

# Chapter 5

## Information Technology in the Heavy Use of Cheap Electricity

August 2019

**This chapter should be cited as**

ERIA (2019), 'Information Technology in the Heavy Use of Cheap Electricity', in Ambashi, M. (ed.), *Development Strategy of Five Selected Sectors in the Lao People's Democratic Republic (2020-2025)*. ERIA Research Project Report FY2018 no.7, Jakarta: ERIA, pp.78–99.

## Chapter 5

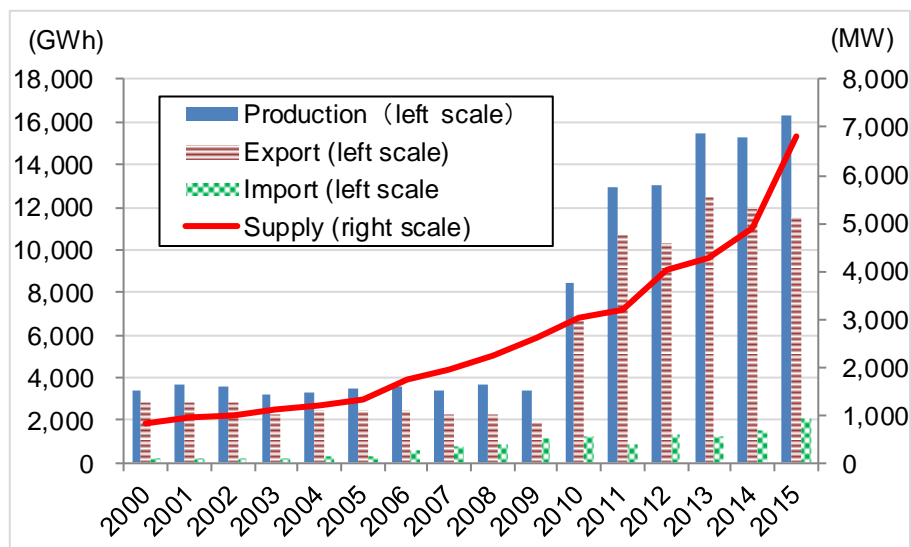
### Information Technology in the Heavy Use of Cheap Electricity

#### 1. Current State

##### 1.1. Use of Electricity in the Lao People's Democratic Republic

Currently, in the Lao PDR, electricity is generated in abundance, mainly by hydroelectric power, and the country exports electricity to Thailand in particular. Therefore, in the Lao PDR, the electricity rate is relatively low compared with neighbouring ASEAN countries.

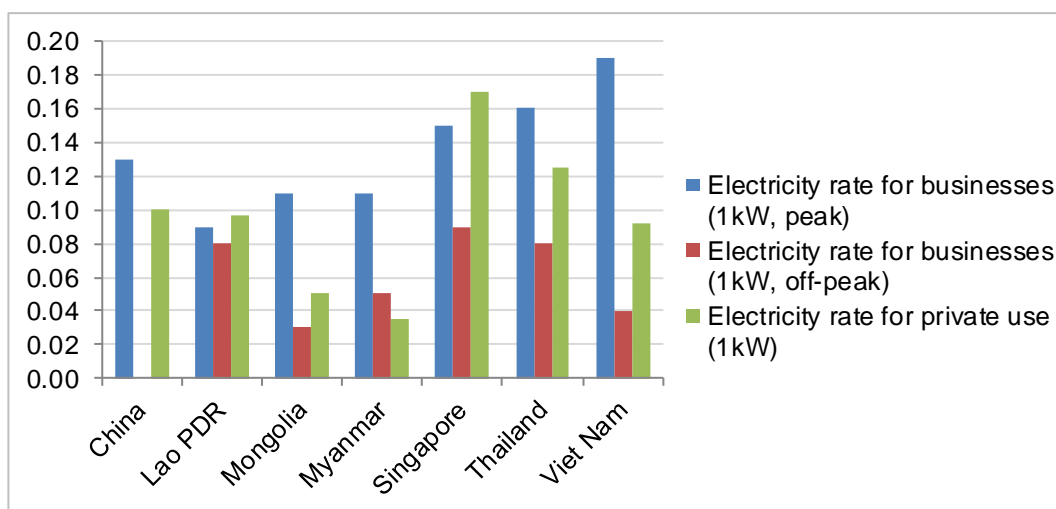
**Figure 5.1: Electricity Production, Import/Export Volumes, and Supply in the Lao People's Democratic Republic**



GWh = gigawatt-hour, MW = megawatt.

Source: Ministry of Energy and Mining, Lao People's Democratic Republic (2018), *Lao PDR Energy Statistics*. Jakarta: Economic Research Institute for ASEAN and East Asia (ERIA). <http://www.eria.org/publications/lao-pdr-energy-statistics-2018/> (accessed 13 April 2019).

**Figure 5.2: Electricity Rates in Southeast Asian Countries, 2016(\$)**



kW = kilowatt, Lao PDR = Lao People's Democratic Republic.

Source: Japan External Trade Organization (2018), 'The FY2017 Comparative Survey of Investment-Related Costs in Asia and Oceania' (in Japanese).

<https://www.jetro.go.jp/world/reports/2018/01/d78a35442e4ce3c0.html> (accessed 13 April 2019).

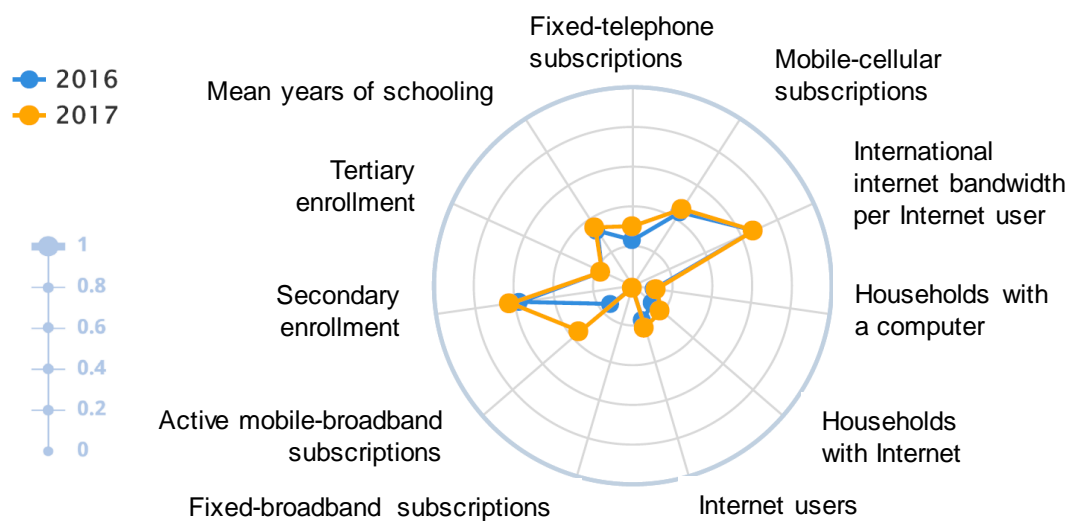
Regarding the export of electricity, the Lao PDR is currently prioritising supply to the Electricity Generating Authority of Thailand (EGAT). Even though domestic electricity demand has increased, exports are given precedence, and as a result, the Lao PDR imports electricity from the EGAT to make up for the ensuing shortage at home. Electricity with a voltage of 115 kilovolts is exported to the EGAT at a price of \$0.0368/kilowatt-hour (kWh) during off-peak times (from 10:00 p.m. to 9:00 a.m. on weekdays and all day long on Saturdays, Sundays, and Thai public holidays hours) and \$0.0491/kWh during peak times (9:00 a.m. to 10:00 p.m. on weekdays). Meanwhile, the import price is \$0.0411/kWh during off-peak times and \$0.0533/kWh during peak times (Lao Statistics Bureau, 2017). Thus, the Lao PDR is currently recording an import surplus in electricity trade, resulting in a deficit of around \$100 million.

## **1.2. Information and Communications Technology Industry in the Lao People's Democratic Republic**

The 2017 ICT Development Index of the International Telecommunication Union ranked the Lao PDR 139th in terms of ICT, meaning that the Lao PDR is less developed in this respect than its neighbouring countries, including Singapore (ranked 18th), Malaysia (63rd), Thailand (78th), Viet Nam (108th), Cambodia (128th), and Myanmar (135th). As for individual ICT-

related items in the Lao PDR in 2017, for every 100 inhabitants there were 17.72 fixed-telephone subscribers, 55.39 mobile-cellular subscribers, 21.9 internet users, 0.34 fixed-broadband subscribers, and 34.66 active mobile-broadband subscribers; moreover, 12.3% of households had computers and 18.7% of households had internet access (Figure 5.3).

**Figure 5.3: The Lao People’s Democratic Republic Various Statistics Profile**



Source: International Telecommunication Union (2017), ‘2017 Laos Country Profile’, ICT Development Index. <http://www.itu.int/net4/itu-d/idi/2017/index.html#idi2017economytab&LAO> (accessed 13 April 2019).

### 1.3. Number of Business Operators and the Employment Situation in the Information and Communications Technology Industry

As is the case in other developing countries, many ICT-related government projects in the Lao PDR currently depend on grant aid and soft loans from international organisations and foreign countries. Therefore, these projects have been carried out by companies from aid donor countries. In addition, since ICT companies in the Lao PDR have no experience in developing large-scale ICT systems and the skill level of the engineers is not high, they have been unable to win orders for the development of such systems; instead, orders are snatched away by companies from neighbouring countries, such as Thailand and Viet Nam.

JICA and the Lao ICT Commerce Association jointly conducted IT service market surveys between 2009 and 2012 (Lao ICT Commerce Association, 2013). In the Lao PDR, there are

only around 150 IT service companies, most of which are small with a workforce of 20 or fewer employees. Most IT service companies simultaneously operate as personal computer and telephone shops, or as internet cafes. Only around 30% provide IT services other than hardware sales. Furthermore, human resource development in the Lao PDR is still lagging. In recent years, an increasing number of young people have grown interested in becoming IT engineers in the Lao PDR as a result of the development of financial services and other fields requiring IT. However, only around 1,000 students graduate from national universities, colleges, and vocational schools annually, and of these, only around 10% become IT engineers. Hence, the supply of human resources is limited.

#### **1.4 Situation of the Internet in the Lao People's Democratic Republic**

There are around 5 million mobile phone subscribers in the Lao PDR (79.5% of the total population). Third-generation (3G) services became available in 2008, followed by Long-Term Evolution (LTE)/fourth-generation (4G) services in 2011, respectively. As price competition among telephone service providers has intensified, the internet use fee has been falling year after year. For example, the fee for asymmetric digital subscriber line services with an access speed of 512 kilobytes per second fell from \$80 per month in 2008, to a quarter of that level (\$18/month) in 2018.

As a result of the development of an optical fibre network, a fixed-line internet service with an access speed of 1 megabyte per second was available at a price of \$50 per month in the capital city of Vientiane as of 2018, while mobile phone internet access is available at \$1.80 per gigabyte. In addition, access improvement due to the diffusion of Wi-Fi connections at cafes, restaurants, and other locations has led to the spread of smartphones and tablet computers at an explosive pace, mainly among younger people in Vientiane. E-commerce trade is also starting to increase gradually, as banks such as Banque Pour Le Commerce Exterieur Lao Public are introducing e-commerce and banking settlement applications for practical use.

## **2. Information and Communications Technology Policy in the Lao People's Democratic Republic**

### **2.1 Orientation of the Five-Year National Socio-Economic Development Plan and its Assessment**

Under its Five-Year National Socio-Economic Development Plan, by 2020 the Lao PDR aims to (i) promote the development of basic communication infrastructure; (ii) promote e-commerce by providing high-speed, high-quality services; and (iii) enact a media protection law.

More specifically, it aims to (i) establish automatic post boxes in post offices in all districts and provinces by 2020, (ii) construct an internet backup centre in the northern and central regions by 2018, (iii) establish a national data centre as a place for consolidated electronic data, (iv) create an intranet and long-distance meeting system to link 50% of government offices, (v) electronically implement 50% of administrative work at government offices, (vi) establish ICT learning centres, and (vii) increase the gross domestic product growth contribution of the post and telecommunications sector to 8%.

While these targets are considered effective, it is not immediately clear what objective they are intended to achieve. In many cases, ICT development can proceed in an uncoordinated way unless the objective of the targets is clear. Therefore, it is necessary to set a unified objective and clearly determine the direction of development. For example, the Lao PDR should aim for full electronification of administrative work to reduce paperwork errors, prevent billing for unnecessary expenses, and lower personnel cost. If administrative work related to automobiles and land can be made electronic by 2020, 50% of all administrative work at government offices will be carried out electronically.

Further, the Lao PDR should reduce expenses related to meetings at government offices as well as travel expenses related to the meetings of public servants. In addition, to support emergency medical care in provincial regions, the Lao PDR should improve the communication environment by developing intra-nets at government organisations, and achieve time and cost savings by taking advantage of network-based remote meetings and diagnosis.

## **2.2. Information and Communications Technology-Related Policies and Laws in the Lao People's Democratic Republic**

Among the Lao PDRs' ICT-related policies is the National Information and Communication Technology Policy, which was approved as a prime ministerial order in 2009 (Sisombounh, 2012). This policy set the direction of ICT use in the Lao PDR. The objectives of this policy include the provision of ICT access to the Lao people, creation of an environment to promote investment in IT-related companies, establishment of a mechanism to protect information security, and dissemination of Lao-language content.

The revised Law on Telecommunications came into force in January 2012, and the Electronic Transactions Law, which prescribes the certificate authority that is indispensable to electronic signatures, came into force in December 2012 (Lao ICT Commerce Association, 2013). However, the Lao PDR still lacks a systematic national ICT strategy, master plan, or industrial promotion policy. This is presumably because, compared with other countries, the Lao PDR has very few senior government officials in decision-making positions who (i) correctly understand the fact that ICT is part of the industrial infrastructure, and will develop in the future in close collaboration with the global economy and all industries; and (ii) can formulate policies based on this understanding.

The realignment of government organisations approved at the first session of the 7th National Assembly in 2011 gave the MOPT and the Ministry of Science and Technology (MOST) jurisdiction over ICT. The MOPT absorbed the e-government project, the Lao National Internet Center, the Lao Satellite Project, and other matters that had been under the jurisdiction of the National Authority of Science and Technology (which was disbanded through the realignment). As a result, the MOPT has jurisdiction over the communications-related portion of ICT, while the MOST has jurisdiction over the technology-related portion. As the two ministries formulate policies and strategies individually, there is no clear unity in the Lao PDR's ICT policy.

## **3. Status of Cooperation and Activities by Donors, Among Others**

In the Lao PDR, the maternal mortality rate is high. In particular, it is a serious challenge to manage the health of expectant and nursing mothers and unborn children in mountainous

and other provincial regions where medical care is not available, mainly during the perinatal period (from the 22th week of pregnancy to the 7th day after birth). Therefore, under the ASEAN Smart Network Initiative of Japan's Ministry of Internal Affairs and Communication, from the viewpoint of medical care ICT, a remote medicine demonstration experiment was implemented to enable expert doctors to conduct examinations based on data on foetal heart rates and other items concerning expectant and nursing mothers sent from regional hospitals to the central hospital. Through a web video conferencing system, the doctors were able to identify the health conditions of the expectant and nursing mothers and unborn children, and provide health guidance, with the aim of lowering maternal and infant mortality rates.

JICA also implemented 'Human Resource Development in IT Service Industry at National University of Laos' as a technical cooperation project in 2008–2013. This was spurred by the concern that, as the Lao PDR was lagging in the introduction of IT and the development of this technology field, the gap between the Lao PDR and other countries in terms of economic development promotion taking advantage of IT would grow further. In March 2001, at the Seventh Party Meeting, it was stated that IT education was important and the Lao PDR would seek to invigorate the economy by making use of IT. In response to the statement concerning the importance of education in the IT field and the intention to invigorate the national economy by introducing IT in all fields (including not only communication but also tourism, transportation, health, and the environment), a seminar on policy for implementing industrialisation and modernisation in the Lao PDR was held for directors and other officials in high positions at all ministries and agencies in January 2003.

The Lao PDR's e-government project was jointly developed in 2006 by Alcatel Shanghai Bell of China and the Lao PDR's National Authority of Science and Technology with loans provided by China (Luanglath, 2010). This project established a nationwide optical fibre network and a Worldwide Interoperability for Microwave Access network in Vientiane, and provided hardware and networking equipment to individual government organisations. It also developed a national portal for e-government applications, service applications for government operation, and applications for the Lao people. However, as there has been no report on the status of use or the evaluation of those applications, it is highly likely that the portal is not in general use, either because the development of the applications was unsuccessful or because the applications did not reach the diffusion stage.



#### **4. Information and Communications Technology/Digitisation Strategies of Neighbouring Association of Southeast Asian Nations Countries**

Of the major ASEAN countries, Indonesia, the Philippines, and Viet Nam are still focusing their ICT policies on the development of broadband lines and other infrastructure. On the other hand, Singapore, Malaysia, and Thailand have entered the second stage of infrastructure development under digital policies that aim to achieve industrial and social advances by making use of ICT.

In particular, Singapore, the only developed country in the ASEAN region, is implementing a digital policy that uses various data and advanced forms of ICT to resolve social challenges, such as an ageing society and traffic problems. The use of various forms of data, including image data collected through sensors installed nationwide, and the active introduction of advanced technologies from countries outside the ASEAN region have enhanced national security. With the support of the Government of Singapore, there is growing room for companies facing constraints on the handling of personal information and other data in their home countries in particular to use Singapore's ICT environment as a testbed where a large variety of data can be used by companies outside the ASEAN region as well.

Thailand, under its digital policy, is seeking to achieve a shift in its industrial structure to avoid the 'middle-income trap.' For example, Thailand aims to strengthen manufacturing, agriculture, and small and medium-sized enterprises by taking advantage of digitisation. However, although the policy indicated the government's perception of challenges and principles of action, concrete measures are still under study. Thus, there is ample room for Thailand to accept proposals and investments from foreign governments and companies. Germany and China have already approached Thailand at the government level, and the government of Japan has recently concluded a memorandum of understanding on cooperation with Thailand.

On 26–27 November 2015, ASEAN held the 14th Meeting of Information and Communication Ministers in Da Nang, Viet Nam. At this meeting, it was confirmed that the ASEAN ICT Master Plan 2015 would be completed and that efforts would be made to advance the digital economy in the region, promote ICT connectivity, make progress in human resource development, and enhance security. In addition, the ASEAN ICT Master Plan 2020, which represents policy goals for 2016 to 2020, was announced. The new master plan prescribed

the following strategic initiatives: (i) economic development and transformation, (ii) integration and empowerment of people through ICT, (iii) innovation, (iv) ICT infrastructure development, (v) human capital development, (vi) ICT in the ASEAN single market, (vii) new media and content, and (viii) information security and assurance. The meeting ultimately adopted the Da Nang Declaration, which was subtitled 'Towards a Digitally-Enabled, Inclusive, Secure and Sustainable ASEAN Community' (ASEAN Ministers of Telecommunications and Information Technology, 2015). On 27 November, the 10th Japan–ASEAN Meeting of Information and Communication Ministers was held in the same location. At this meeting, Japan and ASEAN jointly announced 'ASEAN Smart ICT Connectivity,' which offers a vision of cooperation following the ASEAN ICT Master Plan 2020.

## **5. Advantages of and Bottlenecks for Information Technology in the Heavy Use of Cheap Electricity**

### **5.1. The Advantages of the Lao People's Democratic Republic**

The Lao PDR has the following advantages in the IT industry:

- (i) Since the Lao PDR generates large volumes of electricity through renewable energy, it can supply electricity at low prices and in a stable manner. The key point is a stable supply of electricity, which is the lifeblood of ICT.
- (ii) In the Lao PDR, communication infrastructure has been developed to a certain degree, and the communication environment is particularly stable in and around Vientiane. The stability of communication infrastructure, which is a vital ICT network, is also a very important point.
- (iii) The political situation in the Lao PDR is stable.
- (iv) The frequency of earthquakes and other natural disasters is low. From the viewpoint of physical protection of data, national stability and the low frequency of natural disasters is important in the selection of locations for data centres and other ICT facilities.

## **5.2. The Lao People's Democratic Republic's Bottlenecks**

In contrast to the abovementioned advantages, the following bottlenecks should be noted. The first problem concerns leadership. The Lao PDR lacks human resources with practical knowledge of ICT. Second, it is difficult to procure funds for the development of ICT-related projects. Due to globalisation, ICT-related support provided by international organisations and donor countries has come to play a central role in ICT-related projects in developing countries. As a result, developing countries themselves are lacking the systems, organisations, and knowledge necessary to address ICT-related problems proactively. In addition, due to insufficient social and economic development, the level of recognition and understanding of the importance of promoting the ICT industry is low, as is the priority placed on doing so.

Another problem is related to the quality of ICT-related human resource development and institutional tendencies. Although there is some degree of recognition of the importance of the ICT industry, there is not sufficient understanding of concrete approaches, including knowledge of which industries ICT should be applied to, and basic points such as how concrete approaches can be developed. In addition, just as there is a lack of understanding of electronic processing of administrative work, importance is attached to the existing method of paper-based processing with respect to import, export, and application forms. Therefore, institutional tendencies exist that are detrimental to improving the efficiency of administrative work and reducing personnel cost through the use of ICT.

Another problem relates to the development and use of infrastructure. While hardware is important with respect to ICT, the design and development of software, which is provided as a service, is of primary importance. In the Lao PDR, priority is often placed on hardware, but the country must sufficiently understand that software is of primary importance with respect to ICT.

Finally, there is a problem with coordination among the government, private sector, and nongovernment organisations (including universities and other research institutions). The major factor behind this problem is that, as a firm ICT policy has not been formulated, various donor countries and organisations are introducing technologies presumed to be necessary and effective without coordination, resulting in very low efficiency.

**Box 5.1: Main Points of Attention Related to the Information and Communications  
Technology Strategy**

We explain certain factors related to an effective information and communications technology strategy that are important for the Lao People's Democratic Republic in particular.

- (i) The principle of market competition alone will not bring successful results. Although introducing the principle of market competition (or market opening) is important to promote the reduction of broadband fees, this alone will not yield successful results. Appropriate policy and regulation intended to promote both supply and demand are essential.
- (ii) Communication infrastructure development is inadequate. There is a lack of infrastructure, particularly in thinly populated regions. As infrastructure investment is essential, it is necessary not only to reduce investment risk but also to implement policy measures to provide an incentive. For example, necessary policy measures include subsidies, tax exemptions, sharing of communication lines across companies, and public-private partnership. In addition, deregulation measures to promote the entry of new business operators and innovation are also important.
- (iii) It is difficult to provide follow-up support in thinly populated provincial regions. Regarding the development of infrastructure and provision of services in provincial regions where the population (number of users) is too small to generate sufficient profits for businesses, it is key for the government to provide communication business operators with incentives through subsidies and tax exemptions. It is also important to develop local content and services. Since it is necessary to look for users abroad, deregulation and preferential measures should be implemented to promote entry by foreign investors.
- (iv) The government's leadership is important for maximising the effects of broadband (e.g. job creation, job efficiency improvement, productivity improvement, and economic benefits). While many countries have formulated and implemented policies to promote a shift to broadband, such policies should be comprehensive. The policies should cover both supply and demand; for example, the government should encourage information and communications technology use among people at the bottom of the economic pyramid while promoting infrastructure investment.

## **6. Policy Recommendations**

As a result of the arrival of technologies based on a blockchain, which has been attracting attention in recent years, new businesses such as FinTech and currency mining have emerged. Since these technological innovations are electricity-hungry, they are promising industrial fields in the Lao PDR. To promote ICT in the heavy use of cheap electricity in the Lao PDR, it is essential to invite data centres and other ICT industry businesses, while promoting the Lao PDR's domestic ICT industry. To this end, we present several recommendations below.

### **6.1. Concrete Measures for Industrial Promotion**

#### **Inviting Data Centres and Other Electricity-Hungry Information and Communications Technology Industry Businesses**

The computer systems used in data servers, at data centres, and for currency mining consume a large volume of electricity, and electricity is also used to cool equipment. These systems require a constant supply of electricity. In addition, since important data are handled, systems must be established to guard against natural disasters. In this regard, the Lao PDR is the ideal location for the installation of these computer systems since it has a stable supply of electricity and a low risk of natural disasters and political disturbances. In particular, companies devoting efforts to environmental conservation, such as Google and Apple, are beginning to attach importance to business operations based on renewable energy. Therefore, it is necessary to indicate a clear framework and preferential measures for investment in and the introduction of computer systems.

#### **Inviting Information and Communications Technology Industry Businesses Requiring Physical Input Processes, Such as Data Inputting and Processing**

Many IT industry businesses still require physical input processes, such as map preparation, outsourcing of administrative work, and email-based call centres. If the abundant and cheap human resources in the Lao PDR are employed to perform these processes after receiving basic education, this will create many jobs. To this end, it is necessary to provide general computer knowledge and education to the human resources required by the ICT industry.

## **6.2. Improving Conditions**

### **Promoting Basic Education in Preparation for a Shift to the Information and Communications Technology Industry**

As many industries use ICT, educational institutions at every level must provide basic ICT-related education. Moreover, personnel involved in policymaking, including senior public officers, should acquire practical knowledge related to ICT strategy, and an environment favourable for indicating the Lao PDR's advantages to domestic industries and foreign investors should be developed. The mechanism of the blockchain is important as an advanced and fundamental new digital technology, and it is necessary to popularise blockchain technology.

### **Information Sharing Intended to Enhance the Information and Communications Technology Industry's Technological Capabilities**

It is important for the MOIC and the National University of Laos to play a central role in developing a freely accessible database. Specifically, the sharing of basic information should be promoted, based on the concept that, if the public understand what ICT is, which industries use ICT in which ways, and which technologies will be introduced in the future, efficient business management will become possible even in the Lao PDR, despite its small population. In addition, the MOIC should implement industrial policy measures and the MOST and MOPT should cooperate in developing communications regulations, while prioritising the execution of an ICT strategy as an industrial policy.

### **Establishing an Inter-Ministerial and Inter-Agency Platform Concerning the Information and Communications Technology Industry**

The ICT industry represents an amalgamation of diverse technologies in the fields of communication and finance. Thus, the MOIC must be involved and many ministries and agencies must cooperate to promote the industry's development. It is necessary to establish an inter-ministerial and inter-agency platform for policy and legislation development, industrial promotion, education, and training in the field of ICT. As ICT is an industrial sector using cutting-edge technologies, cooperation among international organisations and other

donors from ICT-advanced countries, including the US and Japanese embassies, should be promoted through this platform to set policy principles and work out concrete measures. This will make it possible to promote the ICT industry in a relatively consistent manner.

### **Strengthening Lao ICT Commerce Association**

Although only very large companies can make technological advances in terms of hardware in the ICT industry due to the industry's research-oriented nature, small companies can achieve growth with respect to the internet of things technology, which centres on software. To support ICT businesses in the Lao PDR (especially small companies), the Lao ICT Commerce Association (LICA) was set up in 2006 under the auspices of the Lao National Chamber of Commerce and Industry, which consists of ICT service companies, software houses, system integrators, training institutions, and internet service providers. The LICA aims to nurture and enhance ICT players, start-ups, and entrepreneurs, and thereby, to realise sustainable economic development through a digital ecosystem in the Lao PDR. Thus, strengthening the role of the LICA has become increasingly important with an emergence of advanced ICT.

Key focuses of the LICA should include (i) providing more assistance and services to affiliated members; (ii) satisfying the demands and requirements of society; (iii) promoting the Lao ICT industry in collaboration with the Lao government; (iv) planning and implementing an ICT roadmap based on the perspective of the private sector; (v) facilitating the application of the latest ICT innovations (such as artificial intelligence, big data, blockchain, the cloud, and the internet of things) to industries and sectors within the Lao PDR and other countries; and (vi) improving the quantity and quality of ICT services by establishing certifications and providing skills training. Further, it is necessary to build close cooperation among relevant ministries (e.g. the Ministry of Post and Telecommunications and the MOIC) on a common platform to develop effective policies to catch up with the new wave of ICT and digitalisation.

### **Promoting Loans to the Information and Communications Technology Industry**

In the ICT industry, even small companies can approach many businesses if they possess computers and the necessary knowledge for software development. Since the possibility of failure is small if the right goal and market direction are set, the ICT industry can be

invigorated by promoting small-lot and short-term loans (that is, small by the standards of the business world).

### **Method of Regulating the Information and Communications Technology Industry**

Around the world, it is difficult to regulate the ICT industry pre-emptively because of its unique nature. While it is usually possible to implement regulation based on prohibitive provisions of basic laws, when business practices in cutting-edge fields may fall into a legal grey zone, countries exercise regulation gradually (e.g. when a practice has caused or may cause a disadvantage). It is mostly unclear what kind of problems may emerge until the ICT industry moves forward. Therefore, to promote the introduction of foreign capital, it is important to first let the industry grow so that human resources can be developed, and then implement regulation when a business practice has caused a disadvantage. In addition, to avoid inequality among stakeholders, it is important to design effective systems when the government formulates relevant laws.

### **Preferential Measures Related to Domestic Electricity Consumption**

The electricity rate in the Lao PDR is currently lower than the rates in neighbouring countries, and this availability of cheap electricity is very attractive for ICT industry businesses, particularly those requiring massive electricity consumption for data storage and processing (the cooling of heat generated through data processing also requires massive electricity consumption). The Lao PDR's low electricity rate and abundant electricity generating capacity should be exploited to promote stable use in the Lao PDR. Therefore, as in the case of specified industries, such as agriculture, it is necessary to implement some preferential policy measures for ICT industry businesses that constantly consume electricity on a large scale. This is necessary both because the stability of their electricity demand will improve the efficiency of electricity sales, and because electricity consumed by the domestic ICT industry will create more jobs than will sales of electricity to foreign countries.

Moreover, in the future, it will become necessary to shift to a sustainable energy policy by creating smart cities in the Lao PDR, promoting energy conservation, and shifting from existing energy to electricity through the diffusion of electric cars within the ASEAN region.



## **A Shift to Information and Communications Technology in the Lao People’s Democratic Republic’s Administrative Systems**

The Lao PDR’s population is small, and the country is lagging in the development of its ICT environment, as well as in the dissemination of mobile phones and internet access. Paradoxically, this presents the Lao PDR with an advantage enabling it to introduce quickly the most advanced systems and software. The Lao PDR should exploit this advantage to digitise its administrative systems (such as systems for various applications and registrations, management of the cadastre, communications and email systems of government ministries and agencies, management of drivers’ licenses and automobiles, and management of registries of public servants and citizens, among others) and its currency,<sup>1</sup> and introduce its own virtual currency.<sup>2</sup> Through these measures, the Lao PDR will be able to invigorate related industries. It is also necessary to indicate guidelines for actions to be taken in individual sectors, and to develop policy measures to promote cooperation by international organisations and investments from companies on a business-by-business basis.

### **Box 5.2: Trends in the Development of Information and Communications Technology**

#### **(i) Current Situation of Information and Communications Technology Worldwide**

Information technology (IT) refers collectively to technologies related to computers and the internet. The Information Technology Association of America defines this as ‘the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware.’ In many cases, the term information and communications technology (ICT), which covers the field of communications technology as well, is also used. Under the present global trend, these technologies are ultimately moving toward realising the internet of things.

IT is used in a broad range of industries. Its applications include (a) the development of websites and computer-aided design of buildings; (b) the operation of e-commerce sites as represented by Amazon; (c) the management of information and data, including patient information at hospitals and land information; (d) visual information for electronic maps used by Google Maps

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<sup>1</sup> This refers not to the introduction of banking and other application services but to the digitisation of the existing currency. The digitisation of the currency itself will make it possible to manage the movement of funds, thus enhancing transparency over tax revenue, preventing fraud, strengthening control of criminal funds, and reducing currency management costs.

<sup>2</sup> Unlike in the case of currency digitisation mentioned above, introducing a virtual currency and opening an exchange will improve the environment for introducing funds directly from other countries.

and other electronic map data used for autonomous driving (the use of which is expected to increase in the future); (e) the management of funds and processing of money transfer data used in financial services; and (f) the collection and analysis of big data used by Facebook and Line. Industries using IT can be roughly divided into two groups: (a) industries that use computers and the internet to improve the efficiency of existing working processes, and (b) new industries that have emerged as a result of the improved performance of computers and the development of the internet.

The first group improves the efficiency of administrative work. In particular, as processes involving human workers are reduced, errors and expenses decrease. In addition, since artificial intelligence (AI) technology has advanced sufficiently to enable AI systems to make routine judgments and those based on accumulated past data on behalf of humans, AI is being applied to image-based diagnosis using X-ray and computer tomography images. This means that it is possible to reduce wasteful investments and invest more appropriately and efficiently by clearly dividing work processes into those that can be performed (a) only by humans, or (b) other processes.

The second group is represented by industries based on new technologies, such as virtual currency, which cannot function without relying on networks and computing capacity. These industries replace existing inefficient infrastructure with efficient ones and make it possible for anyone to access infrastructure at very low cost.

Looking at the current situation of the ICT industry in the Lao People's Democratic Republic, it should be kept in mind that no company has yet advanced into any ICT business there on a large scale and that the country has not yet produced a large number of workers with advanced IT skills.

#### **(ii) Trend of Social Development using Information and Communications Technology**

The term ICT4D (information and communications technology for development) refers generally to the application of ICT in such fields as socio-economic development and international development. For ICT4D, the matter of direct concern is application research of IT for the purpose of resolving poverty. ICT applications include direct use of ICT for the benefit of people in need and indirect use, whereby ICT is used to support foreign aid donor organisations, nongovernment organisations, governments, and companies to improve socioeconomic environments in general. In many poor regions around the world, laws to realise and promote ICT applications need to be enacted, and administrative surveys need to be conducted out of consideration of the risk of monopolisation of communication infrastructure and censorship.

While the vision of ICT4D may be interpreted to be intended to support people in need around the world, it is typically related to the application of ICT to developing countries. ICT4D has come to be recognised as an interdisciplinary research field as a result of an increase in academic associations, workshops and publications that discuss it. The needs for research in this field have grown partly because ICT can be used to examine the effects of various ongoing projects and also because scientifically verified benchmarks and results have become necessary. Currently, many international organisations recognise the importance of ICT4D. For example, the World Bank's Global Information and Communication Technology department has a team of around 200 members that is specialised in dealing with problems related to this field.

In many cases, ICT4D ideas and projects are planned and implemented by international organisations, private companies (e.g. classmate PCs developed by Intel), governments (e.g. the E-Mexico plan), nongovernment organisations (e.g. Institute for International Cooperation and Development), and virtual organisations (e.g. a nonprofit organisation called One Laptop Per Child).

As an example of the impact of ICT in developing countries, farmers are obtaining and making use of better market price information to increase their income. Further, in the Republic of Burundi, mobile communication and radio broadcasting are being used in the fight against a corrupt society.

ICT4D projects aim to resolve at least one of the following challenges:

- (a) Opportunity and infrastructure: provide appropriate hardware, operating systems, software, and internet connection.
- (b) Capacity building and training in the ICT field: provide education on basic computer knowledge, hardware and software development, and digital literacy.
- (c) Digital contents and services: improve access to digital technology by providing computer-based services and business processes, and a system for the use of computers in local languages.
- (d) Control of the ICT sector and digital rights: enhance intellectual property rights, privacy, and security.
- (e) Resolution of social issues in the ICT space: resolve gender issues, health and medical care issues, and development-related technical issues.

### **(iii) Paradox in Information and Communications Technology Development**

Just as there is a ‘development paradox,’ where the use of funds for the development of developing countries does not lead to actual development, there is a ‘productivity paradox,’ where companies’ investments in ICT do not lead to a productivity improvement. In the field of ICT4D, both of these paradoxes apply, as shown by the fact that many ICT4D projects are considered failures. This is because developing countries’ ICT policies lack the following:

- (a) coherence with the main development challenges (e.g. economic, environmental, security, and other challenges) faced by developing countries in the 21st century;
- (b) coherence with the ICT4D value chain—ICT policies focus exclusively on superficial challenges, such as the development of ICT infrastructure and access improvement, and thus fail to cover the last stage of the process of ICT, which is producing an actual impact (i.e. ICT value chain) as represented by the assurance of sustainability and the method of adaptation to ICT.
- (c) coherence with development policies; and
- (d) delivery of ICT policy coherence—apart from support for the specifics of ICT policies (‘what’), there is no support for the method of implementation, including how to formulate policies (‘how’).

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