9	191	Leather Products	15 6129	Misc. articles of leather	488	571	0.4	2.6	230.5
10	210	Paper Products	16 6421	Paper office containers	486	561	50.8	20.7	892.1
11	241	Basic Chemicals	17 2711	Crude fertilizer	497	600	157.5	0.7	37.9
			18 5225	Inorganic bases	670	588	4,940.7	20.2	1,009.0
12	271	Basic Iron and Steel	19 6732	Iron bars and rods	463	513	17.7	40.3	3,640.0
			20 6783	Misc. iron tubes and pipes	462	517	36.6	30.1	2,474.7
13	281	Structural Metal Products	21 6921	Reservoir tanks	434	515	6.6	3.7	414.8
14	315	Electric Lamps and Lighting Equipment	22 8991	Carving and molding tools	529	535	99.8	1.1	57.4
			23 8997	Basketwork	521	523	108.6	9.2	330.2
15	331	Medical Equipment	24 8212	Medical furniture	453	526	137.8	16.6	383.9
16	369	Other Manufacturing	25 8993	Candles and matches	431	548	3.9	5.1	130.8

ISIC = International Standard Industrial Classification, Lao PDR = Lao People's Democratic Republic, PCI = product complexity index, RCA = revealed comparative advantage, SITC = Standard International Trade Classification.

Note: The table shows all unexploited products (RCA < 1) by the Lao PDR in 2014, excluding those (i) for which the PCI is less than the average PCI; (ii) forestry products, mining and quarrying products, and special transactions; (iii) that have no export value; and (iv) products with a distance that is not at most 0.5 standard deviation above the mean for all unexploited products. The remaining products that meet the above criteria were combined into ISIC Revision 3 sectors, weighted by 2014 world exports.

Sources: Estimates based on the United Nations Commodity Trade Statistics Database. <http://comtrade.un.org/db/default.aspx> (accessed December 2015); and United Nations Statistics Division. Correspondence between ISIC Rev. 2 and ISIC Rev. 3. <http://unstats.un.org/unsd/cr/registry/regso.asp?Ci=1&Lg=1>

value-added products. Below are additional areas that emerged from our analysis:

1. Additional food products (151, 153, 154)
2. Additional textile and garment products (171, 172, 181)
3. Metal products (271, 281)
4. Electrical lamps and lighting equipment (315)
5. Medical instruments (331)
6. Additional chemical products (241)

The list of the frontier products mentioned above provides various investment opportunities to diversify the economy. The data-driven method used to choose the frontier products ensures that the selected products are close to the Lao PDR's current capabilities. To diversify the economy, the government can target selected products that offer the best combination of economic complexity, distance, and opportunity gain. The analysis also suggests that while large numbers of unexploited opportunities are available, only a handful of entrepreneurs are currently engaged in exporting these products. Furthermore, regional and global demand for these products is quite high, suggesting good prospectus for future investments. However, this raises important questions: why are only a few of Lao PDR's entrepreneurs engaged in the production of these high value-added products? Why have other entrepreneurs not been attracted to such promising opportunities?

Initiating an effective public-private dialogue can help the government understand the factors that have held the private sector back. This would also enable the government to know whether the right kind of infrastructure is in place, and determine perhaps if problematic regulations are holding them back. Similarly, dialogues with the private sector can also clarify if the appropriate skills needed for such an investment are lacking. By opening effective communication with the private sector, the government can learn about product-specific constraints, and by providing the missing public inputs help induce domestic and foreign investors to upscale investments (Hausmann and Klinger 2008). However, the success of such "strategic bets" would hinge critically upon enhancing the capacity of existing institutions and on creating new institutions. Additionally, this would

involve capacity building of the various government institutions and improvement in the stock of human capital.

2.5 Policy Implications for the Lao PDR

The analysis discussed above highlights the importance of accumulating productive capabilities, which plays an important role in economic diversification and structural transformation. While it is important to develop new and high-productivity activities, the move from traditional to modern sectors does not happen solely through market forces (Felipe 2015). Market failures potentially reduce the ability of the firms and entrepreneurs to invest in new and nontraditional products. But government, through providing a business-enabling environment and necessary infrastructure, can help induce the private sector to invest in these new and high value-added products.

Structural change requires a well-crafted push in which government can play an active role in persuading the private sector to invest in nontraditional products. In the absence of such an initiative, entrepreneurs may continue producing traditional products. A mix of market forces and private sector support would offer an optimal outcome. Through initiating public-private dialogue and by providing the necessary infrastructure, the government can help engage the private sector, with government providing the missing public input and removing the identified obstacles. The main objective of such a policy would be to transfer resources to more dynamic activities, which may include both the "horizontal" as well as "vertical" policies. Horizontal policies may include providing the necessary infrastructure across different sectors. Vertical policies, on the other hand, might be measures that favor a sector.

The Lao PDR can overcome the limits of its small domestic market by upgrading and diversifying its exports. The analysis of the Lao PDR's current export basket has revealed that while it comprises mainly low value-added products with little prospect in enhancing structural transformation, there are also numerous attractive and available high value-added

products that are close enough to its productive knowledge. The government, as a first step, may adopt a parsimonious approach in selecting nearby products and venture gradually into investing in the more distant products. As discussed, the government, by initiating a meaningful dialogue with the private sector, can help provide a conducive environment to upscale private investments. It is worth emphasizing that the process of dialogue should be transparent and the requests from the private sector should be made public to prevent rent-seeking. Moreover, the private sector should be willing to invest its own funds in the necessary input, so that the investment passes a market test. Public interventions should have clear criteria for success (Hausmann and Klinger 2008).

The discussion above highlights the frontier products that offer the best combinations of proximity and economic complexity. Government support for the selected products would be helpful in shifting resources from primary to modern sectors and thus lead to an increase in the overall productivity of the economy. Having identified the priority frontier products, appropriate policies should be devised to expedite private sector investment. However, as pointed out earlier, in case private investors decide to venture into investing in the more distant products, they are likely to face the absence of substantial public input. The government can help identify these public inputs through effective public–private dialogue, which would help persuade entrepreneurs to invest in these unexploited opportunities. Similarly, the government can also encourage entrepreneurs to present their business plans and together identify and understand product-specific constraints. Other measures such as providing financial support to domestic firms, revitalizing industrial zones, and collaborating with foreign firms may also be sought. The main objective of government support and the establishment of industrial zones should be to explore new opportunities, identify constraints, and offer solutions for attracting investments in high-productivity activities, all to help accelerate structural transformation and achieve inclusive growth.

2.6 Conclusions

This chapter provides a comprehensive analysis of the Lao PDR's exports and by applying the product space methodology has highlighted the importance of export diversification. The analysis suggests that for successful structural transformation, the Lao PDR needs to diversify the economy and move from traditional to new drivers of growth. While the Lao PDR has shown impressive growth performance, the greater part of its labor force remains in low-productivity sectors, which carries adverse implications for the sustainability and achievement of inclusive growth.

The analysis of the Lao PDR's product space revealed high-productivity activities through which it can expand investments. It highlighted several areas in which private entrepreneurs are already engaged in exporting frontier products. The government can initiate meaningful dialogues with the private sector to help identify and understand product-specific constraints so that entrepreneurs are encouraged to pursue these highly attractive opportunities. The analysis also revealed that adding frontier products in the export basket would increase economic complexity, particularly important in achieving sustained and inclusive growth in the long run.

Furthermore, the role of the government as facilitator is critical to successful structural transformation. Identifying product-specific constraints and subsequently providing the missing public input will help urge the private sector to engage in upscale investments. The study posits that it is equally important for the government to introduce in its medium and perspective plans the programs and policies that can instill a sense of competition within and dynamism to the private sector. Doing so can help diversify the economy and provide decent job opportunities in the modern sectors of the economy.

Appendix 2.1: Technical Notes on Complexity Concepts in Product Space

This appendix describes the methods used in calculating the economic complexity measures in this paper. The analysis is based on the export of goods using the Standard International Trade Classification (SITC) Revision 2, at 4 digits disaggregation of products. The appendix is based on the Observatory of Economic Complexity and Atlas of Economic Complexity (Hausmann 2011).

Revealed Comparative Advantages

Revealed Comparative Advantage or RCA, based on Balassa (1965), which states that a country has RCA in a product if it exports more than its “fair share,” or a share that is equal to or greater than the share of total world trade that the product represents.

If X_{cp} represents the exports of product p by country c , we can express the RCA that country c has in product p as

$$(1) \quad RCA_{cp} = \frac{X_{cp} / \sum_c X_{cp}}{\sum_p X_{cp} / \sum_c \sum_p X_{cp}}$$

This measure was used to construct a matrix that connects each country to the products it makes. It is used to construct the product space and the measure of economic complexity for a country and its products. Entries in the matrix are 1 if country c exports product p with RCA greater than 1, 0 otherwise. Formally, this is defined as the M_{cp} matrix, where

$$(2) \quad M_{cp} = \begin{cases} 1 & RCA_{cp} \geq 1 \\ 0 & otherwise \end{cases}$$

Diversity and Ubiquity

From equation (2), we can measure diversity and ubiquity simply by summing up the rows or columns of that matrix. Diversity is the number of different products a country can produce and ubiquity is the number of countries able to make those products. Formally, we define them as:

$$(3) \quad \text{Diversity} = k_{c,0} = \sum_p M_{cp}$$

$$(4) \quad \text{Ubiquity} = k_{p,0} = \sum_c M_{cp}$$

Complexity Indexes

To determine the complexity index, a country's diversity is refined by the ubiquity of those products. To generate a more accurate measure of economic complexity, the information was corrected that diversity and ubiquity carry by using each to correct the other. To do this, we look at the diversity of countries that make those products and the ubiquity of the products those countries make. Equations for diversity (3) and ubiquity (4) were used to express the recursion:

$$(5) \quad k_{c,N} = \frac{1}{k_{c,0}} \sum_p M_{cp} \cdot k_{p,N-1}$$

$$(6) \quad k_{p,N} = \frac{1}{k_{p,0}} \sum_c M_{cp} \cdot k_{c,N-1}$$

We then insert equation (6) into (5) to obtain:

$$(7) \quad k_{c,N} = \frac{1}{k_{c,0}} \sum_p M_{cp} \frac{1}{k_{p,0}} \sum_c M_{cp} \cdot k_{c,N-2}$$

$$(8) \quad k_{c,N} = \sum_c k_{c,N-2} \sum_p \frac{M_{cp} M_{cp}}{k_{c,0} k_{p,0}}$$

And rewrite this as:

$$(9) \quad k_{c,N} = \sum_c \tilde{M}_{cc} \cdot k_{c,N-2}$$

Where:

$$(10) \quad \tilde{M}_{cc} = \sum_p \frac{M_{cp} M_{cp}}{k_{c,0} k_{p,0}}$$

Note that equation (10) is satisfied when $k_{c,N} = k_{c,N-2}$. This is the eigenvector of \tilde{M}_{cc} , which is associated with the largest eigenvalue. Since this eigenvector is a vector of ones, it is not informative. Instead, look for the eigenvector associated with the second-largest eigenvalue. This is the eigenvector that captures the largest amount of variance in the system and is the measure of economic complexity. Hence, we define the economic complexity index (ECI) as:

$$(11) \quad ECI = \text{eigenvector associated with second largest eigenvalue } \tilde{M}_{cc}$$

Where \tilde{M}_{cc} is given by (10).

Analogously, a product complexity index is defined. Because of the symmetry of the problem, this is done by exchanging the index of country **c** with that for products **p** (\tilde{M}_{pp}) in the definitions above.

$$(12) \quad PCI = \text{eigenvector associated with second largest eigenvalue } \tilde{M}_{pp}$$

Proximity and Path

If every country that exports a product also exports another product, then these two products must involve similar capabilities. On the other hand, if every country that exports a product does not export another product, then these two products must involve different capabilities. This led to the use of conditional probabilities to measure the similarity between the two products. Proximity is measured as the minimum between the probability that countries export product **p** given that they already export product **r**; and the probability that countries export product **r** given that they already export product **p**. The reason for taking the minimum of the two probabilities is to reduce the likelihood that the relationship is false and to create a symmetric measure of distance for a pair of products. Formally, the proximity between products is defined as:

$$(13) \quad \phi_{p,p'} = \frac{\sum_c M_{cp} M_{cp'}}{\max(\sum_c M_{cp}, \sum_c M_{cp'})} = \frac{\sum_c M_{cp} M_{cp'}}{\max(k_{p,0}, k_{p',0})}$$

For each product, the measure of strength of its linkages with other products is computed by simply adding up the proximities leading to that product. This index, called path, shows which products are in a dense part of the product space, and which are on the periphery. Path is defined as:

$$(14) \quad \text{Path} = \sum_p \phi_{p,p'}$$

Capability Distance, Opportunity Value, and Opportunity Gain

Capability distance measures the proportion of knowledge necessary for a product that the country does not have. The knowledge that the country does have is measured by the proximity between products it is currently making and the product of interest **p**. The knowledge it does not have is measured by the proximity between products it is not making and the product of interest **p**. Therefore, capability distance is calculated as the sum of the proximities between good **p** and all the products that country **c** is not currently exporting, normalized by the sum of proximities between all products and product **P**. Distance is defined as:

$$(15) \quad \text{Distance}_{cp} = \frac{\sum_{p'} (1 - M_{cp'}) \phi_{p,p'}}{\sum_{p'} \phi_{p,p'}}$$

Opportunity value is a measure of how many different products are near a country’s current set of productive capabilities. Countries with a high opportunity or complexity outlook have an abundance of nearby products due to the composition of their current export basket. Development of new industries would be easier for these countries and adds or acquires more missing capabilities necessary to produce. Countries with a low opportunity or complexity outlook have minimal nearby products and will find it difficult to acquire new capabilities and increase their economic complexity.

Distance then is used to calculate opportunity value (OV). The sum of “closeness” was taken, i.e., 1 minus the distance to the products that the country is not currently making, weighted by the level of complexity of these products. Mathematically, this is written as:

$$(16) \quad OV_c = \sum_{p'} (1 - d_{cp'}) (1 - M_{cp'}) PCI_p$$

Where PCI is the product complexity index of product **p**. The term $(1 - M_{cp'})$ makes sure that we count only the products that the country is not currently producing.

Higher opportunity value implies being in the vicinity of more products and/or of products that are more complex. Opportunity value is used to calculate the potential benefit to a country if it were to move to a particular new product. This metric is the opportunity gain (OG) that country c would obtain from making product p . This is calculated as the change in opportunity value that would come as a consequence of developing product p . Opportunity gain quantifies the contribution of a new product in terms of opening up the doors to more and more complex products. Formally, opportunity gain is written as:

(17)

$$OG_{cp} = \left[\sum_{p'} \frac{\phi_{pp'}}{\sum_{p''} \phi_{p''p'}} (1 - M_{cp'}) PCI_{p'} - (1 - d_{cp}) PCI_p \right]$$

Chapter 3

Unlocking Agricultural Growth in the Lao People's Democratic Republic

3.1 Introduction

Most of the people of the Lao People's Democratic Republic (Lao PDR) rely on agriculture for their livelihood, and the country's households spend the most on agricultural products. This makes agriculture central to inclusive growth in the country. Fortunately, the Lao PDR has excellent agricultural potential with abundant water resources, extensive land area relative to its rural population, and close proximity to growing food markets. However, agricultural performance has lagged far behind that potential, with limited productivity, increasing import reliance (according to available statistics), and growth mainly driven by expansion of cropping into uncultivated lands. As a result, progress in poverty reduction and nutritional security has stalled, with undernourishment persisting at higher rates than in the rest of Southeast Asia. Improved agricultural productivity is essential for the Lao PDR to achieve more sustainable and inclusive economic growth, and renewed investment in productive services and infrastructure is needed to foster progress toward better productivity.

This chapter investigates the Lao PDR's agricultural performance and attempts to identify productive investments that can unlock faster growth. It (i) reviews the importance of agriculture to inclusive growth, (ii) identifies the Lao PDR's agricultural potential and comparative advantage, (iii) assesses actual agricultural performance against that potential, (iv) reviews the policy context for agriculture, (v) identifies constraints to agricultural development, (vi) empirically tests the effects of measures to address those constraints, and (vii) offers policy recommendations.

Investing in agriculture is essential for inclusive growth

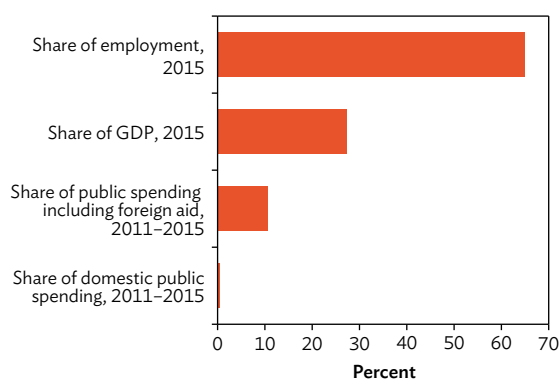
It is well recognized in development economics that growth stemming from the agriculture sector has more poverty-reducing potential than nonagricultural growth, especially at early stages of economic development, when most unskilled labor is concentrated in agriculture. For example, Ligon and Sadoulet (2007) use cross-country regression to find

that a unit percentage of agricultural growth reduces poverty by three times more than nonagricultural growth, and Loayza and Raddatz (2010) identify that this effect occurs primarily when a large share of a country’s unskilled labor force engages in agriculture.

Such evidence suggests that agriculture is the most important sector for fostering inclusive growth in the Lao PDR, as it accounts for 65% of employment as of 2015 (Figure 3.1). This share of the workforce in agriculture is among the highest in the world, and

exceeds nearly all of developing Asia. Given that a substantial share of those employed in the Lao PDR’s agriculture are subsistence producers without net sales, a much more rapid rate of agricultural growth is needed to allow this population to engage in the formal economy and share in overall economic growth. However, public investment in the sector has remained low, and development assistance has driven most expenditure. Domestic public spending on agriculture, including infrastructure, has been very limited in comparison.

Figure 3.1: Agricultural Share of Employment, GDP, and Public Expenditure in the Lao PDR



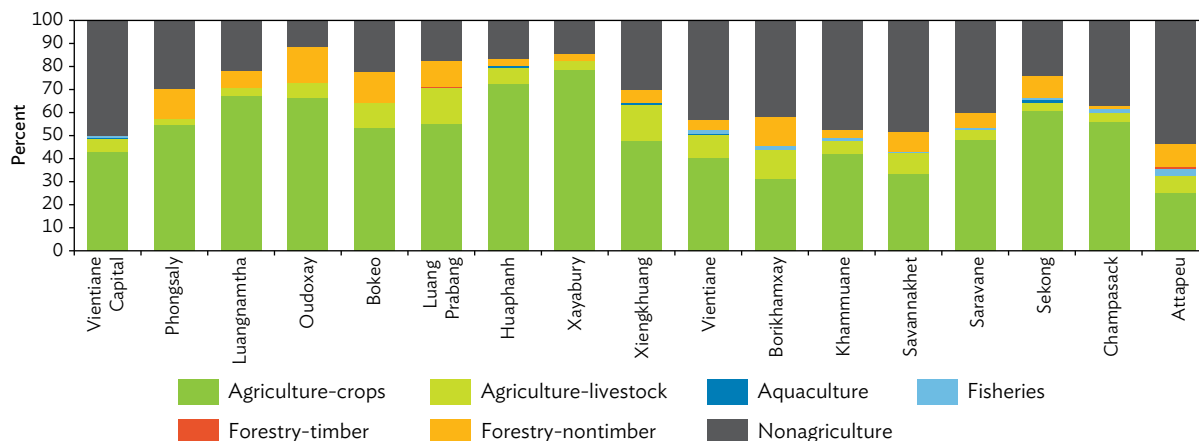
GDP = gross domestic product, Lao PDR = Lao People’s Democratic Republic.

Sources: Authors’ calculations based on data from World Bank. World Development Indicators. <http://data.worldbank.org/data-catalog/world-development-indicators>; ADB. *Key Indicators for Asia and the Pacific 2016*. Manila; and Ministry of Agriculture and Forestry. 2015. *Agriculture Development Strategy to the year 2025 and Vision to 2030*. Vientiane.

At the same time, agriculture is essential to the livelihoods of the majority of the population in the Lao PDR. The main source of rural household income in the country is agriculture (67%), of which the majority is earned from crop production, followed by livestock and forestry. Although agriculture provides the largest share of national household income, its contribution differs geographically. Figure 3.2 shows that income from agriculture is largest among the northern provinces, while income sources are mixed in the central and southern regions. However, even in regions with higher proximity to urban centers, capital cities, and neighboring borders, the share of agriculture remains high.

Agricultural products also remain the largest object of household expenditure—food accounts for 50% of household consumption for the general population and nearly 60% of consumption for low-income

Figure 3.2: Sources of Household Income by Province in the Lao PDR, 2010-2011



Lao PDR = Lao People’s Democratic Republic.

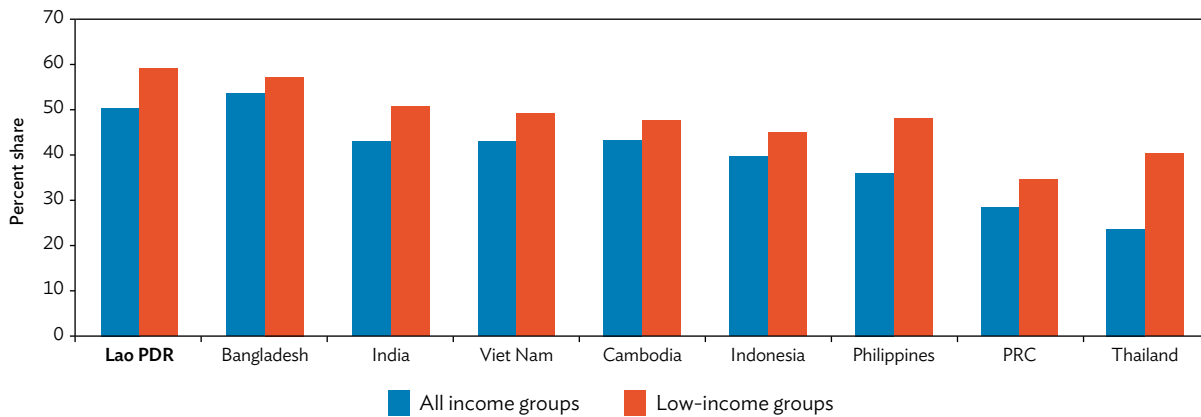
Source: Authors’ analysis of data from Ministry of Agriculture and Forestry. 2014. *Lao PDR: Lao Census of Agriculture 2010/11 – Analysis of Selected Themes*. Vientiane.

households (Figure 3.3). These are among the highest shares of food consumption in developing Asia. About 50% of food consumption value is for rice, a single staple commodity, which is consumed in exceptionally large quantities in the Lao PDR. This means that the population is heavily exposed to the effects of food prices, especially for rice. Given that rice and many other major food items are thinly traded, prices are conditioned by domestic supply and agricultural productivity. As a result, broad-based agricultural growth can boost the purchasing power of the poor, both by enhancing incomes and by reducing the unit costs of most household expenditures.

Agriculture is the sector in which the poor are concentrated. The poverty rate of those engaged in agriculture is nearly three times higher than those working in other sectors (Figure 3.4).

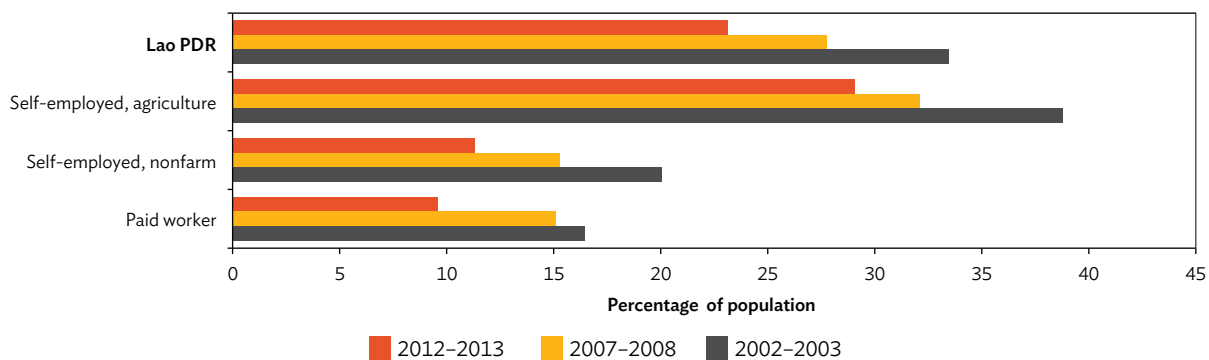
Perhaps more strikingly, the decline in poverty for those working in agriculture has been slower than for those employed elsewhere. The transformation of the Lao PDR into a middle-income country depends on the improvement of the population’s livelihood opportunities, and given the Lao PDR’s resource endowments, a more productive agriculture sector offers enormous unrealized potential to do so.

Figure 3.3: Share of Food in Total Household Consumption Expenditure, National Average versus Low Income, in 2011 PPP



Lao PDR = Lao People’s Democratic Republic, PPP = purchasing power parity, PRC = People’s Republic of China.
 Source: Authors’ analysis of data from ADB. Global Consumption Database.

Figure 3.4: Poverty Headcount Rate by Main Employment Status of Household Head, Lao PDR, 2002–2003, 2007–2008, 2012–2013



Lao PDR = Lao People’s Democratic Republic.
 Source: O. Pimhidzai, N. C. Fenton, P. Souksavath, and V. Sisoulath. 2014. Poverty Profile in Lao PDR: Poverty Report for the Lao Consumption and Expenditure Survey 2012–2013. Washington, DC: World Bank Group.

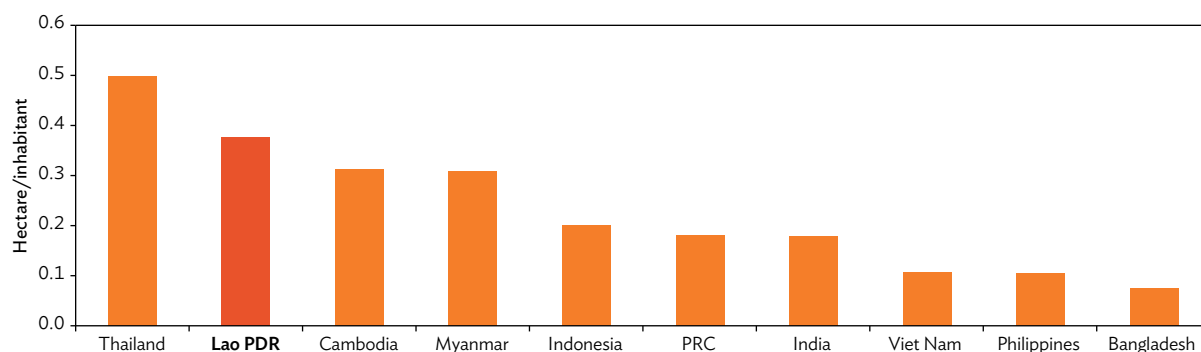
3.2 Potential of the Agriculture Sector

The Lao PDR has abundant land relative to its population, and is well positioned for agricultural potential. The country's total agricultural area, as defined by the Ministry of Agriculture and Forestry, covers about 4.5 million hectares (ha), of which 3.8 million ha is potentially suitable for cultivation (MAF 2015). Under international definitions of arable land, which refer to land already under temporary crops, transient meadows, and fallows of limited duration, about 1.5 million ha is classified as arable. Under either definition, available agricultural land per rural inhabitant is greater than much of Asia, which is a crucial advantage, given that land is the most important input for agriculture (Figure 3.5).

In addition to a generous arable land endowment, the Lao PDR has 650,000 ha of pasture and meadow lands that can benefit livestock, as well as nearly 11 million ha of forest that offer a range of environmental services and forest products. Along with land, water is the most important natural resource for agricultural potential, and it is a scarce resource that faces increasing demand. The Lao PDR is fortunate to have abundant water. Rainfall averages 1,600 millimeters (mm), and is relatively evenly distributed across the country (FAO 2014). When surface waters are considered, the Lao PDR has far more freshwater available per hectare of arable land than other countries in the region (Figure 3.6).

The Lao PDR is also located near one of the world's fastest growing markets for food imports, the

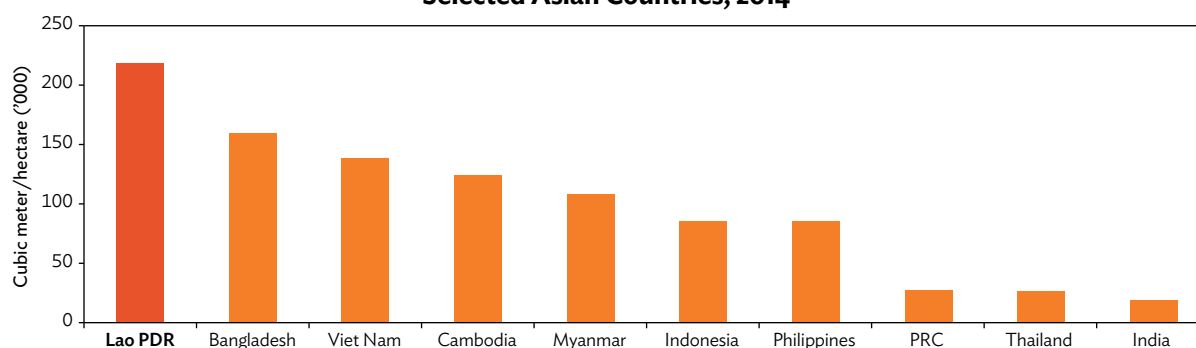
Figure 3.5: Available Arable Land per Rural Inhabitant, Selected Asian Countries, 2014



Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.

Source: Calculations based on data from Food and Agriculture Organization of the United Nations. AQUASTAT. <http://www.fao.org/nr/water/aquastat/main/index.stm> (accessed 15 December 2016).

Figure 3.6: Total Renewable Water Resources per Hectare of Arable Land, Selected Asian Countries, 2014



Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.

Source: Calculations based on data from Food and Agriculture Organization of the United Nations. AQUASTAT. <http://www.fao.org/nr/water/aquastat/main/index.stm> (accessed 15 December 2016).

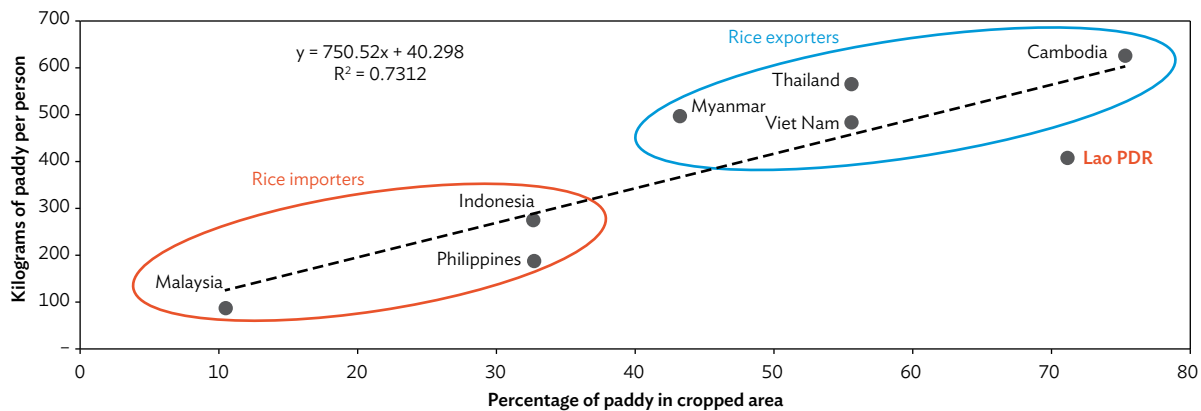
People’s Republic of China (PRC). In particular, the PRC is a growing importer of rice, the country’s principal agricultural product. It has local markets for glutinous rice, which the Lao PDR mostly produces. Considering the Lao PDR’s basic attributes, it should have good potential as an exporter of rice and other food. In fact, the Lao PDR shares crucial characteristics with Southeast Asia’s leading rice exporters, largely as a result of its generous land endowment and hydrology suitable to rice production (Figure 3.7).

3.3 Performance of the Agriculture Sector

Rice dominates the agriculture sector

Rice accounts for a large share of the value of national agricultural output (Figure 3.8). Of the top 20 commodities, rice accounts for 50% of the total value of agricultural production in 2012. Cassava follows at 7%, after which coffee and maize are 6% of the value of top products. Livestock collectively accounts for about 18% of production value.

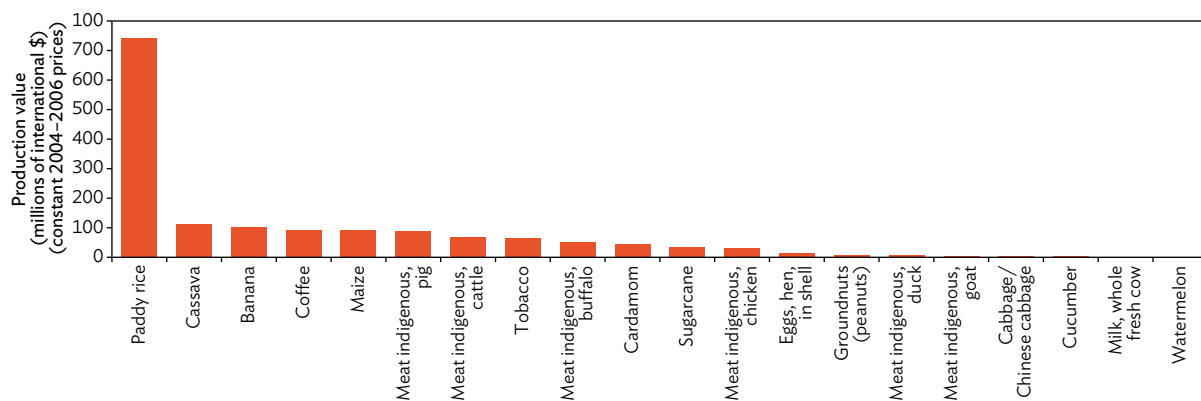
Figure 3.7: Rice Production Endowments, Southeast Asia, 2012



Lao PDR = Lao People’s Democratic Republic.

Sources: Estimates for all countries (except the Lao PDR) on total cropped area, area harvested to rice, and paddy rice production based on data from Food and Agriculture Organization of the United Nations. FAOSTAT. Crops. <http://www.fao.org/faostat/en/#data/QC> (accessed 10 March 2017); Estimates for the Lao PDR on total cropped area, area harvested to rice, and paddy rice production based on authors’ analysis of data from Lao Statistics Bureau. 2013. *Lao Expenditure and Consumption Survey 2012/13*, LECS 5. Vientiane; and visualization adapted from D. Dawe. 2013. *Geographic Determinants of Rice Self-Sufficiency in Southeast Asia*. ESA Working Paper No. 13-03. Rome: FAO.

Figure 3.8: Composition of Agricultural Production Value, 2012

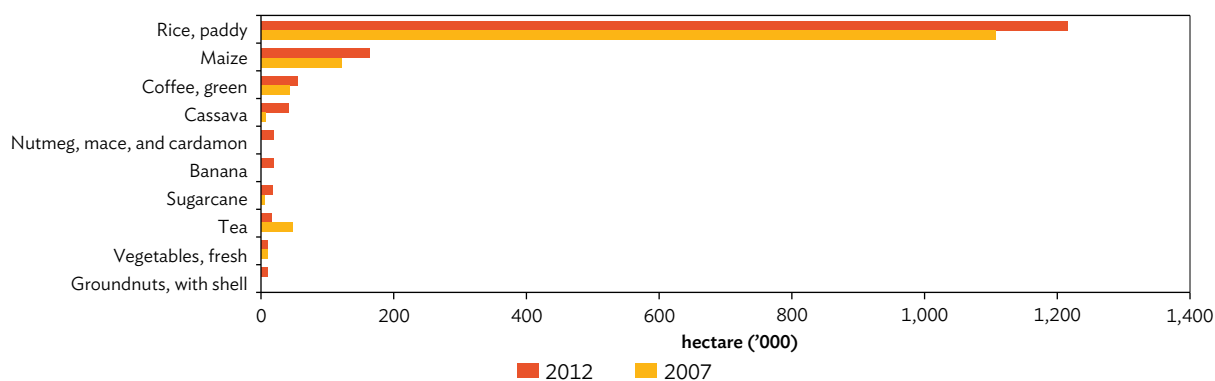


Sources: Calculations for production data on noncommercial, nonplantation crops based on data from Lao Statistics Bureau. 2013. *Lao Expenditure and Consumption Survey 2012/13*, LECS 5. Vientiane; and for price data and production data on commercial plantation crops (cassava, coffee, tobacco, sugarcane) based on data from Food and Agriculture Organization of the United Nations. FAOSTAT. Value of Agricultural Production. <http://www.fao.org/faostat/en/#data/QV> (accessed 12 December 2016).

Over 70% of cropped area is planted to rice, and this share rose between 2007 and 2012 (Figure 3.9). Other major crops grown in the Lao PDR include maize, coffee, cassava, spices, a variety of tropical fruits, and sugarcane. Most crops experienced area growth over this period, but the largest absolute growth in area was for rice, followed by maize and cassava. In contrast, tea has fallen in area.

The Lao PDR has distinct lowland, upland, plateau, and mixed agricultural systems, of which lowland systems are dominant (Table 3.1). Farming systems in the lowlands are predominantly based on rice, along with mixed cropping systems of vegetables, groundnuts, and fruit trees. Major livestock (cattle, buffalo, commercial chickens, and ducks) are also raised in the lowland areas.

Figure 3.9: Planted Area of Top 10 Crops in the Lao PDR, 2007 and 2012



Sources: Calculations for coffee, cassava, and sugarcane based on data from Food and Agriculture Organization of the United Nations, FAOSTAT. <http://www.fao.org/en/#data/RL> (accessed 22 February 2017); for all other crops based on data from Lao Statistics Bureau (LSB). 2008. Lao Expenditure and Consumption Survey 2007–2008. Vientiane; and LSB. 2013. Lao Expenditure and Consumption Survey 2012–2013. Vientiane.

Table 3.1: Farm Area by Province and Land Type, 2010–2011 (hectare)

Province	Lowland	Upland	Plateau	Mixed	Total
Northern Region					
Phongsaly	4,123	28,725	11,481	—	44,328
Luangnamtha	17,944	22,805	12,784	277	53,810
Oudomxay	11,861	62,352	21,065	—	95,277
Bokeo	24,177	7,666	14,112	—	45,954
Luang Prabang	23,623	63,995	39,327	1,568	128,513
Huaphanh	3,753	25,944	21,961	637	52,295
Xayabury	58,807	48,650	53,837	724	162,019
Central Region					
Vientiane Capital	62,036	—	12,033	1,744	75,813
Xiengkhuang	1,929	30,047	39,141	—	71,117
Vientiane	50,383	65,612	31,620	936	148,551
Borikhamxay	40,147	6,879	17,702	—	64,729
Khammuane	77,320	498	10,938	—	88,756
Savannakhet	213,635	21,651	6,179	—	241,465
Southern Region					
Saravan	82,470	7,052	28,615	—	118,137
Xekong	1,761	7,397	16,145	—	25,303
Champasack	107,137	695	37,613	—	145,446
Attapeu	25,355	2,070	1,319	333	29,076
Total	806,460	402,039	375,870	6,219	1,590,589

— = data not available.

Source: Calculations based on data from Ministry of Agriculture and Forestry. 2014. *Lao PDR: Lao Census of Agriculture 2010/11 – Analysis of Selected Themes*. Vientiane.

The highland areas are home to many ethnic minorities (e.g., the Lao Sung), whose main agricultural practices largely rely on shifting cultivation and subsistence farming. Upland cropping systems often include high quality and traditional glutinous rice varieties, maize, cassava, and vegetables. In recent years, cultivation of commercial crops, such as rubber, sugarcane, cassava, and maize, has expanded in the uplands. Livestock raising of indigenous pigs and local chickens is the most common in this area.

Rice, other crops, and livestock are all produced by a majority of farmers, so individual farms are somewhat diversified, even if aggregate output is dominated by rice. In all land types, most farms have some degree of commercialization, and sell rice, other crops, and/or livestock. Rice sales are concentrated in lowland areas, which have the most farm households, while

other crops are more concentrated in upland and plateau environments. Livestock is sold by all classes of farmers. At the same time, a substantial share of farms remain with no net sales (Table 3.2).

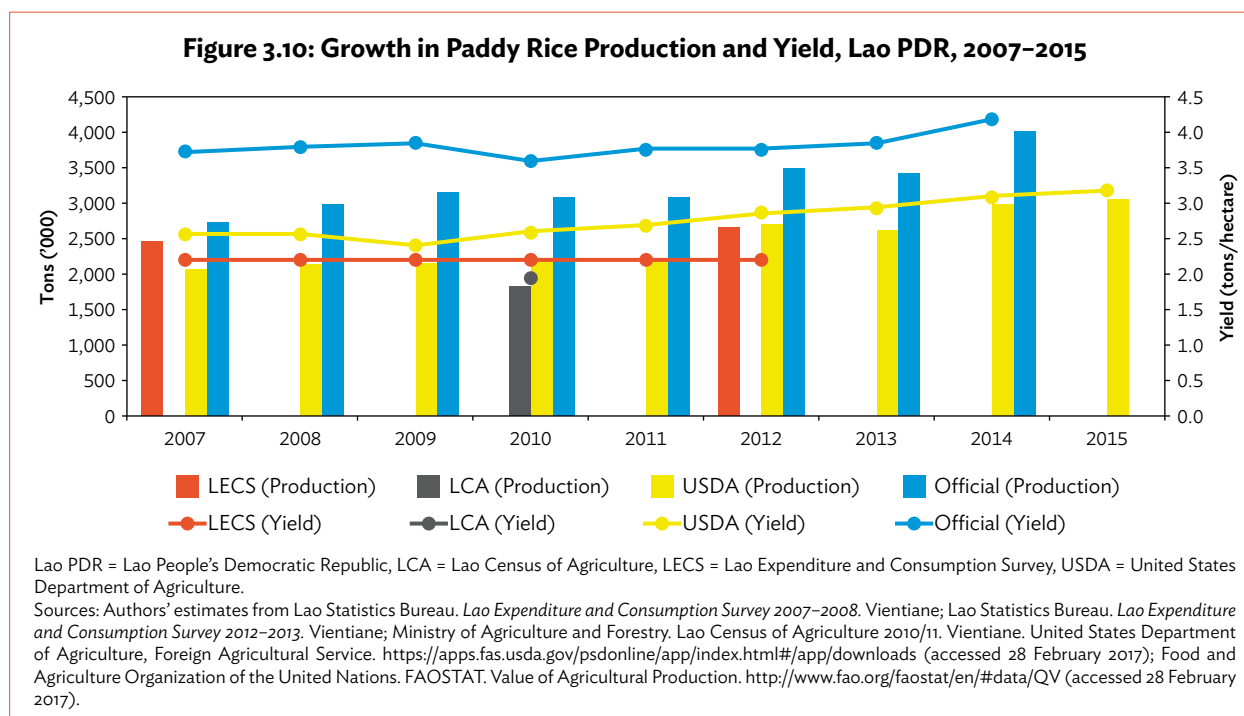
Rice productivity remains low relative to potential

According to official statistics, production growth of rice and other crops has been rapid in recent years, driven by increases in both yields and cultivated area (Figure 3.10). Rice yields in 2014 are reportedly near the Asian average at over 4 tons per hectare, and rates of yield growth are above Asian averages. Rice production is reported as well over 4 million tons, and in strong surplus, compared with consumption, which implies that the country is in a strong position for exports.

Table 3.2: Proportion of Households that Sold Rice, Crops, and Livestock, by Region, 2010–2011

Land Type	Sold Rice (%)	Sold Crops (%)	Sold Livestock (%)	No Sales (%)	Total Farm Households
Lowland	40.2	31.6	42.3	31.5	392,349
Upland	31.9	47.0	39.6	28.6	206,428
Plateau	29.0	56.9	40.7	21.9	179,408
Mixed	12.0	35.2	42.0	35.9	4,646
Total	35.3	41.5	41.2	28.6	782,831

Source: Calculations based on data from Ministry of Agriculture and Forestry, 2014. *Lao PDR: Lao Census of Agriculture 2010/11 – Analysis of Selected Themes*. Vientiane.



At the same time, official crop production statistics in the Lao PDR are based on reporting by village heads, rather than surveys of agricultural producers; and it has been noted that if actual production levels are short of targets, target figures may be reported instead (ADB 2016a). Survey-based data sources paint a very different picture of production trends (see Box 3.1 for a micro example).

The Lao Expenditure and Consumption Survey (LECS) uses a stratified random sampling framework to select a sample of 6,637 agricultural households. According to the survey, rice yields were essentially constant at 2.2 tons per hectare in 2007–2008 and 2.2 tons in 2012–2013. The Lao Census of Agriculture (LCA) in 2010–2011 actually found a still lower yield of 2.0 tons per hectare (Figure 3.10). Such yield levels are among

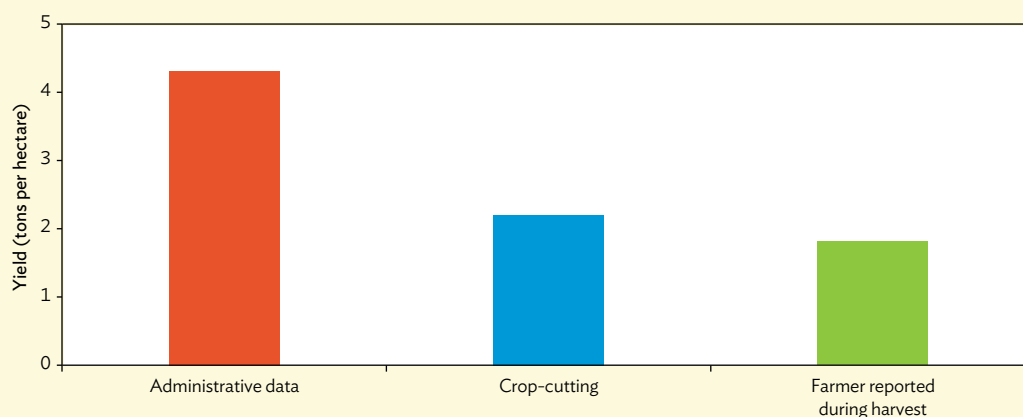
Box 3.1: Accuracy of Paddy Rice Yield Statistics – Evidence from Savannakhet Province, Lao PDR

There are discrepancies between administrative and household survey-based agricultural statistics. A technical assistance project^a conducted by the Asian Development Bank (ADB) in collaboration with the Center for Agricultural Statistics of the Ministry of Agriculture and Forestry offers additional evidence on the relative accuracy of these two statistical sources.

Under this technical assistance project, rice yield was estimated through a farmer recall survey and compared with more accurate measures based on a crop-cutting^b survey for the same set of plots in Savannakhet. A multistage stratified random sample utilizing an area frame was implemented to select the plots for this study and fieldwork was implemented during the rainy season of 2015.

Average paddy yields based on crop-cutting are estimated at 2.1 tons per hectare in Savannakhet in the rainy season of 2015, which is significantly lower than the administrative estimate of 4.3 tons per hectare (Figure B3.1.1). Recall surveys conducted during the harvest period found a yield that is closer to the crop-cutting-based measures.

Figure B3.1.1: Average Paddy Yields in Savannakhet Province during 2015 Rainy Reason, According to Different Sources



Sources: ADB estimates based on the crop-cutting and farmer recall surveys conducted under ADB. *Regional Capacity Development Technical Assistance for Innovative Data Collection Methods for Agricultural and Rural Statistics* (R-CDTA 8369). Manila; Ministry of Agriculture and Forestry. 2016. *Agricultural Statistics Yearbook 2016*. Vientiane.

The results from this study suggest that existing agricultural statistical processes may need strengthening in the Lao PDR to have more accurate estimates of the rice yield. Potential measures to do so include targeted investments in quality data, incorporation of objective measurement approaches within surveys, and improvement in statistical capacity of government agencies tasked with providing information.

Lao PDR = Lao People's Democratic Republic.

^a ADB. *Regional Capacity Development Technical Assistance for Innovative Data Collection Methods for Agricultural and Rural Statistics* (R-CDTA 8369). Manila.

^b Crop-cutting technique relies on identifying a randomized spot on a plot (a square, circle, or triangle) of a certain dimension and harvesting the crop within this spot to calculate the quantity harvested. It is considered as the gold standard for estimating yield (FAO 1982).

Source: Authors.

the lowest in developing Asia. Yields are also rising in nearly all other countries, rather than constant, as indicated by LECS in the Lao PDR (Figure 3.11).

Independent estimates by the United States Department of Agriculture (USDA) are closer to the LECS and LCA figures than to the official figures, with yields of 2.6 tons in 2007 and 2.9 tons in 2012; and USDA and LECS production estimates are nearly identical for 2012. Consistently, USDA estimates of production are 25% lower than administrative data (Figure 3.10), while LCA figures are 40% lower. Such a production difference shifts the Lao PDR from being in a position of strong rice surplus to a level sufficient only to satisfy local demand.

Indeed, the LECS data suggest that nearly all rice production growth in the Lao PDR is driven by area expansion, which is a trend that is not sustainable, given that land is a finite resource, and the government is actively seeking to expand forest cover. While survey estimates reflect no change in rice yields between 2007–2008 and 2012–2013, rice area expanded by nearly 2% annually.

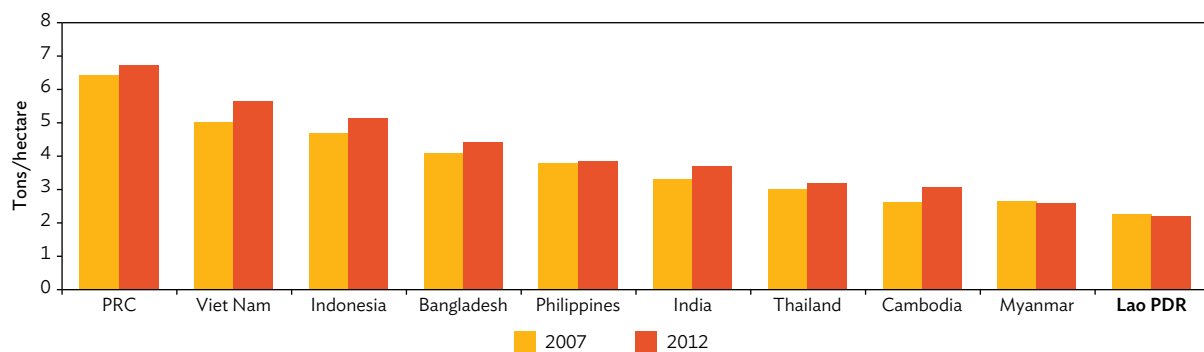
The low level of performance for rice systems according to survey data is not because of especially unfavorable conditions. Modeling of “attainable yield,” or yield that could be reached under good management practices by farmers, shows that biophysical conditions could allow similar yield levels

to leading rice producers, such as Viet Nam. Even without changing the extent of irrigation, attainable yields can be doubled, and with irrigation in place, it could be tripled relative to survey-based estimates. The gap between actual and attainable rice yield in the Lao PDR is the highest in the region (Figure 3.12).

The Lao PDR’s cropping intensity, or the ability to crop multiple seasons within a calendar year, similarly trails most of the rest of the region (Figure 3.13). Within the Lao PDR, the cropping intensity for irrigated areas is 138%, meaning that only about 38% of irrigated area can be cultivated in both wet and dry seasons. This compares with values of up to 200% in comparator countries. Low cropping intensity means that far more land is needed for crop output, placing more pressure on natural ecosystems. As most irrigated area is cropped with rice, this also means that rice cropping intensity is low. Only 4% of wet season rice area is also cultivated in the dry season (FAO 2014). As a result, not only is more area needed, but the greater solar radiation of the dry season, which allows more productive potential, remains unutilized, depressing average yields.

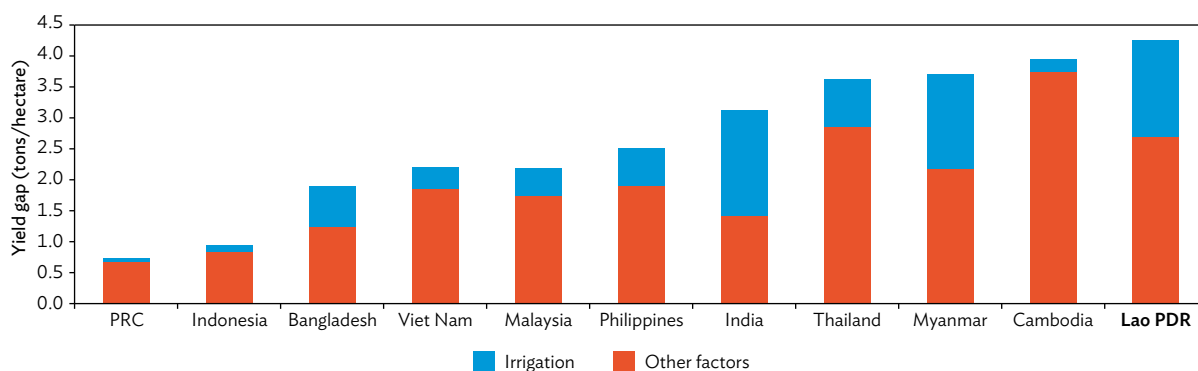
Consequently, while the Lao PDR can be positioned to be a strong rice exporter, and it has had rice exports in recent years, in some years it has imported. More alarmingly, in 2015 it became a substantial net rice importer, according to available data (Figure 3.14). This may be an artifact of declining productivity growth

Figure 3.11: Comparison of Paddy Rice Yields, Selected Asian Countries, 2007 and 2012



Lao PDR = Lao People’s Democratic Republic, PRC = People’s Republic of China.
 Sources: Calculations for all countries (except for the Lao PDR and Myanmar) based on data from Food and Agriculture Organization of the United Nations. 2016. FAOSTAT. Crops. <http://www.fao.org/faostat/en/#data/QC> (accessed 28 February 2017). Calculations for the Lao PDR based on data from Lao Statistics Bureau. *Lao Expenditure and Consumption Survey 2007–2008*. Vientiane; Lao Statistics Bureau. *Lao Expenditure and Consumption Survey 2012–2013*. Vientiane; Data for Myanmar based on United States Department of Agriculture. Foreign Agricultural Service. <http://apps.fas.usda.gov/psdonline/app/index.html#/app/downloads> (accessed 28 February 2017).

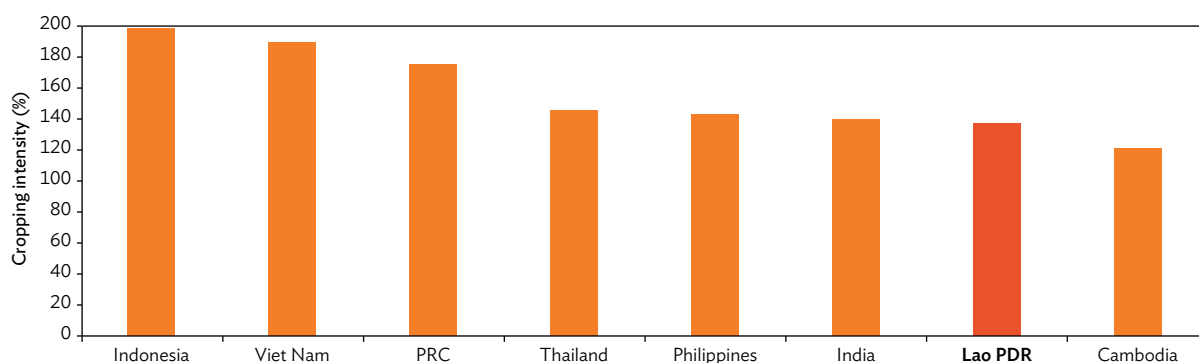
Figure 3.12: Gap between Attainable and Actual Paddy Rice Yields, Selected Asian Countries, 2012



Lao PDR = Lao People’s Democratic Republic, PRC = People’s Republic of China.

Sources: Author’s calculations using data from International Institute for Applied Systems Analysis and the Food and Agriculture Organization of the United Nations (IIASA/FAO). 2012. Global Agro-Ecological Zones (GAEZ v3.0) data. Laxenburg, Austria: IIASA and Rome, Italy: FAO; FAO. AQUASTAT. <http://www.fao.org/nr/water/aquastat/main/index.stm>; FAO. Statistics Division (FAOSTAT). <http://www.fao.org/faostat/en/#home>; Lao Statistics Bureau. Lao Expenditure and Consumption Survey 2012/13. Vientiane; and United States Department of Agriculture. Production, Supply and Distribution Database. <https://apps.fas.usda.gov/psdonline/app/index.html#/app/advQuery> (accessed 5 March 2017).

Figure 3.13: Cropping Intensity in Irrigated Areas, Selected Asian Countries

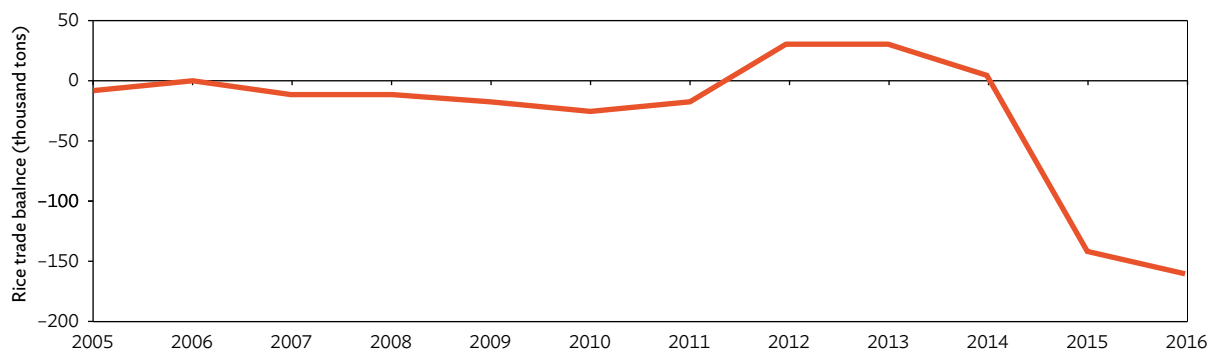


Lao PDR = Lao People’s Democratic Republic, PRC = People’s Republic of China.

Note: Figures reflect latest available data, as follows: India: 2013; Lao PDR: 2010–2011; Thailand: 2007; PRC, Cambodia, and Philippines: 2006; Indonesia and Viet Nam: 2005.

Sources: Calculations for cropping intensity (except for the Lao PDR) based on data from Food and Agriculture Organization of the United Nations. AQUASTAT. <http://www.fao.org/nr/water/aquastat/data/query.html?lang=en> (accessed 3 March 2017). Calculations for cropping intensity of the Lao PDR based on data from Ministry of Agriculture and Forestry. Lao Census of Agriculture 2010/11. Vientiane; and authors’ calculations.

Figure 3.14: Balance of Rice Trade, Lao PDR, 2005–2016



Lao PDR = Lao People’s Democratic Republic.

Source: Calculations based on data from United Nations Comtrade Database. <https://comtrade.un.org/> (accessed 7 August 2017).

relative to other exporters in the region, as illustrated by minimal yield growth discussed earlier. At the same time, given higher prices for Thai rice and in the PRC market, compared with Lao domestic prices, there may be substantial informal exports from the Lao PDR that may escape quantification in official trade statistics.

According to the 2012–2013 LECS, average daily milled rice consumption was 575 grams per capita, implying total national consumption of 1.42 million milled tons. Production of milled rice equivalent, according to the same data set for the same period, was about 1.60 million tons. The 12% surplus is within potential postharvest losses during milling, transport, and storage, so that there may be little net surplus after losses for export. With a 1.8% average population growth rate, the increase in production based on expanded area alone is not sufficient to develop a base for substantial exports, as it has barely kept pace with domestic demand. It is possible that this trend explains the recent negative trade balance.

Nonrice crop performance is varied

Yield performance across crops is mixed. Maize, cucumber, and coffee yields are comparable with many other countries in developing Asia (Figure 3.15). However, yields of cabbage and cassava are much lower.

Yield growth trends are highly variable as well, with positive trends for cassava, cucumber, and coffee, but strongly negative trends for crops such as cassava and cardamom. Few other countries show so much variation in yield trends across crops (Figure 3.16).

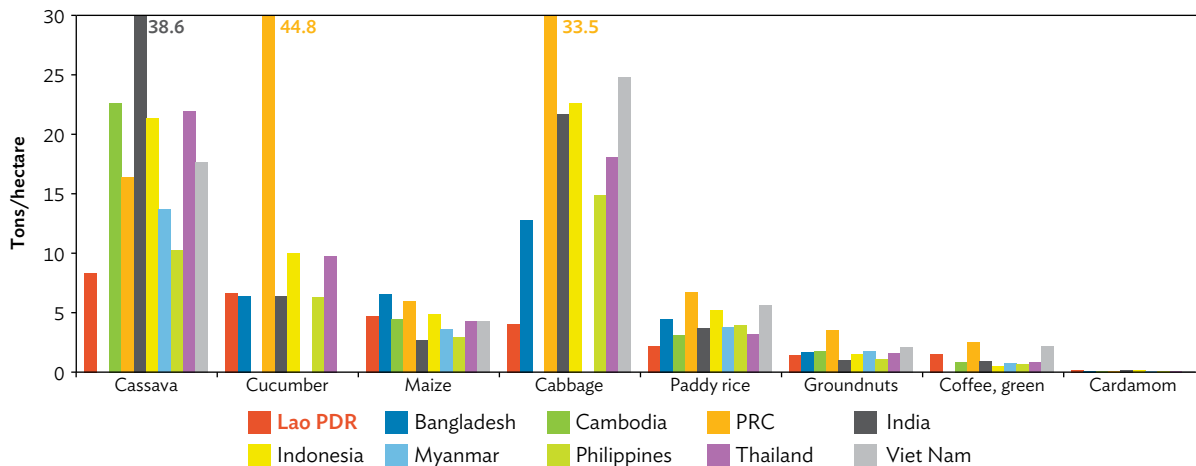
Animal production performance is mixed

Livestock performance is varied

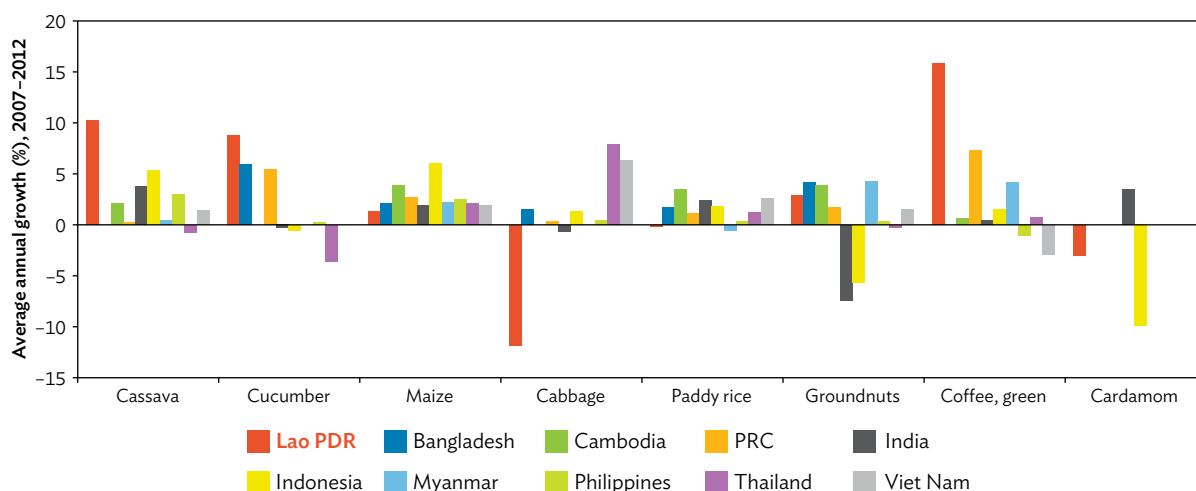
With extensive meadow area and high arable land availability per capita, the Lao PDR should have comparative advantage in livestock production. Yet, livestock remains a relatively small share of total agriculture sector value addition, and indexes of performance are mixed, especially for family farms. Certain subsectors, such as cattle and goats, are growing strongly, as shown in multiple data sources (Table 3.3).

However, data on other subsectors are much more mixed. While administrative data show strong growth in local chicken and pig populations, the LCA’s survey-based estimates show declines. Moreover, chicken and pig stocks, according to the LCA, are a fraction of those according to administrative data. Buffaloes show modest growth according to administrative data, whereas the LCA data show a decline during the same period. Part of the discrepancy may be due to the

Figure 3.15: Yields of Annual Crops, Lao PDR and Selected Asian Countries, 2012



Lao PDR = Lao People’s Democratic Republic, PRC = People’s Republic of China. Sources: Calculations based on data from Food and Agriculture Organization of the United Nations. FAOSTAT. <http://www.fao.org/en/#data/QC> (accessed 23 March 2017). Calculations for Lao PDR crops other than coffee based on data from Lao Statistics Bureau. Lao Expenditure and Consumption Survey 2012–2013. Vientiane.

Figure 3.16: Average Yield Growth of Annual Crops, Selected Asian Countries, 2007–2012

Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.

Sources: Calculations based on data from Food and Agriculture Organization of the United Nations. FAOSTAT. <http://www.fao.org/en/#data/QC> (accessed 23 March 2017). Lao PDR calculations for cucumber, maize, cabbage, paddy rice, and cardamom based on data from Lao Statistics Bureau. Lao Expenditure and Consumption Survey 2012–2013. Vientiane.

Table 3.3: Livestock Population in the Lao PDR

Livestock	Lao Census of Agriculture			FAOSTAT				
	1998–1999	2010–2011	Growth Rate (1998 to 2010)	1998	2010	2014	Growth Rate (1998 to 2010)	Growth Rate (2010 to 2014)
Cattle	944,100	1,586,200	4.4%	1,126,600	1,474,000	1,766,000	2.3%	4.6%
Buffaloes	991,900	774,200	(2.0%)	1,092,700	1,189,000	1,153,000	0.7%	(0.8%)
Pigs	1,036,300	978,300	(0.5%)	1,432,100	2,752,000	3,122,000	5.6%	3.2%
Goats	94,400	215,600	7.1%	122,100	367,000	481,000	9.6%	7.0%
Local chickens	9,379,000	8,664,800	(0.7%)	12,176,000	25,105,000	32,408,000	6.2%	6.6%
Commercial chickens	289,700	648,900	7.0%					
Ducks	1,351,300	1,790,900	2.4%	1,040,000	3,200,000	3,500,000	9.8%	2.3%

(-) = negative, Lao PDR = Lao People's Democratic Republic.

Sources: Ministry of Agriculture and Forestry, 2014. *Lao PDR: Lao Census of Agriculture 2010/11 – Analysis of Selected Themes*. Vientiane; and Food and Agriculture Organization of the United Nations. FAOSTAT. Livestock Primary. <http://www.fao.org/faostat/en/#data/QL> (accessed 21 March 2017).

fact that administrative data may cover industrial livestock producers, in addition to household farms. Industrialization and value-chain integration of the livestock industry are starting to take place in the Lao PDR. Commercial poultry production has expanded because of increased demand for chicken and eggs in the urban centers, particularly Vientiane and other cities. Schönweger et al. (2012) report that livestock concessions cover about 31,500 hectares, with an average land size of 573 hectares per contract.

However, the extent of industrial production is probably too small to explain all the difference. For example, FAO (2011) reports that 30% of pig production is in large farms, whereas 74% would need to be by enterprises to explain the difference in 2010 pig stock observations. Even if industrial production makes up such a large share of production, the implications of the LCA data are that family farm production is facing difficulties, with only a minority of livestock products experiencing growth. Declines in buffalo production are likely an artifact of

farm mechanization and substitution of tractors for animal traction and may be expected. However, declines in pig and chicken production suggest that the smallholder sector may be losing competitiveness in the face of exports and enterprise production.

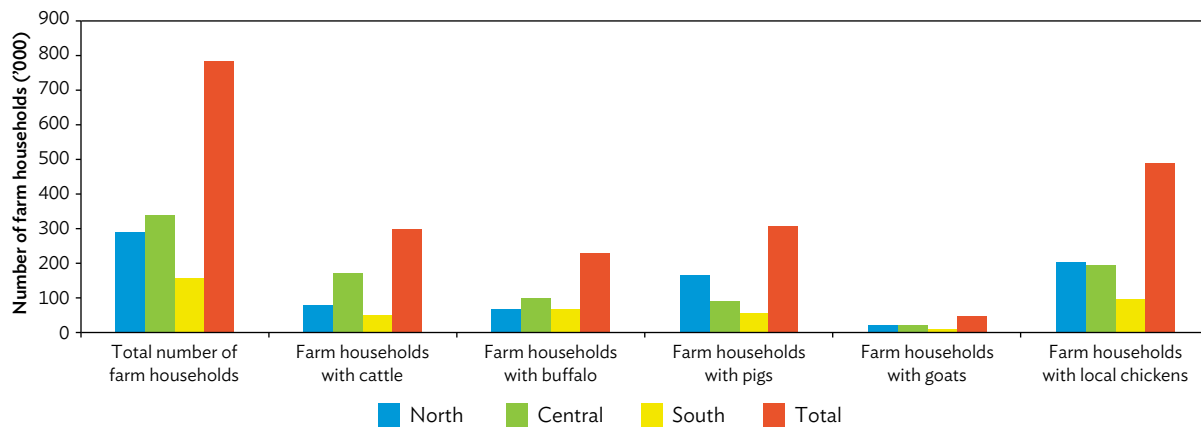
Such trends may be explained by increasingly constrained fodder and feed resources. According to the LCA, 79% of livestock-rearing households depend on pastureland, while 51% use rice straw to feed ruminants (FAO 2014). However, rice productivity, according to the LECS data, is not improving, so that rice straw supplies are not rising, while land used for grazing is increasingly allocated to concessions and long-term commercial leases. Maize for feed is increasingly exported, rather than used locally, according to available trade statistics. Low vaccination rates also mean that disease losses remain high. This could have important implications for livelihoods, as livestock are an important component of smallholder farms in the Lao PDR as a means of accumulating capital and often serve as a safety net that can be liquidated when households are in need of cash. Livestock also play an important part for cultural traditions and ceremonial needs, particularly for various ethnic minorities. About 62% of farm households raise native chickens, 39% of farm households raise pigs, and 38% and 29% raise cattle and buffalo, respectively (Figure 3.17).

Aquaculture is growing quickly

Fish is of rising importance in the Lao PDR’s agriculture and it is estimated that fish and other aquatic animals account for around half of animal protein intake (FAO 2014). Two-thirds of agricultural households engage in fishing or fish cultivation to supplement protein intake. Aquaculture accounts for around 70% of fish consumption, and has helped to drive rapid expansion in fish catch, as it is a growing share of fisheries activity. Fisheries production is rising rapidly (Table 3.4), and aquaculture area doubled between 1998–1999 and 2010–2011, according to the LCA. However, certain categories of aquatic products have declined sharply, which may suggest deteriorating natural aquatic ecosystems.

Nearly 90% of aquaculture rearing is via pond techniques, but only 9% of farm households have their own ponds, so cultivation is concentrated in a smaller share of the population than capture fisheries (FAO 2014). Aquaculture and fishing are primarily secondary and subsistence activities, as only about one-third of households report selling fish or fish products. Although fish cultivation has expanded, fisheries resources are at risk from blockage of fish migration routes during dam construction, as well as contamination of water resources.

Figure 3.17: Total Number of Households with Livestock and Poultry by Region, 2010-2011



Source: Ministry of Agriculture and Forestry. 2014. *Lao PDR: Lao Census of Agriculture 2010/11 – Analysis of Selected Themes*. Vientiane.

Table 3.4: Aquatic Production and Growth Rates, Lao PDR, 2003–2013

Aquatic Product	2003	2008	2013	Growth Rate, 2003–2008	Growth Rate, 2008–2013
Freshwater fish	94,695	93,835	129,969	(0.2%)	6.7%
Marine fish	4,859	9,768	17,601	15.0%	12.5%
Crustaceans	908	117	31	(33.6%)	(23.3%)
Cephalopods	61	13	7	(26.6%)	(11.7%)
Mollusks	–	433	160		(18.1%)

– = data not available, () = negative, Lao PDR = Lao People's Democratic Republic.

Source: Calculations based on data from Food and Agriculture Organization of the United Nations. FAOSTAT. Value of Agricultural Production. <http://www.fao.org/faostat/en/#data/QV> (accessed 12 December 2016).

Concession and commercial lease area has rapidly expanded

One of the most rapid trends in the Lao PDR's agriculture sector is the emergence of numerous corporate land deals and large areas of concessions for estate crops and other purposes. As much as 21% of the Lao PDR's land area is estimated to be under concessions and leases, although a majority of this area is for mining exploration (Wellmann 2012). Agricultural and plantation concessions and leases are still substantial, however, with 446,000 hectares held as of 2012 (Schönweger et al. 2012), which is 19% of agricultural area (Table 3.5). The Lao PDR is 1 of only 10 countries in the world where such deals exceed 10% of agricultural land.

Much of this development has been driven by foreign direct investment (FDI), which dwarfs all public sector and development assistance support to agriculture and forestry. The agriculture sector is the second-largest

FDI recipient, with receipts amounting to 37% of FDI in 2015 (MPI, Investment Promotion Department). The \$466 million received in FDI contrasts with only about \$10 million of domestically sourced public sector expenditure and \$300 million in agricultural official development assistance.

FDI in agriculture was restricted in the country until 2005, but since then, has expanded rapidly. Investors acquire access to land through long-term state land leases, land concessions, or contract farming arrangements. As of 2012, rubber, eucalyptus, acacia, sugarcane, and livestock concessions occupy the largest area (Schönweger et al. 2012). Forest plantation projects are concentrated in the center and south of the country, and 79% of forest plantation area is held by foreign investors. Agricultural concession and lease area has 80% foreign ownership, with sugarcane concentrated in the south under Thai concessionaires. Most of these areas are controlled by investors from the PRC, Thailand, and Viet Nam.

Table 3.5: Agricultural and Plantation Concessions and Long-Term Leases in the Lao PDR as of 2012

Product	No. of Deals	Total Area (ha)	Average Area per Deal (ha)	% of All Deals	% of Total Area under Investment
Rubber	225	129,614	609	31%	29%
Eucalyptus	49	95,978	2,042	7%	22%
Acacia	5	39,971	7,994	1%	9%
Sugarcane	10	34,969	3,885	1%	8%
Livestock	58	31,494	573	8%	7%
Jatropha	49	25,179	547	7%	6%
Coffee	59	19,105	347	8%	4%
Rubber and other plant	23	14,839	707	3%	3%
Cassava	34	14,747	567	5%	3%
Other	215	40,353	188	30%	9%
Total	727	446,249	614	100%	100%

ha = hectare, Lao PDR = Lao People's Democratic Republic.

Source: Adapted from O. Schönweger, A. Heinemann, M. Epprecht, J. Lu, and P. Thalongsengchanh. 2012. *Concessions and Leases in the Lao PDR: Taking Stock of Land Investments*. Bern: Centre for Development and Environment, and Vientiane: Geographica Bernensia.

While FDI offers new resources and market opportunities that may help to lift the productivity of the sector, concession development in the Lao PDR has faced problems. Most farmers have no legally recognized documentation of land-use rights, and this has led to large numbers of land ownership conflicts and uncertainty for the existing farming population. Population displacement and creation of new “landless poor” as a result of concession issuance have been reported (Houythaio 2014). Densely forested lands have also been issued as concessions, so that concession development has been a driver of deforestation.

Remote sensing analysis of concession lease area prior to issuance has shown that very little land issued was unutilized prior to deal approval (Schönweger et al. 2012). About 50% of the area of agricultural concessions and leases was forested prior to issuance, and another 20% was already under sedentary agriculture (Figure 3.18). For forest concessions and leases, about 40% of the area was already under forest cover and 5% was under sedentary agriculture before issuance. Moreover, an important share of the balance is likely to be under shifting cultivation and smallholder upland agriculture. All of these areas represent natural

ecosystems, farming production, and livelihoods likely to be lost as a result of land deals.

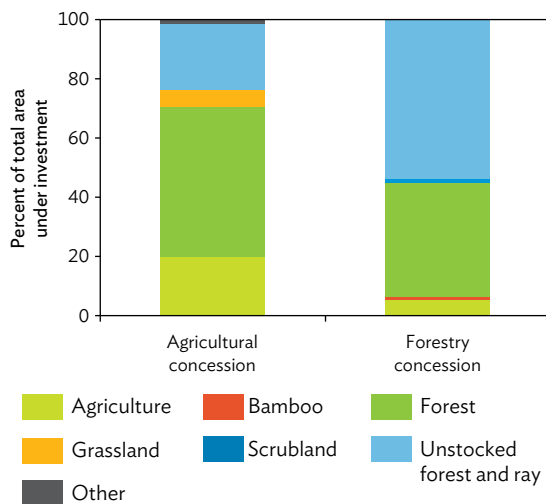
Although there is a relatively well-developed de jure regulatory framework for concession and lease issuance, limited coordination between national, provincial, and district authorities has meant that de facto regulation is limited and transparency is poor. Practices within areas under foreign ownership have faced limited oversight, which has resulted in indiscriminate use of pesticides and other environmental contaminants that have polluted waters and soils (Friis and Nielsen 2016). There are signs of increasing government attention to these issues, with a moratorium on concession issuance in place since 2016, a high-level government review in progress during 2017, and government warnings of revocation of contracts for noncompliant concessions.

Agriculture and land-use sustainability are under rising pressure

Generally, agriculture in the Lao PDR has low rates of chemical input use, with only a minority of farmers employing chemical fertilizers and even fewer applying chemical insecticides, herbicides, or fungicides. Selected agricultural concessions have experienced issues of chemical contamination, which merit attention through better regulation of concessionaires. However, arguably the most important issue regarding the sustainability of agriculture in the Lao PDR is its encroachment into natural ecosystems in the face of increasing competition for land.

Deforestation has been rapid, as the area under forest cover declined from 71.6% of land area in the 1960s to 40.3% in 2010. Furthermore, the proportion of dense and primary forests (which are considered more ecologically important) has fallen even more rapidly. Agriculture is one of the major drivers of deforestation (MONRE and IUCN 2016). Shifting or “slash and burn” cultivation at forest margins has historically affected large areas. Historical estimates of shifting cultivation area range widely from 80,000 ha to 6.5 million ha (Kenney-Lazar 2013). In recent years, shifting cultivation has been brought under greater control through resettlement of shifting cultivators and promotion of “rotational” cultivation in which

Figure 3.18: Land Use Prior to Issuance of Concession or Lease to Investors, Based on Remote Sensing Analysis



Source: O. Schönweger, A. Heinemann, M. Epprecht, J. Lu, and P. Thalongsengchanh. 2012. *Concessions and Leases in the Lao PDR: Taking Stock of Land Investments*. Bern: Centre for Development and Environment, and Vientiane: Geographica Bernensia.

cultivation moves within a fixed land area over time, rather than pioneering into new forested areas. As of 2010–2011, the LCA suggests that 30,000 households practice shifting cultivation and 230,000 practice rotational cultivation. Applying shifting cultivation area to population ratios from previous studies to the LCA households suggests 270,000 to 1.4 million ha of shifting cultivation and 1.6 million ha or more of rotation cultivation.

While pioneering shifting cultivation appears to have reduced, in its place growth of commercial agricultural concessions has put new pressure on forests, as noted in the previous section. It has been estimated that commercial agricultural expansion led to 34,200 ha of annual loss, while smallholder expansion drove 14,700 ha of loss each year (USAID 2015). In addition, commercial concessions may drive shifting cultivation and other agriculture into new forested lands when lands under existing uses are allocated to commercial investors, and this may indirectly lead to additional forest clearance.

Timber overharvesting has also contributed around 1.3 million cubic meters of timber loss, which could equate to around 13,000 ha of loss per year if extraction were contiguous (USAID 2015). This is compounded by the effects of infrastructure development, especially roads, which improve forest access, and induces unsustainable timber extraction and further clearing for agricultural expansion. Road building is at times financed through timber quotas from areas cleared for road development, which can induce road placement into forested areas, especially in the context of poor regulation of quota issuance (Smirnov 2015).

Stenhouse and Bojoe (2010) estimate that mining has been associated with 5,100 to 14,100 ha of annual forest loss. Hydropower concessions also often come at the expense of forests, as 140,635 ha of forest is in areas planned to be flooded (MONRE and IUCN 2016).

At the same time, there have been substantial efforts to replant forests, as the government has a target to increase forest cover to 70% by 2020. A substantial share of this is being driven by plantation expansion, such as 200,000 ha of new rubber, although the overall target is for the bulk of afforestation to be

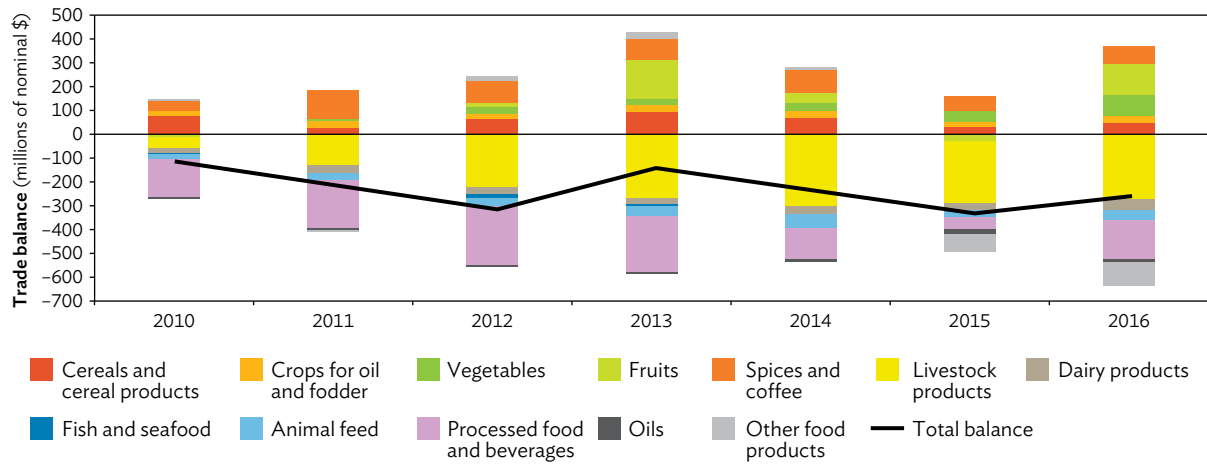
attained through natural forest expansion (MONRE and IUCN 2016). Afforestation efforts have also been complemented by new measures, such as a raw timber export ban in 2016, efforts to consolidate wood processing overcapacity, and the moratorium on concession development. As of 2015, forest cover increased to 46.7% of land area from the 2010 low, which indicates progress in overall afforestation. However, FAOSTAT data indicate that primary forest cover fell from 1.276 million ha in 2010 to 1.210 million ha by 2014, which suggests that the most ecologically important forest is still being lost, as are the ecological services that depend upon it.

Food security remains a challenge

Despite having comparative advantages as a potential agricultural exporter based on generous resource endowments, the Lao PDR has been dependent on agricultural imports, as the trade balance in agriculture has remained negative from 2010 through 2016, according to available statistics (Figure 3.19). These statistics are assembled through a combination of Lao PDR reported and importer reported data (including whichever values are higher for each trade flow), and are the best publicly available indications of trade balances. However, they may miss informal exports, which are anecdotally reported as substantial.

As of 2016, these data indicate that net agri-food trade was a negative balance that equals 10% of agricultural gross domestic product (GDP). The bulk of these imports are livestock, dairy, and processed food products, which are imported principally from neighboring Thailand. Growth in banana exports to the PRC under long-term commercial leases and concessions have driven increases in fruit export values since 2012, as banana exports reached \$126 million in 2016. Vegetable exports have steadily risen between 2010 and 2016, as well. Coffee is another important export commodity, although export values have fluctuated. Although the Lao PDR has a negative rice trade balance, maize exports mean that the country has a slight net export of grain, but this is far less than other imports. Overall, the Lao PDR remains among the most import-dependent countries in the region for food supplies (Figure 3.20).

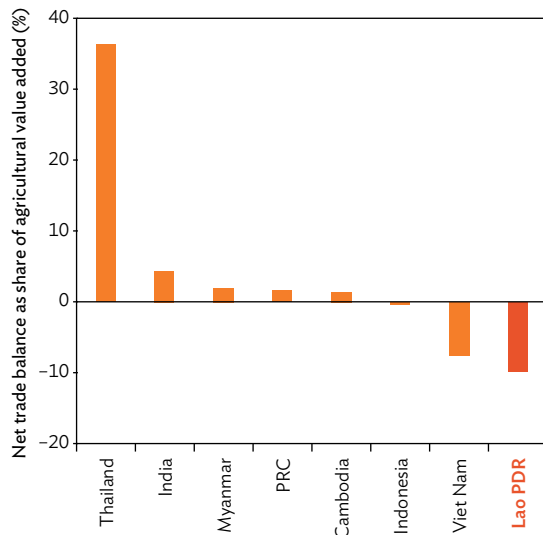
Figure 3.19: Balance of Trade in Food Products, Lao PDR, 2010–2016



Lao PDR = Lao People's Democratic Republic.

Source: Estimates based on data from United Nations Comtrade Database. <https://comtrade.un.org/> (accessed 7 August 2017).

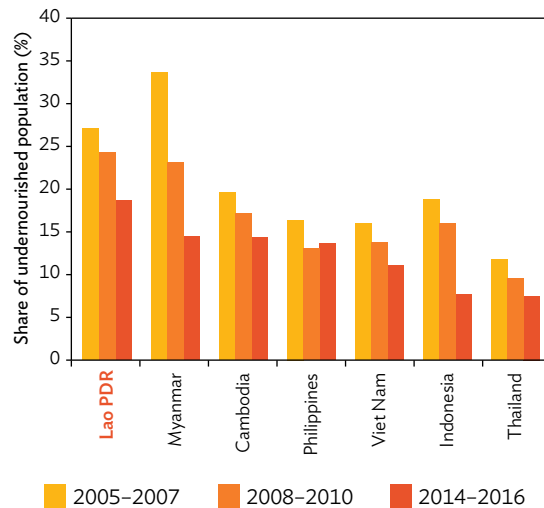
Figure 3.20: Agricultural Trade Balance as a Share of Agricultural GDP, Selected Asian Countries, 2016



GDP = gross domestic product, Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.

Source: Estimates based on data from United Nations Comtrade Database. <https://comtrade.un.org/> (accessed 7 August 2017).

Figure 3.21: Trends in Prevalence of Undernourishment, Selected Asian Countries, 2005–2016



Lao PDR = Lao People's Democratic Republic.

Note: Data are 3-year averages.

Source: Calculations based on data from Food and Agriculture Organization of the United Nations. FAOSTAT. <http://www.fao.org/faostat/en/#data/FS> (accessed 15 December 2016).

At the most basic level of assuring sufficient food energy, the Lao PDR has lagged. The prevalence of undernourishment in the country remains the highest in comparison with other member economies of the Association of Southeast Asian Nations (ASEAN) since 2005 (Figure 3.21). Although levels of food

deficit (kilocalories/capita/day) in the country have fallen significantly over the past decade, they remain the highest in the ASEAN region (Table 3.6). The stunting rate among children under-5 years old is 42%—the highest in Asia.

Table 3.6: Depth of the Food Deficit in Southeast Asian Countries, 2005–2016
(daily kilocalories per capita)

Country	2005–2007	2008–2010	2011–2013	2014–2016
Lao PDR	191	171	139	128
Myanmar	260	171	120	103
Cambodia	135	119	114	97
Philippines	111	87	95	93
Viet Nam	141	119	99	83
Thailand	87	69	63	53

Lao PDR = Lao People's Democratic Republic.

Note: Data are 3-year averages; depth of the food deficit is in kilocalorie/capita/day.

Source: Calculations based on data from Food and Agriculture Organization of the United Nations. FAOSTAT. <http://www.fao.org/faostat/en/#data/FS> (accessed 15 December 2016).

3.4 Evolving Agricultural Policy

National Socioeconomic Development Plans

The Lao PDR has gone through a transformation that has loosened many of the restrictions of its former centrally planned economic system and has given increasing attention to agriculture. After implementing a centrally-planned system for 10 years, the government decided to shift toward a more market-oriented policy with the introduction of the New Economic Mechanism (NEM) in 1986. Recognizing the role of agriculture and natural resources, the second five-year plan abolished the collectivization of agriculture, eased restrictions on private sector activities, and gave state enterprises more leeway on decision making. Trade restrictions between provinces were loosened in 1987. The national socioeconomic development plans (NSEDPs) that followed increasingly emphasized commercialization of agriculture as an objective, and attention to drivers of forest loss rose from the fifth NSEDP onward. The sixth NSEDP opened agriculture to foreign investors through concessions and renewed focus on infrastructure, including irrigation, and the seventh NSEDP gave more attention to agricultural marketing, as well as increasing forest cover.

The latest NSEDP (8th Five-Year National Socio-Economic Development Plan [2016–2020]) has a goal of 3.4% annual growth in agricultural and forestry GDP, and intends to reduce poverty, especially among ethnic minorities. There is a focus on food and nutrition security, agricultural commercialization, and

more value-added processing. Increased agricultural productivity is emphasized to benefit the majority of the population employed in agriculture.

To accomplish this, new technology should be applied to improve processing of products, such as international standard rice mills and furniture factories for wood products to increase value added. Provinces with large areas of flatland (Luang Namtha; Bokeo; Sayaboury; Vientiane, the capital; Borikhamxay; Savannakhet; Saravan; and Champasak) must ensure production of 2.5 million tons of rice in 600,000 ha of land, for domestic consumption and for export. Production of crops (maize for animal feeds, coffee, sugarcane, cassava, etc.) and livestock are to be increased to meet domestic demand and for export. Irrigation systems are to be improved, upgraded, and properly managed. Modern technology should be utilized for increasing production of livestock, while existing agricultural promotion and development centers are to be upgraded. Land zoning for land allocation to particular crops, land registration to discourage conversion of irrigated rice fields, and issuance of agricultural land titles to farmer families are also defined strategies to achieve sustainable production of food and commercial goods. Irrigated area is targeted to be expanded from 315,374 ha in 2016 to 476,012 ha by 2020.

Agricultural Development Strategy 2016–2025

The Agricultural Development Strategy (ADS) approved in 2015 is the country's official strategy for development of the agriculture sector. It is supported by two implementation plans: the Agriculture Master Plan and the Agriculture Investment Plan. Both plans are embedded in the five-year NSEDPs. The vision of the ADS is “ensuring food security, producing comparative and competitive potential agricultural commodities, developing clean, safe and sustainable agriculture and shift gradually to the modernization of a resilient and productive agriculture economy, linking with rural development contributing to the national economic basis.”

The ADS has two programs: food production and commodity production. The goal of the food production program is to ensure sufficient quantities of food for domestic demand, including rice, vegetables,

legumes/beans, sesame, fruits, sugar, meat, fish, and eggs. The commodity production program focuses on agricultural exports, and targets rice exports of 1.5 million tons by 2025, as well as modest meat exports.

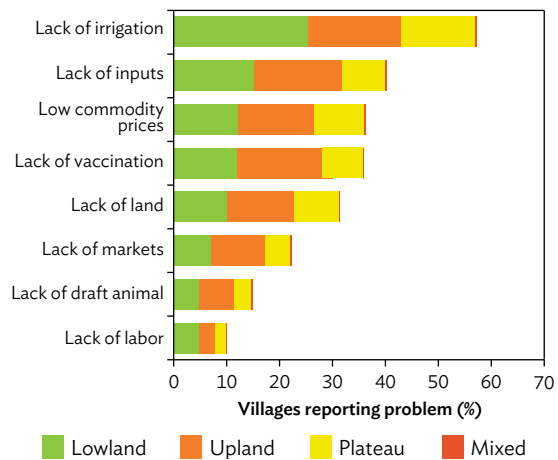
To do so, the ADS envisages improved irrigation infrastructure, improving input availability through simplified border procedures, increasing agricultural credit provision, improving producer prices for rice and priority commodities, increasing agro-processing investment, strengthening agricultural cooperatives, and improving the quality of agricultural extension. The planned public investment need is an average of \$355 million annually from 2016 to 2020, of which more than 90% is to be sourced from development assistance. This contrasts with an expectation of \$1.63 billion in annual domestic and foreign direct investment. Agricultural investment represents an increase from approximately \$300 million of annual support over 2011 to 2015, inclusive of official development assistance, of which only \$10 million was from domestic resources. Domestic public investment under the ADS, which is expected to be \$30 million annually, is planned to be sharply increased.

3.5 Key Constraints to Agricultural Performance

The Lao PDR's low level of agricultural performance takes place in the context of limited historical productive public investment, especially domestic investment, in the sector. This has resulted in clear deficiencies in supportive infrastructure and public services. In addition, the sector is affected by policy distortions and the absence of key enabling conditions for productivity improvement.

According to the LCA, village surveys most frequently reported an absence of irrigation as a constraint to agricultural production. This need was reported frequently across agro-ecologies, but was most frequently expressed for lowland areas, which should be the “rice bowls” of the country. This was followed by “lack of inputs” and “low commodity prices” (Figure 3.22).

Figure 3.22: Prevalence of Village Reported Constraints to Agricultural Production by Agro-Ecological Zone, Lao PDR, 2010–2011



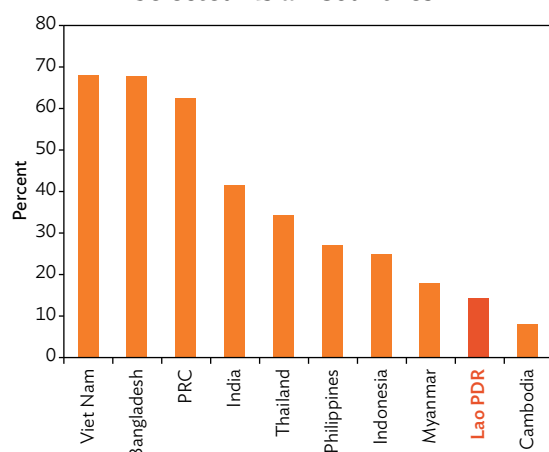
Lao PDR = Lao People's Democratic Republic.

Sources: Estimates based on data from Ministry of Agriculture and Forestry, 2014. Lao PDR: *Lao Census of Agriculture 2010/11 – Analysis of Selected Themes*. Vientiane; and authors' calculations.

These problems suggest a broader series of constraints. Obviously, “lack of irrigation” is a product of infrastructure and supporting services development. “Lack of inputs” may be both a function of the physical presence of inputs, as well as the ability to purchase those inputs through credit, and credit may be conditioned through collateral, such as land titles. The state is also responsible for the provision of certain inputs, such as seed, through the research and extension system, and “lack of inputs” may relate to those systems as well. Output prices are conditioned by market development, connectivity, value-chain integration, and public sector interventions in output markets.

Irrigated agriculture development has lagged

Despite having substantial renewable water resources, the Lao PDR has lagged in irrigated agriculture development. Compared with other countries in the region, the Lao PDR has a very small share of cropped area equipped with irrigation facilities, and dry season cropping remains limited. Only Cambodia has a smaller share of cropped area irrigated among comparator countries in Asia (Figure 3.23).

Figure 3.23: Share of Cropped Area Irrigated, Selected Asian Countries

Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.

Sources: Calculations for all other countries except for the Lao PDR based on data from Food and Agriculture Organization of the United Nations. FAOSTAT. <http://www.fao.org/faostat/en/#data/RL> (accessed 15 December 2016). Calculations for the Lao PDR based on data from Ministry of Agriculture and Forestry. Lao Census of Agriculture 2010/11. Vientiane.

In recent years, little has been done to address this deficiency. According to official statistics, irrigated agriculture area slightly increased from 409,000 ha in 2010–2011 to 419,000 ha in 2014–2015, which is just over half of the master plan target for the period (800,000 ha) (MAF 2015). The supply of irrigated water for dry season production rose by the same amount from 148,000 ha in 2010–2011 to 159,000 ha in 2014–2015, and was similarly behind target. Sprinkler irrigation coverage also did not progress during this period. Irrigation systems remain small scale and village-based, and are more prevalent in the northern and central regions (Table 3.7). Survey data suggest that actual irrigated area is lower than the official statistics. According to the LCA, in 2010–2011, a total of 332,000 ha was reported to have been receiving irrigation water. Most irrigation systems are also only sufficient for supplemental water provision in the wet season, and do not permit dry season cultivation.

Irrigation systems have been principally developed for rice cultivation, and have limited orientation toward other higher value crops, which have a small fraction of irrigation coverage, compared with rice. As services to ensure high rice productivity are absent, even as large transport margins and value-chain fragmentation

Table 3.7: Percent of Cropped Area Irrigated by Province and Land Type, 2010–2011

	Lowland	Upland	Plateau	Mixed	Total
North	27.9	11.7	18.5	10.0	17.7
Center	18.5	21.3	29.8	23.5	20.7
South	12.2	10.9	6.9	—	10.7
Lao PDR	18.5	14.8	19.4	14.2	17.8

-- data not available, Lao PDR = Lao People's Democratic Republic.

Source: Ministry of Agriculture and Forestry. Lao Census of Agriculture 2010/11. Vientiane.

keep domestic prices depressed, there may be limited economic incentives for farmers to invest in irrigation upkeep and improvement.

Infrastructure for irrigation also faces many deficiencies (Bouahom et al. 2016). As a result of design flaws and limited investment in maintenance, headwork pumping systems and supply networks have fallen into disrepair and/or mismanagement. Allocation and scheduling often are not well implemented, so that tail areas receive insufficient water supplies. Many of these problems have arisen because of irrigation development with a focus on infrastructure completion, rather than adequate consideration of irrigation application toward enhanced production value.

Irrigation management transfer to local communities has been a government strategy to improve irrigation operational management and sustainability (Phalaskak 2005). A central part of the strategy is the creation of a water user association (WUA) for each irrigation scheme, with full ability to own, regulate, manage, and finance the scheme. WUAs are often preceded by water user groups (WUGs) with more limited rights to enter into commercial agreements or borrow money as an organization.

Jusi and Virtanen (2005) report that most WUGs received little training on how to manage irrigation assets, and that WUG formation has been imposed in a top-down manner, without appropriate legal frameworks. As a result, WUGs have often not played the role envisaged, and irrigation facilities have fallen into disrepair. ADB (2013a) similarly observed that many irrigation pumps in the Lao PDR were already old and poorly maintained with limited water deliveries, as a result.

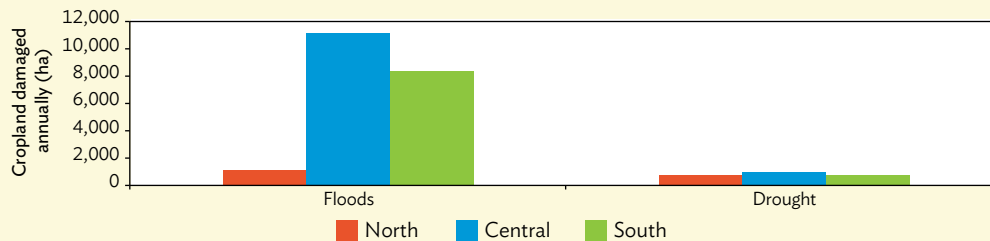
Many indexes suggest that irrigated agriculture development is a key agriculture sector constraint. Irrigation infrastructure obviously lags behind comparator countries, and farmers themselves report irrigation as their principal need. The low level of current irrigation development contrasts starkly with strong potential for irrigation water deliveries. Water resources are ample, and government targets suggest

that irrigation coverage can be more than doubled. Were these to happen, modeling presented in Figure 3.12 suggests that there is biophysical potential for irrigation to increase rice land productivity by more than 50% as well as enable diversification. Moreover, increasing irrigation coverage is an essential means to escape the effects of increasing rainfall variability expected under climate change (Box 3.2).

Box 3.2: Impacts of Climate Change on Agriculture in the Lao PDR

Agricultural production in the Lao People’s Democratic Republic (Lao PDR) is principally rainfed, and is therefore highly dependent on climatic conditions, including predictable rainfall. Climate change is expected to alter these conditions, and poses increasing risks to the sector over coming decades. Overall, the Lao PDR is ranked as the seventh most vulnerable country in the world to climate risk (Kreft et al. 2015). The country principally faces agricultural risks from flooding, and to a smaller degree from drought (Figure B3.2.2).

Figure B3.2.2: Average Climate-Related Crop Damage in the Lao PDR over 2012–2015



ha = hectare.

Source: Data from Ministry of Agriculture and Forestry. Agricultural Statistics Yearbook (2012–2015). Vientiane.

The Lao PDR is projected to experience substantial temperature increases under climate change, with a rise in mean temperatures of up to 2°C by 2050 and a rise in maximum temperature of up to 5°C, relative to the 1982–2002 period (Lefroy, Collet, and Grovermann 2010). Rainfall at the very start of the wet season (April) is also projected to rise, but May will become drier, while October will receive more rainfall. The frequency of intense storm events is also expected to escalate.

Altered precipitation patterns may mean that flood damage risk is increased, as rainfall concentrations are likely to increase, especially during storm events. Reduced rainfall in May may also delay crop establishment and adversely affect yield (Lefroy, Collet, and Grovermann 2010). Increased temperatures may pose heat stress to crops and may reduce agricultural labor productivity as temperatures approach the maximum humidity-adjusted limits for intense physical effort. Livestock may also have reduced immunity to disease, lower reproduction, and less fodder availability during the dry season under climate change. Increased flood frequency may also particularly impact aquaculture ponds and infrastructure, which tend to be near river systems.

Climate change is projected to increase much of the Lao PDR’s relative suitability for rice, as a result of more water availability for production (Lefroy, Collet, and Grovermann 2010). At the same time, agricultural modeling exercises to date do not take into account changes to storm damages, such as flooding, or fully reflect the consequences of climate variability, and hydrological modeling is simplistic. When the effect of increased water availability is removed, modeling suggests a negative climate change impact on rice yields by 7% to 18% by 2050 under the A1B scenario of the Intergovernmental Panel of Climate Change (for a region that includes both the Lao PDR and Cambodia) (Nelson et al. 2010).

To adapt to climate projections, there is a priority need to improve water supply and management, so as to reduce risks from variable rainfall. Doing so will depend upon improving land use at the watershed level and enhancing water infrastructure and improving farm performance. Appropriate investment in innovation for agriculture productivity under variable and evolving climate conditions is also essential.

Source: Authors.

Input markets remain underdeveloped

The Lao PDR's markets for agricultural inputs are still rudimentary. Only a small share of villages has input or machinery retailers, and those that exist are principally in lowland areas (Table 3.8).

Table 3.8: Presence of Input Facilities in the Lao PDR, 2010–2011 (percent of rural villages)

Agri-Ecological Zone	Input Shop	Machinery Shop
Lowland	11.20	9.93
Upland	1.24	2.21
Plateau	4.52	5.69
Mixed	9.68	6.45
Total	6.11	6.19

Lao PDR = Lao People's Democratic Republic.

Source: Ministry of Agriculture and Forestry, 2014. *Lao PDR: Lao Census of Agriculture 2010/11 – Analysis of Selected Themes*. Vientiane.

Given the Lao PDR's mountainous terrain and low level of road development, accessing inputs with so few retailers can pose considerable transaction and transport costs. Farmers have reported input availability as a principal constraint to improved productivity (see earlier section). However, in major

rice areas, fertilizer prices at input retailers are similar to neighboring countries, and nitrogen–rice price ratios are actually lower, meaning that ceteris paribus, and ignoring costs of accessing fertilizer, fertilizer use is more profitable in the Lao PDR (Table 3.9). However, this is a relatively recent phenomenon, as farm gate prices have risen rapidly in recent years.

At the same time, almost all chemical inputs are imported, and there is little domestic capacity for effective regulation of chemical input markets, so input quality may be poor or inputs may be mislabeled. Given low levels of input use, farmers may also be unaware of how to utilize chemical inputs, and limited extension provides little support to this end. In addition, most rice areas planted in the Lao PDR consist of traditional varieties, which often are not fertilizer responsive. Moreover, formal credit availability is limited, which raises the cost of borrowing for inputs among resource-constrained farmers. The combination of input quality/composition uncertainty, weather risk under rainfed production conditions, low response, and increased borrowing cost reduces the expected value of investment in inputs, and may explain why the Lao PDR has one of the lowest rates of fertilizer application in Asia (Figure 3.24).

Table 3.9: Input Market Characteristics in the Lao PDR and Other Mekong Basin Countries in Dominant Rice-Producing Locations

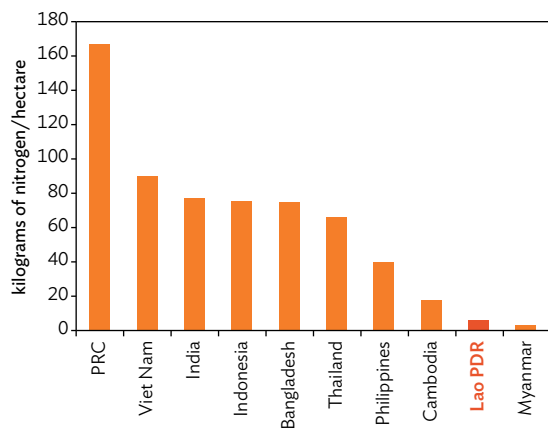
Measure	Indicator	Cambodia	Myanmar	Thailand	Viet Nam	Lao PDR
Access to affordable fertilizers	Urea price at farm gate, \$/ton	425	460	426	357	450
	Ratio of urea price to dry paddy price	1.8	2.3	1.1	1.6	1.6
Depth of fertilizer market	% of farmers using urea fertilizer for paddy production	70 (100) ^a	90	100	100	40
	% of farmers using NPK fertilizer for paddy production	80	30	90	100	20
Availability of seeds	Number of new rice varieties released during 2009–2014	3	19	18	34	n/a
	% of demand met by quality seeds	10	0.4	100	100	9
Depth of seed market	% of farmers using purchased seeds	20 (80)	9	60	53	10

Lao PDR = Lao People's Democratic Republic; NPK = nitrogen, phosphate, and potassium.

Note: ^aData in parentheses for Cambodia are for the dry season. All other data are either for the monsoon season or for all the seasons on average where seasonal differences are small.

Source: S. Zorya, H. Rozemuller, D. Dawe, M. Kung, and C. Manythong, 2016. Rice sector development and poverty reduction in the Greater Mekong Subregion: Leveraging the Rice Value Chain for Poverty Reduction in Cambodia, Lao PDR, and Myanmar. Washington, DC: World Bank Group.

Figure 3.24: Average Nitrogen Fertilizer Application Rates on Cropped Area, 2014



Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.

Source of data: All countries except for the Lao PDR: Food and Agriculture Organization of the United Nations. FAOSTAT. <http://faostat.fao.org/faostat/en#data/EF> (accessed 19 January 2017); For Lao PDR fertilizer imports: United Nations Commodity Trade Statistics Database. <https://comtrade.un.org/> (accessed 6 February 2017); Area harvested data (to compute for fertilizer application rates of the Lao PDR): Lao Statistics Bureau. Lao Expenditure and Consumption Survey 2012–2013. Vientiane.

Formal seed systems are also underdeveloped, as only enough certified seed to cover 3% of rice seed use is produced, with certified seed for rice more developed than for other crops (Bounphanouxay 2014). Total rice seed sales do not exceed 10% of demand, and the state dominates the limited sales that occur (Zorya et al. 2016). However, distribution channels for seeds are not well established, due to the limited reach of the extension system as well as the limited number of input retailers. Farmer-saved seed, after many seasons, has low germination rates, and may alter in genetic compositions, such that productivity is adversely affected by this input deficiency.

In the livestock sector, 75% of grazing lands are in the upland areas, whereas most production is lowland, so that feed is critical (Smith et al. 2015). However, supply chains for fodder and feed are limited. Much maize is exported for animal feed, rather than used in domestic feed industries. Large quantities of domestic agricultural by-products, such as rice straw, also are not effectively utilized in formal feed systems. Given that feed is a constraint to expansion of livestock production, this poses a limitation to improving livestock commercialization.

Credit has limited reach for agriculture

Financial services are at a limited stage of development in the Lao PDR, so that credit for agricultural inputs and investments remains constrained. Only 18% of households nationally (including urban households) report any borrowing activity, of which 4% is from commercial banks, 4% is from friends and family, and 8% is from other informal mechanisms (FinMark Trust 2014). About half of nationally reported borrowing by households is for agricultural purposes. A substantial 29% of rural households are considered financially excluded, without access to any form of savings or credit, and 63% have no participation in any formal financial services.

The Government of the Lao PDR has established three main mechanisms to provide credit to farmers within a financial system that is state dominated. Two of these are state-owned banks that use group lending with joint liability to reach farmers with subsidized interest rates. The Agricultural Promotion Bank (APB) is the larger of the two, and its agricultural lending focuses on seasonal credit for working capital (Eliste and Santos 2012). In 2016, APB lent about \$20 million to farmers through farmer groups endorsed by village heads, with borrowing receiving interest rates that were slightly (less than 1%) lower than for nonagricultural lending by APB or other commercial banks. Nayoby Bank is smaller, but focuses on the 47 poorest districts of the Lao PDR, and targeted groups comprising 8,000 rice farmers with lending of \$2.8 million in 2011. The third mechanism is the Village Development Fund, a credit cooperative system for microfinance at the village level (Sisoumang, Limsombunchai, and Wangwacharakul 2013).

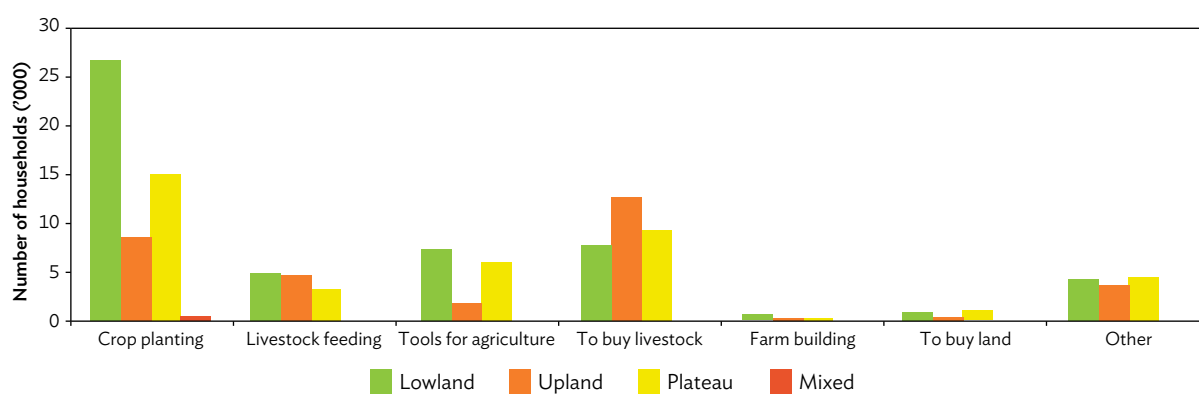
As of 2010–2011, 44% of rural villages had credit presence, of which two-thirds consisted of the Village Development Fund (Table 3.10). Credit is more concentrated in plateau and lowland environments. The substantial share of villages with credit presence masks the fact that credit utilization is very limited. Only 13% of households report agricultural borrowing activity. The principal use of credit is for crop production inputs, followed by livestock, with the former dominant in lowland areas and the latter dominant in upland environments (Figure 3.25).

Table 3.10: Presence of Credit Activities in Agricultural Villages in the Lao PDR, 2010–2011

Village Type	Rural Villages with Credit Activity (%)	Type of Credit Facility Active (% of rural villages)			
		Public Bank	Private Bank	Microfinance Institution	Village Development Fund
Lowland	45.5	15.7	1.9	2.5	35.4
Upland	38.9	14.5	0.7	3.5	26.5
Plateau	51.1	24.1	2.6	2.8	34.7
Mixed land	35.7	10.7	na	na	35.7
Lao PDR	44.1	17.2	1.6	3.0	31.7

Lao PDR = Lao People's Democratic Republic, na = not available.

Source: Ministry of Agriculture and Forestry. 2014. *Lao PDR: Lao Census of Agriculture 2010/11 – Analysis of Selected Themes*. Vientiane.

Figure 3.25: Agricultural Borrowing Activity by Purpose of Borrowing, 2010–2011

Source: Ministry of Agriculture and Forestry. 2014. *Lao PDR: Lao Census of Agriculture 2010/11 – Analysis of Selected Themes*. Vientiane.

Overall levels of credit provision and credit use are modest, which aligns with an agricultural system that is predominantly low-input with a substantial share that is subsistence-oriented. Moreover, state agricultural credit is extended under terms that tend to favor rice for its short duration relative to other products (Zorya et al. 2016). Were agriculture to become more productive and commercialized, a more extensive and flexible system of agricultural finance would become necessary.

Financial sector reforms can help to improve credit market development for agriculture. Currently, caps on interest rates limit the financial viability of credit expansion, and their removal may broaden credit flows (MAP 2016). Similarly, complicated procedures for establishing bank branches and for utilizing third-party agents for representation of banking services impede credit outreach. Mobile money and digital financial services are in their infancy in the country, and enabling regulations have yet to be developed. Village funds have the largest rural outreach of any credit form, but

oversight has been weak, and this has led many such funds to become unsustainable.

With low irrigation development, agriculture in the Lao PDR is exposed to substantial weather risk, which amplifies other uncertainties regarding investment in agriculture. Formal insurance for agricultural production is essentially absent from the market (FinMark Trust 2014), so that farmers manage risks through low-risk low-return agricultural practices and maintaining asset liquidity, especially as credit access for consumption smoothing is limited. Both come at the expense of input intensification and input demand that can drive input market development.

Weather-based index insurance offers a potential means of spreading risk that can be implemented without the high transaction costs that conventional insurance faces to verify individual loss claims from many small farmers. This approach works by making payments not based on individual claims, but by an index, such as for rainfall, that is closely linked to

individual losses, transparent, easily quantifiable and that those insured cannot manipulate. Index insurance has been observed to induce additional investments in fertilizer and other inputs in a range of experimental studies across Asia, Africa, and Latin America (Carter et al. 2014). At the same time, index-based insurance depends upon the presence of enabling conditions that are yet to be fully developed in the Lao PDR. These include (i) a highly accurate and timely system of production statistics and weather monitoring, so that the index (based on rainfall or other data) corresponds well with actual losses; (ii) the widespread presence of insurance intermediaries, which are often rural credit institutions or cooperatives; and (iii) sufficient extension and knowledge transfer for farmers to have confidence in insurance products.

Legal land-use rights are often limited

From the early 1990s onward, the Lao PDR has attempted to clarify land-use rights. This has been undertaken through the Land Titling Program in urban and peri-urban areas, and the Land Use Planning and Land Allocation Program in rural areas. The Land Titling Program provided “permanent land use rights” to individual urban households, which have no expiration and are transferable. However, the Land Use Planning and Land Allocation Program only provided “temporary land use rights” via “temporary land use certificates” (TLUCs) for agricultural and forest land in rural areas, and this issuance was mostly under donor financing. TLUCs are only valid for 3 years, and rights under the TLUCs are transferable only through inheritance. Subsequently, limited allocation of domestic funds has also prevented completion of the Land Titling Program, and coverage has been limited (Fujita and Phanvilay 2008). Furthermore, there has been limited follow-up assistance to TLUC recipients for renewal, so that many certificates have expired. In contrast to agricultural and urban lands, official forest land is reserved as state property.

Land registration has continued since TLUCs were initially issued on a systematic, or comprehensive basis, in selected areas under donor funding, and on a sporadic basis elsewhere when individuals applied for registration (GIZ 2015). In parallel, “micro land use planning” was undertaken by the Department of Land Planning and Development to designate land-

use boundaries in the 47 poorest districts, but this often involved limited consultations with villagers.

Land allocation for industry and agricultural concessions follows a separate process, which may be through special economic zones or long-term leases. This process has limited coordination with the Land Use Planning and Land Allocation Program, which means that such land allocation may conflict with TLUCs. As TLUCs have mostly expired, they offer little legal protection in the event of overlaps in allocation (Wellmann 2012).

Lack of documented land-use rights creates three principal problems for agriculture. First, transferable titles or land-use certificates can serve as collateral and facilitate access to finance, and their absence makes agricultural lending more risky to financial institutions. Second, the absence of documented ownership can mean that land can be reallocated by the government to other users, and that efficient land transfers among farmers may be risky. Third, the risk of land loss can mean that farmers are less likely to make long-term investments in productive potential.

Domestic output prices have been depressed

With low levels of chemical input use, and products with differentiated market niches, such as higher quality glutinous rice, the Lao PDR has the potential for exports of products in premium segments, such as organic. However, the Lao PDR’s current positioning often restricts it to low-quality tiers, and limits export potential.

Regarding rice, the Lao PDR’s principal crop, when international market prices have spiked, the Government of the Lao PDR has periodically imposed bans on rice exports, so as to stabilize domestic prices (Durevall and van der Weide 2017). This policy was successful in isolating domestic consumers from the effects of the food price crisis of 2007–2008, in which international prices of ordinary rice spiked to \$1,000 per ton. However, such policies adversely affect domestic producers, who miss the opportunity to capture high output prices. In addition, low domestic prices reduce the returns to output-enhancing investments, and thereby discourage productivity improvement. Although the Agricultural Development Strategy aims to increase the size of reserves held by individual rice millers, there is no public

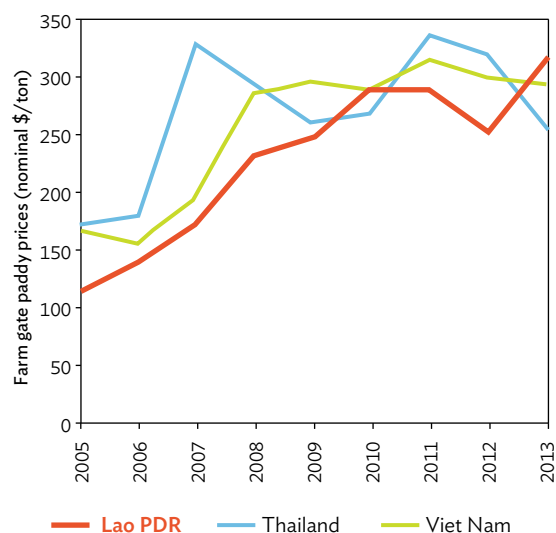
buffer stock managed to stabilize prices. This means that farmers are exposed to rice price volatility.

In recent years, the Lao PDR has eliminated general bans on exports. However, it has not removed onerous restrictions on exports. Exportation of rice is highly regulated through a system involving the provincial and national governments (via the Domestic Trade Department of the Ministry of Industry and Commerce), with rice trade only allowed in the event of a provincial rice balance of more than 350 kilograms per person, plus extra allowances for reserves (Lao PDR Trade Portal). This means that exports are only technically permitted when a province has a production level that is more than twice actual consumption (according to the LECS 2012/2013). Moreover, rice traders need to be licensed and the licenses are restricted to the remit of trade (for example, movement at district or provincial level; Eliste and Santos 2012).

Despite these restrictions, the differential between domestic farm gate paddy prices and those of neighboring countries has fallen over time. In 2007, prices were just over half of those in Thailand, but by 2013, prices were slightly above those of both Thailand and Viet Nam, when glutinous versus nonglutinous distinctions are not considered (Figure 3.26). At the same time, glutinous rice now has a substantial price premium in Thailand, which may mean that the price remains below that of international markets when market niches are considered.

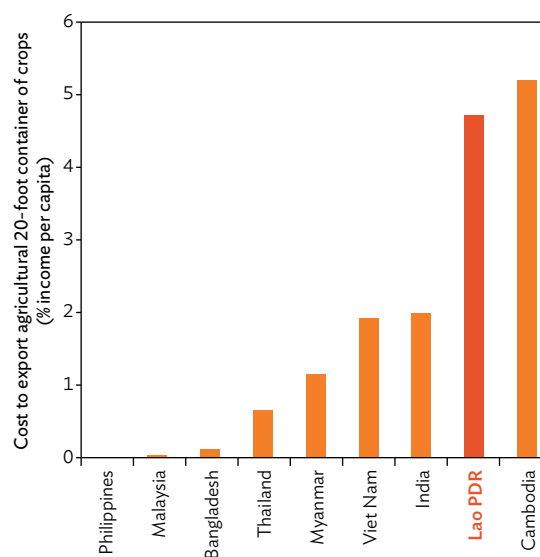
More broadly, import and export procedures have tended to adversely affect agricultural trade, even if formal tariffs and the burden of official nontariff measures are not particularly high (World Bank 2016). The Organisation for Economic Co-operation and Development rates the Lao PDR as having the lowest trade facilitation performance in ASEAN (OECD 2015). This is particularly so for rural agricultural trade, as there is poor coordination between the central authorities that grant licenses and the provincial agencies that enforce the licenses at border crossings, so that the latter may append additional nonstandard requirements and delay trade. The relative cost of permits required for agricultural trade remains among the highest in the region (Figure 3.27).

Figure 3.26: Farm Gate Paddy (Rough Rice) Prices in the Lao PDR, Thailand, and Viet Nam, 2005–2013



Lao PDR = Lao People's Democratic Republic.
Source: Calculations based on data from the Food and Agriculture Organization of the United Nations. FAOSTAT. <http://www.fao.org/faostat/en#data/RL> (accessed 15 December 2016).

Figure 3.27: Costs of Compliance with Agricultural Export Regulations and Permits, 2016



Source: World Bank. Enabling the Business of Agriculture. <http://eba.worldbank.org/data/exploretopics/markets>

In the past, a large share of agricultural trade has been informal, but the government has taken important steps to shift trade toward formal, recognized channels, which can be more efficient and pose less risk of intellectual property loss or pest and disease transmission. Between 2012, the year of the Lao PDR’s accession to the World Trade Organization and early 2017, five market access agreements have been signed with the PRC and four trade agreements were signed with Thailand. Commodities covered include rice, watermelons, banana, cassava, and maize. Each of these agreements includes a Memorandum of Understanding on Sanitary and Phytosanitary Standards required of Lao exports.

The corresponding challenge is to build capacity to ensure compliance with those standards. Surveillance, quarantine, and inspection programs have limited reach in the context of limited extension and public sector service provision for agriculture, as well as food safety standards that are not extensively developed (CUTS International 2016). As a result, sanitary and phytosanitary documentation is slow, and acceptance by importing authorities may be delayed. Electronic application and issuance of sanitary and phytosanitary

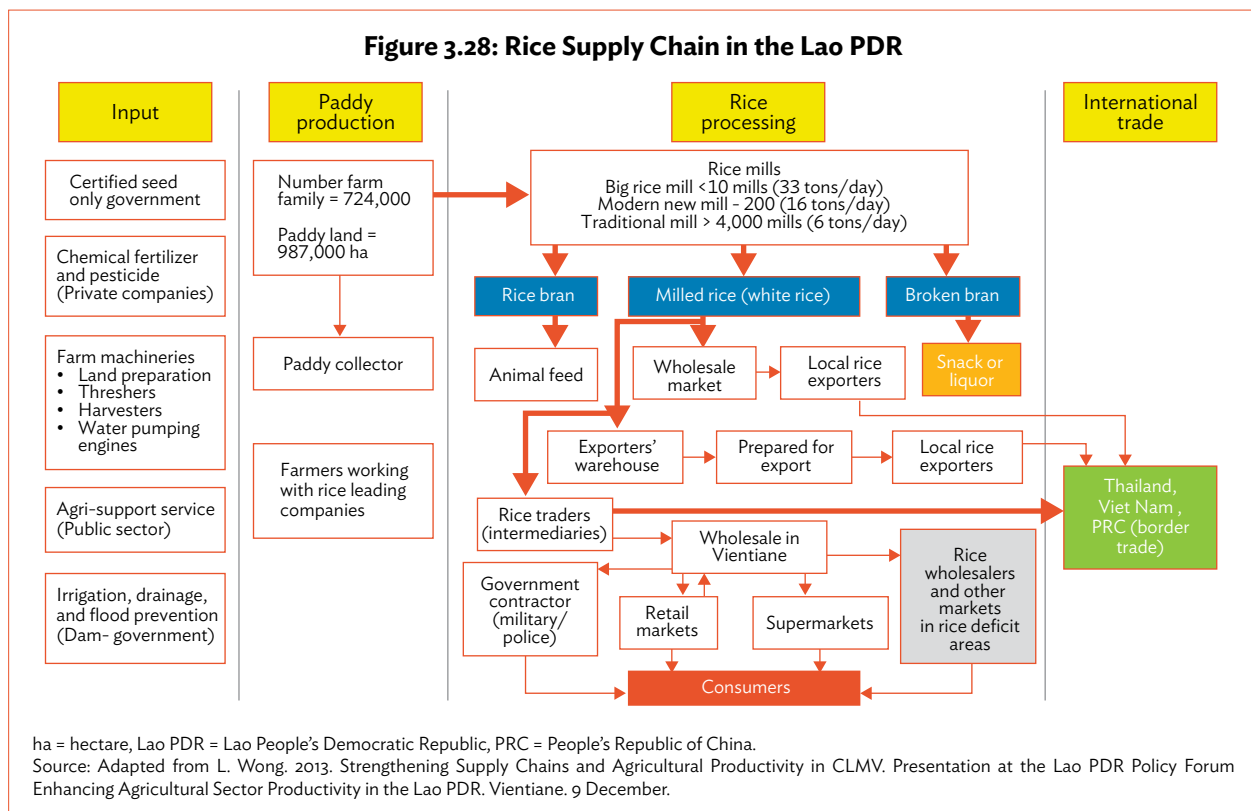
permits remains limited to key commodities and border crossings, so that substantial agricultural trade is not yet covered by streamlined procedures.

Value-chain linkages are weak

Value addition and prices remain depressed as a result of problems maintaining product quality across supply chains composed of numerous actors, including farmers, traders/collectors, processors, retailers, and exporters.

Rice typifies these challenges (Figure 3.28). Approximately 90% of the paddy milled in the Lao PDR is milled in small processing units located at the village or district level with poor equipment and a maximum daily capacity of about 6 paddy tons. There are more than 4,000 of these mills in the country. The remaining milling capacity consists of 200 medium-sized mills with an average daily capacity of 16 paddy tons, and 10 large mills with an average capacity of 33 tons. Most mills only operate at around 50% capacity (Eliste and Santos 2012). Only large mills are integrated into international trade networks.

Figure 3.28: Rice Supply Chain in the Lao PDR



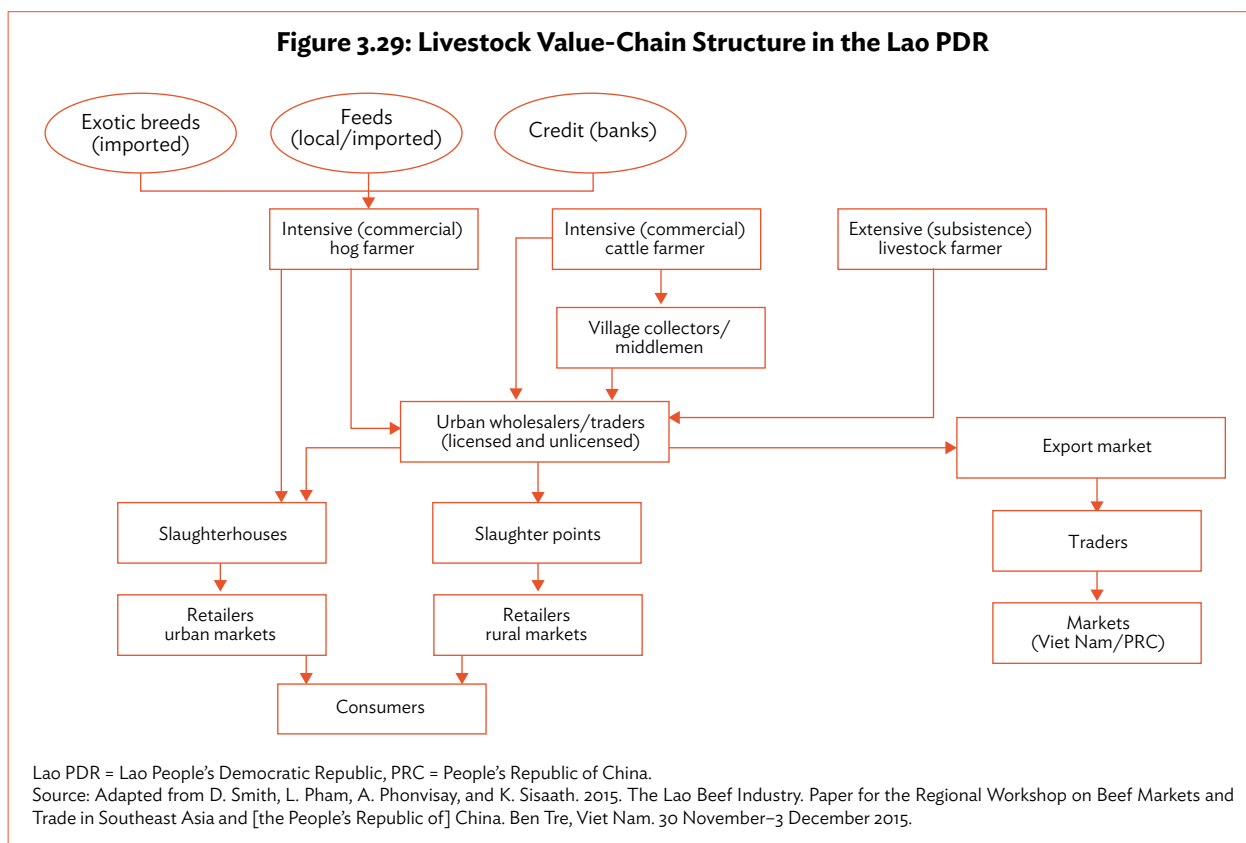
Aside from low capacity utilization, mills in the Lao PDR have poor milling rates because of old and obsolete processing equipment. While modern mills reach milling rates of 62% and higher, average milling rates in the Lao PDR are about 60% and lower (Eliste and Santos 2012). Profit margins are low in the subsector. Overall, the rice milling industry is operating at low efficiency and with insufficient profitability for equipment upgrades, with low quality milled rice as a result, which receives low prices when rice exports are permitted.

Most livestock production is also not well integrated into postproduction value chains (Figure 3.29). Traditional smallholder farmers account for more than 95% of the country's livestock production and usually operate mixed farming systems, simultaneously growing crops and rearing animals. Rural markets are supplied with meat products almost exclusively by smallholders. Vertically integrated commercial livestock production is just emerging. District traders, who also manage slaughter and retail sales of meat, either buy directly from producers in nearby villages or through brokers or small traders. Small traders

buy livestock from rural households and move them to transport points near major urban centers where wholesale or retail traders collect live animals by truck (IFAD 2014). The meat processing sector in the Lao PDR is at a primary stage and largely undeveloped. Slaughterhouses are traditional and do not meet regulations for hygiene, environment, and animal welfare (Smith et al. 2015).

In recent years, the Lao PDR has increasingly become a transit hub for trading live animals and animal products in the Mekong Region. Live animals, especially cattle, are sourced from neighboring countries and transported to Thailand for fattening, and then transit through the Lao PDR to final destinations in Viet Nam and the PRC. The animals are exported informally without official documentation, oversight, or coordination, which may result in increased disease transmission (Smith et al. 2015). This deficiency is compounded by a lack of capacity for sanitary testing and disease monitoring.

The agriculture sector is adversely affected by poor infrastructure, which increases transport costs,

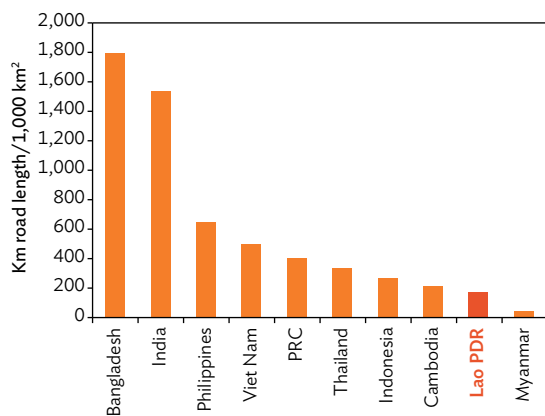


reduces market access, and drives a larger differential between farm gate and retail prices. The Lao PDR has some of the lowest levels of rural road development in developing Asia, which limits connectivity between value-chain segments (Figure 3.30).

A low level of logistics development further exacerbates the effects of poor transport infrastructure to depress domestic prices. The Lao PDR has the lowest ranking among comparator countries, according to the World Bank’s Logistics Performance Index (Figure 3.31). Moreover, that ranking has fallen over time, in contrast to other countries in the region. Poor logistics mean that transaction costs are amplified, so as to further increase differentials between farm gate and export or retail prices. They also mean that export opportunities may be missed because importer requirements of minimum product quantity and quality may be difficult to satisfy.

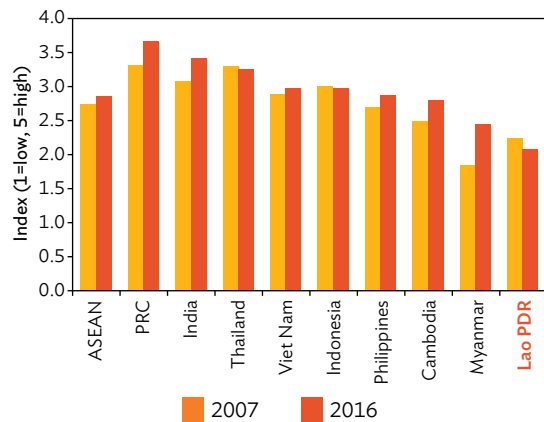
The effect of these logistics and transport challenges can be seen in the lack of development of premium market niches, which depend upon clear and coordinated supply chains in a reliable regulatory environment. For example, as a country with low levels of chemical input usage, organic agriculture has been perceived as a segment where greater value

Figure 3.30: Road Length per Land Area, Selected Asian Countries, 2011



km = kilometer, km² = square kilometer, Lao PDR = Lao People’s Democratic Republic, PRC = People’s Republic of China.
 Source: Calculations based on data from United Nations Economic and Social Commission for Asia and the Pacific. ESCAP Online Statistical Database. <http://www.unescap.org/stat/data/statdb/DataExplorer.aspx> (accessed 5 January 2017).

Figure 3.31: Overall Logistics Performance Index, Selected Asian Countries, 2007 and 2016



ASEAN = Association of Southeast Asian Nations, Lao PDR = Lao People’s Democratic Republic, PRC = People’s Republic of China.
 Source: World Bank. World Development Indicators. <http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators#> (accessed 6 March 2017).

could be captured from many existing production practices. However, even with substantial support from development agencies, the subsector has faced challenges, with organic area falling from 4,880 ha in 2009 to 1,450 ha in 2015 (Willer, Lernoud, and Kilcher 2013; Willer and Lernoud 2017).

Were appropriate value-chain coordination achieved, with clear chains of custody and more advanced processing, in the context of better developed and enforced safety and quality standards, it could be possible for the country to capture higher value market segments for exports. In such a context, it may be possible to build a premium “Lao origin” brand identity, which capitalizes on the clean nature of production practices, as well as the quality characteristics of traditional products.

Innovation receives little support

Public sector investment in agricultural innovation lags behind much of the region. The national agricultural research system (principally composed of the National Agricultural and Forestry Research Institute) has very limited resources, and has been highly dependent on donor funding, which has been unstable. This funding instability is problematic for scientific progress,

which often requires long periods for the successful generation of innovations. The Lao PDR has the lowest agricultural research intensity (research expenditure as a share of agricultural GDP) in developing Asia (Figure 3.32). Moreover, that intensity is falling and is declining faster in relative terms than in any other country in the region.

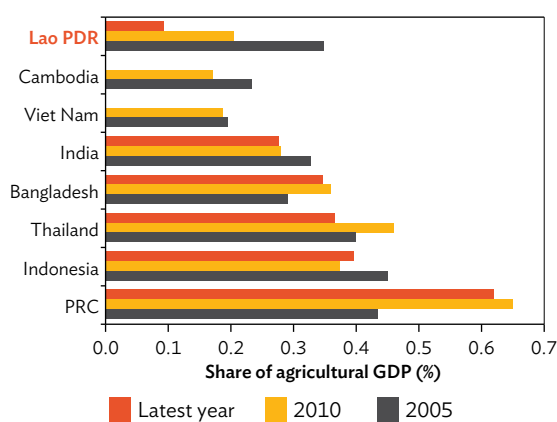
Beyond research, there are large gaps in facilitating technology adoption on farms. The National Agricultural and Forestry Extension Service oversee extension, which also include Provincial and District Agricultural and Forestry Extension Services and Offices (IFPRI). At the district level, extension staff are not specialized and are termed farming systems extension workers. At the village level, there is an informal network of village extension workers recruited from among the village members, who receive information materials and training from district offices. The Lao PDR extension system has the lowest level of staffing per area of agricultural land in developing Asia (Figure 3.33). Only one-third of farmers report any use of information from the extension system according to the 2010 LCA. Moreover, the quality of extension

is limited by the lack of specialization of district office staff, who serve as the formal contact point for advising and training farmers.

Limited attention to research and extension has led to limited adoption of modern technologies in agriculture. Input use levels remain low and infrequent partially as a result of limited knowledge of input management. The Lao PDR also has the lowest adoption rate of modern varieties of rice in Asia, which means that rice production has not benefited from genetic advancements that have substantially improved productivity elsewhere (Figure 3.34).

Several of the popular traditional rice varieties have good quality glutinous characteristics, which may be a reason for low modern variety adoption. However, a robust research system should still be able to build on these genotypes to offer improved performance. In addition, for varieties to maintain performance under changing climatic conditions, genetic adaptation will be required, which modern crop improvement programs help to provide.

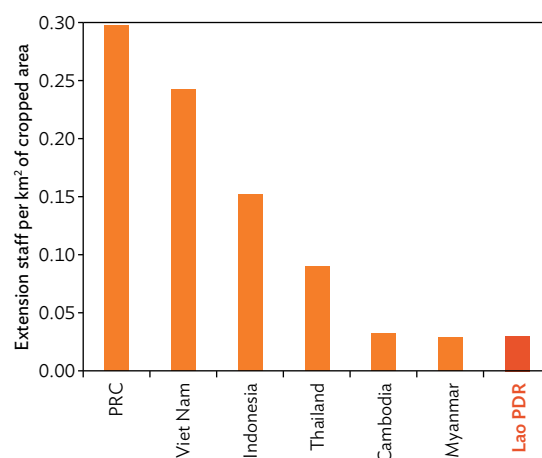
Figure 3.32: Agricultural Research Spending as Share of Agricultural GDP, Selected Asian Countries, 2005, 2010, Latest Year



GDP = gross domestic product, Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.

Sources: Data on agricultural research spending from G. Stads. 2016. A Snapshot of Agricultural Research Investment and Capacity in Asia. In J. L. Karihaloo, B. Mal, and R. Ghodake, eds. *High Level Policy Dialogue on Investment in Agricultural Research for Sustainable Development in Asia and the Pacific 8–9 December 2015 – Papers Presented*. Bangkok. Data on agricultural GDP from World Bank. World Development Indicators. <http://data.worldbank.org/data-catalog/world-development-indicators> (accessed 21 December 2016).

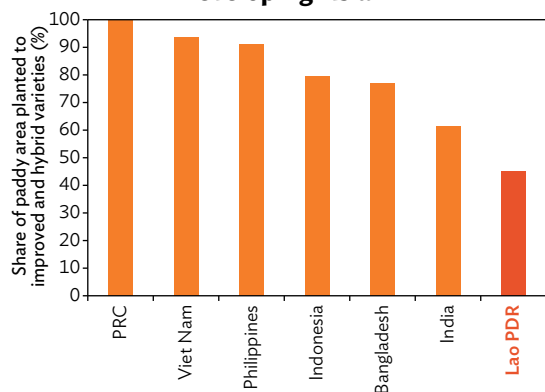
Figure 3.33: Intensity of Extension Coverage in Developing Asia, 2009
(staff per cropped area)



km² = square kilometer, Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.

Source: Authors' calculations from International Food Policy Research Institute. Agricultural Extension and Advisory Services Worldwide. <http://www.worldwide-extension.org/asia/lao-peoples-democratic-republic> (accessed March 2017); Lao Statistics Bureau. Lao Expenditure and Consumption Survey 2012/13. Vientiane; and Food and Agriculture Organization of the United Nations. FAOSTAT. <http://www.fao.org/en/#data/RL>

Figure 3.34: Share of Rice Area Planted to Modern Varieties in Selected Countries of Developing Asia



Lao PDR = Lao People's Democratic Republic, PRC = People's Republic of China.

Sources: Data for the Lao PDR from the Ministry of Agriculture and Forestry. Lao Census of Agriculture 2010/11. Vientiane; Data for other countries from the International Rice Research Institute. World Rice Statistics.

3.6 Empirical Analysis of Public Programs

3.6.1 An empirical approach evaluates which interventions make a difference

Objectives of empirical analysis

The Lao PDR has many important constraints facing its agriculture sector, but public sector resources are limited. For this reason, it is important to understand which government interventions are effectively contributing to agricultural development, as well as those government programs that are currently ineffective. To this end, this analysis applies empirical techniques to assess the effects of a range of public policies and programs on five agricultural performance outcomes: (i) rice productivity, (ii) rice commercialization, (iii) commercialization of other crops, (iv) livestock commercialization, and (v) land clearing (deforestation) for agriculture.

Outcomes assessed

One assessed outcome is rice productivity in terms of yield, as rice is the principal agricultural product of the country. Given that rice dominates production and consumption, even as rice is no longer sufficient for

domestic needs, it is difficult for the sector to achieve growth without rice productivity being enhanced.

Rice commercialization, or that farms sell rice output, is assessed as another outcome. This is important to the farmers' ability to move from subsistence production to engage with formal agricultural markets, obtain cash income, and integrate into the nonfarm economy. A complementary focus is on the propensity to sell nonrice crops, which is indicative of both commercialization and diversification away from rice as the dominant agricultural crop.

The propensity to have livestock sales is a third outcome assessed as indicative of commercialization. The sale of livestock is not only another avenue for diversification, but also is a potential pathway for the landless poor to engage in market-oriented agriculture.

As noted earlier, agricultural expansion into natural ecosystems is an important environmental problem in the Lao PDR. This report also assesses the degree to which forest/vegetation clearance for agriculture is avoided through environmental and land-use interventions.

Interventions assessed

The interventions assessed for impact on rice yield include the following: (i) irrigation development (whether farms have irrigation); (ii) modern irrigation versus traditional irrigation (irrigated farmers located in schemes with improved facilities versus temporary weirs and gabions); (iii) use of modern varieties of rice developed by scientific institutes; (iv) farmer reported use of information from agricultural extension or agricultural projects; (v) participation in training on crop protection and/or integrated pest management; (vi) presence of a year-round motorable road in the village where farmers live; (vii) farmer use of credit for crop or livestock inputs; (viii) the presence of contract farming for farmers with rice sales; and (ix) certification of agricultural land-use rights in the village where farmers live.

The same interventions are assessed for effects on rice commercialization as for rice yield, except for contract farming, which, by definition, affects sales. However, rice commercialization is assessed on a

household basis, using household level variables, rather than variety (plot) level variables used for yield. The same interventions are tested for effects on commercialization of other crops as on rice, with the exception that modern varieties are omitted (varietal information is not available for nonrice crops).

Interventions tested for effects on livestock sales include (i) credit use for livestock, (ii) receipt of livestock vaccine, (iii) information use from agricultural extension, (iv) presence of a year-round motorable road in the village, and (v) presence of a cooperative in the village.

Programs evaluated for effects on deforestation include the (i) presence of environmental and/or anti-shifting cultivation projects in the village; (ii) conduct of land-use planning in the village; and (iii) classification of all forest land in the village as “conservation” or “protection” forest.

Data source

The Lao Census of Agriculture contains observations on a variety by variety basis for a sample of 38,700 farms in 2010–2011, which include production, crop disposal, input use, mechanization, credit use, information use, and household characteristics. The

census also includes village surveys, which contain both village characteristics and facilities, as well as indicators of the presence of various agricultural programs. The frequencies of each of these programs (interventions) range from 1,720 to 32,700 units and are reported in Appendix 3.1.

Methodology

A key problem in assessing the effects of public programs (interventions) is that such interventions are placed purposively by governments, and farmers self-select into participation in those programs. As a result, the characteristics of those participating in programs prior to or without the intervention are not the same as the characteristics of those who participate. This means that direct comparisons between participants and nonparticipants confound those differences in characteristics with program effects, and that explanatory variables for outcomes of interest are correlated with program participation. The methodology applied to estimate the impact of different interventions takes this into account and is discussed in Box 3.3. It consists of regression models for participation/use of the intervention and outcomes of the intervention, which are applied jointly. Descriptive statistics of the variables used in the empirical analysis are reported in Appendix 3.2.

Box 3.3: Methods for Identifying the Effects of the Lao PDR’s Agricultural Programs

This study aims to determine whether existing government programs are beneficial to farm performance in the Lao PDR. Using data from the Lao Census of Agriculture (LCA) 2010/11, it tests the hypothesis that outcomes are higher among households exposed to and/or using specific interventions.

The data utilized from the LCA are observational and cross-sectional. To obtain a valid measure of program treatment effects, an augmented inverse probability weighting, or “double robust” estimator (Robins, Rotnitzky, and Zhao 1994; Lunceford and Davidian 2004) was used to address the fact that farms that participate in interventions differ from those that do not, or what is often termed endogeneity of program participation or “selection bias.”

The unique feature of double robust estimators is that they only require that either of the propensity score model or the regression model is correctly specified to correctly estimate the effect of participation on the outcome. Under this framework, the outcome, Y , is conceptualized as

$$Y = Y_1 Z + (1-Z)Y_0$$

where Y is the response outcome, Z is the indicator of participation/exposure (if $Z = 1$ participating, $Z = 0$ if not), and Y_1 and Y_0 are potential outcomes defined as values of the outcome conditional on participation or nonparticipation. Taking the difference of the means of Y_1 and Y_0 gives the average treatment (participation) effect.

$$\Delta = \mu_1 - \mu_0 = E(Y_1) - E(Y_0)$$

If participation were random, participation is independent of potential outcomes, which implies that $E(Y|Z=1) = E\{Y_1 Z + (1-Z) Y_0 | Z=1\} = E\{Y_1 | Z=1\} = E(Y_1)$, and similarly, $E(Y|Z=0) = E(Y_0)$. Thus, $Y^1 - Y^0$ gives an unbiased estimator for Δ .

continued on next page

Box 3.3 *continued*

However, in this cross-sectional regression, participation is not controlled and may not be independent of other determinants of outcomes. To rectify this issue, the analysis identifies characteristics related to potential outcomes and participation. If the vector of k covariates, X , represents all such confounders, then for subjects sharing a particular value of X , differences in potential outcomes may be ascribed to treatment, i.e., $(Y_0, Y_1) \parallel Z \mid X$.

Eliminating bias due to confounding may be achieved using the propensity score (ρ_i), which is defined as the probability of receiving treatment or exposure given covariates, i.e., subjects' characteristics, in combination with a switching outcome regression. As the first step, ρ_i is estimated as the predicted values from a logistic model given by the following equation:

$$\text{logit}P(Z=1|X) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_k X_k, \text{ or } \rho_i = e(X_i, \beta)$$

As a second step, models are fitted for the outcome on the covariates for the treatment group ($Z_i = 1$) and the control group ($Z_i = 0$) separately. Predicted values of Y are then obtained using both sets of coefficients with observed covariates.

$$m_1(X_i, \alpha_1) = E(Y_i | \text{trt}=1, X_i, \alpha_1) = \alpha_{01} + \alpha_{11}(\text{trt}=1) + \alpha_{21} X_{21} + \dots + \alpha_{q1} X_{q1}, \text{ for trt} = 1, \text{ and}$$

$$m_0(X_i, \alpha_0) = E(Y_i | \text{trt}=0, X_i, \alpha_0) = \alpha_{00} + \alpha_{10}(\text{trt}=0) + \alpha_{20} X_{20} + \dots + \alpha_{q0} X_{q0}, \text{ for trt} = 0$$

where $m_1(X_i, \alpha_1) = Y_1$ = predicted value of the outcome had the subject participated;

$m_0(X_i, \alpha_0) = Y_0$ = predicted value of the outcome had the subject not participated.

In the cases of binary outcomes (for sales/nonsales of rice, other crops and livestock, as well as land clearance), the outcome equation is a logit specification, whereas for rice yield, the outcome equation is estimated via ordinary least squares.

The estimator controls for confounding by taking the inverse of ρ_i or the predicted probability that an individual participates, i.e., $1/\rho_i$ for the exposed and $1/(1 - \rho_i)$ for the unexposed to weight the observed data and predicted values from the switching regression. Weighting by this quantity creates a pseudo population in which the distributions of confounders among the exposed and unexposed are the same as the overall distribution of those confounders in the original total population.

The resulting estimates for the Y_1, Y_0, ρ are then substituted to the double robust estimator given in the following equation:

$$\Delta_{DR} = n^{-1} \sum_{i=1}^n \left[\frac{Z_i Y_i}{\rho_i} - \frac{\{Z_i - \rho_i\}}{\rho_i} m_1(X_i, \alpha_1) \right] - n^{-1} \sum_{i=1}^n \left[\frac{(1 - Z_i) Y_i}{1 - \rho_i} + \frac{\{Z_i - \rho_i\}}{1 - \rho_i} m_0(X_i, \alpha_0) \right] = \mu_{1,DR} - \mu_{0,DR}$$

The double robust estimator, Δ_{DR} , represents the average causal treatment effect.

The standard error for the double robust estimator is $\sqrt{(n^{-2} \sum_{i=1}^n I_i^2) \times VIF}$ where

$$I_i = \frac{Z_i Y_i}{\rho_i} - \frac{\{Z_i - \rho_i\}}{\rho_i} m_1(X_i, \alpha_1) - \left[\frac{(1 - Z_i) Y_i}{1 - \rho_i} + \frac{\{Z_i - \rho_i\}}{1 - \rho_i} m_0(X_i, \alpha_0) \right] - \Delta_{DR}$$

and VIF is the intracluster variance inflation factor that adjusts for clustering (since program participation is often correlated within villages).

As seen above, separate conduct of outcome regressions for participants and nonparticipants allows for interaction effects between interventions and control variables to be addressed, as coefficients may differ for the two regimes. Moreover, each regression includes control variables for the other interventions with significant treatment effects, so that interactions between the evaluated treatment and other treatments are captured. This technique's limitation is that it does not account for unobservable characteristics that covary with program participation.

For each of the programs (i.e., treatment) that were evaluated for impact on outcome, the specification selected as best-fit was that which had the best balance between R^2 value and parsimony. As there is much correlation at the village level in intervention use, cluster robust standard errors were applied.

Source: Authors.

3.6.2 A range of interventions condition agricultural outcomes

Rice productivity

Four out of the nine interventions evaluated have a consistently significant effect on rice yield. Irrigation, modern variety use, plant protection training, and contract farming have significant effects on yields, with the first two interventions being highly significant. The irrigation effect is pronounced and equates to a 24% increase in yield compared with rainfed cultivation. Modern varieties also represent a substantial 15% increase. Contract farming and plant protection training have a much smaller 3% effect (Table 3.11).

Table 3.11: Estimated Effects of Agricultural Interventions in the Lao PDR on Paddy Yields

Dependent variable = Paddy yield (kg) per hectare			
Intervention	ATE	ATE Std. Error	ATE (%)
Irrigation	506.48 ***	44.03	23.94 ***
Use of modern variety	325.13 ***	62.09	15.27 ***
Contract farming	81.85 *	44.19	3.36 *
Plant protection training	58.57 **	24.31	2.67 **
Year-round motorable road	91.57	69.94	4.22
Modern irrigation	76.55	55.22	2.59
Credit for use in rice production	25.36	42.43	1.15
Agricultural land use/ ownership certificates	(3.68)	65.12	(0.17)
Agricultural extension	(34.03)	22.1	(1.51)

() = negative, ATE = average treatment effect, Std. = Standard Deviation, kg = kilogram, Lao PDR = Lao People's Democratic Republic.

Notes: * = significant at 10% level, ** = significant at 5% level, *** = significant at 1% level.

Source: ADB staff estimates using Lao Census of Agriculture data.

In contrast to irrigation facilities in general, modernized irrigation did not have a significant effect on rice yield compared with traditional irrigation. Use of credit for crop inputs also has no significant effect. Year-round road access is found to have an insignificant effect. Land certificates and agricultural extension have insignificant effects.

Rice commercialization

As may be expected, some of the same patterns generally hold for rice commercialization as for yield, with three of the same interventions having significant effects: plant protection training, irrigation, and use of modern varieties (Table 3.12). The relative magnitude of effects is slightly different (19% increase in sales probability from plant protection training, compared with only a 14% increase from irrigation and an 8% increase from modern varieties).²⁰ Plant protection training has a much more pronounced association with sales than yield, while extension information more generally is found to have a small but significant effect.

Table 3.12: Estimated Effects of Agricultural Interventions in the Lao PDR on Rice Sales

Dependent variable = Rice sales (binary)			
Intervention	ATE	ATE Std. Error	ATE (%)
Plant protection training	0.06 ***	0.01	18.76 ***
Irrigation	0.05 ***	0.01	13.94 ***
Use of modern variety	0.03 *	0.02	8.45 *
Agricultural extension	0.02 *	0.01	5.47 *
Modern irrigation	0.03	0.03	7.03
Credit for use in crop production	0.02	0.02	5.14
Year-round motorable road	(0.0)	0.03	(1.22)
Agricultural land use/ ownership certificates	0.0	0.02	0.43

() = negative, ATE = average treatment effect, Std = Standard Deviation, Lao PDR = Lao People's Democratic Republic.

Notes: * = significant at 10% level, ** = significant at 5% level, *** = significant at 1% level.

Source: ADB staff estimates using Lao Census of Agriculture data.

Other crop commercialization

Results on sales of nonrice crops lead to different insights than are found for paddy rice productivity and sales. Unlike for rice, credit access for crops is highly associated with other crop sales, with a 35% increase in sales probability identified as the effect of credit access (Table 3.13).

²⁰ Part of this may be an artifact of how intervention participation is characterized. This regression is performed at the household level, so households with partial intervention use, such as only some plots with irrigated rice or modern varieties, are characterized as "treated," even though treatment is partial. As a result, the treatment effects get dampened for such interventions, relative to those that affect all production.

Table 3.13: Estimated Effects of Agricultural Interventions in the Lao PDR on Nonrice Crop Sales

Dependent variable = Nonrice crop sales (binary)			
Intervention	ATE	ATE Std. Error	ATE (%)
Credit for use in crop production	0.14 ***	0.02	34.80 ***
Year-round motorable road	0.08 *	0.05	22.73 *
Agricultural land use/ownership certificates	0.07 ***	0.02	18.05 ***
Plant protection training	0.06 ***	0.01	14.87 ***
Irrigation	0.02 *	0.01	4.80 *
Modern irrigation	0.02	0.02	5.05
Agricultural extension	(0.02)	0.01	(4.34)

() = negative, ATE = average treatment effect, Std = Standard Deviation, Lao PDR = Lao People's Democratic Republic.

Notes: * = significant at 10% level, ** = significant at 5% level, *** = significant at 1% level.

Source: ADB staff estimates using Lao Census of Agriculture data.

Road access also has a high 23% effect, although the statistical significance is lower. Similarly, documented land ownership also has a highly significant 18% increase in crop sales. Plant protection technical assistance also has a significant 15% effect that is similar in magnitude to the effect for rice sales. Irrigation has a small effect that is significant, but at a lower level.

Livestock commercialization

Empirical findings of the study show a strong association between credit and livestock commercialization (Table 3.14). Similarly, the effects of vaccination programs also have a strong impact on improving the livestock sales. The results indicate that usage of credit for livestock and vaccination programs for the animals each result in 17% to 18% higher propensity to have livestock sales. However, agricultural extension, cooperatives, and road access do not appear to significantly affect livestock commercialization.

Land clearance/deforestation

The results indicate that land-planning processes appear to have an important role in reducing land clearance (a proxy indicator for deforestation) and stabilizing land use. Land clearing for agriculture drops by about 18% when all forest land within a village

Table 3.14: Estimated Effects of Agricultural Interventions in the Lao PDR on Livestock Sales

Dependent variable = Livestock sales (binary)			
Intervention	ATE	ATE Std. Error	ATE (%)
Credit use for livestock	0.08 ***	0.02	17.17 ***
Received vaccine	0.07 ***	0.01	17.50 ***
Agricultural extension	0.01	0.01	3.15
Cooperative in village	0.01	0.02	2.84
Year-round motorable road	(0.01)	0.02	(2.30)

() = negative, ATE = average treatment effect, Std = Standard Deviation, Lao PDR = Lao People's Democratic Republic.

Notes: * = significant at 10% level, ** = significant at 5% level, *** = significant at 1% level.

Source: ADB staff estimates using Lao Census of Agriculture data.

is designated as protected (Table 3.15). Similarly, presence of a land-use planning process within the village also causes clearance to fall by 10%. However, the presence of environmental and anti-shifting cultivation projects has no effect on reported clearance of land for agriculture in the past year.

Table 3.15: Estimated Effects of Interventions in the Lao PDR on Land Clearance for Agriculture

Dependent variable = Land cleared in the last year for agriculture (binary)			
Intervention	ATE	ATE Std. Error	ATE (%)
All forest protected in village	(0.05) ***	0.02	(17.90) ***
Land planning in village	(0.03) **	0.01	(9.72) **
Stop shifting cultivation project	0.01	0.01	4.18

() = negative, ATE = average treatment effect, Std = Standard Deviation, Lao PDR = Lao People's Democratic Republic.

Notes: * = significant at 10% level, ** = significant at 5% level, *** = significant at 1% level.

Source: ADB staff estimates using Lao Census of Agriculture data.

Empirical results suggest that policy effectiveness can be enhanced

At a broad level, the results generated affirm that public interventions and investments in the agriculture sector have been making a difference. Of 15 interventions assessed, 11 are found to have significant effects on at least one outcome. At the same time, the magnitudes of effects and gaps in outcomes identified from programs suggest that there is substantial scope to expand program effectiveness.

Irrigation has important impacts, but is underperforming

Irrigation is reported by farmers as their principal need, and this aligns with the significant positive effect identified for paddy yield and sales. However, the effect is far smaller than what irrigation can potentially offer, according to Figure 3.12. This also aligns with reports of limited maintenance and performance of irrigation systems, and suggests that irrigation systems could benefit from much improved design and management. Insignificant effects of irrigation modernization on rice yield also suggest that new irrigation facilities are not developed or used to their potential.

Surprisingly, irrigation has a relatively small effect on the propensity to sell other crops. This may be because of the dominant use of irrigation for paddy cultivation. At the same time, a larger effect on non-rice commercialization should be possible from irrigation. Modern irrigation has no significant effect on sales of crops or rice, which also indicates that it is not offering improved performance over traditional irrigation schemes.

Agricultural technology impact can be expanded

Significant rice modern variety effects on both yield and sales align with extensive literature regarding the impact of varietal improvement from the “green revolution” onward (Evenson and Gollin 2003; Hossain et al. 2003). Some of the empirical findings for modern variety adopters also seem to suggest that yield stability may be improved implying reduced production risk. In addition, modern varieties show an interaction with dry season cultivation, which suggests that they can play an important role in using the higher productive potential of the dry season. At the same time, modern variety adoption is limited, which means these benefits have much scope for expansion.

Results on extension are mixed. Plant protection training, which often is based on “farmer field school” approaches for training on integrated pest management, appears to be effective in raising paddy yields and increasing the propensity to have rice and other crop sales. This approach is specialized, pedagogically oriented, and is conducted with

considerable assistance from development partners, such as the Food and Agriculture Organization of the United Nations. It also has been found to be effective in similar contexts in improving yields and crop profitability (Waddington and White 2014). Similarly, vaccination for livestock appears also to be associated with commercialization outcomes. Biophysical effects of vaccination on disease losses are logical to expect, and reduced disease incidence is likely to make animals more attractive in the market to increase sales.

However, the results also suggest limited effectiveness of the overall agricultural extension system, which is much less specialized. For rice yield, effects are consistently negative for use of information from extension, and extension actually seems to be associated with less use and effects of modern technologies, such as improved varieties. This appears to indicate serious deficiencies in the information provided by the extension system and a lack of linkage to research and sources of innovation. Other studies have similarly identified negative effects of extension in the Lao PDR on yield (Thanasack 2014). The results relating to commercialization of rice found a minor positive significant effect on rice sales, which suggests that extension may assist in market linkages, even if it does not boost productivity.

Connectivity helps to underpin commercialization

The positive effect of road access on nonrice crop sales aligns with expectations that connectivity should improve access to markets for outputs and facilitate sales through higher output prices and lower input costs. This suggests an important role of improved roads in facilitating agricultural diversification and greater value addition via more commercialized agriculture. However, effects are insignificant for commercialization outcomes for livestock commodities and rice yields. Low effects on rice yields may be because input use levels are already low, such that road effects on input access are minimal. Low effects on the prevalence of livestock sales may be because small units of sales can still persist even in the absence of regular road access. Such an effect may also arise because improved connectivity helps to stimulate labor migration to nonagriculture sectors, so that some agricultural sales do not expand. Limited

effects on rice yields and livestock sales align with other literature that finds small effects from rural roads (Daccache, Knox, and Hess 2013).

Contract farming effects assessed on rice yields are principally indirect, as rice is rarely the main focus of contract arrangements, and the variable captures the presence of contract farming in the village, without specification of the focal crop. This means that the empirical finding is mostly capturing whether contract farming provides spillovers to rice productivity through access to information, inputs, or other resources. The results suggest that such spillovers are occurring. This aligns with previous estimates of effects of contract farming on output, which have been shown to be positive in the Lao PDR (Setboonsarng, Leung, and Stefan 2008).

Credit and land documentation facilitate diversification

Significant credit effects are found for livestock and nonrice crop sales. Increases in sales and commercially oriented agricultural activity for credit recipients are also consistent with the broader microfinance literature (Banerjee 2013). This suggests that credit use may enable investment in ancillary production beyond rice and other staple outputs for subsistence needs, and that existing restrictions on agricultural credit to tie eligibility to rice cultivation are counterproductive. Rather, credit can play a key role in enabling agricultural diversification into higher value commodities. However, caution is needed in interpreting this effect, because even where earlier literature has found an increase in sales of livestock and crop outputs, effects on income are frequently insignificant, as other economic activity may be displaced.

Insignificant credit use effects on yields of rice may appear counterintuitive, but are consistent with observations from earlier studies in similar contexts. Coleman (1999) found no significant impact of farm credit in nearby northeast Thailand, and Sengsourivong and Mieno (2014) find no effect of credit on rice yields in the Lao PDR. This appears to suggest that rice, as a staple for household consumption, is less credit responsive than higher value crops more often cultivated with commercial orientation.

The issuance of land-use certificates in a village is found to have significant effects on nonrice crop sales, although the effect is insignificant for rice commercialization or yields. Rice land use may be stable and long established in lowland paddy areas, which may make certificates less important than in areas with other crops. Rice lands—which are used for a government-prioritized crop and are often hydrologically unsuitable for other forms of cultivation—may also be at less risk of expropriation for concession and other large-scale agri-business development. As a result, the effect of documented ownership on tenure certainty may be greater for other crops, and this may have a greater effect on investment in those crops. This aligns with earlier studies that have shown that the effect of tenure documentation on agricultural investment is often significant (Lawry et al. 2014). Significant effects on nonrice sales may also be explained by priority credit use for commercialization of nonrice crops, as certificates may enable credit to that end. Effects may also be limited by the scope of the certificates issued to farmers, many of which are of only temporary duration, and cannot be transferred. Thus, this partial certification may not confer much certainty of tenure or collateral for borrowing for temporary investment.

Land-use planning has helped to protect natural ecosystems

Results on reported land clearing, as a proxy for deforestation, suggest that certain programs may help in reducing forest loss. In particular, there appears to be an important effect of designating forest as protected, as land clearing is reduced strongly in areas where protection designation is prevalent. This accords with the broader literature, which finds significant effects in Asia of designation of lands as protected (Blankespoor, Dasgupta, and Wheeler 2007; Gaveau et al. 2009). However, the fact that the reduction is partial (about 18%) also suggests that the effect may be enhanced through further enforcement of protective measures. Despite their limitations, land-planning processes also appear to have an important role in reducing land clearance and stabilizing land use. However, projects to protect the environment and/or stop shifting cultivation directly appear to have limited effect. This aligns with the decision of the government to shift

from preventing shifting cultivation to stabilizing the practice, which confirms that eradication is unrealistic, and that the main effective approach is to confine shifting cultivation extent within stable rotations via the land-planning process (Kenney-Lazar 2013).

Key findings

Overall, the empirical analysis affirms several key messages. First, irrigation is essential to improved rice productivity, but the full potential of modern irrigation needs to be better realized. Second, the Lao PDR's farmers can benefit from modern varieties and other new specific technologies, but the research and extension system is only partially effective. Specialized extension on crop protection and livestock vaccination are having important effects, but general extension needs substantial improvement to drive productivity growth. Third, improved connectivity can help to improve commercialization and diversification, with effects most evident for nonrice crops. Fourth, increasing credit access appears to be important to farm diversification and commercialization outcomes, as it favors increased sales of nonrice crops and livestock. Fifth, land titling also plays an important role in securing commercialization of nonrice crops to further underpin diversification. Sixth, the land-use planning process and designation of forests as protected is important to reducing forest clearance, even if interventions to directly reduce shifting cultivation appear ineffective.

3.7 Conclusions

Agriculture should be recognized as the key driver of inclusive growth. Agriculture accounts for a majority of the livelihoods of the Lao PDR's population, and agricultural products account for a majority of household consumption. It is the sector where the poor are concentrated, and agricultural products are the object of most of their expenditure. Fortunately, the country has resource endowments that should allow it to have comparative advantage in agricultural production, including abundant arable land and renewable water resources, as well as proximity to growing food markets. With the right policies in place, agricultural growth could underpin inclusive growth

and poverty reduction, as has occurred in almost all economies undergoing structural transformation.

The limited performance of agriculture to date signals the need for escalated reform and investment. The process of agricultural growth spurring structural transformation has not yet happened in the Lao PDR, and the sector remains far below its potential. According to available survey data, productivity remains low and is not increasing for rice, the main agricultural product, while the productivity of many other crops also trails the rest of the region. The production growth that has occurred has been mostly driven by area expansion, a process that is not sustainable over the long term, and which places pressure on fragile natural ecosystems. Livestock performance has similarly been mixed, with family farm production showing losses of competitiveness.

This underperformance has meant that the Lao PDR is now a net importer of food products (according to available statistics), whereas its factor endowments should allow it to export. Moreover, agricultural imports have risen to a higher share of consumption than in other Asian countries. Malnutrition remains much more widespread than in the rest of Asia and the poverty status of those in agriculture has fallen slowly. A substantial share of farms remains without sales, such that a large segment of the population remains disconnected from the formal economy and the prospects that it offers for better livelihoods. Only with commercialization can those farms have purchasing power that enables increases in demand for nonagricultural goods and services, which drive the structural transformation process and pull employment into other sectors.

Increased public investment can drive increased productivity and commercialization. Agricultural underperformance is the result of public underinvestment in the sector, particularly of domestic resources, which are very limited. As public investment has foundered, private and especially foreign direct investment has escalated, and substantial shares of the country's land resources have been allocated for investors to use. However, this investment largely bypasses local producers and does not provide the services and infrastructure that they need to

improve productivity. Moreover, in the absence of an adequate regulatory environment, this rapidly escalating investment has the potential to do harm by displacing family farms and natural ecosystems. With large revenues from hydropower exports, the Lao PDR should be in a position to increase domestic public investment in agriculture, rather than leave the sector subject to the vagaries of overseas development assistance or foreign commercial interests. This will allow investments to be much more focused on interventions that make a difference for the sector.

New empirical results presented in this chapter show that a range of agricultural programs make important differences to productivity and agricultural commercialization outcomes. This affirms that expenditure in this area is effective, particularly if well targeted, as suggested below.

Increased and improved investment in irrigated agriculture is critical to unleashing productive potential. As demonstrated in multiple ways in this study, irrigated agriculture has proven potential to increase crop productivity substantially, and the country has enormous potential to expand irrigated area. However, actual irrigation development trails behind most of Asia. While irrigation is found to have substantial and significant effects on rice yields, those effects are also far below irrigation’s potential contribution, and nonrice crops appear to have only small benefits from irrigation development. This suggests that irrigation system performance can be substantially enhanced through better irrigation operations, designing segments of irrigation schemes to better suit high value crops and complementing irrigation with other supportive services, such as connectivity and effective extension. Investing in water management is also critical to cope with the expected effects of climate change, which will increase rainfall variability and flooding.

Small-scale and community-managed irrigation is effective. A substantial share of irrigation investment is in modernization and rehabilitation of existing traditional irrigation schemes. However, in the empirical section of this chapter, modern irrigation is found to have no better performance than traditional irrigation schemes, in terms of productivity or

commercialization outcomes. At the same time, the unit costs of traditional irrigation schemes are a small fraction of those of modern irrigation infrastructure projects. Small-scale and community-managed irrigation approaches can also solve incentive problems associated with modern irrigation infrastructure development, because the beneficiaries of the irrigation system have greater responsibility for system design and execution. This indicates that expansion of such schemes may be more cost-effective for raising productivity than modernization of existing schemes, which appears to have little effect.

Rural transport and marketing infrastructure can be expanded from low levels. Transport infrastructure has large deficits compared with other countries in the region, and the Lao PDR is unique in the region with its decline in logistics performance over time. New results from this chapter find that improved transport infrastructure substantially increases marketing of nonrice crops, and can thereby play a key role in agricultural diversification and increased value addition. Increased investment in roads and other means of market connectivity is thereby important to unleashing more broad-based agricultural growth.

Expanded and less restricted credit is important to diversification and greater value addition. Agricultural credit markets in the Lao PDR are limited in scope, and few farmers have access to agricultural finance. The finance that is available is often allocated to rice production. However, this chapter finds that credit access is much more important to marketing of nonrice products, including other crops and livestock. For credit to play its effective role, agricultural credit should be expanded and offered in ways that do not favor rice. Reform of the financial sector is key to expanding credit availability, by establishing conditions that make further credit outreach attractive to the private sector. Development of rural financial markets can also pave the way for introducing index-based weather insurance, which can help to reduce risks associated with agricultural intensification.

Knowledge infrastructure can be improved. Knowledge infrastructure for enhanced agricultural productivity has received even fewer resources than physical infrastructure in the Lao PDR. Both the

quantity and quality of research and extension trail almost all of Asia, as does adoption of productivity-enhancing technologies, such as rice modern varieties.

More focused extension, underpinned by a robust innovation system, can drive growth. As shown in a number of ways, improved technologies have the potential to boost the Lao PDR's agriculture. Empirical work in this chapter finds that new technologies and well-targeted extension offer important contributions to productivity and the shift to commercially oriented production. Plant protection training and modern varieties both significantly increase yields and crop sales, while vaccination increases livestock sales.

However, general extension has limited effects on nearly all agricultural outcomes. It also has little association with adoption of productivity-enhancing technologies. This suggests that the overall extension system needs reform to improve focus and ensure that it supports adoption of technologies with impact potential. Investment in innovation needs to be increased, and agricultural extension requires reform to ensure that it provides quality information to farmers.

Statistical systems can be enhanced to inform policy. Basic agricultural statistics in the Lao PDR would benefit from improvement, so as to gauge the performance of the sector with more certainty along with the effectiveness of existing policies. Currently, statistics have limited coverage, as there are no regular surveys that cover the prices of agricultural inputs or the cost structure of agricultural production. Official trade statistics also are likely to omit substantial informal trade. To make progress toward improved support for the sector, statistical systems to inform policies and services to farmers and value-chain actors should be a priority.

Internal and external trade barriers can be further eliminated. Perhaps most importantly, the enabling environment for agricultural growth needs to be established. Internal trade requirements for rice

should be fully eliminated, and international trade policy should facilitate, not restrict, access to international markets when there are price windfalls. As a complement to this, buffer stocks of rice could be established and managed so as to reduce price volatility, and make trade more predictable.

Land-use rights can be secured. As another critical element of the enabling environment, property rights for smallholders should be secured, so that they have confidence to invest in facilities to improve productivity, and land transactions among farmers can lead to efficient land allocation. At the same time, private sector investment needs to be managed so that it can help build upon smallholder agriculture, rather than put land-use security, livelihoods, and natural resources at risk. The Government of the Lao PDR has enacted a moratorium on concession development in 2016, with an objective to reform concession issuance. This is an important opportunity for progress in this regard.

New evidence from this chapter suggests that more secure land-use rights help to facilitate commercialization of nonrice crops. Land-use planning also helps to stabilize agricultural expansion and prevent deforestation, as does clear demarcation of protected forest. Systematic land registration needs to be revitalized and offer long-term land-use rights to enable diversification and greater agricultural value addition. This can occur through a phased approach, building on remote sensing tools to underpin participatory consultation that defines land-use boundaries, which in turn serve as basis for surveying, adjudication, registration, and titling.

Political commitment to agriculture can be increased. Many of these needs are already recognized by the Government of the Lao PDR. The 2016–2025 Agricultural Development Strategy rightly emphasizes many of these measures, as have earlier strategies and master plans. The challenge is to build the political will to invest in fully implementing these reforms and plans in the face of competing government priorities.

Appendix 3.1: Interventions Evaluated for Impacts in the Lao PDR

Treatment	Outcome	Unit of Observation	Number	%
Agricultural extension	Rice yield per hectare	Rice variety	21,989	47.4
Year-round motorable road	Rice yield per hectare	Rice variety	32,670	70.4
Credit for crop production	Rice yield per hectare	Rice variety	3,353	7.5
Irrigation	Rice yield per hectare	Rice variety	8,702	19.6
Agricultural land certification	Rice yield per hectare	Rice variety	5,797	12.5
Modern irrigation	Rice yield per hectare	Rice variety	6,729	63.6
Plant protection assistance	Rice yield per hectare	Rice variety	8,732	50.9
Modern rice variety	Rice yield per hectare	Rice variety	15,398	33.2
Contract farming	Rice yield per hectare	Rice variety	3,017	16.2
Agricultural extension	Commercialization of crops	Farm household	15,624	46.9
Year-round motorable road	Commercialization of crops	Farm household	23,888	70.8
Credit for crop production	Commercialization of crops	Farm household	2,503	7.5
Irrigation	Commercialization of crops	Farm household	10,326	30.6
Agricultural land certification	Commercialization of crops	Farm household	4,542	13.5
Modern irrigation	Commercialization of crops	Farm household	3,875	37.5
Plant protection assistance	Commercialization of crops	Farm household	20,147	60.6
Agricultural extension	Commercialization of rice	Farm household	15,355	46.8
Year-round motorable road	Commercialization of rice	Farm household	23,481	70.8
Credit for crop production	Commercialization of rice	Farm household	2,449	7.4
Irrigation	Commercialization of rice	Farm household	10,016	30.2
Land certificate as collateral	Commercialization of rice	Farm household	4,542	13.5
Modern irrigation	Commercialization of rice	Farm household	3,754	37.5
Plant protection assistance	Commercialization of rice	Farm household	19,783	60.5
Modern rice variety	Commercialization of rice	Farm household	12,635	37.6
Agricultural extension	Commercialization of livestock	Farm household	16,621	46.9
Year-round motorable road	Commercialization of livestock	Farm household	24,484	68.3
Credit for crop production	Commercialization of livestock	Farm household	2,417	6.7
Received vaccination	Commercialization of livestock	Farm household	21,382	60.5
Cooperative in village	Commercialization of livestock	Farm household	1,716	4.8
Land planning in village	Land clearing in the past year	Farm household	22,509	54.0
Stop shifting cultivation	Land clearing in the past year	Farm household	9,533	22.9
Forest protection program	Land clearing in the past year	Farm household	3,175	7.6

Lao PDR = Lao People's Democratic Republic.

Notes: Commercialization is used in the context of the household's decision to sell or not to sell produce/livestock. Percentages (%) are relative to the total number of observations used in each model.

Source: Author's estimates using Lao Census of Agriculture data.

Appendix 3.2: Summary Statistics for Variables Used in the Regression Models

Variable	Number of Observations	Mean	Std Error	Credit for Crops	Agricultural Extension	Plant Protection Assistance	Year-Round Motorable Road	Land Use/Ownership Certificates	Irrigation	Modern Irrigation	Modern Rice Variety	Contract Farming
Outcome												
Yield per hectare, rice	46,387	2,236.66	6.129									
Double Robust Estimation: Outcome OLS Regression												
Paddy farm size (ha)	46,358	1.74	0.007	✓	✓	✓	✓	✓	✓	✓	✓	✓
Upland	46,387	0.28	0.002	✓	✓	✓	✓	✓	✓	✓		✓
Plateau	46,387	0.22	0.002	✓	✓	✓	✓	✓	✓	✓		✓
Modern rice variety	46,387	0.33	0.002	✓	✓	✓	✓	✓				✓
Use chemical fertilizer	33,793	0.37	0.003		✓	✓						✓
Household uses thresher	46,387	0.45	0.002	✓	✓	✓		✓	✓	✓	✓	✓
Medium/long maturing rice variety	46,387	0.59	0.002	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hired labor	46,387	0.48	0.002		✓	✓			✓	✓	✓	
Wet season crop	46,387	0.96	0.001							✓	✓	
Irrigation	46,387	0.23	0.002	✓	✓	✓	✓	✓			✓	✓
Year-round motorable road	46,387	0.70	0.002	✓	✓	✓		✓	✓	✓	✓	✓
Plant protection technical assistance	45,745	0.62	0.002	✓	✓		✓	✓	✓		✓	✓
Floods	46,387	0.33	0.002	✓	✓	✓	✓	✓	✓	✓	✓	✓
Drought	46,387	1.34	0.004	✓	✓	✓	✓	✓	✓	✓	✓	✓
Double Robust Estimation: Logistic Selection Regression												
Own farm size (ha)	52,892	2.45	0.013	✓			✓		✓			
Household size	56,157	5.97	0.010					✓	✓	✓	✓	
Age of household head	56,126	45.33	0.054	✓	✓	✓	✓	✓	✓	✓	✓	✓
Female-headed household	56,157	0.07	0.001	✓	✓	✓	✓	✓	✓	✓	✓	✓
Household head is non-Lao Tai	56,157	0.43	0.002	✓	✓	✓	✓	✓	✓	✓		✓
Income source is mainly nonfarm	56,146	0.32	0.002	✓	✓	✓	✓	✓			✓	✓
Household has fishing activity	56,157	0.07	0.001		✓	✓	✓	✓				✓
Urban	56,157	0.12	0.001		✓	✓	✓	✓	✓	✓		✓
Grid electricity	56,157	0.59	0.002						✓	✓		
Village resettled	56,157	0.09	0.001						✓	✓		
Center for agriculture technology	56,157	0.40	0.002		✓	✓					✓	
Credit facility in village	56,157	0.53	0.002		✓	✓		✓				
Agricultural shop in village	56,157	0.12	0.001								✓	
Village office	56,157	0.41	0.002	✓				✓				✓
Village development fund	56,157	0.48	0.002									✓
Village is UXO affected	56,157	0.17	0.002		✓	✓	✓	✓	✓	✓	✓	✓

ha = hectare, OLS = ordinary least square, UXO = unexploded ordnance.

Note: All variables included in the outcome equation are also included in the logistic selection equation under double robust regression. (Treatments are indicated in columns, and variables are in rows, with check marks indicating usage as a covariate for the treatment.)

Source: Authors.

Variable	Number of Observations	Mean	Std Error	Credit for Crops	Agricultural Extension	Plant Protection Assistance	Year-Round Motorable Road	Land Use/Ownership Certificates	Irrigation	Modern Irrigation	Modern Rice Variety
Outcome											
Commercialization of rice	33,091	0.38	0.003								
Double Robust Estimation: Outcome Logistic Regression											
Irrigation	33,167	0.30	0.003	✓	✓	✓	✓	✓			✓
Floods	33,013	0.32	0.003	✓	✓	✓	✓	✓		✓	✓
Drought	33,013	1.29	0.005	✓	✓	✓	✓	✓	✓	✓	✓
Year-round motorable road	33,167	0.71	0.002	✓	✓	✓		✓	✓	✓	✓
Upland	33,167	0.31	0.003	✓	✓	✓	✓	✓	✓	✓	✓
Plateau	33,167	0.24	0.002	✓	✓	✓	✓	✓	✓	✓	✓
Paddy farm size	33,148	1.61	0.008	✓	✓	✓	✓	✓	✓	✓	✓
Agricultural extension	32,796	0.47	0.003	✓		✓	✓	✓	✓	✓	✓
Use chemical fertilizer	33,167	0.33	0.003		✓	✓		✓		✓	✓
Credit for use in crop production	33,167	0.07	0.001		✓	✓	✓	✓	✓	✓	✓
Plant protection technical assistance	32,715	0.60	0.003	✓	✓		✓	✓	✓	✓	✓
Modern rice variety	33,167	0.37	0.003	✓	✓	✓	✓	✓	✓	✓	
HH uses thresher	33,167	0.44	0.003	✓	✓	✓	✓	✓	✓	✓	✓
Hired labor	33,167	0.48	0.003	✓	✓	✓		✓	✓	✓	✓
Double Robust Estimation: Logistic Selection Regression											
Household size	41,660	5.81	0.012						✓	✓	
Center for agriculture technology	41,660	0.39	0.002		✓	✓		✓			✓
Urban	41,660	0.14	0.002		✓	✓	✓	✓	✓	✓	✓
Village office	41,660	0.42	0.002	✓							
Credit facility in village	41,660	0.53	0.002	✓	✓	✓		✓			✓
Household head is non-Lao Tai	41,660	0.45	0.002	✓	✓	✓	✓	✓	✓	✓	✓
Village is UXO affected	41,660	0.16	0.002	✓	✓	✓	✓	✓	✓	✓	✓
Household has fishing activity	41,568	0.07	0.001		✓	✓	✓	✓			✓
Income source is mainly nonfarm	41,654	0.33	0.002	✓	✓	✓	✓	✓			✓
Female-headed household	41,660	0.07	0.001	✓	✓	✓	✓	✓	✓	✓	✓
Age of household head	41,642	44.91	0.063	✓	✓	✓	✓	✓	✓	✓	✓
Own farm size (ha)	38,867	2.34	0.051	✓							
Grid electricity	41,660	0.60	0.002						✓	✓	
Village resettled	41,660	0.09	0.001						✓	✓	

ha = hectare, HH = household, OLS = ordinary least square, UXO = unexploded ordnance.

Note: All variables included in the outcome equation are also included in the logistic selection equation under double robust regression.

Source: Authors.

Variable	Number of Observations	Mean	Std Error	Credit for Crops	Agricultural Extension	Plant Protection Assistance	Year-Round Motorable Road	Land Use/Ownership Certificates	Irrigation	Modern Irrigation
Outcome										
Commercialization of other crops	33,611	0.41	0.003							
Double Robust Estimation: Outcome Logistic Regression										
Upland	33,724	0.31	0.003	✓	✓	✓	✓	✓	✓	✓
Plateau	33,724	0.24	0.002	✓	✓	✓	✓	✓	✓	✓
Non-paddy farm size (ha)	33,705	0.79	0.016	✓	✓	✓	✓	✓	✓	✓
Use chemical fertilizer	33,724	0.33	0.003		✓	✓		✓		✓
HH uses thresher	33,724	0.44	0.003	✓	✓	✓	✓	✓	✓	✓
Hired labor	33,724	0.48	0.003	✓	✓	✓	✓	✓	✓	✓
Irrigation	33,724	0.31	0.003	✓	✓	✓	✓	✓		
Year-round motorable road	33,724	0.71	0.002	✓	✓	✓		✓	✓	✓
Plant protection technical assistance	33,266	0.61	0.003	✓	✓		✓	✓	✓	✓
Land use/ownership certificates	33,724	0.13	0.002	✓	✓	✓	✓		✓	✓
Credit for use in crop production	33,724	0.07	0.001		✓	✓	✓		✓	✓
Floods	33,568	0.32	0.003	✓	✓	✓	✓	✓		✓
Drought	33,568	1.29	0.005	✓	✓	✓	✓	✓	✓	✓
Double Robust Estimation: Logistic Selection Regression										
Own farm size (ha)	38,867	2.34	0.051	✓			✓			
Household size	41,660	5.81	0.012						✓	✓
Female-headed household	41,660	0.07	0.001	✓	✓	✓	✓	✓	✓	✓
Age of household head	41,642	44.91	0.063	✓	✓	✓	✓	✓	✓	✓
Household head is non-Lao Tai	41,660	0.45	0.002	✓	✓	✓	✓	✓	✓	✓
Income source is mainly nonfarm	41,654	0.33	0.002	✓	✓	✓	✓	✓		
Household has fishing activity	41,568	0.07	0.001		✓	✓	✓	✓		
Urban	41,660	0.14	0.002		✓	✓	✓	✓	✓	✓
Center for agriculture technology	41,660	0.39	0.002		✓	✓		✓		
Village office	41,660	0.42	0.002	✓						
Credit facility in village	41,660	0.53	0.002	✓	✓	✓		✓		
Village is UXO affected	41,660	0.16	0.002	✓	✓	✓	✓	✓	✓	✓
Grid electricity	41,660	0.60	0.002						✓	✓
Village resettled	41,660	0.09	0.001						✓	✓

ha = hectare, HH = household, OLS = ordinary least square, UXO = unexploded ordnance.

Note: All variables included in the outcome equation are also included in the logistic selection equation under double robust regression.

Source: Authors.

Variable	Number of Observations	Mean	Std Error	Credit for Livestock Raising	Agricultural Extension	Vaccination	Year-Round Motorable Road	Cooperative
Outcome								
Commercialization of livestock/ poultry	35,802	0.47	0.003					
Double Robust Estimation: Outcome Logistic Regression								
Agricultural land size (ha)	35,513	2.45	0.056	✓	✓	✓	✓	✓
Upland	35,860	0.34	0.002	✓	✓	✓	✓	✓
Plateau	35,860	0.24	0.002	✓	✓	✓	✓	✓
Household size	35,860	5.92	0.013	✓	✓	✓	✓	✓
Female-headed household	35,860	0.06	0.001	✓	✓	✓	✓	✓
Age of household head	35,848	45.13	0.068	✓	✓	✓	✓	✓
Household head is Lao Tai	35,860	0.55	0.003	✓	✓	✓	✓	✓
Number of cattle (log)	35,858	-6.7	0.04	✓	✓	✓	✓	✓
Number of goats (log)	35,856	-12.65	0.021	✓	✓	✓	✓	✓
Number of local chicks (log)	35,860	-1.46	0.037	✓	✓	✓	✓	✓
Number of broiler chicks (log)	35,856	-13.74	0.006	✓	✓	✓	✓	✓
Number of pigs (log)	35,857	-6.3	0.039	✓	✓	✓	✓	✓
Number of buffaloes (logs)	35,856	-8.45	0.038	✓	✓	✓	✓	✓
Number of ducks (logs)	35,859	-8.87	0.038	✓	✓	✓	✓	✓
HH uses feeds	35,860	0.1	0.002	✓	✓	✓	✓	✓
HH has cropping activity	35,860	0.98	0.001	✓	✓	✓	✓	✓
Household has permanent crops	35,860	0.53	0.003	✓	✓	✓	✓	✓
HH uses tractor	35,860	0.6	0.003	✓	✓	✓	✓	✓
Household owns forest land	35,860	0.12	0.002	✓	✓	✓	✓	✓
HH sells forest products from others' lands	35,860	0.73	0.002	✓	✓	✓	✓	✓
Livestock vaccination	35,356	0.6	0.003	✓	✓		✓	✓
Credit use for livestock raising	35,860	0.07	0.001		✓	✓	✓	
Irrigation	33,603	0.3	0.002	✓	✓	✓	✓	✓
Urban	35,860	0.12	0.002	✓	✓	✓		✓
Retail shop in village	35,860	0.59	0.003	✓	✓	✓	✓	✓
Credit facility in village	35,860	0.53	0.003					✓
Drought	35,663	1.29	0.005	✓	✓	✓	✓	✓
Double Robust Estimation: Logistic Selection Regression								
Income source is mainly nonfarm work	41,654	0.33	0.002	✓	✓	✓	✓	✓
Household has fishing activity	41,568	0.07	0.001	✓	✓	✓	✓	✓
Year-round motorable road	41,660	0.7	0.002	✓	✓	✓		✓
Center for agriculture technology	41,660	0.04	0.001	✓	✓	✓	✓	✓
Crop development project in village	41,660	0.37	0.002	✓	✓	✓	✓	✓
Village office	41,660	0.42	0.002	✓	✓	✓	✓	✓

ha = hectare, HH = household, OLS = ordinary least square, UXO = unexploded ordnance.

Note: All variables included in the outcome equation are also included in the logistic selection equation under double robust regression.

Source: Authors.

Variable	Number of Observations	Mean	Std Error	Land/forest allocation program	Environmental or anti-shifting cultivation project	All forest designated as protected
Outcome						
Land/forest clearing in the past year	40,707	0.28	0.002			
Double Robust Estimation: Outcome Logistic Regression						
Own farm size (ha)	38,867	0.42	0.005	✓	✓	✓
Upland	41,660	0.33	0.002	✓	✓	✓
Plateau	41,660	0.24	0.002	✓	✓	✓
Household size	41,660	5.81	0.012	✓	✓	✓
Age of household head	41,642	3.76	0.001	✓	✓	✓
Household head is non-Lao Tai	41,660	0.45	0.002	✓	✓	✓
Income source is mainly nonfarm work	41,654	0.33	0.002	✓	✓	✓
HH uses thresher	41,660	0.39	0.002	✓	✓	✓
Hired labor	41,660	0.45	0.002	✓	✓	✓
Access to year-round motorable road	41,660	0.70	0.002	✓	✓	✓
Irrigation	38,727	0.29	0.002	✓	✓	✓
Contract farming	41,560	0.06	0.001	✓	✓	✓
Land/forest allocation program	41,660	0.54	0.002			✓
HH collects nontimber forest products	41,660	0.69	0.002	✓	✓	✓
Village resettled	41,660	0.09	0.001	✓	✓	✓
Proportion of nonagricultural land in village	39,625	0.88	0.096	✓	✓	✓
Village is UXO affected	41,660	0.16	0.002	✓	✓	✓
Shifting cultivation in village	41,660	0.57	0.002	✓	✓	✓
All forest designated as protected	41,660	0.08	0.001	✓	✓	
Double Robust Estimation: Logistic Selection Regression						
Urban	41,660	0.14	0.002	✓	✓	✓
Female-headed household	41,660	0.07	0.001	✓	✓	✓
Floods	41,404	0.32	0.002	✓	✓	✓
Drought	41,404	1.27	0.005	✓	✓	✓
Village resettled	41,660	0.09	0.001	✓	✓	✓

ha = hectare, HH = household, OLS = ordinary least square, UXO = unexploded ordnance.

Note: All variables included in the outcome equation are also included in the logistic selection equation under double robust regression.

Source: Authors.

Chapter 4

Leveraging Services for Sustainable Growth and Employment

The services sector has played a vital role in sustaining higher economic growth in the Lao People's Democratic Republic (Lao PDR). Its share in gross domestic product (GDP) has increased over time, making it the largest contributor to growth. Nevertheless, despite the progress made during the last 2 decades, job creation in the services sector has remained low with an employment share of 23% during 2015. This chapter highlights the major constraints that have inhibited the services sector from tapping its full potential to achieve inclusive growth. It also analyzes the various subsectors within services to determine their contribution to growth and employment creation.

4.1 The Role of the Services Sector in the Economy

The services sector is vital to the Lao PDR's economic transformation. The services sector grew by an average of 8.8% from 2010–2011 to 2014–2015 and its share of GDP rose from 45.2% in 2010–2011 to an estimated 47.2% in 2014–2015 (Table 4.1). Services have overtaken industry and agriculture in contribution to national output. In the period covered by the seventh five-year plan, industry targets for GDP growth were achieved, while services grew faster than targeted.

Table 4.1: GDP Growth and Sectoral Shares in GDP

	7th Plan Target			Actual			Average	8th Plan Target
	2011–2015	2010–2011	2011–2012	2012–2013	2013–2014	2014–2015	2011–2015	2016–2020
1. GDP Growth (%)	8.0	8.1	8.3	8.0	7.8	7.5	7.9	7.5
Agriculture	3.5	2.9	2.8	3.1	3.0	3.0	3.0	3.2
Industry	15.0	15.8	14.4	7.4	8.5	8.9	11.0	9.3
Services	6.5	7.8	8.1	9.7	9.3	9.1	8.8	8.9
2. Share in GDP (%)								
Agriculture	23	27.9	26.7	25.2	24.8	23.7	25.7	19
Industry	39	26.9	29.6	28.2	27.5	29.1	28.3	32
Services	38	45.2	43.7	46.8	47.7	47.2	46.1	41
GDP (KN million, at current prices)	104,000	62,458	70,343	80,199	90,823	102,320		

GDP = gross domestic product.

Note: Targets are based on the national socioeconomic development plans. Data refer to fiscal years.

Sources: Lao Statistics Bureau. 2013. *Lao Expenditure and Consumption Survey 2012/13*. Vientiane; and Ministry of Planning and Investment. 2016. *Eighth National Socio-Economic Development Plan*. Vientiane.

The services sector in the Lao PDR, however, is still in its early stage of development. Traditionally, the country has been a rural and agrarian economy and only recently has it ventured into developing manufacturing, tourism, international commerce, and modern services such as finance and information and communication technology (ICT). Also, the country has only started to develop cities, which typically plays a leading role in fostering the development of manufacturing, industry, modern services, higher education, technology, and international finance and trade. The Vientiane Prefecture, which is inhabited by more than 800,000 people as of 2016, is the only major center for modern and other services. Vientiane offers a wide range of job opportunities in government, education, health care, banking, and other services. It has the comparative advantage of being the country's capital for government and business services as well as a major hub for transport and logistics. Vientiane leads major cities in tourism, followed by Luang Prabang.

The services sector is expected to expand further as it progresses in improving ease of doing business in the Lao PDR—such as developing infrastructure services, improving the education and training system, and developing tourism. Its growth in output and employment has resulted in leading other sectors in share of GDP and employment growth. Between 1986 and 2015 during its transition from a centrally planned to a market-oriented economy, the services sector has made significant progress and it is now the major contributor to economic growth. The contribution in generating new jobs, however, has not matched with the increasing share in GDP. While increasing from about 10% in 1990 to 20% in 2010 and to 23% in 2015 its share of total employment is still low compared with most economies with similar stage of development (Table 4.2).

The Lao PDR government survey data show that skills levels typically are comparatively high in services

Table 4.2: Share of Services in GDP and Employment, 2015

Country	Share of Services in Employment (%)	Share of Services in GDP (%)	GDP Growth (%) 2010–2015	GDP per Capita (2015 current \$)
Sao Tome and Principe	63.4	68.5	4.9	1,870
Nicaragua	60.6	54.3	4.8	1,960
Solomon Islands	49.7	–	5.5	1,935
Djibouti	47.3	–	5.1	1,945
Sudan	46.4	58.1	2.3	1,871
Uzbekistan	46.1	47.1	8.2	1,908
Ghana	42.3	51.4	7.7	1,827
Moldova	39.6	71.2	4.5	1,848
Zambia	34.9	59.4	4.4	1,840
Viet Nam	33.7	39.7	6.0	1,908
Republic of the Congo	32.7	38.1	4.8	1,851
Lao PDR	23.0	41.7	8.0	1,818

– = data not available, GDP = gross domestic product, Lao PDR = Lao People's Democratic Republic.

Note: Data cover countries with GDP per capita ranging from \$1,800 to \$2,000. Missing 2015 data for some countries were replaced with 2014 and 2013 data. Sources: World Bank. World Development Indicators. <http://data.worldbank.org/data-catalog/world-development-indicators> (accessed July 2017); and International Labour Organization.

such as public administration, education, and in social work activities, while majority of the unskilled workers are typically found in wholesale and retail, and accommodation and food services. The predominance of farming and services jobs—both mainly low-productivity jobs—suggests that a significant share of employment is informal²¹ (Table 4.3).

Services have unique characteristics that greatly affect their tradability, including intangibility and nonstorability, but they also typically require differentiation and joint production. To capture these aspects, the World Trade Organization defines trade in services to span four modes of supply: (i) Mode 1, or cross-border trade, are services supplied from the territory of one country to the territory of

²¹ Lao Statistics Bureau (LSB) survey data do not allow us to measure the extent of informal sector employment, i.e., employees with access to social security or employers or own account workers in a registered business (LSB 2010, 2013, and 2015). Nevertheless, the predominance of farming and services jobs—both are characterized by low productivity—suggests that a significant portion of employment is in the informal sector. Disaggregating by employment status, over 40% of employed workers are in unpaid family work, and another 40% are own-account workers. About 9% of the labor force are private wage employees (which could be formal employment in registered firms or informal wage work), and 8% are employed by the public sector (1% in state-owned enterprises and 7% as civil servants (World Bank 2016c).

Table 4.3: Skilled and Unskilled Workers in the Services Sector (in percentage of service employment)

	2007–2008			2012–2013		
	Total	Skilled	Unskilled	Total	Skilled	Unskilled
Wholesale and retail trade, transportation and storage, accommodation, and food service activities	64.7	4.8	59.9	52.7	3.6	49.1
Information and communication	0.8	0.6	0.2	1.4	0.8	0.6
Financial and insurance activities	0.9	0.5	0.4	1.9	1.2	0.7
Real estate activities	0.0	0.0	0.0	0.1	0.0	0.1
Professional, scientific, technical, administrative and support	8.1	5.3	2.9	6.3	3.4	2.9
Public administration and defense, education, human health and social work activities	19.5	13.3	6.2	27.4	17.9	9.5
Other services activities	6.0	1.5	4.6	10.3	2.1	8.3
Total	100.0	26.0	74.0	100.0	29.0	71.0

Note: Skilled workers are those who reported to have worked in the past 7 days and those who completed at least upper-secondary education. Education classifications in the survey are preprimary, primary, lower secondary, upper secondary, vocational, and university graduate. Unskilled are those who completed less than upper secondary school. Services classification is based on high-level System of National Accounts (SNA)/International Standard Industrial Classification (ISIC) aggregation.

Source: Lao Statistics Bureau. Lao Expenditure and Consumption Survey 2007–2008 and 2012–2013. Vientiane.

another (for example, consultancies, market research, graphic design services); (ii) Mode 2, or consumption abroad, are services supplied in the territory of a nation to the consumers of another (for example, tourism, education, health services); (iii) Mode 3, or commercial presence, are services supplied through any type of business or professional establishment of one country in the territory of another, for example, foreign direct investment; (iv) Mode 4, or presence of natural persons, are services supplied by nationals of a country in the territory of another (for example, a consultant or a health worker supplying their services in the importing country). All of these modes are significant to the Lao PDR but weakness in data makes it difficult to assess them. The available data indicate that overall progress in development of trade services has been limited, with the volume of trade services remaining relatively low. Export of services, however, has grown significantly not only in cross-border trade

but also in consumption abroad and as a result of Laotians working in other countries. Export of services continues to be dominated by travel followed by transport and ICT (Table 4.4).

World Bank (2016b) reveals that despite the increase in the Lao PDR's services exports, the country remains well below its potential. The services export share of GDP during 2015 has been estimated to be around 6.5% with growth concentrated in traditional services such as transport and travel. The services share of the Lao PDR's total exports was 18.3% in 2015, which is lower than 23.3% in 2010. Travel and transport combined accounted for 85.6% of services exports in 2010, which has increased further to 93.4% by 2015. A further disaggregation reveals that while the share of travel increased from 74.7% in 2010 to 85.0% in 2015, the share of transport declined from 10.9% in 2010 to 8.4% in 2015.

Table 4.4: Services Exports of the Lao PDR, 2010–2015 (\$ million)

Category	2010	2011	2012	2013	2014	2015
Transport	55.8	51.3	54.3	70.4	57.3	67.5
Travel	381.7	406.2	513.6	595.9	641.6	679.4
Construction	13.1	12.0	11.6	8.6	3.9	5.0
Insurance and pension services	11.0	24.5	3.6	44.1	11.6	10.7
Financial services		0.6	1.3	1.3	0.8	1.3
ICT	27.3	31.0	34.8	40.1	38.6	34.3
Government goods and services	22.2	24.1	24.3	20.1	10.7	1.1
Total	511.0	549.7	643.4	780.4	764.5	799.3

ICT = information and communication technology, Lao PDR = Lao People's Democratic Republic.
Source: ASEANstats. <https://data.aseanstats.org/> (accessed 5 October 2016).

Low use combined with inadequate supply of modern services, such as in business, financial, insurance, and ICT (as well as weaknesses in traditional services), have significantly impeded growth in exports and reduced indirect contribution to growth by embedding services in manufacturing exports.²² The study highlights the weaknesses in developing forward and backward linkages between the manufacturing and services sectors.²³ The study also deduces that the Lao PDR's growth record in services exports points to comparative advantage in travel and ICT relative to other countries in the world. Exports of travel services led by travel sector growth have increased by an average of 13.1% in 2005 and 2014 (World Bank 2016a) (Table 4.5).

Furthermore, the Lao PDR experience indicates that production of goods that use services is negatively affected by the unavailability of a wider range of services as well as by the low quality of available services such as in transport, electricity, and in financial services. Thus, these issues need to be addressed by increasing competition in the services sector, reducing distortive and ineffective regulations, opening sectors to foreign participants, and building skills and investment in hard and soft infrastructure (World Bank 2016b).

4.2 Development of Selected Services Subsectors

In terms of share in services, wholesale and retail trade continues to be the most important of services subsectors followed by public administration and defense, transportation and storage, real estate, and other service activities (Table 4.6).

Furthermore, a subsector analysis of the 2000–2014 shows that output growth in services was led by wholesale and retail, hotels and restaurants, transport and communication, finance, and public administration and defense while the growth in education and health care services was more modest. Tourism alongside wholesale and retail trade, transport and communication, and finance (broadly covering banking, insurance, real estate, and other financial activities) have driven services sector growth—that is, especially after the government implemented policies to integrate the economy with the international community, thus creating better conditions for local and foreign investors. The latter is illustrated by the development of the Association of Southeast Asian Nations (ASEAN) Economic Community and the

Table 4.5: Revealed Comparative Advantage of the Lao PDR in Services, 2000–2014

Services Category	Share to Total Exports (%)				RCA				Average Growth
	2000	2005	2010	2014	2000	2005	2010	2014	2005–2014
Travel	64.8	68.1	74.7	83.9	2.2	2.7	3.8	3.6	13.1
Transportation	11.2	16.0	10.0	7.0	0.5	0.7	0.4	0.4	7.4
ICT	9.0	4.8	6.3	5.6	4.9	2.3	2.6	2.4	7.3
Insurance	0.5	1.4	2.1	1.5	0.3	0.8	0.7	0.6	21.0
Construction			2.6	0.5			0.8	0.2	(32.3)
Financial				0.1				0.0	10.1

() = negative, ICT = information and communication technology, Lao PDR = Lao People's Democratic Republic, RCA = revealed comparative advantage.

Notes: Data for construction are only available starting from 2009 and data for financial in 2011.

Source: United Nations Comtrade Database. <https://comtrade.un.org/> (accessed January 2017).

²² A recent World Bank report on the Lao PDR states, “almost 90 percent of services inputs used by manufacturers come from distribution and transport, while modern services, such as business, financial, insurance, and ICT services, contribute very little to manufacturing value added. Normally, services sector firms are important suppliers of intermediate inputs to other sectors, especially manufacturing firms. When taking these forward linkages into account, the total contribution of services stands at 21 percent of total exports in Lao PDR. Nonetheless, the contribution of modern services in value-added exports remains very small. Inadequate supply of financial and telecommunication services—representing only 3 percent of total services inputs to manufacturing—may also be a constraint on the diversification and upgrading of manufacturing firms, preventing them from moving up the value chain” (World Bank 2016b).

²³ Forward linkages defined as the value added of a sector that is exported indirectly through exports of other sectors that contain inputs from the sector. Backward linkages defined as the value added from other sectors that is embodied in the value of exports of a particular sector (World Bank 2016b).

Table 4.6: Sectoral Shares in Services Sector, 2000–2014 (%)

	2000	2005	2010	2011	2012	2013	2014
Wholesale and retail trade ^a	45.3	48.2	44.1	44.1	44.2	41.2	40.3
Accommodation and food service activities	0.0	1.8	1.6	1.6	1.6	1.5	1.5
Transportation and storage ^b	12.9	12.7	10.7	10.7	10.1	8.2	8.3
Financial and insurance activities	4.6	3.7	8.2	8.2	8.3	8.5	8.7
Real estate activities ^c	0.0	9.5	6.9	6.9	6.8	6.6	6.7
Public administration ^d	9.7	14.5	16.4	16.3	17.0	22.5	22.9
Other service activities ^e	27.5	4.8	3.7	3.7	3.6	3.2	3.1
Activities of households as employers ^f	0.0	1.8	1.5	1.5	1.4	1.2	1.1
Financial intermediation services indirectly measured	0.0	3.0	7.0	7.0	7.1	7.2	7.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Notes:

^a Includes repair of motor vehicles and motorcycles.

^b Includes information and communication.

^c Includes professional, scientific, and technical activities; and administrative and support service activities.

^d Includes education; human health and social work activities; and arts, entertainment, and recreation; and defense and compulsory social security.

^e Refers to the public wage bill.

^f Includes undifferentiated goods- and services-producing activities of households for own use.

Source: ADB. 2016. *Key Indicators for Asia and the Pacific 2016*. Manila.

Lao PDR's accession to World Trade Organization membership.

The domestic market-oriented services sectors have grown significantly but traditional services, such as wholesale and retail trade, education, and other government services, continue to dominate. Wholesale, retail trade, and real estate service developments have provided job opportunities, but most of these are low paying. Much of these advancements take place in Vientiane and other major cities. But significant development is also happening around special economic zones, in border towns, and in some rural areas.

However, the Lao PDR still lags behind in developing modern services as well as in upgrading traditional services. Low purchasing power and weakness in infrastructure and logistics (such as poor quality and high costs), finance, governance, and other factors hinder the development of domestic market-oriented services. Moreover, linkages within and between many services subsectors, agriculture, mining, manufacturing, and other industries tend to be weak. Also, the domestic market is highly fragmented, reflecting major differences between different parts of the country. Looking ahead, many of these sectors are poised to undergo major transformation with higher-income levels and continued economic development in urban and rural areas. ICT will likely

be one of the major drivers of change, such as for example in e-commerce, e-banking, and other ICT-related applications, all of which are yet at an early stage of development in the Lao PDR. Other major drivers will also include expansion of tourism and travel. Progress in these types of development will depend on an advanced supply of energy, transport, and logistics services, and more broadly in the ease of doing business. The government is aware of the potential for developing the wholesale, retail trade, and real estate sectors as reflected in the eighth Five-Year Plan. In 2015, the government declared a major reform and liberalization of the wholesale and retail trade sector, which is hitherto strictly reserved for Lao PDR citizens. These regulations stipulate several conditions and require a minimum capital threshold for foreign investors.

For several decades, public sector services have traditionally been an important part of the economy, but deficiencies in the delivery of such services have impacted the development in services sectors and other parts of the economy. The public sector has traditionally delivered a wide range of services as reflected in public expenditure data and the role of state-owned enterprises, the latter including services sectors such as banking, telecommunication, and provision of electricity. Public expenditure has also increased in both current and investment expenditure but the share of investment spending is modest

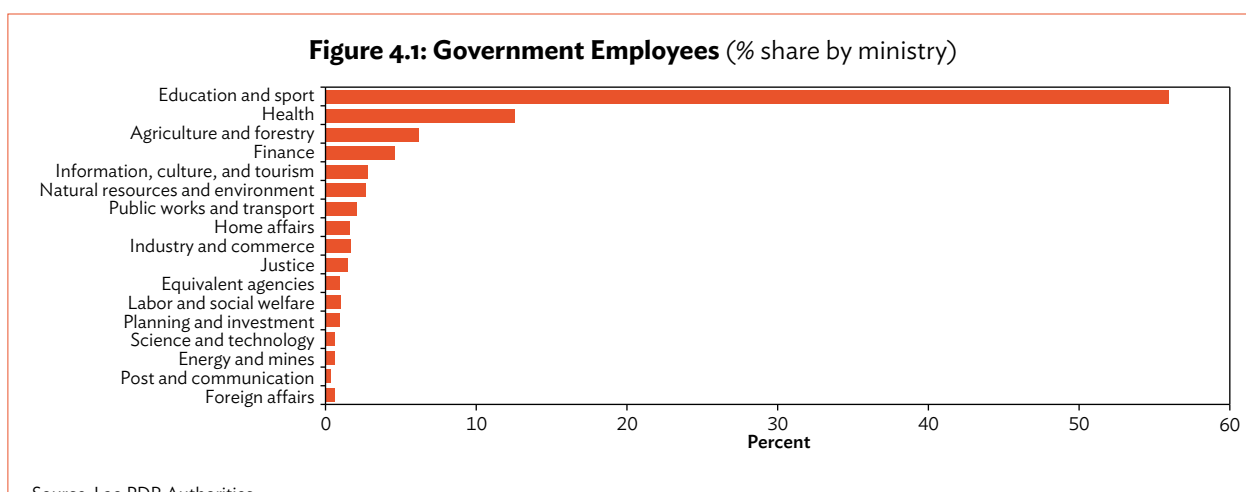
compared with many other ASEAN countries.²⁴ A large amount of public spending is allocated to wages for the country's growing number of civil servants. The number of government employees doubled from 2003–2004 to 2015–2016 (excluding police, defense sector, and state-owned enterprise employees). As of 2015–2016, the Ministry for Education and Sports accounted for more than half of all government employees with teachers being the principal category (Figure 4.1).

According to the seventh Five-Year Plan, government funding focused on numerous programs and projects especially on developing the rural areas and reducing poverty, developing the communications network and supply of electricity, and promoting commercial production. The plan highlighted the importance of linking programs and promoting lifestyles that can generate employment and result in progress in education and training, and health. In this regard, the government has allocated 17% of funds to the education sector and 9% to the health sector (MPI 2016a). Also, donor funds continue to be a significant amount in public sector spending, especially in the infrastructure and social sectors.

Despite the importance of the public sector in provision of vital public services, weaknesses in the efficiency and effectiveness of public sector institutions have

rendered public spending programs incompetent and corrupt. Also, there is considerable scope for reforms in the state-owned enterprises sector (MPI 2016a). These facts are well acknowledged in the country's economic plans.

The banking sector grew rapidly in 2011–2015 (Nishimura et al. 2016), as a result of the government's efforts to promote the development of the sector, particularly by improving the legal and regulatory frameworks to enable banks to support industrial and commercial activities through expansion of bank credit. However, the lack of and limited access to finance continue to constrain development of the private sector, especially small and medium-sized enterprises (SMEs). Legal and regulatory conditions discourage commercial banks from extending loans to SMEs, even when SMEs have sufficient collateral to secure those loans, because of many reasons including the complexities of dealing with legal and regulatory matters coupled with the SMEs' inadequate technical competency. Execution of collateral through the judicial system can take as long as 5 years (World Bank 2014a, 2014b, and 2017b). Also, the Lao PDR trails behind in providing business services such as in accounting and management consultancy, and more broadly in SMEs and other enterprise development (World Bank 2017a and 2017b). Most of the population living in poor communities and those living in remote areas do not have access to modern banking, financial



²⁴ The government has attempted to mitigate the impacts of natural disaster in provinces using its budget to stimulate economic development and address poverty reduction: this policy has resulted in an increase in public investment from KN1,753.23 billion, covering 6.1% of the total investment in FY2010–2011, to KN3,424.93 billion, covering 7.7% in FY2014–2015 (MPI 2016a).

services, and insurance (BFSI). Most of the BFSI industry is in the Vientiane area and some are linked to Bangkok, Singapore, and other financial centers in the region.

As of 2016, the Lao PDR's banking sector comprised 42 commercial banks. The central bank, the Bank of the Lao PDR, is the supervising authority for these banks. Commercial banks are categorized into five groups: (i) state-owned commercial banks are majority-owned by the government and make up half of the banking system; (ii) joint venture banks are mutually owned by local and foreign banks; (iii) private banks are privately owned local banking corporations that are not a subsidiary of any foreign bank; (iv) affiliated banks are locally incorporated subsidiaries of foreign banks; and (v) foreign bank branches are those incorporated overseas. Both government and indigenous banks typically have low levels of capitalization, offering lower skills, technology, and accounting standards than foreign banks in the range of services.²⁵

Despite its progress, the banking sector has limited ability to provide funding. The country's capital markets are still at an early stage of development. In equity finance, the Lao Securities Exchange has only five listed companies with a total market capitalization of KN12 trillion as of the end of 2015. Moreover, 82% of the Lao PDR's market capitalization is attributable to a single company, the electricity generation EDL–Generation Public Company. Furthermore, weaknesses in capital markets are illustrated by few initial public offerings and a virtually nonexistent domestic market for debt financing via corporate bonds. The country's equity market has yet to start serving a broader range of companies. Although the Lao PDR's capital markets have begun to develop in recent years, the banking sector remains the largest

channel in size and outreach through which clients secure funds (Nishimura et al. 2016).

Looking ahead, there is major scope for developing BFSI industries in services offered locally as well as in the ASEAN region and in other international tie-ups. Institutional and human resources capacity building and more extensive use of financial technology can be major catalysts in developing this industry. There is much potential for expanding the scale and scope of digital banking such as providing payment and banking and other financial services to all social groups in urban and rural areas, with the latter including schemes aimed at providing inclusive banking and services for SMEs and microbusinesses. Such development is poised to have major impact in the scope for developing services subsectors as well as other sectors in the economy.

The government's 5-, 10-, and 15-year plans outline numerous initiatives to develop the BFSI industry. The eighth National Socioeconomic Development Plan (NSED) highlights the need to increase the local institutions' efficiency to international standards. In particular, the plan points to the need for banking sector policies that can foster extensively the improvement of nationwide access to financing, including SMEs, the poor, and those living in rural and remote areas (MPI 2016a). Also, the Ministry of Finance (2016) has presented its Vision to 2030 and Public Finance Development Strategy to 2025, which focuses specifically on public finance and expenditure development.²⁶

As noted, the wholesale and retail trade, public services, and the BFSI sectors have contributed the most to output and employment in the services sectors. These subsectors are expected to remain important contributors to growth; however, some key subsectors, such as tourism, transport and logistics,

²⁵ The loan-to-deposit ratio for local commercial banks was 88% at the end of 2014. Because the loan to-deposit ratio of foreign bank branches often exceeds 100%, local banks tend to score lower than the overall average. Compared with local commercial banks, foreign banks have the advantage of being able to extend loans to foreign corporations and large businesses largely because of their advantage in access to international networks, lower cost of funding, and special strengths in technology and expertise. Local banks, however, have certain advantages over foreign banks: special local knowledge and access to local networks all of which are important factors in dealing with local business entities (Nishimura et al. 2016).

²⁶ The overall objective of the vision and public finance development strategy is to build the financial basis for strengthening the public finance system. It aims to ensure holistic changes in the financial system by making the finance sector transparent and dealing with all aspects of irregularities and supporting modernization. Also, it aims to promote sustainability of the macro economy and explore means to provide government revenue in line with the requirements of the eighth NSED (Ministry of Finance 2016).

education, and ICT, are expected to play key roles in supporting growth and economic diversification over the long term. The next section discusses in greater detail the potential and challenges in developing these subsectors.

4.2.1 The Case of Tourism

The tourism sector and related services have achieved major growth since the 1990s. The number of foreign visitors to the Lao PDR has increased sharply from

14,440 in 1990 to 0.35 million in 1995 and to 1.74 million in 2008 (TDD 2016). In 2015, it reached 4.68 million, that is, similar to that recorded in Cambodia, Myanmar, and the Philippines but well below that of Malaysia, Thailand, and Singapore. In annual growth rate, the number of foreign visitors to the Lao PDR has grown at an average annual rate of 15.2% during 2008–2015, which is higher than in all ASEAN countries except for Myanmar (Figure 4.2 and Table 4.7).

According to data from the Tourism Development Department, 93% of the total number of foreign

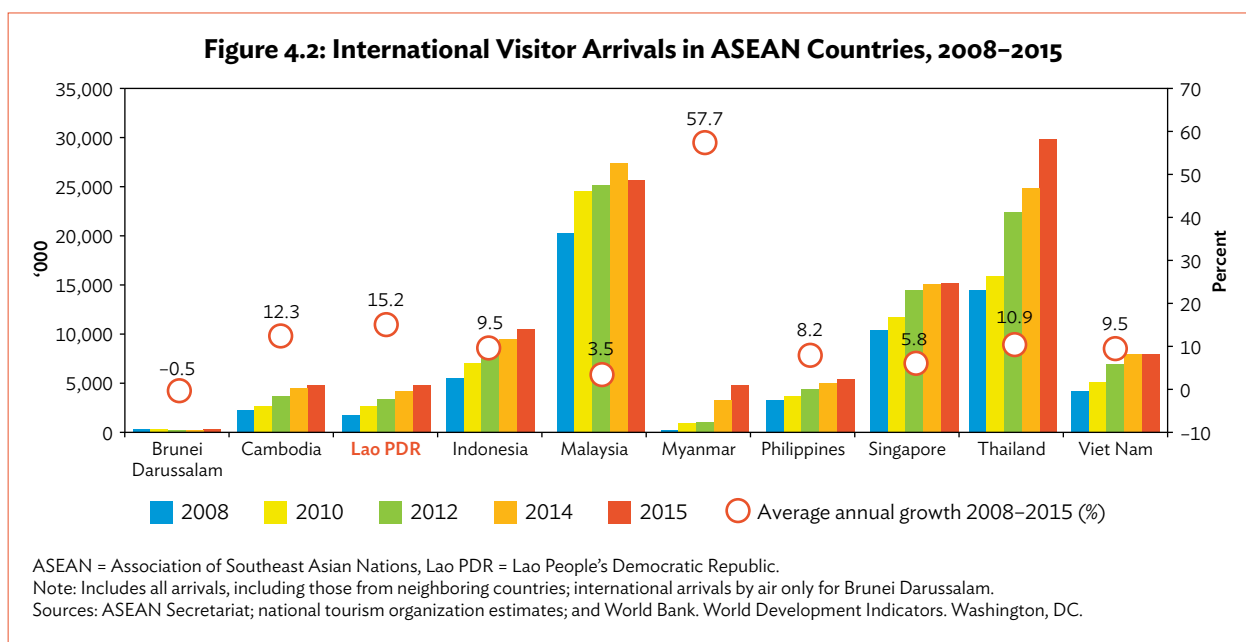


Table 4.7: International Tourist Arrivals, 1995–2015

Year	Number of Tourist Arrivals	Change (%)	Average Length of Stay (Days) for International Tourists	Average Length of Stay (Days) for Regional Tourists	Average Length of Stay (Days) for the Total Tourist Arrivals	Revenue from Tourism (\$ million)	Change of Revenue from Tourism (%)	Revenue Share to GDP (%)
1995	346,460	137.05	4.3	—	—	24.74	—	1.43
2000	737,208	20.01	5.5	2.4	4.00	113.90	21.64	6.62
2005	1,095,315	22.41	7.0	2.0	4.50	146.77	36.25	5.70
2010	2,513,028	25.13	7.0	2.0	4.50	381.67	(2.84)	5.84
2015	4,684,429	13.00	7.5	2.0	4.75	725.37	7.67	6.37

— = data not available, () = negative, GDP = gross domestic product.

Note: Includes all international arrivals including those from neighboring countries.

Sources: Ministry of Information, Culture and Tourism, Tourism Development Department. 2016. *Statistical Report on Tourism in Laos 2016*. Vientiane; share of GDP calculated based on World Bank. World Development Indicators GDP data.

tourists (including international and local regional arrivals)²⁷ visiting the Lao PDR in 2015 were from Asia and the Pacific, particularly Thailand (49.6%) followed by Viet Nam (25.4%) and the People’s Republic of China (PRC) (10.9%). The Europeans contributed to 4.6% of tourists while the United States (US) and Canadian markets contributed to 1.9% of the total foreign tourists. The main medium- and long-haul markets are the Republic of Korea, France, and the US. In terms of growth in international arrivals in 2008–2015, the Republic of Korea and the PRC were leading.

In addition to international tourism, domestic tourism also increased significantly, although data on these developments are limited. However, some basic indicators show that the number of domestic tourists has grown from 2.0 million in 2013 to 2.3 million in 2015, while outgoing Laotian travelers numbered more than 3 million in 2015 (TDD 2016).

In 2015, international tourists (including regional visitors) stayed an average number of 4.8 days in the Lao PDR, with each visitor spending an average of \$152 per day, significantly lower than is the case for most other ASEAN members. Much of the tourism sector is at the lower end compared with other ASEAN economies, which reflects low value added.²⁸ With regard to absolute levels and average spending per day, the Greater Mekong Subregion, Thailand, Cambodia, Myanmar, and Viet Nam generate much higher income from international tourism than the Lao PDR does (TDD 2016). About 80% of total tourist arrivals from ASEAN countries come from Thailand and Viet Nam (Table 4.8).

Furthermore, a comparison of the Lao PDR’s tourist market with other ASEAN countries based on “purpose” of visit and “type of visitor,” shows that the Lao PDR market relies heavily on leisure spending (as opposed to business spending within tourism

Table 4.8: Percentage Share of Tourist Arrivals, 2009–2015

Country of Origin	2009	2010	2011	2012	2013	2014	2015
ASEAN	80.2	79.2	80.5	81.5	80.5	77.5	76.6
Thailand	63.4	60.4	58	58.2	54.5	49.1	49.6
Viet Nam	14.8	17.2	20.6	21.2	24.1	26.7	25.4
Other ASEAN	2	1.6	1.9	2.1	1.9	1.7	1.6
Non-ASEAN	19.8	20.8	19.5	18.5	19.5	22.5	23.4
Total	100	100	100	100	100	100	100

ASEAN = Association of Southeast Asian Nations.

Other ASEAN = Brunei Darussalam, Cambodia, Indonesia, Malaysia, Myanmar, Philippines, Singapore.

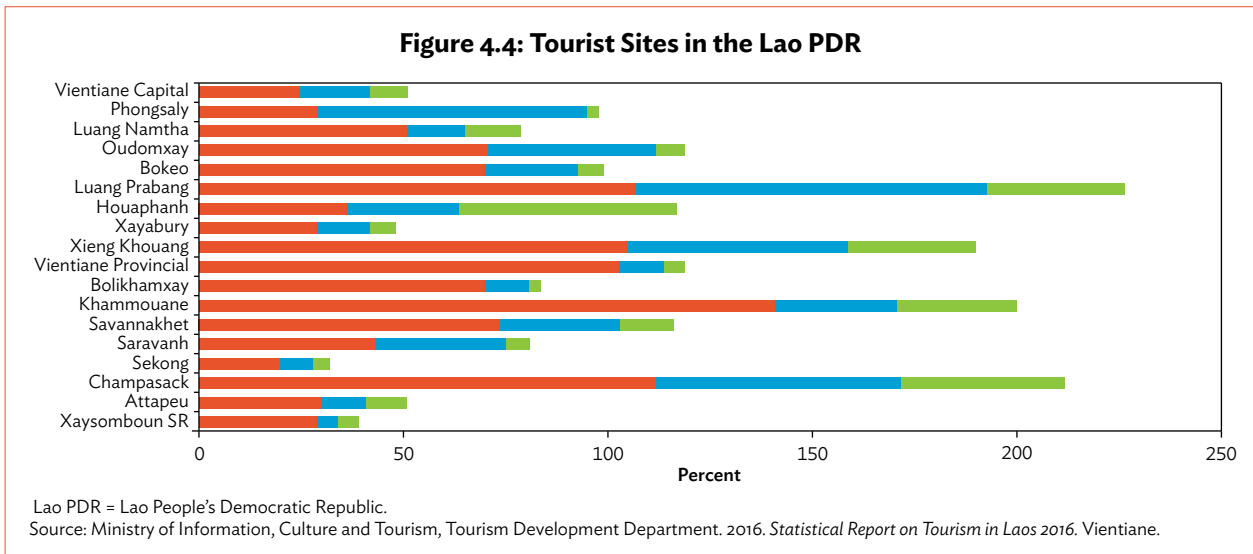
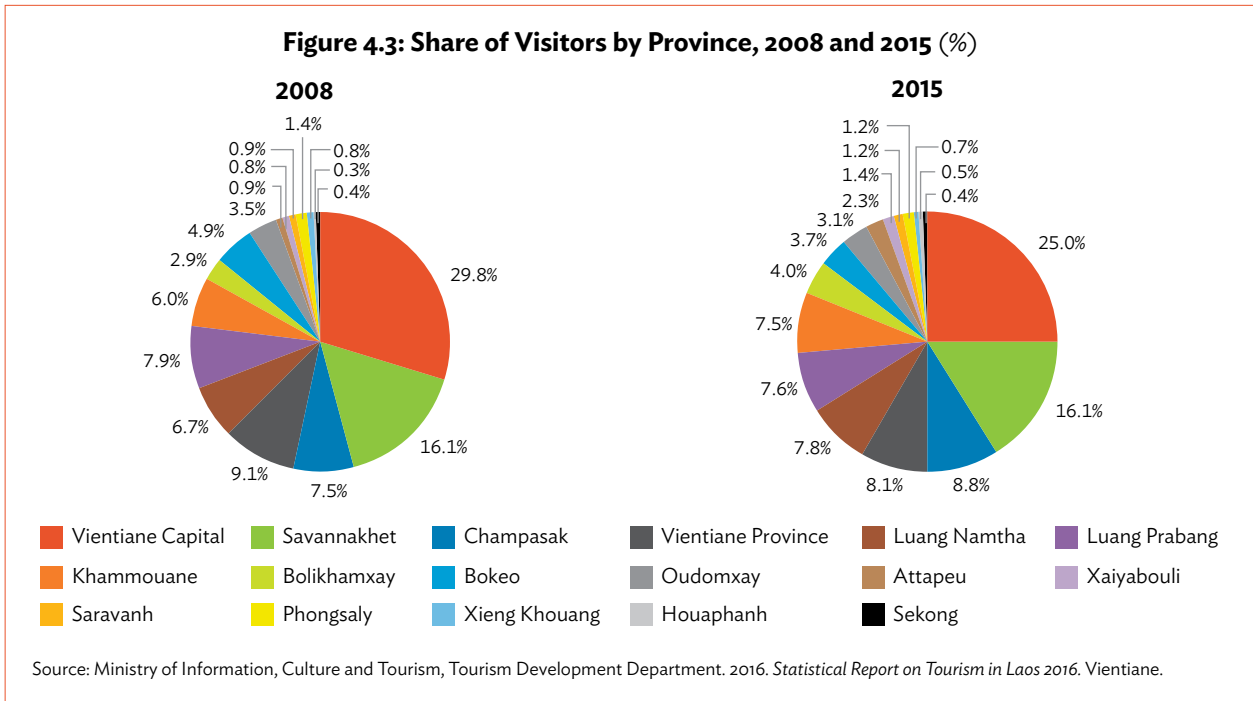
Source: Ministry of Information, Culture and Tourism, Tourism Development Department. 2016. *Statistical Report on Tourism in Laos 2016*. Vientiane.

consumption) and foreign visitors. The analysis of Nishimura et al. (2016) shows that Singapore and Malaysia (i.e., countries with comparatively GDP high-income levels) have a high percentage of business spending within tourism consumption, whereas in low-income countries with fixed tourist sites like the Lao PDR, leisure spending is greater than business spending. Moreover, tourism consumption in populous countries, such as Indonesia and the Philippines, is centered to a considerable degree around domestic tourists, whereas tourism consumption in low population countries, such as the Lao PDR, Cambodia, and Singapore, is dominated by foreign tourists.

While much of the tourist industry is centered in the Vientiane area, most provinces have experienced rapid tourism growth (Figure 4.3). The Lao PDR offers a wide range of tourist attractions in various parts of the country. As of 2015, the Lao PDR had a total of 1,957 tourist attractions, of which 1,450 sites were classified as natural attractions, 534 were cultural attractions, and 275 were historical attractions. The country has 2 world heritage and 20 national heritage sites (TDD 2016) (Figure 4.4).

²⁷ Regional tourists are from neighboring countries such as Cambodia, Myanmar, the PRC, Thailand, and Viet Nam. Some of them are day-trippers who may not stay overnight (TDD 2016).

²⁸ The average number of days and spending per day continue to be comparatively low in the Lao PDR partly because the tourism industry is in an early phase of being developed. This is reflected in weakness in transport, accommodation, ICT, and other facilities and services and the ease of doing business environment impacting on the scale and scope of private investment. Many foreign visitors (especially medium- and long-haul international visitors) to the country stay only for a short time and visit neighboring countries. Furthermore, a significant number of visitors are local day-trippers (or other short-term visitors) who mainly enter at Vientiane capital, Savannakhet, and Luang Namtha, most of whom spend little per day.



Tourism facilities

The number of hotels in the Lao PDR has grown according to the rate visitors have increased. Hotels are located in three main areas of the country: Vientiane, the capital city; Champasack where the southern central city of Pakse is located; and Luang Prabang, the tourist city. The number of hotels in these three places combined account for approximately 60% of the country's hotels. After recently reducing barriers to international investment in tour services,

the number of registered operators increased from 166 in 2009 to 368 in 2015, of which most are based in Vientiane and Luang Prabang. However, tour operators in neighboring countries, such as Thailand, have also expanded their Lao PDR operations. Despite the increase, the 604 active licensed tour guides in the country are insufficient to meet demand (TDD 2016).

International and local air connectivity has improved significantly in recent decades. Annually, 9,900 flights with 1.16 million scheduled inbound seats serve

the international airports in Luang Prabang, Pakse, Savannakhet, and Vientiane. But compared with most ASEAN countries, the Lao PDR continues to lag behind, as reflected in the lack of direct, medium, and long-haul flights and the major role of the Bangkok airport and other regional airports in serving the Lao PDR market. Furthermore, the Lao PDR (as is the case for most ASEAN countries) has a liberal visa regime, which allows tourists from 180 countries to be issued visas upon arrival and visa exemptions for citizens of all ASEAN member states.²⁹

Income from regional and international tourism has grown from less than \$147 million before 2005 to \$382 million in 2010 and \$725 million in 2015, representing a rise in its share of GDP from 5.7% in 2005 to 6.4% in 2015. Compared with other revenues from exports, tourism ranked 2nd and 3rd in 2011–2015.³⁰ As of 2015, it lagged behind minerals and “other industries” but exceeded exports from electricity, garments, and agricultural and wood products (TDD 2016).

The direct and indirect impact in the number of jobs created in major cities and, to more limited extent, smaller towns and rural areas, has been significant. The number of persons directly employed in tourism has increased and is estimated to have reached 122,900 in 2014–2015, significantly lower than in neighboring countries (Table 4.9). Although accurate data on

direct and indirect employment impacts are not readily available, it is apparent that the number of jobs in the tourism industry by itself has been growing and has generated a significant number of jobs in other sectors such as transport, wholesale, retail trade, and banking and financial services.

According to a study undertaken by the World Travel & Tourism Council, travel and tourism generated 129,500 jobs directly in 2014, that is, 4.2% of total employment in the Lao PDR.³¹ In 2014, travel and tourism contributed 396,000 direct and indirect jobs—the latter including wider effects of investment, the supply chain, and induced income impacts—that is, 12.8% of total employment in the country. This number is projected to rise to 469,000 jobs in 2025 (WTTC 2016).

The tourism sector has an increasingly significant impact in poverty reduction,³² fostering intersector linkages through employment, income, and provision of inputs (World Bank 2016b) and change in the overall socioeconomic fabric and the environment, although measuring such impacts has proven difficult. While the expansion of tourism has positive economic implications, such as generation of income and jobs, it can also have downside effects such as unwarranted impact on the natural ecosystem and the socioeconomic and cultural fabric.

Table 4.9: Tourism Contributions to GDP and Employment in Selected ASEAN Countries, 2015

	Cambodia	Lao PDR	Myanmar	Viet Nam
International visitor expenditure (\$ billion)	3.01	0.73	2.12	15.14
Direct contribution to GDP (%)	13.5	6.4	2.6	6.6
Tourism investment (\$ billion)	0.4	0.4	0.1	5.2
Tourism employment (direct)	1,034,700	122,900	661,000	2,783,800
Average expenditure per visitor (\$)	631	152	453	1,905

ASEAN = Association of Southeast Asian Nations, GDP = gross domestic product, Lao PDR = Lao People's Democratic Republic.

Note: Data include international visitors and visitors from other Asian regions.

Sources: National tourism organizations and World Economic Forum. 2015. *The Travel & Tourism Competitiveness Report 2015*. Geneva.

²⁹ Cambodia, the Lao PDR, Myanmar, and Viet Nam have all endorsed the ASEAN framework agreement on visa exemption, which exempts citizens of ASEAN countries holding valid national passports from visa requirements when visiting other ASEAN countries that are party to the agreement, for a stay of up to 14 days.

³⁰ In 2011–2014, tourism ranked number 2, exceeded only by minerals. During this period, exports shown as “other industries” ranked significantly lower than tourism. The exceptionally high number for “other industries” in 2015 resulted in tourism being ranked number 3 in export revenue.

³¹ This covers employment by hotels/guest houses, travel agents, airlines, and other passenger transportation services (excluding commuter services) as well as activities of the restaurant and leisure industries directly supported by tourists.

³² A recent Asia-Pacific Economic Cooperation (APEC 2016b) study states that tourism development has had a positive impact on poverty reduction and inclusive growth (i.e., growth in household incomes coupled with improvements in distribution) in Asia and the Pacific. Tourism contributes to poverty reduction as every 1% increase in tourist arrivals is associated with a 0.12% reduction in the number of poor people in the region. In short, tourism has considerable potential to contribute to inclusive economic growth by providing more employment opportunities and entrepreneurial activities to the poor.

Drivers and constraints

The competitiveness of the Lao PDR's tourist industry ranks in the middle compared with other ASEAN countries, all of which have experienced rapid tourism growth. According to the World Economic Forum's *Travel & Tourism Competitiveness Report 2015* the Lao PDR ranks 96th in the Travel & Tourism Competitive Index of 141 countries for 2015, compared with Cambodia at 105th and Myanmar at 134th. These three countries ranked considerably lower than Viet Nam's 50th, the Philippines' 74th, Indonesia's 50th Thailand's 35th, and Singapore's 11th (WEF 2015).

Tourism development is driven by the country's attractions, of course, in natural beauty (ecotourism), historical sites, cultural diversity, hospitality and accommodation facilities, coupled with comparatively low cost of real estate and manpower and thus in entertainment and food and restaurant services. However, tourism development will depend on the improvement of physical and other forms of connectivity to regional and global markets, ICT-related development, visas and other legal and regulatory frameworks, and rising affluence levels in other countries such as the PRC and in ASEAN member economies.

The number of five-star hotels in the recent year has increased, therefore expanding the scope for achieving higher value in tourism. Also, several international events boosted the Lao PDR's tourism industry, including the hosting of the Southeast Asian Games in 2009, the celebration of the 450th anniversary of Vientiane as the capital of the Lao PDR, and the ASEAN Leaders' Summit in 2016.

Constraints on tourism development include the following:

- air, land transport, and other infrastructure and logistics, and thereby related services such as scale and quality of air and land transport and access to parking lots;

- ICT infrastructure, websites, and other applications, including access to and cost of internet and other ICT-related services; hotel standards and other forms of accommodation;
- hygiene, overall cleanliness, sanitation, and health services;
- production and distribution of local handicrafts and souvenirs;
- availability of qualified tour guides and staff in hotels, restaurants, etc., with adequate training and language skills, including those who speak English and Chinese;
- legal and regulatory frameworks, the rule of law, and the judiciary system affecting the ease of doing business for local and foreign investors, e.g., restrictions on ownership and property rights and the time and cost to start a business; and
- the capabilities of governmental, finance and banking, educational and training institutions, micro, small, and medium-sized enterprises (MSMEs), and other institutions affecting the prospects for tourism-related development (MPI 2016b, WEF 2015, APEC 2016a).

Tackling these constraints will require further private sector investment and government support. Private investment (local and foreign) has, to a large extent, driven tourism growth. Nevertheless, the government needs to facilitate the development of the industry, particularly in human resources and infrastructure (including transport, logistics, ICT, and energy); provide a sound legal and regulatory system; and improve other ease of doing business factors (such as costs for inputs of goods, power, transport, and other services; restrictions in ownership and business permits, land use, and competition policy; and limited access to finance, business development, and other services) affecting local MSMEs and foreign investors.³³ Moreover, additional measures are needed

³³ While the overall foreign investment regime has been liberalized several restrictions apply to tourism-related activities such as foreign rights to invest in guest houses. Local MSMEs are poised to play a crucial role in fostering development of the tourism sector, but they face many challenges such as competition from larger firms, insufficient credit, and inadequate skills (World Bank 2017b).

to develop the local tour operation industry,³⁴ such as providing multilingual guide services, promoting safety and security, complying with international hotel standards (e.g., implementing the ASEAN standard for hotels means better training facilities for staff and managers), and boosting marketing and promotion activities. Furthermore, protecting the cultural and natural environment is also imperative.

A significant hindrance to tourism growth is the Lao PDR's being behind other countries in ICT development. ICT has reshaped the way consumers plan, purchase, and share experiences about tourism-related products and services. Globally, more than 95% of travelers use digital resources for travel planning and consumption and sharing information during and after a trip (Guggenheim et al. 2014). The increasing use and popularity of the internet and social media, online marketing, and travel services are powerful influences. Apart from being an effective tool for government and larger firms in operating and promoting tourism businesses, ICT supports more broad-based and inclusive development by enabling MSMEs to serve local and international markets.

Prospects for growth

Multiple avenues can be pursued to expand the scale and scope of tourism-related development. The potential for increasing tourism from many countries, particularly from the PRC, is high.³⁵ The Lao PDR has favorable prospects for increasing both the number of international and domestic tourists as well as extending their duration of stay and spending levels per day. To expand the scale and scope of its tourist industry, multidimensional initiatives are necessary as detailed in the government's plans for developing tourism and related sectors. Considerable opportunities exist to expand both the scope of foreign investment and the role of indigenous MSMEs. Plans of government and other entities to invest in transport and other infrastructure, the latter including the Belt and Road Initiative (BRI) will likely help boost tourism and other travel to other ASEAN countries and the PRC.

The government's eighth NESDP (2016–2020) and the Tourism Development Plan (2016–2025) integrate a detailed perspective on the development of tourism (Box 4.1). The results of implementing the

Box 4.1: Tourism Targets of the Eighth National Socioeconomic Development Plan

- Promote public and private investment for focal and complete-cycle tourist product development.
- Improve the quality of tourist sites, conduct a survey, and plan tourist site redevelopment in line with the national tourist directions, to create more investment opportunities for the public and private sector.
- Concentrate on developing and renovating tourist site facilities to international standards and to yield local uniqueness.
- Broaden and promote the call for more domestic and foreign investors to invest in the tourist sector.
- Monitor and encourage business units to regularly contribute to the tourism fund.
- Support and promote the sectors surrounding tourism to actively contribute to and participate in developing and promoting tourism.
- Assign tourism diplomats and representatives to target countries to promote Lao PDR tourism.
- Raise the Lao people's awareness of conserving their unique and proud traditions and culture.
- Promote local administrative authorities to organize functions and tourist activities, such as ethnic minorities' cultural fairs, local traditions fairs, and other important functions, to communicate their unique culture and local way of life to the Lao and foreign people so that they will know and perceive ideas to visit various places in the Lao PDR.
- Stabilize the markets and market services management and protect consumers by labeling the goods quality, price, and details, and focus on improving the markets, goods, and price management mechanisms in a truly active manner and in compliance with the market economy.
- Increase economic development in small towns and develop municipal services to create opportunities for nonfarm employment.

Source: Ministry of Planning and Investment 2016. *8th National Socio-Economic Development Plan*. Vientiane.

³⁴ Many international visitors enter the Lao PDR from Bangkok or other regional cities and rely on non-Laotian tour operators. Less than 1% of international tourists use inbound tour operators (TDD 2016).

³⁵ The PRC is now the number one provider in international tourism worldwide and has emerged as a major source of tourism revenue in many Asian countries. The number of PRC tourist arrivals to the Lao PDR has risen from 150,791 in 2011 to 511,436 in 2016 (TDD 2016). Further rise of the PRC's tourism is likely to have a major impact on the Lao PDR. Key drivers in this development include further improvement of air and road transport, and eventually also railway communications. The number of PRC visitors crossing the Lao PDR border with the PRC has increased rapidly. As shown in other countries, attracting more visitors requires concerted effort in servicing their specific requirements including the ability to speak the Chinese language.

plans are impressive but uneven, as evidenced by the lag in providing infrastructure and resolving legal and regulatory and other requirements. Many international studies on tourism, including those undertaken by the ASEAN Secretariat (2015) and others were considered in formulating these plans. According to government plans, the number of international tourists in the Lao PDR is expected to reach 9 million in 2025 and 5 million–6 million people in 2020 compared with 4.7 million in 2015. This is projected to generate annual revenue of \$1,470 million in 2025 and \$801 million–\$953 million in 2020 compared with \$725 million in 2015.³⁶

4.2.2 The Case of Transport and Logistics

Growth in transport, logistics, and energy is central for achieving sustained and inclusive development and generating employment in the services sectors (i.e., travel and tourism, wholesale and retail trade, real estate government, and other services) as well as in goods-producing sectors within the domestic economy and their international linkages. Progress is evident in all these areas as a result of better connectivity between the Lao PDR and its principal trading partners such as the PRC, Thailand, and Viet Nam. In this regard, Thailand is particularly important with regard to access to overseas markets and suppliers via the international gateways. The air, road, and port infrastructure has improved. Border clearance procedures have been rationalized and simplified. Delivery times are quicker and transport costs for land and sea cargo are lower. Nevertheless, the limited volume of trade is a constraint in the development of services in the Lao PDR's transport and logistics sectors (World Bank 2014b).

Despite its progress in recent years, the Lao PDR continues to trail behind most ASEAN members (except for Myanmar) in development of air and land transport and logistics services, particularly in quality and cost for transport, logistics, and other services. An analysis of transport services shows significant improvement but land, air, and waterway infrastructure is still poor. Hence, this weakness in logistics services

and poor access to electric power and the exorbitant cost impede economic growth and transformation.

Transport infrastructure services

The Lao PDR has four types of transportation system and related services:

- Road transportation is the main distribution mode for cargo as well as passenger traffic. Mechanized road transport covering a length of 33,768 kilometers (km) handles 80% of the total transport volume according to the seventh Five-Year Plan (2011–2015). This mode of transport is used to supply goods and enable passengers to travel to all provinces and districts in the country, leaving aside some remote areas. The multiple road construction and improvement projects listed in the seventh plan have resulted in an expansion of road lengths nationwide and pavement of main thoroughfares.
- Water transport across a length of more than 300 km, accounts for 18% of the total transport volume.
- Air transport sector, which includes 11 airports, handles 2% of the total transport volume. The capacity of airports and the number of international flights have expanded but lag many other Asian countries.
- Railway transport, although still very limited, covers only 3 km of passenger traffic from Nong Khai in Thailand to Thanaleng in the Lao PDR.

Being a landlocked country is sometimes considered an impediment to the Lao PDR's economic development—the lack of access to cost-effective ports and inefficient handling of international freight are prime examples. However, the country's geographic position does offer opportunities for it to be developed as a transportation hub servicing the local market and as a land-link system connecting neighboring countries (World Bank 2014b). Developing the latter could potentially result in a large volume of cargo

³⁶ These estimates are based on data published in the eighth NSEDP (MPI 2016a) and by the Tourism Development Department (2016). It should be noted that there are minor differences in projection depending on source and date of publication.

transport between the Lao PDR and its neighbors, and a large volume of transit cargo between Cambodia, the PRC, Thailand, and Viet Nam. The PRC's Belt and Road Initiative (BRI), also called One Belt, One Road, includes the construction of a modern railway system for cargo as well as for passenger traffic in the southern PRC, the Lao PDR, Thailand, and other ASEAN countries, thus implying major opportunities for the Lao PDR to link to other countries.³⁷

As highlighted in the government's five-year plans, border trade-related weaknesses in the transport system must be addressed such as the following:

- **Improving hard infrastructure for border trade.** Hard infrastructure for border trade, such as the construction of the Thai–Lao Friendship Bridge and the opening of the East–West Economic Corridor, is improving. Four “friendship bridges” have been completed: (i) from Nong Khai, Thailand to Thanaleng, Lao PDR, in 1994; (ii) from Mukdahan, Thailand to Savannakhet, Lao PDR, in 2007; (iii) from Nakhon Phanom, Thailand to Thakhek, Lao PDR, in 2011; and (iv) from Chiang Khong, Thailand, to Ban Houayxay, Lao PDR, in 2013 (Kunming–Bangkok Expressway). These improvements will increase trade along the borders.
- **Gradual resolution of customs-related problems.** In soft infrastructure, long-standing customs-related problems need to be resolved. With support from the World Bank, electronic customs clearance was introduced at the main customs offices. So far, an electronic data interchange system using the Automated System for Customs Data has been introduced at 11 main customs offices.

- **Distribution costs and attraction of companies.** The poor development of supply chains and high distribution costs are deterrents in developing business in the country. Further reduction of costs is important not only for distributors but also for the Lao PDR government's strategy to attract foreign investors and develop the local SME sector.³⁸ Distribution costs escalate when consolidation of the various transport-related services is lacking. Transportation costs for border trade need to be lowered—such as those in the Vientiane–Bangkok route and those between southern PRC and the Lao PDR. Shippers of both large and small cargo volumes will benefit from reduced transportation costs using modern transportation systems (railway, road, and air) and consolidated transport services (Nishimura et al. 2016, MPI 2016a).

Logistics

According to the World Bank 2016 report, *Connecting to Compete 2016: Trade Logistics in the Global Economy*, which provides a Logistics Performance Index, the Lao PDR lags behind all ASEAN countries in logistics services (World Bank 2016e). The report shows a big gap in logistics performance among ASEAN member states, with Myanmar ranking 113th and the Lao PDR 152nd among 160 countries. Key determinants of logistics performance include the development of physical infrastructure such as the quality of roads, railways, ports, and airports and related institutions and services. Weaknesses in the infrastructure, institutions, legal and regulatory frameworks as well as human capital assets (such as shortage of trained professionals) deter efforts to develop a cost-effective and integrated logistics sector (Table 4.10).

³⁷ The Government of the PRC launched the BRI after which it issued several documents on the principles of the BRI framework, its priority focus areas, and proposed cooperation mechanisms including the role of the Asian Infrastructure Development Bank. The BRI aims to achieve better connectivity and economic cooperation among numerous countries linking the PRC with the Persian Gulf and the Mediterranean Sea through Central Asia and West Asia and connecting the PRC with Southeast Asia, South Asia, and the Indian Ocean. Among other things this will entail support for the development of six economic corridors in coordination with other concerned countries. The proposed PRC–Mainland Southeast Asia economic corridor covers the Lao PDR, Myanmar, Thailand, and Viet Nam as well as Malaysia and Singapore. Work on developing the railway system covering the Lao PDR began in 2016 (Mitra 2017b).

³⁸ For example, “when some processes in a Thai factory are transferred to the Lao PDR, although labor costs are lowered, distribution costs between Thailand and the Lao PDR are added on. A round-trip service for Bangkok–Vientiane–Bangkok that uses a 40-foot container costs approximately \$2,000 for a Lao PDR logistics company, including customs costs between Thailand and the Lao PDR (according to Suzuki Motoyoshi, Ministry of Planning and Investment of the Lao PDR). Using this service twice a month, therefore, to import raw materials and export products would cost \$4,000. In this case, how many workers would a factory need to pay for the high cost of distribution? According to JETRO (2014), the monthly salary for the working class in Thailand is \$363 and in the Lao PDR \$111. If we assume that the labor productivity per employee in Thailand is double that of the Lao PDR, replacing one Thai employee with two Lao PDR employees will result in a cost cut of $\$363 - (\$111 \times 2) = \$141$. Accordingly, a midsize factory with more than 56 employees (on the Lao PDR side) would make up for distribution costs of $-\$4,000$. When considering the costs involved in setup, preparation, and launch, an investor would likely require roughly 100 employees (on the Lao PDR side) to make up for all these costs and enjoy affordable labor costs” (Nishimura et al. 2016).

Table 4.10: Logistics Performance Index for ASEAN Countries, 2016

Country	Ranking	Customs Score	Infrastructure Score	Information and Shipments Score	Logistics Competence Score	Tracking and Tracing Score	Timeliness Score	Overall Score
Singapore	5	4.18	4.20	3.96	4.09	4.05	4.40	4.14
Malaysia	32	3.17	3.45	3.48	3.34	3.46	3.65	3.43
Thailand	45	3.11	3.12	3.37	3.14	3.20	3.56	3.26
Indonesia	63	2.69	2.65	2.90	3.00	3.19	3.46	2.98
Viet Nam	64	2.75	2.70	3.12	2.88	2.84	3.50	2.98
Brunei Darussalam	70	2.78	2.75	3.00	2.57	2.91	3.19	2.87
Philippines	71	2.61	2.55	3.01	2.70	2.86	3.35	2.86
Cambodia	73	2.62	2.36	3.11	2.60	2.70	3.30	2.80
Myanmar	113	2.43	2.33	2.23	2.36	2.57	2.85	2.46
Lao PDR	152	1.85	1.76	2.18	2.10	1.76	2.68	2.07

ASEAN = Association of Southeast Asian Nations, Lao PDR = Lao People's Democratic Republic.

Notes:

(1) Logistics performance index ranges from 1=low to 5=high, with a higher score representing better performance. The ranking of countries is based on 160 countries.

(2) The World Bank's logistics performance index reflects perceptions of a country's logistics based on efficiency of customs clearance process, quality of trade- and transport-related infrastructure, ease of arranging competitively priced shipments, quality of logistics services, ability to track and trace consignments, and frequency with which shipments reach the consignee within the scheduled time. The index ranges from 1 to 5, with a higher score representing better performance.

Source: World Bank. World Bank Logistics Database. <http://lpi.worldbank.org> (accessed July 2017).

Energy-related services

The Lao PDR has become a significant exporter of electricity owing to its rapid development of hydropower. But its domestic local electric power consumption per capita is lower than most countries in the world. The local power distribution system is weak in many areas and the cost of electricity is high (World Bank 2017b). Also, the construction of dams has resulted in unwarranted effect in the environment and the need to relocate people.

Prospects and plans

Poor infrastructure, logistics, and distribution of electricity hinder the Lao PDR from developing economic ties with other countries and prevent the national integration of all provinces and districts. The poor quality of hard and soft infrastructure leads to delays and raises transportation costs, which is a key component of logistics services expenses.

The government is aware of these facts as illustrated by initiatives in recent plans. Also, the Lao PDR is a party to several ASEAN initiatives that have been undertaken, such as the expedited cargo

clearance through the ASEAN Single Window, and the liberalized air and maritime transport services that support trade through the establishment of the ASEAN Single Aviation Market and the ASEAN Single Shipping Market. The Kuala Lumpur Transport Strategic Plan (2016–2025) was also launched in 2015 to achieve regional connectivity and develop ASEAN as a single market and production base. On land transport infrastructure, the ASEAN Highway Network and the Singapore–Kunming Rail Link projects are expected to boost connectivity and improve cargo transport in the region.

Although the government and the donor community continue to develop the infrastructure, logistics, and energy sectors, progress in developing indigenous private sector projects (including public–private partnerships) has been limited. The World Bank and the Asian Development Bank (ADB) have played significant roles in development of the transport and energy sectors. Furthermore, the PRC's BRI project, connecting the PRC, Viet Nam, Cambodia, Thailand, and Singapore and thus in relation, the economic corridor, foreign investment, and other initiatives, are envisaged to be major game changers for the Lao PDR's economy.

With great effort, the Lao PDR can improve its road networks and the cost and quality of its transport and logistics services and other parts of the distribution system. Transport services hubs may be developed to boost internal and international trade (especially border trade with the PRC, Thailand, and Viet Nam), the latter including the development of economic corridors (World Bank 2014b). Transport and logistics services are essential in developing trade and modern services sectors, one example being e-commerce. The Lao PDR also has tremendous potential for leapfrogging by means of developing the use of geographic information systems and drones and other modern transport and ICT-enabled applications (Mitra 2017a).

The government's 5-year plan, 10-year strategy, and 15-year vision outline various initiatives to develop the transport, logistics, water and sanitation, and urban plans. The eighth NSEDP highlights the need to qualitatively develop smooth and speedy goods transportation systems and subregional inland transit business centers, improve and construct standard roads to transport goods, link them to neighboring countries, and improve urban and local infrastructure.

4.2.3 The Case of Education, Training, and Migration

The Lao PDR government and business community recognize that education, training, and health combined and efficient labor markets are essential for sustained economic growth and transformation and for creating stable and well-paid jobs. Significant progress has been made in education and technical and vocational education and training (TVET) as well as health and nutrition but new job opportunities are lacking, and low pay and productivity continue to be major issues.³⁹

Weak human capital stock and labor markets are major impediments to the development of the services sectors and other parts of the economy. The country continues to trail behind most ASEAN members (Myanmar being the principal exception) in literary status and development of the education and TVET system (Table 4.11). This is reflected in the relatively low amounts spent on education⁴⁰ and outcomes in enrollment rates as well as the quality of education (at all levels) and training.

Table 4.11: Selected Education Indicators for ASEAN Countries, 2015

	Literacy Rate (%) (adult literacy rate, population 15+ years)	Expenditure on Education (%)		Gross Enrollment Ratio (%)			
		Percent of total government expenditure	Percent of GDP	Preprimary	Primary	Secondary	Tertiary
Brunei Darussalam	96.66	9.99	3.77	73.54	107.44	99.12	31.73
Cambodia	78.35	9.91	2.02	17.60	116.39		
Indonesia	95.44	17.51	3.30	58.16	105.74	82.47	31.1
Lao PDR	79.87	15.35	4.19	30.41	116.34	57.24	17.29
Malaysia	94.64	21.48	6.09	98.87	106.88	79.01	29.7
Myanmar	93.09			23.46	99.66	51.30	
Philippines	96.62	20.3	3.41		116.82	88.39	35.75
Singapore	96.77	19.93	2.91				
Thailand	93.98	18.86	4.13	72.79	103.69	86.21	52.51
Viet Nam	94.51	21.44	6.30	81.35	109.35		30.48

ASEAN = Association of Southeast Asian Nations, GDP = gross domestic product, Lao PDR = Lao People's Democratic Republic.

Note: Gross enrollment ratio is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education. Source: World Bank. World Development Indicators. <http://data.worldbank.org/data-catalog/world-development-indicators> (accessed April 2016).

³⁹ Official data show that unemployment rates are as low as 2%, reflecting the agriculture sector's dominance in the economy. The country has significant underemployment issues and lacks new employment opportunities, that is, especially for the young, many of whom would rather migrate in search of job opportunities.

⁴⁰ Currently, the Lao PDR's spending on education corresponds to about 3% of GDP, which is comparable with spending levels in Indonesia, Cambodia, and the Philippines but low compared with Malaysia, Thailand, and Viet Nam. While education spending in the Lao PDR has increased, the country continues to trail behind most other economies in spending on a per capita basis.

Being behind Viet Nam, Thailand, and other Asian members—in education and training and in private entrepreneurship such as in the development of local startups and SMEs—makes it difficult for the Lao PDR to compete and to diversify its economy. Shortage of trained professionals and the lack of on-the-job training adversely affect productivity and competitiveness. In addition, the majority of the Lao PDR's population does not speak English and it ranks among the lowest in English proficiency both in Asia and worldwide (Figure 4.5).

Despite multiple challenges, education in the Lao PDR has improved substantially. The adult literacy rate has risen from 69.6% in 2010 to 79.9% in 2015. Enrollment has increased for all education levels. The net primary enrollment ratio reached 98.5% in 2015

but the completion rate for grade 5 remained low, at around 78%, that is, well below the government's 95% target. As many children drop out in the first year of school and/or do not progress to the next grade level, the completion rate is low. Despite a steady increase in the enrollment rate in primary and lower secondary school, a large proportion (about 30%) of children do not continue to the upper secondary level. The number of higher education and vocational schools has increased from 55 units in 2000 to 163 units in 2014 but enrollment in the tertiary level remains low compared with most ASEAN countries (Tables 4.12, 4.13, and 4.14). Even though higher education systems have undergone reforms since 1995, the quality of higher education remains a major concern (Government of the Lao PDR and UN 2013).

Figure 4.5: English Language Proficiency, 2016

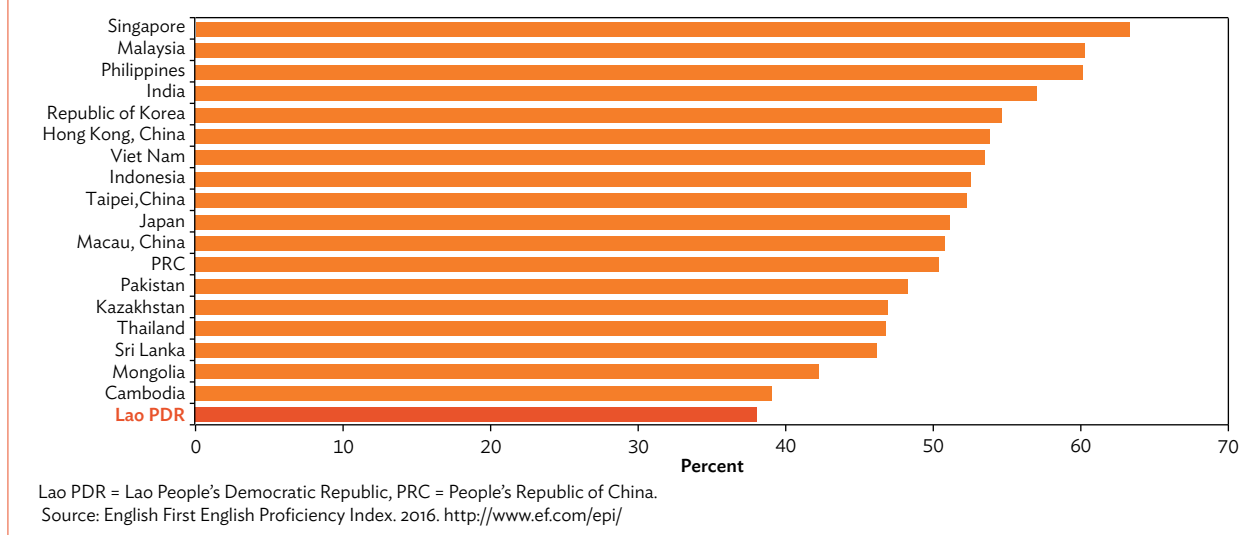


Table 4.12: Indicators of Universal Access to Primary Education, 2010-2015

Indicator	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015 Target
Net enrollment rate in primary school	94.1	95.2	96.8	98.0	98.6	98.0
Proportion of pupils starting grade 1 who reach grade 5	68.0	70.0	71.4	77.5	78.3	95.0
Enrollment rate in secondary school	62.9	64.7	69.0	74.4	78.1	75.0

Source: As reported by the Government of the Lao People's Democratic Republic, Lao Social Indicator Survey, and the Ministry of Planning and Investment.

Table 4.13: Enrollment Rate in Basic Education, 1992-2014 (% of population in relevant age group)

	1992	1995	2000	2005	2012	2013	2014
Primary education	58.8	65.2	77.3	84.0	95.2	96.8	98.0
Lower secondary education	28.9	39.3	53.3	62.7	64.7	69.0	74.4
Upper secondary education	11.0	17.4	34.6	36.8	34.7	37.3	41.3

Note: The enrollment rate for primary education is net enrollment. The enrollment rates for lower and upper education are gross enrollment.
Source: Government of the Lao People's Democratic Republic and United Nations. 2013. *Millennium Development Goals Progress Report for the Lao PDR 2013*. Vientiane.

Table 4.14: Higher Education and Technical and Vocational Education and Training, 2000–2014 (number of units)

	2000	2005	2010	2011	2012	2013	2014
University	1	3	5	5	5	5	5
College	5	25	99	108	108	111	111
TVET	49	47	39	39	48	47	47
Total	55	75	143	152	161	163	163

TVET = technical and vocational education and training.
Source: Lao Statistics Bureau.

The educational and training system is short of qualified teachers, educational facility, access and affordability of textbooks and ICTs. The access and quality of education is typically better in larger cities (Vientiane in particular) while especially weak in smaller towns, and in rural and remote areas (World Bank 2013).

While the education and TVET system has expanded, dropout rates are high and the quality and mismatch between supply and demand of human resources remain uneven. The system has, by and large, failed to produce adequately skilled workers, and has not kept up with evolving labor market needs, which suggests that the mismatch in supply and demand is rooted in the features of the education and training system itself. Accordingly, the focus should not only be on increasing quantity (i.e., increased enrollment, higher labor participation rates, etc.) but also on improving quality to enhance the workforce's basic skills (such as cognitive and numerical skills) and equip tertiary students with relevant, job-specific technical skills (World Bank 2013).

Migration

Outward and inward migration in the Lao PDR is substantial. Internationalization coupled with weak local human resources endowment has resulted in inward migration. Because local job opportunities are lacking, underemployment is seasonal, pay is low, and many people migrate to other countries. Large-scale migration implies that the Lao PDR contributes a significant number of human resources (mainly unskilled) toward developing the manufacturing industry and services sectors of other countries and for all skill levels in North America and France. Lao PDR migrants typically head for Thailand as their main destination because of the wide range of skilled, semiskilled, and unskilled job opportunities it offers

and its cultural similarities, including language. In addition, Thailand has a long border and both the Thai and Lao PDR governments have not applied strict restrictions on workers from the Lao PDR, barring recent initiatives aimed at doing so. However, Lao PDR workers are handicapped by their poor knowledge of English and other languages especially when working in countries other than Thailand (Box 4.2).

Drivers and constraints

The government and the donor community have endeavored to improve the education and TVET system. The share of education and sports in the government budget has increased to 17% in 2015–2016 compared with 15.5% in 2013–2014 and 13.4% in 2009–2010. Nevertheless, limitations in funding as well as the efficacy of spending continue to get in the way of advancement. Efforts to improve the system are hampered by deficiencies in education facilities, education material, and qualified teachers as well as the overall capacity of the government to implement education and training plans (MPI 2016a).

Prospects for growth

A recent World Bank report summarized the Lao PDR's challenges in creating new productive jobs for inclusive growth. The report underscores the slow movement of labor from the agriculture sector to other nonfarm jobs as a result of low productivity and poor skills. Labor movement is also deterred by limited opportunities for higher-paying and higher-productivity nonfarm jobs, in part because of constraints on business startup and on the ease of doing business. Weaknesses in skills do not only apply to vocational skills but can be traced to lack of basic reading and numeracy competency in early childhood. Improving agricultural productivity should be prioritized as it will increase income and help reduce poverty and can contribute toward freeing

Box 4.2: Outward and Inward Migration in the Lao PDR

Outward migration. Roughly 600,000 Laotian migrants are estimated to work abroad, including those who had migrated as refugees and resettled as permanent residents in other countries.^a The majority of these migrants work in Thailand but there are also a large number in the United States, France, and in other countries. In 2013, these overseas workers sent between \$204 million and \$258 million of remittances to the Lao People's Democratic Republic (Lao PDR), accounting for 1.9%–2.5% of the country's gross domestic product (GDP) and 25% to 32% of the official foreign exchange reserves. Since majority of the migrant workers particularly from Thailand are from poor rural households, the remittances inflow from Thailand are particularly instrumental in improving the lives of the poor families in rural areas. While the main goal for seeking employment in Thailand is to improve the economic conditions at home in the Lao PDR, however, most of the Lao migrant workers in developed economies do not intend to return home and were less interested in sending remittances to the Lao PDR. Hence, migration does have some drawbacks for the Lao PDR's economy because it results in the loss of talent, including those with useful skills and entrepreneurial drive and those who are highly educated (Swiss Development Cooperation 2014).^b

Inward migration. As the demand for skilled labor increases, the gap between demand and supply of skilled labor has to be filled by the inflow of foreign workers from the People's Republic of China, Thailand, Viet Nam, and other countries. A recent study of skilled labor employment finds that multinational enterprises in the Lao PDR employ a common strategy of sending high-level staff from their headquarters to their subsidiaries in the Lao PDR (ADB 2015d) since their existing pool of local workers often lack the necessary knowledge and technical know-how, thus making it difficult for local personnel to fill the posts of foreign personnel at the same level. In mid-level management jobs, however, local personnel may be substituted for foreigners in areas such as marketing and administration, if they are able to upgrade their job skills.

Association of Southeast Asian Nations labor markets. The Association of Southeast Asian Nations (ASEAN) Economic Community Blueprint advocates removing not only barriers in trade of goods and services between ASEAN member states but also barriers in labor mobility from 2016 onward. This gives rise to opportunities as well as challenges. Labor mobility will be promoted through a memorandum of understanding on mutual recognition arrangements of nationally endorsed education and training qualifications among ASEAN members. This will put some pressure on the Lao PDR to build up its human capital, and respond to opportunities and challenges that can result from increased labor mobility in the region.

Talent drain and circulation. Internationally recognized higher education is not available in the Lao PDR and those seeking it must go abroad. The number of students going abroad is, however, rather small. Most of them return home after completing their studies. External brain drain has so far not been a major issue but migration of talent to major cities within the Lao PDR is significant. Looking ahead, it is imperative to improve the higher education system in the country and consider avenues to increase the number of students overseas, especially those who are likely to return.

^a The estimate of 600,000 given in a study presented by the Swiss Development Cooperation (2014) differs from official Lao PDR data which show that only 300,000 worked abroad. The government data include only those registered with Lao PDR authorities. The Thai government claims that more than 1 million are working in Thailand (including seasonal workers many of whom work in agriculture and manufacturing, etc., at the Thai border).

^b The majority of Lao PDR's workers in Thailand are from poor communities. The most common reasons for migration are lack of job opportunities at home, poverty, and seasonal underemployment. In addition, wage differentials attract mostly unskilled, relatively uneducated, young Laotian workers to migrate to Thailand. Average unskilled workers earn \$173–\$217 a month for 26 work days, before the minimum daily wage was raised to make a minimum monthly earning of \$260. In the Lao PDR, the current minimum wage, which was raised in 2012, is \$82 for 26 work days per month (Swiss Development Cooperation 2014).

Sources: Swiss Development Cooperation. 2014. *Lao Labor Migration and Remittances Report*; and ADB. 2015. Lao People's Democratic Republic: Support for the Human Resource Development Strategy. *Consultant's Report*. Manila.

some workers to seek employment opportunities in sectors other than agriculture (World Bank 2016a).

Demographic dividend. An increasingly young population, the so-called demographic dividend, presents a major opportunity and challenge to the Lao PDR's education system and labor markets. During the eighth Five-Year Plan period, the number of school-age children (5–14 years old) is projected to decrease by 3.7%, whereas the working-age population is expected

to increase by 10.6% and the elderly population by 10.1%. The working-age population is expected to start rising slowly still in 2050 (MPI 2016a).

To take advantage of the potential demographic dividend, the education system must be strengthened and jobs for the young provided. It is essential to tackle issues relating to the scale and scope of education and training and high dropout rates. Concerted efforts are required to address the current mismatch

in demand and supply of human resources resulting from lack of employment opportunities within the country, and thus forcing Laotians to seek jobs in other countries. Furthermore, development of human capital needs to begin before a child reaches schooling age. The government recognizes the need to ensure the provision of basic literacy and numerical skills by expanding and strengthening early childhood development and education. In addition, ICT offers special opportunities to expand the scope and scale of education and training in urban as well as rural and remote areas such as distant and other forms of online learning. Also, online job postings can help labor markets function better.

Given the current weaknesses in quality of the education and training system, collaboration between training institutions and firms, particularly through internship programs and on-the-job training, can enhance the delivery of job-relevant skills. At the same time, firms should be provided with incentives to encourage knowledge transfer at the firm level, which upgrades the Lao PDR workers' skills and increases their opportunities to replace foreign workers in high-skilled positions. The government can also conduct the human capital training programs stipulated in international agreements with ASEAN and other countries (Nishimura et al. 2016).

Policies and plans

The government's 5-year, 10-year, 15-year plans, and strategies and vision documents outline multiple initiatives to develop education at all levels and the training system (MPI 2016a). The Ministry of Education and Sports recently presented an Education Sector Development Plan and a Technical and Vocational Education and Training Development Plan for 2016–2020 and beyond (Ministry of Education and Sports 2016a and 2016b). The government has emphasized the importance of human resources development and has increased its budget for education to develop education infrastructure and improve teaching–learning from nursery and kindergarten to primary, secondary, and tertiary levels of education and TVET (Box 4.3).

4.2.4 The Case of Information and Communication Technology and Related Services

The Lao PDR has made headway in ICT development. The number of internet users has increased from less than 1 per 100 inhabitants before 2005, to 11 in 2015. Nevertheless, the Lao PDR continues to fall behind most ASEAN members in ICT-related infrastructure,

Box 4.3: Key Focus Areas of the Lao PDR's Education Sector Development Plan for 2011–2015

- Achieve compulsory primary education and expand compulsory education to include lower secondary education.
- Eradicate illiteracy, across all ethnic groups, by supporting relevant lifelong learning.
- Expand, strengthen, and promote secondary education; technical and vocational education and training; and higher education to respond to future demands of the labor market and improve economic outputs.
- Improve the responsiveness of the technical and vocational education and training system.
- Ensure that graduates have competence to enter the workforce through improving the quality of higher education and technical vocation.
- Ensure that technical, professional, and academics have knowledge and are capable of using modern technology and science.
- Improve quality and relevance of education to provide youth with the knowledge needed for socioeconomic development.
- Apply information and communication technology as tools for improving education administration and management and education quality.
- Expand education policy research and evaluation from the central to the local level.
- Expand physical education and sports from the central to the local level.

Lao PDR = Lao People's Democratic Republic.

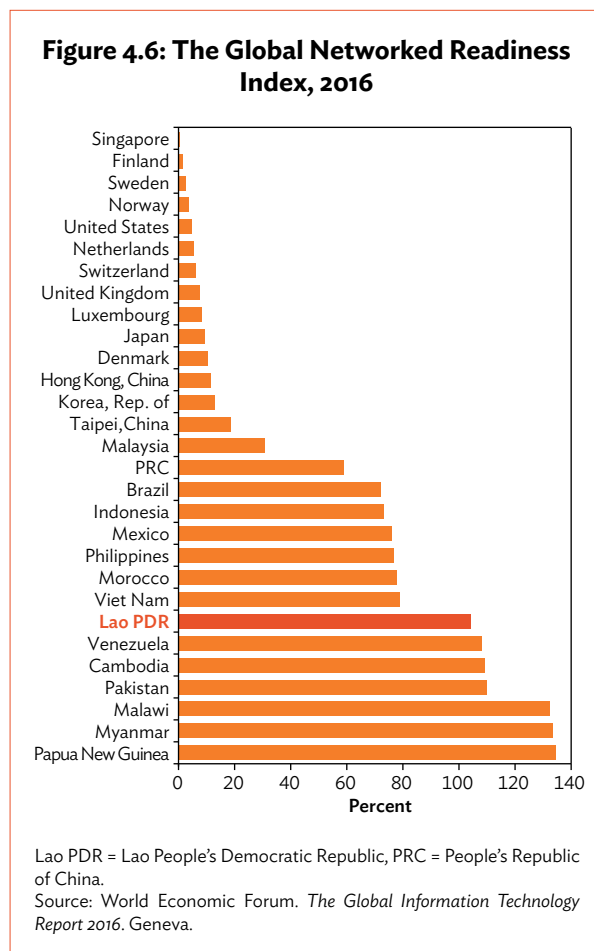
Source: Ministry of Education and Sports. 2016. *Education Sector Development Plan 2016–2020*. Vientiane.

and in institutional, education, and skill developments. According to the Networked Readiness Index of the World Economic Forum for 2016, a composite index that measures the capacity of countries to leverage ICTs for increased competitiveness and well-being, the Lao PDR ranked 104th out of 139 economies, the lowest among all ASEAN countries except Myanmar (Figure 4.6).

Trailing behind other countries in ICT development obstructs the development of services and other economic sectors in the Lao PDR. International data show that countries with strong ICT-related growth also tend to do well in GDP and other indicators for social and economic development (ITU 2016, World Bank 2016d). Conversely, countries that lag in ICT and other innovative economic developments are typically at the lower end of socioeconomic development indicators and are unable to graduate from low- to upper-middle-income status.

The Lao PDR is behind the PRC, Singapore, Malaysia, Thailand, Viet Nam, and several other Asian countries in diffusing, adapting, and adopting ICTs in the domestic economy. ICT development in rural and urban areas and across different social groups has been disproportionate. The country is slow to develop ICT hardware and the services industry that can serve local and external markets. Infrastructure, human resources, and legal and regulatory frameworks are weak. The domestic market is small and the prospect of developing an export-oriented industry is limited. The absence of a significant ICT industry can be a major handicap in the development effort. A more significant ICT services industry (larger firms as well as SMEs) is essential to serve basic needs in the local economy—without it, the scope for ICT-related catch up becomes limited (Table 4.15).

Table 4.15: Networked Readiness Index of the Lao PDR (total and by subindex)



Networked Readiness Index	Rank	Value (1-7)
Networked Readiness Index 2016 (out of 139 countries)	104	3.4
Networked Readiness Index 2015 (out of 143 countries)	97	3.6
Networked Readiness Index 2014 (out of 148 countries)	109	3.3
A. Environment subindex	93	3.8
1st pillar: Political and regulatory environment	68	3.8
2nd pillar: Business and innovation environment	106	3.8
B. Readiness subindex	107	3.9
3rd pillar: Infrastructure	108	2.7
4th pillar: Affordability	82	5
5th pillar: Skills	106	3.9
C. Usage subindex	117	2.9
6th pillar: Individual usage	124	2
7th pillar: Business usage	89	3.4
8th pillar: Government usage	110	3.3
D. Impact subindex	104	3.1
9th pillar: Economic impacts	97	2.9
10th pillar: Social impacts	110	3.4

Lao PDR = Lao People's Democratic Republic.
Source: World Economic Forum. *The Global Information Technology Report 2016*. Geneva.

The development of the digital economy, and thus creative destruction,⁴¹ is poised to affect economic growth, productivity, competitiveness, employment, and intrasector and intersector development and can transform the government and nongovernment organizations. It has huge impacts on the scale and scope of private sector investment and entrepreneurship, including foreign trade and investment, and the progress of future generations of indigenous SMEs and microenterprise jobs.

New technologies, such as ICT, and other innovations, offer possibilities to leapfrog in institutional, infrastructure, and various sector-specific developments; empower all social groups; and transform government, private companies, and other entities. But while creating new knowledge and wealth, these can also marginalize those not empowered by the digital and knowledge-based economic transformation. The impact of ICT ranges from urban and rural areas (smart cities and villages) to industrial agglomeration and many other aspects of spatial development. ICT reduces entry barriers; expands the life-span of small and large enterprises; and transforms supply and value chains, international trade and investment, and the research and development environment. As the application of ICT becomes more pervasive in society, the boundaries between ICT and other sectors become increasingly blurred as ICT becomes central to most traditional brick-and-mortar industries and as ICT companies are established in a wide range of industries. These developments have

direct and indirect outcomes not only for advanced industrial economies but also for less developed countries, including low-income countries such as the Lao PDR (Mitra 2017a). Table 4.16 shows the Lao PDR's progress in selected ICT indicators between 1992 and 2015.

Drivers and constraints

Higher-income levels coupled with lower cost and increased ICT capabilities are principal drivers of ICT development. In recent years, the use of smartphones and particularly the internet is increasing. More broadly, rapid ICT development is determined by the congruence of multiple factors—the society's ability to build on strengths and address weaknesses in the following areas (Mitra 2017a):

- historical legacy in socioeconomic, cultural, and political developments coupled with the implications of timing and geographic positioning;
- income levels and thus related factors that impact the scale and scope of demand (and supply);
- education (all levels) and technical and vocational education and training as well as research in the national innovation system and its international interface;
- telecommunications, broadband connectivity, and other infrastructure development;

Table 4.16: Selected Information and Communication Technology Development Indicators, 1992–2015

Year	Fixed Broadband (in thousands of subscribers)	Fixed Telephone	Mobile Cellular	Internet Users (per 100 people)	Secure Internet Servers (per 1 million people)
1992		8.5	0.3		
1995		16.6	1.5		
2000		40.9	12.7	0.11	
2005	0.31	90.8	657.5	0.85	0.35
2010	5.89	103.1	4,003.4	7.00	0.80
2011	6.55	107.6	5,480.9	9.00	1.26
2012	7.58	450.0	4,300.0	10.75	0.94
2013	9.03	701.7	4,612.6	12.50	1.08
2014	11.29	920.9	4,618.6	14.26	2.12
2015	36.41	962.5	3,727.2	18.20	2.55

Source: World Bank. World Development Indicators. <http://data.worldbank.org/data-catalog/world-development-indicators> (accessed August 2017).

⁴¹ The term “creative destruction” was coined by Joseph Schumpeter (1950) in his work, *Capitalism, Socialism and Democracy*, to denote a “process of industrial mutation that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, and incessantly creating a new one.

- institutional capability and the aptitude to deal with change in the government, private sector, and other entities;
- legal and regulatory frameworks of governing telecommunications, intellectual property rights, data privacy, e-security, e-commerce e-banking, e-government, and other aspects of ICT development; and
- leadership and technical competency to formulate and implement government, private sector, and academic community projects, plans, strategies, and vision for ICT-related development within the country and the rest of the world.

A comparative analysis of the Lao PDR reveals weakness in these dimensions, thus resulting in its being left behind in telecommunications⁴² and in the use of the internet and computer-enabled devices and related applications in the government, the private sector, and the academic community as well as in individuals and households. The country was late in adopting the internet and trails behind in adopting and implementing data privacy, e-security, intellectual property rights, foreign investment and trade, and other regulatory regimes.⁴³ Also, internet costs are relatively high and reliability of connectivity is uneven (ITU 2016). Moreover, ICT development is constrained by weakness in institutions and ICT (and other related sector-specific domain competency), education, skills, English language proficiency, and shortage of Laotian content. There is no sizeable ICT hardware and industry—it has only a few ICT professions that are filled by importing skilled professionals from India and other locations, or by outsourcing work to India, Thailand, and other Asian countries.

Despite multiple barriers, demand for ICTs is growing and the government and the private sector increasingly recognize the potential of ICT-related and other innovative developments. Nevertheless, there is a

compelling need for coordinated efforts to improve the legal and regulatory regime, ICT infrastructure, and the ICT-related education and training—because of wide-ranging consequences for the development of public sector services delivery in all levels of education, health care, social welfare, security and defense, the judiciary, and government administration; in banking and finance; in wholesale and retail trade; in transport and logistics; in tourism; and in other sectors and their interface. For example, simulations using ICT (e.g., connectivity software platforms, etc.) are needed in developing transport and logistics services in order to engage in e-commerce and other modern services.

Prospects for growth

ICT-related development is still in its infancy in relation to ICT application in the Lao PDR. However, this is poised to change as the private sector, the government, and other stakeholders foster its development despite multiple constraints and impediments—such as weak experience and lack of commitment, slow response from the government and the private sector, and the gap between a generation of younger policy makers and ICT-savvy workforce and their elders.

The Lao PDR still lacks potent ICT industry associations. The Lao National Chamber of Commerce and Industry, which serves as an umbrella for private industry associations, has been involved in establishing an internet committee, but has so far given lesser attention to ICT than other countries have. Also, compared with most of the other Asian countries, the Lao PDR is weak in initiating ICT-related start-ups and in developing SMEs.

Policies and plans

The country is slower in formulating and executing ICT-related plans and other modern technologies, and it is behind other countries in implementing telecommunication, cyber and intellectual property

⁴² A study of the regulatory and institutional assessment of the telecommunications sector was completed during the seventh NSEDP period. It pointed to two main priorities for developing the telecommunications sector: (i) to establish an effective sector regulator independent from the policy-making role, and (ii) to implement a licensing framework to allow the authorization of telecommunications operators. Furthermore, it also underscored the need for the Ministry of Post and Telecommunications to draft and implement regulatory instruments, particularly relating to the framework for competition, interconnection, licensing regime, and spectrum management (MPI 2016c).

⁴³ ICT services have gradually become significant components of the Lao PDR's exports and imports. Its share of the country's total exports increased from 3.2% in 2005 to 4.9% in 2013. Appropriate legal and regulatory frameworks, such as the country's relatively ambitious commitments to the World Trade Organization, need to be established to further expand ICT-related foreign trade and investment (World Bank 2016b).

legislation and regulatory framework reforms. The eighth Five-Year Plan does, however, stress the importance of ICT, science and technology, and other innovations more than the earlier five-year plans did. Among stakeholders, a comprehensive understanding of the opportunities and challenges relating to these developments is essential as well as a stronger championship of ICT and other technology developments.

The Lao PDR is one of few countries in Asia that did not have a comprehensive plan for ICT. Only recently did the government show greater, albeit gradual, interest in ICT development. For instance, the Ministry of Post and Telecommunications launched a long-term ICT development plan only in 2016,⁴⁴ and its vision to 2030 and strategic development plans for 2016–2025 was presented in 2016, which cover development in seven major areas: human resources, postal sector, telecommunications and ICT infrastructure, cyber security, ICT industry, e-government, and ICT innovation (MPT 2016).

ICT is also given considerable attention in the government's eighth NSEDP Five-Year Plan, in its strategy for 2025, and vision for 2030 (MPI 2016a). In promoting innovation, the eighth NSEDP's general policy direction calls for efforts to (i) develop science and technology as a key driving force for rapid and stable economic growth; strengthen science, technology, and innovation for industrialization and modernization; and promote the innovative economy; (ii) develop knowledgeable and competent human resources in the science and technology sector that will contribute intellectually to national development; and (iii) apply science and technology as a tool for effective environmental protection and sustainable development; and prepare and respond to natural disasters effectively. Specific development targets include the following: (i) increase investment in research and development from 1% to 2% of public investment by 2020, (ii) promote private investment in research and development to cover at least 30% of public investment by 2020, and (iii) establish a science and technology zone by 2018 (MPI 2016a).

In management and application of ICT, the general directions outlined in the plan call for efforts to (i) promote the development of basic infrastructure for telecommunications and electronic information; provide high-speed and quality services to support modernization of the services sector; facilitate e-trading; strengthen socioeconomic development; and upgrading telecommunications as a central support for ICT integration to international standards; and (ii) develop quality, modern, accurate, and up-to-date media outlets in the Lao PDR to ensure information safety and security; promote media as a voice of the Party and the government; integrate into regional and international media; improve and develop up-to-date, strict, and comprehensive media protection laws.

Specific ICT development targets involve (i) creating an intranet and long-distance meeting system to link 50% of government offices, districts, and villages; (ii) strengthen e-governance at the central level to provide comprehensive services and extend e-governance service coverage in the provinces to 50%; (iii) increase the computer literacy rate to 30% and internet literacy rate to 40% of the population, the proportion of computer-literate households to 20% of all households, the proportion of registered landline and wireless home phone users to 15%, the proportion of registered mobile phone users to 100%, and the proportion of registered landline and wireless internet users to 20% of the total population, by 2020; and (iv) promote the post and telecommunications sector to contribute its revenue to GDP growth, to reach the target of GDP 8% growth by 2020 (MPI 2016a).

In short, it is essential for the Lao PDR to respond to opportunities and challenges relating to worldwide innovative developments. The accelerating pace and sweeping implications of new technology developments underscore the absolute urgency of effective responses to the digital and other innovation developments, which will entail major changes in government intervention and the role of the private sector and imply new challenges for academe, the international donor community, and civil society. While

⁴⁴ Earlier initiatives include the e-government development plan 2013–2020, which was established under the framework of the national e-government action plan and the e-government ASEAN strategy plan. This plan covers information infrastructure, security system, e-government service center, videoconference, e-applications, data deployment, regulations, and end-user training (MPT 2016).

the Lao PDR lags behind most Asian countries in ICT development, it needs to unite efforts in developing ICT and other innovations and learn from the success and pitfalls of other countries.

The historical evidence from Asia and elsewhere suggests that the effective use of existing and new technologies and the willingness to adopt new business models, work processes, and other innovations—alongside education, infrastructure, and other transformative development efforts—are essential to remain competitive and sustain economic growth. A country, an institution, and a social group risk being left behind unless they take forceful action to foster technology-enabled development and therefore related institutional transformation. Indeed, if a national economy (or other entity) is not a digitally transformed economy 10 years from now, it will not be a functioning economy by any modern regional, or international standard; it will simply be a legacy or an outdated economy (Mitra 2017a).

Technology in itself cannot be a panacea for development and it is important to realize the unwarranted effects that disrupt the overall socioeconomic fabric—more specifically privacy, natural security, problems relating to digital ethics, vulnerability to technology disasters, and other downside risks that can be associated with adopting new technology. ICT and other technology developments are central to sustainable and inclusive growth but these have sweeping implications for human resources and other developments in the Lao PDR and elsewhere (Box 4.4).

It is often said that the escalating digital revolution—alongside other innovations, climate change and energy sector transformation, urbanization, aging population, mounting inequalities, and other megatrends—is one of the most important game-changing developments of our time. And yet this phenomenon is poorly understood by many, misperceptions are common, and progress uneven. The digital revolution, and more

Box 4.4: Information and Communication Technology Development in Asia

Implications of the digital revolution and knowledge economy-enabled transformation include the following:

- Direct and indirect impacts on productivity, competitiveness, industrial organization, labor markets and related legal and regulatory, financing and other development conditions especially because it empowers creative destruction and transformation of human relations with the machine-technology.
- Changes in the context for development in areas as diverse as transportation and logistics, information and communication technology (ICT), energy, natural resource utilization, climate change, defense and national security, finance, retail, health care, education, manufacturing and construction industry, mining and agriculture, and other natural resource-based sectors. This also includes change in the overall context for the development of value chains, production, and other networks that enables national integration transformation of international trade, investment, knowledge, and other relations.
- Reduction of entry barriers and life-span of large, midsize, small, and start-up firms and other institutions that gives rise to new sets of powerful corporations (and other entities) with major capabilities to access and process information for competitive advantage. High-, middle-, and low-income groups can create new knowledge, wealth, and concentration of power. Other groups are empowered by the new digital economy and its education, skills, and innovation requirements. The development of smart cities and connectivity empowers rural and remote areas.
- Advancements in biotechnology and other science and technology developments and transformation of access, processing and use of data, and information and knowledge has resulted in complex intellectual property right issues, vulnerability to technology-related disasters, data privacy, cyber security, ICT waste management, problems relating to digital ethics, and other unwarranted issues that can be a consequence of poor design and ill-managed dependency on technology.

Source: R. M. Mitra. Forthcoming. Transforming Asia: Leveraging the Digital Revolution and Knowledge Economy: Opportunities and Challenges for Asia and Its Partner.

broadly knowledge-based society transformation and the so-called fourth industrial revolution, implies major creative destruction in all social groups, sectors, industries, and countries.

The next 5 years and beyond will see new waves of development and deployment of creative and disruptive innovation, ranging from new materials and nanotechnology, next generation biotechnology and genomics, energy storage and renewable energy generation, 3-D printing, advanced robotics, driverless vehicles, software development and other forms of automation, the Internet of Things, sensors, wearable devices, and mobile internet applications, cloud technology, big data, artificial intelligence, and so on.

All will be transformed—agriculture, construction, manufacturing industry, natural resource utilization, energy, aerospace, land and sea transport, logistics, education, health care, media, government and business, logistics and other services, capital and labor markets, business models, and the way institutions function and people live their life.

Autonomous robotics, 3D-printing, big data, cloud computing, artificial intelligence, the Internet of Things, and sensor technologies are driving a paradigm shift in manufacturing as well as in other industries. Among other things, this is reflected in worldwide transformational trends in trade, investment, and employment, which impact not only the manufacturing industry, agriculture, and other natural resource-based sectors but also the services sectors. Many services sector jobs will be reshaped or disappear, the latter including accounting, banking, financial, insurance, legal, wholesale, retail trade, hotel and restaurant, transport and logistics, education, health care, national security, and government administration.

In all Asian societies, the importance of digital economy transformation has increased. This is a development that is typically spearheaded by larger cities with the foremost interface between international innovation developments. The diversity of socioeconomic development within Asia is demonstrated by several forms of societies—subsistence and more advanced agriculture, industrial and postindustrial economy—existing at the same time. Moreover, significant

diversity in supply and demand conditions are manifest in different scale and scope of adaptation and adoption of innovations between sectors, institutions, regions, and social groups, with the latter often referred to as the digital divide or dividend potential. In short, technology can be a great enabler, as well as an equalizer with regard to being nonexclusive, but it can also have problematic implications, as in e-security for example.

Key decision makers in Asia are compelled to ask how a country or other entity can foster the development of internationally competitive industries and modern infrastructure, education and innovation ecosystems, and governance and public administration in the fastest growing region of the world—a world that will be increasingly interconnected, hypercompetitive, vulnerable to climate change, and dependent on bio, digital, and other technology and innovative developments. Countries, institutions, and individuals that respond effectively to the opportunities and challenges in the digital era can be successful in the emerging *new economy* while those who falter in doing so risk losing out.

In short, the digital revolution is triggering a major socioeconomic transformation in Asia and the rest of the world—the future for competitiveness and inclusive and sustainable development is likely to be radically different from the past. Japan; the Republic of Korea; the PRC; Hong Kong, China; Taipei, China; Singapore; and some major cities in developing countries (the PRC, India, Malaysia, and the Philippines being prime examples) will continue to play a major role in this transformation. New technologies will be major catalysts in development trajectories for today's low- and middle-income countries in Asia—some of which have potential to become high-income economies if they can leverage the potential benefits from technology and other innovative developments.

4.3 Developing Cross-Cutting Synergies across Sectors

The Lao PDR's one major dilemma is that labor surplus emanating from population growth and productivity developments in the rural agriculture sector are absorbed, to a limited extent, only in the services sector.

The informal sector and the rural economy continue to be the main sources of employment. The services sector is leading in job creation but the Lao PDR is still behind other countries at similar stage of development. Sustainable growth and structural transformation that will generate new job opportunities will require the upgrading of all major sectors, including services and their synergies with manufacturing, agriculture, and other parts of the economy.

The Lao PDR is at an early stage of developing industrial agglomeration and modern competitive cities, e.g., smart cities (Box 4.5) that could pave the way for cross-sector synergies. To develop smart cities and associated modern transport and logistics services, concerted efforts are needed. Vientiane and other cities can potentially be built into more substantive regional transport and logistics services hubs—a development promoted by the government, which entails, among others, investing in transport systems (road, railways, and air) that will connect the country with the PRC, Thailand, and Viet Nam.

The country is a latecomer in developing export processing zones (EPZs) and other forms of industrial agglomeration—which very much rely on growth in education, transport, logistics, and other services sector. The industrial clusters and/or EPZs emerging gradually focus on the services sector (e.g., entertainment services and logistics) followed by manufacturing and commerce. However, the scale and scope of ongoing industrial estate development are quite limited for many reasons such as weakness in infrastructure, education, and training coupled with strong competition from neighboring countries.

The government's recent five-year plans have been explicit regarding the need to reduce poverty and develop urban, rural, and remote areas. The plans emphasize the scope for building special and specific economic zones that could provide a large number of new direct and indirect employment opportunities (MPI 2016c). Construction of EPZs and other developments akin to them, however, only began in 2009. Economic corridors are largely limited to cross-

Box 4.5: Smart Cities

What is a smart city?

A smart city, digital city, electronic community, intelligent city, knowledge-based city, or wired city is defined as an urban development vision to integrate multiple information and communication technology (ICT) and Internet-of-Things solutions in a secure fashion to manage a city's assets including, but not limited to, local departments' information systems, schools, libraries, transportation systems, hospitals, power plants, water supply networks, waste management, law enforcement, and other community services.

This addresses issues on population growth such as congestion, high cost of living, rising level of pollution, increasing crimes, etc., as world urbanization continues to grow with population. The technologies associated with smart cities include intelligent lighting, smart building controls, demand response, LED lighting, solar panels, fuel cells, wireless charging for automobiles, etc.

Smart cities around the world

The development of smart cities and others akin to them have been promoted in Europe (e.g., Amsterdam, Barcelona, London, Madrid, Manchester, Oslo, and Stockholm) and also in other parts of the world. In Asia, Singapore; Hong Kong, China; Tel Aviv; and several cities in Japan, India, the Republic of Korea, and the PRC are much noted examples. In some cases, the context is used more broadly, referring to smart nations (Singapore, Thailand, Sri Lanka, and others).

A global forecast is that by 2020, the market size of smart cities will expand to \$757.74 billion from \$312.03 billion, focusing on transportation (rail and road), utilities (energy, water, and gas), building (commercial and residential), and services (education, health care, and security). The key service providers would be IBM, Cisco Systems, Microsoft, Schneider Electric, Siemens, Oracle, Huawei Investment & Holding, Ericsson, Toshiba, and Hitachi.

Sources: Institute of Electrical and Electronics Engineers. <http://smartcities.ieee.org/about.html>; and Cision PR Newswire. 2016. Smart Cities Market by Solution and Services for Focus Areas – Global Forecast to 2020. <http://www.prnewswire.com/news-releases/smart-cities-market-by-solution-and-services-for-focus-areas---global-forecast-to-2020-300272187.html>

border development with Thailand, Viet Nam, and the PRC. Such developments require, among others, major investment in infrastructure, for which the Lao PDR has lesser financial and other resources than its neighboring countries. Thus, the country has lagged behind in development of these EPZs, special economic zones (SEZs), and economic corridors. Furthermore, low wages dominate the EPZs on the border with Thailand and Viet Nam as they provide little value added and generally low productivity.

Tax incentives coupled with moderate labor cost, land and real estate, and the availability of electricity push forward the development of EPZs, SEZs, or similar zones. Also, some foreign companies are especially interested in the Lao PDR for reasons such as to diversify locations so that they are not excessively dependent on Thailand and to avoid flooding and other issues. But many weaknesses constrain this development such as those in infrastructure, logistics, labor productivity, and poor access to skilled and experienced labor, legal and regulatory conditions, and others in the business environment (World Bank 2017a and 2017b). These weaknesses in services and other sectors and in intersector linkages need to be addressed. All these point to the need for integrated approaches that cover manufacturing, natural resources, as well as cross-cutting development in infrastructure, services (e.g., commerce, logistics, education, training, and ICT), and overall improvement in the legal and regulatory environment (Nishimura et al. 2016).

In short, it is imperative to revitalize the development of modern cities and industrial estates in the Lao PDR to create competitive cities and expand the scale and scope of industrial clusters. This will require investing further in infrastructure and logistics, developing education and skills, and improving overall in the doing business environment for services and other sectors and especially promoting private–public partnerships and foreign investment. It is also essential to align EPZs and economic corridors with international developments, particularly in the PRC (including the BRI) and ASEAN members such as Thailand and Viet Nam.

4.3.1 Special Economic Zones: Lessons from the Asian Experience

Majority of the developing countries have created SEZs and EPZs that are widely used to initiate or expand export-oriented manufacturing—thus promoting broad structural change through linkages and demonstration effects. SEZs and EPZs are insulated from the rest of the economy and therefore offer a convenient vehicle for testing export-led strategies and incentives to produce for the global market. To this end, the success of Taipei,China; Malaysia; the Philippines; Singapore; and the Republic of Korea have attracted the attention of other developing countries. Since then, the industrial achievements of the PRC and other East Asian economies have been emulated and EPZs have been established by a number of developing countries.

One of the primary objectives of EPZs is to establish and diversify the manufacturing base to earn foreign exchange. EPZs are also an ideal platform for developing countries that are typically short in the capital, technology, and soft skills needed to transform their economies. More recently, EPZs in the PRC and the Republic of Korea have been used to promote services. However, in many Asian economies, EPZs are a combination of a stand-alone area and agglomeration, which promote export-oriented manufacturing. EPZs can help improve productivity, promote innovation, strengthen skills development, and upgrade the technological spillovers as exemplified by the success of the PRC, the Republic of Korea, and Taipei,China.

Overall, the experience of Asian economies in the success of their EPZs is quite diverse. For example, the success of the Republic of Korea; the PRC; Hong Kong, China; and Taipei,China was largely based on their efforts to support and promote outward-oriented exports. Through EPZs, these economies succeeded in promoting the manufacturing industry, thereby enabling them to sustain higher economic growth and substantially transforming their economies. On the other hand, the success of Hong Kong, China was based on its free port status, which allowed it to transform into a high-performing economy.

The benefits emanating from economic zones are not uniform across zones or economies and are conditioned upon the type of activity they attract and their evolution. Similarly, the industrial composition of EPZs and/or SEZs, their linkages with the rest of the economy, and composition of products also determine their contribution to the technological catch-up and growth. One of the key elements to the success of promoting manufacturing and diversifying the industrial base through EPZs is to have a strong focus on the domestic firms' competitiveness and continuously strengthen their competitive advantage. This success is also determined by how successful policy makers are in addressing the challenges that domestic firms face in moving up the value chain.

In the case of the Republic of Korea, the key element of its EPZs is based on the crucial role played by the state. The government has remained focused in targeting industries and strengthening the production capabilities of domestic firms. To this end, the government provided targeted credit, subsidies, and incentive packages, and focused more on attracting foreign direct investment (FDI) for manufacturing technologies and stimulating growth of large companies. Taipei, China, on the other hand, used EPZs as a platform for strengthening SMEs by integrating them into global value chains (GVCs) and upgrading firms within them. The PRC, on the other hand, complemented vertically specialized industrialization with the agglomeration approach and promoted the domestic firms' production capabilities by facilitating alliances directly with foreign firms. To this end, it has also created numerous specialized zones with varying degrees of technological sophistication.

Malaysia, for example, has successfully attracted large volumes of FDI through the creation of EPZs, thus it has a vibrant electrical and electronic sector. These EPZs have also benefited the country through the economy-wide technological spillover impacts that encouraged development beyond production capabilities. In Malaysia, EPZs are integrated with the rest of the economy, thus helping to acquire new skills and competencies to produce and supply domestic inputs to EPZ-based semiconductor companies. In contrast, the Philippines could attract large inflows of FDI, but the benefits of agglomeration and

technological spillovers have remained quite limited because of weak linkages to the rest of the economy.

Likewise, Cambodia, the Lao PDR, Myanmar, and Viet Nam, as a group, while remaining primarily agriculture-based and transition economies, have also been developing SEZs and EPZs as part of promoting their manufacturing and industry sectors. Following the success of the PRC, these countries plus Thailand have focused on creating agglomeration economies. Thailand moved from assembling imported inputs to increasing sales of merchandise and subsequently producing its own branded products in the domestic and global market. Among these countries, Viet Nam has been quite successful in its massive industrialization drive, and has benefited from the relocation of firms from the PRC and other Southeast Asian economies where labor cost has started rising. The output generated in its industrial zones has significantly increased from 8% in 1996 to 32% in 2010.

Cambodia's SEZ policy has quite a unique feature in which the government's role is limited to providing a "one-stop" service on the zone site to process all the requirements for export, import, employment, and other regulatory matters. All other management accountabilities for the zones are left to the private sector developers to avoid the wasteful public sector costs that are associated with SEZs, thus saving time and cost of firms having to travel to the ministry offices in the capital city of Phnom Penh. Another advantageous feature of Cambodia's SEZs is a more diversified industrial base within the SEZ than outside of it. Garment firms heavily dominate outside the SEZ while the firms inside the SEZ produce various products such as electronics, electrical products, and household furnishings. This diversification is advantageous such that if the global garment industry suffers a downturn, Cambodia's overall employment in the manufacturing sector will be less vulnerable.

In South Asia, Bangladesh, India, Pakistan, and Sri Lanka have promoted various economic zones. Bangladesh and Sri Lanka have been successful in attracting FDI inflows and generating employment. In Bangladesh, where majority of workers are low-skilled, EPZs benefited from lower labor cost, which thus promoted the garment industry. As of 2012, Bangladesh has eight

EPZs providing jobs to over 3.4 million workers and accounting for 17.1% of total exports. Sri Lanka has also been quite successful in attracting FDI through the creation of EPZs, which accounted for 38% of export receipts in 2008 and over 80% of zone investment coming from FDI. Likewise, Pakistan is also promoting its EPZs by offering industry-friendly labor laws. India has pursued vertically specialized industrialization using economic zones as a platform to diversify and upgrade its industry.

However, economic benefits from the zones operating in Cambodia, the Lao PDR, Myanmar, and Viet Nam and the South Asian region are not up to the mark. The weak business-enabling environment continues to drag the performance of firms while many zones operate below their capacity. Consequently, the firms fail to move up the industrial value chain. Likewise, economic zones in Central Asia also continue to face difficulties and even lagging behind other economies in Asia.

The success of EPZs and SEZs depends on many factors, including types of incentives, infrastructure, business-enabling environment, and the capabilities and services these zones offer. Ultimately, the performance and future of economic zones depend on the international environment. With the rise in world GDP growth, trade, and FDI flows, these zones become attractive opportunities for investors. The success of the economic zones in part is also influenced by multilateral and regional free trade agreements, which influence both intra- and extra-regional trade and FDI flows.

As discussed, the government plays an important role in the success of the economic zones. In both the Republic of Korea and in the PRC, the state actively targeted industries and strengthened domestic firms' competitiveness and production capabilities by providing various incentives and time-bound imports protection to expand output, productivity, export competitiveness, and economic growth. Thus, both the Republic of Korea and the PRC quickly moved up to the higher-value chain. Appropriate government strategy combined with effective planning to develop local production capacity and make the best use of the opportunities and spillover effects of FDI

on technological promotion created by economic zones are vital for the success of the zones. Similarly, other factors are also crucial such as technical skills, management expertise, and marketing skills and skilled labor.

Economic zones can also help develop the services sector by promoting a knowledge-based economy through innovations, improvement in logistics, finance, ICT, and other business-related services. The Lao PDR can also examine the potential of these services by focusing on ICT and introducing e-governance systems. The success of Asian economies such as the PRC, the Republic of Korea, and Taipei, China also suggests that SEZs can facilitate their nationwide impact by introducing reforms in the labor market and services sector. This is important to improve productivity, promote innovation, and benefit from technological upgrading and spillovers (ADB 2015a).

4.4 Conclusions

The Lao PDR has major potential for economic catch-up by developing the scale and scope of activity in wide-ranging services sectors. In urban and rural areas within the domestic economy, as well as in its integration with GVCs, production, knowledge, and other international networks, there is considerable potential for further development of modern services and upgrading of traditional services, and thus opening opportunities to transform the domestic economy and increase and diversify foreign trade and investment. There is significant scope to improve productivity and to develop stronger synergies across services subsectors and between various services and their interface with manufacturing, agriculture, mining, and energy sectors. The current state of low productivity and value added in agriculture and manufacturing is partly related to weaknesses in services and vice versa.

Export of services is at an early development phase, tourism being the prime exception. The country has yet to maximize the potential advantages in developing human and natural resources and its geographic position. The Lao PDR has a large potential to diversify and upgrade its economy and create new jobs by means of export-

oriented growth in tourism in particular, as well as in hydropower, mining, and niche markets for agriculture (e.g., coffee and other processed products) and in the manufacturing industry and related input of services. Moreover, it can be a prospective major regional transport hub—a development that is boosted by the Asian Development Bank, the World Bank, the PRC’s Belt and Road Initiative, and other projects. Also, the Lao PDR is likely to continue exporting labor to the services and other sectors in other countries.

In further developing its trade-related services export (and domestic market growth), the Lao PDR stands to gain from the potential role it can play as a catalyst for structural transformation and for boosting productivity and competitiveness, and thus resulting in increased income and creation of jobs. In addition, the diaspora could play a more significant role in upgrading the Lao PDR’s economy by increasing consumption (primarily through remittances to family members) and investment, providing professional skills, and facilitating access to international business and other networks.

Domestic market-oriented services sectors, despite having grown significantly, continue to be dominated by traditional services, but are open to substantial opportunity to expand the scale and scope of modern and traditional services. Low purchasing power and weaknesses in infrastructure and logistics, finance, SME development, governance, and other factors constrain the development of local market-oriented services. Moreover, linkages within and between many services subsectors, agriculture, mining, manufacturing, and other industries are typically shaky. The domestic market is also highly fragmented as reflected in major socioeconomic diversity between different social groups and neighboring regions.

Sector-specific prospects

The inputs of key areas such as education, TVET, health care, ICT, tourism, banking and finance, transport, and logistics and other services can contribute further to development of the services sectors and other parts of the economy. Realizing these opportunities will require the concerted

development effort by the government (such as in education, health care, infrastructure, and judiciary services) and the private sector (such as in tourism and ICT applications).

Education and training

Education and training in the past decades have significantly improved, but the Lao PDR continues to lag behind most Asian economies in this regard.

The education and TVET system must be expanded while simultaneously improving quality and ensuring better matching of supply and demand for human resources. The Lao PDR’s economic plans include a development strategy for the education sector for 2025 and beyond. But high dropout rates, uneven quality, and mismatch between supply and demand of human resources continue to be major issues even though the government and international donors have dedicated major efforts to improve all levels of education as well as the TVET system. Despite these efforts, the country has by and large failed to produce workers that employers find adequate. The country lags behind in labor productivity in all sectors, and especially in producing human resources with the skill sets and knowledge in technology required in a modern economy. Despite the improvement in the quantity and quality of education and the TVET system, the country has not been able to keep up with evolving labor market needs, which suggests that the mismatch is not rooted in the features of the education system itself. The focus should not only be on increasing quantity (i.e., increased enrollment, higher labor participation rates, etc.) but also on improving quality to strengthen the workforce’s basic skills and equipping tertiary students with relevant job-specific technical skills. The education and TVET system could be enhanced with stronger collaboration between education and training institutions and firms, particularly through internship programs and on-the-job training. At the same time, incentives will encourage knowledge transfer at the firm level.

To achieve upper-middle-income country status by 2030—implying a switchover to nonagriculture and urban economic-based sectors—the country must improve the TVET system and all levels of education. Also, basic literacy in the Lao and English

languages, and proficiency in other foreign languages as well as numerical and ICT-related skills are essential. Furthermore, measures that can increase the number of Laotians going abroad for higher education and professional training must be considered. It is also necessary to enhance the local employment prospects for semiskilled and skilled Laotians, including those with technical, managerial, and entrepreneurial talent to enable them to work productively in the Lao PDR rather than overseas.

Concerted efforts to educate, attract, and retain human talent should consider not only the requirements of the old brick-and-mortar economy but also new trajectories for economic development, such as responding to challenges relating to creative destruction in terms of institutions and the job market. Multiple efforts are needed to provide jobs for the less skilled and the poor as well as those with higher education and entrepreneurial talent. To improve education and training and the functioning of labor markets, strong measures are needed to carry out state government policy objectives, including national development plans and those provided by international agreements with ASEAN and other countries.

ICT and other modern services and technologies

The country has considerable opportunities for leapfrogging in ICT infrastructure and the application of new technologies and business models in all sectors of the economy as well as more broadly in public administration and SME and foreign investment development. Major opportunities to make use of technologies are available to foster entrepreneurship and to empower high-, middle-, and low-income groups in urban, rural, and remote areas. There is an urgent need to promote the greater use of ICT devices (computers, smart phones, and others) and access to broadband and hence related applications, many of which are examples of low-hanging fruits that are relatively easy to develop. This type of development is poised to have major impact on all institutions, social groups, and regions.

The country needs to further unite efforts to develop and execute comprehensive plans and carry out strategies to transform into a

digital and knowledge economy and develop other innovations. The Lao PDR is one of the few Asian countries that for a long time did not have a comprehensive plan for ICT. Such a plan, however, has been presented in 2016. It is essential that the government, the private sector, and other entities continue to update their ICT-related competencies, project, plans, and strategies.

Tourism

There is considerable scope to expand tourism-related developments, some of which could be considered low-hanging fruits. The country has great potential for increasing the number of international and domestic tourists and their duration of stay and spending levels per day. Tourism can create a large number of direct and indirect employment opportunities for a variety of skills categories and all social groups, including low-income communities. Further development of tourism, travel, and consequently related activities, can boost economic growth and employment in cities as well as in rural and remote areas.

Policies need to maximize the potential for gains in income and employment in the tourism industry and intersector linkages while minimizing risks associated with environmental degradation and other pitfalls. Improvement in air connectivity, land transport, hotels and other facilities, and the application of ICT can greatly increase tourism-related income. Realizing the potential to expand the tourism industry implies the need for multidimensional initiatives as indicated in the government's tourism-related plans. Carrying out these plans and strategies will require major efforts by a wide range of stakeholders at all levels of government and the private sector, including foreign investors as well as local SMEs.

Cross-sector development dimensions

Public and private investment opportunities. There is considerable potential for reorienting public expenditure and for improving its efficacy, such as in current expenditure as well as investment in services, infrastructure, and in reforming state-owned enterprises. Expanding the scale and scope of indigenous private investment as well as foreign

investment in services and other sectors is a major possibility. The country lags behind other ASEAN countries in developing its indigenous SMEs and the scope of its foreign portfolio and direct investment. The private sector's role in economic development needs to be revitalized, with the government playing a facilitating role and promoting public-private partnerships. Continued expansion in the scale and scope of larger companies as well as in SMEs, start-ups and the microenterprise business segments offers major growth potential much of it in service-related activities.

Spatial opportunities. Uneven development across different regions (and social groups) is a major challenge as well as an opportunity. The further development of industrial zones and/or parks and economic corridors (within the country and across international borders) can have major impacts on services employment such as income and jobs for the skilled, semiskilled, and unskilled labor, the latter including the poor and underemployed and those active in the informal sector. There is much room for services (particularly in transport, logistics, education and training, and the use of ICT) as well as for natural resources-based development, which could empower urban, rural, and remote areas. The country is still at an early stage of developing industrial agglomeration, and has significant scope to develop small and midsize industrial clusters focusing on services and other sectors.

The country needs to implement “new” concepts for spatial development, e.g., rethinking current approaches of developing EPZs, SEZs, and economic corridors, and more broadly on building cities and rural areas. The eighth NSEDP alludes to green development but it does not make explicit references to smart cities and smart villages or other similar developments. Such programs exist under different names in most parts of Asia and elsewhere. Policy makers and development plans need to greatly emphasize the importance of foresight in planning rural and urban areas, SEZs, and other industry “clusters” while recognizing that achieving rapid progress requires stronger technical and managerial and entrepreneurial competency and incentives and unwavering commitment of multiple stakeholders.

Socioeconomic disparities and the demographic dividend opportunity. Socioeconomic diversity and disparity in economic development present both an opportunity and a challenge in regard to the large number of young people. Much effort is needed to create jobs, generate income, and improve overall living conditions for all social groups in larger and smaller towns in rural and remote areas. Multiple efforts must be united to tackle poverty and foster the development of a larger middle class. This implies a need to create productive jobs and major advancement in education, health, social welfare, and other services.

Much of the country's future development will depend on global and regional developments, the latter including relations with the PRC, Thailand, and Viet Nam, in particular. The regional integration initiatives of ASEAN and the PRC opens development possibilities for trade, investment, and other ties with neighboring countries. Recently, the rapid economic development of neighboring economies, the infrastructure projects of ADB and the World Bank, and the PRC's investment and trade initiatives offer major opportunities for the Lao PDR to expand the scale and scope of its services and other sector-specific development. Also, the implementation of WTO and other global agreements is likely to have significant impact on the economy.

Potential costing and other advantages in access to manpower, real estate, land and other natural resources, and geographic positioning coupled with improvement in socioeconomic development conditions imply significant opportunities to expand the scale and scope of international trade and investment. Therefore, the Lao PDR's effective response to the efforts of the Greater Mekong Subregion, the ASEAN Economic Community, and other Asian integration is critical to realize the potential for boosting trade (exports of services and other niches as well as imports) and attracting foreign investments particularly from other ASEAN economies and the PRC. This suggests opportunities to foster integration in enhancing the prospects for participating in GVCs, production, and other networks and labor markets. Further development of already “strong” linkages in services (finance, commerce, education, and others) and other sectors with the PRC, Thailand, and Viet Nam will be a major opportunity and a challenge to the Lao PDR.

International experience points to the central role of developing services in tandem with manufacturing and other sectors to achieve sustainable inclusive economic development. Replicating the growth trajectories of the Republic of Korea, Malaysia, Viet Nam, the PRC, and other Asian countries toward an export-oriented manufacturing industry is constrained by global and regional competition and the slackened demand in high-income economies coupled with rapid development of new technologies and business models. The international economic development catch-up experience also shows that it is imperative to address potential pitfalls in development such as undesirable weakness in cyber security and other unwarranted consequences of depending on new technologies, deficiencies in city planning, and uneven socioeconomic development.

Global development trends toward servicification of all sectors highlight the importance of leveraging the services sectors for economic growth and transformation, thus implying a need to respond to *new economy* developments that may involve major changes in the context of competitiveness, productivity, employment, and structural transformation all of which would result in creative destruction in services and other sectors. The Lao PDR is behind most economies in responding to opportunities and challenges relating to human assets, technology, and other innovative developments—such as for instance worldwide trends relating to digital and knowledge economy transformation and the fourth industrial revolution, which is of major consequence for all economies, the Lao PDR included.

Furthermore, the services sector developments—including tourism, infrastructure, and ICT-related development—can have significant consequences in natural resources, climate change, and environmental development. More effective and efficient practices in public administration and the implementation of legal and regulatory frameworks are essential to limit environmental and other potential negative impacts from the development of mining, hydropower, forestry, use of chemicals in agriculture, increase in waste, and air and other forms of pollution and environmental degradation.

While there is scope to distill the lessons from the experience of Asian and other countries as they develop the scale and scope of their services sectors, it is important to comprehend that each circumstance has unique peculiarities and must be treated accordingly. There is no single approach (or one-size-fits-all model) or everlasting model for the development of the services sector or manufacturing and natural resource-based industry. Each country, region, city, sector, firm, social group, and individual must develop approaches that are relevant to the local and global conditions at any given place and time. While it is essential to learn from past experience, it is also crucial to address the fact that the global and regional context for economic catch-up in the next 10 years and beyond is likely to differ significantly. All these have major consequences for the Lao PDR.

It is imperative to comprehend the major differences between old “models”—to catch up in economic growth, structural transformation, and generation of employment opportunities—versus new economy approaches such as strategies relating to digital and knowledge economy transformation and the fourth industrial revolution, and thereby bring about worldwide change in the context of innovation, competitiveness, trade, investment, the use of natural resources, and development of human resources and institutions. These developments have major direct and indirect implications for all countries, subregions, industries, and social groups.

If the Lao PDR is to achieve its vision of being an upper-middle-income country by 2030, it must meet basic development requirements relating to education, health care, infrastructure, logistics, the environment, finance, while taking advantage of opportunities and addressing the challenges constraining the innovative transformation toward a digital and knowledge society. Rapid changes worldwide in socioeconomic development has resulted in a new setting for economic catch-up, with many Asian countries already ahead of the Lao PDR. This has major implications for development of the services sector and its linkages to other parts of the Lao PDR’s economy.

Chapter 5

Power Sector Development in the Lao People's Democratic Republic

5.1 Introduction

The eighth Five-Year National Socio-Economic Development Plan (NSEDP) for 2016–2020 identifies the power sector as a strategic factor in achieving sustainable economic growth and poverty reduction, both in the short and longer term. Development of the sector is central to modernization and industrialization. It is also vital to basic social services such as education, health care, clean water supply, and sanitation. As such, access to reliable and affordable electricity can help a developing country such as the Lao People's Democratic Republic (Lao PDR) meet its development goals. In the Energy Policy 2015, the government laid out the following targets for the power sector: (i) provide affordable, reliable, and sustainable electricity supply to the population; (ii) achieve an electrification rate of more than 90% by 2020; (iii) improve and expand transmission networks to facilitate power exchange with member countries of the Association of Southeast Asian Nations (ASEAN); (iv) develop the country's hydropower potential with private investor participation; and (v) develop renewable energy to account for 30% of the power mix under a reasonable feed-in tariff scheme.

The Lao PDR's power sector faces several challenges. Electricity demand has grown at an annual average rate

of about 14% in the last 2 decades but this is expected to grow further by 10% in the medium term. Although the country has abundant energy resources including coal, lignite, and renewable alternatives, hydropower remains the main source of fuel for electricity requirements, but it is largely being exported. This has made the supply insufficient for domestic needs, thus causing frequent power outages.

The Lao PDR's national electrification program is hailed for its outstanding results. Access to electricity has increased to 91% in 2016 from 36% in 2000, surpassing the 90% electrification target by 2020. Revenues from hydropower exports have been instrumental in financing the initial years of the national electrification program, which involved grid expansion and connection programs. Although the country's electricity consumption increased sharply between 2000 (640 gigawatt-hours [GWh]) and 2015 (4,239 GWh), around 0.9 million people still have no access to electricity and rely on traditional biomass for lighting and cooking (Ministry of Energy and Mines 2014 and 2017). Electricity consumption per capita, at 663 kilowatt-hours (kWh) in 2015, remains one of the lowest in Southeast Asia. The government must solve the problem of how to effectively use the country's hydropower resources to achieve a balance between meeting the domestic demand while earning a steady

source of foreign exchange revenues from the export of power.

The Lao PDR’s hydro resources combined with its strategic geographic position will continue to be a key source of foreign exchange earnings in the future. However, funds will need to be allocated to expand generation and transmission capacity in a sustainable manner. While revenues from the export of hydropower have funded the government’s public investment programs, particularly education and health programs, these revenues should also be used to develop new generation, transmission, and distribution assets as well as for rehabilitation and/or maintenance of existing assets.

This chapter assesses the current status of the power sector, identifies the critical challenges, and offers specific policy options to help achieve the country’s socioeconomic development goals. The analysis is based on studies, information, and data provided by government agencies, the Electricité du Laos (EDL), Lao Holding State Enterprise (LHSE), and public sources. The study benefited from a series of consultation workshops that was attended by representatives of the EDL, the LHSE, the Ministry of Energy and Mines, and the Ministry of Finance. This chapter is organized as follows: following the introduction which provides an overview of the

government’s targets and the challenges in the sector, Part 2 presents the country’s energy resources and consumption patterns. Part 3 discusses the legal and institutional framework focusing particularly on the power sector. Part 4 presents the status of the power sector while Part 5 elaborates on the challenges. Finally, Part 6 offers policy recommendations to address identified challenges.

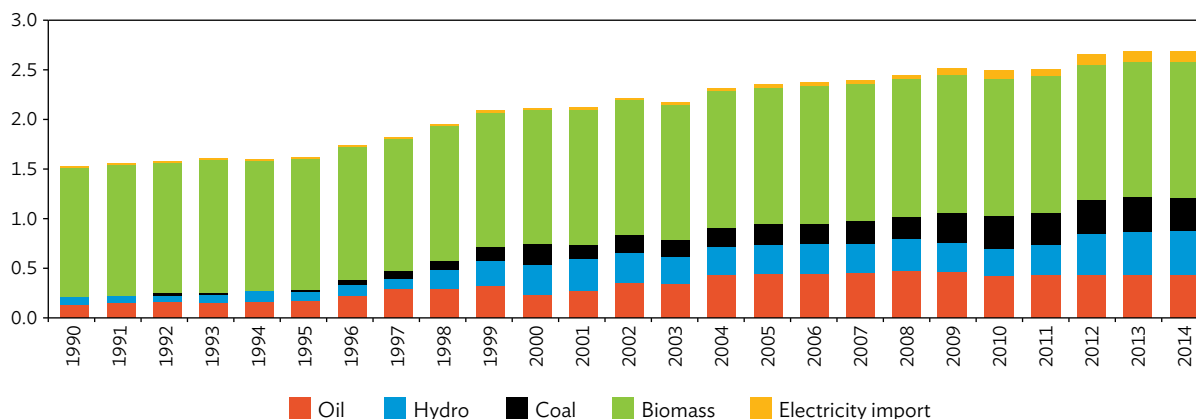
5.2 Status and Trends in the Energy Sector

5.2.1 Primary Energy Supply

Total primary energy supply—coal, oil, gas, hydropower, biomass, and electricity import—was around 2.7 million tons of oil equivalent (mtoe) in 2014 (Figure 5.1). More than half (51% or 1.38 mtoe) of the country’s energy supply was from biomass followed by hydro (17% or 0.44 mtoe), imported oil (16% or 0.3 mtoe), and electricity import (4% or 0.11 mtoe).

From 2000 to 2014, hydropower production increased by 2.5% annually. Its share in total energy supply increased significantly in 2012 as a result of the commissioning of several hydropower plants in 2010, of which the biggest is Nam Theun 2,⁴⁵ which became fully operational in 2012. The Lao PDR is a net exporter

Figure 5.1: Lao PDR’s Total Primary Energy Supply, 1990–2014 (mtoe)



Lao PDR = Lao People’s Democratic Republic, mtoe = million tons of oil equivalent.
 Source: Enerdata. Energy Research & Data. <https://www.enerdata.net/research/> (accessed August 2016).

⁴⁵ The hydropower plants that were commissioned since 2010 are as follows: Nam Nhone, Nam Tha 3, Houay Ngou, Nam Sae, Nam Long, Nam Lik 1/2, Nam Ngum 2, Nam Song, Ngum 5, Ka 1,2, ANam Ngiep 3A, Tadlang (Nam Saen), Nam Theun 2, Nam Phao, Nam Gnouang 8, Tadsalen, Xekamman 3, and Xe Namnoy 1. Appendix 5.1 provides a full list of existing power plants.

of energy (to Thailand and Viet Nam). In 2014, it exported 11,936 GWh of electricity and contributed to about 12.5% of the country’s total export revenues of \$4,637 million.

5.2.2 Final Energy Use

Overall, final energy consumption in the Lao PDR increased by an average of 2% annually during 2000–2014, from 1.81 mtoe to 2.51 mtoe. Based on 2014 data, biomass was the main source of energy used, which accounted for about 56% of the total, followed by petroleum products (18%), coal (14%), and electricity (11%) (Figure 5.2).

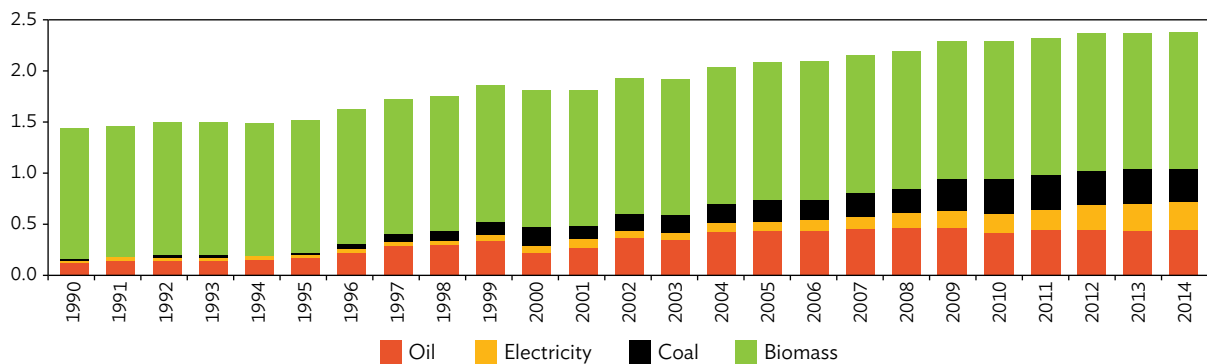
As for energy consumption by sector for the same period, residential consumers were the largest,

accounting for 76% of the total and mainly in the form of biomass. The transport sector came second with 17%, followed by services and agriculture (4%), and industry (3%) sectors (Figure 5.3). While petroleum fuels (which are all imported) are used for transport and industry, they are also used by households that are not connected to the grid.

5.2.3 Energy Resources

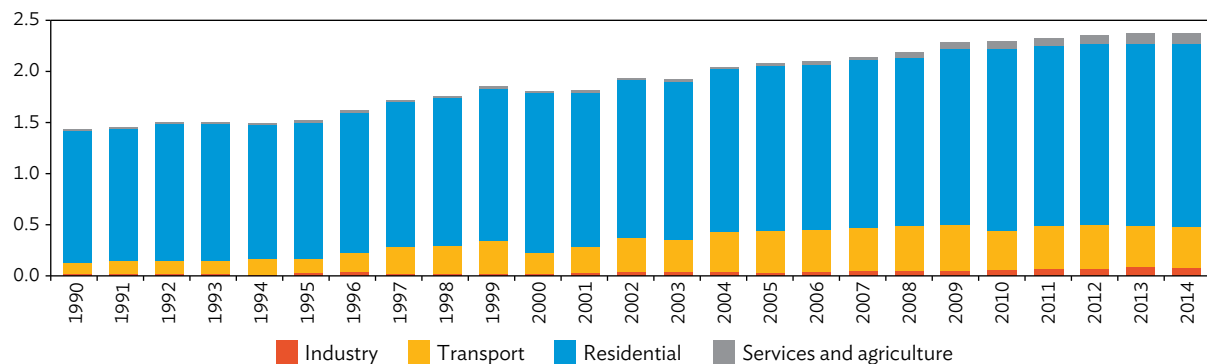
The Lao PDR has abundant energy resources, particularly hydropower, coal, and renewables. The Lao PDR’s main sources of hydropower are the Mekong River subbasins, which produce an estimated 26,000 megawatts (MW) of technically viable capacity. By 2015, around 3,894 MW of estimated capacity had been developed and is now operational

Figure 5.2: Lao PDR’s Total Final Energy Use by Source, 1990–2014 (mtoe)



Lao PDR = Lao People’s Democratic Republic, mtoe = million tons of oil equivalent.
Source: Enerdata. Energy Research & Data. <https://www.enerdata.net/research/> (accessed April 2016).

Figure 5.3: Lao PDR’s Total Final Energy Use by Sector, 1990–2014 (mtoe)



Lao PDR = Lao People’s Democratic Republic, mtoe = million tons of oil equivalent.
Source: Enerdata. Energy Research & Data. <https://www.enerdata.net/research/> (accessed April 2016).

for domestic consumption and export. Another 1,700 MW of hydropower capacity is now in various stages of construction.

The Lao PDR's coal reserves are estimated to be about 600 million tons to 700 million tons, most of them lignite and with smaller amounts of anthracite. The largest reserve of lignite found in Hongsa in Xayabouly province is estimated to contain about 400 million tons, or more than half the estimated total reserves of the country. Mid-grade lignite is suitable for electricity generation and other industrial thermal energy requirements. Coal is largely used by cement factories and a few smaller users, with consumption totaling to about 35,000 tons per year. However, this pattern of use has changed with the commissioning of the 1,878-megawatt Hongsa Mine Mouth Power Project in 2015. Most of the electricity generated from this plant will be exported to Thailand, with 100 MW reserved for sale to EDL.

Apart from large-scale hydropower and coal, the country is also endowed with other renewable energy resources, which include biomass, small and mini hydro energy (less than 15 MW installed capacity), solar, wind, and geothermal energy resources. Biomass is produced mainly from the waste of the agriculture and forestry sectors such as rice straw and husks, sawdust, and corn cobs. The annual potential of this waste is estimated at 500 mtoe, which can be used as feedstock for power generation. So far, households are the largest users of biomass, with more than 80% of the population relying on biomass energy, especially for cooking; biomass is also used for small-scale rural industrial production (e.g., alcohol production and tobacco processing). The country has high potential for biofuel production from crops such as jatropha, oil palm, and soybean. There have been some pilot projects to plant jatropha for biodiesel production—for example, the Kolao Company has invested in a 2,500-hectare jatropha plantation and biodiesel factory (2,000 liters per day) in Xayabouly province (ADB 2013b).

The Lao PDR gets an average of 200–300 sunlight days per year, with more sunlight days in the south. The potential capacity for solar energy is estimated at around 4.5–5.0 kilowatt-hours per square meter (m²)

per day. Solar power is an essential source for off-grid electric power in remote rural areas. At present, 25,000 households, mostly in remote areas, have solar home systems. Local companies are capable of supplying and installing solar home systems, but the quality of service needs to be improved (ADB 2013b).

Despite these renewable resources, no comprehensive assessment has been undertaken to determine the Lao PDR's overall energy potential to use in proper planning and development of these energy resources.

5.3 Institutional, Legal, and Policy Framework of the Energy Sector

Management of energy-related activities in the Lao PDR is mainly the responsibility of the Ministry of Energy and Mines (MEM). The EDL, the LHSE, the Ministry of Finance, and the Ministry of Natural Resources and the Environment are also important players in the sector.

The MEM is responsible for energy policy and overall strategic guidance, as well as management of sector development. In 2011, MEM, with technical assistance from the Asian Development Bank (ADB) and other development partners, undertook a major reorganization to better align departmental responsibilities, duties, and authorities. This resulted to newly organized departments. Box 5.1 enumerates them and their functions.

The power sector is mainly managed and operated by the EDL. The EDL is a state-owned electricity utility and it performs the functions of generation, transmission, distribution, and services to all electricity customers served by the national grid. The EDL also holds shares in four export-oriented hydropower plants (HPPs) that are operational and a number of other independent power projects under construction. Recently, the EDL initiated the gradual unbundling of the sector. EDL-Generation Public Company (EDL-GEN), a public company owned by the EDL, was established in 2011, to take charge of EDL's generation functions. With this, the EDL now functions as the single buyer of electricity from EDL-

Box 5.1: Reorganization of the Ministry of Energy and Mines

- (i) **Department of Energy Business.** Formerly the Department of Energy Promotion and Development, the Department of Energy Businesses (DEB) oversees private sector investments in the power sector. Until recently, DEB focused mainly on supervising private sector investment in large hydropower projects. As private sector investment in the Lao PDR's power sector rapidly increased, DEB expanded its supervisory role to include investment in transmission projects and coal-fired thermal power projects. While DEB is involved in planning, development, and appraisal of project proposals, its main role is to negotiate project development agreements, concession agreements, and power purchase agreements. DEB also monitors project implementation. The department has four divisions: Administrative Division, Contract Division, Project Development Division, and Project Monitoring Division.
- (ii) **Department of Energy Policy and Planning.** The main responsibility of the Department of Energy Policy and Planning (DEPP) is formulating national energy policies and plans. DEPP collects and analyzes energy consumption data, both by consumer categories (industry, household, and business) and fuel type. It also analyzes energy supply options, based on the energy resources and import and export considerations of the Lao People's Democratic Republic (Lao PDR). DEPP prepares energy balance tables, energy demand forecasts, and supply projections. More importantly, DEPP proposes and implements pricing policies for all types of energy supply, including for electricity and petroleum products. DEPP also formulates policies and mechanisms to promote development of the Lao PDR's hydropower resources. In support of DEB, DEPP takes part in reviewing feasibility studies, project development agreements, concession agreements, and memorandums of understanding for power projects. The department provides assistance to investors and developers interested in power generation and transmission, both for domestic consumption and export. Finally, DEPP is responsible for ensuring sustainable development of the energy sector. In this regard, DEPP conducts research on the impact of hydropower projects on river flows, sediment, and fish stocks. It reviews environmental impact assessments and the anticipated impact of climate change on the Lao PDR's hydropower potential. The department has five divisions: Administration Division, Energy Policy Division, Electricity Generation Planning Division, Power System Planning Division, and Environmental Engineering Division.
- (iii) **Department of Energy Management.** This newly created department is responsible for drafting energy-related laws, regulations, guidelines, and technical and safety standards. The Department of Energy Management (DEM) also monitors government agencies, state-owned enterprises, and private operators to ensure that they operate in accordance with the rules and regulations. Further, DEM monitors the energy use of enterprises, factories, and buildings and presents energy awards to the most efficient users. Another important function of the DEM is inspecting the technical standards of electrical equipment and appliances, either domestically produced or imported. The department issues energy business licenses and approves or rejects extensions. DEM also provides technical consultation services and information on energy administration and management.
- (iv) **Institute of Renewable Energy Promotion.** Equivalent to a department, the Institute of Renewable Energy Promotion (IREP) is mainly responsible for promoting renewable energy and conservation by implementing the Renewable Energy Policy and Strategy prepared in 2011. In support of renewable energy, IREP is tasked with developing small-scale hydro, biodiesel, and biogas projects, and preparing a manual on renewable energy production and use. In support of rural electrification, the institute formulates and implements a rural electrification master plan. In support of energy efficiency and conservation (EEC), IREP formulates regulations, guidelines, and a user's manual on EEC. Its conservation targets include developing more efficient cooking stoves and implementing a model EEC project.

Source: ADB. 2013. *Validation Report: Decentralized Irrigation Development and Management Sector Project in the Lao People's Democratic Republic*. Manila.

GEN, independent power producers (IPPs),⁴⁶ and small power producers (SPPs). The government took another step toward opening up the sector by selling about 30% of its stake in EDL-GEN through an initial public share offering. The EDL also owns shares in export-oriented HPPs such as the Theun-Hinboun (60% share), Houay Ho (20% share), Nam Lik ½ (20%

share), and Nam Ngum 2 (25% share) hydropower projects. It also imports electricity from neighboring countries.

The EDL effectively led the construction of the first hydropower plants in the country and the implementation of the national electrification

⁴⁶ IPPs own most of the power-generation plants. There are two types of IPPs: the so-called domestic IPPs that produce electricity and supply to the domestic market, and export IPPs that mostly produce electricity for export to neighboring countries, with small percentages retained for domestic consumption.

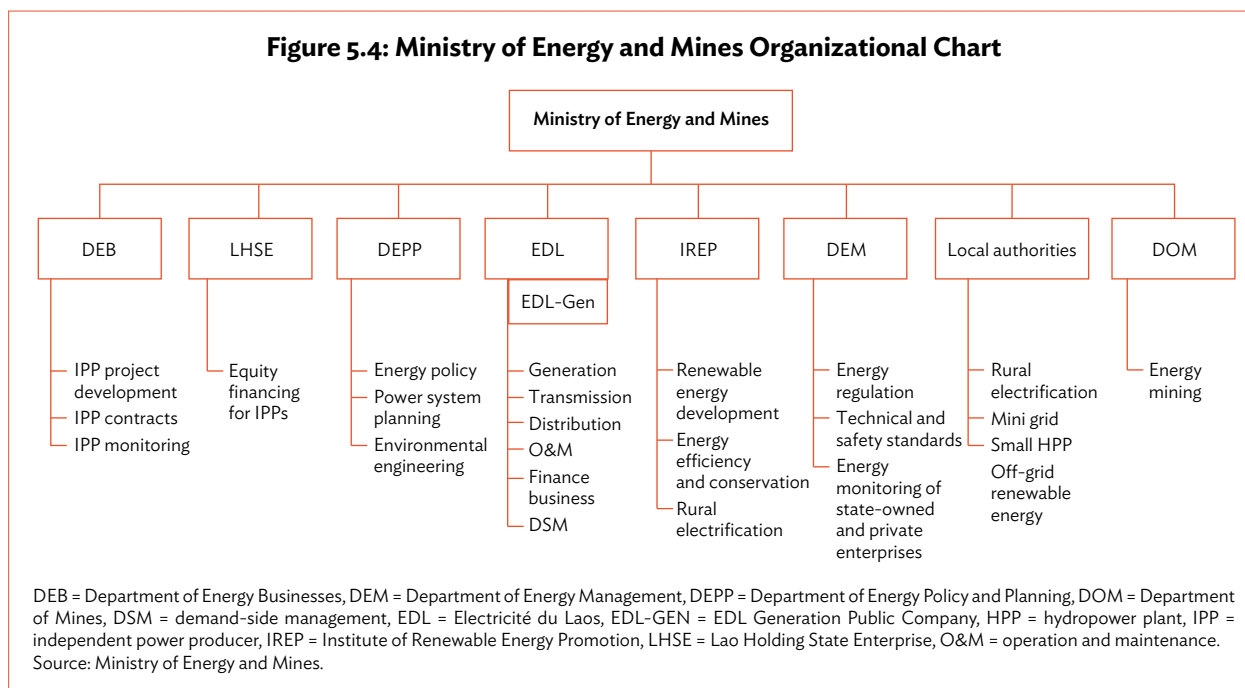
program. The EDL’s vision is to become a leading force in contributing to national socioeconomic development, by ensuring electricity supply for the Lao PDR and by establishing the country as an important power generation source in Southeast Asia. The EDL’s mission includes (i) ensuring sufficient power supply to domestic consumers and exporting electricity to neighboring countries to earn revenue to support the Lao PDR’s socioeconomic development; (ii) developing the power system with due consideration for the environment and society while supporting country industrialization; and (iii) developing the power sector economically and efficiently.

The Government of the Lao PDR established LHSE in February 2005 to facilitate investment in energy generation. LHSE holds, manages, and maintains, on behalf of the government, shares in the Nam Theun 2 Power Company and any other power projects and/or companies acquired by LHSE or transferred to it by the government. Currently, LHSE has a stake in the following power projects: Hongsa Mine Mouth Power Project, Nam Nghiep 1, Nam Theun 2, and Xepian Xe Nam Noi. It also owns the fly ash (a by-product of the Hongsa lignite power generation) business.

Under the reorganization, LHSE is under MEM. The local authorities (province, capital, district, and municipality) are responsible for the approval of rural electrification projects, as well as the management and operation of rural electrical facilities. Figure 5.4 shows these agencies in an organizational chart for the energy sector.

The Electricity Law, which was first promulgated in 1997 and revised in 2008 and 2011, defines the principles, regulations, and measures on the administration, management, and monitoring of the electricity subsector. Its objective is to promote efficient and sustainable use of energy resources to support the successful implementation of the national socioeconomic development plan and to improve the standard of living of multiethnic people. It defines four principles of electricity activities.⁴⁷ The law requires the development of strategic, long-, medium-, and short-term electricity development plans, which should define the targets and direction of the electricity subsector. The plans should support electricity exports, but prioritize meeting domestic demand to enable industrial expansion and national development.

Figure 5.4: Ministry of Energy and Mines Organizational Chart



⁴⁷ Electricity activities, according to the Electricity Law (2011), include conduct of data collection survey, planning, designing, construction and installation, generation, transmission, distribution, export, import and other services of electricity which should conform with the national economic and social development; efficiency and sustainability; protection of the environment, society, and nature; and safety.

When developing power plants, the law directs the use of modern equipment that conform to international standards and the placement of measures that mitigate social and environmental impacts. On electricity transmission, the law requires that electricity be transmitted through the National Electricity Transmission Grid. Should the system's capacity be insufficient, the law allows transmitters to build transmission lines themselves under the management and inspection of MEM and other organizations concerned. In relation to distribution of electricity, the law mandates that it should be continuous and regular, inclusive and efficient, safe, and consistent with socioeconomic development and public security.

The law sets the institutional arrangement for engaging in the electricity business. General activities such as planning, data collection survey, construction, installation, distribution, and general services should be authorized by the industry and commerce sector, and approved by MEM, and shall be in accordance with the Enterprise Law⁴⁸ Electricity businesses under concessionary arrangements (generation and transmission) should be authorized by the planning and investment sector, with the approval of MEM and in accordance with the Law on Investment Promotion. Generation and transmission projects may take different forms: build-operate-transfer, build-and-transfer, build-own-and-operate, and state-operated. Moreover, the law details the application procedure for concession and the conditions of the concession agreement; the rights and obligations of concessionaires; and the components of technical, economic, financial feasibility studies and social, environmental, and natural assessments.

The law also provides for the promotion of rural electrification, in line with the objective of improving the lives of multiethnic people. It allows investments in construction and installation of electrical facilities by domestic and foreign individuals or entities, but requires that management of such be under the local authorities. The local community should be involved in developing electricity in their areas. For very remote areas, the government shall promote or provide funds

for the construction of medium- and low-voltage distribution lines, transformers, and power metering.

The law also contains details on tariff-setting, but it does mention that the government is responsible for determining prices for electricity imports and exports and domestic purchase and sale of electricity. For rural electricity, purchase and sale prices of state-owned electricity generation assets are decided by MEM in collaboration with local authorities. The investor proposes the prices of electricity from privately owned generation sources in collaboration with MEM and other sectors concerned, and for consideration by the local authorities.⁴⁹

Entities operating in the energy sector of the Lao PDR are governed by the new Enterprise Law (2005),⁵⁰ which aims to improve the business and investment climate in the country. It provides for the incorporation and operation of domestic, foreign-owned, and state-owned enterprises. The new law has (i) improved business registration and licensing process (from 219 working days to an ideal 3 working days); (ii) eliminated minimum capital requirements; (iii) improved availability of public information; and (iv) created single access points for business registration.

The Law on Investment Promotion (2009) sets the financial and nonfinancial incentives for investments in generation and transmission such as the following: (i) no import duty on production machinery, equipment, and raw materials; (ii) no import duty on chemical materials necessary for biofuels production within 7 years; (iii) profit tax exemption for a certain period depending on activities, investment areas, and size of investment; (iv) subsidies on product depending on energy type; (v) lease period of up to 75 years; (vi) permission to expatriate income to home or other countries; and (vii) permission to employ foreign workers, but not more than 10% of the total company employment.

The first power sector policy was formulated in 1990 and aimed to (i) earn foreign exchange through

⁴⁸ National Assembly of the Lao PDR. *Law on Enterprises*. Resolution No. 11/NA Passed into Law on 9 November 2005. Vientiane.

⁴⁹ Recently, the EDL has been offering feed-in tariffs based on whether they are peak or base load.

⁵⁰ National Assembly of the Lao PDR. *Law on Enterprises*. Resolution No. 11/NA Passed into Law on 9 November 2005. Vientiane.

electricity export to finance the country's economic and social programs; (ii) increase electricity access by grid extensions and off-grid rural electrification; and (iii) maintain an affordable tariff to promote economic and social development. By 2005, the power sector played a more significant and strategic role when the government laid out important targets in the sixth NSEDP, in particular to (i) provide a source of foreign exchange to fund economic and social development and reduce poverty; (ii) meet the export commitments under intergovernmental agreements with Thailand, Viet Nam, and others; (iii) extend rural electrification to promote better socioeconomic development and reach electrification rates of 70% by 2010 and 90% by 2020; and (iv) integrate the power sector and maintain its economic development as a whole with international communities through its power exchange programs and foreign direct investment (Phonekeo 2015). In 2008, the EDL published the Power Development Plan (PDP) 2007–2016, which was subsequently updated in 2010 with the approval of the PDP 2010–2020. The PDP 2010–2020 is anchored on the important role of the power sector in poverty reduction by making electricity accessible to 90% of the population by 2020. Investment plans are focused on preparing the necessary infrastructure to meet this target and the consequent increase in domestic demand.

5.4 Status and Trends in the Power Sector

5.4.1 Capacity and Generation

The Lao PDR had approximately 6,360 MW of generating capacity in 2016, comprising 67% hydropower, 32% coal, and 1% from small renewable energy-based power plants. Appendix 5.1 enumerates existing power plants as of 2015. The largest share of the total capacity comes from export IPPs comprising 69%; 20% from domestic IPPs; and 11% from the EDL and EDL-GEN (Table 5.1). More IPPs will be functional in the near future including Nam Ngiep 1, Xepian Xe Nam Noy, Xayaburi, and Donsahong hydropower projects (see full list in Appendix 5.2).

The total electricity generated in 2015 was 16,501 GWh (see Appendix 5.3 for generation of each power

plant), of which 10,842 GWh was exported and 4,239 GWh was supplied to the domestic market. The Lao PDR imports power when hydropower production dedicated for the domestic market is insufficient (Table 5.2).

Table 5.1: Power System Capacity of the Lao PDR, 2016

Capacity by Source	MW	% Share
EDL and EDL-GEN	686.5	11
IPP(d)	1,263.5	20
IPP(e) ^a	4,410.0	69
Total	6,360.0	100

EDL = Electricité du Laos, EDL-Gen = EDL-Generation Public Company, IPP = independent power producer, Lao PDR = Lao People's Democratic Republic, MW = megawatt.

^aThe large IPPs include dedicated units for domestic use for EDL: 100 MW for NT2 and 100–175 MW for Hongsa.

Source: Electricité du Laos. 2016. A Powerpoint presentation at the Greater Mekong Subregion 21st Meeting of the Regional Power Trade Coordination Committee. Siem Reap. 8–9 December.

Table 5.2: Electricity Generation, Consumption, Export and Import, 1991–2015 (GWh)

Year	Generation	Domestic		
		Consumption	Export	Import
1991	834.6	220.7	562.6	34.9
1992	751.6	252.7	459.8	41.3
1993	919.6	264.8	595.8	47.7
1994	1,198.3	280.0	829.3	57.4
1995	1,085.0	337.5	675.6	76.8
1996	1,247.8	379.5	792.4	87.6
1997	1,218.7	433.9	710.2	101.6
1998	2,165.6	513.3	1,613.5	142.3
1999	2,806.3	565.5	2,228.8	172.2
2000	3,438.4	639.9	2,792.8	180.2
2001	3,653.7	710.3	2,871.4	183.8
2002	3,604.1	766.7	2,798.3	200.8
2003	3,178.2	883.7	2,284.6	229.3
2004	3,347.6	902.8	2,424.6	277.6
2005	3,509.4	1,007.4	2,506.0	329.5
2006	3,595.0	1,114.3	2,487.4	631.1
2007	3,373.6	1,298.4	2,230.4	793.4
2008	3,717.0	1,915.7	2,315.4	844.5
2009	3,384.3	2,257.7	1,920.8	1,175.1
2010	8,449.0	2,440.7	6,646.5	1,209.7
2011	12,979.5	2,555.8	10,668.4	904.3
2012	12,760.1	3,074.9	10,363.0	1,329.1
2013	15,511.6	3,381.0	12,494.0	1,271.7
2014	15,638.5	3,791.3	11,936.2	1,559.1
2015	16,501.1	4,239.1	10,842.4	2,049.8

GWh = gigawatt-hour.

Source: Ministry of Energy and Mines. 2017. *Electricity Statistics Yearbook 2015 of the Lao PDR*. Vientiane.

5.4.2 Transmission and Distribution System

Before 2009, the EDL's operations in the country's 17 provinces were divided into four areas: northern, central 1, central 2, and southern. Each area had a 115-kilovolt (kV) grid but they were not interconnected. During 2009–2011, the 115-kilovolt network was expanded and became interconnected, consolidating the network into three areas (central 1 and 2 have been combined). Presently, the country has 13 cross-border connections for electricity trading: 3 from the People's Republic of China (PRC), 5 from Thailand, and 5 from Viet Nam. The northern area is interconnected with the power system of the PRC from the Namo substation in Oudomxay province to Meung La substation in the PRC (by 115 kV). The central area is interconnected with the power system of the Electricity Generating Authority of Thailand (EGAT) from Thanaleng substation in the Lao PDR to Nongkai substation in Thailand and from Pakxan substation to Bungkan substation in Thailand (by 115-kilovolt lines). The southern area is also linked to EGAT Thailand through three interconnections: from Thakhek substation to Nakhophanom substation in Thailand, from Pakbo substation to Mukdahan substation in Thailand, and from Bangyo substation to Sirinthon hydropower plant (through 115-kilovolt lines). Meanwhile, each of the existing five export IPPs has dedicated transmission lines linking the power plants to their designated export markets: (i) Theun Hinboun to Sakhonnakhon (Thailand) 230 kV, 176 kilometers (km); (ii) Houay Ho to Ubon 2 (EGAT, Thailand) 230 kV, 230 km; (iii) Nam Theun 2 to Roi Et (EGAT, Thailand) 500 kV, 300 km; (iv) Nabong to Udon 3 (EGAT, Thailand), 500 kV, 100 km; and (v) Xekaman 3 to Thanh My (Viet Nam Electricity, Viet Nam) 230 kV, 150 km.

Currently, there are 340 km of 500-kilovolt, 1,371 km of 230-kilovolt, and 5,257 km of 115-kilovolt transmission lines. The distribution network includes 35 0.4-kilovolt lines (Table 5.3). The transmission and transformer capacities are concentrated in the central region, which serves the Vientiane capital and Luang Prabang. Its power system is interconnected through medium-voltage lines with neighboring countries such as the PRC, Thailand, Viet Nam, and Cambodia. Several grid

extension projects have been undertaken to increase volume of export to the Greater Mekong Subregion.

Table 5.3: Transmission and Distribution Lines, 2015

Capacity	Length (km)
500 kV	340
230 kV	1,371
115 kV	5,257
35 kV	237
34.5 kV	417
25 kV	10
22 kV	26,450
12.7 kV	294
0.4 kV + SWER	17,766

km = kilometer, kV = kilovolt, SWER = single wire earth return.
Source: Ministry of Energy and Mines. 2017. *Electricity Statistics Yearbook 2015 of the Lao PDR*. Vientiane.

Provincial authorities operate 85 mini grids, supplied either with diesel generators or small hydropower stations. These facilities primarily serve remote areas that are not connected to the EDL grid. In addition, the EDL imports power from neighboring countries to help serve these areas using 22-kilovolt and 35-kilovolt distribution system.

5.5 Challenges in the Power Sector

5.5.1 Unreliable Supply for the Domestic Market

Power sector development in the last 2 decades has not kept pace with the rapid increase in domestic demand resulting from carrying out the rural electrification program. Electricity consumption grew by an average annual growth rate of 14% during 1995–2015. The country consumed about 4,239 GWh of electricity in 2015 from only 337 GWh in 1995. Peak load rose to 760 MW in 2015, from 209 MW in 2003. The residential sector used to be the dominant consumer of electricity until 2013. With the growth of the industry sector largely from the influx of investments in construction and construction-related activities and mining, it became the top consumer of electricity by 2014. In 2015, the industry sector accounted for 41%

of the total consumption, followed by the residential sector at 38%, services with 20%, and agriculture at only 1% (Figure 5.5).

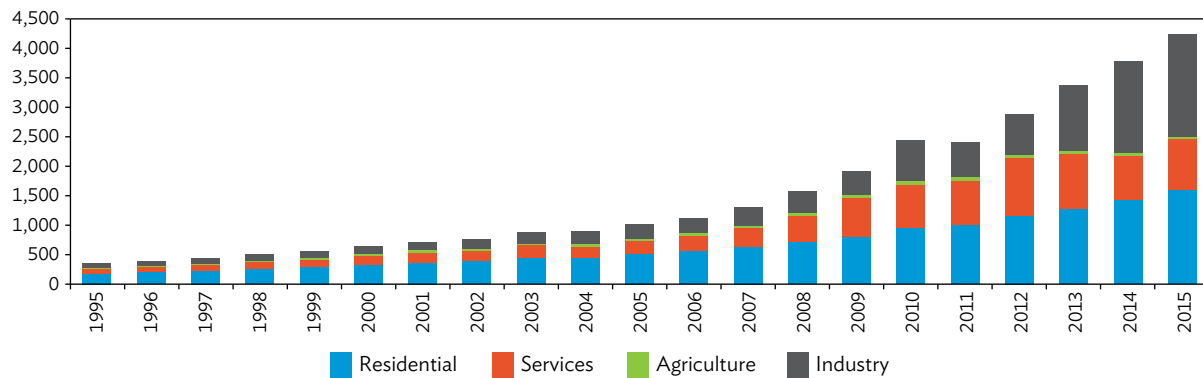
When compared with other ASEAN countries, the Lao PDR consumes more electricity than Indonesia, the Philippines, and Singapore, despite having low per capita income (Figure 5.6). The country’s electricity intensity grew by 86% from 2005 to 2014. This can be attributed to the structural change in the economy and in part on inefficient pricing of electricity. The country transformed from being a largely agricultural economy to a modern, industrial economy that increasingly relies on power-intensive machinery. Fueling demand

even more is the low tariffs charged to households and the agriculture sector, which has encouraged heavy and wasteful consumption.

From 1995 to 2015, electricity consumption grew about 10 times while income increased only 3 times (Figure 5.7).

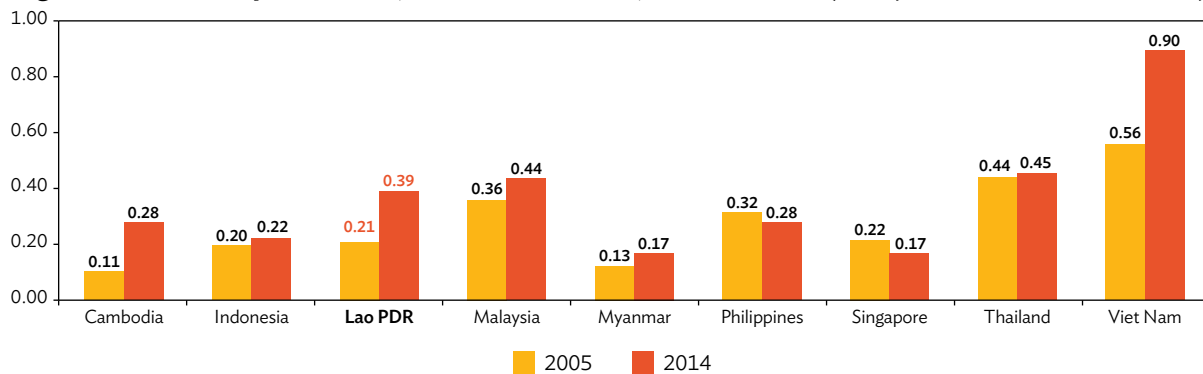
The rise in electricity consumption was driven by the residential sector during 1995–2013. Among production sectors, industry was the most electricity-intensive although the services sector’s electricity intensity rose significantly during 2007–2012, largely driven by the growth of tourism (Figure 5.8).

Figure 5.5: Electricity Consumption by Sector, 1995–2015 (MW)

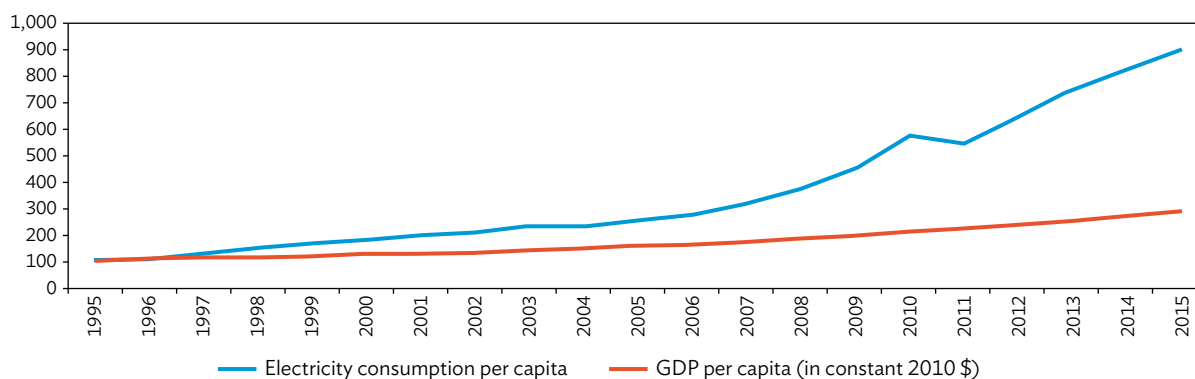


MW = megawatt.
Sources: For 1995–2005: *Électricité du Laos. Various years. Electricity Statistics of the Lao PDR*. Vientiane; For 2006–2015: Ministry of Energy and Mines. 2017. *Electricity Statistics 2015 of the Lao PDR*. Vientiane.

Figure 5.6: Electricity Intensities, Selected Countries, 2005 and 2014 (kWh per constant 2010 \$ of GDP)

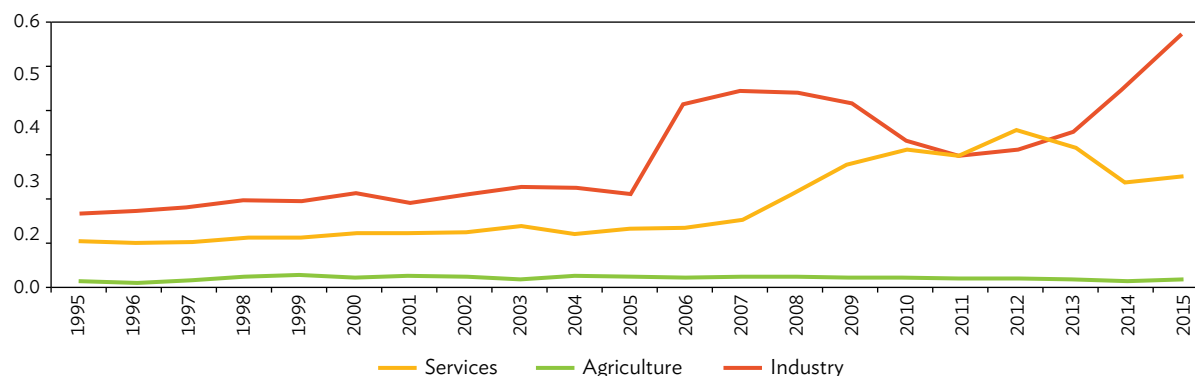


GDP = gross domestic product, kWh = kilowatt-hour, Lao PDR = Lao People’s Democratic Republic.
Sources: For the Lao PDR, electricity intensity is computed using data from Ministry of Energy and Mines. various years. *Electricity Statistics of the Lao PDR*. Vientiane. For other countries, electricity intensity is calculated using data from World Bank. World Development Indicators. <http://data.worldbank.org/data-catalog/world-development-indicators> (accessed 5 July 2017).

Figure 5.7: Growth of Electricity Consumption Versus Income (1995=100)


GDP = gross domestic product.

Sources: Electricité du Laos. Various years. Electricity Statistics of the Lao PDR. Vientiane; World Bank. World Development Indicators. <http://data.worldbank.org/data-catalog/world-development-indicators> (accessed 5 July 2017).

Figure 5.8: Electricity Intensity by Sector, 1995–2015 (kWh per constant 2010 \$ of output)


kWh = kilowatt-hour.

Source: Ministry of Energy and Mines. 2014. *Electricity Statistics Yearbook 2014 of the Lao PDR*. Vientiane.

Domestic demand for electricity is expected to increase further, by 10% annually. To achieve 100% rural electrification and the planned expansion of mining activities (especially bauxite mining and processing), cement production, construction of a railway, and the opening of several special economic zones will require much greater generation, transmission, and distribution capacity. From about 4,239 GWh in 2015, domestic demand for power is projected to reach 13,253 GWh by 2020 and 30,680 GWh by 2030, which translates to an increase of 14% annually (Table 5.4).

Power outages in the country have been frequent, especially during the dry season. According to the

Table 5.4: Forecast of Domestic Power Demand, 2016–2030

Description	Unit	2016	2020	2025	2030
Power Demand	GWh	6,131	13,253	22,407	30,680
System Losses	GWh	658	1,125	1,649	2,243
	%	9.7	7.8	6.9	6.8
Power Demand (including system losses)	GWh	6,789	14,378	24,057	32,923
Peak Load	MW	1,349	2,723	4,395	5,892
Load Factor	%	57.5	60.3	62.5	63.8

GWh = gigawatt-hour, MW = megawatt.

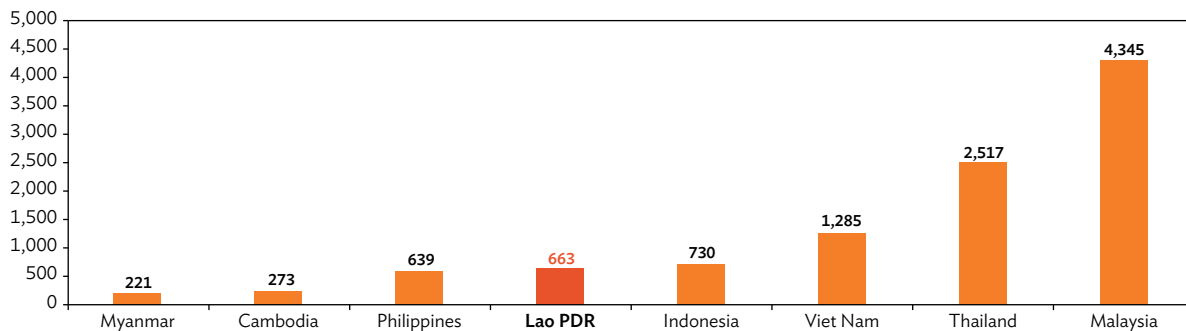
Note: The forecast is based on a scenario where gross domestic product grows by 7% annually.

Source: Ministry of Energy and Mines and Electricité du Laos. 2015. *Electricity Demand Forecast and Supply 2016–2030*. Vientiane.

Enterprise Survey 2016, 23.3% of entrepreneurs identify electricity as a major constraint on their current operations. Businesses across the country experienced an average of one outage per month in 2015, typically lasting for 3 hours (World Bank 2016f). This has undermined the competitiveness of businesses—losses due to outages are estimated at 2.6% of annual sales. Central and southern areas are critically affected by long hours of power interruptions due to load shedding. The southern area recorded a total of 55 hours of interruptions in 2015 and 17 hours in 2016, while central area 1 had about 8 hours in 2016. With the insufficient supply of electricity, per capita electricity consumption in the Lao PDR has remained among the lowest in Southeast Asia (Figure 5.9), despite the improvement of electrification rate to 91%.

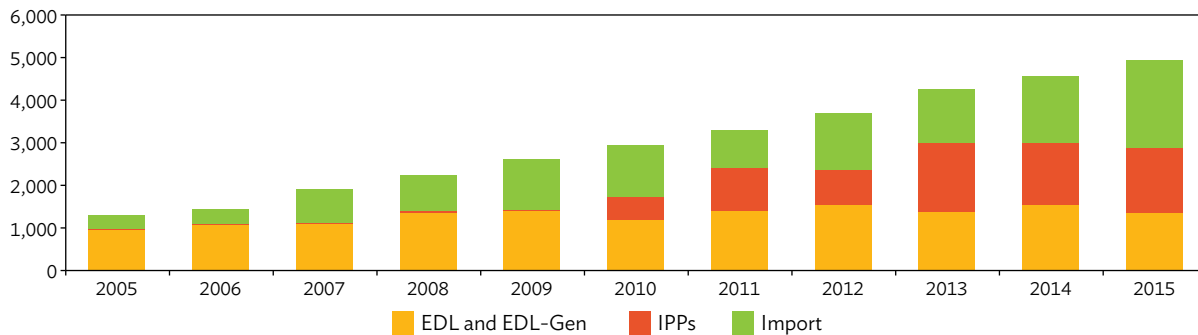
In response to the power crisis, the government constructed new power plants. Since 2009, the EDL and EDL-Gen rapidly increased in generation capacity with the commissioning of six power plants, the largest of which is the 130-megawatt Nam Karn power plant in Luang Prabang. These plants added a total of 314 MW to the generating capacities of the EDL and EDL-Gen. Despite the expansion, however, the supply of both companies was still insufficient to supply the domestic market. Hence, the EDL buys power from the IPPs and supplements supply by importing from the PRC, Thailand, and Viet Nam. In 2015, supply generated from the EDL and EDL-Gen accounted for only 28% of the country’s electricity requirements. Purchases from domestic and export IPPs supplied 31% of electricity needs, while power imports accounted for 41% (Figure 5.10).

Figure 5.9: Electricity Use per Capita in Selected ASEAN Countries, Latest Year (kWh per capita)



ASEAN = Association of Southeast Asian Nations, kWh = kilowatt-hour, Lao PDR = Lao People’s Democratic Republic.
 Sources: Calculations for 2014 data for Cambodia, Myanmar, and Thailand and 2013 data for Viet Nam: Greater Mekong Subregion Information Portal. <http://portal.gms-eoc.org/charts/overview/electricity-consumption-per-capita#> (accessed 28 September 2015). Calculations for 2012 data for Indonesia and Malaysia: World Bank. World Development Indicators; Calculations for 2014 data for the Philippines are computed from the electricity consumption data published in the Department of Energy, Power Statistics 2014. Population data calculated based on data from World Bank. World Development Indicators. Data for the Lao PDR are for 2015 from ADB. *Lao People’s Democratic Republic Energy Sector Assessment, Strategy, and Road Map Update 2015*. Manila.

Figure 5.10: Electricity Supply for Domestic Needs, 2005–2015 (GWh)



EDL = Electricité du Laos, EDL-Gen = EDL-Generation Public Company, GWh = gigawatt-hour, IPP = independent power producer.
 Source: Ministry of Energy and Mines. 2017. *Electricity Statistics Yearbook 2015 of the Lao PDR*. Vientiane.

Supply from both the EDL and EDL-Gen for the domestic market was flat during 2005–2015, averaging 1,300 GWh per year. In 2015, installed capacity doubled from 2014, but generated electricity remained at 2,000 GWh (of which 700 GWh was exported), yielding a capacity factor of only 37%. The low capacity factor is partly a result of the nonoperation of several power plants and limited diversification of the generation mix. Power plants owned by EDL and EDL-Gen are all hydro-based; thus, levels of electricity generation are extremely vulnerable to seasonality. Hydropower generates 96% of total domestic power supply, while coal provides 3% and small renewable energy resources only 1%.

Compounding the challenge of meeting the increase in domestic demand is the location of the supply sources largely in the northern and southern part of the country while growth in demand is most rapid in the central region. The central region is expected to account for more than three-fourths of the total growth of demand. Balancing demand and supply has been difficult because of the fragmented transmission lines and inefficient distribution system. The plan to integrate the four sub-grids has proceeded at a snail's pace, overshadowed by investments in high-voltage transmission lines. The IPPs build and own dedicated high-voltage transmission lines directly connected to demand centers outside the country but are not connected to the Lao PDR network. Additional lines are being planned by investors to serve electricity exports to Thailand and Viet Nam, including the Hongsa–Mae Moh (EGAT Thailand) transmission line. These dedicated lines, however, cannot be tapped to transmit power to the national grid. Often, the IPPs and importers use reliability and stability concerns as reasons for not connecting to the national grid.

The distribution system is aging, and with increasing load requirements, has recorded high losses during 2005–2008. Fast-paced construction of network infrastructure, use of modern technology (such as shield wire technology), and the successful distribution loss reduction measures by the EDL have improved the efficiency of the system. Distribution losses improved from 19% in 2005 to 10% in 2015 (Table 5.5). However, the overall system loss as of 2015 remains high at 14% given the limited power supply.

Table 5.5: Distribution Losses, 2005–2015
(% of output)

Year	Losses
2005	19.3
2006	17.9
2007	15.3
2008	13.7
2009	12.0
2010	10.8
2011	10.1
2012	10.3
2013	12.0
2014	13.1
2015	10.2

Sources: For years 2005–2009: Ministry of Energy and Mines. 2014. Electricity Statistics Yearbook 2014 of the Lao PDR. Vientiane. For 2010–2015: Electricite du Laos. 2016. A Powerpoint Presentation at the Greater Mekong Subregion 21st Meeting of the Regional Power Trade Coordination Committee. Siem Reap. 8–9 December.

5.5.2 Disparities in Access to Electricity

Among countries that have executed electrification programs successfully, the Lao PDR has achieved results faster at a relatively slower increase in GDP per capita (Figure 5.11). Rapid implementation of the National Electrification Program has raised electrification rates, starting at 26% in 1997 to 91% in 2016. However, disparities in access between urban and rural areas remain. Latest available data show that 95% of the population in urban areas has access to electricity, while only 68% of those in rural areas had power. Disparity is also apparent across regions. The least populated regions in the far north and south still have low electrification rates such as Phongsaly (53%) and Sekong (73%), and the mountainous Huaphan (70%). Whereas, the Vientiane and Vientiane region are fully electrified, provinces near Vientiane, Xayabury (95.66%) and Borikhhamsay (93.71%), and densely populated regions of Savannakhet (89.68%) and Champasak (97.66%) also have high electrification rates (Table 5.6).

Although the Lao PDR has achieved its electrification target, providing electricity access to the rest of the unconnected population in far-flung rural areas will be expensive. The high cost can be partly attributed to the private sector's entry in building distribution systems. The cost of grid extension to electrify rural areas has increased over the course of 7 years—from

about KN7.7 million (about \$900) in 2012 compared with KN3.8 million to KN4.7 million (about \$450–\$550) in 2005.

The government sees the potential of renewable energy to support off-grid electrification of households in far-flung areas. In 1999, the government established the off-grid pilot program to start the development of off-grid systems. At present, small hydropower plants and solar photovoltaic systems provide off-grid electricity, with combined capacity

of only 40 MW. There are about 16,600 units of solar photovoltaic panels installed to electrify rural households in 379 villages in 2015. Supporting the use of solar photovoltaic systems as well as construction of small hydropower plants to cover more rural villages, however, will also require financial resources from the government.

5.5.3 Huge Investment Requirements—A Challenge to Limited Fiscal Resources

The EDL’s strategy to meet the domestic demand projections is to (i) expand the EDL’s generating capacity, (ii) increase purchases from domestic IPPs, (iii) increase purchases from small power producers (SPPs) and export IPPs, and (iv) import from neighboring countries. Based on the EDL’s Power Development Plan 2010–2020, the EDL’s own generation will be expanded by 103 MW during 2016–2020. In addition, 2,010-megawatt capacity is expected to be built by domestic IPPs, bringing the total generating capacity serving the domestic market to around 2,900 MW. During the same period, export IPPs are expected to add another 648 MW. By 2020, about 77% of the additional capacity will come from domestic IPPs, while about 20% will be from export IPPs and only about 4% from the EDL. The eighth NSEDP targets completion of 15 hydropower dams, such as the Sayabouly Dam with installed capacity of 1,285 MW by 2019, Xe Pien–Xe Namnoi with installed capacity of 410 MW by 2019, Sekhamane 1 with installed capacity of 322 MW by 2016, Nam Ou 5 with installed capacity of 240 MW by 2017, and others.

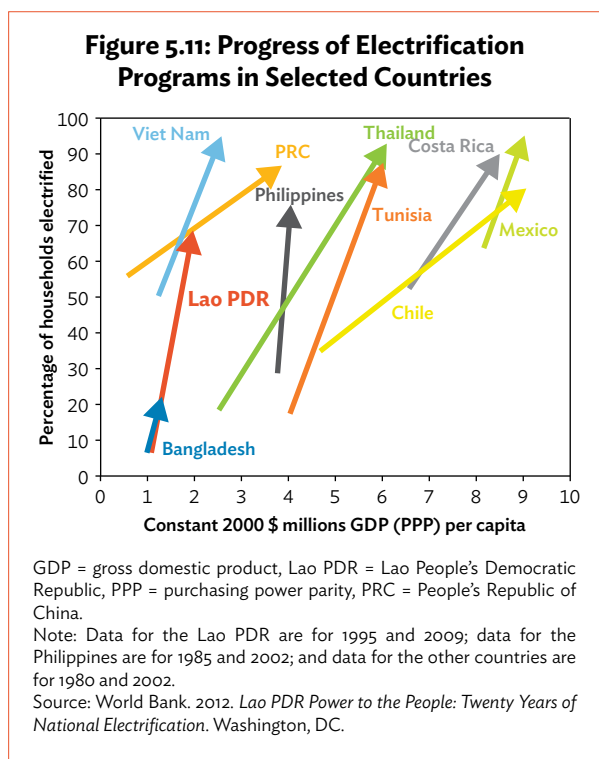


Table 5.6: Electrification Rates by Region, 2015

Region	% of Electrified Households	Region	% of Electrified Households
Vientiane (Capital)	99.99	Vientiane	100.00
Phongsaly	52.52	Xaysomboune	89.89
Luang Namtha	93.367	Borikhamsay	93.71
Oudomxay	80.633	Khammuane	88.10
Bokeo	91.98	Savannakhet	89.68
Luang Prabang	83.62	Saravane	89.54
Huaphanh	70.24	Sekong	72.95
Xayabury	95.66	Champasack	97.66
Xiengkhuang	88.71	Attapeu	84.26

Source: Ministry of Energy and Mines. 2017. *Electricity Statistics Yearbook 2015 of the Lao PDR*. Vientiane.

In parallel with increasing its generating capacity, the EDL needs to expand its transmission and distribution network considerably. The EDL is responsible for delivering power to final domestic consumers regardless of whether it generates the power or purchases it from SPPs and/or IPPs. Foreign and private sector investors already play a major role in both generation and transmission, and are expected to contribute further to expansion of the transmission network. The EDL will continue to be responsible for developing the national network for 115 kV and below. Private investors will play a dominant role in building the high-voltage transmission network consisting

of 230 kV and 500 kV. Between 2015 and 2020, the EDL will construct a total of 907 kilometer-circuits of 115-kilovolt transmission lines covering the entire country. Private investors will build 819 kilometer-circuits of 230-kilovolt lines and 1,661 kilometer-circuits of 500-kilovolt lines. All the 230-kilovolt lines will be part of the national grid. A number of 500-kilovolt lines will be used for export purposes and the rest will form the backbone for the national high-voltage transmission network.

Based on the EDL's Power Development Plan, the Lao PDR will need a total of \$30.32 billion to complete the plan during 2016–2020. The EDL will need to mobilize \$1.59 billion for increased generation while domestic IPPs will need to invest \$7.6 billion. A huge amount of investment in generation or about \$17.7 billion will

need to come from the IPPs for electricity export (Table 5.7). Furthermore, the EDL needs \$2.2 billion for expanding the transmission system including for substations (see Appendix 5.4 for list of planned transmission lines).

Given that the EDL's current investment plan is only until 2020, the additional capacity and investment needs of the country up to 2030 have also been estimated. Based on the domestic power demand forecast published by MEM and the EDL, the Lao PDR will need an additional capacity of 1.5 GW to 2.7 GW by 2020, and 3.7 GW to 6.0 GW by 2030. The Lao PDR will need a total investment of \$9.7 billion to \$15.7 billion from 2015 to 2030, or \$640 million to \$990 million of investment annually to meet the expected domestic power demand (Tables 5.8, 5.9, and 5.10).⁵¹

Table 5.7: Generation and Transmission Investment Plan, 2016–2020

	Generation			Transmission
	Capacity (MW)	Annual Generation (GWh)	Plant Factor (%)	Estimate of Investment Needed (\$ million)
Northern Area	1,533	7,383	55	17,302.4
EDL	47	222	54	737.2
Domestic IPPs	976	4,695	55	2,902.6
Export IPPs	510	2,466	55	13,662.6
Central Area	323	1,524	54	4,501.4
EDL	–	–	–	225.1
Domestic IPPs	255	1,172	52	1,716.6
Export IPPs	68	352	59	2,559.7
Southern Area	905	4,729	60	5,173.5
EDL	56	150	31	633.7
Domestic IPPs	779	4,301	63	3,031.7
Export IPPs	70	278	45	1,508.1
Total	2,761	13,636	56	26,977.2
EDL	103	372	41	1,596.0
Domestic IPPs	2,010	10,168	58	7,650.8
Export IPPs	648	3,096	55	17,730.4

– = data not available, EDL = Electricité du Laos, GWh = gigawatt-hour, IPP = independent power producer, MW = megawatt.
Source: Electricité du Laos. 2010. *Power Development Plan 2010–2020*. Table 4.1-1. Vientiane.

Table 5.8: Forecast of Domestic Power Demand and Capacity Gap, 2020–2030

Year	Power Demand (GWh)			Capacity Gap (GW)		
	Low	Mid	High	Low	Mid	High
2020	11,985	14,378	18,419	1.68	2.15	3.05
2025	18,270	24,057	27,233	2.69	3.79	4.39
2030	23,442	32,923	35,439	3.67	5.47	5.95

GW = gigawatt, GWh = gigawatt-hour.

Notes:

(i) Three scenarios were considered in estimating power demand: low-growth scenario, which assumes annual gross domestic product (GDP) growth rate of 6.5%; mid-growth scenario, which assumes annual GDP growth rate of 7%; and high-growth scenario, which assumes annual GDP growth rate of 7.5%.

(ii) Capacity gap is the difference between the required installed capacity to meet the forecasted domestic demand and the installed capacity of power plants dedicated for the domestic market as of 2014 which stood at 0.79 GW.

Sources: Ministry of Energy and Mines and Electricité du Laos. 2015. *Electricity Demand Forecast and Supply 2016–2030*. Vientiane; and ADB estimates.

⁵¹ The estimates are based on the average unit cost of \$2,500 per kW.

Table 5.9: Investment Requirement to Meet Domestic Demand (\$ billion)

Investment Requirement	Low	Mid	High
Total for 2015–2030	9.66	14.19	15.72
Annual average	0.64	0.91	0.99

Sources: ADB computation based on power demand forecast published in Ministry of Energy and Mines and Electricité du Laos. 2015. *Electricity Demand Forecast and Supply 2016–2030*. Vientiane.

Table 5.10: Investment Requirement for 2016–2020 (\$ million)

Investment Requirement	Amount
Generation	26,977
New generation by ownership:	
EDL	1,596
Domestic IPPs	7,651
Export IPPs	17,730
Overhaul of existing power plants	114
Substations	410
New	281
Reconstruction	129
Transmission	2,341
EDL	1,757
Independent power producer (for domestic consumption)	554
Independent power producer (for export)	30
National grid 500 kV and substations	1,252
Planned LDC and phase-shifting	271
Rural electrification	354
Distribution	220
TOTAL	30,302

EDL = Electricité du Laos, IPP = independent power producer, kV = kilovolt, LDC = least developed country.

Source: Electricité du Laos. 2010. *Power Development Plan 2010–2020*. Vientiane.

Clearly, the need for rapid expansion of power generation, transmission, and distribution will challenge the EDL's technical capacity and financial resources. While the EDL's technical capability has improved over the past decade or more, it has not reached the level needed to cope with such expansion.

The EDL has been suffering losses in its main operations. Thanks to its non-operating income, the EDL recorded profits in 2014 and 2015. The EDL earns revenues from the sale of electricity to domestic and foreign consumers and dividends from the IPPs in which it holds shares (at present four HPPs). Neither its domestic sales nor its export receipts were

profitable. For many years, the electricity tariff was set at a low level, seriously undermining the EDL's financial position. About 82% of domestic consumers enjoyed tariff rates lower than the cost of electricity. The EDL incurred huge losses from its sales to the agriculture and residential sectors, which accounted for 39% of the country's total electricity consumption in 2015.

Low tariff collection rates due to the arrears by agricultural consumers and government agencies have further weakened the EDL's financial situation. Policy dialogue between the government and its major development partners led to the government's decision to increase electricity tariffs to cover production, transmission, and distribution costs.⁵² According to the government's decision of March 2012, electricity tariffs will increase on average by 2% or more annually. From 2012 to 2015, average tariffs grew by about 5% per year. Despite these increases, tariff rates remain below cost-recovery level.

The separation of EDL-Gen from EDL in 2011 led to increases in purchasing cost of electricity from EDL-Gen. This consequently drove the increase in EDL's operating expenses and led to unprofitable export of electricity. Electricity from EDL-Gen was initially priced at KN413 per kWh, with prearranged increases of 1% annually. This price is higher than the purchase cost from IPPs. Revenues from the sale of electricity to EDL have enabled EDL-Gen to finance additional generation projects.

5.5.4 Managing the Downside Risks of Electricity Exports

The Lao PDR's vast hydropower potential and its central location in the Greater Mekong Subregion offer the opportunity to export electricity to energy-deficit neighboring countries. Thailand will likely remain a huge source of electricity export revenue as the country continues to grapple with its energy shortage. In 2014, Thailand imported 12,259 GWh of electricity, of which more than 80% was from the Lao PDR (Energy Policy and Planning Office, Ministry of Energy, Thailand 2015). Viet Nam also struggled with

⁵² The Ministry of Energy and Mines, with funding from the World Bank, is working on a research project that aims to enhance the financial sustainability of the Lao PDR's power sector and develop a suitable power tariff regime.

an electricity deficit, importing about 2,500 GWh of electricity in 2014, of which about 500 GWh was from the Lao PDR (ADB 2015e).

Power export to neighboring countries is an important policy objective. The Lao PDR has signed memorandums of understanding with Thailand and Viet Nam, under which the Lao PDR will export 9,000 MW of hydropower to Thailand and 3,000 MW to Viet Nam by 2020. Since the commissioning of the Theun Hinboun, the Nam Theun 2, and the Nam Ngum 2 HPPs, and the Hongsa Lignite power plant, power exports have become a vital source of foreign exchange income for the country.

Power exports significantly increased starting 2010 with the commissioning of the Nam Theun 2 hydropower project, which has been exporting 4,600 GWh to 5,900 GWh of electricity to Thailand. Power exports rose further in the following years with the addition of Nam Ngum 2, which has been exporting

more than 2,000 GWh since 2011 (Figure 5.12). Power exports accounted for 12% to 16% of total export values during 2010 to 2015.⁵³ With export income projected to increase by about 18% annually for 2016–2020, the sector’s contribution to GDP will be about 16% in 2020 (Phonekeo 2015). Revenues generated from electricity exports are in the form of royalties, taxes, and dividends. In 2015, total revenues from power export amounted to \$140 million and are expected to more than double by 2020 (Table 5.11).

Under the framework agreement for the implementation of the Nam Theun 2 project, the government, with assistance from ADB and the World Bank, designed a revenue management scheme under which a proportion of the revenues received from the project will be channeled to eligible rural development and poverty reduction programs. The scheme includes a set of eligibility criteria, procedures for appraisal, and approval of programs to be funded by revenues from the project. Table 5.12 presents actual and

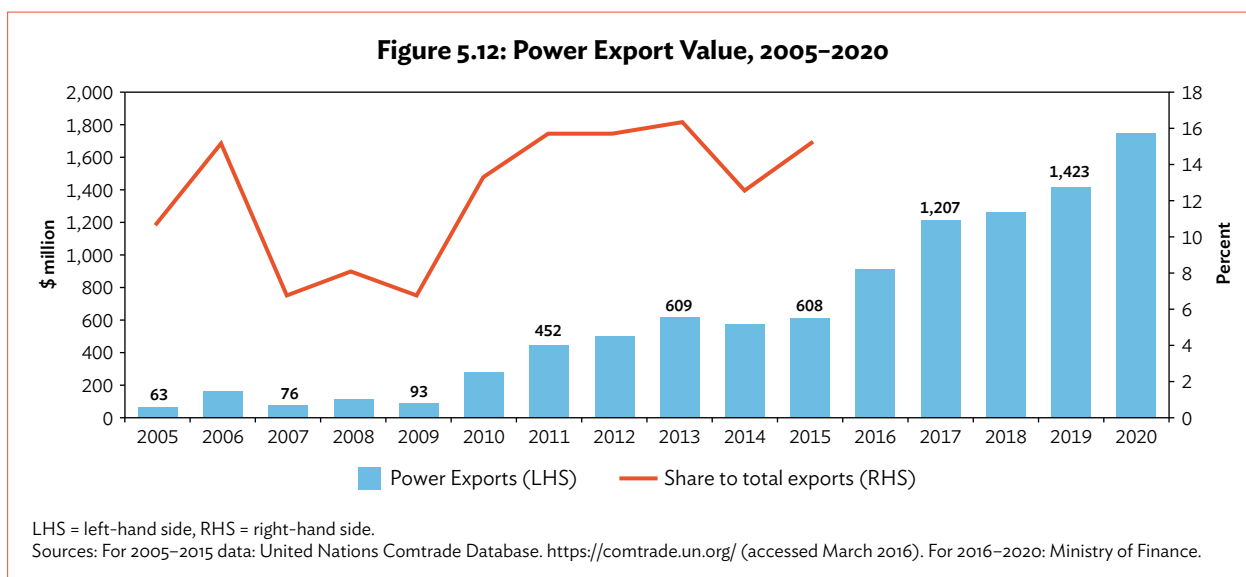


Table 5.11: Government’s Revenue from Power Export, 2010–2020 (\$ million)

Item	2010	2011	2012	2013	2014	2015	2016*	2017*	2018*	2019*	2020*
Royalties	21.9	41.4	50.1	63.4	78.7	76.7	96.8	113.0	129.2	143.4	165.7
Dividends	9.6	32.9	35.8	38.7	42.3	44.3	49.0	65.8	70.0	83.4	107.0
Taxes	5.4	7.2	8.2	9.5	11.4	18.9	23.8	35.6	37.2	43.4	80.6
Total	36.8	81.6	94.1	111.6	132.3	139.8	169.7	214.3	236.4	270.2	353.3

* = Revenue forecast.
Source: Ministry of Finance.

⁵³ Data on power export values are from UN Comtrade (accessed March 2016).

Table 5.12: Government’s Revenue from Power Export from Nam Theun 2 Project, 2010–2018 (\$ million)

Item	2010	2011	2012	2013	2014	2015	2016*	2017*	2018*
Royalties	5.4	13.2	13.7	12	14.4	12.7	13.1	13.0	13.2
Dividends	–	8.8	13.5	12.4	17.2	13.8	18.1	18.1	17.5
Taxes	–	–	–	–	–	3.2	4.9	6.0	6.6
Total	5.4	22	27.2	24.4	31.6	29.7	36.1	37.1	37.3

– = not applicable.

* = Revenue forecast.

Source: Nam Theun 2 Power Company.

forecast revenue from power export generated from Nam Theun 2.

The export of power has been recognized as one important source of revenue to support the government’s poverty reduction initiatives. However, this export-oriented policy on the generation of hydropower projects will face the following challenges (ADB 2013a):

- (i) ensuring that negative social and environmental impacts are properly assessed and minimized;
- (ii) balancing domestic consumption needs and export opportunities;
- (iii) optimizing trade-offs between short-term benefits (e.g., dividends from equity participation in IPPs) and longer-term benefits (e.g., unified transmission network with interconnection to Greater Mekong Subregion countries);
- (iv) mobilizing and managing financial resources to avoid adverse impact on the economy (e.g., exchange rate effects on agriculture and other exports);
- (v) ensuring development of hydropower projects are consistent with the least-cost expansion planning and done not on an ad hoc basis;
- (vi) improving capacity for managing the concession awarding process to ensure that terms and conditions for investors are consistent;
- (vii) building capacity for enforcing inspection procedures and monitoring environmental

and social safeguards compliance, particularly at the local level; and

- (viii) ensuring proper management and tracking of export revenues.

5.5.5 Policy, Regulatory, Legal, and Capacity Gaps Undermine Power Sector Development

The sustainable development of the power sector requires the government and its agencies to resolve institutional bottlenecks. For a power sector to be viable, a clear legal, institutional, and regulatory framework is necessary, which the current setup lacks despite the various initiatives that are already in place.

In the early years, the development of the country’s power sector proceeded in a largely intuitive and ad hoc manner. Projects were small and were created to respond to a locality’s specific need. This has been largely driven by private developers on an ad hoc basis, without considering the least-cost principle. Most projects were covered by build–own–operate–transfer agreements that were successfully implemented through the issuance of multiple memorandums of understanding in the absence of clear guidelines on the awarding of concessions to private investors.⁵⁴

Although various laws have been put in place such as the new Electricity Law and Law on Promotion of Foreign Investment, these lack the specifics on mandates of the various institutions involved in the energy sector. Efforts have been undertaken such as the creation of new entities or reorientation of the

⁵⁴ For procurement, there is only an IPP procurement manual in draft form dated 2010.

mandates of responsible ministries. Notwithstanding, there is still no comprehensive and integrated energy development strategy that is regularly reviewed and updated to integrate activities of the sector's main actors and to incorporate new developments such as the use and exploration of new energy sources to help diversify the power supply mix.⁵⁵ Consequently, implementing sector policies and adopting a consistent concession process for IPPs have been difficult. Coordination among agencies is also poor, most especially at the local levels where capacity is weakest (Phoutonesy 2015 and Lord 2011).

While regulations to maintain electrical technical standards have been drafted with the help of the Japan International Cooperation Agency, there is still a shortage of skilled national staff at all levels particularly at the provincial level where many distribution network projects need to be inspected. The Department of Energy Businesses—which is tasked to promote and oversee the involvement of foreign and private sector investors in power generation and has been acquiring skills in planning, technical evaluation, and project implementation and monitoring—remains relatively weak in four critical areas: social and environmental assessments, managing arbitration proceedings, financial modeling and analysis, and strategic leadership.

More importantly, there is no independent regulator that oversees the efficient operation of the energy sector. Ideally, the regulator's primary function is to balance the interests of various stakeholders by (i) protecting consumers from abuse by firms with substantial market power; (ii) supporting investments by protecting investors from arbitrary government action; and (iii) promoting economic efficiency. The current Electricity Law also lacks provision for fair and transparent tariff determination, which should be another function of the regulator, to ensure that the sector is self-sustaining and sufficiently profitable to attract investors for efficient delivery of electricity. In practice, tariffs are determined through negotiations between the generation company and the distribution company, and finalized by MEM or by the local authority.

5.6 Recommendations

The discussions in the earlier sections highlight the need for a balanced power sector development to allow the efficient harnessing of the country's power resources for export, while effectively addressing domestic demand.

The demand from neighboring countries and the growing domestic market require optimal development of power generation assets and transmission and distribution systems. A comprehensive national energy policy and a systematic approach to energy planning and power sector development are needed. With a firm national energy policy as framework, MEM needs to be equipped to undertake its responsibilities on energy planning and providing strategic guidance. This includes MEM's capacity to promote renewable energy and energy efficiency, which is a government priority. Systematic planning would lead to efficient utilization and economic development of all energy resources, beyond the present planning approach, which largely focuses on developing the country's hydropower export potential. Sustained capacity building will enable MEM to perform its mandated tasks of being able to determine current and future demand for energy, and to analyze cross-sector issues such as energy substitution.

To further facilitate development by IPPs, it is therefore important to establish a system of screening hydropower project developers, a competitive and transparent bidding process, a tariff negotiation process, and an environmental and social assessment of power projects. Along with this, it is necessary to enhance the capacity of personnel of the Department of Energy Businesses to facilitate the IPP procurement process. One more important task in the short term is to establish appropriate regulatory framework and create an independent regulatory body that will assist government and various stakeholders in developing and ensuring sustainability of the sector.

The following are the specific recommendations to address the main constraints discussed in the previous section (ADB 2015c).

⁵⁵ The new Energy Development Strategy until 2025 is being reviewed by the Ministry of Energy and Mines.

5.6.1 Implement Demand-Side Interventions

- Develop a comprehensive national strategy for energy efficiency and conservation. Consider successful strategies in different countries that may be applied in the Lao PDR.
- Conduct several consultation meetings with stakeholders when designing the Energy Efficiency and Conservation (EEC) program. Ensure active participation of the EDL during the design and implementation stages of the EEC program.
- Create and/or assign an agency to take charge of implementing and monitoring the EEC program.
- Put in place legal and regulatory provisions to encourage efficient use of electricity.
- Rationalize subsidies and tariffs to encourage efficient consumption of electricity across consumer groups.
- Promote energy efficiency improvement by encouraging use of energy-efficient technologies, starting with the industry sector, particularly in cement and mining companies where potential energy savings are highest.

5.6.2 Develop New Sources of Electricity

- Diversify the power mix by increasing electricity generation from nonconventional renewable energy. Conduct a comprehensive assessment of renewable energy potential, which should include improved provincial-level data. Accordingly, create a master plan for renewable energy development.
- Promote generation from small hydropower plants to provide electricity in rural areas and enhance supply reliability. Rehabilitate old and inefficient small hydropower plants. Assess potential capacity and develop an investment plan for building small hydropower plants.

- Put in place a sound policy, regulatory, and institutional framework for the development of nonconventional renewable energy and promotion of small hydropower plants. Ensure that right incentives are put in place to encourage these investments.
- Ensure grid access to nonconventional renewable energy and small hydropower plants.

5.6.3 Improve the Transmission and Distribution Network

- Conduct a comprehensive assessment of the transmission and distribution network to identify bottlenecks. Prioritize rehabilitation and upgrade of critical sections of the transmission and distribution network.
- Develop the national transmission network into a fully integrated system to facilitate delivery of supply to domestic consumers and enable full development of hydropower potential. This and other expansions will depend on foreign investment as a source of both funding and expertise and will require an adequate form of risk sharing between international capital and the public sector.
- Improve the stability and reliability of the Lao PDR's network by implementing binding grid codes and technical performance standards.
- Continue expansion of the distribution network where it is cost-effective to improve access to electricity, especially in rural areas.

5.6.4 Improve Viability of the Power Sector to Attract Investments

- Establish clear guidelines for entry and operation of IPPs. Set a standard screening process and competitive and transparent bidding for the award of contracts. Hydropower development through build-own-operate-transfer agreements should

be based on clear and consistent guidelines, not on ad hoc negotiations. Ensure implementation of incentives for private investments in power generation and transmission.

- Provide enabling environment for IPPs by establishing a clear and transparent process for the award of contracts. Improve coordination between the government and private investors to facilitate faster response to investment gaps.
- Ensure that tariff setting continues to be determined by rational criteria, linking tariffs with costs, not by negotiation between the generation company and the distribution company. The EDL will need to adopt a tariff regime that will allow the utility to fund capital investment requirements. However, it is important to assess affordability of electricity to the poor population, and create a targeted subsidy scheme if necessary.
- Improve the operational and financial efficiency of the EDL. Reduce the amount of accounts receivable to manageable limits. Manage outstanding arrears from government and irrigation consumers.

5.6.5 Address Policy, Legal, Regulatory, and Capacity Gaps

- Accelerate formulation of a comprehensive energy policy that will guide MEM in energy planning and in drafting strategies for sector development.
- Enhance the capacity of government agencies and/or units to perform their respective functions. For example, provide technical assistance to MEM in the preparation of a sound energy plan that includes estimation of future energy supply and demand, and strategies for energy

resource development. Enhance the capacity of the Department of Energy Businesses to attract, evaluate, negotiate, and process private sector investments. Assess and improve human resources capacity of power agencies, especially at the provincial level.

- Review power purchasing agreements and revise terms to raise the fiscal take from power exports so that the government's share in power export revenue increases.
- Strengthen the capacity of MEM's staff and those from relevant agencies on
 - conducting resource assessments and mapping to better facilitate on-grid and off-grid electricity generation;
 - conducting well-coordinated research and planning especially concerning pricing policies; and
 - establishing procedures for streamlined review of private investment proposals.
- Support capacity building for promotion of energy demand-side management, energy auditing, updating and strengthening the regulatory framework, and creating an independent regulatory body that will
 - promulgate and approve the rules and regulations of the power sector;
 - establish a tariff-setting methodology;
 - screen and approve power purchasing agreements;
 - issue licenses to electricity industry participants, among other regulatory functions;
 - ensure unbiased settlement of disputes among stakeholders; and
 - coordinate with stakeholders.

Appendix 5.1: Existing Power Plants in the Lao PDR (2015)

	Plant Name	Province	Generation Capacity (kW)			COD	Ownership
			Total	Domestic	Export		
North	Nam Ko	Oudomxay	1,500	1,500	0	1996	EDL
	Nam Boun 1	Phongsaly	110	110	0	1996	EDL
	Nam Mong	Luang Prabang	80	80	0	1996	EDL
	Nam Dong	Luang Prabang	1,000	1,000	0	1970	EDL
	Nam Ngay	Phongsaly	1,200	1,200	0	2001	EDL
	Nam Nhone	Bokeo	3,000	3,000	0	2011	Nam Nhone Power Company (IPP[d])
	Nam Tha 3	Luangnamtha	1,250	1,250	0	2011	Nam Tha 3 Power Company (IPP[d])
	Houay Ngou	Xayabury	7.5	7.5	0	2011	PDEM
	Nam Sae	Oudomxay	80	80	0	2012	EDL
	Nam Long	Luangnamtha	5,500	5,500	0	2013	Nam Long Power Company (IPP[d])
	Hongsa Coal	Xayabury	1,878,000	13,680	1,549,060	2015	Hongsa Power Company (IPP[e])
	Nam Ou 2	Luang Prabang	120,000	120,000	0	2015	Nam Ou 2 Power Company (IPP[d])
	Nam Karn	Luang Prabang	130,000	130,000	0	2015	EDL
	Nam Beng	Oudomxay	36,000	36,000	0	2015	Nam Beng Power Company (IPP[d])
Central 1	Nam Ngum 1	Vientiane	155,000	155,000	0	1971	EDL-Gen EDL
	Nam San	Huaphanh	110	110	0	1995	
	Nam Et	Huaphanh	60	60	0	1995	EDL
	Nam Sat	Huaphanh	250	250	0	1999	EDL
	Nam Leuk	Vientiane	60,000	60,000	0	2000	EDL-Gen
	Nam Mang 3	Vientiane	40,000	40,000	0	2005	EDL-Gen
	Nam Lik 1/2	Vientiane	100,000	100,000	0	2010	Nam Lik 1/2 Power Company (IPP[d])
	Nam Ngum 2	Xaisomboune	615,000	0	615,000	2010	Nam Ngum2 Power Company (IPP[e])
	Nam Song	Vientiane	6,000	6,000	0	2012	EDL-Gen
	Ngum 5	Xaisomboune	120,000	120,000	0	2012	Nam Ngum5 Power Company (IPP[d])
	Ka 1, 2	Xiengkhuang	80	80	0	2013	Sunlabop Company (IPP[d])
	Nam Ngiep 3A	Xiengkhuang	44,000	44,000	0	2014	Phongsupthavy Construction Company Co. (IPP[d])
	Tadlang (Nam Saen)	Xiengkhuang	5,000	5,000	0	2014	Bor Thong Intre Company (IPP[d])
	Nam Ngiep 2	Xiengkhuang	180,000	180,000	0	2015	Nam Ngiep 2 Power Company (IPP[d])
	Nam Sana	Vientiane	14,000	14,000	0	2015	EDL
	Nam San 3B	Xaisomboune	45,000	45,000	0	2015	Phongsupthavy Construction Company (IPP[d])
	Nam Theun 2	Khammuane	1,075,000	75,000	995,000	2010	Nam Theun 2 Power Company (IPP[e])
Nam Phao	Borikhamxay	1,700	1,700	0	2011	Nam Phao Power Company (IPP[d])	
Central 2	Nam Gnouang 8	Borikhamxay	60,000	60,000	0	2012	Nam Gnouang 8 Power Company (IPP[d])
	Tadsalen	Savanakhet	3,200	3,200	0	2012	Tadsalen Power Company (IPP[d])
	Theun-Hinboun	Khammuane	440,000	8,000	432,000	1998/2012	Nam Theun-Hinboun Power Company (IPP[e])
Mit Lao Biomass Factory	Savanakhet	9,700	9,700	0	2012	Mit Lao Biomass Factory (Private)	

continued on next page

Appendix 5.1 continued

	Plant Name	Province	Generation Capacity (kW)			COD	Ownership
			Total	Domestic	Export		
South	Selabam	Champasak	5,000	5,000	0	1969	EDL-Gen
	Xeset 1	Saravane	45,000	45,000	0	1991	EDL-Gen
	Houay Ho	Attapeu	152,100	2,100	150,000	1999	Houay Ho Power Company (IPP[e])
	Xeset 2	Saravane	76,000	76,000	0	2009	EDL-Gen
	Houay Samong	Attapeu	113	113	0	2003	Houay Samong Power Company (Private)
	Xekamman 3	Sekong	250,000	25,000	225,000	2013	Xekamman 3 Power Company (IPP[e])
	Houg Anh Biomass Power House	Attapeu	30,000	30,000	0	2013	Houg Anh Biomass Power House (Private)
	Xe Namnoy 1	Attapeu	14,800	14,800	0	2014	Xe Namnoy 1 Power Company (IPP[d])
	Solar photovoltaic		432	432	0	2014	IREP
	Huay Lamphangnay	Sekong	88,000	88,000	0	2015	EDL
Total		5,813,273	1,518,953	3,974,000			
EDL		623,390	623,390	0			
IPP (d)		739,530	739,530	0			
IPP (e)		4,410,100	115,780	3,974,000			
Private + IREP		40,245	40,245	0			
PDEM		7.5	7.5	0.0			

COD = commercial operation date, EDL= Electricité du Laos, EDL-Gen = EDL-Generation Public Company, IPP(d) = domestic independent power producer, IPP(e) = export independent power producer, IREP = Institute of Renewable Energy and Promotion, kW = kilowatt, Lao PDR = Lao People's Democratic Republic, PDEM = Provincial Department of Energy and Mines.

Source: Ministry of Energy and Mines. 2017. *Electricity Statistics Yearbook 2015 of the Lao P.D.R.* Vientiane.

Appendix 5.2: Power Projects in the Pipeline

No	Name	Location	Agreement Signed	Signed	No	Name	Location	Agreement Signed	Signed
1	Luang Prabang (Mekong)	Louangprabang	MOU	13 Oct 2007	55	Xelanong 2	Savannakhet	PDA	5 Aug 2016
2	Ban Koum (Mekong)	Champasak	MOU	25 Aug 2008	56	Nam Phoui 1	Xayaboury	PDA	25 Apr 2016
3	Nam Ngiep (Meung Mai)	Bolikhamxay	MOU	25 Feb 2010	57	Tadsakhoi	Savannakhet	PDA	4 Aug 2016
4	Nam Khan 4	Loaungprabang	MOU	9 Feb 2013	58	Meungkaleum Coal Power	Xekong	HOA	14 Jul 2016
5	Xekong 5	Xekong	MOU	5 Feb 2014	59	Nam Nga	Louangphabang	PDA	7 Sep 2016
6	Xelanong III	Savannakhet	MOU	10 Feb 2013	60	Nam Seaung 1 and 2	Loaungprabang	PDA	24 Apr 2006
7	Pak Lay	Xayaboury and Vientiane	MOU	11 Jun 2007	61	Nam Bi 1, 2, 3	Xekong	PDA	28 Oct 2010
8	Nam Mouan	Bolikhamxay	MOU	23 May 2014	62	Hoy La-nge	Xekong	PDA	17 Feb 2017
9	Xepian-Huaysoy	Attapeu	MOU	31 Jan 2014	63	Nam Theun 2	Khammuoan and Bolikamxay	CA	2 Oct 2002
10	Xekong (Downstream) B	Attapeu	MOU	28 Nov 2011	64	Nam Kong 2	Attapeu	CA	31 Jan 2013
11	Nam Moan (Ban Vangdea)	Bolikhamxay	MOU	23 May 2013	65	Xekaman 1	Attapeu	CA	2 Oct 2011
12	Nam Ma 1, 2, 3	Huaphan	MOU	10 Jun 2014	66	Xekaman 3	SeKong	CA	1 Apr 2006
13	Nam Ngum (Xayaburi)	Xayaburi	MOU	20 Jun 2013	67	Nam Nhone	Bokeo and Louangnamtha	CA	3 Mar 2006
14	Nam Theun 4	Bolikhamxay		No developer yet	68	Nam Ngum 2	Vientiane	CA	26 Mar 2006
15	Xekong 3A and 3B	Attapeu	MOU	31 Mar 2015	69	Nam Ngum 5	Louangphabang and Xiengkhouang	CA	10 Apr 2007
16	Nam Mang (Upstream)	Xaysomboun	MOU	27 May 2015	70	Theun-Exp	Bolikhamxay	CA	27 Aug 2008
17	Wind Power (Savannakhet)	Savannakhet	MOU	21 May 2015	71	Tadsalen	Savannakhet	CA	3 Feb 2009
18	Wind Power (Attapeu)	Attapeu	MOU	21 May 2015	72	Hongsa Liqnite	Xayaboury	CA	30 Nov 2009
19	Wind Power (Salavan)	Salavan	MOU	21 May 2015	73	Xayaburi	Xayaboury and Louangphabang	CA	29 Oct 2010
20	Wins Power (Bolikhamxay)	Bolikhamxay	MOU	30 Jan 2015	74	Nam Lik 1	Vientiane	CA	6 Feb 2013
21	Wins Power (Khammouan)	Khammouan	MOU	30 Jan 2015	75	Nam Lik ½	Vientiane	CA	31 Oct 2006
22	Solar Power	Vientiane Capital	MOU	9 Jun 2015	76	Nam Long	Louangnamtha	CA	23 Mar 2011
23	Nam Tha 2	Luang Prabang	MOU	9 Jul 2015	77	Nam Ngiep 2	Xiengkhuang	CA	18 Aug 2011
24	Caol Power (Meungphim)	Savannakhet	MOU	9 Oct 2015	78	Nam Sim	Huaphan	CA	13 Jun 2011
25	Caol Power (Bolikhamxay)	Bolikhamxay	MOU	1 Jul 2015	79	Nam Ngiep 3A	Xiengkhuang	CA	28 Nov 2013
26	Caol Power (Khammouan)	Khammouan	MOU	1 Jul 2015	80	Xepian-Xenamnoy	Champasack and Attapeu	CA	19 Oct 2012
27	Nam Cha 2	Xaysomboun	MOU	4 Sep 2015	81	Nam Mang 1	Bolikhamxay	CA	9 Jan 2013
28	Xekong 4A and 4B	Xekong	MOU	6 Nov 2015	82	Nam Beng	Oudomxay	CA	7 Jan 2013
29	Railway Coal Power	Lao PDR	MOU	11 Dec 2015	83	Xenam Noy 1	Attapeu	CA	11 May 2012

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Appendix 5.2 continued

No	Name	Location	Agreement Signed	Signed	No	Name	Location	Agreement Signed	Signed
30	Nam Seng 4, 5, 6	Luang Prabang	MOU	9 Sep 2013	84	Nam Ou 2, 5, 6	Louangprabang and Phongsaly	CA	10 Jun 2012
31	Nam Hong	Borikhamxay	MOU	19 May 2016	85	Huay Ho	Champasak and Attapeu	CA	23 Sep 1993
32	Nam Ngum Nanin	Vientiane	MOU	28 Apr 2017	86	Nam Ngiep 1	Xiengkhuang and Bolikhamxay	CA	27 Aug 2013
33	NamSum 4	Huaphan	PDA	26 Oct 2016	87	Nam San 3A	XiengKhuang	CA	22 Nov 2013
34	XePon 3	Salavanh	PDA	21 May 2015	88	Nam San 3B	XiengKhuang	CA	22 Nov 2013
35	Pakngum	Vientiane Capital	PDA	5 May 2017	89	Nam Ngum 1	Vientiane	CA	24 Jul 2013
36	Nam Pha	Louangnamtha and Bor Keo	PDA	20 Aug 2010	90	Nam Leak	Vientiane	CA	24 Jul 2013
37	Nam Sum 1, 3	Huaphan	PDA	19 Sep 2011	91	Nam Mang 3	Vientiane	CA	24 Jul 2013
38	Nam Phoun	Xayabouri	PDA	18 Feb 2012	92	Xe Xet 1	Salavanh	CA	24 Jul 2013
39	Nam Pod	Xiengkhoang	PDA	5 Jun 2012	93	Xe Xet 2	Salavanh	CA	24 Jul 2013
40	Nam Phouan	Xaysomboune	PDA	23 May 2014	94	Xelabum	Champasack	CA	24 Jul 2013
41	Nam Ang Tabeng	Attapeu	PDA	23 May 2014	95	Nam Xong	Vientiane	CA	24 Jul 2013
42	Pak Beng (Mekong)	Odomxay	PDA	27 Dec 2010	96	Nam Phay	Xaysomboune	CA	28 Feb 2014
43	Sanakham (Mekong)	Vientiane	PDA	27 Dec 2010	97	Nam Tha 1	Louangnamtha and Bor Keo	CA	18 Nov 2014
44	Xekatom	Champasack	PDA	20 Dec 2007	98	Nam Phak	Champasack	CA	10 Feb 2014
45	Phou Ngoy (Mekong)	Champasack	PDA	7 Dec 2010	99	Nam kong 1	Xekong	CA	30 Mar 2016
46	Xekaman 4	Attapeu	PDA	27 Aug 2012	100	Nam Ou 1, 3, 4, 7	Louangprabang / Phongsaly	CA	31 Aug 2015
47	Nam Phak 1, 2, 3	Oudomxay	PDA	10 Sep 2015	101	Don Sahong	Champasack	CA	8 Jul 2015
48	Nam Mo 1 (Nam Kan)	XiengKuang	PDA	10 Sep 2015	102	Nam Theun 1	Bolikhamxay	CA	14 Jun 2016
49	Nam Emoon	Sekong	PDA	22 Jul 2015	103	Huaphan Coal Power	Huaphan	CA	29 Mar 2016
50	Xelanong 1	Savannakhet	PDA	19 Jan 2015	104	Nam kong 3	Xekong	CA	30 Sep 2016
51	Xekong (Downstream) A	Attapeu	PDA	20 Mar 2015	105	Nam Mo 2 (120 MW)	Xiengkhuang	CA	30 Mar 2017
52	Nam Leng	Pongsaly	PDA	24 Oct 2014	106	Nam Khan 2	Louangprabang	Waiting for CA	
53	Nam Neun 1, 3	Huaphan	PDA	26 Aug 2014	107	Namkhan 3	Louangprabang	Waiting for CA	
54	Monsoon Wind Energy	Xekong	PDA	7 Aug 2015	108	Houylamphanyai	Attapeu	Waiting for CA	
					109	Xexet 3	Saravan	Waiting for CA	

CA = concession agreement, Lao PDR = Lao People's Democratic Republic, MOU = memorandum of understanding, MW = megawatt, PDA = project development agreement.

Source: Ministry of Energy and Mines.

Appendix 5-3: Power Generation of Each Power Plant, 2005–2015 (GWh)

Plant Name	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015		
North													
Nam Dong	5.1	4.6	4.6	5.6	5.2	4.7	5.4	5.7	6	3.2	2.0	EDL	
Nam Ko	8.5	8	9.5	9	9.9	7.8	9.3	9.9	9.3	7	7.5	EDL	
Nam Ngay	0.6	0.8	1.8	1.8	2	1.9	2.2	2.3	1.7	0.8	NA	EDL	
Nam Boun 1	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NA	EDL	
Nam Sae	-	-	-	-	-	-	-	0.3	0.2	0.2	0.1	EDL	
Nam Mong	NA	NA	NA	NA	NA	NA	NA	0.3	0.1	0.2	NA	EDL	
Nam Nhone	-	-	-	-	-	-	7.4	10.3	11.6	11.5	7.3	Nam Nhone Power Company (IPP[d])	
Nam Tha 3	-	-	-	-	-	-	3.3	3.1	3.7	3.7	3.0	Nam Tha3 Power Company (IPP[d])	
Nam Long	-	-	-	-	-	-	-	-	1	30.9	31.8	Nam Long Power Company (IPP[d])	
Houay Ngou	-	-	-	-	-	-	NA	NA	0.1	0.1	0.1	PDEM	
Hongsa Lignite												2,245.5	Hongsa Lignite Power Company (IPP [e])
Nam Ngum 1	1,127.3	1,013.8	852.9	1,145.8	1,009.5	833.0	1,160.7	1,074.0	1,180.2	1,141.8	1,209.7	EDL-Gen	
Nam Leuk	227.2	225.2	196.0	252.3	166.3	218.1	253.4	186.5	215.6	197.3	221.6	EDL-Gen	
Nam Mang 3	188.9	187.6	155.9	223.8	192.5	196.6	216.8	192.5	188.2	177.7	181.0	EDL-Gen	
Nam Song	-	-	-	-	-	-	-	4.5	13.2	13.0	8.7	EDL-Gen	
Nam San	NA	NA	NA	NA	NA	NA	0.2	NA	NA	0.2	0.4	EDL-Gen	
Nam Sat	NA	NA	NA	NA	NA	NA	0.4	NA	NA	0.5	0.7	EDL-Gen	
Nam Et	NA	NA	NA	NA	NA	NA	0.2	NA	NA	0.0	0.7	EDL-Gen	
Nam Lik 1/2	-	-	-	-	-	277.4	561.6	435.0	435.0	435.0	510.7	Nam Lik 1/2 Power Company (IPP[d])	
Nam Ka	-	-	-	-	-	-	-	-	0.1	0.1	0	Nam Ka Power Company (IPP[d])	
Nam Ngum 5	-	-	-	-	-	-	-	-	500.0	500.0	520.8	Nam Ngum5 Power Company (IPP[d])	
Nam Ngum 2	-	-	-	-	-	-	2,779.9	2,098.0	2,506.5	2,118.8	2,155.2	Nam Ngum2 Power Company IPP(e)	
ANam Ngiep 3A	-	-	-	-	-	-	-	-	-	14.9	57.7	Phongsupthavy Construction Company Co. (IPP[d])	
Tadliang (Nam Saen)	-	-	-	-	-	-	-	-	-	3.1	13.8	Bor Thong Intre Company	
Nam Sana	-	-	-	-	-	-	-	-	-	-	34.2	EDL	
Nam Sun 3B	-	-	-	-	-	-	-	-	-	-	63.5	Phongsupthavy Construction Company Co. (IPP[d])	
Central 1													

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Appendix 5.3 continued

Plant Name	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Central 2											
Nam Phao	-	-	-	-	-	-	-	6.3	8.1	6.7	6.0
Nam Gnouang 8	-	-	-	-	-	-	-	-	269.3	368.4	208.5
Tadsalen	-	-	-	-	-	-	-	-	14.4	15.0	9.4
Theun-Hinboun	1,365.6	1,489.3	1,500.5	1,546.8	1,470.9	1,338.7	1,136.8	1,740.4	3,075.9	3,267.8	2,530.9
Nam Theun 2	-	-	-	-	-	4,909.9	6,318.0	6,029.0	6,274.0	6,184.0	5,644.0
Mit Lao Biomass Factory	-	-	-	-	-	-	-	-	4.7	4.1	2.4
Selabam	22.7	25.6	27.1	23.7	26.3	19.5	18.6	24.4	27.1	29.8	23.4
Xeset 1	135.3	174.6	150.5	115.5	169.3	116.5	163.8	155.5	171.8	180.1	136
Xeset 2	-	-	-	-	74.9	154.7	252.6	240.1	264.5	256.3	214.7
Houay Ho	428.8	466.4	474.7	392.6	257.5	370.4	89.5	542.2	328.3	612.0	371.2
Xekamman 3	-	-	-	-	-	-	-	-	0.6	0.0	16.1
Houay Samong	NA	NA	0.7	0.8	0.9	1.5	1.6	NA	NA	NA	NA
Houy Anh Biomass Power House	-	-	-	-	-	-	-	-	0.7	1.1	1.2
Xe Namnoy 1	-	-	-	-	-	-	-	-	-	52.9	61.4
Total	3,510.0	3,595.8	3,373.6	3,717.0	3,384.3	8,449.0	12,980.1	12,760.1	15,511.6	15,638.5	16,501.1
EDL	1,715.6	1,640.1	1,398.4	1,777.6	1,655.9	1,552.7	2,083.6	1,895.9	2,077.8	2,008.3	2,006.5
Private + IREP	0.0	0.0	0.0	0.0	0.0	277.4	572.3	454.6	1,248.6	1,447.5	1,531.8
IPP (e)	1,794.4	1,955.7	1,975.3	1,939.4	1,728.4	6,618.9	10,324.3	10,409.6	12,185.1	12,182.6	12,962.9

- = data not available, EDL= Electricité du Laos, EDL-Gen = EDL-Generation Public Company, GWh = gigawatt-hour, IPP (d) = domestic independent power producer, IPP (e) = export independent power producer, IREP= Institute of Renewable Energy and Promotion, NA = not applicable, PDEM= Provincial Department of Energy and Mines.

Sources: Ministry of Energy and Mines. 2017. *Electricity Statistics Yearbook 2015 of the Lao P.D.R.* Vientiane. Ministry of Energy and Mines. 2016. *Electricity Statistics Yearbook 2014 of the Lao P.D.R.* Vientiane.

Appendix 5.4: Summary of Planned Transmission Lines

No.	Project Name		Voltage (kV)	No.	Length		Project Period	COD	Ownership	Source of Funds	Status
	From	To			(km)	cct-Km					
1	Nam Khan 2	Nam Khan 3	115	2	14	28	2011–2015	2015	EDL	Exim Bank of Korea	
2	Mekong Sayaboury	Sayabouly	115	1	14	14	2012–2015	2015	EDL		
3	Na Mo (SWS)	Luangnamtha 1	115	1	43	42	2014–2016	2016	EDL	Kuwait	
4	Viengphukha	Luangnamtha 1	115	2	50	100	2014–2016	2016	EDL		
5	Nam Thong	Viengphukha	115	2	91	182	2014–2016	2016	EDL	Kuwait	
6	Nam Khan 3	Luang Prabang 2	115	2	11	22	2014–2016	2016	EDL	Kung Thai Bank	
7	Na Mo (SWS)	Boun Neua	115	1	92	92	2014–2017	2017	EDL	Exim Bank of Korea	
8	Xayaboury	Paklay	115	2	121	121	2014–2017	2017	EDL	Exim Bank of Korea	
9	M. Long	Viengphukha	115	2	50	100	2014–2016	2016	EDL		
10	Sen Souk	Luang Prabang 2	115	1	18	18	2014–2016	2016	EDL		
11	Nam Ngao	Houayxay	115	1	16	16	2015–2018	2018	EDL	PRC	
12	Nam Tha 1	Nam Thong	115	2	22	44	2015–2018	2018	IPP(d)		
13	Nam Beng	Pak Nguen	115	1	12	12	2015–2018	2018	IPP(d)		
14	Paklay	Tha Li	115	1	71	71	2014–2017	2017	EDL	Exim Bank of Korea	
15	Nam Thong	Houayxay	115	2	61	122	2015–2017	2017	EDL	NEDA (Thailand)	
16	Luang Prabang 2	Sayabouly	115	1	76	152	2012–2017	2017	EDL	YNPG (Export-Import Bank of China)	
17	Nam Pha	M. Long	115	2	50	100	2012–2017	2017	IPP(d)	Datang (PRC)	
18	Nam Seung 1	Siensouk	115	2	20	40	2017–2020	2020	IPP(d)	PRC	
19	Nam Ngao	Pakmong	115	2	38	76	2017–2020	2020	IPP(d)	EDL and PEA ENCOM	
20	Nam Seung 2	Nam Seung 1	115	2	38	76	2016–2020	2020	IPP(d)		
21	Nam Ngiep 3A	Na Hor (M. Koun)	115	1	3	3	2009–2014	2014	IPP(d)	Lao Company	
22	Nam San 3B	Thavieng	115	2	27	54	2014–2016	2016	IPP(d)	Planned	
23	Nam San 3A	Nam San 3B	115	1	10	10	2014–2016	2016	IPP(d)	Planned	
24	Nam Chiene 1	Thavieng	115	2	35	70	2014–2016	2017	EDL	Planned	
25	Phonsavan	M. Kham	115	1	56.2	56.2	2012–2016	2016	EDL	Export-Import Bank of China	
26	Ironmelting (Factory)	Khoksa-at	115	1	31	31	2012–2016	2016	EDL	Planned	
27	Phone Kor	Nabong 1	115	2	16	32	2012–2016	2016	EDL	Planned	
28	Nam Ngum 1 (Ext)	Nam Ngum 1	115	2	31	62	2015–2017	2017	EDL	Planned	
29	Namleuk	Thabok	115	1	36	36	2015–2018	2018	EDL		
30	Nam Phai	Nam PhaGnai	115	2	16	32	2014–2018	2018	IPP(d)	Planned	

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Appendix 5.4 continued

No.	Project Name		Voltage (kV)	No.	Length		Project Period	COD	Ownership	Source of Funds	Status
	From	To			(km)	cct-Km					
31	Nam Neun 1	M. Kham	115	2	50	100	2016-2019	2019	IPP(d)	Lao Company	
32	Nam Neun 3	Khorhing	115	1	5	10	2016-2019	2019	IPP(d)	Lao Company	
33	Nam Peun 1	Khorhing	115	2	22	44	2018-2020	2020	IPP(d)	Lao Company	
34	nam Peun 2	Nam Peun 1	115	1	12	12	2018-2020	2020	EDL	Planned	
35	Nam PhaGnai	Thongkoun 2	115	2	25	15	2013-2016	2016	IPP(d)	Lao Company	
36	Paklay	Non Hai	115	1	89	89	2015-2017	2017	EDL	ADB	
37	Nam Xam 1	Nam Xam 3	115	2	36	72	2016-2019	2019	IPP(d)		
38	Nam Lik 1	Hinheup	115	2	10	20	2017-2020	2020	IPP(d)		
39	Nam Hao	Nam Sim	22	1	18	18	2018-2020	2020	EDL	ADB	
40	Nam Bak 2	Thabok	115	1	55	55	2017-2020	2020	EDL	Planned	
41	Nam Bak 1	Thabok	115	2	64	128	2017-2020	2020	EDL	Planned	
42	Korhing	Viengthong	115	1	39	78	2016-2019	2019	EDL		
43	Nam Et 4	Nam Et 5	115	1	15	15	2018-2020	2020	IPP(d)		
44	Nam Et 5	Viengthong	115	1	57	57	2018-2020	2020	IPP(d)		
45	Nam Et 3	Nam Et 2	115	1	26	52	2018-2020	2020	IPP(e)		
46	Nam Et 1	Nam Et 2	115	2	47	94	2018-2020	2020	IPP(e)		
47	Thasala	Lak 20 (Pompik)	115	1	50	50	2013-2014	2014	EDL	Exim Bank India	
48	M. Phin	Nathone	115	2	120	240	2013-2015	2015	EDL	Exim Bank India	
49	Nongdeun	Taothan	115	2	148	296	2014-2016	2016	EDL	JICA	
50	Pakbo	Nongdeon	115	2	4	8	2014-2016	2016	EDL	JICA	
51	Nongdeun	Ban Met (Seno)	115	2	42	84	2014-2016	2016	EDL	Export-Import Bank of China	
52	Ban Met(Seno)	M. Phin	115	2	108	216	2014-2016	2016	EDL	Export-Import Bank of China	
53	Nam Hinboun	Khonsong	115	1	15	15	2012-2016	2016	EDL	Planned	
54	Lak 20	Nakadok (Miming)	115	1	23	23	2013-2015	2015	IPP(d)	Planned	
55	Nam Ngiep 1	Pakxan	115	1	35	35	2015-2018	2018	IPP(e)	Planned	
56	Kengsuaten	Nam Gnuang 8	115	1	20	20	2017-2019	2019	EDL	Planned	
57	Nam Mang 1	Tha Bok	115	1	12	12	2017-2019	2019	IPP(d)	Export-Import Bank of China	
58	M. Phin	M. Nong	115	2	53	106	2018-2020	2020	EDL		
59	Xelanong 2	M. Nong	115	1	18	18	2018-2020	2020	IPP(d)		
60	Xepon 3 (Down)	M. Nong	115	2	49	98	2017-2020	2020	IPP(d)	Planned	
61	Xelanong 1	M. Nong	115	2	16	32	2017-2020	2020	IPP(d)	Norway	

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Appendix 5.4 continued

No.	Project Name		Voltage (kV)	No.	Length		Project Period	COD	Ownership	Source of Funds	Status
	From	To			(km)	cct-Km					
62	Xe Neua	Sepon (Mining)	115	1	60	60	2016-2018	2018	IPP(d)	Planned	
63	Nam Phouan	Thavieng	115	1	30	30	2018-2020	2020	IPP(d)	Planned	
64	Xanamnoy 1	Nongbong (Sekong)	115	1	35	35	2012-2014	2014	IPP(d)	Lao Company	
65	Sugar Factory	Saphaothong	115	1	22.5	22.5	2012-2014	2014	IPP(d)	Viet Nam	
66	Houaylamphan Gnai	Nongbong (Sekong)	115	2	18	36	2013-2015	2015	EDL	Export-Import Bank of China	
67	Jiangxai	Bangyo	115	1	10	10	2013-2015	2015	IPP(d)		
68	Taothan	Nathone	115	2	63	126	2014-2016	2016	EDL	JICA	
69	Xeset 3	Pak Xong	115	2	3.2	6.4	2015-2017	2017	EDL	PRC	
70	Xepien...Xenamnoy	Sapathothon	115	1	8	8	2014-2017	2017	IPP(e)	Republic of Korea	
71	Nam Kong 3	Sugar Factory	115	1	40	40	2013-2015	2015	IPP(d)		
72	Nam Kong 2	Nam Kong 3	115	1	15	15	2014-2016	2016	IPP(d)		
73	Xelanong 2	Nathone (Saravan)	115	2	88	176	2018-2020	2020	IPP(d)	Planned	
74	Xekaman-Xanxai	Sapathothon	115	2	38	76	2014-2016	2016	EDL	ADB + Viet Nam	
75	HouayPaOay	Xekaman - Xanxai	115	1	42	42	2016-2018	2018	IPP(d)		
76	HouayChampi	Salabam	22	1	12	12	2017-2019	2019	IPP(d)	Lao Company	
77	Xeset 4	Xeset 3	115	1	8	8	2016-2019	2019	EDL	Planned	
78	Nam Phak/Houaykatam	Pak Xong	115	2	26	52	2016-2019	2019	IPP(d)	Planned	
79	Houaylamphan Gnai 1	Nongbong (Sekong)	115	1	20	20	2017-2020	2020	EDL	Planned	
80	Xekatom	Pak Xong	115	2	35	70	2017-2020	2020	IPP(d)	Planned	
81	Xedon 2.3	Nathone (Saravan)	115	1	41	41	2017-2020	2020	IPP(d)		
82	Mekong Tha Kno	Ban Hat Xan	115	1	19	19	2017-2020	2020	IPP(d)		
83	Xepon 3 up	M. Nong	115	2	46	92	2017-2020	2020	IPP(d)		
84	Na Mo	Pakmong	230	2	92	184	2013-2015	2015	EDL	China Development Bank	Under Construction
85	Pak Mong	Luang Prabang 2	230	2	97	194	2012-2015	2015	EDL	China Development Bank	Under Construction
86	Na Mo (SWS)	Phongsaly (Bountai)	230	2	74	148	2012-2015	2015	EDL	China Development Bank	Under Construction
87	Nam Ou 2	Pakmong	230	1	28	28	2014-2016	2016	EDL	China Development Bank	Under Construction
88	Na Mo (SWS)	Liming	230	1	27	27	2014-2016	2016	EDL		Under Construction
89	Pak Ngeuy	Luang Prabang 2	230	2	146	292	2015-2018	2018	EDL	Kung Thai Bank	FS

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Appendix 5.4 continued

No.	Project Name		Voltage (kV)	No.	Length		Project Period	COD	Ownership	Source of Funds	Status
	From	To			(km)	cct-Km					
90	Nam Ou 6	Phongsaly	230	2	55	110	2014-2016	2016	IPP(d)	Export-Import Bank of China	MOU
91	Nam Ou 5	Phongsaly	230	2	68	136	2014-2016	2015	IPP(d)	Export-Import Bank of China	MOU
92	Luang Prabang 2	Latsen	230/500	2	145	290	2015-2017	2017	EDL	Kung Thai Bank	MOU
93	Latsen	Thavieng	230	2	45	90	2015-2017	2017	EDL	Kung Thai Bank	MOU
94	Viengphukha	PakNguey	230	2	53	106	2015-2018	2018	EDL		MOU
95	Nam Ou 7	Nam Ou 6	230	2	37	74	2017-2020	2020	IPP(d)	Venture Capital and Equipment, Inc.	MOU
96	Nam Ou 3	Pakmong	230	2	48	96	2016-2020	2020	IPP(d)	PRC	Planned
97	Nam Ou 1	Luang Prabang 2	230	2	34	68	2016-2020	2020	IPP(d)	PRC	Planned
98	Nam Ou 4	Namo	230	1	75	75	2016-2020	2020	IPP(d)	EDL	Planned
99	Tha Bok	Nabong 1	230	2	54	108	2013-2015	2015	EDL	Exim Bank India	Under Construction
100	Thavieng	Pakxan 2	230	2	150	300	2013-2017	2017	EDL	China Development Bank	Under Construction
101	Nam Ngeip 2	Thavieng	230	2	18.5	37	2013-2017	2017	IPP(d)	Sinohydro (Export-Import Bank of China)	Under Construction
102	Naxaythong	Nabong 1	230	2	40	80	2015-2017	2017	EDL	Planned	FS
103	M. Naxaythong (Dans)	Naxaythong	230	2	8	16	2015-2017	2017	EDL	Export-Import Bank of China	FS
104	Thavieng	Laksao	230	2	209	418	2015-2018	2018	EDL		FS
105	Nam Ngum 1	Nabong 1	230	2	60	120	2015-2017	2017	IPP(d)		FS
106	HinHeup	Nam Ngum 1	230	2	33	66	2015-2017	2017	EDL		FS
107	Thavieng	Nam Mo 2	230	2	68	136	2017-2020	2020	IPP(d)		FS
108	M. Kham	Lat Sen	230	2	115	230	2015-2019	2019	EDL	Export-Import Bank of China	MOU
109	Nam Ngum 4	Laisen	230	2	22	44	2018-2020	2020	IPP(e)		MOU
110	HouaMuang (lignite)	HouaMuang S/S	230	2	85	170	2017-2020	2020	IPP(e)		Planned
111	Xamtai (lignite)	Nam Neun s/s	230	2	85	170	2017-2020	2020	IPP(e)		Planned
112	Khoksa at	Nabong 1	230	2	30	60	2015-2017	2017	EDL	Planned	Planned
113	M. Kham	Khorhing	230	2	50	100	2015-2019	2019	EDL		Planned
114	Nam Xam 3	Houa Muang	230	2	63	126	2016-2019	2019	IPP(e)	Planned	Planned
115	Nam Ngum 3	Latsen	230	2	38	76	2016-2018	2018	IPP(d)		Planned
116	Nam Et 2	Xam Neua	230	2	30	60	2018-2020	2020	IPP(e)	Planned	Planned

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Appendix 5.4 continued

No.	Project Name		Voltage		Length		Project Period	COD	Ownership	Source of Funds	Status
	From	To	(kV)	No.	(km)	cct-Km					
117	Nam Theun 1	Pakxan 2	230	2	47	94	2017-2019	2019	IPP(e)	Planned	FS
118	MK Paklay	Sanakham	500	2	60	120	2010-2020	2020	IPP(e)	Sinohydro (PRC)	Planned
119	PakNguen	MK Pakbeng	500	2	23	46	2010-2020	2020	EDL	EDL	Planned
120	Meuang Nan	Na Phia	500	2	135	270	2016-2019	2019	EDL	EDL	FS
121	Meuang Houn	Meuang Nan	500	2	105	210	2016-2020	2019	EDL	EDL	FS
122	MK Pakbeng	Nan (EGAT)	500	2	255	510	2015-2020	2020	IPP(e)	Dalang International	Planned
123	Mekong Sanakham	Non Hai	500	2	90	180	2010-2020	2020	IPP(e)	Planned	Planned
124	Non Hai	Ban Dansi	500	2	98	196	2012-2020	2020	EDL	Planned	Planned
125	Xam Neua	Latsene	500	2	170	340		2018	EDL		MOU, FS
126	Latsene	Danxi	500	2	216	432		2018	EDL		MOU, FS
127	Nam Theun 1	Thasara	500	2	53	53	2012-2018	2018	IPP(e)	Planned	Planned
128	Nam Theun 1	Tha Bok	500	1	101	101	2012-2018	2018	IPP(e)	Planned	Planned
129	Thavieng	Thasala	500	2	179	358		2018	EDL		FS, Rev. 1, October 2012
130	Thasala	Mahaxai	500	2	127	254		2016	EDL		FS, Rev. 1, October 2013
131	Mahaxai	Xeno (B Met)	500	2	86	172		2016	EDL		Final FS, Loan Processing
132	Xeno (B Met)	Salavan (Na Throne)	500	2	190	380		2016	EDL		Site Resurvey
133	Ban Lak 25	Border (Lao PDR)	500	2	60	120	2011-2017	2017	IPP(e)	Republic of Korea and Thailand and LHSE	Planned
134	Ban Hat Xan	Border (Lao PDR)	500	2	75	150	2012-2020	2020	EDL	Viet Nam	Planned
135	Salavan (Na Throne)	Xekong (Vangxang)	500	2	72	144		2016	EDL		Loan Processing
136	Pakxong	Ban Lak 25	500	2	80	160	2012-2020	2020	IPP(d)		Planned
137	Mahaxai	Pakkading	500	2	160	320	2015-2021	2021	EDL	Export-Import Bank of China	FS
138	Nam Ou (2), (5), (6)	Phongsaly, Pakmong	230	2	151	302	2014-2016	2016	IPP(d)	Export-Import Bank of China	Under Construction
139	Nam Ou (1), (3), (4), (7)	Nam Ou 6, Pakmong, Luang Prabang 2, Namou	230	2	214	383	2016-2020	2020	IPP(d)	Venture Capital and Equities, Inc.	MOU
140	LiMing (PRC)	Namou (Boder)	230	2	41	82	2012-2015	2015	IPP(d)	Kung Thai Bank	MOU
141	Na Mo (SWS)	Bountai	230	2	74	148	2012-2015	2016	IPP(d)	YNPG (Export-Import Bank of China)	MOU
142	Nam Ngeip 2	Thavieng	230	1	19	37	2013-2017	2017	EDL		Under Construction

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Appendix 5.4 continued

No.	Project Name		Voltage (kV)	No.	Length		Project Period	COD	Ownership	Source of Funds	Status
	From	To			(km)	cct-Km					
143	Na Mo	Pakmong	230	2	92	184	2013-2015	2015	EDL	China Development Bank	Under Construction
144	Pak mong	Luang Prabang 2	230	2	97	194	2012-2015	2015	EDL	China Development Bank	Under Construction
145	Na Mo (SWS)	Phongsaly (Bountai)	230	2	74	148	2012-2015	2015	EDL	China Development Bank	Under Construction
146	Thavieng	Pakxan 2	230	2	150	300	2013-2017	2017	EDL	China Development Bank	Under Construction
147	Na Mo (SWS)	Liming	230	1	27	27	2014-2016	2016	EDL	Export-Import Bank of China	Under Construction
148	M. Naxaythong (Dansi)	Naxaythong	230	2	8	16	2015-2017	2017	EDL	Export-Import Bank of China	FS
149	M. Kham	Lat Sen	230	2	115	230	2015-2019	2019	EDL	Export-Import Bank of China	MOU
150	Ban Hat	Saphaothong	230	2	160	320	2017-2020	2020	EDL	Export-Import Bank of China	FS
151	Sekong	Saphaothong	230	2	109	218	2018-2020	2020	EDL	Export-Import Bank of China	FS
152	M. Huen to M Nan to Xiengkhueng (Naphia)	Luang Prabang 2, Latsen (Naphia), Thavieng	500	2	336	672	2015-2018 2015-2017 2015-2017	2018 2017 2017	EDL	Kung Thai Bank	FS
153	Viengphukha	PakNguey	230	2	53	106	2015-2018	2018	EDL	Exim Bank India	MOU
154	Tha Bok	Nabong 1	230	2	54	108	2013-2015	2015	EDL	Export-Import Bank of China	Under Construction
155	Naxaythong	Nabong 1	230	2	40	80	2015-2017	2017	EDL	Export-Import Bank of China	FS
156	Thavieng	Laksao	230	2	209	418	2015-2018	2018	EDL	Export-Import Bank of China	FS
157	Nam Ngum 1, HinHeup	Nabong 1, Nam Ngum 1	230	2	93	186	2015-2017 2015-2017	2017	IPP(d) EDL	Export-Import Bank of China	FS
158	Thavieng	Nam Mo 2	230	2	68	136	2017-2020	2020	IPP(d)	Export-Import Bank of China	FS
159	Nam Ngum 4	Latsen	230	2	22	44	2018-2020	2020	IPP(e)	Export-Import Bank of China	MOU
160	Nam Theun 1	Pakxan 2	230	2	47	94	2017-2019	2019	IPP(e)	Export-Import Bank of China	FS
161	Xekaman 2B	Sekong	230	1	22	22	2015-2018	2018	IPP(e)	Export-Import Bank of China	FS
162	Mekong Donsahong	Thakho (T-Off)	230	2	5	10	2016-2018	2018	IPP(d)	Export-Import Bank of China	FS
163	Houamuang (lignite)	Houamuang S/S	230	2	85	170	2017-2020	2020	IPP(e)	Export-Import Bank of China	Planned

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Appendix 5.4 continued

No.	Project Name		Voltage (kV)	No.	Length		Project Period	COD	Ownership	Source of Funds	Status
	From	To			(km)	cct-Km					
164	Xamtai (lignite)	Nam Neun s/s	230	2	85	170	2017-2020	2020	IPP(e)		Planned
165	Khoksa at	Nabong 1	230	2	30	60	2015-2017	2017	EDL	Planned	Planned
166	M. Kham	Khorhing	230	2	50	100	2015-2019	2019	EDL		Planned
167	Ban Hat	230 kV Attapeu	230	2	190	380	2014-2018	2018	EDL	CGGC	Planned
168	230 kV Attapeu	500 kV B. Vangxang (Sekong) (S)	230	2	53	106	2014-2018	2018	EDL	CGGC	Planned
169	Nam Xam 3	Houa Muang	230	2	63	126	2016-2019	2019	IPP(e)	Planned	Planned
170	Nam Ngum 3	Latsen	230	2	38	76	2016-2018	2018	IPP(d)		Planned
171	Nam Et 2	Xam Neua	230	2	30	60	2018-2020	2020	IPP(e)	Planned	Planned
172	Xekong 3A	Sekong	230	1	13	13	2016-2018	2018	IPP(e)		Planned
173	M. Kalum (Lignite)	Nathone (Saravan)	230	2	87	174	2017-2020	2020	IPP(d)	Planned	Planned

ADB = Asian Development Bank, cct-Km = circuit kilometer, CGGC = China Gezhouba Group Co., COD = commercial operation date, EDL = Electricité du Laos, EGAT = Electricity Generating Authority of Thailand, FS = feasibility study, IPP(d) = domestic independent power producer, IPP(e) = export independent power producer, JICA = Japan International Cooperation Agency, km = kilometer, kV = kilovolt, Lao PDR = Lao People's Democratic Republic, LHSE = Lao Holding State Enterprise, MOU = memorandum of understanding, NEDA = Neighbouring Countries Economic Development Cooperation Agency, PRC = People's Republic of China, S/S = substation, SWS = switching station, YNPG = Yunnan Power Grid Company.

Source: Ministry of Energy and Mines.

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LAO PDR—ACCELERATING STRUCTURAL TRANSFORMATION FOR INCLUSIVE GROWTH

Country Diagnostic Study

The Lao People's Democratic Republic (Lao PDR) has shown remarkable progress by consistently building itself into a market-oriented economy, with economic growth in 1986–2016 averaging around 6.5% per annum. The rapid and sustained growth brought about changes in the structure of output, but did not alter job composition: resource-based products still dominate in industry, low value-added jobs in services, and 65% of the labor force in agriculture. This country diagnostic study provides comprehensive analysis and identifies promising new drivers of growth which the Lao PDR can develop to diversify its production structure and speed up structural transformation.

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