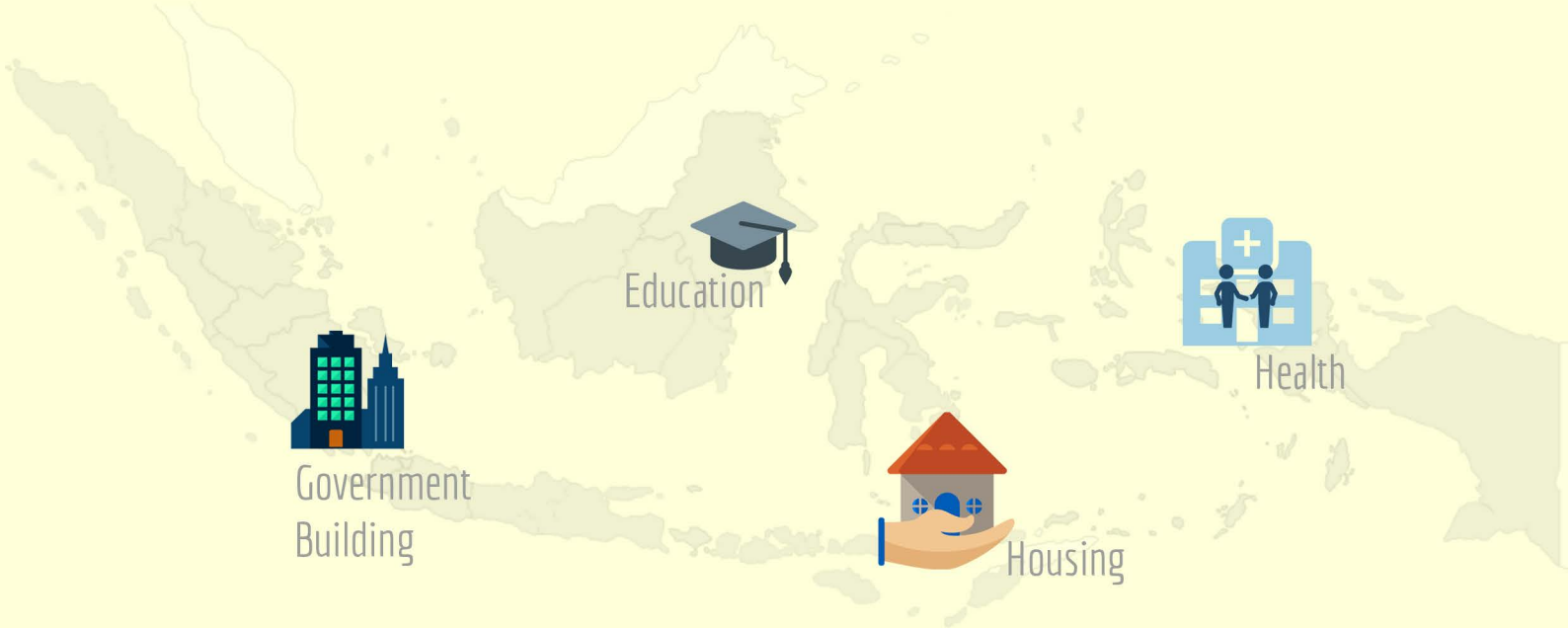
ESTIMATING THE DEMAND

FOR SOCIAL INFRASTRUCTURE INVESTMENT IN INDONESIA



Institute for Economic and Social Research
Faculty of Economics and Business Universitas Indonesia

FINAL REPORT

ESTIMATING THE DEMAND FOR SOCIAL INFRASTRUCTURE INVESTMENT IN INDONESIA

August 2018

Prepared by
Principal Investigator: Dr. Koki Hirota
Team Member of JICA: Tsuyoshi Hara, Fumiaki Ishizuka, Rinko Jogo
Team Member of LPEM FEB UI: Dr. Teguh Dartanto (Co-Principal Investigator), Dr. M. H. Yudhistira, Chairina Hanum, Andhika P. Pratama, M. Sowwam, Edith Zheng Wen Yuan, M. Iqbal and Moslem Afrizal

This report was prepared by the Institute for Economic and Social Research, Faculty of Economics Universities Indonesia (LPEM-FEUI) in collaboration with Japan International Cooperation Agency (JICA) as a background paper for the Research on Demand Estimate on Infrastructure in Asia.

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FOREWORD

Providing social infrastructure remains a challenge in Indonesia. Since it is not only become a complement for economic infrastructure but also will bring a significant impact on Indonesian human development as well as sustainable economic growth. As the implementation of *Jaminan Kesehatan Nasional*, increasing number of productive population and also increasing socio-economic welfare, the demand of social infrastructure in Indonesia tends to increase. This mean, the Government of Indonesia (GoI) has a big task to fulfilling the needs. Given to the limited amount of national budget for social infrastructure provision, the GoI needs to know the needed investment amount and also financing option.

This study provides such comprehensive information of the current trend of Indonesia's social infrastructure and estimation of its future demand. This study also illustrates the level of social infrastructure provision in Indonesia and relative to ASEAN level. Furthermore, this is the first study that estimate the investment need in social infrastructure need, covering education, health, housing, and government, using Indonesia as the pilot project and could be broaden to Asia level. This study also tries to find out the financing option.

This is the internal final report of ***"Estimating the Demand for Social Infrastructure Investment in Indonesia"*** which is conducted by the Institute for Economic and Social Research, Faculty of Economics Universities Indonesia (LPEM-FEUI) in collaboration with Japan International Cooperation Agency (JICA). I hope that JICA could disseminate this report to public as a part of knowledge sharing initiative.

On behalf of the Institute, I would like to appreciate JICA-Indonesia and JICA Headquarter Tokyo for giving us the opportunity to collaborate in this study. I specifically thank to Dr. Koki Hirota (JICA Tokyo as Principal Investigator), Tsuyushi Hara (JICA) and Fumiaki Ishizuka (JICA) for their constructive idea, participation and also valuable inputs on workshop and also Jogo Rinko (JICA) for important and useful inputs that have helped us improve this report. Last but not least, I would like to give my sincere thanks to the research team: Teguh Dartanto (Co-Principal Investigator), M. Halley Yudhistira, C. Hanum Siregar, Muhammad Sowwam, Andhika Putra Pratama, Edith Zheng Wen Yuan, M. Iqbal and Moslem for completing this study.

Jakarta, September 2017

Riatu Mariatul Qibthiyyah, Ph.D

Director

ABBREVIATION

ADB	Asian Development Bank
AP	Availability Payment
AMDAL	*Analisa Dampak Lingkungan* (Environmental Impact Analysis)
ASEAN	Association of Southeast Asian Nation
ASKRINDO	*Asuransi Kredit Indonesia* (Indonesian Credit Insurance)
Bappenas	*Badan Perencanaan Pembangunan Nasional* (National Development Planning Agency)
BKN	*Badan Kepegawaian Negara* (National Civil Service Agency)
BOK	*Bantuan Operasional Kesehatan* (Health Operational Cost)
BOKB	*Bantuan Operasional Keluarga Berencana* (Family Planning Program Operational Cost)
BOT	Built-Operate-Transfer
BPJS Kesehatan	*Badan Pelaksana Jaminan Sosial Kesehatan* (Social Security Agency for Health)
BPS	*Badan Pusat Statistik* (Central Statistical Agency)
BUMN	*Badan Usaha Milik Negara* (State Owned Enterprise)
CEIC	Census and Economic Information Center
DAK	*Dana Alokasi Khusus* (Special Transfer Fund)
DAK Fisik	*Dana Alokasi Khusus* (Physical Special Transfer Fund)
DAU	*Dana Alokasi Umum* (General Transfer Fund)
GDP	Gross Domestic Product
FLPP	*Fasilitas Likuiditas Pembiayaan Perumahan* (Liquidity Facility for Housing Mortgage Policy)
IDR	Indonesia Rupiah
IIGF	Infrastructure Guarantee Fund
JAMKESMAS	*Jaminan Kesehatan Masyarkat* (Government Subsidized Health Insurance)
JKN	*Jaminan Kesehatan Nasional* (National Health Insurance)
Kemendikbud	*Kementrian Pendidikan dan Kebudayaan* (Ministry of National Education and Culture)
KIK – EBA	*Kontrak Investasi Kolektif Efektif Efek Beragun Aset* (Contract - Security Backed Asset)
KPPIP	*Komite Percepatan Pembangunan Infrastruktur Prioritas* (Committee of Infrastructure Priorities Development Acceleration
MI	*Madrasah Ibtidaiyah*
MoH	Ministry of Health

NJOP	Nilai Jual Obyek Pajak (Tax Object Sale Value)
PHK	*Pemutusan Hubungan Kerja* (Termination of Employment)
PPP	Public Private Partnership
Puskesmas	*Pusat Kesehatan Masyarakat* (Community Primary Healthcare)
RSU	*Rumah Sakit Umum* (General Hospital)
RSK	*Rumah Sakit Khusus* (Special Hospital)
SD	*Sekolah Dasar* (Elementary School)
SDN	*Sekolah Dasar Negeri* (Public Elementary School)
SDGs	Sustainable Development Goals
SNG	Sub National Government
SPV	Special Project Vehicle
SUSENAS	*Survey Sosial Ekonomi Nasional* (National Socioeconomic Survey)
USD	US Dollar
UN	United National
WHO	World Health Organization

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ABSTRACT

There is no a shortcut for fostering economic growth without investing in physical and social infrastructure. Despite improvements in social infrastructure provisions, Indonesia still lags behind other ASEAN countries and Indonesia also faces a domestic problem of unequal distribution of social infrastructure. How much social infrastructure investment is needed in Indonesia to facilitate and boost economic growth as well as to address the population dynamics? Using macro and micro approaches, this study estimates the social infrastructure demand, including education, health, housing, and government office building. While Indonesia needs 5.5%-5.7% of GDP annually to fulfill the demand of physical infrastructure, our study reports that Indonesia needs USD719.7-USD747.74 billion to fulfill its social infrastructure need over 2016-2030, which will account for 3.7%-3.9% of projected GDP annually. A large part of investment will go toward the education and housing sector, which accounts for more than 67.7%-71% of total projected investment. Indonesia, however, should invest around 2.1-2.2% of GDP annually in education and healthcare facilities to prepare for human capital development that meets future economic challenges. Moreover, housing for the low-income group will also be a challenge for the Indonesian government due to a high investment demand that takes around 1.4-1.5% of GDP. This result is of interest to the government, particularly when dealing with the priority of public spending on social infrastructure. Due to the resource constraint, the government should focus first on education and healthcare. The government has underinvested in social infrastructure investment, leaving a financing gap challenge. Since the government faces difficulties in raising the tax ratio and other revenues, Public Private Partnership (PPP) as innovative and creative financing schemes should be promoted to deal with the resource constraint.

Keywords: Social Infrastructure, Health, Education, Housing, Public Private Partnership

CHAPTER 1
SOCIAL INFRASTRUCTRE AS A SOURCE OF FUTURE ECONOMIC GROWTH

Why are Japan, South Korea, and Singapore more advanced and developed than many other Asian countries? Why are some countries still lagged behind? There are various reasons and associated answers to these questions; however, one of them is the fact that all of these nations have very good infrastructure. There is no shortcut for fostering economic growth without investing in sound infrastructure. Infrastructure facilitates and spurs economic growth by providing better connectivity and enhancing productivity and efficiency. Well-developed physical infrastructure such as ports, roads, highways, and bridges will reduce the effect of distance between regions, integrating and connecting the local and national markets at low cost to markets in other countries and regions. Effective modes of transportation including quality of roads, railroads, ports, and air transport access would enable business sectors to get their goods and services to market in a secure and timely manner. Yudhistira and Sofiyandi (2017) clearly show that access to seaports has positive effects on GDP per capita and labor productivity as well as a decrease in poverty in Indonesia. On the other hand, a broadband internet network as a means of solid and extensive communications allows for a rapid and free flow of information that would increase overall economic efficiency. Therefore, massive investment in infrastructure theoretically and empirically constitutes one of the main mechanisms to increase income, employment, productivity, and competitiveness of a nation.

The Asian Development Bank in its latest study (2017) estimates that Asia needs USD1.7 trillion per year in infrastructure investment until 2030 to maintain its growth momentum, address poverty, and overcome the climate change issue. This estimate focused on physical infrastructure covering transport (roads, railways, airports, and seaports), power (generation, distribution, and transmission), telecommunications, and water supply and sanitation.

While investment in transport, power, telecommunication, and water infrastructure remains crucial for national development, one must not overlook the importance of investment in social infrastructure. Investment in physical infrastructure of social sectors such as education, health, housing, and government must also follow and be considered more as a complement to, rather than a substitution for, investment in transport, power, telecommunication, and water infrastructure. Education, health, housing, and government services would be a part of infrastructure development that ensures improvement in quality of life. Social infrastructure, especially investments in healthcare and education, would enhance the skills of the employees and their productivity and productive capacities. Endogenous growth theory confirms that investment in human capital, innovation, and knowledge are significant contributors to faster economic growth (Romer, 1994). The question, then, is: how many schools and healthcare facilities should we build to have sufficient human capital? How much money should we spend for this social infrastructure?

This report will be the first in estimating the investment requirement in social infrastructure demand covering education, healthcare, housing, and government in Indonesia. Its significance is reflected by the fact that there are limited studies that analyze the investment demand of social infrastructure in Indonesia by utilizing macro and micro approaches. The first approach is the macro approach, in which we adapt Fay and Yepes' framework (2003). We rely on the historical, provincial relationship between social infrastructure stocks and key economic provincial indicators. Based on this relation, we forecast the social infrastructure needed to fulfill the dynamic of economic growth and demographic trends during 2016-2030. In the second approach, we estimate the need using the micro approach, in which we calculate the

need based on minimum standard service for each type of infrastructure and the population dynamics.

This will be the first study in Indonesia to address the described issues using macro and micro approaches. The estimation results will be unique and valuable for Indonesia's policymaking process. This result can also guide the government to decide how much budget should be allocated for achieving a minimum standard of social infrastructure as well as for accomplishing the Sustainable Development Goals in 2030. We expect that this study will be a successful case and a reference for future policymaking procedure. Beyond providing input to the government's policymaking process, this report serves as a pilot project for a greater purpose of being a reference in the field of social infrastructure. Given Indonesia's results, the projections will be broadened to all of Asia to estimate characteristics at this level. Furthermore, the result of this study will also be valuable as a case applicable to the same kind of analysis in other countries.

This report provides a portrait of the current trends of Indonesia's social infrastructure in the context of future dynamic economic growth and demographic change; it estimates its future demand. Chapter 2 illustrates level of social infrastructure provision in Indonesia and relative to the Association of Southeast Asian Nations (ASEAN) level as well as an issue of inequality at the provincial level. The level of provision is sufficient in Java Island, yet far lacking in other islands, notably in the eastern provinces.

Given the existing trend in social infrastructure provision, this report then aims to provide the estimation of investment demand of Indonesia's social infrastructure up to 2030 at the national level. It will be the first in estimating the investment need in social infrastructure, covering education, health, housing, and government, using Indonesia as the pilot project. This study then calls for policy recommendations from the Indonesian Government to fill the projected gap of social infrastructure investment.

This report faces challenges in establishing the demand forecast. While education and health datasets are relatively easy to obtain, difficulties arise in collecting demand for housing and governmental building. Yet, despite limited data, this report is able to estimate the demand for housing and governmental building by using as proxies the housing ownership of the 20% lowest-percentile income group (extracted from the SUSENAS (National Socioeconomic Survey) dataset) and the number of government officers at the provincial level. This approach is of interest for similar studies when direct demand measurements are unavailable.

Based on our approaches and assumptions, Chapter 3 provides our estimates of social infrastructure needs for Indonesia for 2016-2030. Over 15 years, we estimate the annual infrastructure need as the base for the total investment need. We compare and discuss the potential sources of gaps between the macro and micro approaches. The estimates in the national social infrastructure create challenges in the extent of how to finance such need. Chapter 4 hence provides further discussions related to possible private sector involvement. Chapter 5 concludes this study and presents commentary on Indonesia's need for social infrastructure.

CHAPTER 2
SOCIAL INFRASTRUCTURE IN INDONESIA: DEFINITION, MEASUREMENT, AND REGIONAL DISTRIBUTION

2.1 Social Infrastructure

Social infrastructure is a subset of the infrastructure sector and typically includes assets that accommodate social services.[1] This infrastructure, including health, education, housing government services, transportation system, legal system, and public safety, is intended to maintain and improve the standard of living and quality of life in a society or community. In recent decades, many governments have become increasingly aware of the impact of not providing adequate social infrastructure. There are several benefits of having high-quality and affordable social infrastructure such as[2]: 1) supporting the growth of population, 2) assisting economic development, 3) driving social inclusion, 4) encouraging social inclusion, and 5) supporting diverse and sustainable communities. In most countries, local and central government most often provide social infrastructure. Recent trends show that public-private partnerships (PPP) would be a promising initiative for providing social infrastructure.

Table 2.1 Social Infrastructure

Sector	Physical Assets
Education	Schools (Elementary, Junior Secondary, and Senior Secondary)
Health	Community health center (Puskesmas), Hospital beds
Housing	Public house (number of household owned the houses)
Civic	Government office building
Sanitation	Safe drinking water and wastewater treatment
Sport, cultural and recreation	Public hall and park
Legal, Law and Order	Prisons and court houses

Source: Authors' compilation

2.2 National Trends: Indonesia's Position in ASEAN

There are many types of social infrastructure; however, in the case of Indonesia, this report only covers four social infrastructures: **education, healthcare, housing, and government office buildings.** Education and health infrastructure address the issue of human capital formation, while housing addresses human security. The government office building represents how the government provides services to people.

2.2.1 Education Infrastructure

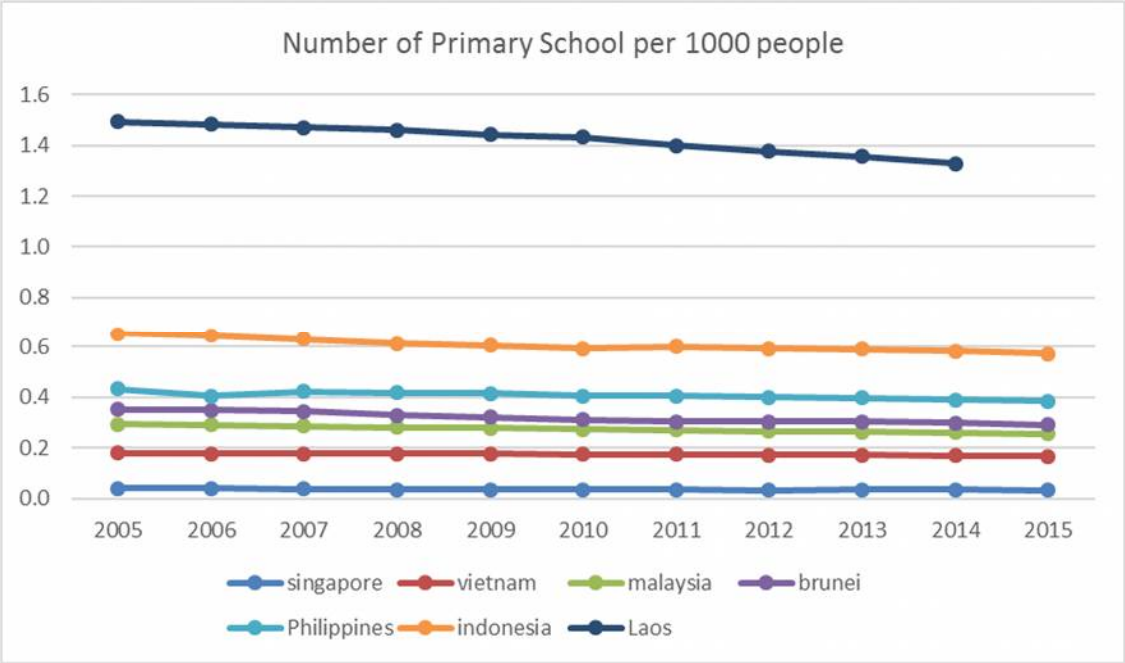
Figure 2.1 shows the number of primary schools in ASEAN countries per 1,000 people. The lowest number of primary schools per 1,000 residents is Singapore, while the highest is Laos. The trend of the number of primary schools is flat for all ASEAN countries. This figure does not cover the capacity of each school to accommodate students. The schools across the country that have a homogenous area will have similar capacity in accommodating students. Different

[1] http://www.nzsif.co.nz/Social-Infrastructure/What-is-Social-Infrastructure/
[2] http://www.sgsep.com.au/assets/20130332-Linda-Perrine-presentation-130719.pdf

situations will be found where the disparities of the geographical areas exist, and there is a divided area between rural and urban environments. When the country has a geographically wide area, divided between urban and rural, and the spread in the population is very diverse, then the existence of the school will follow the spread of population and area. In other words, there will be more schools with different capacities across the country, when widespread population and vast area characterize the region. For example, Indonesia, the differences in the school capacity can be seen across geographical area, urban and rural. In remote areas, there will be found school with only few students. Lao PDR has the same story, with uneven spread of population.

When assessing the ratio of number of schools per 1,000 residents, it should be noted that it does not necessarily mean that the country with the lowest ratio (Singapore) is worse than the country with the highest ratio (Laos and Indonesia). According to the net enrollment in primary education among ASEAN countries, Singapore has 100%, while Laos and Indonesia have 95.2% and 96.2%, respectively.

Figure 2.1 Number of Primary Schools per 1,000 People

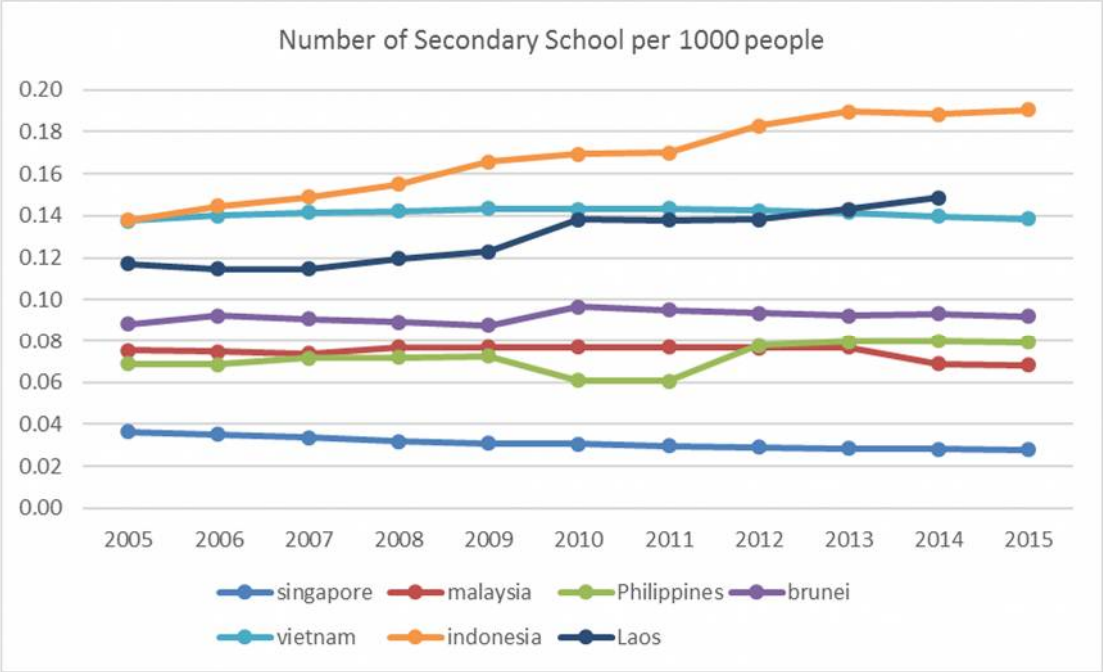


Source: CEIC Data

The ratio of lower secondary schools per 1,000 people in ASEAN countries has a similar pattern for primary schools. The difference is the trend for Indonesia and Laos, which have positive slopes; the others have flat trends. This trend means that Indonesia and Laos have increased their number of secondary schools. Based on the projection of Gross Enrollment Ratio in lower secondary education from 2000-2025, Indonesia and Laos have positive slope trends from 2005 to 2015 (Education Policy and Data Center, 2013).[3]

[3] http://www.epdc.org/tags/education-trends-2000-2025

Figure 2.2 Number of Secondary Schools per 1,000 People

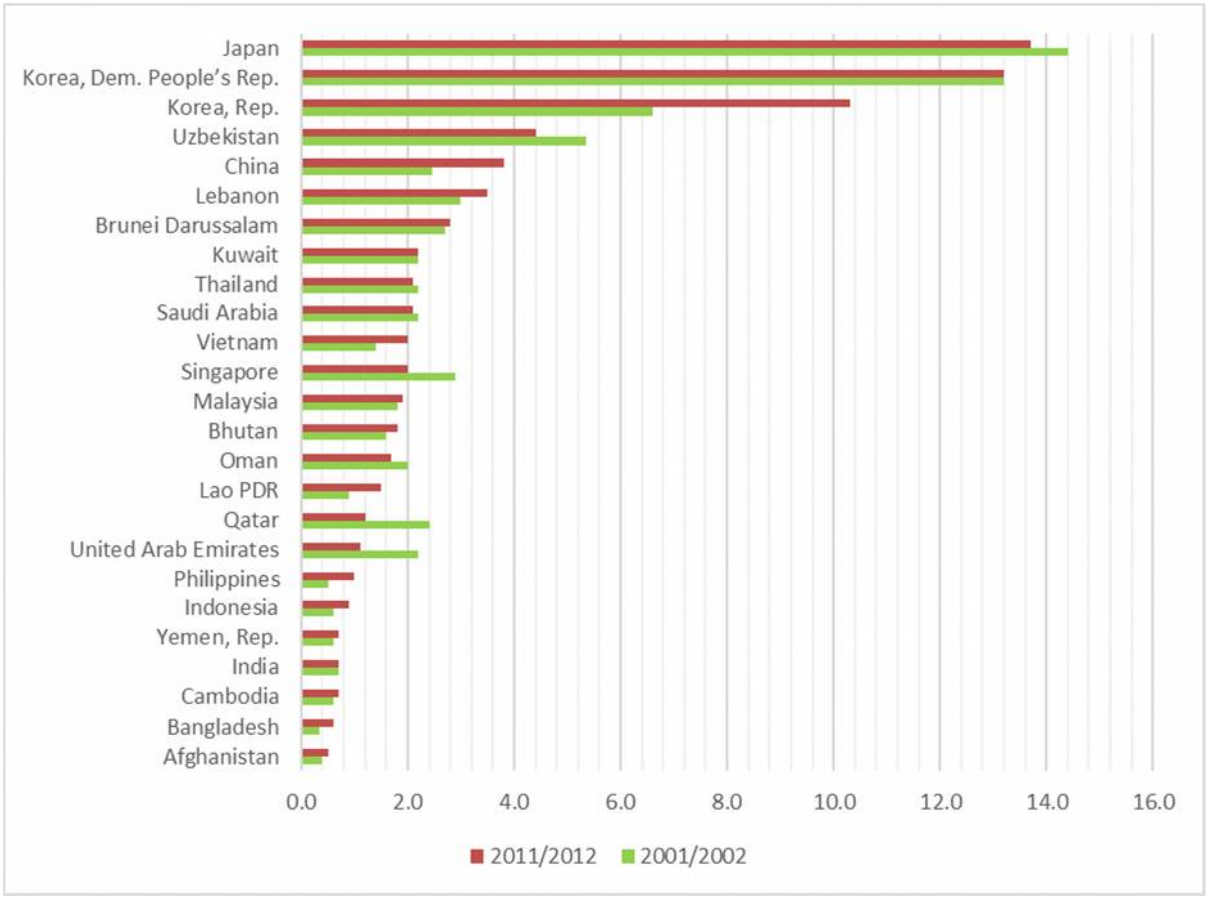


Source: CEIC Data

2.2.2 Health Infrastructure

In the past decade, improvement in health infrastructure in several ASEAN countries has been more rapid compared with most Asia countries. Using data from the World Health Organization over the period 2002-2012, the average additional beds per 1,000 people in Asia is approximately 0.1 beds per 1,000 people per country. In the same period, Indonesia has increased its number of beds per 1,000 people as many as 0.3, Philippines 0.5, and Vietnam 0.6. Other notable countries with high improvement in beds per 1,000 people are Korea, Rep (3.7), and China (1.3). Low expansion of beds per 1,000 people in Indonesia may create a problem in service delivery as a response to the government program of the National Health Insurance Program. Another problem faced by Indonesia is the unequal distribution of beds among regions in Indonesia.

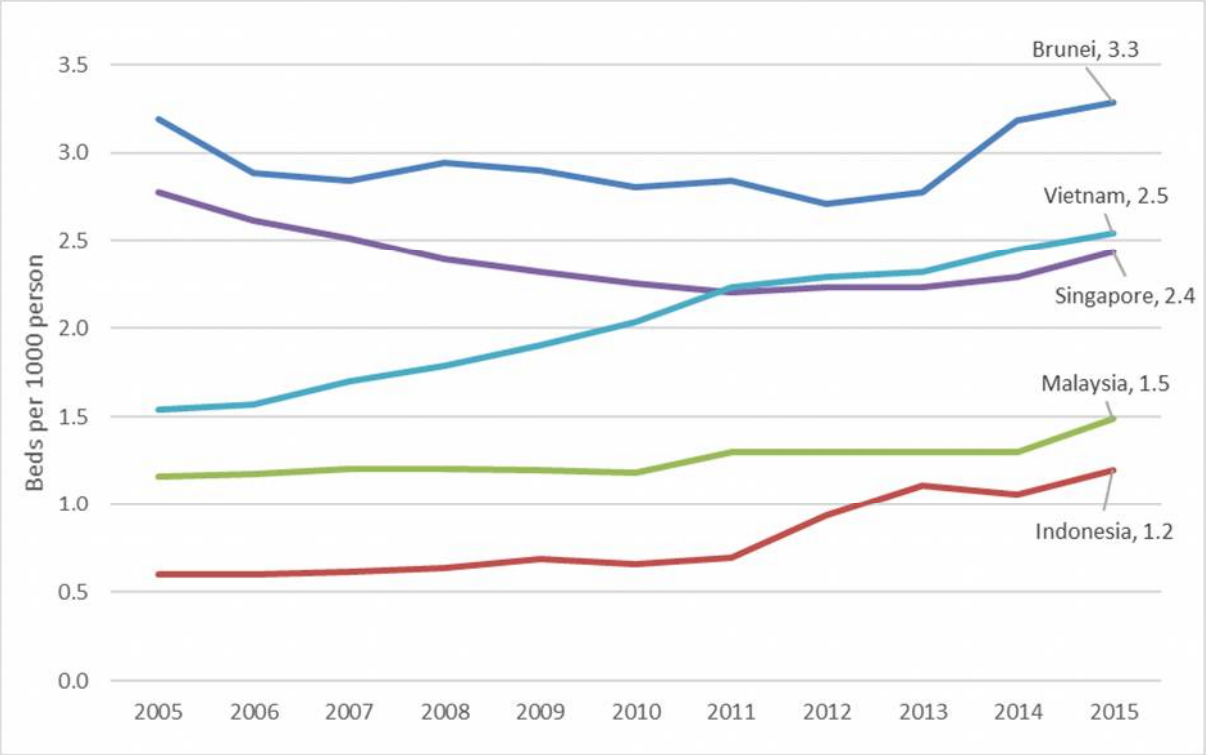
Figure 2.3 Beds per 1,000 People in Asia



Sources: World Health Organization (2013)

Using CEIC data (2016), several ASEAN countries including Brunei, Vietnam, Malaysia, and Indonesia have improved their number of beds per 1,000 people during 2005-2015. Brunei is still the country with the highest number of beds per 1,000 people in ASEAN countries, with 3.29 in 2015, followed by Vietnam (2.54), Singapore (2.44), Malaysia (1.49), and Indonesia (1.20). Among those five ASEAN countries, Vietnam had the highest increase in number of beds per 1,000 people by 1.0 beds per 1,000 people, followed by Indonesia (0.6), Malaysia (0.3), and Brunei (0.1). The significant expansion of Vietnam in beds per 1,000 people is due to the fact that Vietnam has been investing around 6% during the last 10 years (World Bank Development Indicator).

Figure 2.4 Beds per 1,000 People in ASEAN Countries



Source: CEIC Data

2.2.3 Housing Infrastructure

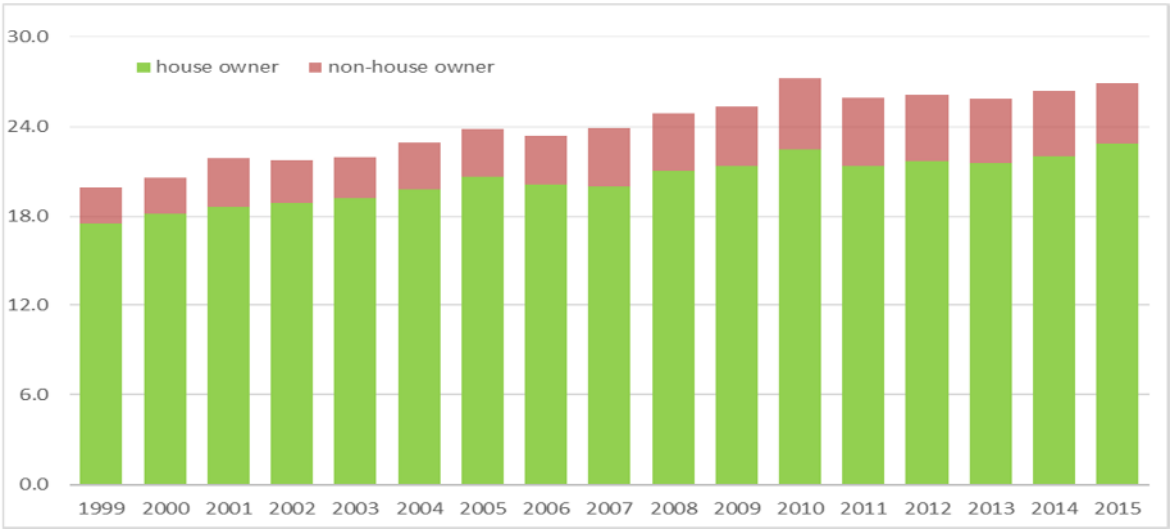
This study used the house ownership of the lowest 20% of household income/expenditure as the proxy the demand of public housing. However, as a comparison, this study also calculated the house ownership of the lowest 40%. The number of households with the 20% lowest income without owning houses have been increasing in the last fifteen years from 990,000 households in 2000 to almost 2 million households in 2015. A similar pattern can be observed for households in the 40% lowest income/expenditure. This phenomenon can be explained from two different view of point, first, the change in the household income. Second, a decrease in ownership of houses during this period is likely due to unaffordable prices of housing. For example, rumah123.com (online) reported that the price of landed houses in the Jakarta Greater Area (Jabodetabek) had increased yearly around 27%.[4] The increase of housing prices has been faster than the increase in income; therefore, it is predicted that the number of household that not owning the house is increasing.

[4] http://properti.bisnis.com/read/20170303/48/633568/setahun-kenaikan-harga-rumah-tapak-jabodetabek-27

Figure 2.5 House Ownership of Bottom 20% (in Millions of Households)

Source: Authors' calculation based on Susenas

Figure 2.6 House Ownership of People in the Bottom 40% (in Millions of Households)



Source: Authors' calculation based on Susenas

2.2.4 Government Building

The government office building represents how government serves and provides public services. This study, however, defines government office building as a place where someone whose status is considered as government employee (civil servant) excluding the police and army. Despite difficulties to collect data/information of how many buildings in each province in Indonesia, this study proxies the need of government office building through the number of government officials in each province.[5] This information is most likely available at National Civil Service Agency (*BKN-Badan Kepegawaian Negara)* and Central Statistical Agency *(BPS-Badan*

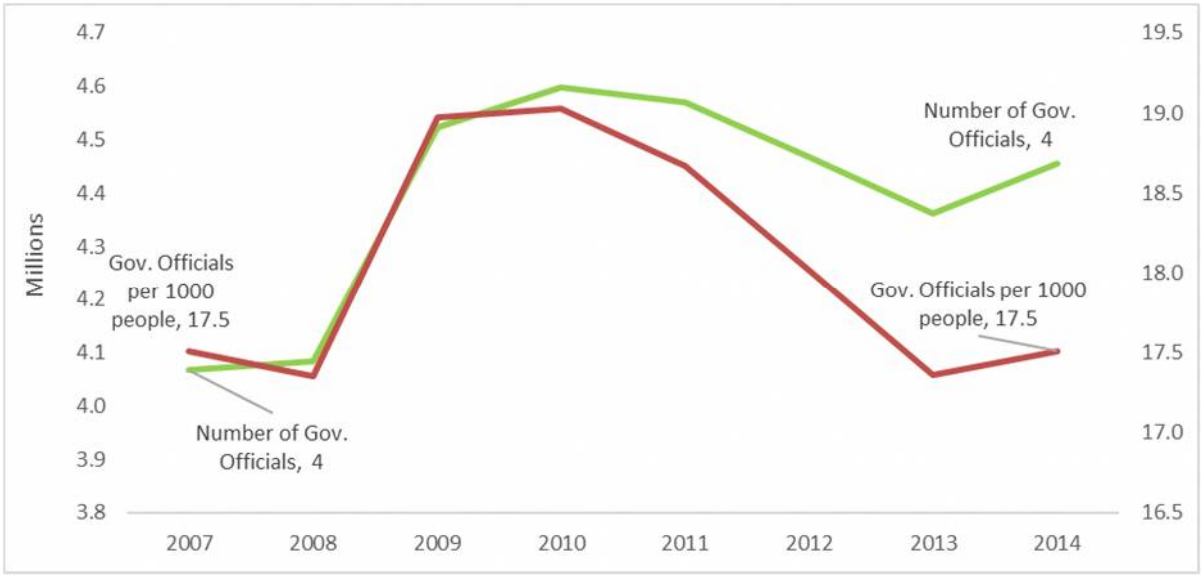
[5] There is no integrated information of government office building including the number, square meter and location. This study, therefore, faced a difficulty to estimate the future demand of government office building. We then estimate the number of government employee as a proxy of government office building.

Pusat Statistik). This study assumes that the government office building will increase as a response to an increase in the number of government employee.

Figure 2.7 shows that the number of government officials increased dramatically from 2008, and subsequently returned back to the initial number in 2013. The decrease in the number of government officials from 2010 is due to the increase in pension and also the rationalization of government officials. Rationalization of government officials is a process of placing and distributing employees in each unit of government agencies in accordance to the needs with respect to quantity, qualification, and competence. Rationalization of government officials in a natural way is conducted by tightening the selection of government official candidates but not with the termination of employment (PHK). For example, in one year, there are 12,000 government officials who retired; then in the fifth year, the government will only receive 60,000 candidates of government officials.

Based on the Ministry of Public Work regulation, every government official needs 9-10 m^2 of room to work. Using the minimum standard of room to work, we could estimate the demand of government office building. If the number of new recruited government officials exceeds the number that retired, there is the need to add room or build government offices.

Figure 2.7 Total number of Government Officials and Government Officials per 1,000 People



Source: CEIC Data

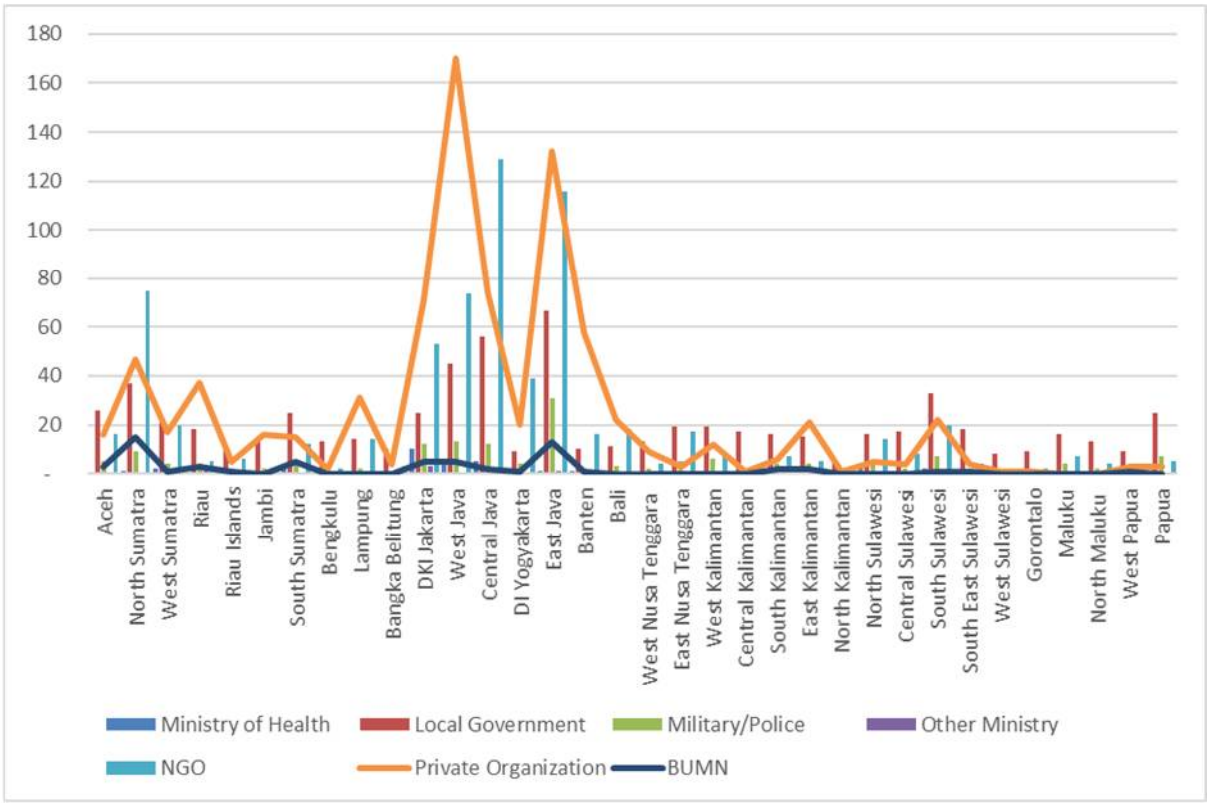
2.3. Regional Distribution

Indonesia is geographically very diverse and unequal. Looking at the national level of social infrastructure availability may provide misleading information due to the unequal distribution of infrastructure that is concentrated in the developed and urban areas like Java. Therefore, information at a regional level may help to construct a comprehensive picture about social infrastructure in Indonesia.

2.3.1. Health Infrastructure

There are mainly three types of hospital management in Indonesia: public hospitals, private hospitals, and community/non-profit organization hospitals. Public hospitals in Indonesia are managed by the Ministry of Health, the Provincial Government, District/City Government, Military/Police, Other Ministries, and the private non-profit sector (religious and social organizations). Unlike the public hospitals, private hospitals are managed by state-owned enterprises (BUMN) and the private sector (individuals, companies, and other private-sector entities).

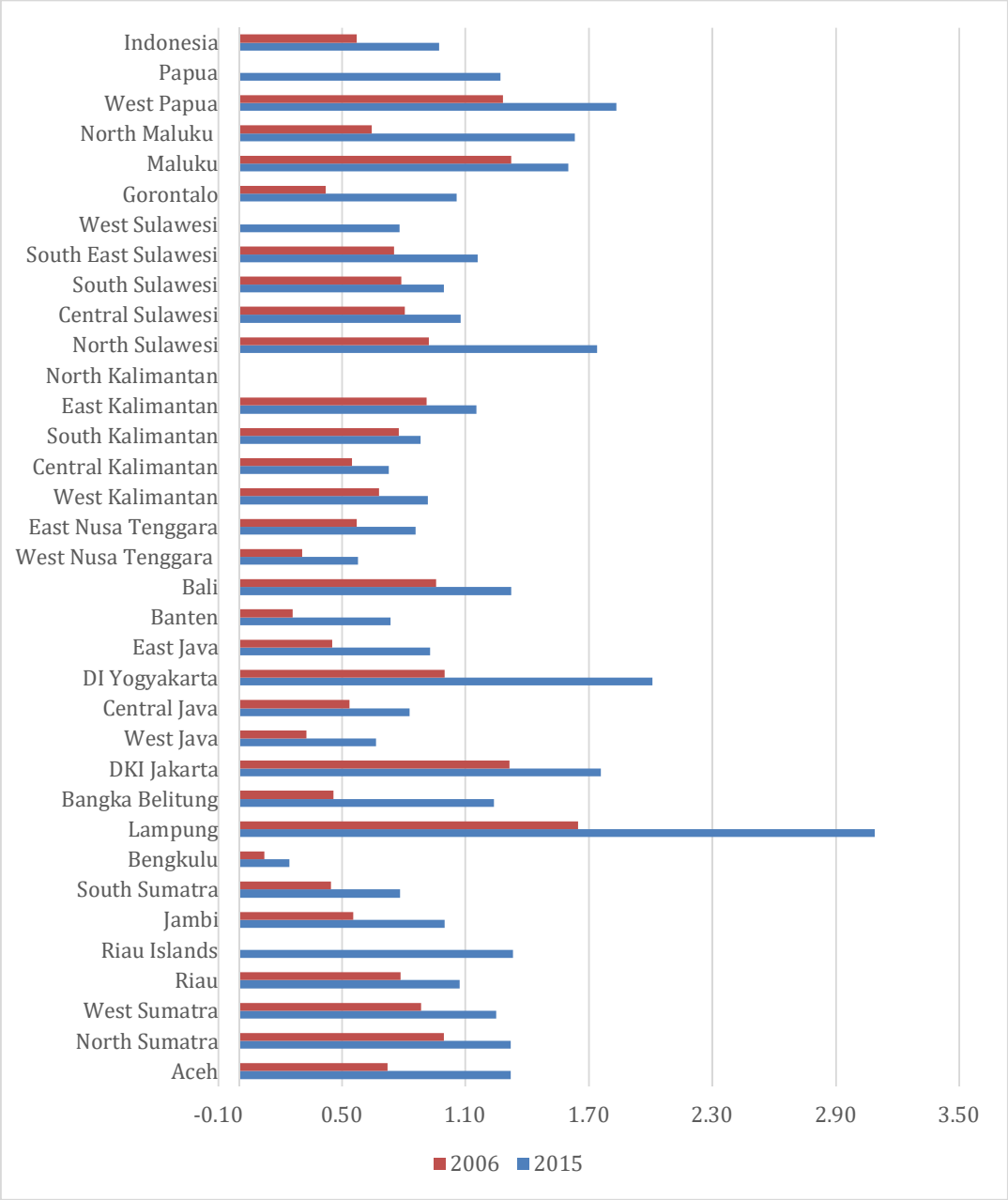
Figure 2.8 The Number of Hospitals under Management by Province, 2015



Source: Authors' compilation based on BPS and Ministry of Health

In 2015, hospitals operated or owned by social/religious organizations dominated around 44% of public hospital in Indonesia, while other hospitals are operated by local governments (43%), military/police (10%), ministries of health (2%), and other ministries (1%). For private hospitals, 93% were managed by the private sector, with the rest being managed by BUMN. In 2015, there were 2,488 hospitals in Indonesia that are divided into public hospitals and private hospitals. The number of public hospitals in Indonesia in 2015 was 1,593 hospitals, which consists of 1,341 general hospitals (RSU) and 252 special hospitals (RSK). In 2015, there were 895 private hospitals in Indonesia, which consisted of 608 general hospitals (RSU) and 287 special hospitals (SSR). With regard to the spread among provinces, these hospitals were mostly located in Java. This is because the demand is high, indicated by the number of people lived in Java constituting nearly 60% of population. In addition, for private hospitals, 63% of private hospitals were managed by the private sector located in Java.

Figure 2.9 Ratio of Hospitals per 100,000 People



Source: Authors' compilation based on BPS and Ministry of Health

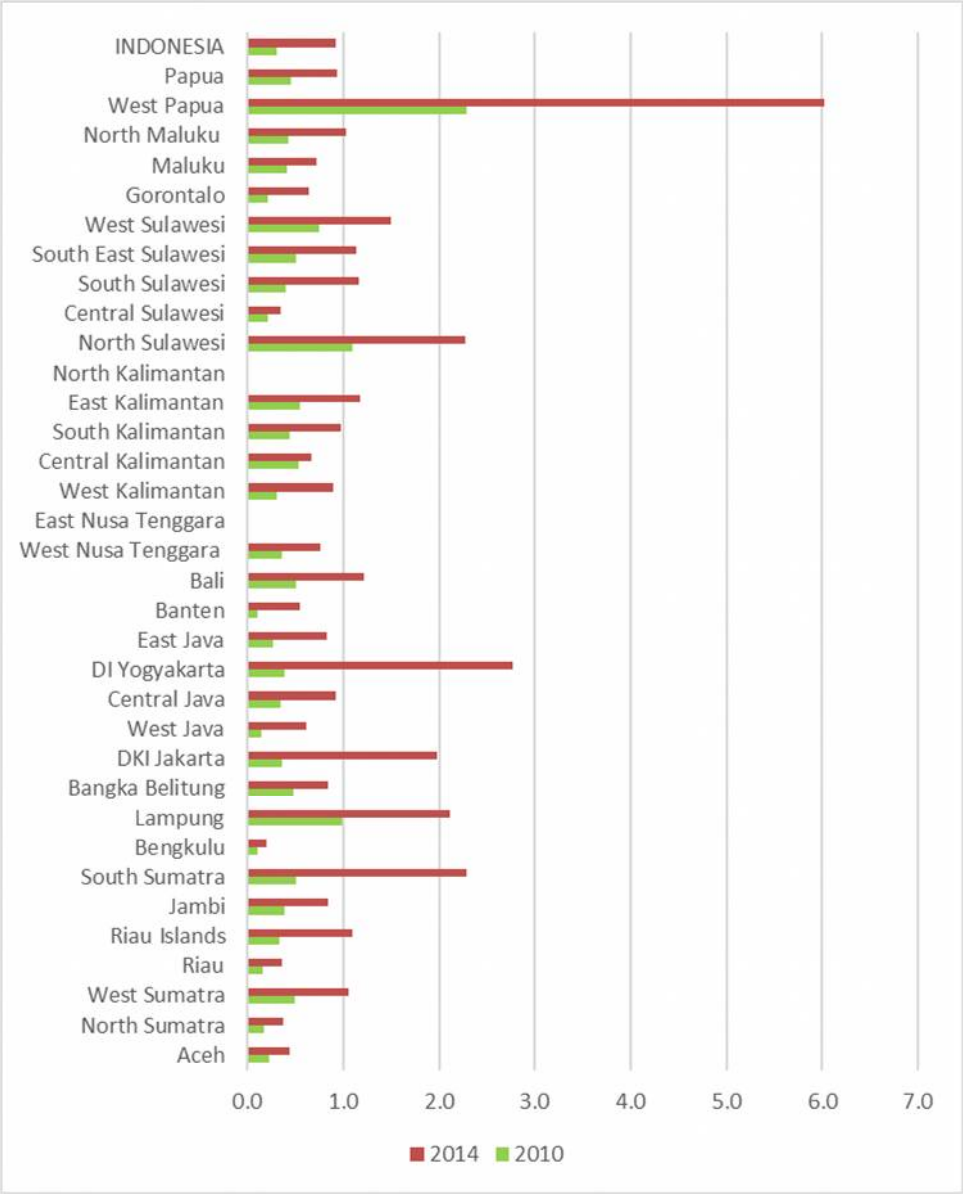
Regarding the provincial distribution of hospitals in Indonesia, it appears that there is inequity in the availability of hospitals. Figure 2.9 shows that two provinces left behind are Bengkulu and West Nusa Tenggara, with 0.2 and 0.6 hospitals per 100,000 people in 2015, while the highest are Lampung and Yogyakarta, having 3 and 2 hospitals per 100,000 people in 2015. Furthermore, with respect to the growth in the number of hospitals, some provinces demonstrated very good performance. The five provinces having the highest growth in the number of hospitals between 2006-2015 are, in descending order, Banten, Bangka Belitung, North Maluku, Gorontalo, and East Java.

Number of Beds in Hospitals

To explore referral health care services in more detail, the availability of beds can be an indicator to define whether people are having their needs met with respect to referral health services. Figure 2.10 shows the ratio of hospital beds per 1,000 people for each province in

Indonesia.[6] In 2010, only two provinces met this ideal ratio, namely West Papua (2.29) and North Sulawesi (1.1). Though West Papua has the most ideal indicator, this does not imply that people could easily access health facilities. This is because hospital facilities are most likely concentrated in urban areas, while many of West Papua residents live in island and remote area. In 2014, hospital capacity increased; there are now 14 provinces that meet the ideal ratio of hospital capacity. The provinces that remain insufficient in hospital capacity are Bengkulu, Central Sulawesi, Riau, North Sumatra, Aceh, Banten, West Java, Gorontalo, Central Kalimantan, Maluku, West Nusa Tenggara, East Java, Jambi, Bangka Belitung, West Kalimantan, Central Java, Papua, and South Kalimantan.

Figure 2.10 Ratio of Hospital Beds per 1,000 People



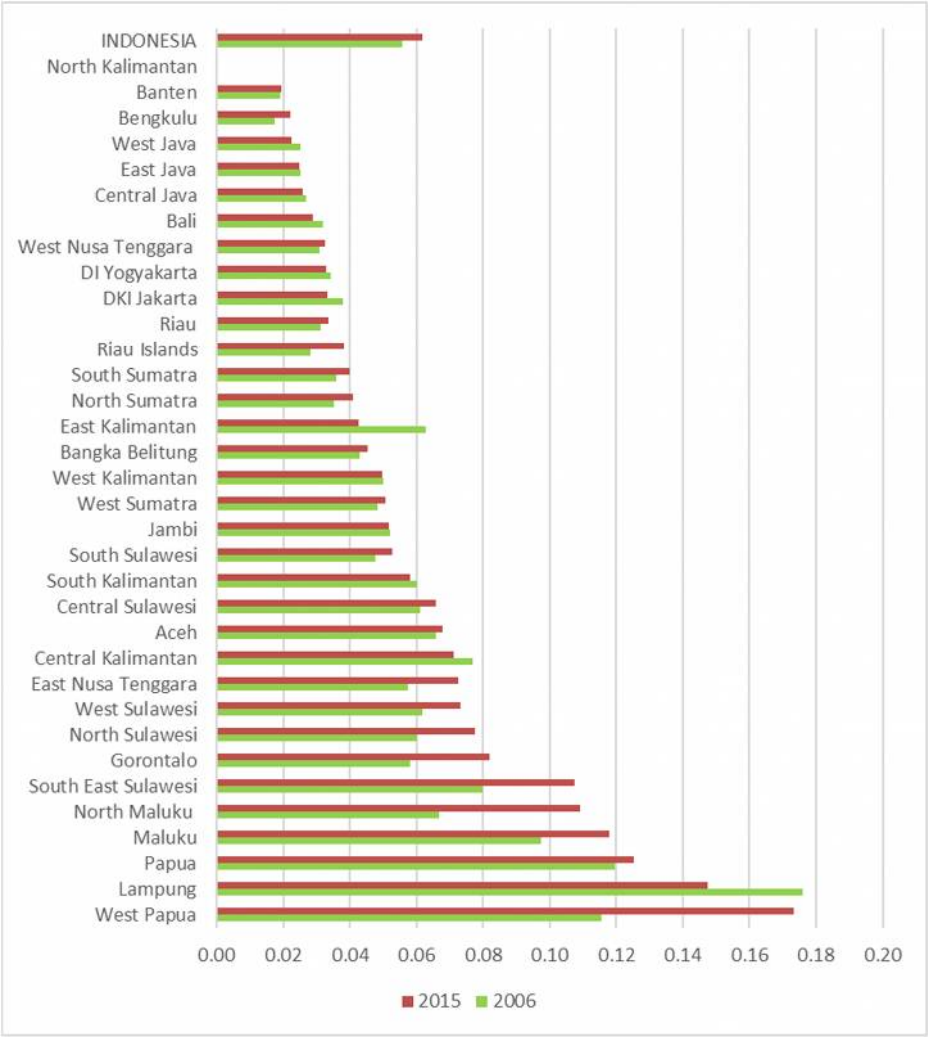
Source: Authors' compilation based on BPS and Ministry of Health

[6] There is no a minimum standard for hospital beds per population. Some international organizations use hospital beds per 10,000 people or per 1,000 people. However, the most common used is the number of hospital beds per 1,000 people.

Puskesmas

Puskesmas refers to community healthcare services that organize public health efforts and the efforts of individual health at the first level, with more emphasis on promotive and preventive efforts. This is intended to achieve the highest degree of public health possible in the covered area. The number of community health centers in Indonesia as of December 2015 was 9,754 units, consisting of 3,396 units with inpatient facilities and 6,358 units for outpatient services only. The availability of basic health services is proxied by the ratio of health centers for 1,000 residents. The province with the highest ratio of health centers in 2015 was West Papua (0.173), while the lowest was Banten (0.019). However, the ratio of health centers per 1,000 inhabitants has not fully described the actual conditions regarding public accessibility to basic health services. For example, the eastern region dominated the five provinces with the highest ratios: these provinces were Papua Barat, Maluku, North Maluku, and Papua. One Puskesmas in West Papua serves around 5,800 people; this can be caused due to a relatively small number of people while the area of coverage is extensive. On the other hand, almost every province in Java Island has a low ratio of health centers; this is due to the high population density.

Figure 2.11 Ratio of Puskesmas per 1,000 People[7]



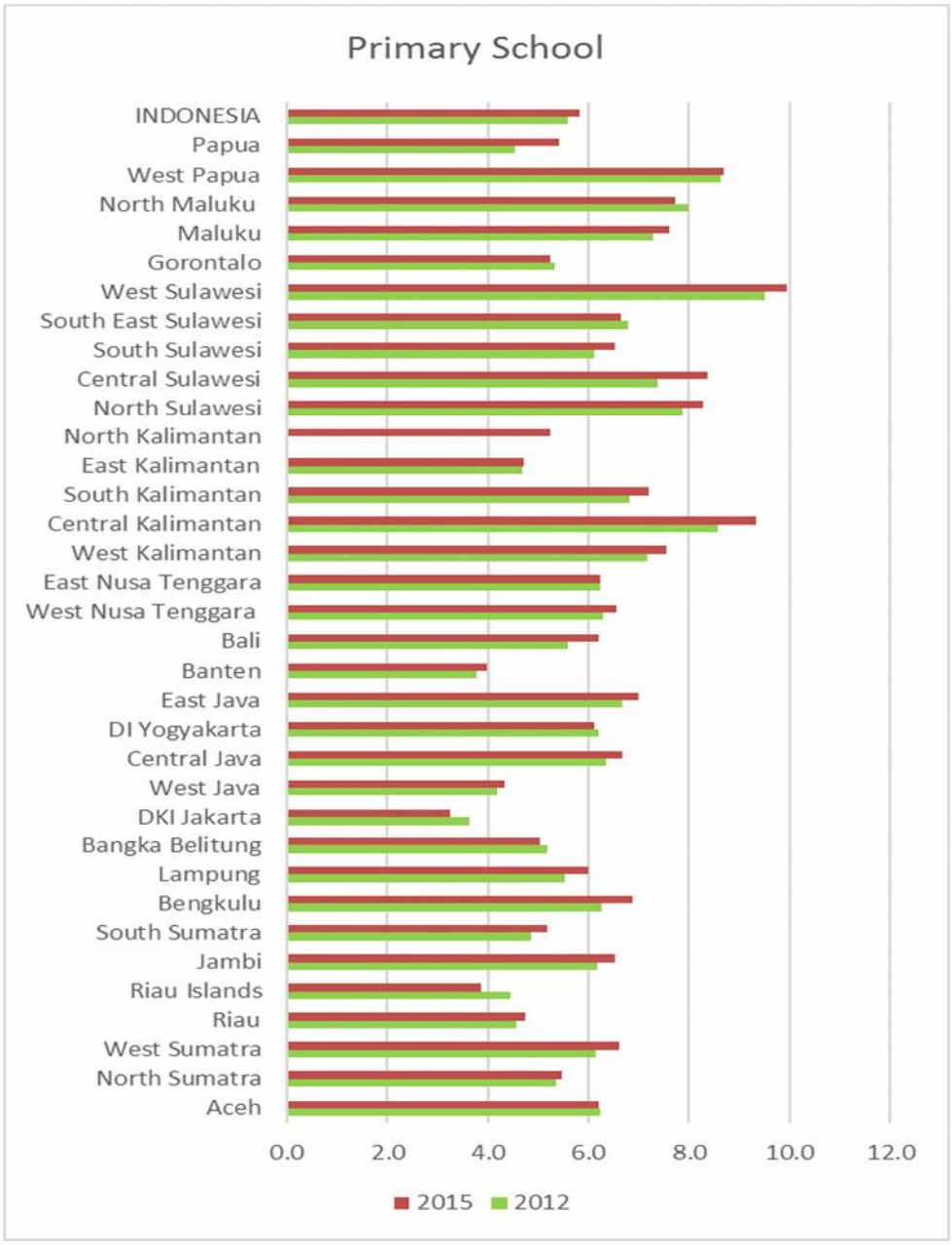
Source: Authors' compilation based on BPS and Ministry of Health

[7] The decreasing number of Puskesmas in some provinces is likely due to merging multiple Puskesmas into a single Puskesmas with inpatient facilities.

2.3.2 Education Infrastructure

The school availability ratio is the number of primary education level schools (SD+MI) per 1,000 residents of primary education age (7-12 years old). This ratio indicates the ability to accommodate all residents of primary education age. The highest three provinces with school availability are West Sulawesi (9.9), Central Kalimantan (9.3), and West Papua (8.6). On the other hand, the lowest three provinces are Banten (3.9), Riau Islands (3.8), and DKI Jakarta (3.2). Some provinces have a school availability ratio for 2015 for elementary schools that have been declining compared with the previous year. This is due to the increase of the number of schools not being proportional to the increase in the school-age population. For junior high school, the provinces that have ratios below 5 still dominate, characterizing 23 provinces. The average ratio availability school at the junior high school level is 4.4, which indicates near-sufficiency. Three provinces in 2005 had the lowest ratios: West Java (2.75), Central Java (2.6) and Bali (2.03).

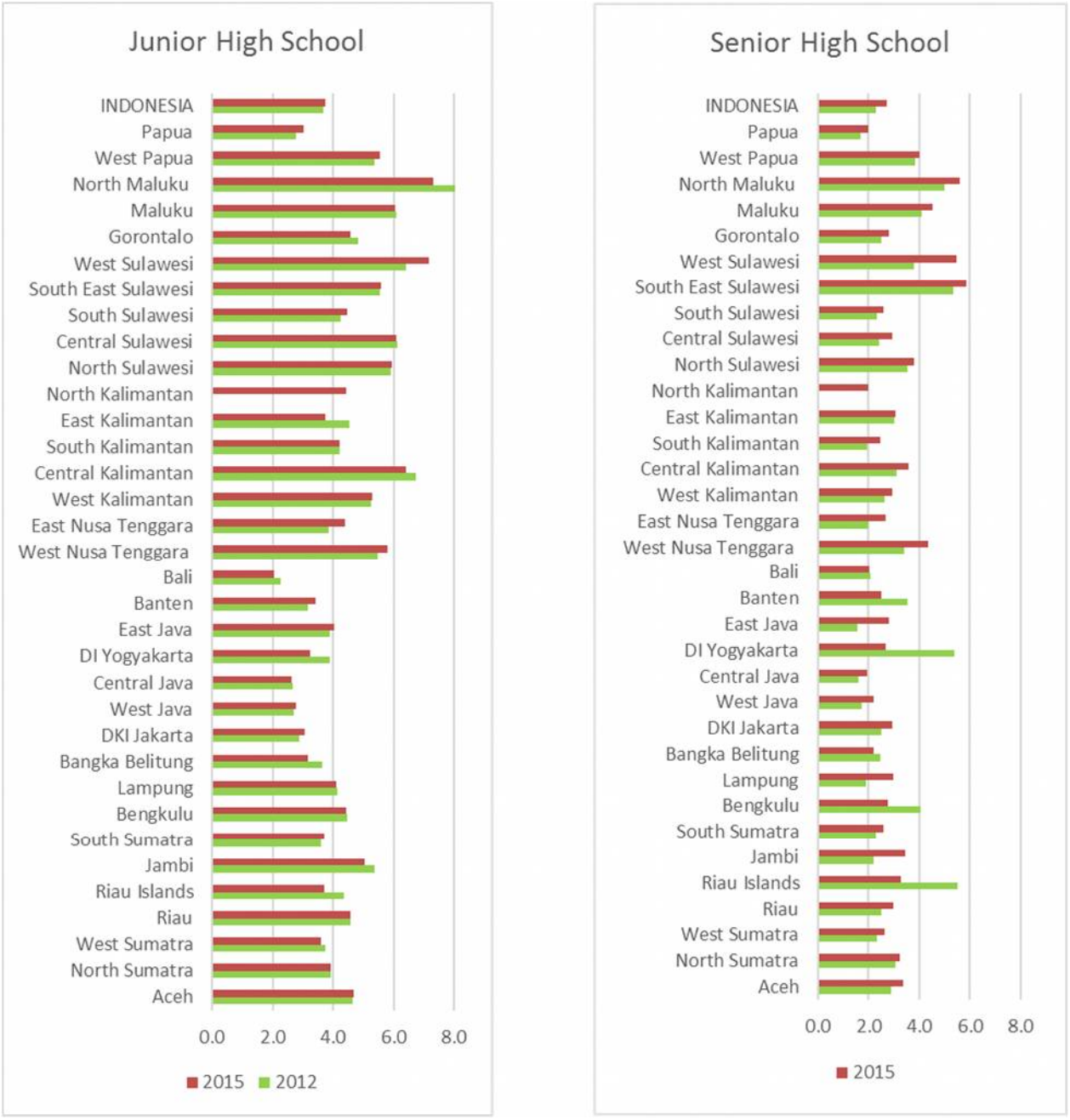
Figure 2.12 Ratio Number of Primary Schools per 1,000 People (School Age) by Province



Source: Authors' compilation based on BPS and Ministry of Education and Culture

The ratio of school availability at the secondary level varied, from 1.9 to 5.8 in 2015. The highest is in South East Sulawesi, while the lowest is in Central Java. The best performance of the province with the increase of the school availability is East Java from 1.5 to 2.8 from 2012 to 2015. Six provinces have poor performance, in which the ratio decreased from 2012 to 2015; these are Bali, Bangka Belitung, Banten, Bengkulu, Riau Islands, and DI Yogyakarta.

Figure 2.13 Ratio Number of Secondary Schools per 1,000 People (School Age) by Province

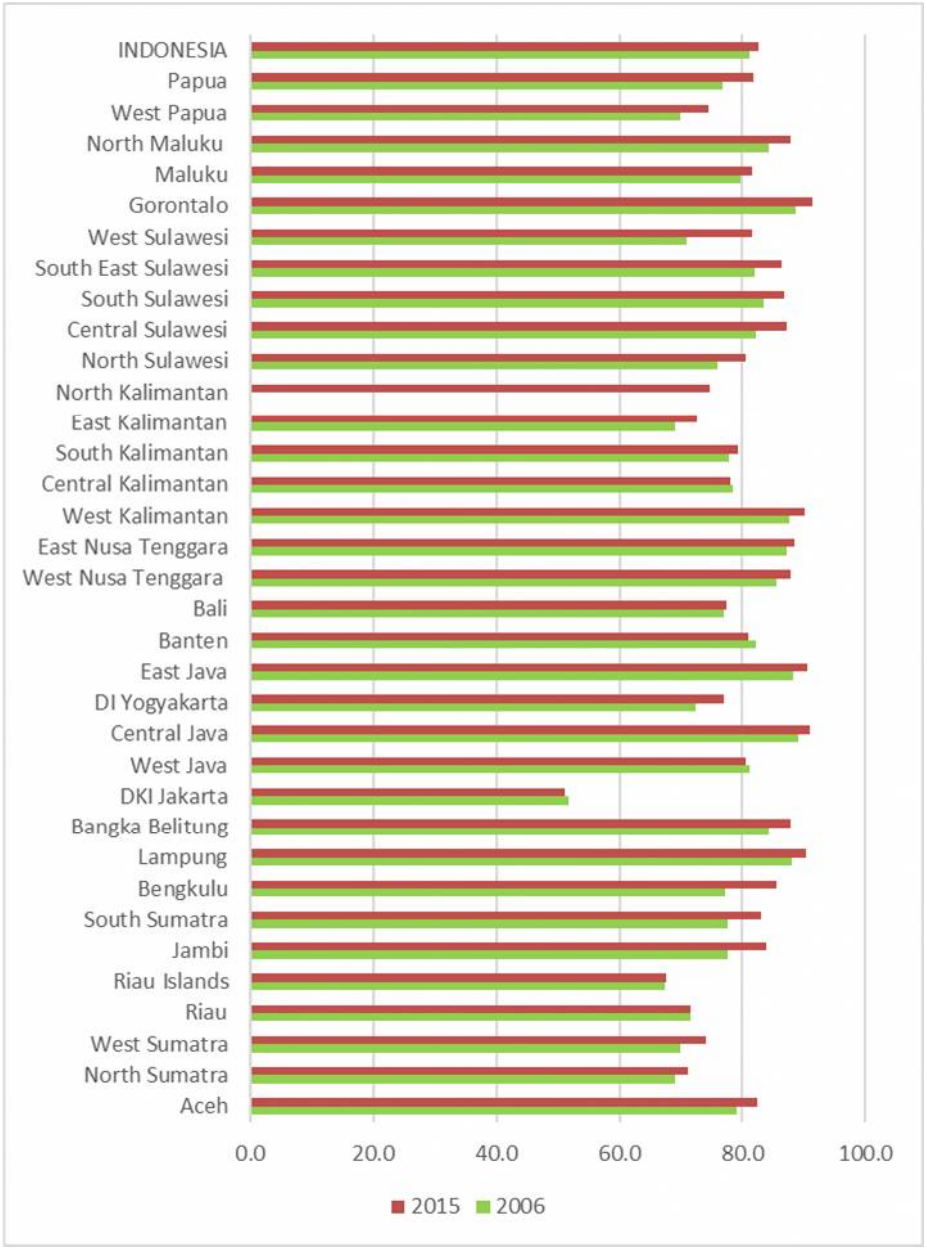


Source: Authors' compilation based on BPS and Ministry of Education and Culture

2.3.3 Housing Infrastructure

Nationally, the percentage of households having house is approximately 82.63%. There are 18 other provinces that have a percentage of households with ownership status of their own residential buildings that remain below the national figure. The three bottom provinces are North Sumatra (71.09%), Riau Islands (67.67%), and DKI Jakarta (51.09%). The latter is the province with the highest population density in Indonesia. Almost a half of Jakarta's residents is renting their house. As the BPS data published in 2016 noted, the overcrowding in Jakarta reached 15.328 inhabitants per km^2. This led to high demand for residential buildings that subsequently resulted in high housing prices. This condition has prevented some Jakarta residents from affording to buy houses. Furthermore, some residents also could not rent a decent house/place due to the high rent price of house/apartment in Indonesia.

Figure 2.14 Proportion of Households Owning Houses by Province, 2006 & 2015.

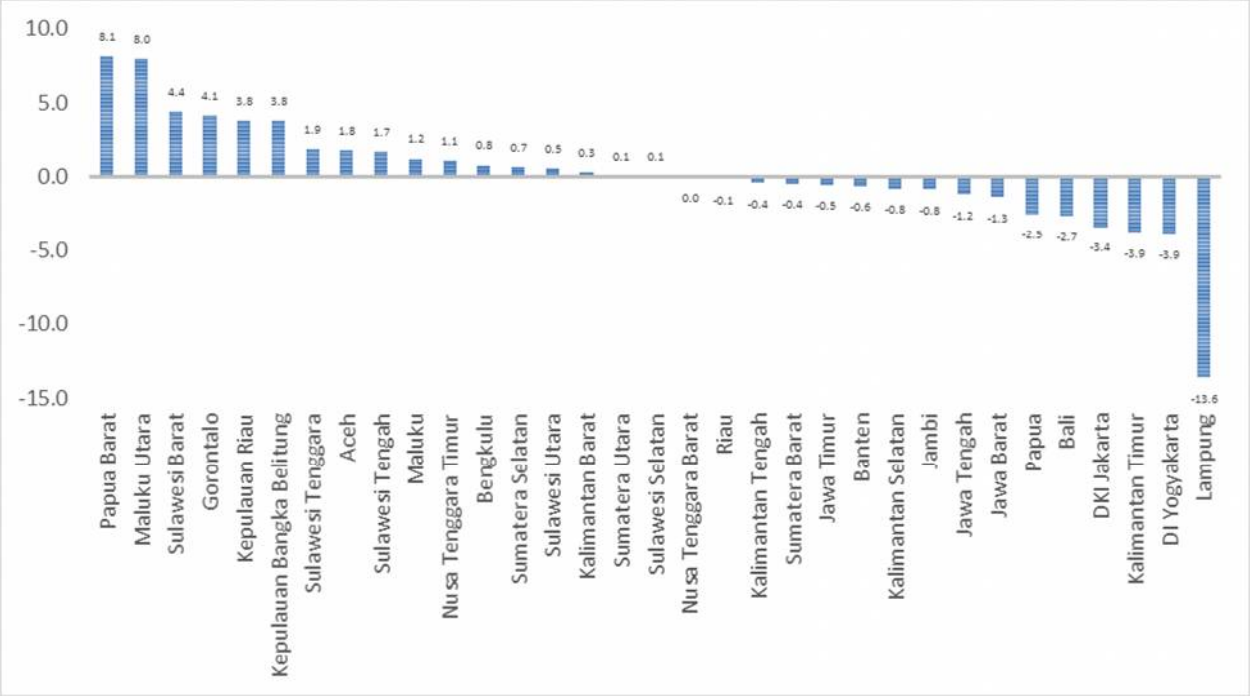


Source: Authors' compilation based on BPS and Ministry of Education and Culture

2.3.4 Government Office Building

As mentioned previously, we use the number of government employee as a proxy of government office building. Figure 2.15 shows the change in government officials between 2007-2014 across provinces. The decrease of government officials mostly happened in Java. This figure shows that the proportion of the government officials placed in the central government is still huge, as their job is just to coordinate the policy, while the government officials who provide services to the people are located at the regional level. This figure also indicates that the need of government offices outside Java remains high as the increase of the number of government officials.

Figure 2.15 Change of Number of Government Officials per 1,000 People



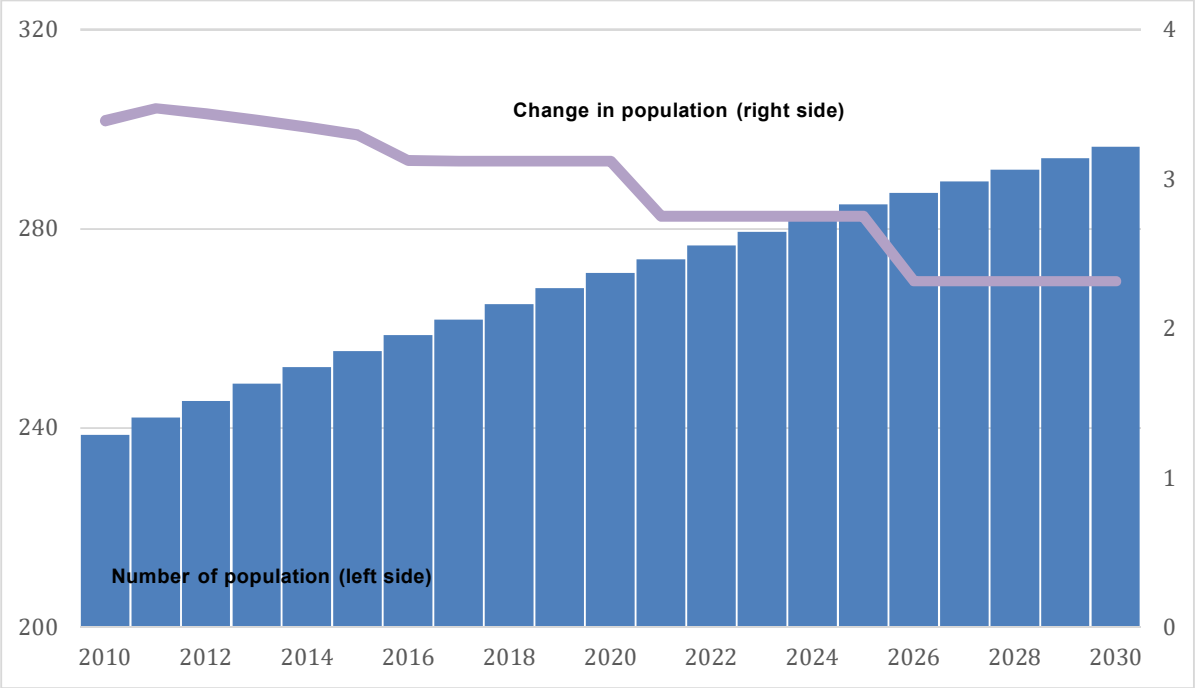
Source: Authors' compilation based on BPS data

2.4 Population Dynamics of Indonesia

The dynamics of population plays significant roles in estimating the demand for social infrastructure in Indonesia. Faster population growth, accompanied with young population structure, is associated with higher need in social infrastructure demand. Bigger population needs more houses, while larger share of early age population creates more demand in primary education infrastructure. A larger share of elderly population will push demand in health services.

Figure 2.16 illustrates a projected growing population trend of Indonesia between 2010-2030, published by Central Statistical Agency (BPS). By 2030, the projected population reaches 296 million people, 23.8% increases from the figure in 2010, despite a decreasing rate of projection growth. In 2016-2020, the average annual population increase is 3.1 million people, while in 2021-2025 and 2026-2030 is 2.8 and 2.3 million people respectively. Additionally, the projection tends to be underestimated. Comparing with latest statistics, the actual population in 2010-2015 is larger than the BPS projection by 0.8% on average, which in turn creates underestimation issue in investment need calculation.

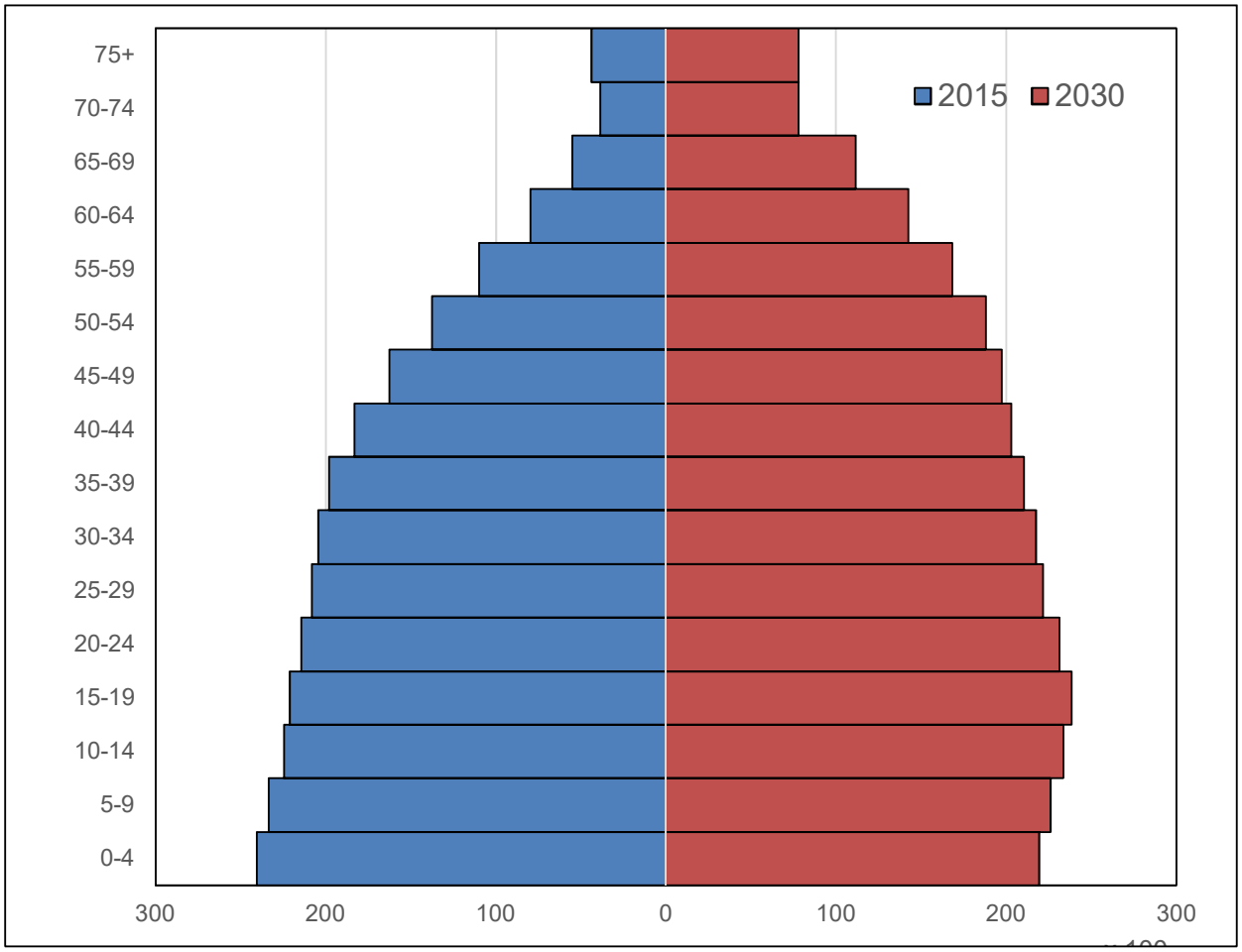
Figure 2.16 Indonesian Projected Population Trend, 2010-2030 (million people)



Source: BPS (2011)

Along with the positive trend in population, Figure 2.17 compares the Indonesian population structure based on the BPS projection. The pyramids represent the population structure by 2015 and 2030, respectively. The pyramid groups population based on five-year categories. By 2015, the pyramid narrows toward the top, indicating Indonesia as a young country. Most of population is under productive age (15 – 64), accounting for one third of total population, followed by young generation (less than 15), 27.3% of population. This structure creates higher demand in social infrastructure, particularly in basic education and health. Better service provision in those sectors will determine in what extent Indonesia can optimize the demographic bonus in the next 5-15 years.

Figure 2.17 Indonesian Population Pyramid, 2015 and 2030 (in hundred million people)



Source: BPS's projection

In the 15 years later, Indonesia will remain enjoy the benefits of demographic bonus, yet shows some degree of ageing population. The structure is predicted to be still dominated by productive population, yet portion of older population increases by about 4 percentage points. Those with age 65-74 years old contribute a significant increase in elderly people. Issues in healthcare of elderly people may arise, along with education and housing demand from productive population.

CHAPTER 3
ESTIMATING INDONESIA'S SOCIAL INFRASTRUCTURE NEEDS 2016 – 2030

This section presents a strategy to estimate social infrastructure needs in Indonesia during 2016-2030. We combine two approaches that consider population dynamics, change in standard of living, and economic condition. The first approach is the macro approach; a top-down methodology relating the social infrastructure needs as a function of economic and demographic factors. The second approach is the micro approach, a bottom-up methodology that calculates needs based on the change in number of beneficiary times the construction cost, adjusted by operation and maintenance cost. We also refer to several government regulations on minimum service standards in calculating the cost.

The estimated projections are then compared with the estimated physical infrastructure investment needs provided by ADB in Meeting Asia's Infrastructure Needs 2017. The ADB estimated that Indonesia needs 1.1–1.2 trillion USD, depending on assumptions, or equivalent 5.5–5.7% of projected GDP to meet the infrastructure demand over the period 2016-2030, covering transport, telecommunications, power, and water supply and sanitation. Combining both ADB's projection and this study's projection, we could calculate the amount of investment needed for the better and wealthier Indonesia.

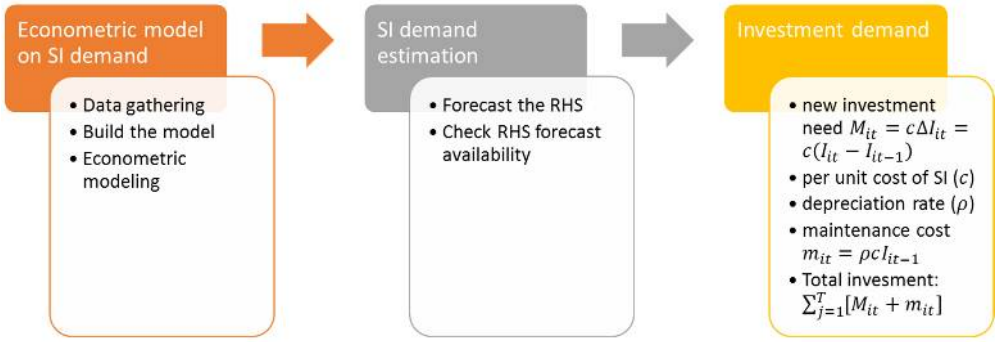
3.1 Approaches and Assumptions

3.1.1 Macro Approach

Figure 3.1 provides our framework for estimating the infrastructure need using the macro approach. We define total investment demand ($SI_{i\,t}$) of each social infrastructure as a sum of new investment needed ($M_{i\,t}$) and annual maintenance cost for existing social infrastructure ($m_{i\,t}$). The amount of total investment demand is derived from multiplying per-unit cost of social infrastructure (c) with the additional number of social infrastructure needed per year ($I_{i\,t} - I_{i\,t-1}$). The cost of maintaining a social infrastructure is obtained by taking the annual depreciation rate (ρ) into account and multiplying with per-unit cost of social infrastructure (c), and total social infrastructure in the previous year ($I_{i\,t-1}$). The mathematical explanation of the social infrastructure demand is provided as follows:

$$SI_{i\,t} = \sum_{j=1}^{t} [M_{i\,t} + m_{i\,t}]$$
$$M_{i\,t} = c\Delta I_{i\,t} = c(I_{i\,t} - I_{i\,t-1})$$
$$m_{i\,t} = \rho c I_{i\,t-1}$$

Figure 3.1 Change of Government Officials per 1,000 People



Source: Authors

Generating estimates of social infrastructure demand is based from the relationship between the social infrastructure stocks, and economic and demographic factors, using econometric models. The dataset is drawn from historical data that reflect such relationships. Various prior studies have been conducted to estimate demand for physical infrastructure such as power, roads, railways, telecommunications, and water sanitation. Fay and Yepes (2003) estimate the infrastructure investment required for each income group (developing countries and developed countries) using quinquennial data from the first decade of the millennium (2000-2010). Despite having the limitation of not taking rehabilitation costs into account, this study stimulates many complementary studies, both at the individual country level and at the regional level.

The extended study by Yepes (2004) estimates the investment needs for infrastructure for the East Asia region. The total expenditure needed in this study is divided into expenditure for new investment and expenditure for the maintenance of existing infrastructure. Another study by Chatterton and Puerto (2005), adapting the study by Fay and Yepes (2003), estimates the infrastructure investment needs in the South Asia region. This study presents a refined estimation by using annual data rather than quinquennial data for electricity, roads, railways, and telecommunications.

With a similar approach, Nath and Bhattacharyay (2010) estimated infrastructure needs in the Asia-Pacific region to prepare a regional infrastructure financing toward Asian Connectivity. We consider this study as the newest study that includes ASEAN countries in estimating the amount of infrastructure investment needs for 2010-2020 as well as a broad study with greater data sets, including many additional sub-sectors like airports and ports in transportation, and telephones, mobile phones, and broadband in telecommunications.

Following the literature on infrastructure demand, our economic-demography variables include lagged social infrastructure stock, per capita GDP, tax-GDP ratio, shares agriculture and industry to GDP, population density, share of urban population, and unemployment. We then further add more control variables, following the studies by Sole-Olle (2006) and Rothenberg (1998), in order to achieve more robust results. The model can then be written as follows:

$$I_{i,t} = \alpha_0 + \alpha_1 I_{i,t-1} + \alpha_2 y_{i,t} + \alpha_3 A_{i,t} + \alpha_4 M_{i,t} + \alpha_5 Urban_{i\,t} + \alpha_6 Popden_{i\,t} + \alpha_7 YoungPop_{i\,t} + \alpha_8 OldPop_{i\,t} + \alpha_9 Tax_{i\,t} + \alpha_{10} CPI_{i\,t} + \alpha_{11} Pov_{i\,t} + \alpha_{12} Unemp_{i\,t} + \delta_i + \gamma_t + \epsilon_{i,t} \quad (1)$$

where $I_{i,t}$ is demand for infrastructure stock of type j in country I at time t, and $I_{i,t-1}$ is the lagged value of the infrastructure stock. $y_{i,t}$ is income per capita, as we expect that it will positively affect number of infrastructure needs (Mazumdar, 1999; Adjei et.al, 2013). $A_{i,t}$ is the share of agriculture value added in GDP, as we expect that this will affect a number of

infrastructure needs in a positive way, as well (Pinstrup-Andersen and Shimokawa, 2006; Fan and Zhang, 2004). $M_{i,t}$ is the share of manufacturing value added in GDP, as we assume that will positively affect a number of education infrastructure needs (Saldanha, 1999). $Urban_{i\ t}$ is the urbanization rate (share of population in urban areas), which we expect in this research has a positively effect on civic infrastructure needs (Logan, 1985). $Popden_{i\ t}$ is population density, which we expect will positively determine a number of education infrastructure needs (Belmonte et.al, 2014). $YoungPop_{i\ t}$ is share of young population, which is expected to significantly positively affect demand for education infrastructure (Das and Kar, 2016).

$OldPop_{i\ t}$ is the share of adult-age population; we expect that this has a positive correlation with a number of health infrastructure needs (Chakraborty, 2004). Tax_{it} is tax revenue per capita, and we expect this also to have positive correlation with demand for infrastructure (Michael, 2013; Christie and Rioja, 2012). This is because higher tax revenue means a higher ability to finance infrastructure. $CPI_{i\ t}$ is consumer price index; we expect this to have a negative correlation with demand for infrastructure (Mesagan and Ezeji, 2016; Busari and Olaniyan, 1998; Mojekwu and Iwuji, 2012). $Pov_{i\ t}$ is poverty rate, and we expect that this will negatively affect demand for housing infrastructure and civic infrastructure (Fiadzo et.al, 2001; Logan, 1985). $Unemp_{i\ t}$is unemployment rate; this is assumed to negatively affect a number of education of infrastructure needs (Saphiro, 1987). All of these variables are expressed in natural logs. δ_i is a country fixed effect, γ_t is a time dummy, and $\epsilon_{i,t}$is the error term. Appendix 2 provides the detailed definition of each economic and demographic variable.

Aside from all of the proposed independent variables in Equation (1), the macro approach also introduces some other specific independent variables for each social infrastructure to obtain more reliable results. For instance, the model for health infrastructure uses variables that represent the quality of housing sanitation. The rationale is straightforward: sanitation is directly related to the quality of people's health. Fewer sanitation facilities increase the number of diseases in the community (Bartlett, 2005; Buttenheim, 2009; Adjei et al., 2013). Similarly, housing proximity to sewerage is positively associated with diarrhea incidence (Buttenheim, 2009). Both channels, in turn, increase demand for public health infrastructure. To capture this channel, the health demand model incorporates other explanatory variables, i.e. portion of households with health-related complaints, households with semi-damaged houses, households with unprotected bathtubs, households without access to sanitation, and households with access to sanitation under 10 kilometers. On government building infrastructure, the number of junior high schools is added in the set of explanatory variables. Having more schools stimulates a demand more public teachers, which in turn increases the demand for public officials.

We use several datasets in our panel data estimation at province level for each social infrastructure. For education, we use data on the number of elementary schools, junior high schools, and senior high schools from the Ministry of Education and Culture and Central Statistical Agency *(BPS-Badan Pusat Statistik)*, while for higher education, we use data from Susenas. For health infrastructure, we use data on the number of hospital beds and number of district health centers from CEIC Indonesia. For housing and government building, we use data on house-ownership and number of government employees as proxies from Central Statistical Agency.

For independent variables, per capita GDP, manufacturing share of GDP, urban share of population, population density, and poverty rate are obtained from BPS Indonesia and CEIC Indonesia. Susenas provides other population-related data, including population under 15 years old, population over 65 years old, portion of households with health-related complaints, households with semi-damaged houses, households with unprotected bathtubs, households without access to sanitation, and households with access to sanitation under 10 kilometers.

The detailed of data used for macro approach are as follows (Table 3.1),

Table 3.1 Variables of Macro Approach

Variables	Source of Data	Series of Data
Number of primary school	Ministry of education/ Indonesia Bureau of Statistics	2006 - 2015
Number of junior high school	Ministry of education/ Indonesia Bureau of Statistics	2006 - 2015
Number of senior high school	Ministry of education/ Indonesia Bureau of Statistics	2006 - 2015
Number of students at higher education	National Socioeconomic Survey (Susenas)	2003 - 2015
Number of district health center	Ministry of Health/ CEIC Indonesia	2000 - 2015
Number of hospital beds	Ministry of Health/ CEIC Indonesia	2010 - 2014
Percentage of household without owning a house, income bottom 20%	National Socioeconomic Survey (Susenas)	2006 - 2015
Number of government employee	Indonesia Bureau of Statistics	2007 - 2014
GDP per capita	Indonesia Bureau of Statistics	2000 - 2015
Population density	CEIC Indonesia	2000 - 2015
Manufacture share of GDP	Indonesia Bureau of Statistics / CEIC Indonesia	2000 - 2015
Unemployment rate	Indonesia Bureau of Statistics / CEIC Indonesia	2000 - 2015
Poverty rate	Indonesia Bureau of Statistics / CEIC Indonesia	2005 - 2015
Number of population age 7-12	National Socioeconomic Survey (Susenas)	2002 - 2015
Share of population age 13-15	National Socioeconomic Survey (Susenas)	2002 - 2015
Share of population under 15 y.o	National Socioeconomic Survey (Susenas)	2002 - 2015
Number of Population age 19-23 y.o	National Socioeconomic Survey (Susenas)	2002 - 2015
Percentage of households with health-related issues	National Socioeconomic Survey (Susenas)	2002 - 2015
Percentage of households with semi-damaged house	National Socioeconomic Survey (Susenas)	2002 - 2015
Percentage of households with unprotected bathtub	National Socioeconomic Survey (Susenas)	2002 - 2015
Percentage of household without access to sanitation	National Socioeconomic Survey (Susenas)	2002 - 2015
Percentage of household with access to sanitation under < 10 km	National Socioeconomic Survey (Susenas)	2002 - 2015
District Health Center per 1000 people	Ministry of Health/ CEIC Indonesia	2000 - 2015
Junior High School per 1000 people	Ministry of education/ Indonesia Bureau of Statistics	2006 - 2015

Source: Authors' compilation

Estimation Results of Econometric Models

Table 3.2 provides the econometric results for each type of infrastructure. We estimate the respective social infrastructure demand using panel regression. Aside from estimation for hospital beds and district health centers, the entire social infrastructure is estimated using fixed effect panel data regression. We use random effect panel regression for hospital beds estimation because this estimation provides a better predictive result for demand projection for hospital beds in comparison with other forms of estimation.

There are several reasons why we did not include every possible independent variable in our estimation. First, we want to ensure that we have the best estimation possible in predicting our demand for social infrastructure, showed by high R^2 values. Secondly, we also ensure that parameters can be explained in line with economic theory, resulting in no explanations that contradict existing theory of infrastructure demand. Lastly, we also chose the most reasonable estimation result, in line with the current conditions of social infrastructure demand in Indonesia.

Table 3.2 Econometric Results

Variables	Elementary School	Junior High School	Senior High School	District Health Center	Hospital Beds	Housing	Government Building
Lagged Dep. Variable	0.670*	0.877*	0.567*	0.996***	0.876***	0.326***	0.637***
	(0.092)	(0.042)	(0.098)	(0.007)	(0.061)	(0.044)	(0.065)
GDP per capita	0.063**	0.0347	0.068	0.008	0.040	-1.810	0.017
	(0.028)	(0.0452)	(0.074)	(0.006)	(0.070)	(1.728)	(0.033)
Manufacture Share of GDP		0.002	0.008			0.154**	
		(0.002)	(0.006)			(0.069)	
Urban Share of Population						0.154**	0.001
						(0.069)	(0.001)
Population Density	-0.321*	-0.112**		-0.024***	0.102**		
	(0.097)	(0.050)		(0.009)	(0.041)		
Unemployment			-0.007				
			(0.067)				
Number of People Age 7-12	0.053						
	(0.042)						
Share of People Age 13-15		0.0002					
		(0.023)					
Number of People Age Under 15			0.015**				
			(0,00692)				
Percentage of People with Health-related Complaint				0.0004	0.002		
				(0.0004)	(0.006)		
Percentage of Semi-damaged Houses				0.001***	0.001		
				(0.0003)	(0.004)		
Percentage of People Unprotected Bathing				0.0001	0.0062***		
				(9.31e-5)	(0.0018)		
Percentage of People without Access to Sanitation				0.001**	0.003		
				(0.0004)	(0.005)		
Percentage of Households with Access to Sanitation under < 10 km				0.0006			
				(0.0004)			
District Health Centers per 1,000 people					0.223***		0.224***
					(0.094)		(0.079)
Poverty Rate						0.014	0.0013***
						(0.019)	(0.0003)
Junior High Schools per 1,000 People							0.018
							(0.041)
Constant	-1.664**	-0.583**	-1.970*	-0.102**	0.736	13.03*	1.715***
	(0.727)	(0.248)	(0.591)	(0.0472)	(0.550)	(6.500)	(0.398)
R-square overall	0.887	0.916	0.584	0.998	0.781	0.834	0.984
Number of province	160	163	161	32	30	33	33
Observations	32	33	33	156	120	294	132
Estimation Strategy	Fixed Effect	Fixed Effect	Fixed Effect	Random Effect	Random Effect	Fixed Effect	Fixed Effect

Standard errors in parentheses, *** p<0.10, ** p<0.05, * p<0.010
Source: Authors' estimation

Assumptions for Projection

Given the estimates in Table 3.2, we forecast the social infrastructure using projections of all economic and demographic variables. Table 3.3 presents the assumptions for each projected economic and demographic variable. Excepting GDP per capita, urban share, population, and poverty rate, we assume that all variables are constant across year.

Table 3.3 Assumptions for Projected Economic and Demographic Variables

Variables	Unit	Year			
		2016	2020	2025	2030
GDP per Capita	Million IDR	36.51	42.49	51.86	63.91
Manufacture Share GDP	%	20.84	20.84	20.84	20.84
Unemployment Rate	%	6.0	6.0	6.0	6.0
Urban Population Share	%	53.3	56.7	60.0	63.4
Population Density	People/km-sq	0.1	0.1	0.1	0.2
Poverty Rate	%	11.1	6.0	3.2	1.8

Source: BPS (2017)

The new investment need is then calculated by taking the difference between this year and the previous year's social infrastructure stock. Monetary values of the new investment are then calculated by multiplying the additional investment need and the total unit costs of the given infrastructure. Furthermore, maintenance, rehabilitation, and replacement cost is estimated as the percentage of previous stock multiplied by the building/construction cost of each social infrastructure. The percentage of maintenance cost is 1% of the building cost, while rehabilitation cost is 2% of the building cost. Replacement cost as the age of building is estimated until 50 years, and then the percentage is 2% of building cost. The interior cost is the percentage of building cost; its value is 15%. All of this cost is stated in the Ministerial Decree of Public Works No: 45/PRT/M/2007 about technical guidance of government office building.[8] The unit costs of each social infrastructure element are presented in Table 3.4.

Land acquisition cost for the government building is assumed to have similar value as building cost due to lack of comprehensive information on land price.[9] The standard of government building we calculate using the minimum standard of space required for each government official from the Ministry of Public-Works (Permen No. 45/PRT/M/2007). This study, however, makes an adjustment for land acquisition cost for elementary school, junior high school and senior high school that is 50% of building cost. This is because most of new schools are not built in business/city center area; consequently, the land price for schools would be cheaper than the

[8] http://birohukum.pu.go.id/uploads/DPU/2007/PerMenPU45-2007.pdf

[9] Land price also varies among region, province and area. The price of land is also different between market price and Tax Object Sales Value *(NJOP-Nilai Jual Obyek Pajak)*. For instance, in Depok-West Java near Universitas Indonesia, the market value of land is almost IDR 15 million/m^2, while the NJOP's price is around IDR 6 million/m^2. The construction cost is not much varied among region, province and area because the material price is almost similar across countries (except in remote area and eastern part of Indonesia), but the wage rate of construction labor is quietly different among region. In some regions like Jabodetabek (Jakarta, Bogor, Depok, Tangerang and Bekasi), the cost of building is lower than the price of land while in the other region such as in eastern part of Indonesia and rural area, the cost of building is higher than the price of land. For instance, the land price in a middle city of Java is around IDR 1 million/m^2 while the construction cost is around IDR 3 million/m^2. This study, therefore, assumes that the land price is equal to the construction/building cost.

land price for government office buildings that are most likely located in city center/business area.

We use multiple sources to obtain the unit cost of each infrastructure. We derive the unit cost of school from the Ministerial Decree of National Education No. 24/2007 on the infrastructure standard for schools. It regulates the number of classrooms, the minimum land area of schools for each level, and the associated infrastructures. The minimum land area for a primary school with at least 6 classrooms is 1.340 m^2, while the minimum land area for a junior high school with 7 classrooms and senior high school with at least 19 classrooms are 2.300 m^2 and 5.100 m^2 respectively. The regulation stated that the minimum area per student for each education infrastructures (primary, junior high and senior high) is at least 4,1 m^2 per student. The Ministerial Decree of National Education No. 23/2013 stated that the ratio student per classroom is 36 students.[10] Additionally, we also perform adjustment of unit cost for each year during the period of 2016-2030. In terms of cost of education infrastructure, we define the total cost of each education infrastructure as a sum of the cost of construction of building, the cost of land acquisition for a minimum requirement area, and its interior cost.

The cost of building hospital per bed is equivalent to IDR 714 million (USD0.07 million) that includes land, construction, interior and installation. The cost of one hospital bed is an average unit cost of building hospital (type C) with 100 units of beds (cost/100 beds).[11] We use this assumption to capture the cost of supporting items related to hospital beds in a hospital. We assume that the land acquisition cost and installation cost are 50% and 15% of construction cost. The cost of building Puskesmas including land acquisition and installation is around IDR 11.2 billion.[12]

The total investment need is the sum of new investment cost, and maintenance, rehabilitation, and replacement costs. These calculation formulae are applied for infrastructure of education, health (health center), and government building. For public housing units, the cost is a single price without any breakdown of cost. This is because the available information of housing price is a bundling price of land and house. Subsidized housing price subsidized is around USD 0.01 million. We obtain this cost from the standard minimum cost of subsidized housing from the Ministry of Public-Works.

Table 3.4 Unit Cost of Each Social Infrastructure Category

Category	Unit Cost	Account	2016	2030
Education				
Elementary *Sekolah Dasar (SD)*	Building	unit cost mill IDR	4,592.00	8,306.12
		unit cost mill USD	0.44	0.84
	Land	unit cost mill IDR	2,680.00	4,847.65
		unit cost mill USD	0.26	0.49

[10] http://sdm.data.kemdikbud.go.id/upload/files/Profil%20Dikdasmen%202014.pdf

[11] https://www.slideshare.net/adnanims/proposal-pendirian-rumah-sakit. Based on the proposal for development of RS Madani Cikarang, the cost of building hospital with 52 beds is around IDR 42 billion rupiah. However, other hospital needs less than that amount.

[12] http://www.tribunnews.com/regional/2014/11/23/wali-kota-tanjungpinang-janjikan-semua-puskesmas-berstandar-internasional.
Due to limited information of the building cost of Puskesmas as well as diverse types of Puskesmas, this study then takes some information from online news and other sources (including interview with health agency and Ministry of Health). The construction cost of Puskesmas in Tanjungpinang Batam excluding land acquisition was around IDR 4 billion in 2014.

Category	Unit Cost	Account	2016	2030
Junior Secondary *Sekolah Menengah Pertama (SMP)*	Interior	unit cost mill IDR	459.20	830.61
		unit cost mill USD	0.04	0.08
	Building	unit cost mill IDR	8,610.00	15,573.97
		unit cost mill USD	0.83	1.58
	Land	unit cost mill IDR	4,600.00	8,320.59
		unit cost mill USD	0.44	0.84
Senior Secondary *Sekolah Menengah Atas (SMA)*	Interior	unit cost mill IDR	861.00	1,557.40
		unit cost mill USD	0.08	0.16
	Building	unit cost mill IDR	13,776.00	24,918.36
		unit cost mill USD	1.32	2.52
	Land	unit cost mill IDR	10,200.00	18,450.00
		unit cost mill USD	0.98	1.87
	Interior	unit cost mill IDR	1,377.60	2,491.84
		unit cost mill USD	0.13	0.25
Health				
District Health Center *Puskesmas*	Building cost	millions IDR	7,142.86	12,920.17
		millions USD	0.69	1.31
	Land Cost	millions IDR	3,571.43	6,460.09
		millions USD	0.34	0.65
	Interior Cost	millions IDR	1,071.43	1,938.03
		millions USD	0.10	0.20
	Total Cost	millions IDR	11,785.71	21,318.28
		millions USD	1.13	2.16
Hospital Beds (including land, construction, installation and interior)	Total Cost	millions IDR	714.29	1,292.02
		millions USD	0.07	0.13
Public Housing				
Simple Housing (including land and building)	Total Cost	millions IDR	132.22	239.17
		millions USD	0.01	0.02
Government Building				
Government Building	Building	unit cost per person mill IDR	65.00	117.57
		unit cost per person mill USD	0.01	0.01
	Land	unit cost per person mill IDR	65.00	117.57
		unit cost per person mill USD	0.01	0.01
	Interior Cost	unit cost per person mill IDR	9.75	17.64
		unit cost per person mill USD	0.00	0.00
	Total Cost	unit cost per person mill IDR	139.75	252.78
		unit cost per person mill USD	0.01	0.03

Source: Authors' Compilation

Trend in the building cost of school, district health center, subsidized housing, and government building is assumed to follow compound annual growth rate of 4.5%. The annual growth is, however, decreasing from 5.5% in 2017 to 3.3% in 2030. This number is derived from extrapolation of subsidizing housing price as regulated in the Ministerial of finance Decree No 113/PMK.03/2014. The decree regulates the floor price of subsidized housing for various regions over the period of 2014-2018.

3.1.2 Micro Approach

The micro approach calculates the demand for infrastructure based on the projected population. This study uses projected population data from the Central Statistical Agency (BPS), since this is the official source used by the Indonesian government in every policymaking process. In estimating the demand for infrastructure in education and health, this study follows its official minimum standard of services. In projecting the number of schools, this study uses the average ratio of student per school that is available at Kemendikbud's website.[13] We found that in 2015/2016, the average student per school is 175 student per SD[14], 270 student per SMP[15], 344 student per SMA[16] and 343 student per SMK[17]. We used this information as a basis for calculation of the need of school per student age. The standard demands of SD, SMP and SMA per 10,000 people/student age are 57, 37 and 29 respectively.

Meanwhile, for health facilities, this study follows the standard from the WHO, such as one community health center for 15,000 people, one bed for 750 people, and ideally one local hospital (Type C) that meets the minimum standard for the national health insurance program; such a hospital should have 100 beds. In calculating demand of projected hospital beds this study uses gradual increase scenario from one bed for 750 people in 2016 to one bed for 250 residents in 2030. The gradual increase of standard bed per 1,000 people is to capture the future demand of health services as a consequence of aging population and an increase of socio-economic welfare.

In projecting the demand for government building, firstly, this study projected the number of civil officers based on its ratio to population. By assuming that this ratio is constant, we then get the estimated number of civil officers. For public housing, we estimate the demand from people in 20% lowest income bracket who do not own a house.

Given the stock estimates for social infrastructure for 2016–2030, the new investment need is later calculated by taking the difference between this year and the previous year's social infrastructure stock. Monetary values of the investment are subsequently calculated by multiplying the additional investment need by the unit costs of one building of the given infrastructure. The unit cost is based on the standard that has been used by government. In education facilities, the unit cost is derived from the number of students. Then, by multiplying the number of students by the minimum space needed per student and the cost per meter, we get the total cost for the building. We also include cost for land.

In the term of school, the total cost for land is calculated based on the total area of the school. An elementary school is 1,340 m^2, a junior high school is 2,300 m^2, and a senior high school is 5,100 m^2. Interior cost is 15% of the cost of building. There are another costs for stock of infrastructures (school), namely maintenance, rehabilitation, and replacement. Each cost respectively is 1%, 2%, and 2% of the cost of building. Meanwhile, for health, it spends IDR 7.1

[13] http://data.go.id/dataset/rasio-siswa-sekolah
[14] http://niep.data.kemdikbud.go.id/index.php?r=Indikator/SiswaSekolah&bpid=5&ta=2015&akses=1
[15] http://niep.data.kemdikbud.go.id/index.php?r=Indikator/SiswaSekolah&bpid=6&ta=2015&akses=1
[16] http://niep.data.kemdikbud.go.id/index.php?r=Indikator/SiswaSekolah&bpid=13&ta=2015&akses=1
[17] http://niep.data.kemdikbud.go.id/index.php?r=Indikator/SiswaSekolah&bpid=15&ta=2015&akses=1

billion to build one *Puskesmas*, and IDR 714 million for one bed of hospital (including all costs: land, building, interior and installation). Furthermore, there is also an interior cost for *Puskesmas* that is 15% of the cost of building. Another cost as in education such as maintenance, rehabilitation, and replacement cost also applied.

In government building infrastructure, the building cost per m^2 at the national level is IDR 6.5 million. Every government official needs 10 m^2. The land cost is assumed to be the same as the building cost. An interior cost is 15% of the building cost. Maintenance, rehabilitation, and replacement costs are also applied. In public housing, the cost of housing is IDR 132.2 million at the national level that is similar to the assumption of macro approach in Table 3.4.

The above analysis related to price is the average price at the national level. Using the micro approach, this study also estimates the total investment needed for social infrastructure at the province level; this study uses province price level. For education and health, the average price at the national level is adjusted by the BPS construction cost indices. These indices describe the costliness of construction in each district in Indonesia.

3.2. Estimates of Infrastructure Needs

3.2.1 Aggregated Estimates

Macro Approach

Table 3.5 provides the estimated social infrastructure total investment needs of Indonesia for 2016-2030 that resulted from the macro approach (using the provincial dataset). The estimates are based on Indonesia's constant price 2000. We obtain the projection of total investment needs for three education infrastructures, two health infrastructures, and one for housing and government buildings. For each group, we calculate total investment needs, the annual average, and the size relative to projected GDP.

Over the 15 years, Indonesia needs a total of USD735.6 billion, or USD49.0 billion a year, to fulfill its social infrastructure demand. This number is equivalent to 3.8% of Indonesia's projected GDP. This number is approximately 67% of investment demand in economic physical infrastructure projected by ADB. Furthermore, the proportion between new investment and maintenance cost is relatively comparable. Investment for new infrastructure accounts for USD158 billion, or 49.1% of total investment.

Most of the projected total investment amount falls in the housing sector for the bottom 20% of households, which requires USD17.8 billion per year, and a total of USD266.7 billion over 15 years, or 1.38% of projected GDP. However, if we exclude housing for the low-income group from the calculation, then the amount of investment only requires 2.42% of GDP or equivalent to 42% of investment demand projected by ADB. Education is in second place, requiring USD15.4 billion annually or 1.20% of GDP. This number is reasonable, as the education sector covers three levels, i.e. elementary, junior high, and senior high school. The health sector and government building require USD12.6 and USD3.3 billion annually, respectively. These numbers are equivalent 0.98% and 0.25% of GDP, respectively.

Table 3.5 Projected Infrastructure Needs by Sector using the Macro Approach, 2016-2030

Sector	Total Investment needs (USD Billion)	Annual average (USD Billion)	% of projected GDP*
Education	231.4	15.4	1.20%
Elementary (SD)	89.5	6.0	0.46%
Junior high (SMP)	75.2	5.0	0.39%
Senior high (SMA)	66.5	4.4	0.34%
Health	188.9	12.6	0.98%
Health center *(Puskesmas)*	13.6	0.9	0.07%
Hospital beds	175.3	11.7	0.91%
Housing for Low Income Group	266.7	17.8	1.38%
Government building	48.8	3.3	0.25%
Total	**735.6**	**49.0**	**3.80%**

**Annual investment need as % of GDP*
Source: Authors' estimate

Micro Approach

Table 3.6 is the projected infrastructure need using the micro approach. As mentioned previously the micro approach uses two types of infrastructure prices: average national price and provincial or big island price.[18] Comparing the results of Table 3.5 and Table 3.6, this study firmly confirms that both approaches result similar amount of investment needs. In total, using the national and provincial price level, total investment is around USD719.74 to USD747.74 billion, or USD48-USD50 billion annually or the equivalent of 3.7%-3.9% of GDP. The sectoral detail is quietly similar to the macro approach. Both macro and micro approach result that housing for low-income group needs the highest total investment of USD18.70 billion annually or 1.5% of GDP.

[18] Using both prices allows us to capture the variation of price between region in Indonesia. The significant difference of social infrastructure demand between using the national price and provincial price will necessarily reflect the significant price different among province in Indonesia.

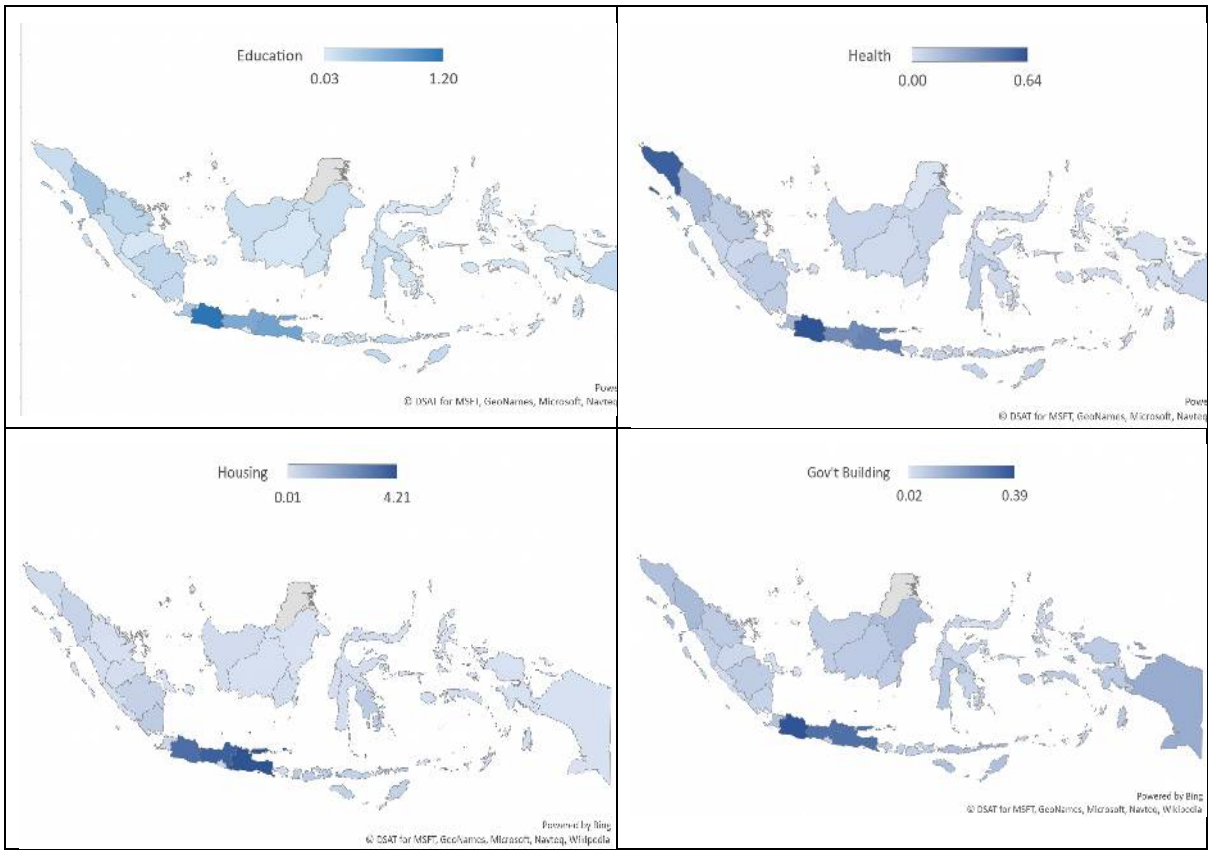
Table 3.6 Projected Infrastructure Needs by Sector using Micro Approach, 2016-2030

Sector	Price at National			Price at provincial/islands		
	Investment needs (USD Billion)	Annual average (USD Billion)	% of projected GDP	Investment needs (USD Billion)	Annual average (USD Billion)	% of projected GDP*
Education	224.71	14.98	1.2%	259.74	17.32	1.3%
Elementary (SD)	96.60	6.44	0.5%	103.90	6.93	0.5%
Junior high (SMP)	58.79	3.92	0.3%	84.89	5.66	0.4%
Senior high (SMA)	69.32	4.62	0.4%	70.95	4.73	0.4%
Health	166.23	11.08	0.9%	165.96	11.06	0.9%
Health Center (Puskesmas)	26.00	1.73	0.1%	25.74	1.72	0.1%
Hospital Beds *(a gradual increase of standard)*	140.22	9.35	0.7%	140.22	9.35	0.7%
Housing for Low Income Group	280.54	18.70	1.5%	271.24	18.08	1.4%
Government building	48.26	3.22	0.2%	50.79	3.39	0.3%
Total	**719.74**	**47.98**	**3.7%**	**747.74**	**49.85**	**3.9%**

**Annual investment need as % of GDP*
Source: Authors' estimate

This study calculates the total investment need of each infrastructure type at the provincial level. Provinces located in Java have a high demand for social infrastructure investment due to the larger number of projected population. Consequently, Java with high population density needs a high investment of social infrastructure. For housing, East Java, West Java, and Central Java are the provinces with the highest demand of average annual investment. In education, the provinces in Java and North Sumatera also have significant need for education infrastructure investment. As for government buildings infrastructure, provinces outside of Java that need quite high total investment are Papua, North Sumatera, East Kalimantan, and East Nusa Tenggara. The significant government building costs is due to maintenance, rehabilitation, and replacement rather than new investment. For health infrastructure, provinces with high total investment need are Aceh, North Sumatera, Riau, and South Sumatera.

Figure 3.2 Average Annual Investment Cost of Social Infrastructure by Province



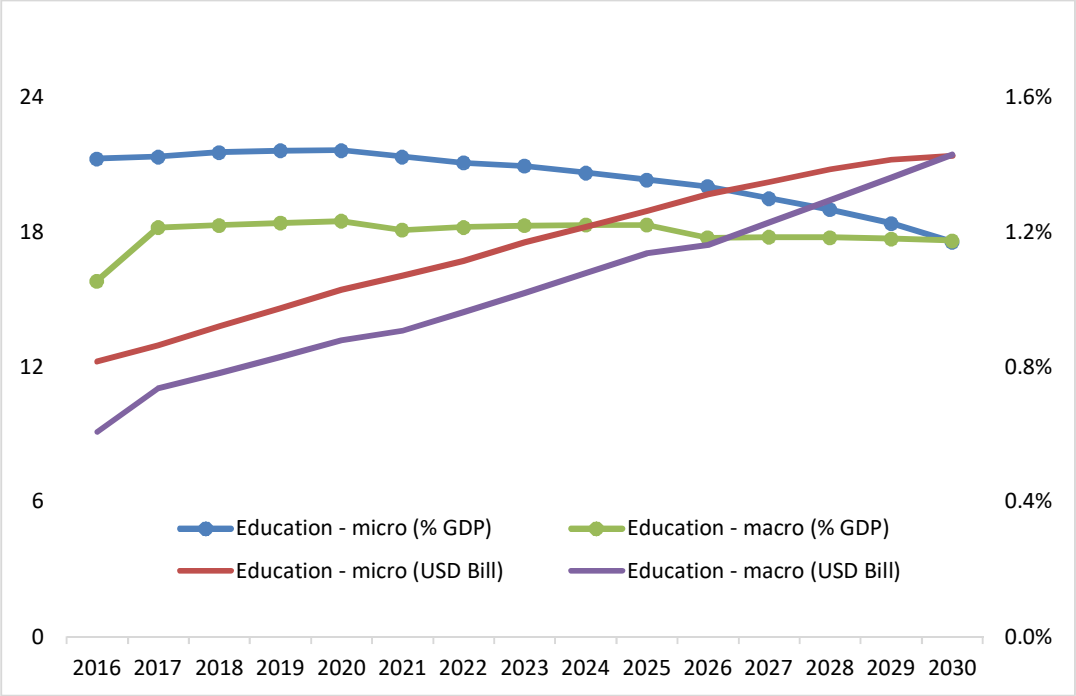
Source: Authors' estimate

3.2.2 Detailed Estimates

Education

Figure 3.6 shows the detailed estimation of total investment needs for education infrastructure. Total Investment need is projected to increase during 2016-2030, using both the macro approach and the micro approach (at the provincial price). The estimation using the micro approach for total investment needs in education is slightly above the estimation using the macro approach. In terms of total investment need for education infrastructure as percentage of GDP, both estimations provide a steadily decreasing trend of total investment during 2016-2030, with a slight downward trend in the micro approach from 2025-2030. By 2030, our projection shows that Indonesia needs to spend 1.2% of GDP annually on financing its education infrastructure.

Figure 3.3 Total Investments for Education Infrastructure



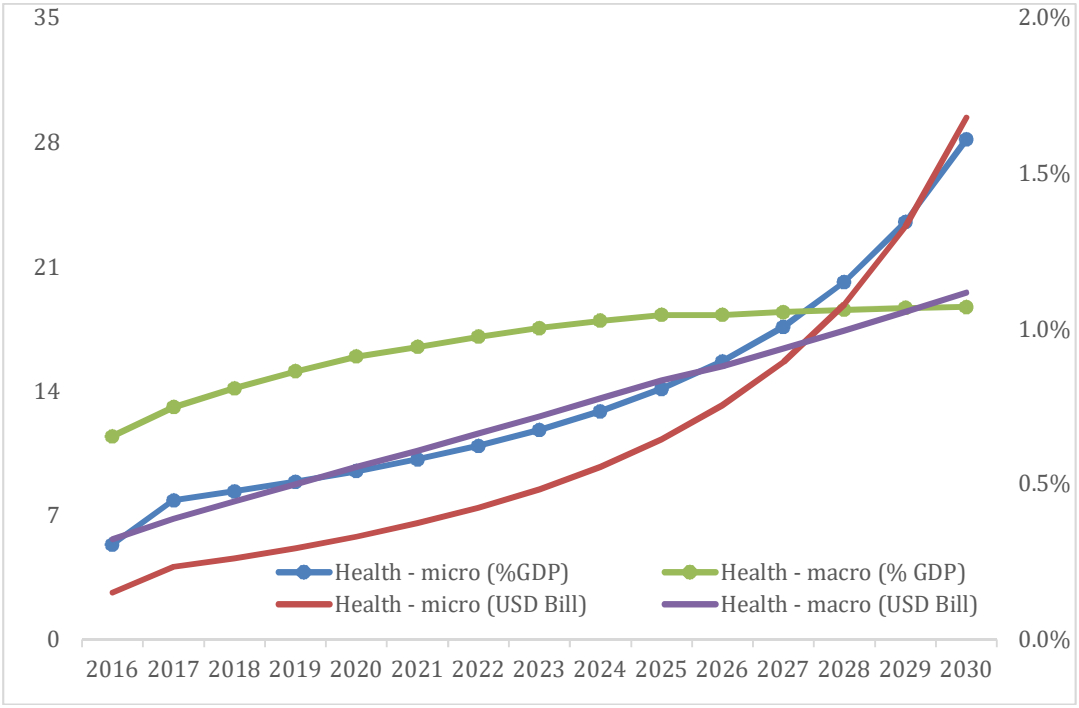
Source: Authors' Estimate

The negative trend of the need as percent of GDP indicates that the need grows slower than the GDP does. The dynamics of population structure plays a significant role in explaining this decreasing trend. Population projection 2016-2030 presented in Figure 2.16 and 2.17 indicates that schooling population grows at decreasing trend. More people enter productive age and labor market. Both factors potentially create less demand in basic education infrastructure.

Health

The total investment need in health infrastructure is defined as investment in community health centers and hospital beds as a proxy for health infrastructure. Using macro and micro approaches, this study indicates that the need of health infrastructure is quite stagnant after 2025 (macro approach) and increased after 2025 (micro approach). In micro approach as stated at previous section, for hospital beds, this study used gradual increase scenario from one bed per 750 people (2016) to one bed per 250 people (2030).

Figure 3.4 Total Investments for Health Infrastructure



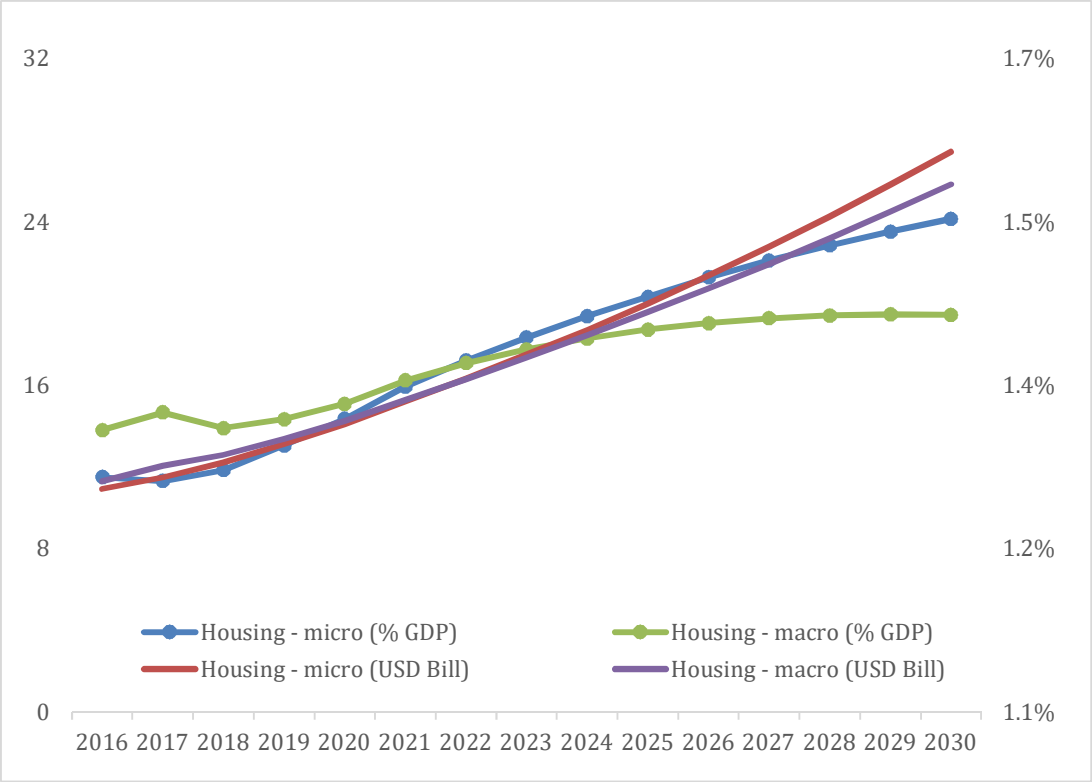
Source: Authors' estimate

The model predicts that the demand of health care services will increase significantly a long with an increase in income and standard of living. This study, therefore, increases the standard of number of hospital bed per 250 people. Additionally, growing population along with more portion of elderly population potentially contributes to the increasing demand. This is the reason why the graph in micro shows the increase in total investment steadily. The need for total investment in health infrastructure is projected to be as much as 1.1%-1.6% of GDP.

Housing

House ownership for households in the bottom 20% of household income is used as a proxy for housing investment. Using both the micro and macro approaches, we found a convergent result, as shown in the graph below. Our estimation shows that by 2030, the need for housing investment for the bottom 20% is around USD25.8 to USD27.8 billion or the equivalent of 1.4%-1.5% of GDP.

Figure 3.5 Investments for Housing Infrastructure



Source: Authors' estimate

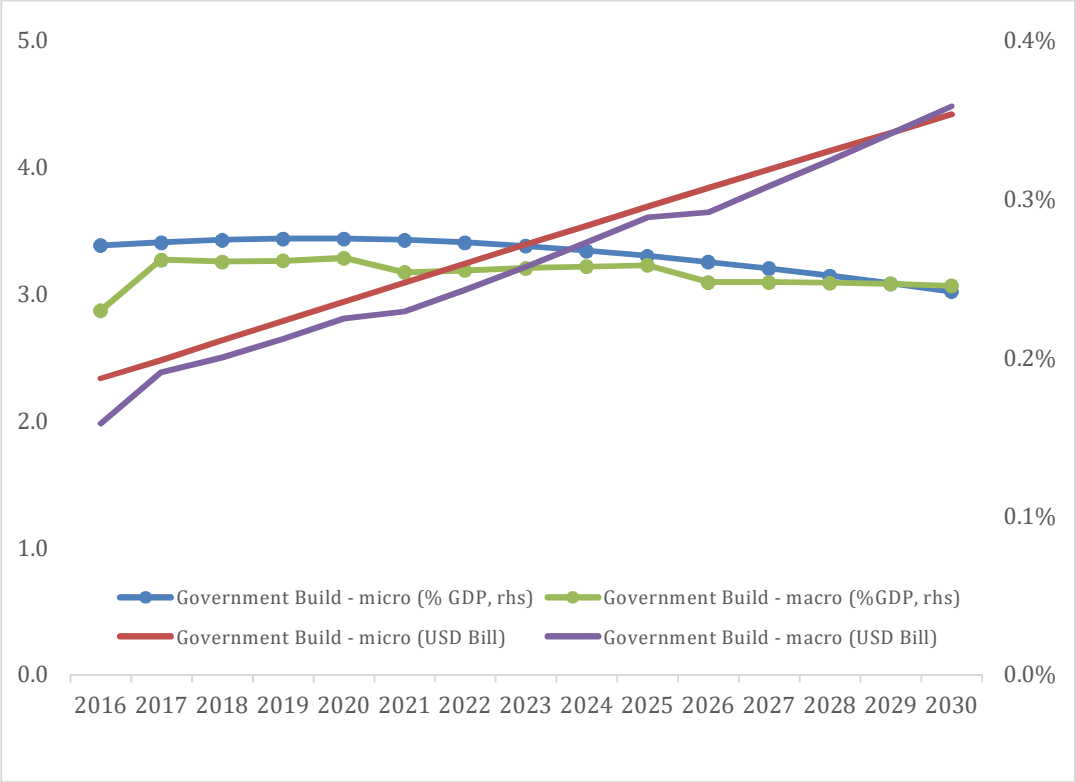
Investment demand in housing as percent of GDP also shows positive trend. The number is estimated to increase from 1.3% in 2016 to 1.4-1.5% by the end of 2030. Growing productive population, along with lower dependency ratio, during the period is expected to push higher demand for housing. Public housing policy, together with private sector cooperation will play a significant role in addressing this growing housing demand.

Government Building

Using projected government officials as a proxy for total investment needs for government building costs, we find that by 2030 the need for investment in government building is in the range of USD4.4 to USD4.5 billion, equivalent to 0.2% of GDP. Our estimation using micro and macro approaches produced an upward trend for investment need for government building. In macro approach, the curve is not quite smooth, as the projected population has decreased significantly every five years then stagnant during five years. The investment as percent of GDP is relatively constant over the period. The increasing demand in government building relatively is relatively proportional with the increasing income per capita and number of population.[19]

[19] The estimation of government office building is the most ideal condition that may overestimate.

Figure 3.6 Total Investments for Government Building



Source: Authors' estimate

Box 3.1 Estimating the Need for University Education

This report also estimates the need for university education to support Indonesia's industrialization medium-term national plan as well as a change in economic structure using both the macro and micro approaches. Yet, the projection excludes education infrastructure, as the estimate tends to be less precise, relative to other estimates, due to data limitations, particularly for building cost data.

The demand of labor with holding at least diploma as the size and quality of higher education infrastructure (universities, institutes, polytechnics, academies, and colleges) would substantially change as response to structural economic transformation in Indonesia. Specifically, the macro model uses the following empirical specification:

$$I_{i,t} = \alpha_0 + \alpha_1 I_{i,t-1} + \alpha_2 y_{i,t} + \alpha_4 M_{i,t} + \alpha_6 \text{Popden}_{i\,t} + \alpha_{11} \text{Pov}(19-23)_{i\,t} + \alpha_{12} \text{Unemp}_{i\,t} + \delta_i + \epsilon_{i,t}$$

Where the definition of each variable follows Equation (1). For the micro approach, this study uses Bappenas's prediction stated in Indonesia 2045 that the enrollment rate of higher education in 2045 is 60%. By doing interpolation, higher-education enrolment rate by 2030 is 44.95%, in 2015 the enrollment rate is 29.90, so the growth rate is 50% within 15 years. All approaches assume four cost components. There is no official cost data on higher education infrastructure and hence the number is assumed to be 20 times that of senior high school infrastructure cost. This key number is obtained by roughly comparing the operational cost between higher education and senior secondary education. Table 5 summarizes the projection of higher education infrastructure need 2016 – 2030.

The estimated need reaches USD17.6 billion, or USD1.17 billion annually, equivalent to 0.09% of projected GDP under micro approach. The estimate is comparable to the macro approach, which is 0.1% of GDP.

Table 3.7 Investment Needed for Higher Education

Sector		Investment needs (USD Billion)	Annual average (USD Billion)	% of projected GDP
Micro				
Higher Education	Total	17.60	1.17	0.09%
	New Investment	7.21	0.48	0.04%
	Maintenance	2.08	0.14	0.01%
	Rehabilitation	4.16	0.28	0.02%
	Replacement	4.16	0.28	0.02%
Macro				
Higher Education	Total	18.38	1.23	0.10%
	New Investment	7.53	0.50	0.04%
	Maintenance	2.17	0.14	0.01%
	Rehabilitation	4.34	0.29	0.02%
	Replacement	4.34	0.29	0.02%

Source: Authors' Estimate

Box 3.1 Continued

Table 3.8 Econometric Result for Higher Education

Variables	Higher Education
Lagged Dep. Variable	0.600*
	(0.0596)
GDP per capita	0.398*
	(0.0667)
Population Density	0.340***
	(0.201)
Unemployment	-0.0105
	(0.00481)
Number of people Age 19-23	0.200*
	(0.0618)
Constant	-1.913***
	(0.945)
R-square	0.828
Number of prov.	33
Observations	437
Estimation Strategy	Fixed Effect

Source: Authors' estimate

Source: Authors' estimate

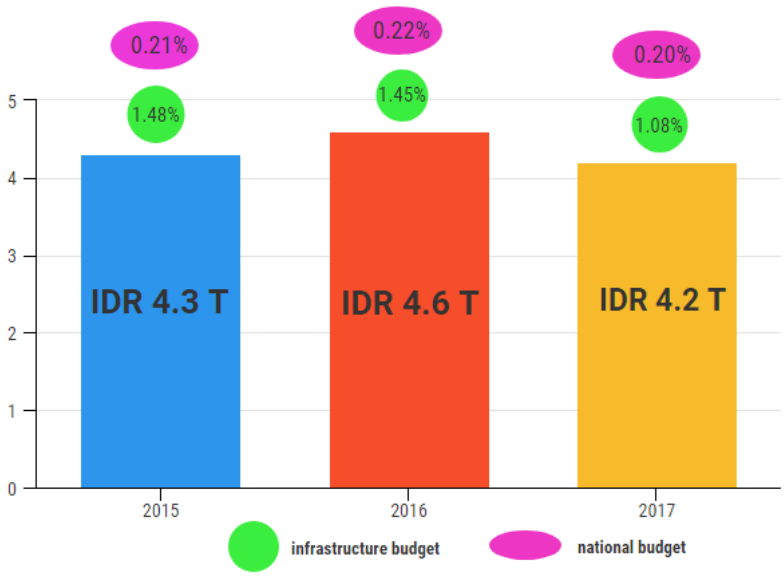
CHAPTER 4
FINANCING THE NEEDS

4.1 Current Condition

4.1.1 Education

The Constitution and Law No. 20/2003 Article No 49 outlines mandatory spending for the Indonesian government. The government must allocate at least 20% of its national and local budget to education sector. In 2017, the total allocated budget for education is IDR 416.1 trillion, and 65% of the allocated budget is transferred to sub-national governments, both provincial government and district government, as a local transfer fund. Figure 4.1 shows the allocated infrastructure budget for education through the Ministry of Education. In terms of absolute value, the allocated budget for infrastructure is relatively stable, but as a percentage there is a significant decrease from 2016 to 2017. For instance, in 2016 the national government invested 1.45% of its total infrastructure budget (equivalent to 0.22% of the total government budget) into education facilities, while in 2017, the government only invested 1.08% of total its infrastructure budget into education facilities.

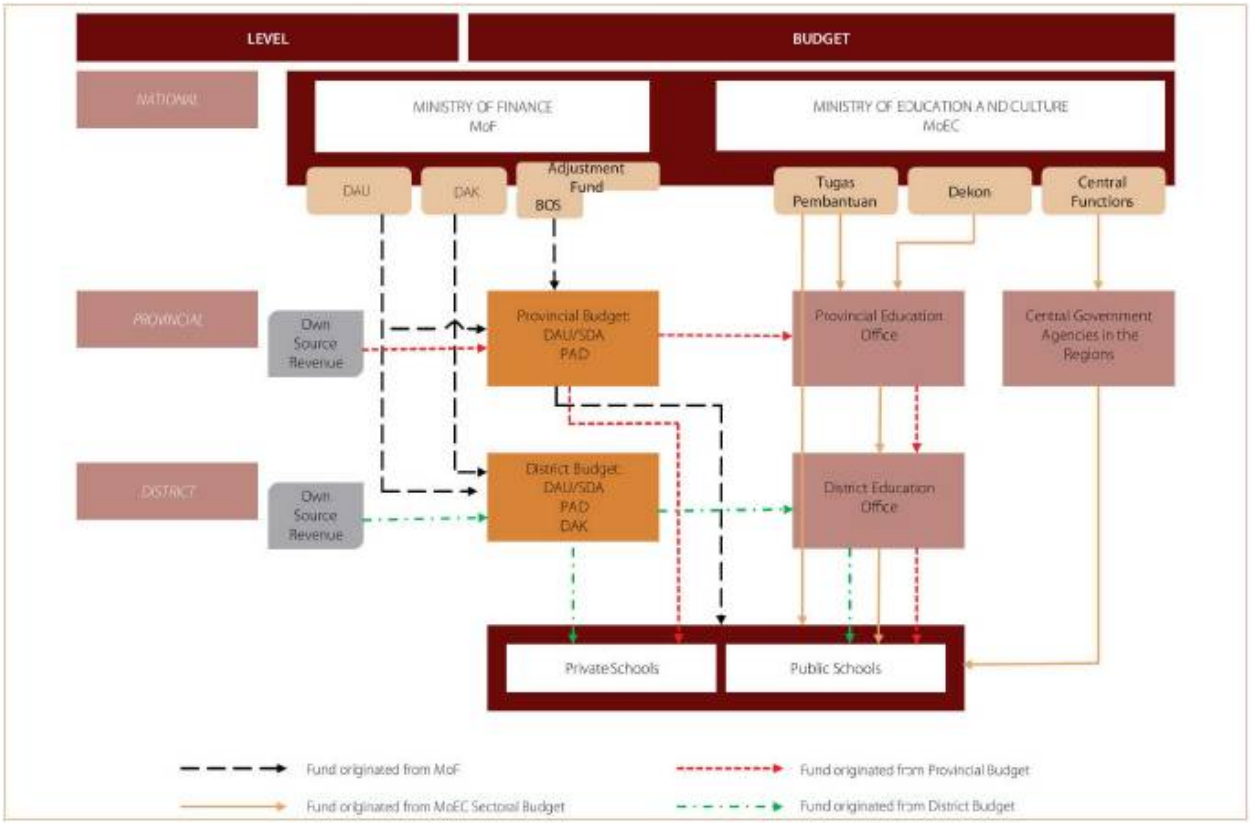
Figure 4.1 Infrastructure Budget



Source: Ministry of Finance and author calculation

While the government has committed to the 20 percent rule for education spending, Indonesia's system for education funding is quite complex. Currently, schools receive funds from eight different sources and four different budgets, including national, provincial, district, and school budgets. At the national level, two ministries specifically allocate education in their budget spending, the Ministry of Finance and Ministry of Education and Culture, which account for 88% of district budgets and 44% of provincial budgets, respectively, making them the main source of revenue for district government budgets. The Ministry of Finance transfers the education fund in three funding types: General Allocation Fund *(Dana Alokasi Umum)*, Specific Allocation Fund *(Dana Alokasi Khusus)*, and Adjustment Funds. The Ministry of Education and Culture has two types of education fund transfers, Co-administered Tasks *(Tugas Pembantuan)* and de-concentration fund *(Dana Dekonsentrasi)*.

Figure 4.2 Education Financing in Indonesia



Source: World Bank Report (2013)

The General Allocation Fund provides funding for salaries of civil servants, including teachers. The Specific Allocation Fund covers most funding for school and classroom reconstruction and school improvement in addition to de-concentrated funds. But with smaller contributions of de-concentrated funds allocated for funding the physical aspects of education, and its other role in funding social assistance and capacity building programs, the Specific Allocation Funds is the main contributor in school building management. Further, education is a key priority for spending, with approximately 40% of Special Allocation Funds allocated for education. The Adjustment Funds, which also provide additional benefits for teachers, primarily transfers the funds in the form of School Operational Assistance Program *(Bantuan Operasional Sekolah*), which has a significant role in operational assistance and quality management. Figure 4.2 illustrates the complexity of education funding in Indonesia.

Furthermore, the private sector also makes their contribution to the provision of education infrastructure. In 2015, in Indonesia there were 144,803 private schools, or 44.87% of the total number of schools. They managed the student tuitions fee collected to finance their costs, however, many private schools also rely on donations. Private schools usually offer better infrastructure to attract more students. Another form of private financing is through corporations' Social Responsibility investment funding, which not only provide education facilities for rehabilitation, but also to build new facilities.

4.1.2 Housing

For low-income households, with 20% and 40% of the lowest income households not owning a house in the past decade, the Indonesian government has been increasingly concerned with housing policies and financing for low-income households. This phenomenon corresponds with the fact that most banks will not give mortgage loans to households with an income in the lowest 60th percentile. Thus, to fill in the gap of financing for low-income households (simple and modest housing), there are two types of financial institutions that focus on the middle and lower income house: Bank Tabungan Negara (BTN) and micro-finance lenders.

BTN is the state owned-housing bank and the main housing finance creditor. Its mandate is to provide housing loans to middle- and lower-middle income households, which includes loans subsidized by the government. Before 2009, BTN's primary funding base came from the Bank Indonesia (BI), and it received the last BI soft loan of IDR 2 trillion in 2002. And in 2009, it securitized housing mortgages through Collective Investment Contract - Security Backed Asset *(Kontrak Investasi Kolektif Efek Beragun Aset - KIK EBA)*, and terminated the subsidized loan policy for housing in 2009.

The second type of financial institution is the micro-finance lender. While few of these institutions offer housing funding, we can discern two sub-types of mortgage finance systems in Indonesia developed specifically for housing, which are government led micro-finance lending programs tied to housing projects, usually supported by international agencies, and BRI's special *Kupedes* product for housing credit. Co-Bild, a UN-Habitat project in Indonesia, is one example of a government-sponsored micro-credit program designed in collaboration with international agencies.

In 2010, after the termination of the previous subsidized housing loan policy, governments started to implement the Liquidity Facility for Housing Mortgage policy *(Fasilitas Likuiditas Pembiayaan Perumahan - FLPP)*. The policy was based on a highly subsidized structure that relies on government funding and is budgeted in the Ministry of Public-Works and Public Housing. Seventy percent of mortgage funding was covered using the government's budget, and the other 30% was the banks' own funding. With an annual interest rate of 0.5%, and maturity in 20 years, Asuransi Kredit Indonesia (Askrindo) covers 70% of outstanding loans when defaults occur, with a premium of 0.3%. Figure 4.3 illustrates the structure of the FLPP programs funding (see Figure 4.3).

Box 4.1 Green Citayam City: A New Hope for Public Housing

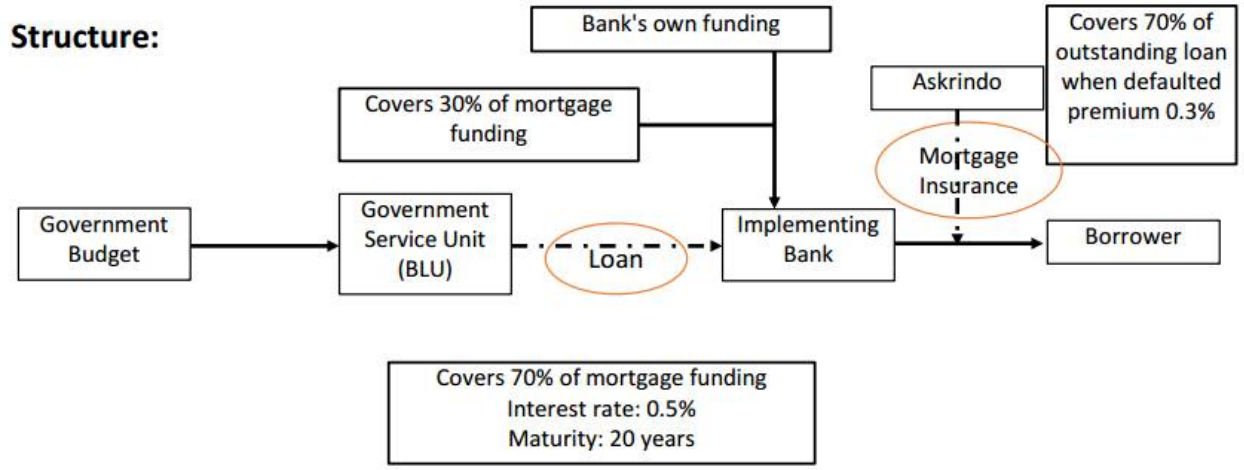
Since 2010, The Government of Indonesia provides Liquidity Facility for Housing Mortgage Policy (FLPP, Fasilitas Likuiditas Pembiayaan Perumahan). This facility would enable low-income group to buy subsidized house. They should only pay 1% down payment (around IDR 1.41 Million) and installment around IDR 800,000 per month. The government will subsidize 5% of the mortgage loan interest. The Government of Indonesia in cooperation with private sector tries to develop the subsidized house all over Indonesia. This is a part of "One Million Livable Housing" program, which is initiated by President Joko Widodo. The target of this program is those whose monthly income not more than IDR 4 million ($300).

Green Citayam City (GCC) developed by PT. Green Construction City is one example of subsidized housing project. GCC is built in 150 HA area at Citayam of Depok City, West Java. They build four types of house: 27 m^2 (72 m^2 of land), 36 m^2 (84 m^2 of land), 41 m^2 (84 m^2 of land) and 45 m^2 (84 m^2 of land). In total there will be 6,145 unit houses. The houses will consist of two-bed room, one living room and one bathroom. The owner has to build kitchen in the backyard since this house still have enough free space on the backside. On the first launching in 2016, they offered the smallest type at IDR 126 Million, but current price is IDR 141 Million, as the increase of demand and construction price.

Currently they have built 894 unit houses. The first batch of this housing is for employee at the Ministry of National Defense, the Indonesian Military, and the Indonesian Police. This housing will also have Mosque, Gas Station, Playground, Sports Center and School. If GCC project is completed, then GCC will become a new township in Citayam Sub-District.

Source: Authors' compilation based on the field visit and rumahdijual.com

Figure 4.3 FLPP Housing Program Funding Structure



Source: Ministry of National Development Planning, 2014

4.1.3 Health

Financing the health sector is one of the most challenging issues for the Indonesian government, since the expenditure tends to increase year by year due to the demographic structure and the national health insurance program. And also, based on the Presidential decree of 122/2016 for the acceleration provision of priority infrastructure, like education, the development of infrastructure in the health sector has become a priority for Indonesia's government.

According to Law No. 36/2009 on health, since 2016 the Indonesian government has allocated 5% of the national budget to financing the health sector, especially on promotive and preventive care, and increasing access and quality of service activities. This includes financing for national health insurance, health workers, and health facilities. In addition, the local government should allocate 10% of its budget for health sector. In the 2017 national budget, the Indonesian government allocated IDR 104 trillion for the health sector, with IDR 17.1 trillion allocated as a physical Special Transfer fund *(DAK Fisik)*, which account for 29.33% from total allocated physical DAK. For, the Non-Physical Special Transfer Fund (*DAK Non Fisik*), the allocated budget was IDR 6.9 Trillion, which allocates funding for the Health Operational Cost (BOK) and the national family planning program operational cost (BOKB). When compared with total non-physical special transfer fund, it is only 5.9% of total allocation in health sector.

Unlike the education sector, there is no specific allocated fund for health infrastructure. The main sources are JKN premium and the Special Allocation Fund (DAK) even though the source of public financing of health expenditure includes the revenue managed by the central government, provincial governments, district governments, social security schemes, and global funds, which are channeled through the government budget (WHO, 2016). Moreover, DAK is allocated directly to local governments and earmarked for specific health infrastructure construction, such as the construction of *Puskesmas, sub-Puskesmas*, and district hospitals (WHO, 2012). In addition to the Ministry of Health, the allocated fund for health infrastructure is allocated through the Ministry of Public-Works.

Choi et.al (2007) and Rokx et.al (2009) predicted that public spending on infrastructure would need to increase by 51% in real terms by 2020. These estimates do not reflect the recent increases in JAMKESMAS (Government Subsidized Health Insurance) coverage and thus understate the increased demand resulting from increased insurance coverage. Furthermore, Rokx et.al (2009) argue that investment in health and education infrastructure is expected to grow particularly strongly from a low base to more than 10% per year on average between 2015 and 2025. As such, social infrastructure is expected to account for 10% of the total budget spent by 2025, up from 7% in 2014.

Furthermore, the private sector also made their contribution to health sector by developing private health facilities. Currently, there are 437 private hospitals. Most of the clinics are integrated with BPJS health as primary health care facilities.

4.1.5 Government Office Building

Perpres (Presidential Regulation) No. 73/2011 states that the government's building funding come from national budget, and/or regional budget, or other legitimate sources, such as grants and purchases. Spending related to the government's building, including construction, rehabilitation, renovation, and restoration is accounted for in the national budget as capital expenditure. In 2014, the capital expenditure for government building was IDR 65 trillion, or 20.4% of capital expenditure. In 2015, it decreased significantly to IDR 98 trillion, or 13.8% of capital expenditure. However, current administration is trying to optimize the existing building instead of building the new government office building.

4.2. Social Infrastructure Expenditure

According to the summary of 2017 National Budget, total spending of Central Government for social infrastructure is only IDR 5.5 Trillion, which allocated only to Ministry of Education and Ministry of Religious affair. Compare to total GDP in 2017, the Indonesian government tends to spend 0.33% of GDP on new investment of social infrastructure (not including government building[20], exclusive of O&M spending by the government. Furthermore, according to the summary of 2017 National Budget, the government allocates IDR 12.3T for education infrastructure, IDR 17.1T for Health infrastructure and IDR 11.8T for public housing.

This budget allocated through different scheme. First, through social infrastructure budget, as mentioned above that it was only allocated to Ministry of Education and Ministry of Religious Affair. The second channel is through the Regular Physical Transfer Fund *(DAK Fisik)*, which allocated to support the basic services and minimum service standard. Under this scheme, the Government allocates IDR 6.1T for education, IDR 10T for Health and IDR 0.7T for housing. The third scheme is through the Assignment Physical Transfer Fund *(DAK Fisik Penugasan)*, which allocated to support national priority, for example, in education this fund is allocated for vocational high school (SMK) and for health, it is allocated to hospital. Under the third scheme, the government allocated IDR 2T for education and IDR 4.8T for health. Moreover, the fourth scheme is through the Affirmation Physical Transfer Fund *(DAK Fisik Afirmasi)*, which allocated to accelerate infrastructure development in remote and border areas. This focuses on basic services such as *Puskesmas* and housing. The government allocated IDR 2.3T for health and 0.4T for housing.

[20] The government has not yet made a clear breakdown for new investment, as well as, O&M spending for government building.

Table 4.1 Breakdown of infrastructure budget

Budget Item	Education	Health	Housing
Social Infrastructure Budget	4.2		
DAK Fisik (Regular)	6.1	10	0.7
DAK Fisik (Assignment)	2	4.8	
DAK Fisik (Affirmation)		2.3	0.4
FLPP			9.7
PT.SMI			1
Total	**12.3**	**17.1**	**11.8**
Compare to National Spending (%)	**0.59**	**0.82**	**0.57**
Compare to GDP (%)	**0.10**	**0.14**	**0.09**

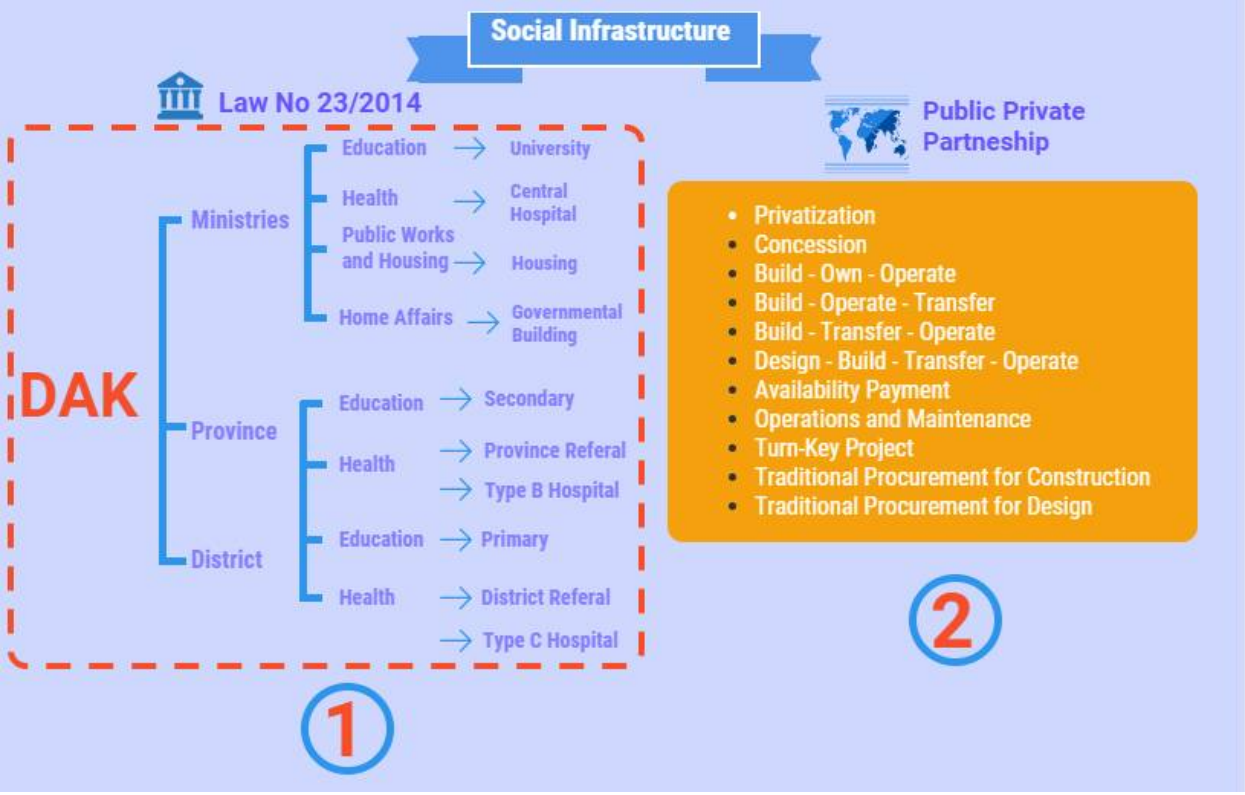
Source: Ministry of Finance, 2017

Furthermore, for housing the Government allocates IDR 9.7 T for *Fasilitas Likuiditas Pembiayaan Perumahan* (FLPP, Liquidity Facility for Housing Mortgage Policy) and also IDR 1T for one million housing programs, which distributed through PT. Sarana Multi Infrastruktur (SMI), a state-owned company which focused on infrastructure development. In total, the government allocates 1.98% of national spending or 0.33% from GDP for financing physical infrastructure in education, health and housing (Table 4.1).

4.2 Another Financing Option

In Indonesia, there are two additional financing options for social infrastructure: government budget and Public Private Partnership (PPP). Indonesia has tried to implement both financing options, though PPP still faces many challenges. These two options can be summarized as in Figure 4.4 below.

Figure 4.4 Options for Social Infrastructure Financing



Source: Authors' compilation

Local Budget Financing

Under law No. 23/2014 of Sub National Government (SNG), the Indonesian Government tries to define the authority sharing between governmental levels in provision of social infrastructure services. The SNGs financed these services using DAK (Special Allocation Fund), meanwhile the central government uses ministerial DAK. Each government level has a different authority. In primary education (elementary and junior high school), the authority is in municipalities/sub – districts level, but secondary education (high school) is given to provincial level. The central government manages higher education, such as university.

Meanwhile, in the health sector the central government will manage the national referral health facilities (hospital type A). At the provincial level, they will manage the provincial and district level referral and hospital type B. Districts manage the district level referral hospital and hospital type C and D, including *Puskesmas*. Furthermore, government office building is fully financed by the Ministry of Home Affairs and SNGs. SNGs (provincial and district level) most likely contribute in land acquisition. As for housing for the poor, it is under the authority of the Ministry of Public-Works and Housing, but SNGs could also contribute using their local budget.

Financially, this scheme has several advantages and disadvantages. The first advantage is that since each government level, especially SNGs, have different abilities, this scheme enables the government level to share the financial burden. Second, this scheme makes the division authority between each government level clearer. Thus, each government level could be more focused in allocating its budget. Furthermore, the number of allocated budgets for each facility will be larger, such as in the education sector, so the province level could allocate funding to more high schools and the district level could allocate funding more toward primary education.

Meanwhile, this scheme also brings disadvantages, such as the different abilities of each level of government level will result in different levels of services. For example, in the education sector, since the provincial level, which has a larger budget than the district level, finances secondary education. Therefore, the condition of secondary education could be better funded than primary school. Likewise, this scheme makes the lower governmental levels require more bureaucracy to finance the services that are managed by the higher governmental levels. Despite another issue of the status of human resources, this option is quite promising for financing the social infrastructure in Indonesia.

Possibility Private Financing through PPP

The percentage of the budget allocated to finance the social infrastructure in health and education is relatively small when compared with the total national budget. Because of the increasing demands of health and education facilities, Indonesia, however, needs another scheme to finance social infrastructure. The PPP scheme could be one of feasible choices. By using the PPP scheme, there will be a risk sharing between government and private sector. Unfortunately, the Indonesian government still needs significant improvements, especially in the readiness of government official, strengthening the laws, and reducing conflicting laws between governmental institutions before it is ready for such a partnership with the private sector.

Financing social infrastructure projects through PPP is not yet common for Indonesia. Most PPP schemes in Indonesia are used for physical economic infrastructure, such as transportation. But the 2017 PPP Book, which lists the infrastructure projects to be established through the PPP scheme, notes that the Indonesian government will establish a Teaching Hospital in North Sulawesi. This is a postponed project, first initiated in 2009 and stopped in 2013 due to lack of funding.

Box 4.2 PPP in Health Sector: Sam Ratulangi Teaching Hospital at North Sulawesi

In collaboration among the Ministry of Research, Technology, and Higher Education (contracting Agency), the Ministry of National Development Planning, and the University of Sam Ratulangi (preparation agency), the Indonesian government is trying to build Sam Ratulangi Teaching Hospital at North Sulawesi Province. This project is still holding at "under preparation" status, which means the preliminary study documents are complete, but they must provide the feasibility documents to get the in-principal approval for the Government Support/Guarantee. The estimated cost for this project is US4 28.70 million with an estimated concession period for 20 years.

Based on the PPP Book 2017, this hospital will have 100 beds in the first year and 243 beds in seven years. This hospital also planned not only to support medical students in education and medical research at the University of Sam Ratulangi, but also become a complementary health service in North Sulawesi. This project started in 2009, but was postponed in 2013 due to lack of funds. In 2015, the Ministry of Research, Technology, and Higher Education began to redevelop this project. Currently, the government established Sam Ratulangi Teaching Polyclinic as a part of this hospital.

Source: Compilation from many sources

Moreover, through the Committee of Infrastructure Priorities Development Acceleration (KPPIP), the government has tried to expedite infrastructure projects, including social infrastructure. KPPIP is the point of contact for coordination to reduce the bottlenecks in national strategic project and priority projects, including the possibility for financing through PPP. Furthermore, the government also established the Indonesia Infrastructure Guarantee Fund (IIGF), a state-owned company that aims to increase private participation in financing infrastructure projects.

Based on Government Regulation No. 27/2014, social Infrastructure, which is categorized as state property, could be built and operated through the partnership between government and a private entity (Public Private Partnership) as we called as PPP. This scheme ensures that there is an optimal risk allocation for each party depending on their ability. There are eleven spectrums for this scheme, each with a different kind of partnership. The Indonesian government could choose one of these spectrums to be implemented, depending on the needs, ability of our government and also the risk. Different spectrum could be chosen for different kinds of social infrastructure. These spectrums can be seen in Table 4.2.

According to Indonesia Infrastructure Guarantee Fund (IIGF) in 2016, every infrastructure sector should apply different spectrum of PPP. For example, availability payment (AP) spectrum, is suitable for the sector/project which economically feasible but not financially feasible. Thus, the return to private sector should be given within the concession period.

In Indonesia, social infrastructure such as hospital and school could be built through this scheme. On this scheme, the private sector will receive the return gradually within the concession. The private sector should build, operate and maintain the infrastructure and transfer it to government at the end of concession period. Furthermore, for public housing, the most suitable spectrum is Build-Operate-Transfer (BOT), because it enabled the private sector to be more flexible and do the transactions process through credit. On this spectrum, the private

sector will pay fix contribution to government. Based on the experiences of other countries, PPP scheme is common for the provision of social infrastructure, such as in India with the provision of a laboratory (PWC, 2012), or New Zealand's the healthy house (Llewelyn, 2011).

The European Commission (2013) has divided the PPP financing scheme in the health sector into eight categories: 1) accommodation model, 2) accommodation model with SPV (Special Project Vehicle) owned, 3) extended accommodation model, 4) twin-SPV model, 5) accommodation and service model, 6) full service provision secondary health model, 7) full service franchise provision tertiary health care model with teaching and research and development (R&D), and 8) full service provision at all levels of care that range from financing the hospital infrastructure to full service financing. In many European contingent countries, such as United Kingdom, Portugal and Italy, however, the PPP scheme has been unsuccessful. The provided infrastructure did not meet public needs, even though in the United Kingdom, PPP became the main source of investment in the health sector (European Commission, 2013).

Many implementations of PPP in the education sector can be found around the world. In India, for example, the PPP scheme in the education sector works through private non-seeking organizations (charity and religious organization) that set up a school with their own funds and run the school for a minimum number of years before it becomes eligible for government aid for recurring expenditures. Similarly, private non-profit schools in United States (state level government) where government pays all costs of these charter schools operate under contract with the government and are publicly funded on per student basis. The implementation of PPP in the housing sector can also be observed in many forms, ranging from under the direct control of the level of government involved in the partnership, to a model that transfers greater responsibility over the provision of the public service to the private partner.

One famous example of PPP in the housing sector is Regent Park in Toronto, Canada. The project, which started in 2003, included demolishing and replacing supportive housing units and bringing in an additional 3,300 mixed-income market units. The City of Toronto in partnership with the Daniels Corporation carried out the plan. Both sides contributed to and shared in the risks and rewards of the affordable housing project. Daniels Corporation, as the private developer, agreed to help finance and oversee the design, construction, and completion of all housing units.

Box 4.3 Reshaping the Area, Fulfilling the Needs: Health Infrastructure Provision in Ambon City Through PPP

Ambon city has a unique geographical contour that is hilly and quite difficult to find an area that is both flat and wide. Therefore, it takes an extra effort and cost to build infrastructure in the city. Currently, the city has 11 hospitals: one public, four private, four armed forces, one mother and child, and one special. Dr. Haulussy Hospital, the only public hospital, is owned and funded by Maluku Province. Ambon City itself does not have a public hospital, even though ideally each municipality/district should have one of its own.

Ambon City's government wants to build more hospitals due to the increasing demand for health services. But it has met difficulties providing an appropriate and suitable area to build because of the terrain, even though there are many idle areas. Currently, the Ministry of Health plans to build a central hospital located near Ambon City. The government already passed the environmental impact analysis (AMDAL) and will conduct the feasibility study and land acquisition process. Dr. Haulussy Hospital will be given to and managed by the Ambon City government, and provincial government will manage the new central hospital.

In this case, the Ambon City government could implement a PPP scheme to plan for its own hospital, especially to fund the construction process. Most of cost will be used to flatten the grounds and for feasibility studies. This project will be costly, but will have a big impact on the city's health sector and in the eastern part of Indonesia. Most of the PPP spectrum could be implemented on this project, as long as the construction process funded by private sector. This project also will give a high investment return, since after the implementation of the JKN program, people's awareness of the health facility increased visits.

Source: Field Visit

Table 4.2 Types of Public Private Partnership in Indonesia

Spectrums	Design	Construction	Operation	Maintenance	Financing	Demand Risk	Asset Transfer	Funding resource
Privatization	Private	Private	Private	Private	Private	Private	After Signing	Final user, private determine the tariff
Concession	Private	Private	Private	Private	Private	Private	At the end of contract	Final user, government determine the tariff
Build-Own-Operate	Private	Private	Private	Private	Private	Government	Never	Final user through government
Build-Operate-Transfer	Private	Private	Private	Private	Private	Government	At the end of contract	Final user through government
Build-Transfer-Operate	Private	Private	Private	Private	Private	Government	At the end of construction	Government (Government will pay the return after the concession)
Design-Build-Finance-Operate	Private	Private	Private	Private	Private	Government	At the end of contract	Final user through government
Availability Payment	Private	Private	Private	Private	Private	Government	At the end of construction	Government (Government will pay the return gradually within the concession)
Operations & Maintenance	Government	Government	Private	Private	Government	Government	Never	Government
Turn-key Project	Private	Private	Government	Government	Private	Government	At the end of construction	Government
Traditional Procurement for Construction	Government	Private	Government	Government	Government	Government	At the end of construction	Government
Traditional Procurement for Design	Private	Government	Government	Government	Government	Government	Never	Government

Source: The Priority Infrastructure Development Acceleration Committee (KPPIP)

4.3 Beyond the PPP: One Stop Services Area

Another model of financing could follow Japan model on recent social infrastructure development projects in Japan. According to reports published by Cabinet Office and other government entities, the central and local governments have been trying to reduce the construction and operation costs by demolishing unnecessary facilities, combining different facility functions, using facilities jointly with other ministries/local governments, extending facility lifetimes through proper maintenance management or securing Value for Money with the PPP contracts. They are also trying to create and collect new sources of revenue from private sector by providing land/floor to cash-generating private business. Applying those measures, concrete projects have been developed, such as Ichikawa City Public Facility Complex, Kudan Dai-san Joint Government Building in Chyoda Ward, Kitakyusu City Shiei Junior High School and Toshima Ward Office Building. In Toshima Ward Office Building development project, the local government provided land and floor to shopping malls and condominiums and offset a certain amount of the project cost with the revenue collected from those private businesses.

In several SNGs, they placed most governmental offices in one building, such as South Tangerang City and Ambon City. Moreover, with the increasing demand of health and education services, the Indonesian government could combine the health services and private business, such as small shopping mall, into one building. The government could deliver their health services and monetize the building from the small shopping mall. The rents from the mall tenants could be used for building maintenance and operations costs. And, the government could use the PPP scheme to develop this building. Many private hospitals in Indonesia have implemented this model, creating a small shopping mall with many restaurants, coffee shops, and bookstore tenants, in the hospital's lobby. Other combining options are possible, as long as they do not disturb the basic function of social infrastructure.

Box 4.4 Surviving After the Disaster: School Building in Nanggroe Aceh Darussalam Province

After the tsunami hit Nanggroe Aceh Darussalam (NAD) Province in 2004, both the central government and local government tried to rebuild the province's social infrastructure. Many international aids were also given to the government to help in the rebuilding process. Unfortunately, due to limits on government funds, and too many education facilities that had to be rebuilt, some schools were rebuilt below standard and now the buildings are in disrepair.

The government spent approximately IDR 3 billion to build an elementary school and IDR 6.4 billion to build junior high school. To fulfill the need for schools, the provincial government has been engaging private sectors in building standardized schools. For example, SDN 25 Manulife (elementary school) was rebuilt through Manulife insurance's Corporate Social Responsibility (CSR) Program. It could be another option for financing the social infrastructure, even though the CSR scheme is not clear yet. Furthermore, it shows that the PPP scheme could be applied. A strong commitment from the local government could be used as the basis for obtaining one of these financing options.

Source: Field Visit to Banda Aceh

CHAPTER 5
CONCLUDING REMARKS

There is no shortcut for fostering economic growth without investing in good physical and social infrastructure. Infrastructure facilitates and spurs economic growth by providing better connectivity and enhancing productivity and efficiency. While Indonesia needs 5.5%-5.7% of GDP to fulfill the demand of physical (economic) infrastructure during 2016-2030, there is no an estimation yet for the demand for social infrastructure. Therefore, there is an urgent need to estimate this demand, which considers population dynamics and the dynamic of development and economic conditions.

This report has portrayed the current condition and distribution of social infrastructure in Indonesia, including education, health, housing, and government building. We have also provided estimates for education, health, public housing, and governmental building infrastructure through 2030, and examined how the estimates may differ between the macro "bird's-eye" approach (econometric model of provincial panel data) and the micro approach (population based simulation). Furthermore, given the gap between existing patterns of public spending and investment need, the report provided a discussion on the challenges of alternative financing.

Several main findings can be outlined. First, despite improvements in social infrastructure provisions, Indonesia is still lagging behind other ASEAN countries, at least in the health sector. There is also a challenge with the regional disparity in infrastructure provisions, which entails comprehensive and more policies for tackling this problem. In some infrastructure, such as health sector, the provision is sufficient at the national level. Yet, some provinces continue to suffer with a limited number of hospital beds or district health centers. The policy maker, hence, must carefully address this issue by including figures from the national level as well as the provincial distribution of funds.

Second, our report estimates that Indonesia needs USD719.74-USD747.74 billion to fulfill its social infrastructure needs over 2016-2030, accounting for 3.7%-3.9% of projected GDP annually. A large part of the investment comes from the education and housing sectors, which account for more than 67.7%-71% of total projected investment. Most of the social infrastructure effort would be toward housing for the low-income group (the 20% lowest income), or 1.4%-1.5% of GDP. Housing has become unaffordable for the low-income group because an increase in housing prices is always faster than an increase in income.

This result is of interest to the government, particularly when dealing with the priority of public spending on social infrastructure. Due to the resource constraint, the government should focus more on education and healthcare because these are most likely related to human capital development as a driver of future sustainable economic growth in Indonesia. Indonesia should invest around 1.2% of GDP for education facilities and around 1% of GDP for healthcare facilities.

Third, given the estimates of social infrastructure investment need, there is a financing gap in maintaining Indonesian economic growth and population dynamics. Based on ministry of finance (2017), Indonesian government tends to spend 0.33% of GDP on new investment of social infrastructure (not including government building), exclusive of O&M spending by the government. Due to a resource constraint as the government are faced difficulties to raise tax ratio, the government would face a significant challenge to fulfill both physical and social infrastructure demand. Nevertheless, we believe combining these sources remain insufficient in meeting the investment need. Therefore, innovative and creative financing schemes should be promoted. Possible private involvement in infrastructure provisions for education, health, and public housing is welcomed. Well-structured private-public initiative is needed to invite private financing as soon as possible.

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