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FINAL REPORT

ESTIMATING SOCIAL INFRASTRUCTURE NEEDS IN DIVERSE AND DYNAMIC ASIA

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This report was prepared by the Institute for Economic and Social Research, Faculty of Economics and Business 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.

FOREWORD

Providing social infrastructure remains a challenge for All Asian Countries. As an increasing number of populations in Asia, some governments in Asia will struggle to deliver the demand of services, and it will require crucial policy planning to achieve more sustainable future. Asia is very unique in culture, ethnicity, language, religion and regional characteristics. This report provides a brief picture of the current trends of Asia's social infrastructure in the context of dynamic and diverse Asia. Furthermore, Infrastructure is both the goal and the tools to achieve the 2030 agenda, the sustainable development goals (SDGs). This means, Most of Asian countries have a big task to fulfilling the needs. Given to the limited amount of national budget for social infrastructure provision, the governments need to know the needed investment amount and also financing option.

This study provides such comprehensive information of the current trend of Asian Countries' social infrastructure and estimation of its future demand. This is the first study that estimate the investment need and financing gap in social infrastructure, covering education, health, housing, and government. This study also tries to find out the financing option.

This is the internal final report of "Estimating Social Infrastructure Needs in Diverse and Dynamic Asia" 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 (Saitama University as Principal Investigator) and Fumiaki Ishizuka (JICA) for their constructive idea, participation and also valuable inputs on ADB's workshop and other several discussions. Also, Jogo Rinko and Sayuri Uematsu (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, Muhammad Hanri, C. Hanum Siregar, Muhammad Sowwam, Sulistiadi Dono Iskandar, Bisuk Abraham Sisungkunon, Yusuf Simbolon, Wahyu Wibowo, Nia Kurnia Sholihah, Regi Kusumaatmadja, Hamdan Bintara, Alvin Ulido Lumban Raja, Dwi Rani Puspa Artha, Andhika Putra Pratama, Faizal Moeis, Fandy Rahardi and Waranney Gerald Massie for completing this study.

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Riatu Mariatul Qibthiyyah, Ph.D

Director

ABBREVIATION

ADB	Asian Development Bank
BPO	Business Process Outsourcing
BMIUE	Urban Employment Based Basic Insurance
BMIUR	Urban Resident Basic Insurance
BSUP	Basic Service for The Urban Poor
CBDT	Central Board of Direct Taxes
CCP	Chinese Communist Party
CEIC	Census and Economic Information Center
CFC	Central Finance Commission
CHC	Community Health Center
CPH	Copped-Price Housing
CPI	Consumer Price Index
CNA	Central Nodal Agencies
CRH	Cheap Rental Housing
DFAT	Department of Foreign Affairs and Trade
ECB	External Commercial Borrowing
ECH	Economic Comfortable Housing
EWS	Economically Weaker Sections
FDI	Foreign Direct Investment
G20	Group of Twenty
GDP	Gross Domestic Product
GER	Gross Enrolment Ratio
GPs	General Practitioner
HDB	Housing and Development Board
HUDCO	Housing and Urban Development Corporation
HWCs	Health and Wellness Centers
ICU	Intensive Care Unit
IFC	International Finance Corporation
IHDSP	Integrated Housing and Slum Development
IMF	International Monetary Fund
IT	Information and Technology
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
LIG	Lower-Income Group
MFA	Medical Financial Assistance
MIG-II	Middle Income Group II
MoH	Ministry of Health

MoHUA	Ministry of Housing and Urban Affairs
MoHUPA	Ministry of Housing and Urban Poverty Alleviation
MoPR	Ministry of Panchayati Raj
NBO	The National Buildings Organization
NHB	National Housing Bank
NPC	The National People's Congress
NSP	The National Solidarity Program
NRCMS	New Rural Cooperative Medical Scheme
NUHHP	The National Urban Housing and Habitat Policy
OECD	The Organization for Economic Co-operation and Development
O & M	Operation and Maintenance
OOP	Out Of Pocket
Perpres	Peraturan Presiden (Presidential Regulation)
Perumnas	Perumahan Nasional (Indonesia National Public Housing Program)
PHC	Primary Health Center
Politburo	Political Bureau
PMAY	Pradhan Mantri Awas Yojana
PM-JAY	Pradhan Mantri Jan Arogya Yojana
PPP	Purchasing Power Parity
PR1MA	1Malaysia People's Housing Program
PRH	Public Rental Housing
SDGs	Sustainable Development Goals
SEA	South East Asia
SHB	State Housing Board
SRH	Shantytown Renovation Housing
UEBMI	The Urban Employee Basic Medical Insurance
UHC	Universal Health Coverage
ULBs	Urban Local Bodies
UIS	UNESCO Institute for Statistic
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNESCAP	United Nations Population Fund
UNFPA	United Nations Economic and Social Commission
UNICEF	United Nations Children's Fund
URBMI	Urban Residence Basic Medical Insurance
USAID	United States Agency for International Development
WDI	World Development Index
WEO	World Economic Outlook
WHO	World Health Organization

ABSTRACT

Asia, where more than half of the world's population (4.96 billion) resides, has very diverse and dynamic characteristics. Despite improvements in social infrastructure provisions, some parts of Asia should continuously increase social infrastructure investment to further support more sustainable economic growth. Dealing with diverse and dynamic Asia, then, the question is how much social infrastructure investment is needed in Asia to facilitate and boost economic growth, as well as to address economic and population dynamics? Considering various challenges in data and methodological approaches, this study uses two approaches, micro- and macro-approaches, then estimates the social infrastructure demand and financing gap. Over the next 15 years, we estimate that Asia Pacific will need approximately 26-27 trillion, or $1.8 trillion annually, to meet its social infrastructure needs. This number is equivalent to 4.5%-4.6% of the projected GDP. East Asia dominates investment needs, which accounts for 68%-71% of the total needs. It is mainly driven by China's demand, given its economic condition, population size, and stage of development. In the education sector, the total investment needed for the University level is the highest, with the needs of investment at approximately 0.4%–0.6% of Asia's GDP for the period of 2016–2030, followed by secondary education (0.3%–0.4%) and primary education (0.2%). Investment for health infrastructure from 2016 to 2030 would need approximately 1.1% of Asia's GDP. Asia needs approximately $13 trillion for providing public housing for urban slum population. These amounts are approximately 2.3% of Asia's GDP. Moreover, the total investment for government building infrastructure is approximately 0.1%-0.2% of Asia's GDP. Since the government faces difficulties in raising the tax ratio and other revenues, then the government have to search innovative and creative financing schemes for dealing with the resource constraint.

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CHAPTER 1
FULFILLING SOCIAL INFRASTRUCTURE NEEDS WITHIN DIVERSE AND DYNAMIC ASIA

1.1. Introduction: Challenges and Opportunities

The Asian Development Bank report on estimating Asia's physical investment revealed that Asia needs to spend at least $1.7 trillion annually, equal to 5.9% of the GDP, to maintain its growth momentum, address poverty, and overcome the climate change issue. This estimate focused on network-based infrastructure (roads, railways, airports, and seaports), power (generation, distribution, and transmission), telecommunications, and water supply and sanitation. While investments in these physical infrastructures are undoubtedly important, one must always consider that investment in education, health, housing, and government-supporting facilities also plays a crucial role in shaping the nation's wealth and prosperity. Investment in the 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 network 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, as well as their productivity and productive capacities. The question, then, is how many schools and healthcare facilities should we build to have sufficient human capital? How much money should we spend on this social infrastructure? And, more importantly, how may it differ across countries' unique characteristics?

Asia, where half of the world's population (almost 5 billion people) resides, faces many challenges in dealing with infrastructure issues. Together with rapid population growth, the proportion of elderly people in Asia has changed drastically. The proportion of aged people in 2015 was only 8% and was projected to reach 11%, or 553 million people, in 2030. There has also been an increase in urbanisation trends. The proportion of the urban population in 2030 is projected to be 57%, while in 2015 it was just 48% (UN, 2017). Some governments in Asia, then, will struggle to satisfy the demand for services, both in terms of social and physical infrastructure. This will require crucial policy planning to achieve a more sustainable future.

Infrastructure is both the goal and the tool needed to achieve the 2030 agenda's sustainable development goals (SDGs). The goals of the 2030 development agenda related to infrastructure are the SDG 9 regarding industry, innovation, and infrastructure; the SDG 6 regarding healthy water and sanitation; and the SDG 7 regarding affordable and clean energy. These types of infrastructure are heavy on economic and physical infrastructure. Another type of infrastructure underpinning the 2030 agenda is social infrastructure, namely public housing, government buildings, hospitals, and schools. Housing infrastructure considerably influences the SDGs' targets, including no poverty and sustainable cities and communities (SDG 1 and 11). Hospitals, health centres, and schools are linked with effective means to combat poverty, achieve good health and wellbeing, and provide quality education (SDG 1, 3, and 4). Government building infrastructure represents a location where all resources are managed, allocated, and evaluated to achieve the SDGs' targets.

Given the importance of investment in social infrastructure, a recent study by JICA on social infrastructure needs in selected countries shows that the needs are not due to negligence. For instance, while Indonesia needs 5.5%–5.7% of the GDP annually to satisfy the demand for physical infrastructure, they will need $719.7–$747.74 billion for social infrastructure needs between 2016 and 2030, which will account for 3.7%–3.9% of the projected GDP annually. Similarly, another study also revealed an estimate of 1.8–2.4% of the GDP is needed for Japan's social infrastructure requirements. This comparison provides initial information to show that the social infrastructure demand is diverse, potentially more so than that of physical infrastructure, among Asian countries, and this heavily depends on their state of development, population dynamics, and rich diversity in cultures and history.

Asia is very unique in terms of culture, ethnicity, language, religion, and regional characteristics. This report provides a brief discussion of the current trends of Asia's social infrastructure in the context of dynamic and diverse Asia. The analysis of social infrastructure will closely link to the attainment of the SDGs' targets for 2030. While some countries in Asia are classified as developed countries, some of them remain developing and emerging countries. Therefore, the challenge faced by each country is different based on the country's stage of development. For instance, Indonesia, as an emerging country with a young population structure, should focus on the expansion of their health and education infrastructures, while Japan, as a developed and ageing country, should heavily invest in their healthcare program. In

terms of geographical conditions, pacific countries have to deal with how to effectively and efficiently provide social infrastructure in their scattered islands, while landlocked countries in Central Asia have to provide social infrastructure in compact regions.

This report first provides an existing figure of the current condition of social infrastructure in developing Asia. In Chapter 2, the substantial difference in social infrastructure provision is shown to be prevalent across countries, despite significant development over decades. The report also reveals that most countries continue to face challenges in providing decent housing for poor people, while it is also evident that some countries face limited infrastructure for public service delivery. Given this deficiency, estimating social infrastructure investment needs and formulating various potential funding mechanisms to close the gap are urgent.

This report will be the first to estimate the investment requirement of the social infrastructure demand up to 2030, covering education, healthcare, housing, and government at the Asian level. There are 45 target countries for the social infrastructure demand estimation. The importance of this study lies in the fact that there is no previous study that analyses the investment demand of social infrastructure at the Asian level. Chapter 3 provides a detailed discussion on the estimation procedures of such needs. We use macro- and micro-approaches to estimate the social infrastructure needs of diverse and dynamic Asia over the years 2019–2030. The first approach is the macro-approach and is an adaptation of the estimation approach of ADB's infrastructure needs. We rely on the historical relationship between social infrastructure stocks and key economic provincial indicators. Based on this relation, we estimate the future social infrastructure needed to accomplish the dynamics of economic growth and demographic trends during 2016–2030. In the second approach, we estimate the demand using the micro-approach, in which we calculate the need based on the minimum standard service for each type of infrastructure along with population dynamics. It should be noted that the estimates here do not represent the optimal path of infrastructure needed to guarantee that each country achieves optimal social welfare. The approaches estimate investment needs based on the existing macroeconomic or demographic variables trend and the underlying behaviour of those variables in explaining social infrastructure outcomes.

As mentioned previously, social infrastructure in Asia differs and has a different standard. Thus, in Chapter 4, this report provides all the standards from each social infrastructure used for the estimation process. Chapter 5 presents the estimates of social infrastructure investment needed between 2016 and 2030. The estimates are presented in a range to capture both the micro- and macro-approaches. Asian countries will need $1.8 trillion annually on average, equivalent to 4.5-4.6% of the GDP, between 2016 and 2030, mainly for education and public housing. There is substantial variation in needs across geographies and economies, indicating that 'one-size-fits-all' strategies for infrastructure provision might be less relevant.

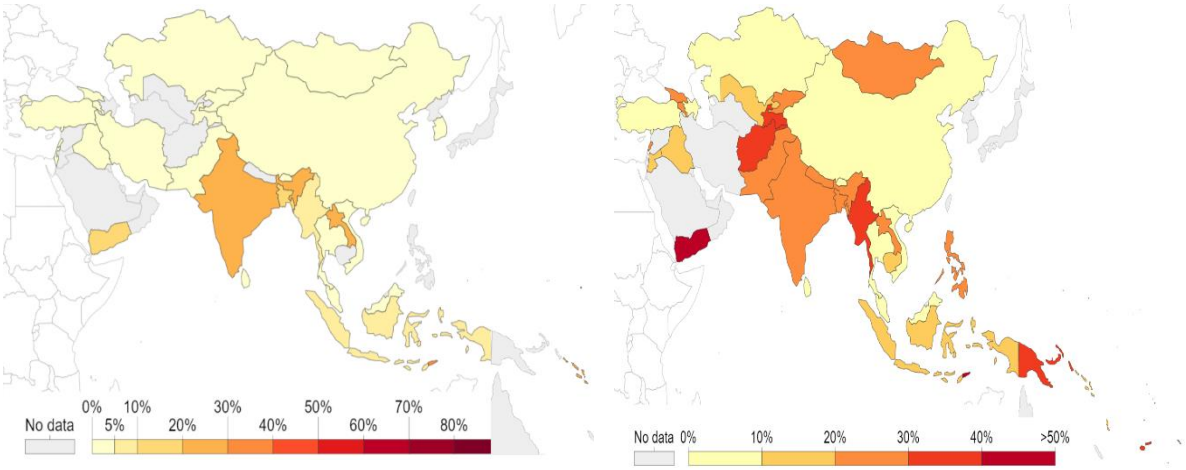
After estimating the demand for social infrastructure development, in Chapter 5, a discussion on several potential financing schemes is provided, including the PPP model, land value capture, user fees, and mixed-use development. The analyses the potential financial gap as well as policy recommendations on how to fill this gap will discuss separately in other report. This report also shows the experiences, challenges, and policies of the two giants in Asia (India and China) in Chapter 6. Finally, the concluding section of the report will summarise the key findings and discuss policy suggestions for how to fulfil these needs.

CHAPTER 2
RECENT DEVELOPMENT OF SOCIAL INFRASTRUCTURE IN ASIA

2.1. SDGs target for Asia

Asia, where more than half of the world population (4.96 billion) resides, has diverse and dynamic characteristics. Countries in Asia range from lowest to highest income, from the least to the most highly industrialized. Some countries have populations in the hundreds of millions, while others' populations measure only in the thousands. Some countries have an excellent standard of healthcare, while others still struggle to provide a minimum standard of healthcare.

The picture in panel (A) of Figure 1.1 shows the population living with per capita household consumption below $1.90 per day (in 2011 PPP prices). India and Laos both have the greatest population share living in extreme poverty. Some countries in Oceania, such as the Solomon Islands and Micronesia, also have a significant number of inhabitants living in extreme poverty. The map in panel (B) shows the percentage of the population living below the national poverty lines, which differ among countries depending on the countries' conditions, such as living standards, costs and the definition of 'poverty line'.



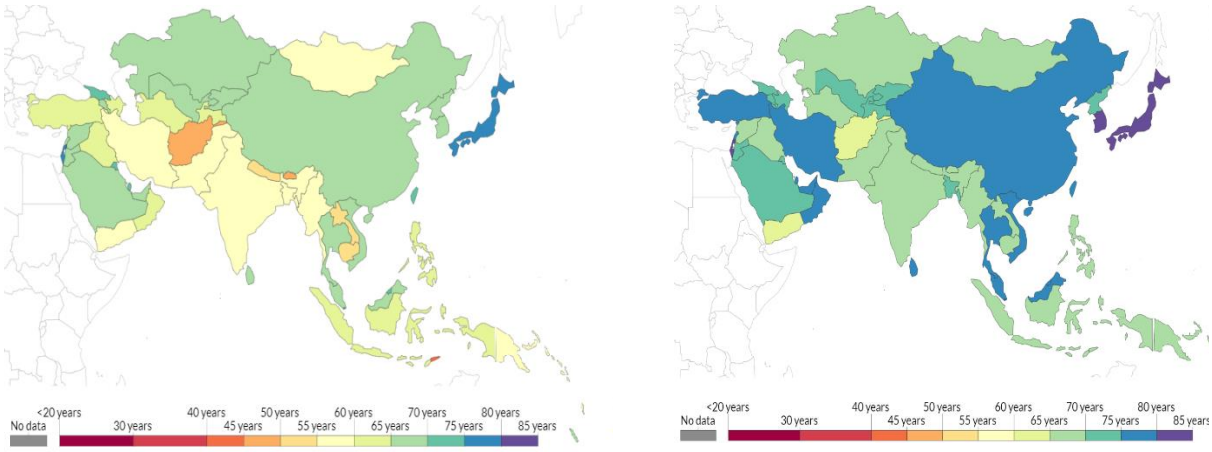
Panel (A): Share of the population living in extreme poverty

Panel (B): Share of population living in poverty by national poverty lines

Source: WDI

Figure 1.1. Poverty in Asia and the Pacific, 2017

The third sustainable development goal (SDG) target is to ensure healthy living and promote wellbeing for people of all ages. To evaluate this achievement in a population's health, the most commonly used indicator is life expectancy. The picture below, Figure 1.2, depicts the increase in life expectancy in Asia and the Pacific. For example, in 1985, China's average life expectancy was 68.5 years, a value that increased significantly by 2015 to 76.1 years. An increase in life expectancy is most likely due to an increase in living standards as well as to improvements in healthcare.

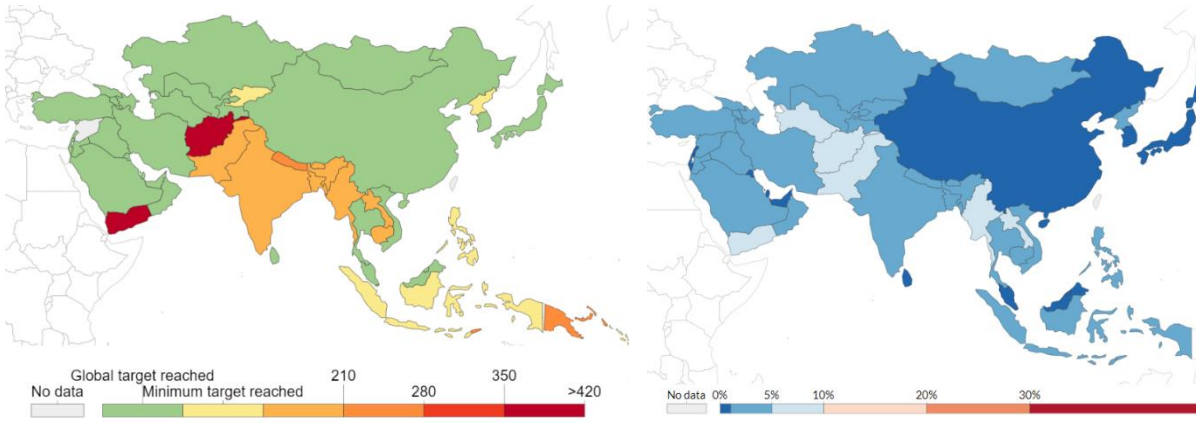


Panel (A) Life expectancy in 1985 Panel (B) Life expectancy in 2015

Source: WDI

Figure 1.2. Life expectancy in Asia and the Pacific

An additional indicator for assessing the SDG target related to health is the maternal mortality rate. The number of women who die from pregnancy-related causes is rather high in some countries. The SDG target is to lessen global maternal mortality to less than 70 per 100,000 live births each year by 2030. The maternal mortality ratio in Afghanistan is relatively high, with a rate of 396 deaths per 100,000 live births; the rate in Nepal is 258, and Pakistan and India have similar rates around 170. Regarding child mortality, countries in South Asia such as Afghanistan, Pakistan and Turkmenistan have intense child mortality rates, all above 5%. Some countries in Southeast Asia, such as Myanmar and Laos, also have high child mortality rates relative to those of their neighbouring countries.

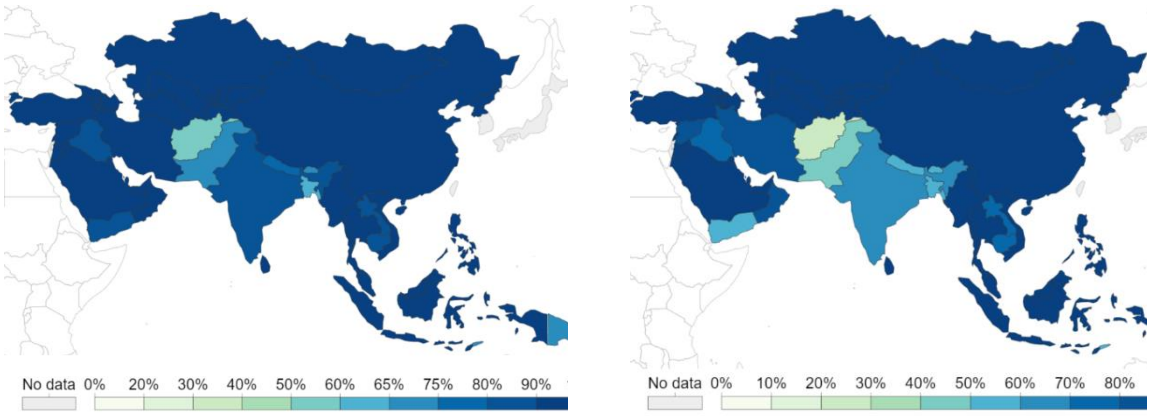


Panel (A) Maternal mortality Panel (B) Child mortality

Source: WDI

Figure 1.3. Mortality rates in Asia and the Pacific, 2015

In education, the sustainable development goal is to ensure inclusive and high-quality education for all and to promote lifelong learning. One of this goal's targets is universal literacy and numeracy among both men and women by 2030. The maps below (Figure 1.4) exhibit the literacy rate by gender for people aged 15 and above. South Asia seems to have a lower rate of literacy, and in addition, there is a marked difference between the male and female literacy rates: the male literacy rate is higher than the female literacy rate in multiple countries. For example, in India, the male literacy rate is 80.90%, while the female literacy rate is 62.98%. This imbalance is related to the disparities in educational access.

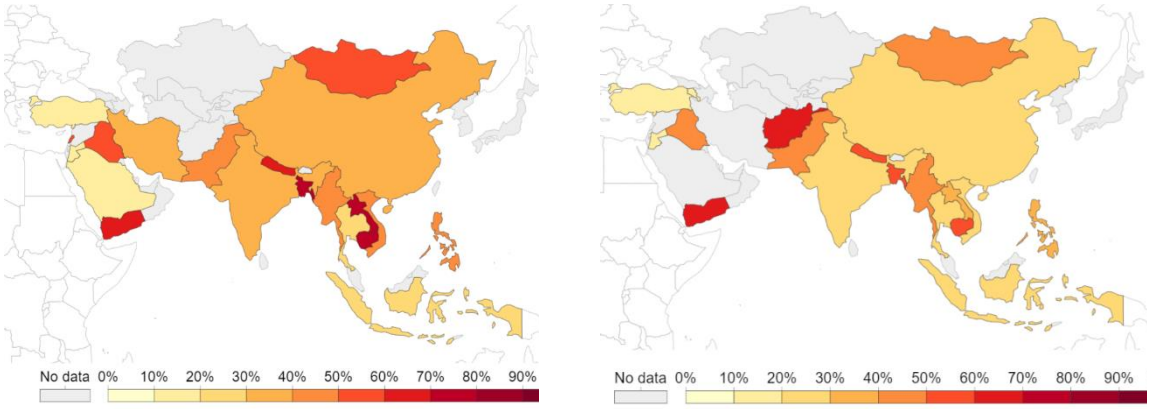


Panel (A) Male Panel (B) Female

Source: WDI

Figure 1.4. Adult literacy rate (%), population 15+ years, 2015

The other target of this SDG is access to safe and affordable housing for all. A slum is defined as the condition of lacking access to improved water, sanitation, sufficient living area or durability of housing. In Asia, the average urban population living in slum areas is around 25% from 2005 to 2014, there was a moderate decrease in the population living in urban slums. The proportion of urban residents living in slums in Pakistan was 47.5% in 2005 and slightly decreased to 45.5% in 2014.



Panel (A) 2005 Panel (B) 2014

Source: WDI

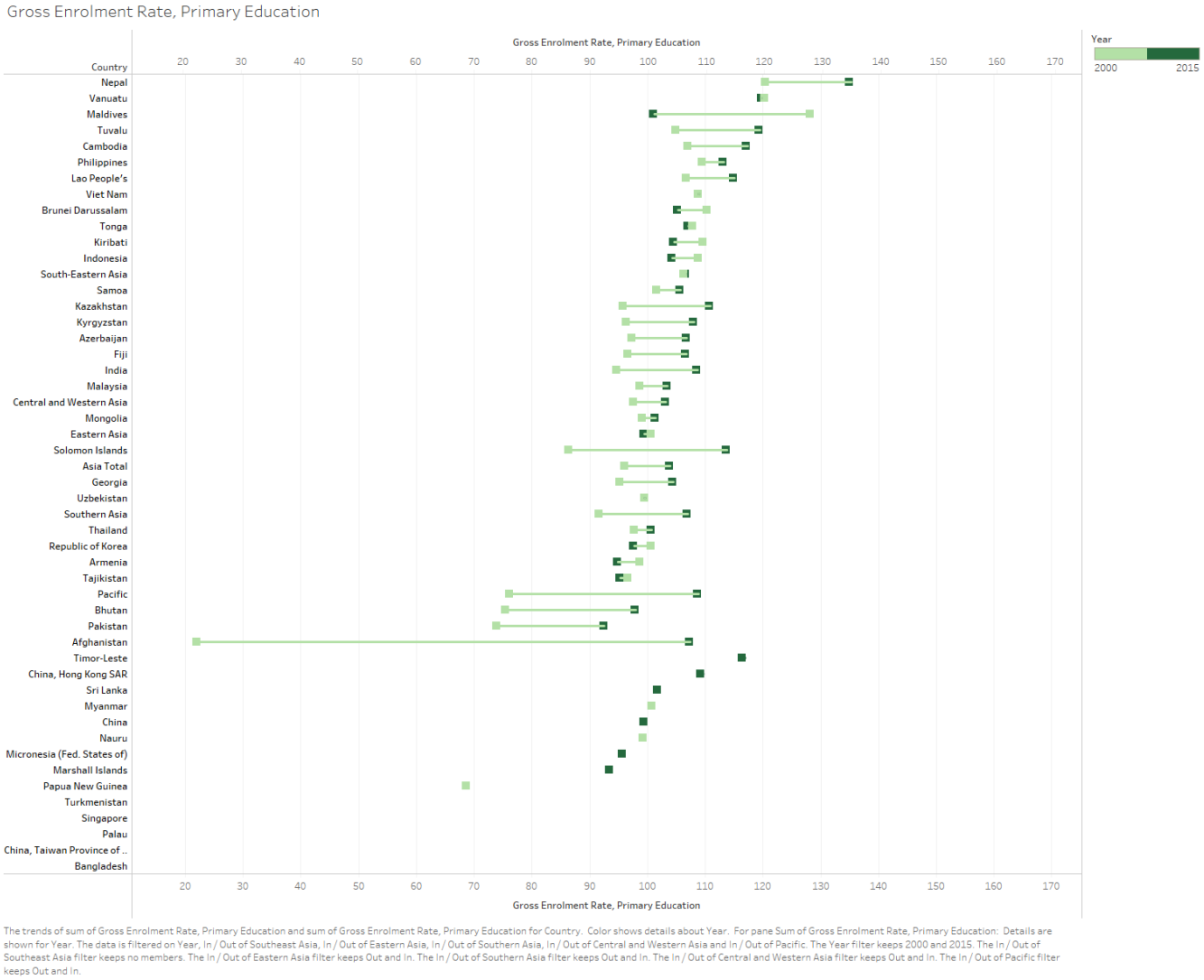
Figure 1.5. Share of urban population living in slums in Asia

2.2. Latest trends in social infrastructure

Social infrastructure is crucial in the development of human capital, leading to better economic growth. As Sahoo and Dash (2012) explored, there exists a notable, long-running equilibrium relationship between output and infrastructure. In the case of four South Asian countries, infrastructure development has significantly contributed to output growth in South Asia. Social infrastructure, as one of the pivotal subsets of general infrastructure development, plays a key role in this context: elements of social infrastructure, such as education, health, water and sanitation, affect growth by increasing literacy, health and manpower, which together lead to higher productivity. However, the state and development of social infrastructure in Asian countries have been modest at best, if not lacking. Our study focuses on four specific types of social infrastructure: education, health, public housing and government building.

First, looking at the gross enrolment rate in primary education, Asian countries have fared relatively well; most have achieved more than 80 percent enrolment. Major improvements are noted for countries such as Nepal, Afghanistan and the Solomon Islands, which are among the countries with exponential increases from 2000 to 2015.

Second, looking at the gross enrolment rate in secondary education, Asian countries have fared differently, though there has been a noticeably similar positive trend. Countries such as Kazakhstan are around the lower end of the spectrum in the region, while Thailand and Malaysia are among the those with the highest secondary education enrolment rates. Marked increases between 2000 and 2015 are noted for countries such as Georgia, Malaysia and Indonesia.



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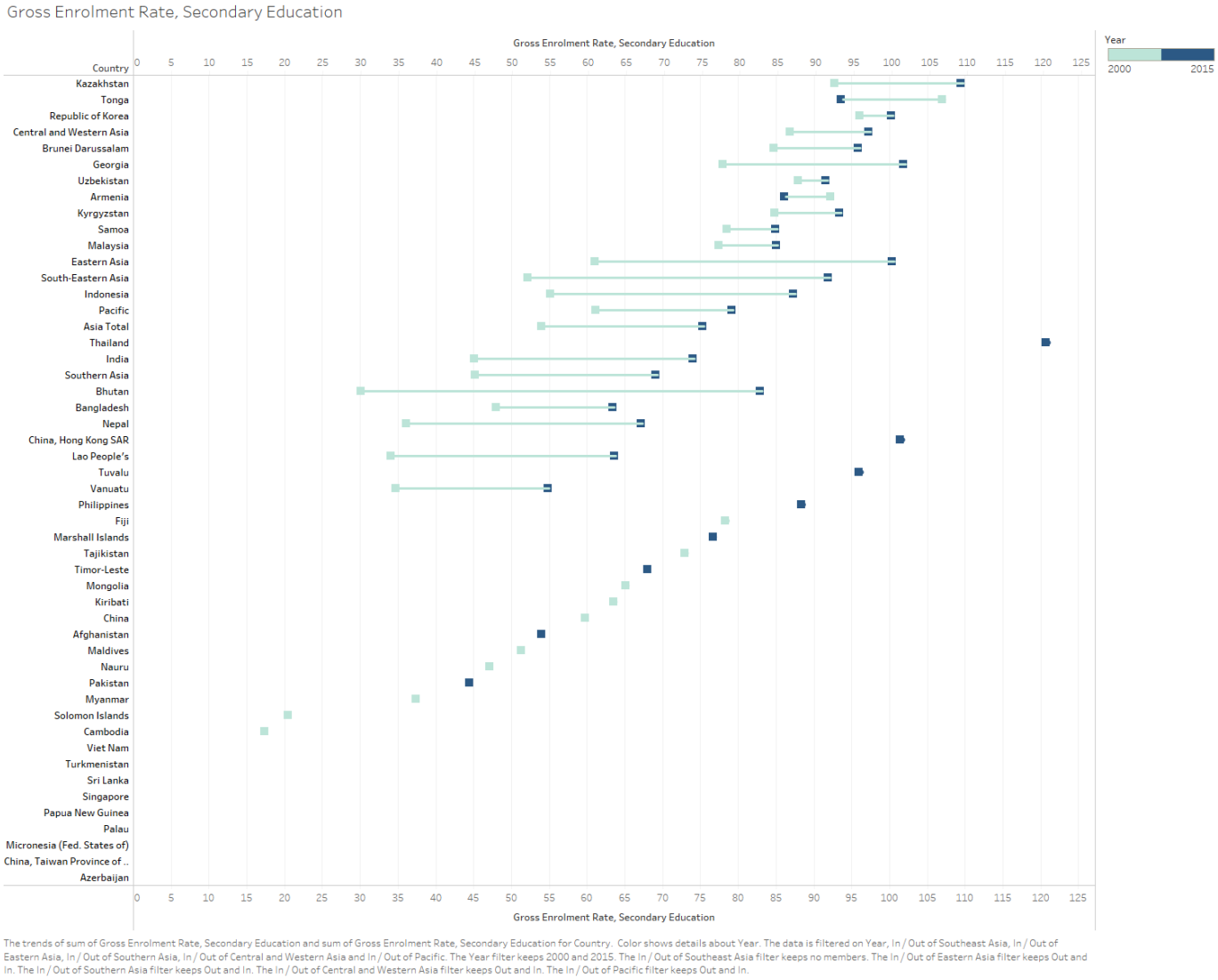
Source: WDI

Figure 2.1. Primary education gross enrolment rate comparison



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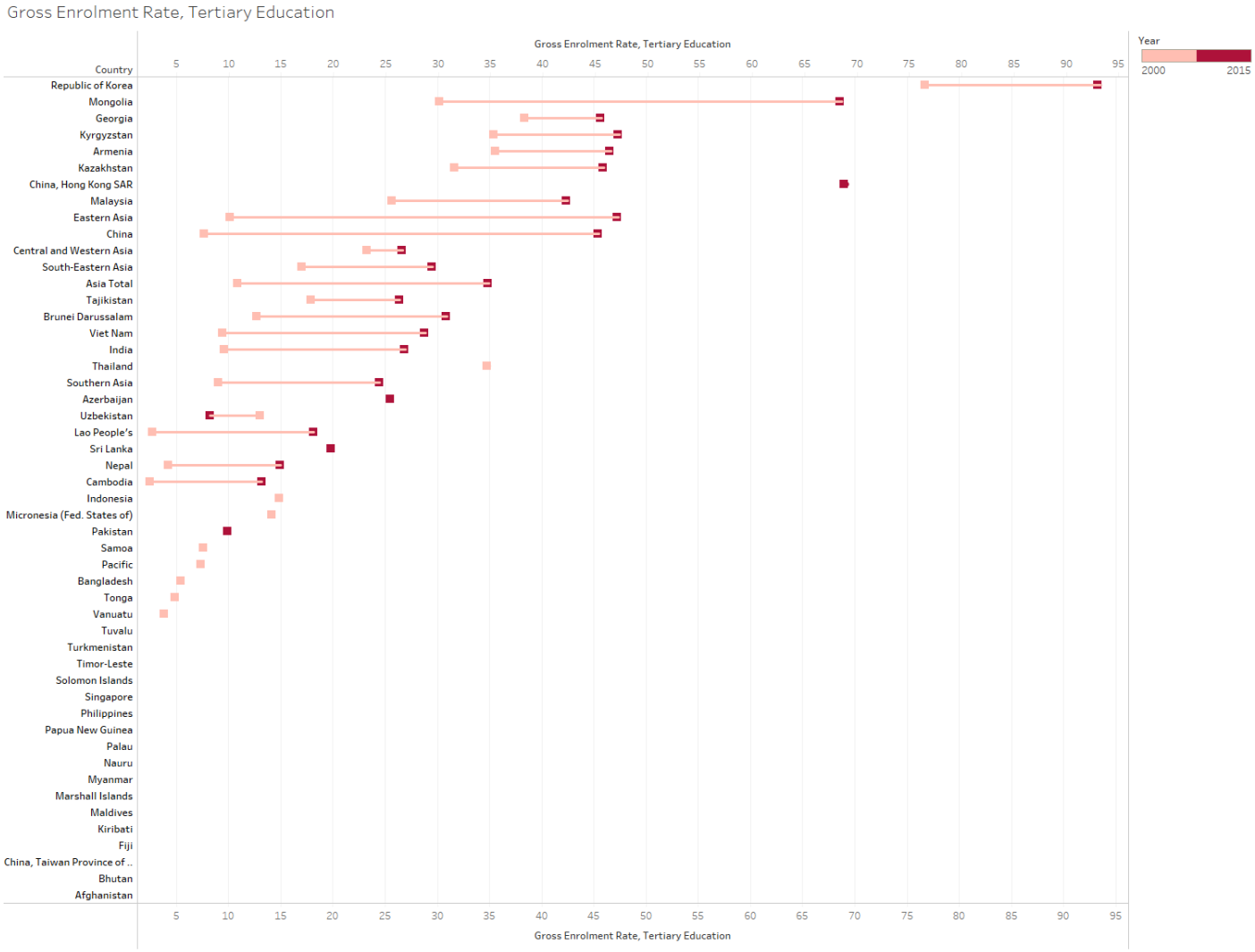
Source: WDI

Figure 2.2. Secondary education gross enrolment rate comparison



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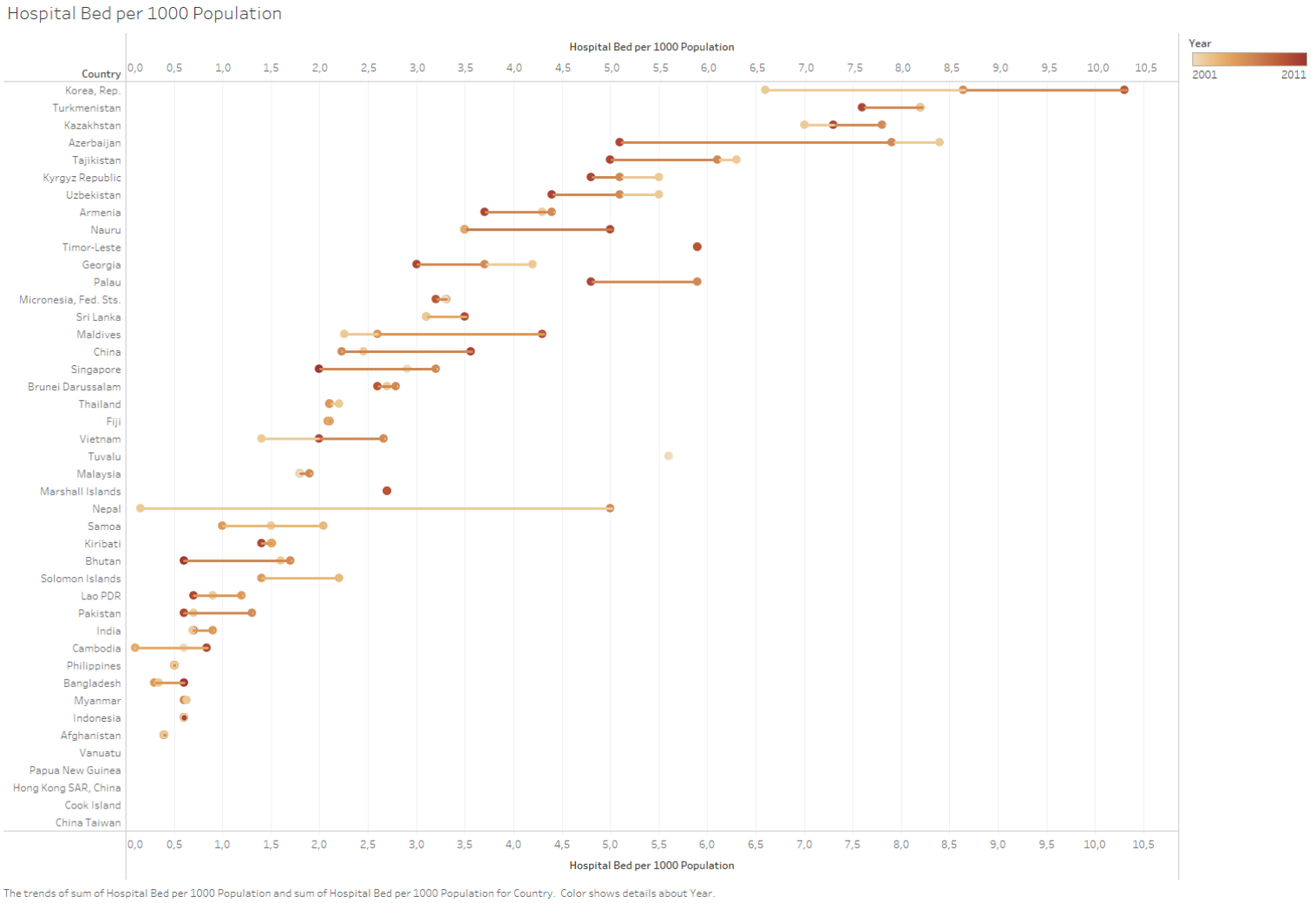
Source: WDI

Figure 2.3. Tertiary education gross enrolment rate comparison

Meanwhile, the tertiary education gross enrolment rate has increased at a relatively lower rate among the countries of Asia, though there has been noticeable positive growth over the years. Mongolia and the Republic of Korea are among the nations in the continent with the highest tertiary education gross enrolment rates, while India, Pakistan and Uzbekistan are among those in the region with the lowest rates of enrolment. As such, the Republic of Korea continues to set an example in Asia with the immense growth of its enrolment rate.

In the literature, Lavakare (2018) reported specific examples include India and China with the large and comparable higher education infrastructures. In a globalized world, both of these countries have the potential to attract a large number of international students from other parts of the world – from developed and developing nations alike. China has recognized the importance of undertaking reforms to internationalize its higher education. Seven Chinese universities are now ranked among the top 200 worldwide, attract 10 times more international students than India does and ensure that a significant portion of their own student populations is exposed to education abroad.



Note: Several data points are missing due to limited data availability

Source: WDI

Figure 2.4. Hospital beds per 1,000 individuals comparison

Healthcare provision is another key social infrastructure. In terms of hospital beds per 1,000 individuals, the continent is also rather saturated. Several countries, such as Singapore, Pakistan and Georgia, lead the pack. On the other hand, countries such as Bangladesh, Tajikistan and Myanmar are among the those with the lowest number of available hospital beds.

Generally, healthcare infrastructure development in Asia, especially Southeast Asia, is constrained by financial problems (Mir & Varma, 2018). This situation is caused by the low foreign and private investment in the healthcare market. For comparison, though the healthcare market in Asia is growing rapidly by 12% (higher than the average world growth of 5%), Southeast Asian governments generally allocate small budgets for healthcare infrastructure development. In Southeast Asia, the healthcare infrastructure budget spent by local governments is below the world average of 60%. So far, Malaysia and Vietnam are the only countries in Southeast Asia that focus on improving healthcare infrastructure within their borders. In fact, at the end of 2022, it is predicted that Asia will face a shortage of 3.6 million beds.

Further, Deloitte (2015) discusses that many of the economies in Southeast Asia are currently struggling with relatively underdeveloped public healthcare systems. The region has a chronic shortage of medical personnel: the average number of physicians in Southeast Asia is 0.6 per 1,000, far lower than that in developed economies such as the UK (2.8 per 1,000), Germany (3.7) and the US (2.4). Additionally, the numbers of dentists and of nursing and midwifery personnel are much lower than those in developed economies. As we look to the future, we find that the impending systemic changes in our daily human behaviour will undoubtedly influence the changing lifestyle of our society. Economic prosperity, the aging population, the growing middle-income population and sensitive public policy are key demand drivers of better healthcare and infrastructure. These trends will ultimately manifest in a gradual but undeniable shift in health outcomes of the population together with a similar adaptation in the related areas of the healthcare ecosystem.

Household consumption of housing varies across the continent. Sri Lanka, Thailand, Pakistan, India and Indonesia are the countries with the highest proportion of consumption of housing, and China, Vietnam and Mongolia are those with the lowest proportions. In terms of housing stock, a study by Gurstein et al. (2015) suggests that a majority of the analysed regions in both East and Southeast Asia showed declining percentages of public housing stock since the 1990s. For instance, smaller countries in Asia such as Singapore and Hong Kong have shown a trend of declining stock even when the available units of public housing increased. Hong Kong added 277,000 units of public housing from 1994 to 2012, but in contrast, the percentage of households living in public housing declined from 50.4% to 46.8% over the same period. This pattern was due to the increasing growth of either the country's population or the amount of private housing stock. However, contrary to the general trend, there are a few countries in Asia where public housing has increased since 1990, such as in South Korea, or that have shown more recent upward trends, such as in China. At the same time, there are several countries and regions where public housing is an increasing priority of public policy and funding; in these areas, target groups are expanded rather than restricted. In Asia, Singapore and Hong Kong have been leaders in public housing for years, with 75.8% and 47% of the population housed in public housing, respectively. According to country-specific data, ownership as a key public housing tenure is particularly prevalent in these two countries with a high percentage of public housing; in Singapore, 94.3% of public housing is owner occupied, while in Hong Kong, 33.4% is owner occupied. More recently, China has launched one of the most ambitious public housing construction projects, with a target of 36 million units by 2015, and in South Korea, the public housing sector has been expanding since 1989.

In Malaysia, the Central Bank of Malaysia said in its 2016 annual report that the deficit of affordable housing could exceed one million units in the nation by 2020 (Siew, 2019). The Malaysian government is aware of this shortage as it continues to roll out low-cost housing developments through its PR1MA (1Malaysia People's Housing Programme) initiative, in which the Malaysian government has been developing affordable homes that cost between $23,000 and $94,000 in key, strategic urban areas across the nation. As a countermeasure, the Malaysian government is planning to set up a single entity to manage affordable housing issues in the country. Conversely, following cooling measures that the Singaporean government put in place, Singapore's property prices have dropped for 15 straight quarters, as home values are down by 12% in comparison with 2013 prices (Siew). As houses have become more affordable, home sales in Singapore have grown lately amid greater local demand.

Table 2.1. Proportion of expenditure on housing, select countries (2010)

Country	Lower-Income Population	Middle-Income Population	Higher-Income Population	All
Afghanistan	9.85	16.93	18.57	8.97
Bangladesh	16.34	27.65	19.37	9.88
China	5.73	6.04	7.85	6.46
Fiji	6.29	9.05	11.85	6.82
India	20.18	32.68	38.69	12.47
Indonesia	13.54	17.62	7.22	11.60
Mongolia	2.04	3.52	1.07	1.92
Pakistan	17.11	27.33	56.16	14.18
Papua New Guinea	8.16	7.11	9.11	7.98
Philippines	15.55	20.71	29.95	14.78
Sri Lanka	21.58	33.42	31.01	22.52
Thailand	24.54	31.30	43.19	29.38
Vietnam	5.91	17.41	57.52	5.31

Source: Global Consumption Database, The World Bank[1]

Indonesian President Joko Widodo initiated the One Million Houses program in mid-2015 to address shortages of affordable houses in the country (Siew, 2019). Since its introduction, the Indonesian government has implemented deregulation for residential property projects for low-income families in order to speed up the program. Despite these efforts, there is still currently a shortage of about 11.4 million houses in Indonesia. Furthermore, in Thailand, the Thai government is promoting the development of affordable housing projects through the PPP (public–private partnership) scheme to cater to low-income earners and the lower middle class. This is in line with the fact that demand for affordable housing projects remains high in Thailand, where many low-income earners and members of the lower middle class have yet to own a house.

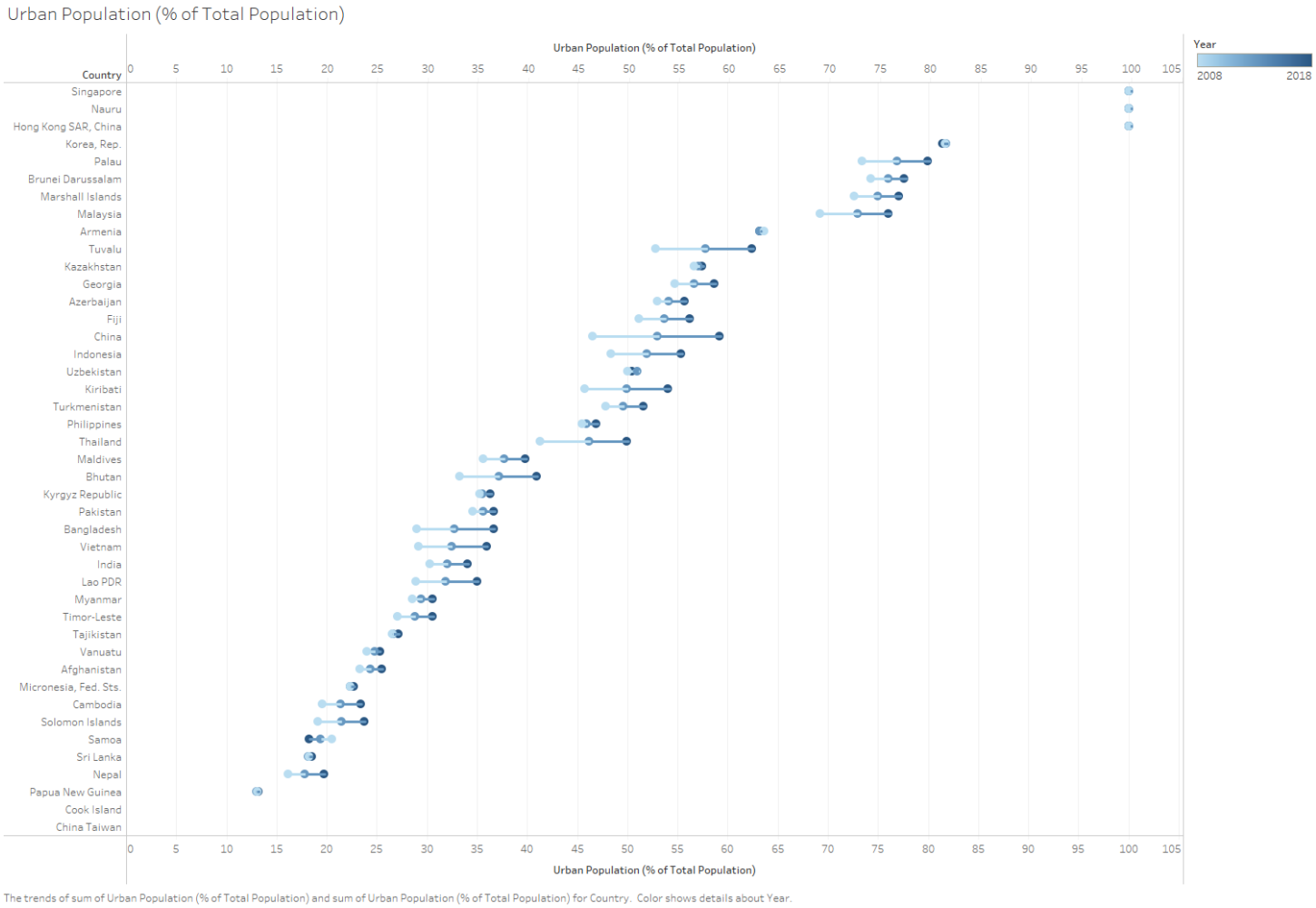
The government of the Philippines will need to allocate an average of over $822 million annually to overcome issues with illegal settlers, will earmark a further $4.49 billion per year to fund socialized housing loans, and will commence its 10-year plan to solve the country's backlog of 6.5 million housing units (Siew, 2019). The Vietnamese government, in contrast, has introduced a massive stimulus package amounting to $1.32 billion in order to encourage social housing development in the country and to revitalize the real estate sector. Even so, private developers in Vietnam have commented that a stimulus package alone is not enough to sustain the social housing program as capital runs out. As a result, Vietnamese developers have called for a more sustainable mechanism and institution to back the program. The country's neighbours, Myanmar and Cambodia, have shown increasing demand for affordable homes. According to Myanmar's Ministry of Construction, Myanmar will require an additional 4.8 million housing units by 2040 based on the nation's population growth rate between 1983 and 2014. Meanwhile, in Cambodia, based on the Cambodian government's 2014 National Housing Policy, the country will require an extra 1.1 million houses to meet demand by 2030.

The latest trend in South Korea reflects its societal changes: there has been expansion and diversified coverage of public housing under its move towards a 'universal' public housing policy (Seo & Joo, 2018). Concurrent with this expansion at the national level, the local governments of Seoul and Gyeonggi have also redefined their role and emerged as creative suppliers of public housing, albeit mostly for the young. For 'localized' public housing to succeed, it is important that the national government does not make a full return to its 'productivity' tendency but continues its policy efforts in housing the poor. This would complement the efforts of local governments and allow the governments to experiment with providing for a wider group of those in need of affordable housing, including the poor, according to these individuals' specific local needs and contexts.

[1] The data are gathered from the Global Consumption Database of the World Bank. It is accessible online by accessing the following link: http://datatopics.worldbank.org/consumption/detail

The United Nations Human Settlements Program in 2011 projected that urbanization trends in Asia will continue in the coming decades. Between 2010 and 2050, the urban population in Asia is projected to reach 3.4 billion. The rate and scale of urban growth in Asia are distinct from those in all other regions, and such extensive change will steadily increase pressure on the affordability of land and housing in the region.

In 2017, Eastern Asia had the highest average proportion of the population living in urban areas, at 52.29%. Meanwhile, in the same period, 46.03% of the population of the Pacific region was urban. In Central and Western Asia, Armenia's urban population was the highest in the region, at 63.10%. The Maldives had a high urban population (39.38%) compared to other countries in Southern Asia. Urbanization in South-eastern Asia was the second highest in Asia, and Singapore's urban population proportion (100%) surpassed that of every other Asian country.



Source: https://www.numbeo.com and WDI, 2018

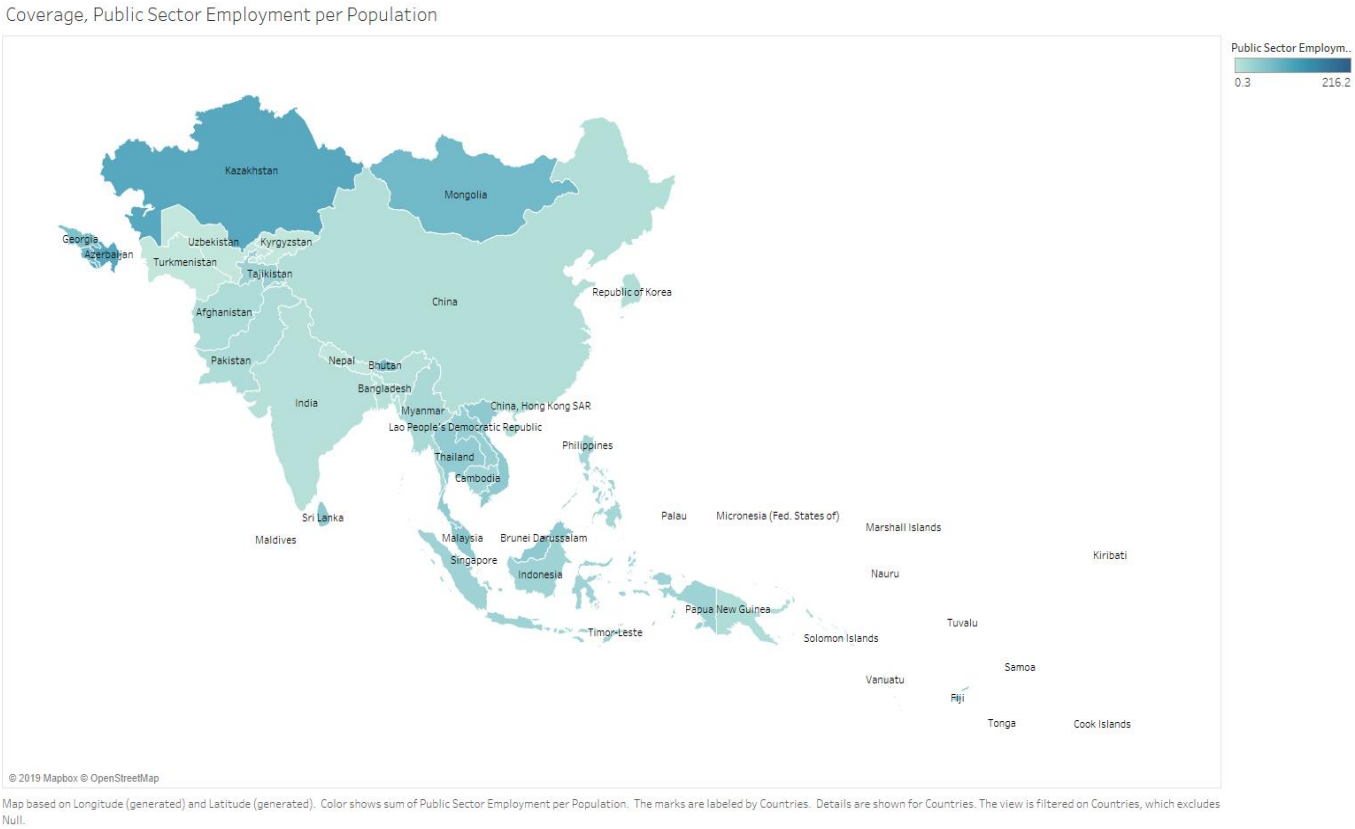
Figure 2.5. Urban population proportion, 2017[2]

[2] Urban population proportion: proportion of urban population to total population.

The number of public employment offices also serves as an important aspect worth consideration, as the availability of offices is critical to government building infrastructure needs. In Thailand, Limskul and Puttanapong (2018) found that 24,388 million square meters of office space are needed by 2030, translating into around US$302 million in 2030. Further, Hirota et al. (2017) noted that, in Indonesia, the need for investment in government building by 2030 is in the range of US$4.4 to 4.5 billion, equivalent to 0.2% of Indonesia's GDP. The authors' estimation, which used micro and macro approaches, produced an upward trend for the investment need for government building. The investment, as a percent of GDP, is relatively constant over the period, while the increasing demand in government building is proportional to the increasing income per capita and number of populations.

In Indonesia's current state, *Perpres* (Presidential Regulation) No. 73/2011 stated that the funding for government building came from the national budget, the regional budget and/or other legitimate sources such as grants and purchases. Spending related to government building, including the cost of construction, rehabilitation, renovation and restoration, is listed in the national budget under capital expenditure. In 2014, the capital expenditure for government building was IDR 65 trillion (US$4.6 billion), or 20.4% of capital expenditure. In 2015, this cost decreased to 13.8% of capital expenditure. However, Indonesia's current administration is trying to optimize existing buildings instead of constructing additional office buildings.

In general, Asia's public sector employment has increased over the years, while in the Pacific region, civic employment has decreased. Among regions, the number of public sector coverage varies. Countries in Southeast Asia tend to have high coverage (above 26 public sector workers per 1,000 people), with Brunei having the highest coverage between the Asia 45.[3] Central Asia is also high in coverage, as Azerbaijan and Kazakhstan have public sector coverage above 100 workers per 1,000 individuals. The Solomon Islands, in contrast, have the lowest public sector coverage of a mere 0.26 workers per 1,000.



Source: ILO and Worldwide Bureaucracy Indicator, 2018

Figure 2.6. Public sector employment in Asia 45 per region per 1000 people

While the quantity of public sector workers per capita will increase as the population level rises, does this mean that the quality of the public sector will also improve? The government effectiveness index measures the quality of public institutions, capturing perceptions of the quality of public services, the quality of civil service and the degree of the

[3] The Public Employment Data used is the latest data available ranging from 2008 to 2017.

government's independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to these policies. This score ranges from 2.5 to -2.5, where 2.5 indicates a strong public institution and -2.5 denotes a weak public institution.

Among all the regions of Asia and the Pacific, Eastern Asia's countries tend to have received positive scores. As most countries in this region are developed, the institution's quality may also be well developed. South-eastern Asian countries are sharply divided into two categories: half of the countries have positive scores, but the other half received negative scores. In the remaining four regions – Southern Asia, Central Asia, Western Asia and the Pacific – the majority of countries have negative scores. Singapore has the highest score (2.2) not only among the 45 countries of Asia but also of all the countries on Earth. The Marshall Islands received the lowest score of -1.53. In general, most of Asia's 45 countries have negative scores, which underscores the need for improvement in institution quality.

Source: WDI

Figure 2.7. Government effectiveness scores of Asia 45 and per region

All the above-mentioned trends and progresses of the multiple forms of social infrastructure in Asia demonstrate the hugely differentiated landscape of infrastructure needs. We argue that this variety only amplifies the need for a comprehensive study encompassing a wide range of countries in the region. In that regard, this study aims to estimate the education, health, public housing and government building needs in 45 Asian countries by using a general holistic framework that allows policymakers to make comparable inferences among the countries of interest.

2.3. Relevance of social infrastructure

One subset of infrastructure that is widely considered as a crucial part of any nation's economy is physical infrastructure. Physical infrastructure plays a key role in economic activities, and several studies highlight the importance of physical infrastructure to economic development in Asian countries, such as Allcott, Collard-Wexler and O'Connell (2016) on the importance of electricity to industrial productivity in India or Sahoo, Dash & Nataraj (2010) on the impact of infrastructure development to China's economic growth.

In Meeting Asia's Infrastructure Needs, ADB (2017) focuses on four critical physical infrastructures in Asia: transport, power, telecommunications, and water supply and sanitation. Each of these infrastructures affects economies and improves welfare through different channels. The existence of telecommunications tools provides people with the ability to communicate with one another regardless of distance. At the other end of the spectrum, electricity and power supply enable people to perform their daily activities efficiently. All of these infrastructures combined satisfy the necessary conditions for an economy to achieve sustainable and inclusive growth.

However, physical infrastructure is not sufficient on its own. Although infrastructure has been shown to positively influence the economy, the benefits earned from additional infrastructure will decline as physical infrastructure continues to be added. If the government only focuses on building more physical infrastructure, it will reach a point at which the cost of building outweighs the benefits that new infrastructure provides.

In addition, the effectiveness of building new infrastructure often relies heavily upon the enabling or external factors. One example that illustrates this dependence is the construction of new transportation infrastructure. Transportation infrastructure investment has been found to have positive effects on regional economic growth in China (Song & van Geenhuizen, 2014) and India (Pradhan & Bagchi, 2013). However, as Banerjee, Duflo, & Qian (2012) argue, the impact of factor mobility plays an important role in determining the benefit of infrastructure development. If labour movement is relatively immobile, for example, due to the lack of housing for incoming labour, the benefit of new infrastructure investment in one region will be severely limited.

It is important to note that all the reasons above do not imply that physical infrastructure should be abandoned. On the contrary, since physical infrastructure is crucial to the economy, it is even more important to develop a complementary solution that can maximize the benefits from infrastructure investment. Social infrastructure can fill the existing gap and satisfy the necessary conditions for sustainable and inclusive growth.

The importance of social infrastructure cannot be undermined, especially given the current conditions in Asia. As mentioned in Section 2.2, the social infrastructure in many Asian countries is still underdeveloped. These circumstances pose a threat to the achievement of sustainable growth in Asia. However, at the same time, the above provides an opportunity for Asian countries to focus on investing in social infrastructure to fully capitalize on the benefits of existing physical infrastructure in Asia. Thus, this study will heavily focus on four aspects (education, health, provision of public housing and government building) as the critical components of social infrastructure throughout Asia.

Many research studies have explained how social infrastructure positively affects an economy. The 1974–1978 INPRES (President Order) programme in Indonesia showed that the construction of more than 61,000 primary schools changed the enrolment rates of the young generation and induced a long-lasting change in the rate of human capital accumulation Duflo (2001). As exhibited in the Endogenous Growth Theory (Romer, 1986), human capital accumulation has significant influence on economic growth in the long run.

Banerjee, Deaton & Duflo (2004) also explained the importance of a different part of social infrastructure: healthcare. From 100 hamlets in Udaipur, Rajasthan (the poorest district of India), it was found that access to healthcare was one of the determinants of the villagers' health. If the health of local villagers improves due to better access to healthcare, it will enable these individuals to engage in productive activities and improve their wellbeing. However, the benefits of social infrastructure are not limited to its direct effects.

As previously mentioned, in order to fully maximize the benefit of physical infrastructure, it is critical to maintain good social infrastructure. In the example of the port construction, the issue of labour mobility can be easily resolved by providing public housing to or improving the knowledge of employees. Having a sufficient amount of public housing will attract more labour to the region, and enhancing educational options will provide labourers with different skillsets so that they can access a broader range of job opportunities. All of the examples above show that direct investment in social infrastructure will lead to improvement in human capital, while indirect investment in social infrastructure strengthens the efficiency of infrastructure investment as a whole. Both of these types of investment stimulate more sustainable and inclusive growth.

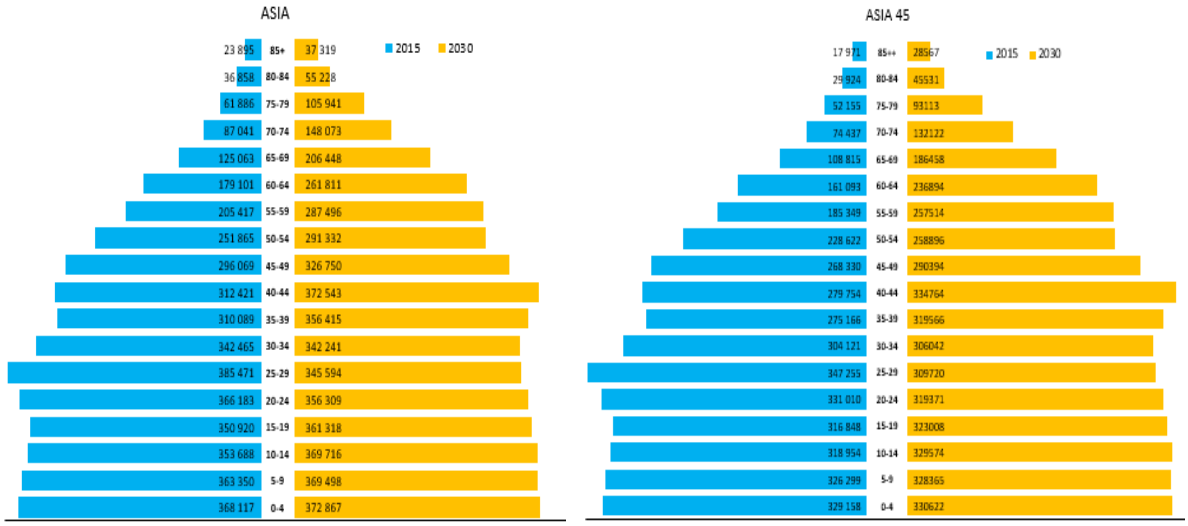
2.4. Variation in population structure

The population of Asia will reach 4.96 billion people in 2030, an increase of 12% from 2015. Based on the population pyramid, individuals between 0 and 64 years of age, the 'productive' age range, constituted the largest part of the population in 2015, numbering 4.09 billion people. This condition will remain the same in 2030, at which time this group is projected to reach 4.4 billion, an increase of 8.04% from 2015. The population between 25 and 29 years of

age became the largest five-year age bracket in 2015, constituting approximately 385 million people, but this group is projected to decrease by 10.34% in 2030. Meanwhile, in 2030, the largest group will consist of children ages 0–4, a population of 372.8 million people.

The 20–24, 25–29 and 30–34 age brackets will decrease by 2.70%, 10.34% and 0.07% respectively by 2030, while the number of elderly people aged 65 and above is projected to increase by 65%, reaching 553 million in 2030. This pattern shows that Asia will contend with a disproportionately large elderly population after 2030.

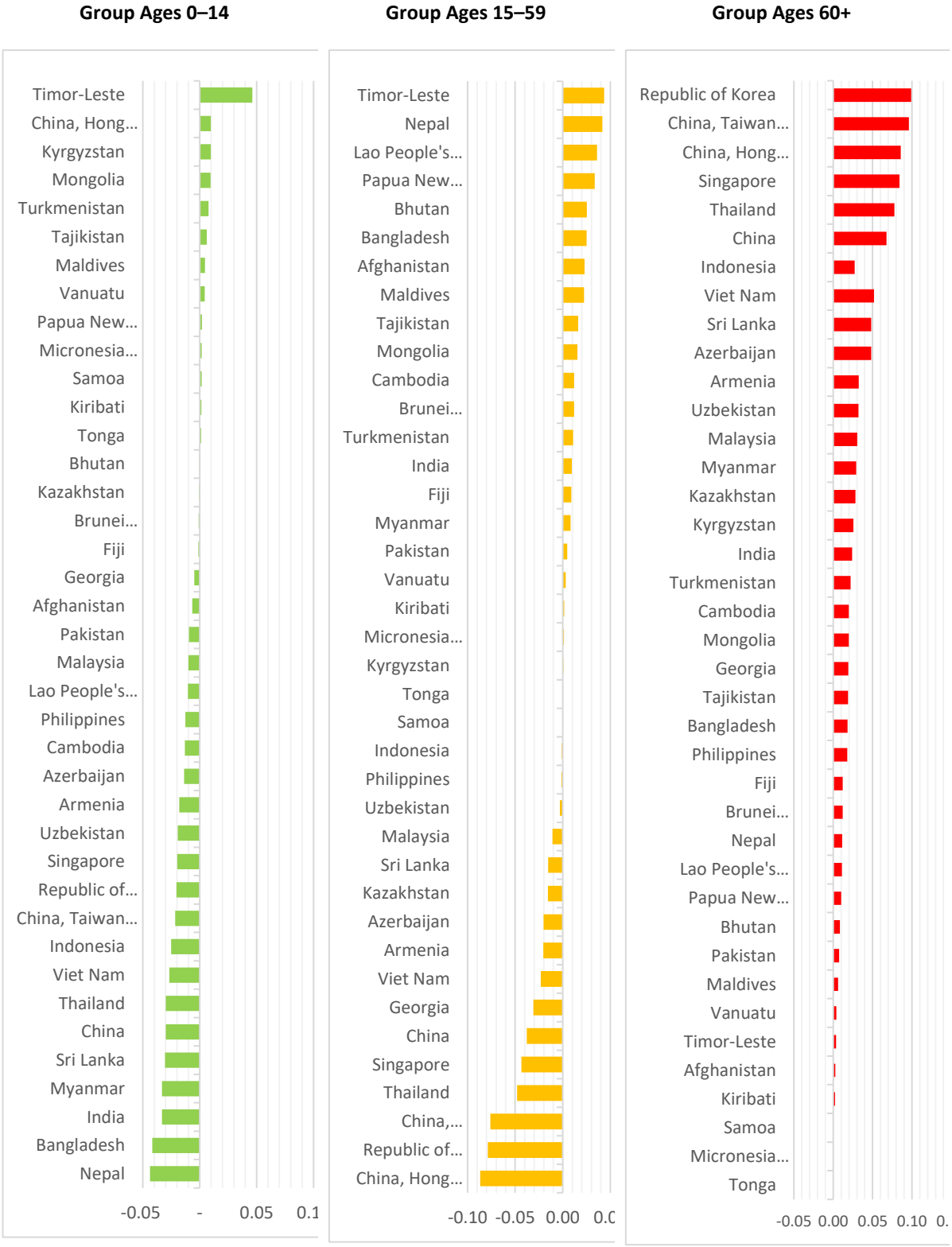
Moderately no differences with Asia, the Asia 45 countries will reach approximately 4.4 billion people in 2030. The age proportion of Asia 45 is also somewhat no differences with Asia. The Asia 45 populations are almost 90 percent of Asia's population.



Source: UN, 2017

Figure 2.8. Asia population pyramid (in thousands of people)

The figure below (Figure 2.9) is the percentage share of each age group in each country in Asia from 2015 to 2030. A positive value means that there is an increase in the percentage share of a certain age group from 2015 to 2030. As we can see in the figure, there are countries in which the younger age groups will decrease in size and a plurality of the population will be elderly in 2030. There are also countries that will benefit from increases in their 'productive' populations. Of the regions of Asia and the Pacific, Eastern Asia will feature the highest share of elderly people from 2015 to 2030.



Source: UN, 2017

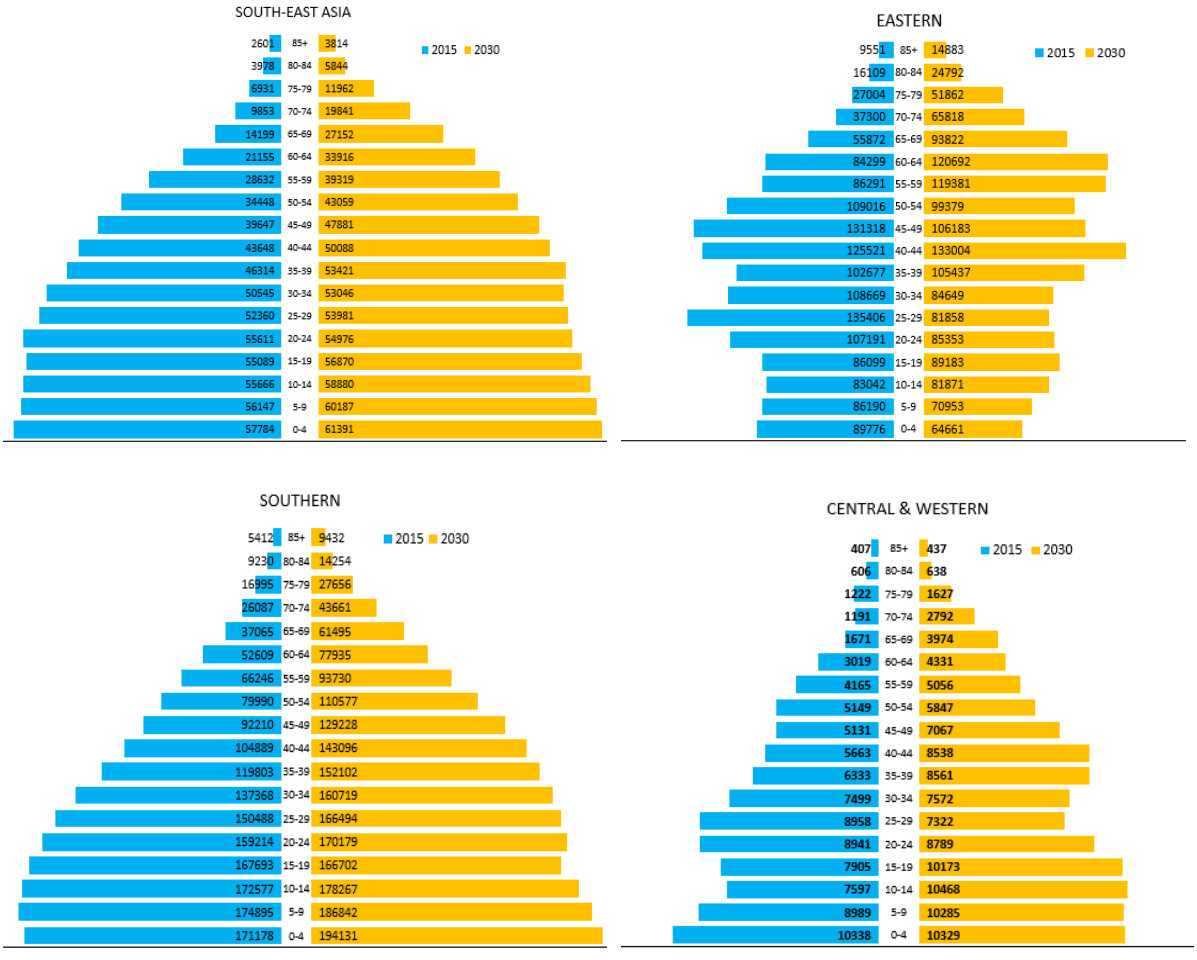
Figure 2.9. The change in the proportion of population by age group in Asia 45, 2015–2030

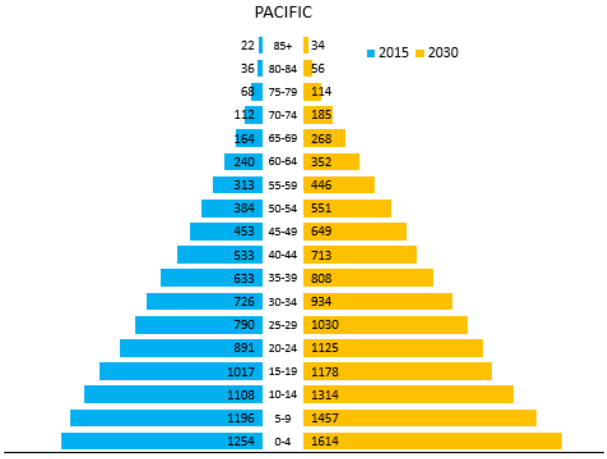
According to the World Population Prospects 2017, Southern Asia (Asia 45) is the most populous region in Asia; the number of people living in the region was an estimated 1.74 billion people in 2015, and this number is likely to increase by 19.6% (2.08 billion people) by 2030. The second-largest population is in Eastern Asia, with an estimated 1.48 billion

people in 2015 and an estimated increase of 0.84% (1.49 billion people) by 2030. The third-largest population is in South-eastern Asia, where more than 634 million people lived in 2015 and where an additional 15.92% (735 million people) will live in 2030. The two smallest regions, namely, Central and Western Asia and the Pacific, had 94.7 million and 9.9 million residents, respectively, in 2015; by 2030, the population of these regions is estimated to grow by 20.07% (113.8 million people) and by 29.1% (12.8 million people).

The youngest population (ages 0–14) in the Pacific and the Central and Western regions will show the highest growth from 2015 to 2030. The Pacific and Southern Asia will experience the highest and the second-highest growth among the 'productive' population during the given 15-year period, and the growth of the youngest and the 'productive' populations from 2015 to 2030 in Asia 45 shows positive trends. In South-eastern Asia, the growth of the young population is 6.4%, and that of the productive population is 13.8%. While Eastern Asia will experience a 4.8% growth rate in its 'productive' population, it is estimated to show a decline of -16% in its youngest population. The growth rates of the youngest and the 'productive' populations in the remaining regions are as follows: Southern, 7.8% and 31.3%; Central and Western, 15.4% and 16.7%; and the Pacific, 23% and 30.2%.

In terms of the aging population (65+) among all the regions in Asia 45, the Central and Western and the South-eastern regions will have the highest growth rates during the given period: 85.8% and 82.7%, respectively. The growth rates in the three remaining regions are estimated to be the following: Eastern, 72.2%; Southern, 65.1%; and the Pacific, 63.3%.





Note: The Pacific region includes Melanesia, Micronesia and Polynesia but excludes the Solomon Islands, the Marshall Islands, Nauru, Palau, the Cook Islands and Tuvalu

Source: UN, 2017

Figure 2.10. Asia 45 population pyramid by region (in thousands of people)

2.5. What makes Asia so diverse

2.5.1. Health

Countries in Asia range from lowest to highest income, from the least to the most highly industrialized. Some countries have populations in the hundreds of millions, while others' populations measure only in the thousands; some have predominantly young populations while others' populations are aging rapidly. With this great diversity, it is not surprising to find similar variation in health systems. Factors that drive differences in health systems[4] include the following:

- The level of economic development per capita of gross domestic product (GDP)
- Income distribution profile
- Total healthcare expenditure per capita, public health expenditure per capita and the relative mix of public and private expenditure
- Availability and spatial distribution of both medical and paramedical service providers and the degree of public and private provision
- The geophysical features of the country and their relationship to logistical issues
- The priority given to this sector under the country's social policy, particularly the degree of risk pooling and social solidarity

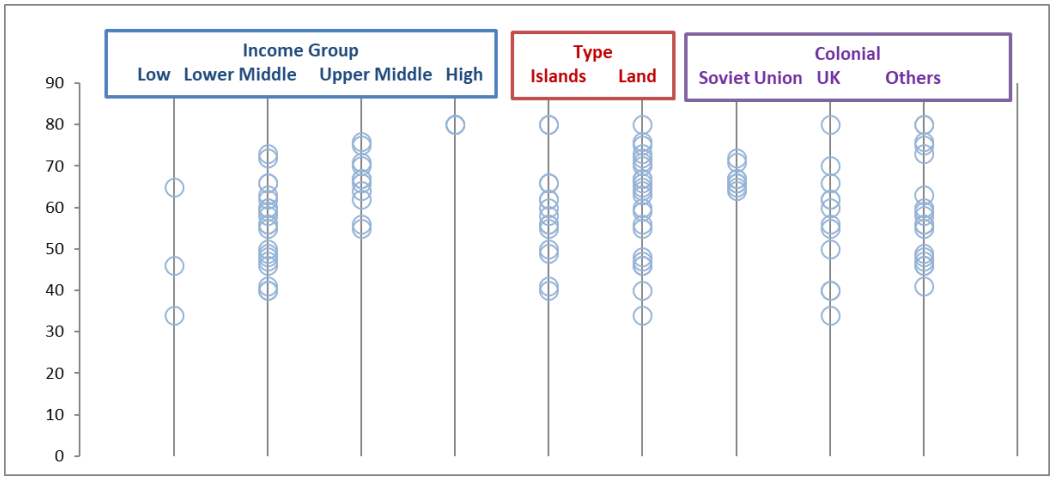
Most countries rely on a mix of general and specialized hospitals as well as smaller facilities such as primary health and district-level hospitals. In many industrialized countries, most healthcare is provided by urban hospitals and private clinics supported by the latest technology. Agrarian countries rely on small rural health facilities supported by secondary hospitals and a few tertiary hospitals. In island countries, such as the Cook Islands, the Marshall Islands, the Federated States of Micronesia, Nauru, Palau, the Solomon Islands and Tuvalu[5], the health system is serviced largely by the public health system. The striking exception to this trend is Singapore, an island state functioning as a global commercial and financial hub. For larger countries, including multi-island nations such as the Philippines, the health system requires a multi-tiered organizational structure. The centralization of health service facilities, except in countries that are very small, results in limited access for the dispersed citizenry. For financing, developed countries typically allocate a larger percentage of their GDP to health expenditure. There are only a handful of developed countries where public health expenditure is less than 5%; in most countries, the expenditure is well above that meagre amount. The percentage of public health expenditure for most low- and middle-income developing countries is small.

The UHC (universal health coverage) service coverage index has a value of 60 (out of 100) regionally, with values ranging from 41 to over 80 across Asia as of 2015. This index measures the percentage of tracer indicators in the UHC

[4] http://www.wpro.who.int/health_information_evidence/documents/Health_in_Asia_Pacific.pdf

[5] http://www.wpro.who.int/publications/CHIPS2010.pdf

service coverage. As the index measures, coverage of essential services is highest in high-income countries, which tend to spend more on public healthcare that improves the service coverage. All high-income countries have service coverage index values greater than 80. The type of land affects the difficulty of health facility distribution and transportation: island countries tend to have lower values on the service coverage index than mainland countries do. In Figure 2.11, each circle depicts a country's value according to the UHC service coverage index.



Source: WHO, 2017

Figure 2.11. Universal Health Coverage index by country characteristics in Asia 45

2.5.2. Education

While a country with more eligible school-age children will, in general, have greater need for educational infrastructure, each country presents different conditions and circumstances that necessitate differences in resource quantity and allocation. For example, dense and prosperous city-states like Singapore may need fewer school buildings that nevertheless have higher capacities and higher unit costs, while the sparsely populated and mountainous interior of Papua New Guinea may require a greater number of low-capacity schools. More urbanized regions with higher labour costs also drive up the price per physical unit.

The differences can be seen also in the age range of a country's students. The official minimum age of primary education students differs among countries, as does the duration of primary and secondary education. Table 2.2 shows these differences in each level of education, and these differences, particularly in micro approach, will be used to estimate the demand of education. Differences in demand for education infrastructure across Asia thus cannot be separated from the various economic and non-economic factors of each country.

We analyse the factors that drive difference in demand for education infrastructures as follows:

1. **Economic factors**

   On average, Asian countries at more advanced stages of development tend to have better taxation mechanisms and more taxable income so that more resources can be allocated for educational expenditure. As such, highly developed countries tend to build schools that include more than the basic features alone. For example, highly developed economies such as Singapore, Japan and Hong Kong tend to build more schools with amenities and facilities such as musical rooms, gymnasia and classroom laboratories. In emerging economies, expectations of school facilities tend to be more rudimentary, and as such, schools in these countries only meet the minimum requirements.

   One concrete example of the differences mentioned above is the minimum service standard that each country implements. Singapore, for example, requires by law that each classroom has two exit doors and is a minimum of 3.4 meters in height, and the country also demands that all school laboratories have safety equipment against fire and safety certifications from appropriate architects or structural engineers.[6] Hong Kong's standard for new 30-student, primary school classrooms stipulates the presence of amenities such as music rooms, arts and crafts

[6] https://sso.agc.gov.sg/SL/87-RG1#pr21-

rooms, language rooms, libraries, conference rooms, assembly halls and medical inspection rooms.[7] In contrast, developing economies with more limited resources for education may set lower building standards for school so as not to strain their education budget.

This difference is even more pronounced at the university level, which tends to feature much greater variation and is not as highly standardized in terms of quality and curriculum as primary and secondary education institutions are. Universities in advanced economies, such as Singapore and Hong Kong, might be more interested in competing with top universities in other advanced economies, and as such, these institutions require significantly higher construction costs. Conversely, universities in emerging economies, such as Indonesia, that have laxer educational regulatory standards may be more focused on generating profit and, as such, tend to be built at lower overall costs and unit costs.

2. National curriculum and colonial legacy

The years of schooling for at the primary, lower secondary and upper secondary levels greatly affect the cost of construction of primary, lower secondary, upper secondary and tertiary education buildings, as the minimum required number of classes required per school varies from country to country. Generally, longer periods of schooling for each educational stage necessitate an increase in the minimum number of required classes for each school. Thus, the curricula adopted by different Asian countries tend to reflect the variations in these factors.

Because most Asian countries were colonized by other powers at one point in their respective histories, the legacies of colonial powers are also evident in education infrastructure through post-colonial educational institutions. Changing the number of years that average students are expected to attend at any educational level (primary, lower secondary, upper secondary and tertiary) necessitates a related change in the number of classrooms that are needed in each school, which entails significant and sometimes unnecessary capital expenditures. As such, educational reforms in the post-colonial era are largely more concerned with expanding access to education rather than changing the length of attendance at institutions; this explains the trend of adoption of colonial education systems.

[7] https://www.legco.gov.hk/yr99-00/english/panels/ed/papers/e1693-03.pdf

Table 2.2. Asian education systems

	Path	Official Age Allowed to Enter Education	Primary	Secondary		Post secondary
China	General	6 years old	6 years	3 years junior middle school	3 years senior middle school	4 years bachelor 2 years master 3 years doctoral
	Vocational				3-4 years vocational senior secondary school	2-3 years higher vocational degree "Zhuanke"
Uzbekistan	General	6 or 7 years old	4 years primary school	5 years general secondary (up to this point: partial secondary education), and 2 years upper secondary		4 years bachelor 2 years master 6 years doctoral
	Vocational			2 years technical (vocational) secondary		3 years specialized secondary (vocational)
Afghanistan	General	6 to 8 years old	6 years primary	3 years lower secondary "Maktabek Motsaveh"	3 years "Doreyeh Aali"	4-7 years bachelor 2 years master 3 years doctoral
	Vocational				3-5 years vocational education certificate	
Bangladesh	General	6 years old	5 years primary	3 years junior secondary	2 years secondary + 2 years higher secondary	3 years bachelor 1-2 years master 3 years doctoral
	Vocational				2 years vocational/artisan course (specialized)	4 years diploma Engineering / 2-4 years technical vocational
	Religious			5 years secondary "Dakhil" (Secondary school) 2 years "Alim" (Higher secondary school)		2 years "Fazil" (Associates) 2 years "Kamil" (Bachelor)
India	General	6 years old	5 years (lower) primary	3 years middle school (upper primary) +2 years General/Lower secondary + 2 years Upper/Senior secondary		3-4 years bachelor 2 years master 5 years doctoral
	Vocational					Vocational/Technical school
Pakistan	General	5 years old	5 years primary	3 years middle school+2 years secondary + 2 years higher secondary/intermediate colleges		2 years (Pass)/3-4 years (Honors) bachelor 1 year master (after Honors)/2 year master (after Pass) 3 years doctorate
	Vocational					Vocational/Technical school
Indonesia	General	6 years old	6 years primary	3 years junior high school SMP	3 years senior high school "SMA"	4 years bachelor 2 years master 3 years doctorate
	Vocational				3 years vocational high school "SMK"	1-3 years Diploma
Malaysia	General	7 years old	6 years primary	3 years Lower secondary	2 years upper secondary	1-2 years post-secondary education + 4 years bachelor 1 year master 3 years doctorate
	Vocational				2 years vocational/technical secondary	Diploma
Myanmar	General	5-6 years old	5 years elementary	4 years Secondary Middle school	2 years Secondary High school	4 years bachelor 1 year master 3 years doctorate
	Vocational					Diploma
Philippines	General	6 years old	6 years elementary	4 years junior high school	2 years senior high school	4 years bachelor 2 years master 3 years doctorate
	Vocational				2 years vocational track (senior high) school	Vocational Colleges
Thailand	General	6 years old	6 years elementary	3 years Lower secondary	3 years upper secondary	4-6 years bachelor 1 year master 2-5 years doctorate
	Vocational				3 years vocational track (senior high school)	2-3 years Technical/Higher Diploma (DVT Program)
VietNam	General	6 years old	5 years primary	4 years lower secondary (Intermediate)	3 years secondary	4 years bachelor 2 years master 3 years doctorate
	Vocational				3-4 years technical/vocational education	2 years Vocational colleges
Fiji	General	6 years old	8 years primary	3 years lower secondary	2 years senior secondary	Higher Education
	Vocational			4 years vocational school		
Papua New Guinea	General	6 years old	3 years elementary 6 years primary	4 years secondary school		Higher Education
	Vocational			2-3 years vocational school		

Table 2.3. European education system and adopter countries in Asia

No	Model Countries	Primary	Secondary		Adopters
			Lower	Upper	
1	United Kingdom	6 years	4 years	2 years	Singapore Malaysia* India* Pakistan* Philippines
2	France[8]	5 years	4 years	3 years	Vietnam
3	Netherlands	6 years	3 years	3 years	Indonesia
4	United States	6 years *5 years**	3 years	3 years *4 years**	Japan Thailand Cambodia Hong Kong Afghanistan

* Denoting some deviation from the original model

Source: Authors' compilation

There are, however, cases where adoption happens not through colonization. Thailand, which has never been colonized by early-modern-era foreign powers, was initially influenced by the British model and adopted a 4-3-3-2 structure before switching to a 6-3-3 model. Cambodia, while initially adopting the French model, experienced significant decline in educational access during Khmer Rouge era and effectively started from scratch in adopting its current 6-3-3 model.

3. Geographical factors and population density

Aside from economic development, which affects the cost of school construction through differences in the expected quality of the education system, differences in the cost of school construction across Asian countries are also driven by spatial factors, which include but are not limited to geographical factors and population density. As a general rule of thumb, denser countries tend to (1) experience more incidence of land constraints and (2) benefit more from economics of scale due to their ability to absorb more students in a given geographical area.

As a result, schools built in densely populated areas tend to be more expensive both in terms of total cost and unit cost in comparison to schools in sparsely populated areas due to three factors. First, schools in densely populated urban areas, due to land constraints, usually have multiple storeys. This raises the construction and engineering cost per square meter well over that of the average single-storey school; there is an increased need for a deeper foundation and better structural design for safety reasons. Schools in densely populated urban areas also tend to occupy more expensive tracts of land, which drives up the land purchase costs. Furthermore, schools in dense urban areas can serve significantly more students, and these buildings thus require more classrooms. An extreme example of this is Hong Kong; schools with more than five storeys are not uncommon due to extreme land shortage, and the equipment needed to support multi-storey buildings, such as emergency stairs, lifts, water pumps and fire extinguishers, also drive up the cost considerably.

Lower population density nevertheless does not necessarily indicate that the unit costs of building will be significantly lower than the costs in densely populated urban areas are. In theory, if the minimum educational standard is uniformly applied across jurisdictions, building schools in remote areas (e.g., landlocked countries at high elevation, island nations and countries with mountainous terrains) without good access to infrastructure would make unit costs for school construction higher due to the more expensive transportation costs for both materials and skilled building workers. However, sparsely populated countries with difficult terrains, such as Papua New Guinea, Fiji or Nepal, also tend to be less economically developed and must settle for more rudimentary building standards, thus making building costs appear lower.

4. Regulatory and institutional differences

Another factor that influences the cost of building schools is the relevant building codes and safety regulations in each country. In jurisdictions that utilise more multi-storey buildings for schools (such as Singapore and Hong Kong) or that are more disaster prone (such as Japan), building codes are likely to be more stringent and thus impose additional costs such as structural reinforcement or design by certified structural engineers. Complicating the matter further is the fact that some aspects of construction regulation, such as limits on floor

[8] http://cache.media.education.gouv.fr/file/scolarisation/91/4/pripi_286914.pdf

area ratios or minimum parking requirements, usually fall under the purview of local governments (except in small city-state and island nations), thus creating wide variation among building costs even within a single country.

In addition to relevant building and zoning codes that affect school size, another regulatory aspect that induces variations in building costs within and between countries is the way in which each jurisdiction treats education-related matters. Larger countries, like India, China and Indonesia, usually fully assign the portfolio of education to local governments or treat education policy as falling under concurrent jurisdiction between national and local governments. As such, affluent urban municipalities with larger budgets may afford to set higher minimum school construction standards compared to more budget-constrained, rural municipalities, thus accentuating cost variation within and among regions.

2.5.3. Housing

Public and/or affordable housing is the type of social infrastructure where differences, both in terms of cost and type of housing, may be even more pronounced than other types of social infrastructures. In most jurisdictions, housing policies are treated as local matters, although national governments may assume some of the responsibility of providing affordable housing when local governments lack the budget or technical expertise to do so. In this case, we are confining our analysis to what drives differences in housing costs between urban and suburban areas for each country, as the need for public/subsidized/affordable housing units are is the greatest in urban areas.

We analyse the factors that drive differences in demand for public housing as follows:

1. **Local and national housing law**

   Local/city-state municipalities may dictate certain ordinances and regulations that may drive up the costs of housing units. Safety-related regulations, such as earthquake-proofing or fire safety regulations, may be necessary but also drive up the prices of housing units. Other regulations, such as land usage policies, may restrict the maximum size of land that can be occupied by an individual structure and/or may dictate maximum building floor count or height, usually for aesthetics and environmental consideration. In these cases, restrictions will most likely reduce the maximum number of affordable housing units that can be built in a given land parcel, thus increasing the cost of land acquisition for each housing unit.

2. **Land affordability and urban density**

   Land affordability affects construction costs of housing units in two ways: first, more affordable land reduces the land acquisition cost for affordable housing units, and second, more affordable land also shifts the preferred housing types for affordable housing from multi-storey units to single-family housing, which is cheaper to build per unit. Therefore, land prices have a positive correlation with construction costs; per unit housing costs in jurisdictions with more affordable land prices are considerably cheaper than those with more expensive land prices.

3. **Economic factors**

   The median wage and per-capita income of a region affect construction costs of housing units through two channels. First, a higher median wage pushes construction costs higher through increases in labour costs, which constitute considerable percentage of construction costs. Second, a higher median wage, which translates to a higher standard of living, also increases expectations about the standards of affordable housing. In addition to functionality, even low-income households and city planners tend to have higher expectations for designs and building materials. Examples of regions with these heightened expectations include Singapore, South Korea, Hong Kong and Japan.

4. **Geographical conditions**

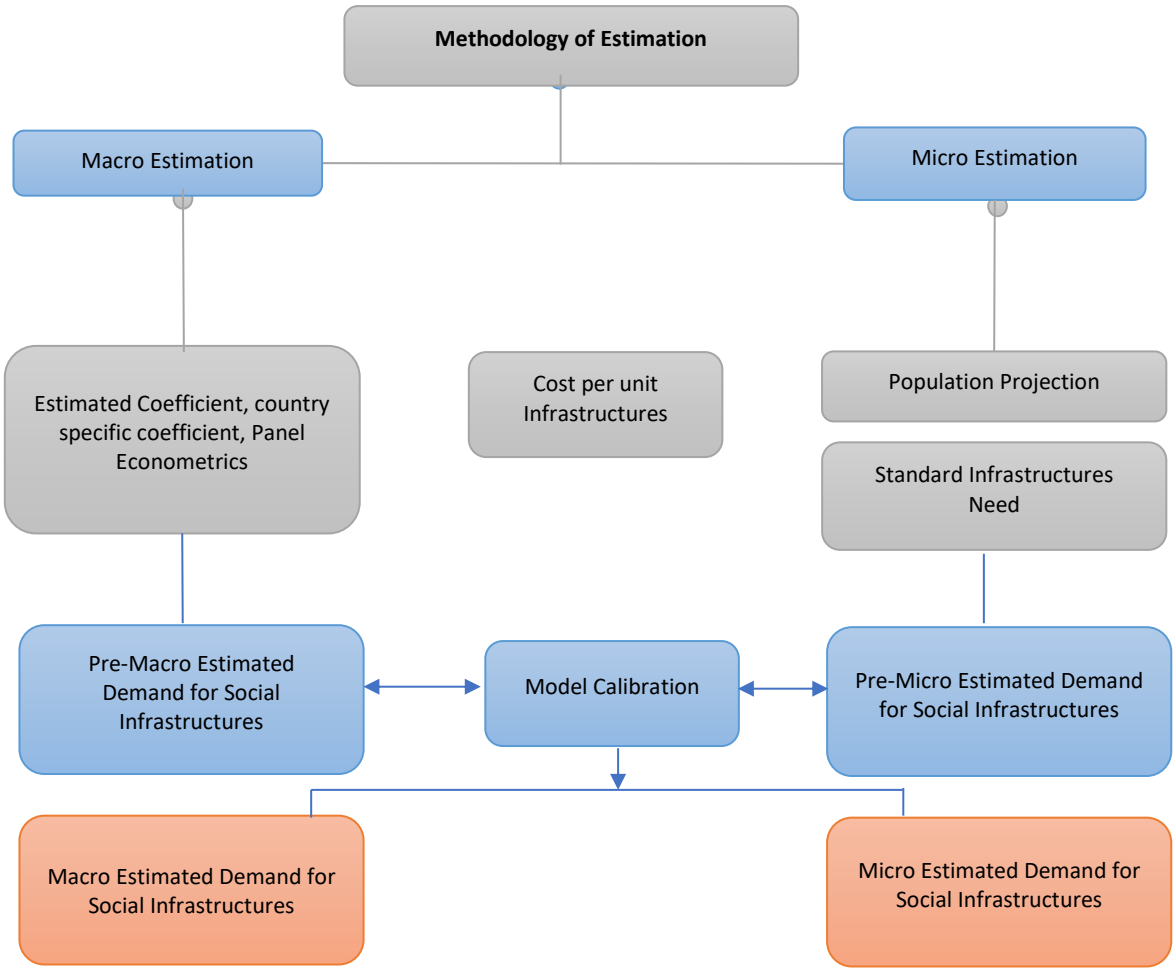
   Differences in housing costs also stem from geographical factors. It tends to be cheaper to build housing in flatlands, areas with stronger soil and less disaster-prone areas, and this tendency also applies to places that are located near coastal areas, which have easy access to harbours and thus to building materials and labour. More isolated areas, such as those near jungles or mountains, relatively isolated islands and areas with softer soil, serve as challenging construction sites. As such, these areas require additional reinforcement and higher costs for building materials.

CHAPTER 3
ESTIMATING SOCIAL INFRASTRUCTURE NEEDS FOR 2016–2030

This chapter presents a strategy to estimate social infrastructure needs in Asia between 2016 and 2030. This study combines two approaches that consider population dynamics, changes in standard of living, and the country's economic condition. The first approach is the macro approach, a top-down methodology relating 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 changes in the number of beneficiary or population dynamics.

3.1. Methodology and Procedure

Figure 3.1 shows the two approaches that will be employed in this study, i.e. macro estimation and micro estimation. Having the estimated demand for social infrastructure on hand allows us to calculate the estimated cost of social infrastructure investment. Since both approaches will give us two estimated costs, this study will calibrate both approaches before discerning the final estimated demand for social infrastructure from both approaches.



Source: Authors

Figure 3.1. Approaches for the Estimation of the Demand for Social Infrastructure

3.1.1. Macro Approach

Under the macro approach, the demand for social infrastructure was modelled using the econometric panel data model. The demand was assumed as the function of economic and demographic variables. The model can be mathematically expressed as follows:

$$I_{i,t}^{l} = \alpha_0 + \alpha_1 I_{i,t-1}^{l} + \sum_{j=1}^{J} \beta_j X_{i,t}^{j} + \sum_{k=1}^{K} \gamma_k Z_{i,t}^{k} + \delta_i + \theta_t + \varepsilon_{i,t} \quad (1)$$

$I_{i,t}^{l}$ is the demand for infrastructure stock of type l in country i at time t; $I_{i,t-1}^{l}$ is the lagged value of the respective infrastructure stock. X and Z are the vectors of the economic and demographic variables, respectively. All these variables were expressed in natural logs. δ_i is a country-fixed effect and θ_t is a time dummy. Lastly, $\varepsilon_{i,t}$is the error term consisting of the time-invariant error (τ_i), which captures the unobserved heterogeneity that varies across country i but is invariant over time, and the idiosyncratic error ($\eta_{i,t}$), which has a mean of zero and varies both across country i and time t. Thus, the error term of our model could be expressed as $\varepsilon_{i,t} = \tau_i + \eta_{i,t}$. Classic statistical tests (such as a Hausman test, a high R-square, etc.) were also conducted to select the most appropriate model.

Under the Hausman test, the hypothesis null is $E(X_{it}\tau_i) = 0$. Therefore, a large result from the Hausman test suggests that we should reject the hypothesis null or, in other words, we should use the fixed effect (FE) model and vice versa. It should also be noted that in the case of the employment of the FE model, the time-invariant error term (τ_i) would be dropped, thus leaving $\varepsilon_{i,t} = \eta_{i,t}$. This is because the FE model applied to the transformation data would omit all time-invariant variables.

We replicated JICA (2016)[9] as our initial attempt and learned whether the models were appropriate for the Asia case. To fit in with the Asia case, we modified the model and used different sets of variables that depended on the robustness of the model and data availability[10]. In the education sector, in particular, we conducted separate regressions for each level of education: primary, junior-secondary, upper-secondary, and higher education (university).

Details on Estimating the Demand for Public Housing for the Urban Slum Population

Compared to the three other sectors (i.e. health, education, and government buildings), the macro-estimation method that we used to calculate the demand for public housing was adjusted. Instead of estimating the demand for public housing investment, our focus was to estimate the demand for public housing for those who live in urban slums. One of the SDGs is to create substantial progress in reducing the proportion of the urban population living in slums, and global countries need to ensure access for all to adequate, safe, and affordable housing and basic services, thus upgrading slums by 2030. To achieve this target, the government must provide public housing for the urban population who currently lives in slums through a public finance scheme. Public housing can take the form of either rental housing or owner-occupied housing. Therefore, there is a need to estimate the demand for public housing for the urban slum population.

However, there is a challenge that arises in forecasting this demand. The data for actual public housing stock is not available. As an alternative method, we computed the demand for public housing stock in urban slums that needs to be built (necessary stock) by using the following formula:

$$Necessary\ Stock\ = \left(\frac{urban\ slum\ population}{average\ household\ size}\right)\ x\ service\ standard$$

We assumed that the government will provide a one-bedroom house for each household from urban slum locations, given the fact that the government in each country usually constructs public housing for households who live in a feeble and deteriorated house or poor-quality environment. We also presumed that the urbanisation rate and percentage of the population who live in urban slums has not changed significantly over the years. With this approach, our forecast started with zero actual public housing stock in the initial year.

Another consideration in calculating the total demand for new-construction public housing stock in urban slums is the incremental necessary stock. The incremental necessary stock possibly changes over the years due to changes

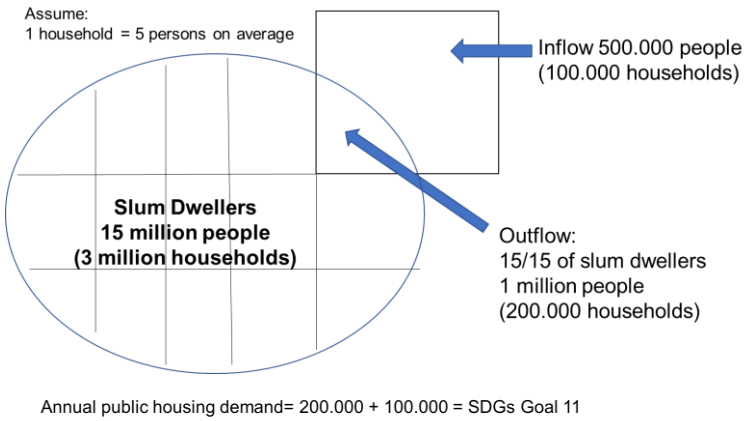
[9] The full set of variables and their availability can be seen in Table 3.2.

[10] Except for health, the team found that the JICA (2016) specification works best for the Asia case.

in macroeconomic indicators (e.g. GDP per capita, population density, urbanisation rate, urban poverty rate, share of the manufacturing sector, etc.). We computed the incremental necessary urban slum population's public housing stock by forecasting the increase in demand based on the macro-estimation regression result. Given that the construction years needed to provide the necessary stock is 15 (from 2016 until 2030), we calculated the new-construction demand for each year:

$$Annual\ new\ construction\ demand\ = \frac{Necessary\ Stock}{15} + incremental\ necessary\ stock$$

Figure 3.2 is an illustration showing how our approach provides an indicative figure to achieve the SDGs:



Source: Authors' compilation

Figure 3.2 An Illustration Approach of Public Housing for Urban Slum Population

We supposed that the size of the urban slum population in a country is equal to 15 million people and the average household size in the country is 5. Next, we computed the number of households who live in urban slum areas: 15 million/5 persons = 3 million households. This number gave us the total necessary housing stock that should be provided by the government during 2016–2030. Implicitly, the necessary housing stock would be equal to 200,000 units per year.

Additionally, based on the macro-estimation result, we forecasted that the number of slum dwellers would increase over the years (seen as an 'inflow') due to macroeconomic conditions. For example, a higher population density and faster urbanisation rate are positively correlated with the size of the urban slum population. If the inflow is equal to 100,000 households, the annual public housing demand for the urban slum population would be 300,000 units.

Finally, the unit price of public housing in urban slums should reflect the average price of a modest house. By expressing the standard cost (i.e. the price per m^2) in USD, this report calculated the price per unit of a public house for the urban slum population by multiplying the standard cost by the international standard floor size of a modest house. The other costs, such as O&M, rehabilitation, and replacement, were taken into account as a percentage of the annual new-construction demand from the previous year.

3.1.2. Micro Approach

To calculate the total cost of social infrastructure with the micro approach, this report constructed two strategies. First, "standard services" and "cost proxy" of social infrastructure were defined. "Standard services" is defined as the usual amount of services used by the citizens of each country, for instance, for education, how much space is needed for each student. In health infrastructure, the standard service is how many people can be facilitated by one hospital. The "cost proxy" for each infrastructure depicts the cost of building each infrastructure as per a standardised measurement. In general, this report used the price of building each infrastructure as documented in Spon's *Asia Pacific: Construction Costs Handbook* (2015) edited by Langdon and Seah. As for other countries that were not documented in the book, this study also used market-based data for the price of building in such countries

from different sources. This data was for construction only and did not include land cost, interior, etc. We already excluded the electrical items from the interior cost, since these costs were already included in the unit cost in Langdon and Seah (2015). This study also took into account other costs, such as land, O&M, rehabilitation, and replacement costs. The other costs, except for land, were a certain percentage of the construction cost. Thus, this study first excluded the land cost from the construction cost. Second, we made a population dynamic projection to assess the number of beneficiaries. Having these two strategies, assessing the new investment demand was attainable. A more detailed breakdown of these strategies is discussed to follow.

3.1.2.1. Education

This report used infrastructure at three education levels: primary, secondary, and tertiary school. The first step to estimate the infrastructure demand was to use the projection population data produced by the United Nation Population Fund (UNFPA). This population projection was then multiplied by the net enrolment ratio in each country to estimate how many students entered for each education level in each country. Since the school age is different between Asia's countries, this study adjusted the projected age groups' populations proportionally. After estimating the number of students, this study used the minimum amount of space needed per student. The next step was to estimate the cost of building for primary, secondary, and tertiary schools. We added other costs such as land, O&M, rehabilitation, and replacement costs. Multiplying the number of students by the minimum space needed and the cost of construction and other costs resulted in the total investment needed for education.

3.1.2.2. Health

Similar to the calculation used in education, we defined health infrastructure as general hospitals consisting of public, private, general, and specialised hospitals. The data used was quite close to the calculation for education. The costs used were the construction cost per m^2 of a general hospital in USD. We also found data for hospital beds per 1,000 people (bed coverage) for the fourteen countries of interest. The bed coverage is assumed to increase gradually from 2016–2030 to achieve the OECD bed coverage average/standard (see section 4.1 for more details on the target calculation). With the assumption of one bed needing 40 m^2, we multiplied the construction cost, bed coverage, and space needed by the population. This was used to calculate the stock value of hospitals. Using this value, we were able to calculate land, interior, and medical device values based on certain proportions. After the total value was calculated, we divided it by the population, thus showing how much it costs per person. For the calculation of a new investment, the population increase was weighted with the growth of the elderly population, as this population segment will have higher usage, and multiplied this by the cost per person. By adding other costs, we were able to calculate the total health investment. Other costs, like for education, were also taken into account, such as medical device replacement costs.

3.1.2.3. Public Housing for the Urban Slum Population

The term "public housing" in our study refers to the housing funded by the public sector, regardless of whether it is rental or owner-occupied housing, for the urban slum population. In this aspect, this report used a percentage of the urban people living in the slum area. Besides the challenge in estimating the demand for public housing, the reasoning behind choosing this criterion is that the government in each country usually constructs public housing for people who live in a feeble and deteriorated house or a poor-quality environment. However, forecasting the public housing demand using the number of households living under the poverty line was an option, but it could not be used due to data availability. The urbanisation rate and percentage of the number of people living in slum areas were considered to be constant over the years. The incremental number of urban people living in slum areas each year was then divided by the standard number of household members in the country. In calculating the total investment needs for public housing for urban slum population, the macro and micro approaches use the same formula. That is, the unit cost is multiplied by the volume of beneficiary and service standard. However, the two approach could produce a different number of total investments because the macro- and micro-approaches are different in the way of estimating the volume of beneficiary.

The cost is the price of housing subsidised by the government or the average price of modest housing. Using the building house cost in USD per m^2 as the standard cost, this report calculated the price of a one-bedroom public house by multiplying this number by the international standard area of a modest house. Finally, the total number of investments needed for public housing consists of two components: (i) the incremental necessary stock that refers to the incremental number of families living in slum areas and (ii) the necessary stock at first year divided

by fifteen years. Each component is multiplied by the unit cost of a house with a set of service standards. The other costs, such as O&M, rehabilitation, and replacement, were taken into account as a percentage of the existing public housing in the previous year.

3.1.2.4. Government Offices

The demand for government offices is the number of civil servants needed relating to the number of people in each country. For some countries, this report used the OECD standard to determine the number of civil servants, the standard being 1.5% of the country's population. This report also used the standard space (in m^2) needed per public officer. The cost was the cost per m^2 of the office, and the other costs included operation and maintenance costs such as maintenance, rehabilitation, and replacement.

First, this report calculated the total cost of building, which was the result of multiplying the number of civil servants by the office space needed per person in m^2 and the cost per m^2 of building the office. Second, this report calculated the total cost, which was the result of multiplying the land cost and interior cost (83% of the cost of building). Third, this report calculated the unit cost per person as the result of the total cost divided by the number of civil servants. Fourth, the new investment was calculated as the result of multiplying the unit cost per person by the number of civil servants. Finally, the total new investment was calculated as the result of adding the new investment to the operation and maintenance costs.

3.2. Challenges in Data Measurement

3.2.1. Data Availability

This report used the CEIC, United Nations data, and the World Bank's World Development Indicator as the main sources for finding the required data and information. The research team still needed to explore some possible data sources, such as data from the statistical bureau and ministries in each sample country, as well as the report and electronic databases from international non-governmental organisations such as United Nations-related organisations, International Monetary Funds (IMF), and other relevant institutions.

3.2.2. Different Standardisation Among Sample Countries

All sample countries do not set identical qualitative standards for the provision of education, health, and public housing for the urban slum population and governmental facilities. Some countries have longer schooling years for their citizens compared to others, and some countries set more advanced specifications for healthcare facilities in their administrative areas, while similar conditions are also found in the provision of public housing for the urban slum population and governmental buildings. The aforementioned differences could potentially create some issues in generating variables for modelling purposes.

The most apparent issue can be identified in defining explanatory variables for modelling the needs of physical infrastructure in the education sector. Different schooling periods in sample countries complicated the research team's setting of the upper and lower bounds for the schooling age in every educational stage. For instance, a citizen's official age to enter formal education is five years old in Pakistan and seven years old in Malaysia, while the common official age to start primary education in most of the sample countries is six years old. Furthermore, citizens in Pakistan and Malaysia ideally require five and seven years, respectively, to finish primary education. These periods are not similar to that of other sample countries who have an average of six years to finish primary education. This situation resulted in the research team having to make a professional judgement regarding whether to insert the number of citizens between five and 10, five and 11, six and 11, six and 12, or seven to 13 years old as the explanatory variable into the first macro model.

In addition to the difference in schooling ages, the differences in educational stages among sample countries also created some problems for the research team. Citizens in the majority of the sample countries generally have to pass three schooling stages before being able to pursue a higher degree at the university or academy level, i.e. primary, junior-secondary, and upper-secondary school. The research team, therefore, separated the needs for physical infrastructure for education into primary, junior-secondary, and upper-secondary stages. However, countries like India and Pakistan have more schooling stages than others. Graduates from primary school in both of these countries must enter middle school before continuing to secondary school. A different number of

educational stages meant that the research team had to make a professional judgement in reclassifying the additional stages into three main schooling stages as outlined previously.

This study could not specify the details of how qualitative standards differ among healthcare, social housing, and governmental physical infrastructure in the sample countries. The problem regarding these three corresponding infrastructures was mainly due to data availability at the time.

During micro estimation, this study ought to have used the standard service data for each country, for example, the minimum space needed (in m^2) for each primary school student for each country. This study argued that the standard services for each country would be a better representation of each country's social and economic condition. However, this study was not been able to collect all of the standard services for each country due to this data only being available on the micro level, provided by each country's statistics bureau or other related ministerial-level institutes. For instance, in the previous Indonesian social infrastructure report, we were able to obtain such standard service data from micro data only provided by the Indonesian Ministry of Public Work and Public Housing. Applying the same framework to other countries proved to be a challenge, since this required much effort to delve deeper into each country's statistics bureau and other ministerial agencies in addition to each country not always having an English version of the report or website available.

Therefore, this study used a different approach, that is, by using the standard services set by international agencies such as the WHO and UNESCO. This report acknowledges that, however, this approach is not without shortcomings. It might be assumed that this report is oversimplified due to using an international standard for each country, since each country has different economic and social conditions.

3.3. Methods of Calculating Interior, Operation, Maintenance, Rehabilitation, and Replacement Costs.

The interior cost structure was based on the Ministerial Decree of Public Works, Republic of Indonesia No: 22/PRT/M/2018 regarding technical guidance for government office buildings. This is the revised regulation from the previous regulation No: 45/PRT/M/2007. This regulation governed the other component costs outside of the building cost, such as air circulation, barrier-free infrastructure, and green building. The differences between these regulations are that the new regulation includes facilities for persons with disabilities and environmentally friendly building construction. These facilities are convenient for people with disabilities and those with special needs, including the elderly and pregnant women, as they include signs and markers, parking, stairs, and elevators.

Table 3.1. Interior Cost Structure

	Education & Government Buildings (% of building cost)	Housing (% of building cost)	Health (% of building cost)
Air circulation	7	7	11
Elevators	8	-	11
IT installation and computers	9		8.5
Fire protection, sound system, lightning rod (for housing, sound systems are not included)	14	10	14
Interior (including furniture)	15	-	20
Water waste installation, city gas installation (for medical purposes, including O_2, N_20, etc.)	4	4	6
Environmental facilities (parking lots, drainage, public lighting, etc.)	3	3	5.5
Barrier-free infrastructure (for persons with disabilities)	3	3	5
Green building	9.5	4.5	9.5
TOTAL	72.5	31.5	90.5

Source: Ministerial Decree of Public Works, Republic of Indonesia No: 22/PRT/M/2018

The total interior cost for education and government buildings was 72.5% of the building cost, while the housing and health costs were, respectively, 31.5% and 90.5% of the building cost. To avoid double counting costs, this

study hitherto excluded certain interior costs, such as electrical installation, since they were already taken into account in the unit cost in Spon's *Handbook of Construction Price*. The land cost was assumed to be the same as the building cost, considered as the average between land prices in populated and non-populated locations. The maintenance cost was the cost for regular inspections and repairs. This study used a fixed method to determine the magnitude of rehabilitation and replacement costs, since the actual record of the volume of infrastructure stock was not available. The determinant of the magnitude was the building's estimated age. The rehabilitation and replacement costs were 2%. The rehabilitation costs included costs associated with changes to the physical characteristics of the building and upgrades required to meet codes or standards. It also included costs when simple renovation was not economically feasible. Based on Indonesian practices, some also included changes in the building's structure. The replacement cost was defined as the cost to construct or replace an entire building with equal quality and structure (Issa, 2012).

Based on the regulations of the Ministry of Public Works No: 24/PRT/M/2007, the damage intensity of the building can be classified into three levels:

1) Light damage is when the damage is to mainly non-structural components, such as roof and floor coverings, ceilings, and wall fillers.
2) Moderate damage is when the damage is to some non-structural components and/or structural components, such as roof forms, floors, etc.
3) Heavy damage is when the damage is to most building components, either structural or non-structural, which if, after having been repaired, can still function as it should.

Based on the regulations of the Ministry of Education No: 61/2012, rehabilitation also can be done when the building has undergone massive damage. Rehabilitation on heavily damaged classrooms aims to improve learning quality. Planning for the rehabilitation of severely damaged classrooms is based on the results of data collection and mapping of the building components in each school (regulation of the Ministry of Education No: 56/2011)

Table 3.2. Cost Structure

Cost Component	Amount
Initial Cost:	
Building cost	Based on survey collection
Land cost	100% of the building cost
Interior cost of education and government buildings	72.5% of the building cost
Interior cost of housing	31.5% of the building cost
Interior cost of health	90.5% of the building cost
Medical devices (for healthcare)	43% of the building cost[11]
Annual Cost:	
Maintenance	1% of building and interior costs
Rehabilitation cost	2% of the building cost
Rehabilitation cost of interior	10% of the interior cost
Replacement cost of building	2% of the building cost
Replacement cost of interior	10% of the interior cost
Replacement cost of medical devices	10 % of the medical device cost

Source: Ministerial Decree of Public Works, Republic of Indonesia No: 22/PRT/M/2018; OECD (2015); and authors' compilation.

3.4. Assumptions from the Projection

The projection of Asian infrastructure needs under the macro approach was generated by inserting the forecast of all independent variables being used in the macro model into the equation (1). The research team obtained all the required forecasts from external sources, such as the World Economic Outlook (WEO), the World Development Indicator (WDI), and World Population Prospects: 2017 Revision. Multiplying the physical amount of required infrastructure by the unit cost of building using the micro approach provided the extra cost required to provide all of those additional infrastructures. All of these projected extra-cost figures are applicable from 2016 to 2030. This

[11] OECD (2015), "Capital expenditure in the health sector", in Health at a Glance 2015: OECD Indicators, OECD Publishing, Paris

study use the USD exchange rate based on 2015 nominal price. However, for construction inflation was based on average growth of the construction price index from 2015-2018. The projection from 2018 then assume has annual constant growth. However, this study also limits the average growth with some threshold in the specific countries. Therefore, for some countries there is no explosion in construction price due to high inflation.

The following table specifies all assumptions and adjustments made throughout the projection process. The projection data covers 2016–2030. The list of the variables of projection is also available in Appendix 2.

Table 3.3. List of Projected Variables

No.	Independent Variables	Data Source	Assumptions and Adjustments
1.	Population size	World Population Prospects: 2017 Revision	No modifications.
2.	Population density	World Population Prospects: 2017 Revision	No modifications.
3.	GDP per capita	Self-computed	The GDP per capita was obtained from the division of the projected nominal GDP with the projected population size of each sample country. The nominal GDP was the result of multiplying the real GDP, GDP growth, and GDP deflator. Economic growth was assumed to be constant between 2016 and 2030. The GDP deflator, on the other hand, was allowed to inflate at various rates until 2024, after which the inflation rate became constant. All forecasts for the real GDP, GDP growth, and GDP deflator were obtained from the WEO.
4.	Unemployment rate	WEO	No modifications.
5.	Life expectancy	World Population Prospects: 2017 Revision	No modifications.
6.	Share of the manufacturing sector in the GDP	WDI	The share of the manufacturing sector in each sample country's GDP was assumed to be constant from the last year of observation until 2030.
7.	Share of the agriculture, fishery, and forestry sector in the GDP	WDI	The share of the agriculture, fishery, and forestry sector in each sample country's GDP was assumed to be constant from the last year of observation until 2030.
8.	Enrolment rate (secondary school)	UNESCO Institute for Statistics (UIS) Database	Respective enrolment rates in each sample country were assumed to be constant from the last year of observation until 2030.
9.	Urbanization rate	Self-computed	The urbanisation rate is defined as the change in urban population from one year to the next. The urban population size was computed by multiplying the share of the population size, from point 1, by a long-run projection of the urban population share from the UN World Urbanisation Prospects, 2018.
10.	Urban poverty headcount ratio	WDI	Urban poverty headcount ratio constitutes for the share of urban population living below the national poverty lines in each country. Urban poverty headcount ratio was assumed to be constant from the last year of observation until 2030.
11	Construction Price Index	Self-computed	Utilizing the average growth of the construction price index from 2015-2018. Then projecting with constant growth and limiting the average growth not to exceed 10%.

3.5. Service Standards of Social Infrastructure in Asia

3.5.1. Health

For health infrastructure, this study used the number of hospital beds needed per person. The hospital beds were measured for buildings that deliver services to inpatients in hospitals including for curative, rehabilitative, long-term, and other care. There is no global rule for the density of hospital beds in relation to the total population. In high-income countries like Japan, there are 13.7 hospital beds per 1,000 people, compared with 0.5 per 1,000 in Afghanistan. The recommended WHO target is more than 3.5 beds per 1,000 people (DFAT & IFC, 2016).

However, the number of beds needed is decreasing for some countries that already meet the WHO target recommendation. Japan is an example of this. This is due to investments in technology and preventive effort. For low- to middle-income countries, there might be an increase in the number of hospital beds needed due to current conditions being below the WHO's recommended standards for the ratio of hospital beds to people, as well as to the distribution of buildings among regions within each country.

The number of hospital beds is then used as the determinant of the total area of the hospital. In the western pacific region, a figure of 40 m^2/bed is used as the standard area per bed (WHO, 1998). Therefore, a hospital with 100 beds will need an area of 4,000 m^2. For standard services, this study used scenarios as long as the rate of increase in the number of hospitals was realistic (i.e. not over the GDP-per-capita growth rate). If the initial number of beds per 1,000 people was below 3.5, the standard service would be 3.5 beds per 1,000 people in 2030. If the number of hospital beds per 1,000 people already exceeded the WHO standard, the maximum number of hospital beds would be seven per 1,000 people. The gradual increase in the number of beds was used in the demand projection for hospital beds. The details of this projection are shown in the graph below.

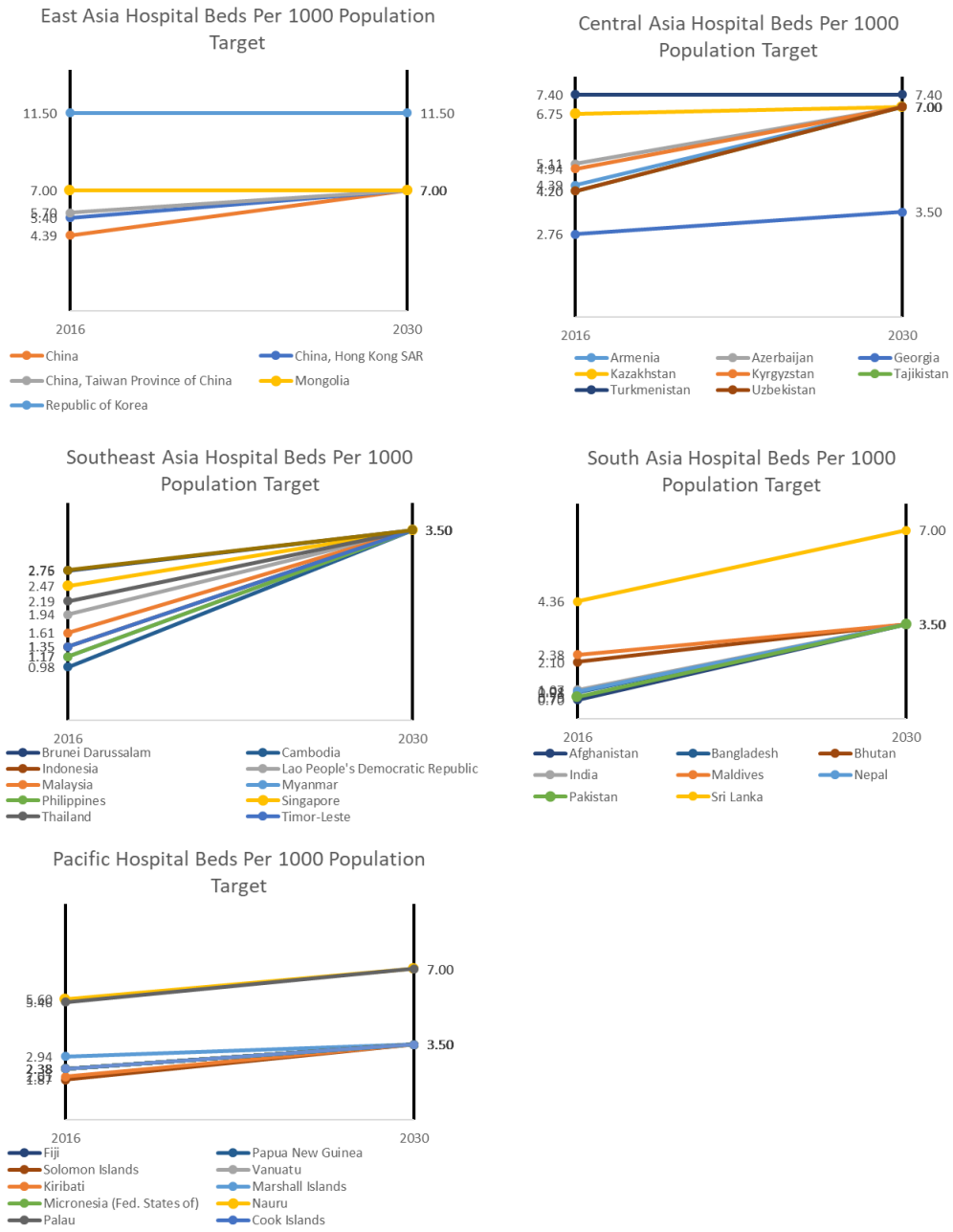


Figure 3.3. The Target for the Number of Hospital Beds in Asian Countries

3.5.2. Education

For primary and secondary education, this study used the international standard for the space needed per student and for the other facilities in the school. For standard-sized classrooms holding 40 students, the space needed is 1 m^2 per student. The area for the toilet is 9 m^2. The total area for staff is 174 m^2 (De Spiegeleer, 1995). The average space needed per student is 1.5 m^2 in primary school and 2.3 m^2 in secondary school.

For higher education, there are three size classifications for universities: small (5,000 students), medium (5,000–15,000 students), and large (more than 15,000 students). This study used the large size as the benchmark (17,500 students with a total area of 200,000 m^2 or 11.4 m^2 per student).

To project the number of students, we used a net enrolment ratio as the basis. However, there was no data available for the net enrolment ratio in tertiary education. Therefore, this study used an adjusted gross enrolment ratio. This study used the same proportion of gross enrolment for each level of education and applied it to the net enrolment ratio for tertiary education. Particularly for primary education, this study used a very small change scenario for the net enrolment ratio until 2030.

3.5.3. Government Offices

There are two components of government offices, namely central and local government administration. As a percentage of the population, the number of government employees is different among regions. In Asia, central government employment is 0.9% and local employment is 0.7%. For OECD countries, the employment in central government is 1.8% and 2.5% in the local government (Schiavo–Campo, 1998). This study used the OECD as the benchmark for ideal government employment. The study used the HSE's required space per worker to calculate the space of government buildings. The required space is 4 m^2 per employee for an office area and 11 m^2 for the overall building (HSE, 1992).

3.5.4. Public Housing for the Urban Slum Population

This study used the space approach as a measurement of adequate living space. The United Nations (2000) indicates an average (median) floor space per person by development level, region, and country based on information from 188 cities. It was 11.9 m^2 for the world, 7.3 m^2 for least-developed countries, 8.6 m^2 for Africa, 10.2 m^2 for Asia and Oceania (excluding Australia, New Zealand, and Japan), 11.0 m^2 for Latin America and the Caribbean, and 21.3 m^2 for more developed regions.

There is a difference in floor space for government-supported low-income and affordable housing in each Asian country. For example, the standard house space in Vietnam is 30 m^2, India's is 28–48 m^2, China's is 44 m^2, and Malaysia's is 60 m^2. However, discerning the average space for each country was challenging; thus, this study used the generic space of a simple house, which is 37 m^2.

By 2030, the UN's target, through utilising the SDGs, is to ensure access for all to adequate, safe, and affordable housing and basic services and to upgrade slums. Thus, one of the indicators used to estimate the demand of public housing is the size of the urban population living in slums, defined as a group of individuals living under the same roof lacking one or more of the following conditions: access to improved water and sanitation, a sufficient living area, and the durability of the house. The calculation of public housing investment for the urban slum population in Asia's 45 countries was based on a projection of the number of people and the ratio of the urban slum population in each country.

3.6. Cost Per Unit of Infrastructure

To compute the total cost for each sector (education, health, public housing for the urban slum population, and government offices), this study took into account several components: the cost of the building, the land cost, and the interior cost. This study made several assumptions in this report. First, because of the lack of data on land value for each country, this study assumed that the value of the land is the same as the value of the building. The currency this study used was the average USD for each year (with respect to each nations' currency). This study mostly used Spon's *Asia Pacific: Construction Cost Handbook* as a reference for the cost per unit. The details of the unit cost per country are available in the appendix.

For the education sector, to calculate the total cost, this study used the following methods: First, this study needed data on the total number of students at primary, secondary, and tertiary level. While this study could retrieve the data for several countries, it was not able to do so for most countries. Our solution to this problem was to compute the number of students corresponding to their schooling age-group, multiplying the schooling age-group by the enrolment rate for each level in each country. Thus, this study obtained the total number of students for each level. Second, this study referred to the minimum service standard of space required (unit: m^2/students) for each student. Third, we used data to calculate how much money it would cost to build a school at each level (unit: USD/m^2). The total cost was retrieved by multiplying the first, second, and third values.

As for the health sector, in this report, we only used the general hospital, i.e., the large building. First, this study divided the total population by 1,000. Second, we used standard service data for the general hospital. There are two standards: the actual data for how many beds can be served for 1,000 people (unit: beds/1,000 people) and the ideal space required for each bed (m^2/beds). The former data was obtained from the World Bank and the latter from the WHO. Third, the cost required to build a general hospital per m^2 was calculated (unit: USD/m^2). The total cost, then, was calculated by multiplying the first, second, and third values.

This study then calculated the total cost for the urban slum public housing sector using three types of data. First was the number of people living in the slum areas (as a percentage of the total population) and the poverty rate. This method is in line with most government strategies to eliminate poverty, as well as to reduce people who live in slum areas. Second, we collected data on the minimum space required for people to be able to live. Third, the cost data (unit: USD/m^2) to build a house with one bedroom and one storey was discerned. Finally, the total cost was retrieved by multiplying the total population by the first, second, and third values.

For the last sector, the government office sector, this study calculated the total cost as follows: First, this study collected data on the average percentage of government employees in the population (either in the central government or local government). Second, this study used the minimum space required for each office worker (unit: m^2/person) (HSE, 1992). Lastly, we obtained data on the cost of building a standard office for an entry-level position, such as a clerk or the like (unit: USD/m^2). The total cost, then, was retrieved by multiplying the total population by the first, second, and third values.

For rehabilitation and replacement costs, this study used the Indonesian JICA report. This study used a method whereby all of the costs were divided within each year. Unfortunately, we could not obtain the infrastructure data stock for 30–40 years ago.

CHAPTER 4
SOCIAL INFRASTRUCTURE NEEDS IN ASIA

This section provides the estimates for social infrastructure investment needs in Asia for the period 2016–2030, covering education, health, public housing for urban slum populations, and government building projects. The estimates will take both a bird's-eye macro approach and a bottom-up micro approach. The section will begin by providing the econometric model used for the macro approach, followed by the estimated investment needs.

4.1. Econometric Model

In this section we will discuss the results of the estimation calculated using the macro approach. As discussed in section 3.1, the macro approach tries to estimate the needs of social infrastructure by employing econometric methods. Using an econometric approach, we model social infrastructure as a function of several independent variables. After estimating the coefficient for each independent variable, a projection of the needs of social infrastructure is obtained by multiplying the coefficient by the projected values for each variable. It is worth noting that the estimation of the result using this approach depends on multiple variables whereas the micro approach uses only the projected population as the sole variable in estimating the needs of social infrastructure.

Table 4.1 presents our econometric results for each social outcome. The econometric specification relating to educational infrastructure utilised a number of students as the proxy for determining the needs of education-building at each respective level. The selection was made due to the limited amount of available data on the physical amount of education infrastructure in the sample countries.

The econometric specification relating to health infrastructure replicates the econometric specification proposed by Ishizuka et al., (2019) using Japan as the case study. The dependent variable is the natural log form of the number of hospital beds per 1,000 population. While the independent variables are lags of the dependent variable, the GDP per capita, and the fraction of population counts using the random-effect approach. The econometric specification in this study, however, could not implement UHC coverage as an independent variable due to the invariability or lack of UHC data in some countries. We are also unable to incorporate lower-level health indicators such as district health services or clinics due to data limitations. In the table, similar to the econometric result taken from the Japan case study above, the only significant variables are the lagged variables. Hence, the results for this sector may be considered to support micro-estimation.

The model of urban-slum public housing infrastructure employs the econometric specification in the case of Indonesia, with a modification. The original specification utilises GDP per capita, urban poverty level, urbanisation rate, and value added in the manufacturing sector. We later add population density to the model as another explanatory variable. The dependent variable in macro-estimation is the ratio of the total population living in slums to the average household size, which implicitly reflects the minimum number of houses required to be built for the households in the slum areas. We further assume that these houses are low-cost housing or public housing for urban slum population that should be provided to each household and funded by the national government programme. We follow Cavalcanti et al. (2019) by incorporating the GDP per capita into the model. The relationship between slums and poverty has been examined by Muth (1967). The relative supply of poor-quality housing increases due to poverty. To capture such an effect, we use the poverty headcount in urban areas as a proxy. Research suggests that the productivity improvements in agriculture, industry, and services have significant implications for poverty reduction, which would implicitly encourage the poor to leave slum areas (Cazzuffi, Pereira-López, & Soloaga, 2017; Ivanic & Martin, 2018). We incorporate the value added by the manufacturing sector as a share of GDP to control the slum-reduction benefits that arise from changes in industrial growth. We include the population density in the econometric model in order to capture the agglomeration effects (Chauvin, Glaeser, Ma, & Tobio, 2017) which, to an extent, cause further slum formation (Cavalcanti, Da Mata, & Santos, 2019). Also, according to Malthusian Equilibrium, the society of a country with a higher population density would have lower living standards (Ashraf & Galor, 2011). We employ the urbanisation rate variable as the control variable in our econometric model to capture the effect of the rate of change in rural-to-urban movement over the years on the quantity of informal (slum) housing, where there is expected to be a negative association (Jedwab, Christiaensen, & Gindelsky, 2017). Finally, the dependent variable is a natural log form of the ratio of the urban

slum population to the average household size, where the differences will implicitly provide us with the 'inflow' or necessary incremental stock.

The econometric specification for government building uses number of public sector employment per 1,000 population as its dependent variable. The selection was made because most of sample countries do not publish the existing physical amount of their governmental buildings or facilities. Explanatory variables in the econometric model are the first lag of the dependent variable, unemployment rate, and agricultural sector's share in GDP. The Hausman test of the specification results indicates that fixed-effect model should be preferred over the random-effect model. Findings from this sector could be regarded to justify micro-estimation.

Table 4.1. Econometric result for macro approach

Variables	Primary School student	Secondary School student	University Student	Hospital Beds per 1000 Population	Ratio of Urban Slum Population to Average Household Size	Number of Public Sector Employees per 1,000 Population
y_{t-1}						0.827***
						(0.054)
$ln(y_{t-1})$	0.668***	0.796***	0.881***	0.323***		
	(0.036)	(0.030)	(0.025)	(0.053)		
$ln(y_{t-2})$				0.393***		
				(0.102)		
Unemployment rate$_{t-1}$						0.056
						(0.086)
Share of agriculture in GDP $_{t-1}$						-0.010
						(0.029)
Life expectancy	-0.002		0.015*			
	(0.003)		(0.009)			
Gap between primary + secondary education with total years of compulsory education[12]		-0.012*				
		(0.006)				
Ln (Age 0-5 population)				-0.026		
				(0.021)		
Ln (Age 65+ population)				0.033		
				(0.025)		
Ln (GDP per capita)				0.033	-0.058	
				(0.032)	(0.484)	
Ln (GDP per capita) $_{t-1}$	0.011	0.035***				
	(0.008)	(0.011)				
Ln (Population density)					0.030	
					(0.163)	
Ln (Urban poverty headcount)					0.797***	
					(0.076)	
Ln (Population of respective age in each education level)	0.328***	0.207***	0.307***			
	(0.046)	(0.065)	(0.106)			
Share of manufacture in GDP					-0.011**	
					(0.004)	
Secondary School enrolment rate			0.002			
			(0.002)			
Urbanization Rate (%)			0.498		0.191	
			(1.634)		(0.156)	
Constant	0.098	-0.314	-4.324***	0.216	58.195	4.065
	(0.472)	(0.911)	(1.419)	(0.382)	(80.915)	(1.516)
Num. Observation					**127**	
R-Squared	**0.885**	**0.951**	**0.927**	**0.983**	**0.929**	**0.695**
F stat	**415.80**	**739.98**	**767.43**	**104.07**	**254.29**	**89.46**

Note: standard error in parentheses. * significant at 1%; ** significant at 5%; *** significant at 10%

Source: LPEM-FEBUI's calculation

[12] The gap represents the total years of primary-level education + total years of secondary-level education - total years of compulsory education. For instance, in Indonesia, the total period of primary-level education is 6 years and the total period of secondary education is 6 years. Meanwhile the total length of compulsory education is 9 years. Thus, the gap in Indonesia's case is 3 years.

4.2. Aggregate estimates

Table 4.2 presents the baseline estimates for the social infrastructure investment needs of 45 Asia and Pacific countries for the 15-year period from 2016 to 2030.

Table 4.2. Estimated social infrastructure investment needs, 2016–2030

	Population (million)		Infrastructure Need (USD billion)					
			Micro approach			Macro approach		
	2015	2030	Investment need	Annual average	% of GDP	Investment need	Annual average	% of GDP
Asia	3,955	4,416	27,237.1	1,815.8	4.6	26,307.7	1,753.8	4.5
Asia w/o China	2,558	2,975	9,282.9	618.9	3.8	9,373.5	624.9	3.8
Low	71	91	167.9	11.2	9.9	151.3	10.1	8.9
Lower Middle	2,239	2,618	7,095.5	473.0	4.5	7,735.3	515.7	4.9
Upper Middle	1,559	1,615	18,589.2	1,239.3	4.9	17,410.5	1,160.7	4.6
High	87	92	1,384.4	92.3	2.5	1,010.6	67.4	1.9
Central	85	99	393.4	26.2	2.5	189.0	12.6	1.2
East	1,481	1,530	19,339.1	1,289.3	4.9	17,939.1	1,195.9	4.5
China			17,954.2	1,196.9	5.2	16,934.2	1,128.9	4.9
South	1,744	2,046	4,514.8	301.0	4.2	5,525.4	368.4	5.1
India			3,180.8	212.1	3.7	3,963.2	264.2	4.6
South East	635	728	2,956.1	197.1	4.1	2,618.6	174.6	3.6
Indonesia			1,263.1	84.2	4.7	1,037.4	69.2	3.9
Pacific	10	13	33.8	2.3	4.6	35.5	2.4	4.8

Source: LPEM-FEBUI's calculation

Over the next 15 years, it is estimated that Asia-Pacific needs around USD 26-27 trillion, or USD 1.8 trillion annually, to meet its social infrastructure needs. This figure is equivalent to 4.6 % of the projected GDP, lower than the ADB's projection on physical infrastructure needs by 5.1% GDP. The investment needs are concentrated in the lower middle and upper middle-income countries, which account for 95% of the total investment needed.

The estimate also reveals regional variation in investment needs. East Asia dominates, with investment needs accounting for at least 71% of the total needed. This investment is equivalent to 4.5-4.9% of the region's GDP, comparable in relative terms with the average figure for Asia. The scale of investment is mainly driven by China's demands, given its economic magnitude, population size, and stage of development. South Asia follows, requiring 21% of the total investment need according to the macro approach, which is 5.1% of the region's projected GDP. Nevertheless, the relative investment needs are higher in terms of their respective projected GDP figures, particularly for the Pacific. The number is understandable given the low level of GDP of Pacific countries relative to other countries in South East Asia and Central Asia.

There is a different chronological trend (in an upward or downward direction) between the macro and micro estimate results in some sectors or regions. This might be due to the limitations of the macro top-down approach. Rather than estimating infrastructure based only on population and minimum standards, macro approaches use more aggregative macro variables, hence their trends may differ from micro ones. We, however, focus on the total number of investments needed, with both approaches producing similar results.

Table 4.3 and 4.4 present the decomposed structure of total social investment needs by regions and income groups based on micro- and macro-estimation results, respectively. The cost structure is broken down into three subcomponents, namely: (i) new construction costs, (ii) operation and maintenances costs, and (iii) rehabilitation/replacement costs. All costs are measured in USD billion.

The micro-estimation result shows that the largest proportion of total social investment needs is allocated to rehabilitation/replacement cost. This cost is estimated to be around USD 15.4 billion in Asia, which is approximately equal to 57% of the total investment needs. Meanwhile, the rehabilitation and replacement costs in the macro-estimation are relatively lower. This cost is estimated to be around USD 12.3 billion in Asia, which is approximately equal to 47% of the total investment needs. The result is understandable since the estimated

amount of new construction costs in housing and government building sectors seem to outweigh the other costs significantly according to the macro-estimation approach. The result also indicates that, unlike health and education sectors, the countries should prioritise establishing new physical infrastructure rather than rehabilitating that which currently exists.

Table 4.3. Social investment needs (micro), by area

	GDP (in billion USD) (2016-2030)	Micro (Infrastructure Need (USD billion))					
		Total Investment Need (in billion USD) 2016-2030	Annual Average (in billion USD)	% of GDP	New Construction (in billion USD)	O & M (in billion USD)	Rehabilitation/ Replacement (in billion USD)
Asia	**591,022**	27,237.1	1,815.8	4.6	10,447.8	1,398.6	15,390.6
Asia Without China	**244,253**	9,282.9	618.9	3.8	3,250.8	506.9	5,525.2
Low	**1,700**	167.9	11.2	9.9	39.9	10.9	117.1
Lower Middle	**157,906**	7,095.5	473.0	4.5	2,740.7	374.1	3,980.7
Upper Middle*	**377,079**	18,589.2	1,239.3	4.9	7,333.6	933.0	10,322.6
High	**54,337**	1,384.4	92.3	2.5	333.6	80.7	970.2
Central	**15,761**	393.4	26.2	2.5	55.9	27.8	309.7
East*	**394,880**	19,339.1	1,289.3	4.9	7,534.3	972.2	10,832.5
China	**346,769**	17,954.2	1,196.9	5.2	7,197.0	891.8	9,865.4
South	**107,802**	4,514.8	301.0	4.2	1,751.5	236.5	2,526.7
India	**85,701**	3,180.8	212.1	3.7	1,257.2	166.8	1,756.9
South East	**71,846**	2,956.1	197.1	4.1	1,095.3	160.3	1,700.5
Indonesia	**26,726**	1,263.1	84.2	4.7	461.0	68.7	733.5
Pacific	**733**	33.8	2.3	4.6	10.8	1.9	21.1

Source: LPEM-FEBUI's calculation

Table 4.4. Social investment needs (macro estimates), by area

	GDP (in billion USD) (2016-2030)	Macro (Infrastructure Need ($ billion))					
		Total Investment Need (in billion USD) 2016-2030	Annual Average (in billion USD)	% of GDP	New Construction (in billion USD)	O & M (in billion USD)	Rehabilitation/ Replacement (in billion USD)
Asia	**591,022**	26,307.7	1,753.8	4.5	13,065.8	936.5	12,305.3
Asia Without China	**244,253**	9,373.5	624.9	3.8	4,131.3	352.7	4,889.5
Low	**1,700**	151.3	10.1	8.9	49.9	8.2	93.3
Lower Middle	**157,906**	7,735.3	515.7	4.9	3,376.8	297.9	4,060.6
Upper Middle*	**377,079**	17,410.5	1,160.7	4.6	9,132.2	602.4	7,675.8
High	**54,337**	1,010.6	67.4	1.9	507.0	28.1	475.5
Central	**15,761**	189.0	12.6	1.2	63.6	8.5	117.0
East*	**394,880**	17,939.1	1,195.9	4.5	9,440.0	611.7	7,887.4
China	**346,769**	16,934.2	1,128.9	4.9	8,934.5	583.8	7,415.8
South	**107,802**	5,525.4	368.4	5.1	2,302.0	217.8	3,005.7
India	**85,701**	3,963.2	264.2	4.6	1,601.9	159.6	2,201.7
South East	**71,846**	2,618.6	174.6	3.6	1,246.1	97.0	1,275.5
Indonesia	**26,726**	1,037.4	69.2	3.9	463.9	40.7	532.8
Pacific	**733**	35.5	2.4	4.8	14.2	1.6	20.3

Source: LPEM-FEBUI's calculation

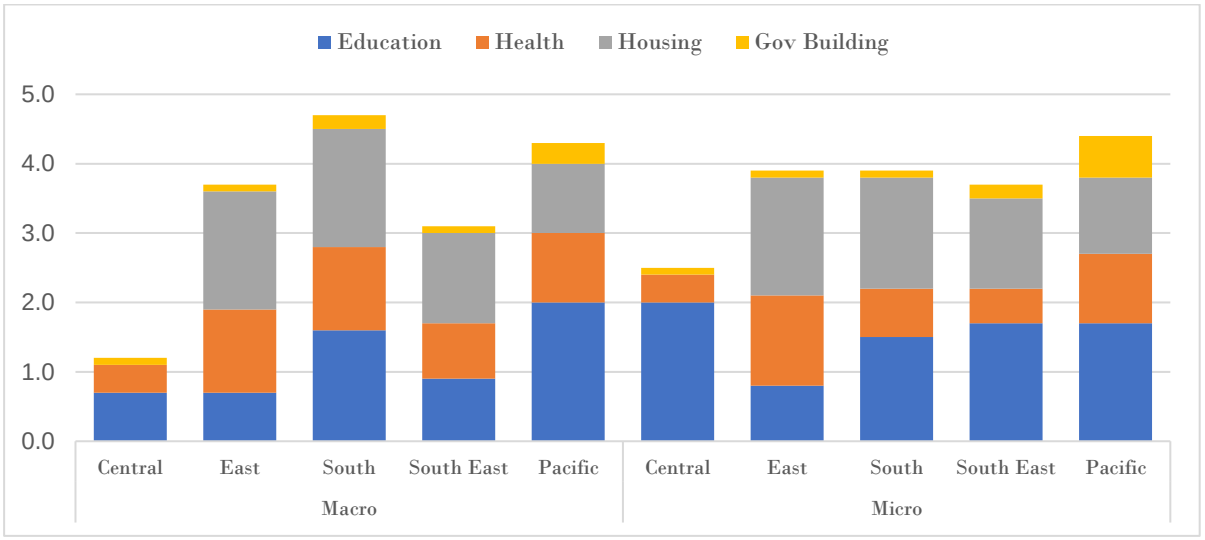
Table 4.5. Social investment needs, by sector

	Infrastructure need ($ billion)					
	Micro approach			Macro approach		
	Total investment needs	Annual average	% of GDP	Total investment needs	Annual average	% of GDP
Education	6,470	431	1.1	5,461	364	0.9
Primary	895	60	0.2	921	61	0.2
Secondary	1,762	117	0.3	2,113	141	0.4
Tertiary	3,812	254	0.6	2,427	162	0.4
Health	6,523	435	1.1	6,728	449	1.1
Housing	13,348	890	2.3	13,404	894	2.3
Gov Building	897	60	0.2	715	48	0.1
Total	27,237.1	1,815.8	4.6	26,307.7	1,753.8	4.5

Source: LPEM-FEBUI's calculation

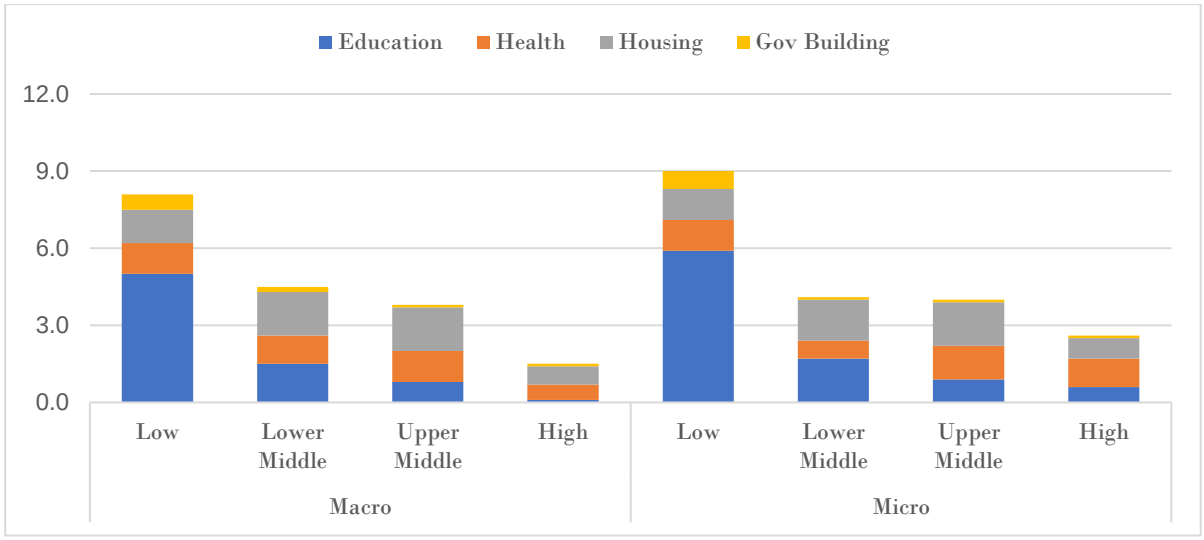
Table 4.5 provides estimates of the investment by sectors. The sectors of public housing for urban slum population and health dominate the investment needs, accounting for 2.3% and 1.1% of GDP respectively, depending on the approach. In terms of total investment needs, public housing for urban slum population and health are 49-51% and 24-26%, respectively. There is immediate pressure on Asia to invest in public housing for urban slum population, with vast urbanisation and slum areas become more evident in urban areas of Asian megacities. Investment in health follows, accounting for 1.1% of GDP. A similar figure is needed for the education sector (around 0.9-1.1% GDP), which is dominated by tertiary education sector. Meanwhile, government building needs the lowest investment at only 0.1-0.2% of GDP.

Figure 4.1 provides further disaggregation of investment needs by geography. It is suggestive that some regions have higher specific investment needs than others. Investment needs for education infrastructure are more prevalent in the Pacific region than other areas according to the micro approach. The demand for public housing for urban slum population is more evident in South Asia due to its relatively high proportion of slum areas compared with other regions. The investment is also likely to be a function of a nation's stage of development. Low-income countries are estimated to invest more in education and public housing for urban slum population relative to their total investment. In contrast, investment needs in health and public housing for urban slum population are more prevalent in high-income countries.



Source: LPEM-FEBUI's calculation

Figure 4.1. Social investment needs, by geography (% to GDP)



Source: LPEM-FEBUI's calculation

Figure 4.2. Social investment needs, by stage of development (% to GDP)

4.3. Sectoral estimates

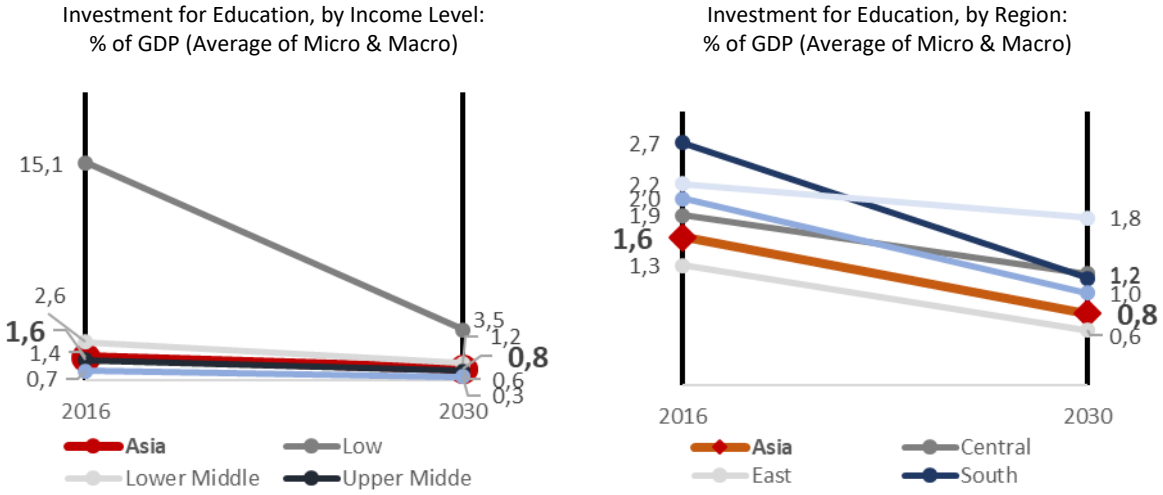
4.3.1. Education

Investment in education infrastructure follows the same pattern for all levels of education using both macro and micro approaches. All three levels of education follow a decreasing pattern in terms of total investment needed as a percentage of GDP throughout the period 2016–2030. However, the total investment needed for university-level education is the highest, requiring around 0.4%–0.7% of Asia's GDP for the period 2016-2030, followed by

secondary education (0.3%–0.4%) and primary education (0.2%). This is due to the significant difference of the unit cost for universities, even though the projection for university students is lower than for the other two lower education levels.

In terms of geographical location, East Asia is the region with the highest total investment needed, with China being the main driver owing to its gigantic population. The total investment needed for China itself is in the region of USD 2.8–3 trillion, which higher than the total amount of investment needed by the other of 44 countries combined. There are differences between the results produced by macro and micro approaches within the region. In terms of investment as a percentage of GDP, the macro approach indicates that the Pacific is the region with the highest investment needed (2.0%), whereas use of the micro approach suggests that Central Asia is the highest (2.0%). The trends of education investment to GDP tend to decrease in all regions where the needed investment for south Asian countries decrease with the highest rate compare to the other region. This is may be due to the fact that south Asian countries is dominated by populous country with low level of development such as India, Pakistan and Bangladesh.

Lastly, based on the country's phase of development, there is an obvious pattern that suggests that the richer the country is, the less investment in education infrastructure is needed. While the low-income countries need investment of around 5.0–5.9% of their GDP, the high-income countries only need around 0.1–0.6%. This is related with the fact that the size of the aging population in high-income countries is larger than it is in low-income countries. Therefore, the projected number of students is lower in high-income countries. In addition, in terms of the availability of infrastructure such as schools, high-income countries will shift their demand toward the quality of the capital and technology. The trends of education investment to GDP tend to decrease in all type of countries, however it is worth noted that the decreasing rate of low-income countries is the highest among other type of countries. This result suggests that the provision of education in low income countries are catching up to the richer countries.



Source: LPEM-FEBUI's calculation

Figure 4.3. Comparison of investment needs for education infrastructure as a percentage of GDP in 2016 and 2030

Table 4.6. Distribution of investment needs for education infrastructure in 45 countries across Asia and the Pacific

Region	Micro						Macro					
	Total Investment Need	Annual Average	% of GDP	New Construction (in billion USD)	O & M (in billion USD)	Rehabilitation/Replacement (in billion USD)	Total Investment Need	Annual Average	% of GDP	New Construction (in billion USD)	O & M (in billion USD)	Rehabilitation/Replacement (in billion USD)
Asia	6,469.9	431.3	1.1	957.4	470.2	5,042.4	5,460.9	364.1	0.9	627.1	410.9	4,422.9
Asia Without China	3,428.8	228.6	1.4	556.8	245.0	2,627.1	2,625.9	175.1	1.1	426.5	187.0	2,012.5
Low Income	100.4	6.7	5.9	10.4	7.7	82.3	85.4	5.7	5.0	13.0	6.2	66.2
Lower Middle Income	2,676.4	178.4	1.7	489.6	186.5	2,000.2	2,313.2	154.2	1.5	387.8	163.7	1,761.8
Upper Middle Income*	3,392.6	226.2	0.9	431.9	252.5	2,708.2	2,985.7	199.0	0.8	223.4	234.8	2,527.5
High Income	300.4	20.0	0.6	25.4	23.5	251.6	76.6	5.1	0.1	3.0	6.3	67.3
Central	309.3	20.6	2.0	43.4	22.7	243.2	109.9	7.3	0.7	31.2	6.7	72.0
East*	3,342.8	222.9	0.8	429.7	248.5	2,664.6	2,911.0	194.1	0.7	204.6	230.1	2,476.4
China	3,041.0	202.7	0.9	400.5	225.2	2,415.3	2,835.0	189.0	0.8	200.7	223.9	2,410.4
South	1,596.4	106.4	1.5	272.8	112.9	1,210.7	1,775.2	118.3	1.6	287.1	126.5	1,361.7
India	1,102.3	73.5	1.3	158.5	80.5	863.3	1,246.3	83.1	1.4	151.1	93.1	1,002.1
South East	1,208.6	80.6	1.7	209.4	85.2	914.0	650.2	43.3	0.9	101.1	46.7	502.3
Indonesia	636.2	42.4	2.4	149.8	41.5	444.9	316.1	21.1	1.2	49.1	22.7	244.3
Pacific	12.7	0.8	1.7	2.0	0.9	9.8	14.6	1.0	2.0	3.1	1.0	10.5

Note: All values are in billion USD

*including China

Source: LPEM-FEBUI's calculation

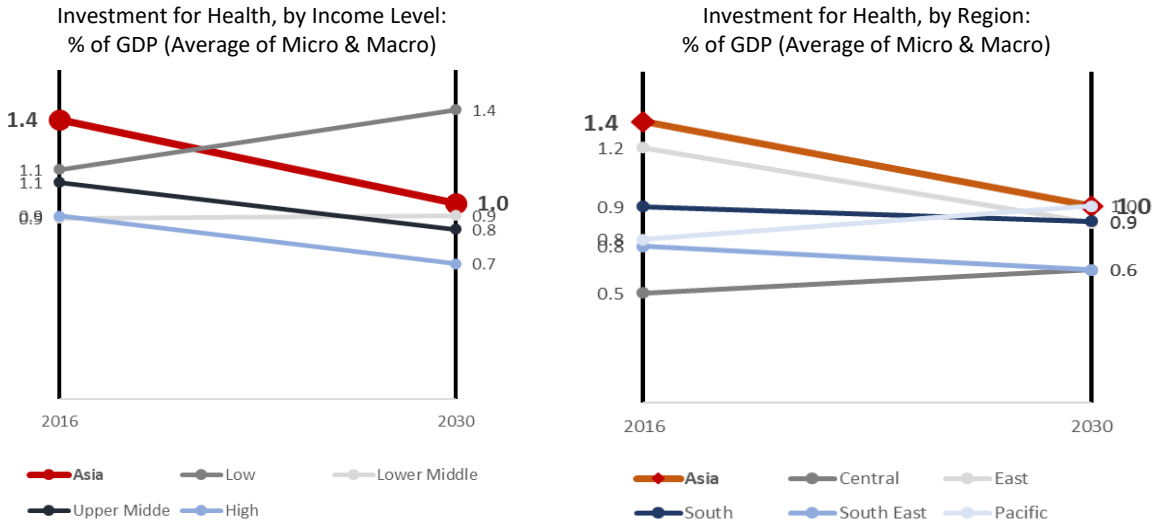
4.3.2. Health

Investment for health infrastructure from 2016 to 2030 would need a total investment in the region of 1.1% of Asia's GDP. Within the same period, health investment continuously increases, while the health investment to GDP continuously decreases. This shows that health investment grows more slowly compared to GDP. Comparing countries based on development, health investment to GDP is higher in developing countries compared to developed countries. This may be explained by the increasing need for new health investment due to the developing countries needing to increase their hospital beds per 1,000 population (while developing countries tend to have a stagnant number of health beds per 1,000 population) which is amplified by the higher population growth in developing countries. The trends of health investment to GDP tend to decrease in both type of countries[13].

Among the Asian regions, East Asia contributes the highest level of health investment. China contributing 67-72% of these investment needs, while the Pacific region contributes the lowest. However, in terms of health investment per GDP, the Pacific contribution is, on average, the second highest. This condition is added to by the increasing trend between 2016 and 2030, meaning that health investment grows faster than GDP. This is due to the Pacific region having the highest population growth (1.71%) compared to other regions, meaning that new health investment is needed there. The trend of health investment to GDP in this period in Central Asia and East Asia will tend to decrease, whereas in South Asia, South East Asia (albeit quite flat), and the Pacific region, it will increase.

In general, one of the biggest challenges in health investment stems from rising standards regarding bed coverage. This may be especially costly for countries with low GDP figures, particularly in the Pacific region. With the combination of rising standards and high population growth, the Pacific region may need to brace itself for an increase in the demand for health facilities.

By income level and region, there is a clear pattern that suggests that the developed the country is, the less investment in health infrastructure is required. The low-income countries need an investment of around 1.4% of their GDP; on the other hand, the high-income ones need roughly 0.7%. These figures imply that the development in high-income countries has taken into account the basic health needs into their infrastructure spending, while their counterparts are still coping to meet the minimum standard. While in terms of region, Pacific and Central Asia have an increasing pattern of required investment, while other regions show the pattern oppositely.



Source: LPEM-FEBUI's calculation

Figure 4.4. Comparison of Investment Needs for Health Infrastructure as Percent of GDP in 2016 and 2030

[13] Our macro estimation tends to underestimate in the early periods of observation. Nevertheless, both estimations converge at the final periods. Underestimating the investment needs means more expenditure to build the infrastructure rather than expenditure for operation and maintenance. Therefore, the total O&M part in macro estimation is far less than that in the micro estimation, and on the contrary, the total figure for building the infrastructure in macro estimation is far bigger than that in micro estimation.

Table 4.7. Distribution of investment needs for health infrastructure in 45 countries across Asia and the Pacific region (USD billion)

Region	Micro						Macro					
	Total Investment Need	Annual Average	% of GDP	New Construction (in billion USD)	O & M (in billion USD)	Rehabilitation/Replacement (in billion USD)	Total Investment Need	Annual Average	% of GDP	New Construction (in billion USD)	O & M (in billion USD)	Rehabilitation/Replacement (in billion USD)
Asia	6,522.8	434.9	1.1	244.2	414.1	5,864.5	6,727.7	448.5	1.1	2,910.4	102.0	3,715.3
Asia Without China	1,848.7	123.2	0.8	156.8	111.6	1,580.3	2,224.3	148.3	0.9	952.0	34.0	1,238.4
Low Income	21.0	1.4	1.2	3.7	1.2	16.1	21.2	1.4	1.2	8.8	0.3	12.0
Lower Middle Income	1,096.9	73.1	0.7	127.3	63.9	905.6	1,728.4	115.2	1.1	735.0	26.5	966.8
Upper Middle Income*	4,793.5	319.6	1.3	93.6	309.9	4,390.0	4,660.2	310.7	1.2	2,024.2	70.4	2,565.6
High Income	611.5	40.8	1.1	19.6	39.0	552.8	317.9	21.2	0.6	142.3	4.7	170.9
Central	64.4	4.3	0.4	7.5	3.8	53.1	61.4	4.1	0.4	24.6	1.0	35.9
East*	5,285.1	352.3	1.3	107.2	341.4	4,836.5	4,816.5	321.1	1.2	2,098.5	72.6	2,645.3
China	4,674.1	311.6	1.3	87.5	302.5	4,284.2	4,503.3	300.2	1.3	1,958.4	68.0	2,476.9
South	779.2	51.9	0.7	88.3	45.5	645.3	1,256.4	83.8	1.2	531.5	19.4	705.5
India	474.7	31.6	0.6	50.8	28.0	396.0	810.5	54.0	0.9	344.0	12.5	454.0
South East	386.6	25.8	0.5	39.9	22.9	323.8	586.2	39.1	0.8	252.8	8.9	324.5
Indonesia	153.3	10.2	0.6	15.2	9.1	129.0	246.0	16.4	0.9	105.7	3.7	136.6
Pacific	7.5	0.5	1.0	1.3	0.4	5.8	7.3	0.5	1.0	3.0	0.1	4.1

Note:

All values are in billion USD

*including China

Source: LPEM-FEBUI's calculation

Box 1. Calculating Primary Health Care Needs (Clinics)

The report also estimates the need for primary health care (clinics) to give a holistic picture of health needs in terms of preventive (clinic) and curative (hospital) facilities. However, due to the lack of data availability on clinics, only the micro approach is used to calculate the investment needs of clinics. Even with the micro-estimation these estimates may tend to be less precise, relative to other estimates, due to the aforementioned constraints in data, especially building cost and clinic density data.

To calculate the investment needs for clinics, we use the clinic density (clinics per 100,000 population). However, due to the limitations of the data, some countries' density figures had to be proxied by using the density of referenced countries or averaging peer countries in their reference group/region.[1] With the assumption of 1 clinic needing 109m^2, we multiply the construction cost, clinic density, and population. This is used to calculate the stock value of clinics. Using this stock value of clinics, we are able to calculate land, interior, and medical device values based on certain proportions (equivalent to hospital investment). After the total value is calculated, we divide this value by the population figure thus showing how much it costs per person. For the calculation of new investment, the population increase is weighted with the growth of the elderly population as this population segment will have higher usage, and then multiplied by the cost per person. By adding other costs, we are able to calculate the total clinic investment. Other costs are taken into account under health, with the addition of medical device replacement costs.

The estimated needs amount to USD 77 Billion, or USD 5 billion annually, equivalent to 0.01% of projected GDP, under the micro approach. East Asia contributes the highest clinic investment needs, followed by South East Asia.

Region	Micro		
	Total Investment Need (USD billion)	Annual Average (USD billion)	% of Projected GDP
Asia	77	5	0.01
Asia Without China	40	3	0.02
Low Income	0.9	0.1	0.05
Lower Middle Income	25	2	0.02
Upper Middle Income	44	3	0.01
High Income	7	0.5	0.01
Central	9	0.6	0.06
East	43	3	0.01
South	8	0.6	0.01
South East	14.9	1	0.02
Pacific	0.9	0.1	0.13

4.3.3. Public Housing for Urban Slum Population

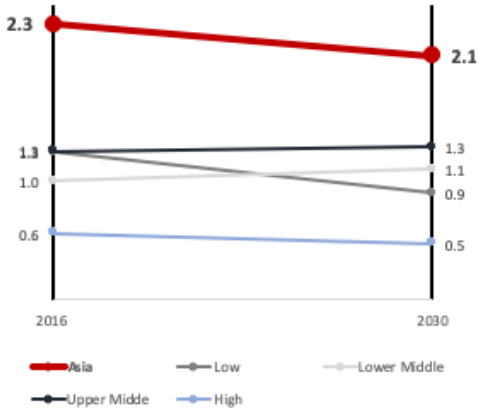
During the period 2016–2030, a total investment of USD 13.3-13.4 billion is required to support the development of infrastructure of public housing for urban slum population in Asia. These amounts are approximately equal to 2.3% of Asia's GDP. Although the amount of investment increases during this period, a ratio of investment of public housing for urban slum population to GDP will continuously decrease over the years. Therefore, it shows that the investment grows slower compared to GDP.

Comparing countries based on income level, both macro- and micro-estimations show that the highest investment allowances for the public housing for urban slum population infrastructure should be allocated to upper middle-income countries, while the lowest proportion of investment should go to low-income countries.

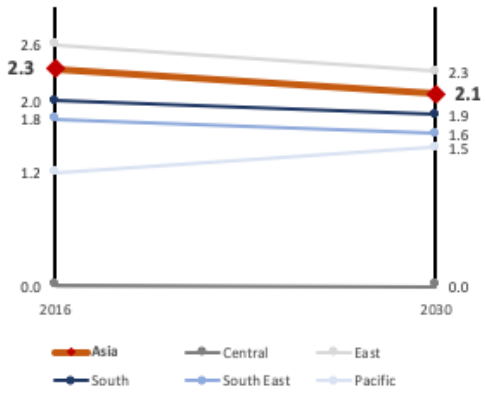
Among the Asian regions, East Asia contributes the most to the investment needs of public housing for urban slum population (due to China accounting for almost 94-96% of the total needs in East Asia), while Pacific contributes the least. In terms of the public housing for urban slum population -to-GDP ratio, the macroeconomic and microeconomic estimations lead to similar results. Both estimations show that the East Asia has the highest ratio. The trend regarding the share of public housing for urban slum population investment to GDP in almost all Asian regions during the period 2016–2030 is toward a decrease, except in Pacific, where it is likely to increase.

In general, one of the biggest challenges in investing in the public housing for urban slum population stems from the increasing price of land. This may be especially costly for countries which have faster growing urban populations. With the combination of increasing land prices and high population growth, the governments from East and South Asian countries may face difficulties in satisfying the demand of public housing for urban slum population.

Investment for Housing, by Income Level:
% of GDP (Average of Micro & Macro)



Investment for Housing, by Region:
% of GDP (Average of Micro & Macro)



Source: LPEM-FEBUI's calculation

Figure 4.5. Comparison of investment needs for public housing for urban slum population as a percentage of GDP in 2016 and 2030

Table 4.8. Distribution of investment needs for public housing for urban slum population in 45 countries across Asia and the Pacific region

Region	Micro						Macro					
	Total Investment Need	Annual Average	% of GDP	New Construction (in billion USD)	O & M **(in billion USD)**	Rehabilitation/Replacement (in billion USD)	Total Investment Need	Annual Average	% of GDP	New Construction (in billion USD)	O & M **(in billion USD)**	Rehabilitation/Replacement (in billion USD)
Asia	13,347.7	889.8	2.3	9,061.3	453.7	3,832.7	13,403.9	893.6	2.3	9,294.0	382.7	3,727.2
Asia Without China	3,721.0	248.1	1.5	2,500.5	129.2	1,091.4	4,192.6	279.5	1.7	2,639.2	113.3	1,440.1
Low Income	35.2	2.3	2.1	23.9	1.2	10.1	34.4	2.3	2.1	24.1	1.1	9.2
Lower Middle Income	3,135.1	209.0	2.0	2,092.8	110.3	932.0	3,436.5	229.1	2.2	2,165.0	93.3	1,178.2
Upper Middle Income*	9,769.8	651.3	2.6	6,658.5	329.3	2,782.0	9,364.7	624.3	2.5	6,758.9	273.8	2,331.9
High Income	407.5	27.2	0.8	286.1	12.9	108.6	568.3	37.9	1.0	345.9	14.4	208.0
Central	4.6	0.3	0.0	3.1	0.2	1.3	5.8	0.4	0.0	3.9	0.1	1.8
East*	10,034.1	668.9	2.5	6,846.8	337.4	2,849.9	9,779.5	652.0	2.5	7,000.7	283.8	2,495.0
China	9,626.6	641.8	2.8	6,560.8	324.5	2,741.4	9,211.3	614.1	2.7	6,654.8	269.4	2,287.1
South	2,065.1	137.7	1.9	1,372.3	73.3	619.5	2,308.5	153.9	2.1	1,419.1	61.6	827.9
India	1,571.8	104.8	1.8	1,042.1	56.1	473.6	1,784.5	119.0	2.1	1,065.8	47.1	671.6
South East	1,233.9	82.3	1.7	832.3	42.5	359.1	1,298.8	86.6	1.8	863.3	36.8	398.7
Indonesia	435.3	29.0	1.6	292.6	15.1	127.6	447.8	29.9	1.7	299.6	12.7	135.5
Pacific	10.0	0.7	1.4	6.7	0.3	2.9	11.2	0.7	1.5	7.1	0.3	3.8

Note:

All values are in billion USD

*including China

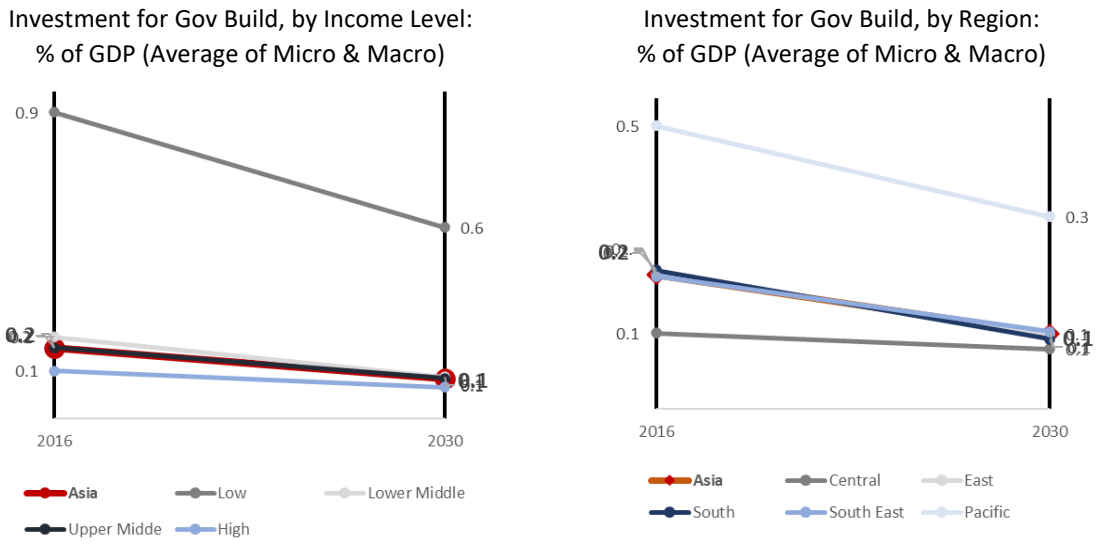
Source: LPEM-FEBUI's calculation

4.3.4. Government Building

All 45 countries across Asia and the Pacific region will require a total investment within a range between USD 0.7 to 0.9 trillion for their government building infrastructure between 2016 and 2030. In other words, they will need approximately USD 48 to 60 billion annually to construct new government buildings and maintain the existing ones. Both macro and micro approach in this study reveal that the total required investment for government building as a percentage of GDP shows a declining trend towards 2030 (see figure 4.6). In 2016, the total required investment for government building in all 45 countries was estimated to be equal to 0.2% of their overall GDP. The respective figure is expected to be closer to 0.1% in 2030.

Countries in the upper middle-income group will need a higher rate of annual investment for government building infrastructure compared to the others, in the region of USD 26.7-42,2 billion each year. From a spatial point of view, countries located in East Asia are the ones who need the highest annual investment in government building. East Asian countries would need around USD 28.8-45.1 billion on average to invest in their government building infrastructure.

More attention should be directed toward government building investments from low income and Pacific region countries. Despite their relatively low investment size in nominal terms, providing new government building infrastructure, along with the related operational burden, may prove very costly for those countries. Estimated investment needs for government buildings for countries in the low-income group ranges from 0.6% to 0.7% of their overall GDP, while the investment range for countries in the Pacific region is between 0.2% and 0.3%.



Source: LPEM-FEBUI's calculation

Figure 4.6. Comparison of investment needs for government building as a percentage of GDP in 2016 and 2030

Table 4.9. Distribution of investment needs for government building in 45 countries across Asia and the Pacific region

Region	Micro						Macro					
	Total Investment Need	Annual Average	% of GDP	New Construction (in billion USD)	O & M (in billion USD)	Rehabilitation/ Replacement (in billion USD)	Total Investment Need	Annual Average	% of GDP	New Construction (in billion USD)	O & M (in billion USD)	Rehabilitation/ Replacement (in billion USD)
Asia	896.8	59.8	0.2	185.0	60.7	651.1	715.2	47.7	0.1	234.3	41.0	439.9
Asia Without China	284.4	19.0	0.1	36.7	21.1	226.5	330.7	22.0	0.1	113.7	18.5	198.5
Low Income	11.3	0.8	0.7	1.9	0.8	8.6	10.4	0.7	0.6	3.9	0.6	5.9
Lower Middle Income	187.2	12.5	0.1	30.9	13.3	142.9	257.2	17.1	0.2	89.0	14.4	153.9
Upper Middle Income*	633.3	42.2	0.2	149.7	41.2	442.4	399.9	26.7	0.1	125.7	23.4	250.8
High Income	65.0	4.3	0.1	2.4	5.3	57.2	47.7	3.2	0.1	15.7	2.7	29.3
Central	15.1	1.0	0.1	1.9	1.1	12.1	12.0	0.8	0.1	3.9	0.7	7.4
East*	677.0	45.1	0.2	150.7	44.9	481.5	432.1	28.8	0.1	136.2	25.2	270.6
China	612.4	40.8	0.2	148.2	39.6	424.6	384.6	25.6	0.1	120.6	22.5	241.4
South	74.0	4.9	0.1	18.0	4.8	51.2	185.3	12.4	0.2	64.3	10.3	110.6
India	32.1	2.1	0.0	5.8	2.2	24.0	122.0	8.1	0.1	41.1	6.9	74.0
South East	126.9	8.5	0.2	13.6	9.7	103.6	83.5	5.6	0.1	28.9	4.7	49.9
Indonesia	38.3	2.6	0.1	3.4	3.0	31.9	27.4	1.8	0.1	9.5	1.5	16.4
Pacific	3.6	0.2	0.5	0.7	0.2	2.7	2.4	0.2	0.3	0.9	0.2	1.9

Note:
All values are in billion USD
*including China
Source: LPEM-FEBUI's calculation

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CHAPTER 5
SOURCES OF FINANCING FOR SOCIAL INFRASTRUCTURE

This chapter will provide some financing options that Asian countries can utilise to fulfil their social infrastructure needs. Some of the options have been implemented in Asian countries, especially in East Asia. Each option has its advantages and disadvantages depending on the country's capabilities, especially regarding how they maintain the financing scheme. No one policy is appropriate for everyone; thus, this chapter also provides the experiences of other countries in implementing the scheme. The following options can be divided into two large schemes: The first is by involving the private sector and the second is through government support.

5.1 Involving the Private Sector

As the government budget is limited for providing adequate social infrastructure, involving the private sector in financing social infrastructure could be a feasible option. This possibility could be executed through using the PPP scheme. Through this scheme, there will be risk sharing between the government and the private sector. This will promote high-quality standards and innovation and help avoid unintended consequences (ADB, 2014). The PPP allows the private sector to utilise its competence and innovative resources and, simultaneously, gain fair benefits from it. Users receive higher benefits and better-quality services resulting from the private sectors' professionalism and efficiency (Zen, 2018).

The PPP is utilised for a range of reasons, such as pursuing better quality and more relevant and efficient (ADB, 2014). A study conducted by Aman and Chakraborty (2019) showed that the PPP is optimal in the provision of infrastructure. This study obtained an interior optimal solution for tax rates in a command economy, regardless of whether public capital and private capital are substitutes for or complementary to each other. In Asian countries, the PPP has been playing an important role in infrastructure provision in those countries that do not have an abundant infrastructure budget, such as Indonesia, Malaysia, the Philippines, Thailand, and Vietnam (Zen, 2018). The PPP scheme could be applied in many sectors, not only in transportation infrastructure, which is common in many countries, but also in social infrastructure such as education, healthcare, and housing.

Education is very well-suited to the PPP model, as it can simplify complicated resettlement and land acquisition issues (ADB, 2014). In India, for example, the PPP scheme in the education sector works through private non-seeking organisations (charity and religious organisations) that set up schools with their own funds and run the school for a minimum number of years before it becomes eligible for government aid for recurring expenditures. According to McKinsey (2014), several reasons make the PPP relevant for the education system in many Asian countries, namely:

1. Significant government infrastructure, resources, and ongoing budgets
2. Strong opportunities for private sector collaboration for quality outcomes
3. Unviable business models

There are some examples of the PPP in education infrastructure, such as:

1. A build–transfer lease system for education in the Republic of Korea. This project was initiated in 2005, and the private sector has financed the design, building, and maintenance of these schools for 20 years. The government has made availability payments to the private sector for 20 years, and the facilities were ultimately transferred to the public sector[14].
2. International-level training in hospitality and tourism in Lao People's Democratic Republic. Here, the government proposed providing land to a private operator to be constructed.

In the health sector, private partners could provide and maintain hospital buildings or other health facilities (ADB, 2014). China and Hong Kong use this scheme to build new hospitals.

In the social housing sector, the PPP model can be used to enhance the performance incentive of the build–transfer model and introduce a lifecycle approach to social housing. The PPP model is particularly well-suited to public rental housing, which can bring affordable housing within reach of those that cannot afford to buy a property (ADB, 2014).

However, applying the PPP scheme to social infrastructure is quite challenging. The challenges in applying the PPP on a large scale include that it is a complex system; it requires specific and sufficient knowledge of financing structure,

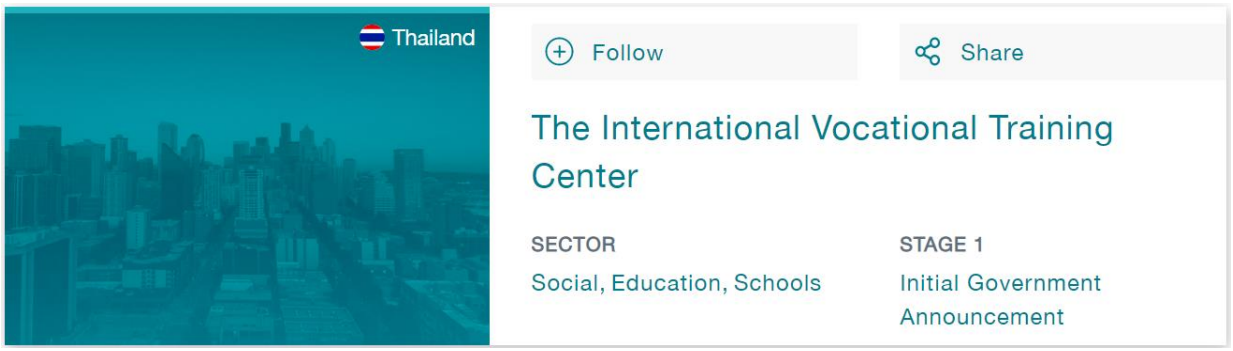
[14] ADB, 2014

risk allocation, contract management, and dispute resolution; and the transaction process usually takes a long time to conclude (Zen, 2018). In many developing countries, such as Indonesia, the provision of social infrastructure is given to the local level. Each level has different roles, and this creates a complex administration procedure, especially when involving the private sector. As an example, in Indonesia, the provision of infrastructure in secondary education is given over to provincial-level authority, and basic education is on the municipal level. Meanwhile, the central government has the authority to provide tertiary education. Every governmental level should allocate 20% of its annual budget to the education sector.

Furthermore, each governmental level sometimes has a different capacity for understanding the PPP principles and procedures. The government should have a sufficient level of understanding, especially in legal action, contract management, risk sharing, fiscal support, and negotiation (Zen, 2018). Institutionalising the PPP is one of the solutions, and many countries in Asia have established a PPP agency or unit to manage the PPP project. Zen (2018) also mentioned that a conducive business environment is another challenge in applying the PPP model. This is how the government could maintain macroeconomic conditions and the investment climate.

Box 2. The use of technology 4.0 to attract private sector financing

Attracting private sector to finance the social infrastructure is very challenging. To accommodate this issue, there is a web-based platform named Global Infrastructure Hub (*Gihub*). This platform aims to connect the global infrastructure community and sharing insights to facilitate delivery of G20 members' economic, social and environmental outcomes through more and better infrastructure. One of the features is the infrastructure project pipeline, which enable governments to promote public infrastructure projects to a global investor network. This platform accommodates all types of infrastructure, including social infrastructure. Many countries have used this platform to promote their infrastructure investment opportunity, including Asian countries such as Thailand, Indonesia, China and India. This platform could be a good medium to attract PPP.



Furthermore, to achieve the SDGs goals, The Government of Indonesia through the Ministry of Finance and *PT. Sarana Multi Infrastruktur (PT. SMI)* established an integrated platform called "SDG Indonesia One" in 2018. This platform aims to combine public and private funds through blended finance schemes to be channelled into infrastructure projects related to the achievement of SGDs. This platform enable The Indonesian Government to raise funding from investors, donors, and philanthropist to be channelled to projects in Indonesia that support the achievement of SDGs. This platform also ensures the development of the infrastructure sector from the beginning until the availability of funding and its implementation in the field.

5.2. Government Policy Support

5.2.1. Land value capture

According to Chi-Man Hui, Sze-Mun Ho, and Kim-Hin Ho (2004), land value capture refers to the government collecting all types of taxes derived from land and its attached property. This method is common in financing transportation infrastructure. This method enables the government to provide infrastructure by capturing the increased value of land generated by improving accessibility. The government will capture the "surplus land value as revenue to finance public infrastructure and social services" (Hong and Lam, 1998).

Land-based financing is rapidly becoming an important element of urban infrastructure finance in developing countries, especially in locations where cities are growing rapidly (Peterson, 2008). Furthermore, this method could

also be implemented in those countries where land is very scarce, such as Hong Kong, Taiwan, and Singapore. This scheme enables people to be more careful with and use the land more efficiently. This scheme could be implemented through land taxes. According to Chi-Man Hui, Sze-Mun Ho, and Kim-Hin Ho (2004), five factors determine changes in land value:

1. Re-zoning
2. Changes in locational advantages as towns and cities expand
3. Improvements in public infrastructure and social services
4. The growth of urban population through migration and urbanisation
5. Increases (or decreases) in private investment in land

Many Asian countries have implemented this scheme. According to Lin (2001), tax finance can be used to avoid transferring the burden of infrastructure finance to future generations. Indonesia imposed a land and building tax to each land and building. This tax is managed by the sub-national government, except for the mining, forestry, and plantation sector. The tax is based on the market value of a tax object, which is determined by the market price of each area. This market price changes every year. In Hong Kong, the government charges two types of annual taxes on real property, namely rates and government rent. The rates are levied on land properties at a fixed percentage of their rateable value (Chi-Man Hui, Sze-Mun Ho, and Kim-Hin Ho, 2004). Meanwhile, according to Chi-Man Hui, Sze-Mun Ho, and Kim-Hin Ho (2004), the Singapore government also charges an annual tax on property, levied on all immovable properties in Singapore, including flats, offices, factories, shops, and land. This tax is computed based on a percentage of the annual value of the property.

The revenue from this tax could be used as a funding source to develop or maintain infrastructure. In Singapore, collected taxes are selectively spent in areas that yield longer-term welfare benefits, such as education, healthcare, infrastructure, and housing programs to protect the environment (Chi-Man Hui, Sze-Mun Ho, and Kim-Hin Ho, 2004).

Similar to other financing options, according to Peterson (2008), land value capture also has some limitations, such as:

1. Urban land markets are volatile, and recent transactions may reflect a land asset bubble
2. Urban land prices in developing countries cannot steadily increase; the prices have been volatile in the past and are predicted to be unchanging in the future. The land prices in developing-country cities now reflect worldwide economic conditions
3. Land values often lack transparency and accountability
4. There is little public accountability as to how revenue is used
5. Special measures may need to be taken to make land-based financing support investments in basic municipal services

Furthermore, this scheme will work properly in those countries that have a well-established property taxation system and will enable them to manage the revenue well. Good tax administration and law is needed in this scheme. As most Asian countries tend to be ageing countries and there is an increasing demand for social infrastructure, this scheme could be a viable option. People could manage the use of land and buildings. Furthermore, if the country could manage their tax revenue properly, they could allocate it to providing better social infrastructure, such as schools, hospitals, or even public housing and government buildings.

The land value mechanism is also important when applying this scheme. As land prices are volatile, each country should undertake proper valuations. Salaj et al. (2018) stated that the central principle in assessing the value of a property in the process of expropriation should be based on the existing financial and market conditions; therefore, values should be compared to real estate transactions. However, the issue of fairness remains, and that of “full compensation”, which is defined by the legal framework of each country.

5.2.2. User fees

According to Lin (2001), fees and user charges can be used to finance infrastructure that could be attributed to particular people or households. Here, the government collects fees and user charges from the people who use these facilities and then uses the revenue to construct and maintain the infrastructure, such as for airports and water provision. This scheme is quite popular in China for financing infrastructure. Zhao and Cao (2011) showed that the average annual growth rate of fees and user charges is 21.7%, which is higher than fiscal revenue and market financing.

Referring to ADB (2017), in most high-income countries, the fees can cover not only the operation and maintenance costs of infrastructure but also part of the capital required. In contrast, in many low-income countries, the fees sometimes do not sufficiently cover the costs of O & M.

Despite its success in providing infrastructure in China, this scheme has faced serious problems. The fees are excessive, arbitrary, and irregular (Lin, 2001). According to Zhao and Cao (2011), some municipal authorities have overcharged for infrastructure services, where 28 different fees have been imposed on various aspects of real estate development in Shanghai. Furthermore, according to Lin (2001), there are several problems in imposing fees and user charges, such as:

1. Fees are not closely related to the costs of public provision
2. For consumption types of infrastructure, the government sets a low price to subsidise lower-income households
3. User fees are often misused for the salaries and bonuses of government employees instead of for providing new infrastructure, for example

Imposing user charges for those who cannot afford to pay is one of the biggest concerns. Furthermore, user fees may also be politically difficult to implement, particularly for services with large spill over benefits. Sometimes, the administrative and social costs of collecting the fees also exceed the revenue that they generate.

5.2.3. Mixed-use development

Mixed-use development is very popular in European and North American countries but, currently, it is growing rapidly in Asian countries. According to Knight Frank (2004), in Dziomba (2013), mixed-use developments are schemes with a mix of three or more uses, for which planning permission has been granted under a single consent. According to Lorino (2013), it is seen as a powerful tool to create sustainable, liveable, and attractive neighbourhoods and city centres. Mixed-use development is beneficial for those countries facing suburbanisation or who have an ageing population, poor quality of life, and environmental degradation. According to Dziomba (2013), generally, there are four different areas of mixed-use implementation. They are:

1. Regeneration/redevelopment
   This is the most popular scheme. This scheme enables us to develop new infrastructure in unused areas such as former industrial sites, docks, rail land, or military bases
2. Greenfield development
   An example of this scheme is suburban residential areas or business parks
3. The improvement of mono-structured areas
4. The preservation of an existing mixed-use development

This refers to urban renewal and development, especially in attractive and historic areas.

Due to there being limited space and how people currently tend to save their time by visiting 'one-stop' places, enabling them to do many activities in one place, the mixed-use development concept could be a viable option. This forces developers to rethink their assumptions about the industry and the necessity of incorporating non-traditional elements, such as housing, entertainment, and healthcare, into retail spaces[15]. Moreover, combining multiple uses within a single development allows developers to share common resources within the overall development, lowering development costs and maximising the use of the land[16].

An example of mixed-use development is the Oxo Tower in Germany. It was originally a power station building which was transformed and refurbished into a mixed-use building, comprising co-operative homes, retail design shops, studios, specialist shops, galleries, restaurants, cafes, and bars. Meanwhile, in Asia, an example is Dusit Central Park, which is planned to have flagship hotels, a high-end shopping complex, luxury residences, and office buildings[17]. Another example is the many Indonesian developers who have built low-cost apartments containing malls and offices in one area.

[15] https://www.nationthailand.com/Corporate/30341616

[16] https://www.nationthailand.com/Corporate/30341616

[17] https://www.ttgasia.com/2019/04/02/live-work-play-demand-drives-mixed-use-development-boom-in-bangkok/

CHAPTER 6
THE TWO GIANTS OF ASIA: INDIA AND CHINA

Many studies have forecasted that by 2030 China will overtake the US as the world's largest economy. India is likewise predicted to overtake Japan, Germany, the UK and France and place third. The economies of the two together will become bigger than those of countries in the developed world.

In addition to rapid economic growth, India and China have many elements in common geographically, historically and demographically. Not only are the two countries located in the same continent, but they are also separated by a shared border. Both countries have rich and long histories and were considered two of the world's leading economies until the late modern period. In terms of population, both are giants. Each has a population exceeding one billion. Over the next decade, India's population is projected to rise to 1.51 billion. Despite the risk of a population decline after 2030, China's population is projected to rise to 1.4 billion. Therefore, by 2030, the total population of both countries will be slightly over two-thirds of the world's population[18].

The rapid economic growth and massive population growth require support from not only physical infrastructures but also social ones. Per the focus of this study, this chapter will focus more on the social infrastructure aspects of both countries: education, health, affordable/public housing and government offices. This chapter will descriptively explore the functional arrangement, system of each aspect, recent developments, and opportunities and challenges.

6.1. China

6.1.1. Education System in China

China's educational structure consists of six years of primary school, six years of secondary school (comprising three years each for junior secondary and senior secondary) and four years of the standard university curriculum. China's compulsory education includes free education for all students over six years old for the six years of primary school and three years of lower secondary school. The policy is funded by the government; as such, tuition is free. However, schools are still able to charge miscellaneous fees. Senior secondary school and college education are not compulsory in China.

Children begin primary education at the age of seven, though it is possible to start primary school one year early in major cities, such as Shanghai and Beijing. 60 percent of the allocated teaching time is dedicated to Chinese and maths (the "Big Two"). Additionally, children are instructed in music, art, morals and society, and nature, and take practical work classes. Some schools also add extracurricular activities and teach foreign languages towards the end of primary school.

Between the ages of 12 and 17, children attend secondary school. Public secondary schools are divided into three years each of junior secondary school and senior secondary school. After completing compulsory education (junior secondary school), students can choose to attend a regular school, a vocational school, or a professional school. To enter senior secondary school, students take a public examination called the *Zhongkao*. The admission into senior secondary school is dependent upon students' *Zhongkao* scores. Similarly, to enter tertiary education, students have to pass the National Higher Education Entrance Examination (*Gaokao*). Although the number of tertiary education institutions has continued to increase since 2006, they are still considerably limited compared to the high number of applicants. Therefore, it is not surprising that secondary school students are under a lot of pressure to perform well in the *Gaokao*. In China, undergraduate degrees normally require four years of study, master's degrees take two or three years of study depending on the programme and doctoral programmes take approximately three to five years of study.

[18] The population figures were obtained from the UN Population Projection Report.

Table 6.1. Chinese Education System

Age	Years of Schooling	Level
> 22	> 17	
21	16	
20	15	Higher education
19	14	
18	13	
17	12	
16	11	Senior secondary school
15	10	
14	9	
13	8	Junior secondary school
12	7	
11	6	
10	5	
9	4	Primary school
8	3	
7	2	
6	1	
5		
4		Pre-school and kindergarten
3		

Source: OECD

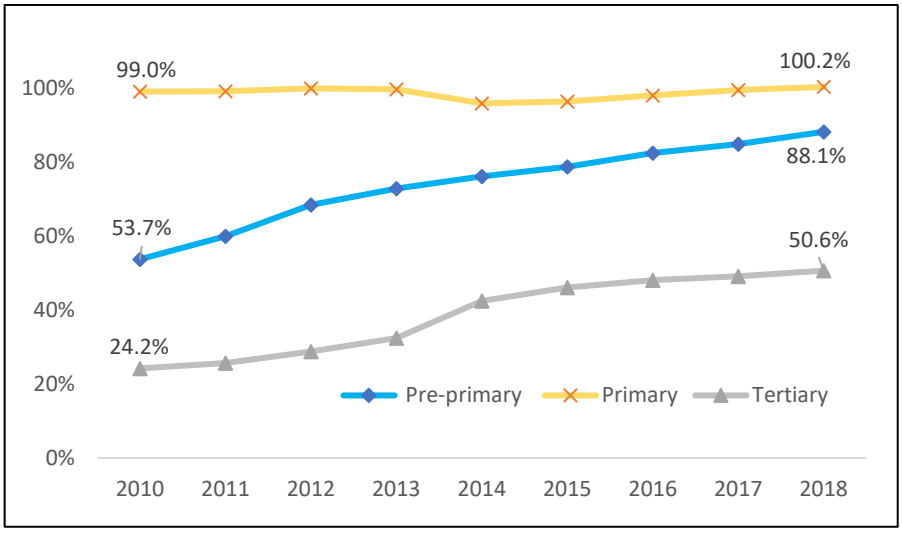
The Chinese education system is overseen by the Ministry of Education of the People's Republic of China as the agency of the State Council for educational affairs. The State Council is the chief administrative authority in China and is chaired by the Premier. It is responsible for carrying out the policies of the Chinese Communist Party (CCP) and the regulations and laws adopted by the National People's Congress (NPC).

The Ministry of Education administers six universities that are considered the top of the Chinese higher educational system. Three are in Beijing: Peking University (*Beijing Daxue*), the leading nontechnical institution; Tsinghua (*Qinghua*), a university that focuses primarily on science and engineering; and the People's University of China. The three outside Beijing are Nankai University in Tianjin, which is specialised in the social sciences; Fudan University in Shanghai; and Sun Yat-sen (Zhongshan) University in Guangzhou (Canton), the principal university of South China. In addition to these universities, every province has at least one major provincial university and there are hundreds of other technical and comprehensive higher education institutions around the country.

China's gross enrolment ratio (GER) for primary education has been steadily high since 2010. In 2018, China's GER was around 100.2 percent, indicating more people enrolled in primary education than the total population aged 6 to 11. It is also China's highest primary education GER since 2010. China has been expanding its education coverage to pre-primary and tertiary education. The GER for pre-primary and tertiary education has been increasing significantly since 2010. The pre-primary GER increased from 53.7 percent in 2010 to 88.1 percent in 2018 and the tertiary education GER doubled in this time from 24.2 to 50.6 percent.

Table 6.2 presents trends in the number of physical educational infrastructures in China from 2010 to 2017. The number of primary schools and junior secondary schools declined, while the number of senior secondary school has remained steady at around 13,300 to 14,000 schools. Such changes are mostly caused by shifts in the population structure of China. The number of physical pre-primary and tertiary schools, however, has been increasing since

2010. It is in line with the rising rate of GER for pre-primary and tertiary education in China for the last 10 years. In terms of financing educational needs, government expenditure on education in China is about 3.8 percent of GDP. Tertiary education takes the highest proportion of this—about 2.75 percent of GDP per year. Spending on primary education has been steady, at approximately 0.4 percent of GDP from 2015 to 2017.



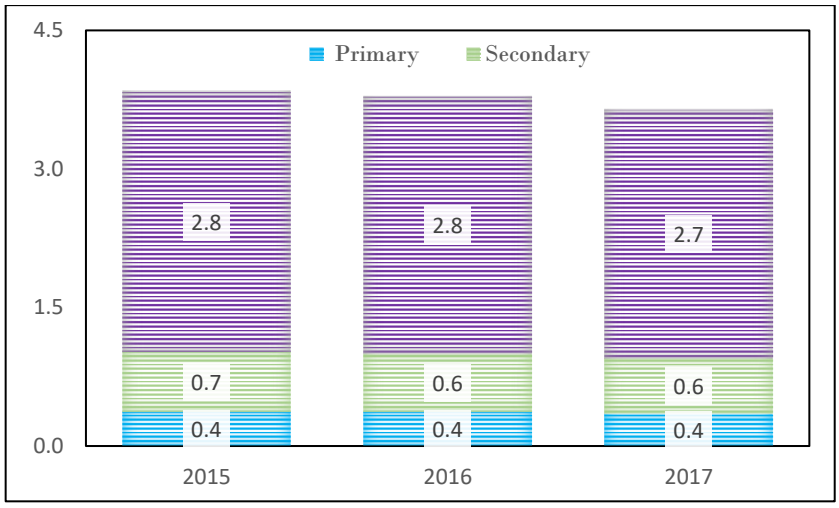
Source: UNESCO, 2018

Figure 6.1. Gross Enrollment Ratio for Pre-primary, Primary and Tertiary Education (%)

Table 6.2. Number of Educational Institutions by Level (Unit)

Year	Pre-primary school	Primary school	Junior secondary school	Senior secondary school	Tertiary school
2010	150,420	257,410	54,890	14,058	2,358
2011	166,750	241,249	54,117	13,688	2,409
2012	181,251	228,585	53,216	13,509	2,442
2013	198,553	213,529	52,804	13,352	2,491
2014	209,881	201,377	52,623	13,253	2,529
2015	223,683	190,525	52,405	13,240	2,560
2016	239,812	177,633	52,118	13,383	2,596
2017	254,950	167,009	51,894	13,555	2,631

Source: China Statistical Yearbook, 2018



Source: UNESCO, 2018

Figure 6.2. Government Expenditure on Education (% of GDP)

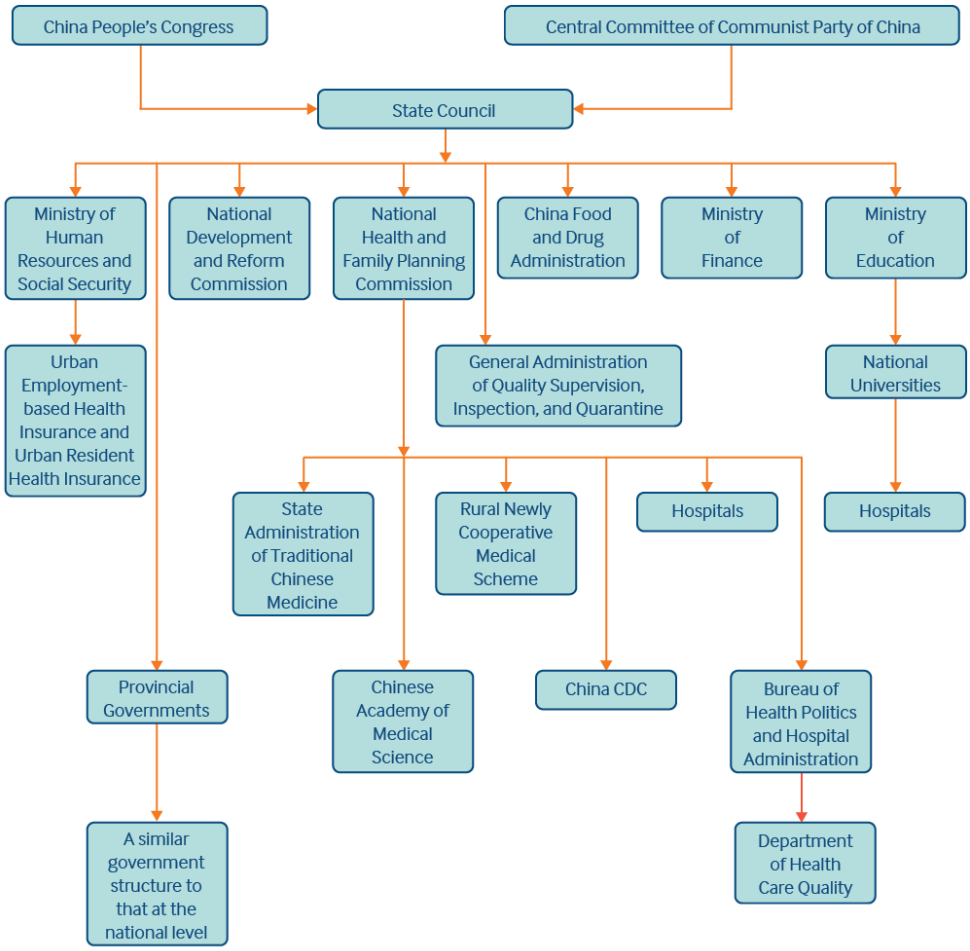
6.1.2. Health Care System in China

In China, the central government has overall responsibility over national health legislation, policy and administration. It is guided by the principle that every citizen is entitled to basic health care services, with local governments—provinces, prefectures, cities, counties and towns—responsible for providing them, with variations for local circumstances. Health authorities include the National Health and Family Planning Commission and local Health and Family Planning Commissions, which have primary responsibility over organising and delivering health care services and supervising providers (mainly hospitals). Health authorities at the lower levels have limited flexibility in carrying out provincial health policies.

China's health care services are delivered at three levels. Primary care service is delivered by rural clinics, rural townships and urban community hospitals. Services at these levels are delivered by village doctors and general practitioners (GPs). Patients are encouraged to seek care at the primary level before seeking specialists or medical professionals in secondary and tertiary care hospitals. Nowadays, hospitals in China can be public or private and non-profit or for-profit. Until 2014, there were 13,314 public hospitals and 12,546 private hospitals, of which 17,705 were non-profit and 8,155 were for-profit. Hospitals are paid through a combination of health insurance compensation, out-of-pocket expenses and government subsidies. In 2014, government subsidies accounted for 13.2 percent of total hospital revenue.

The National Development and Reform Commission, which has been heavily involved in the recent health care system reform outlined below, oversees health infrastructure plans and competition among health care providers. Government health subsidies, health insurance contributions and health infrastructure funding are provided by the Ministry of Finance. The Ministry of Human Resources and Social Security runs urban employment-based basic medical insurance (UEBMI) and urban resident-based basic medical insurance (URBMI). In 2013, the Ministry of Health and the National Population and Family Planning Commission were merged into the National Health and Family Planning Commission, the main agency for health controlled by the State Council. The State Administration of Traditional Chinese Medicine is affiliated with this new agency and the NPC is responsible for health legislation. However, major health policies and reforms may be initiated by the State Council and the Central Committee of the Communist Party and these are also regarded as law.

The national and local Health and Family Planning Commissions have comprehensive responsibilities for health quality and safety, cost control, provider fee schedules, health information technology and clinical guidelines. In terms of universal health coverage issues, China began to undergo a comprehensive health care insurance reform in 2003 and achieved universal health insurance coverage in 2011. The new health care insurance system provided China with a huge opportunity for the development of health care. China now has three main insurance schemes. The Urban Employee Basic Medical Insurance (UEBMI) covers urban employees and retired employees. The Urban Residents Basic Medical Insurance (URBMI) covers urban residents, including children, students, elderly people without previous employment and unemployed people. The New Rural Cooperative Medical Scheme (NRCMS) covers rural residents.

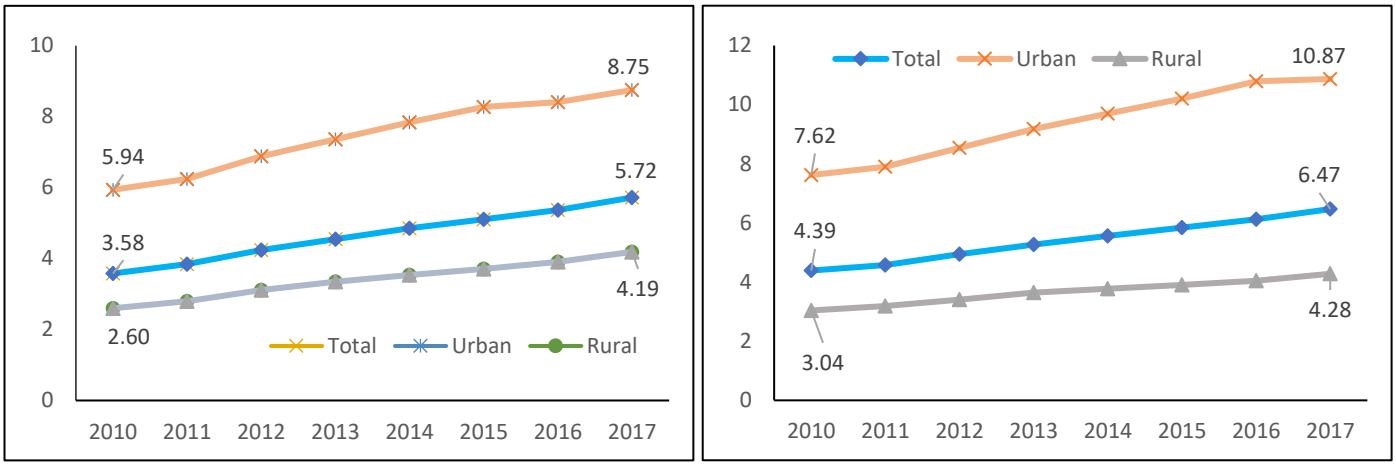


Source: The Commonwealth Fund

Figure 6.3. Chinese Health Care System

Nonetheless, challenges still exist. A significant amount of China's health care resources have been concentrated in larger hospitals; particularly those in urban areas. More than 80 percent of health expenditure is allocated to urban areas even though 70 percent of the total population resides in rural areas. This spending disparity is reflected in the number of hospital beds and health care personnel in rural and urban areas and is in line with the overall emphasis of China's social security system on urban areas.

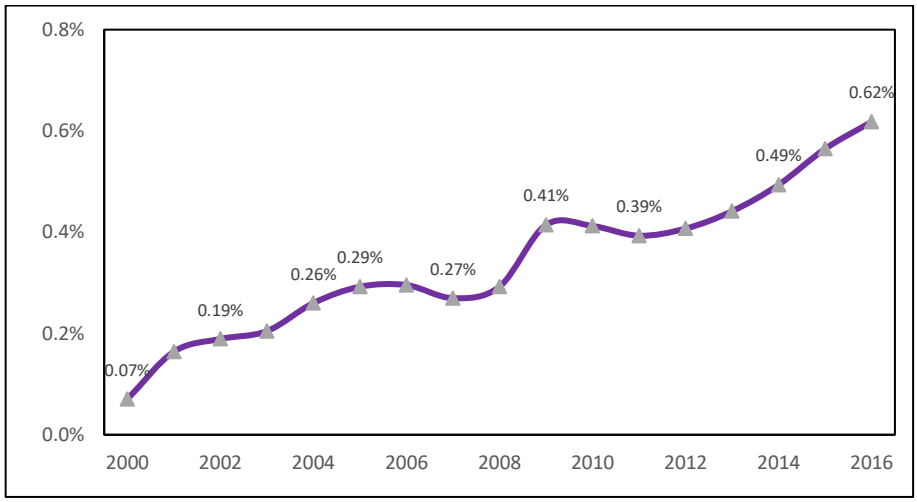
On the other hand, inefficiencies in resource utilisation are exacerbated by patients who are more likely to use larger hospitals in urban areas. The average number of outpatients per doctor in Ministry of Health (MOH)-owned hospitals is 7.3; in the next largest, province-owned hospitals, the average is 6.2; and in the smallest, city-owned hospitals, it is 4.4. This is problematic because larger hospitals are more expensive: the average cost per outpatient in MOH-owned hospitals is RMB 234.8 (US$28.36), compared to RMB 174.5 (US$21.08) in provincial hospitals and RMB 77.2 (US$9.32) in city hospitals at the county level.



Source: Chinese Statistical Yearbook. 2018

Figure 6.4. Number of Hospital Beds per 1000 People (Left) and Number of Medical Professionals per 1000 People (Right)

In the last decade, China has been improving its health infrastructure and services. The number of hospital beds and medical professionals in medical institutions has been steadily rising since 2010. The number of hospital beds per 1000 people rose on average from 3.6 to 5.7 between 2010 and 2017, while the number of medical professionals per 1000 people increased from 4.4 to 6.5. This growth, however, predominantly took place in urban areas. As such, improving physical infrastructure in rural area remains a challenge for China. China's commitment to improving health facilities is also reflected in the capital expenditure on health. Capital expenditure on health has been rising since 2000; even more in the past decade. China's capital expenditure on health increased from 0.41 percent of its GDP in 2010 to around 0.62 percent in 2016.



Source: World Bank, 2019

Figure 6.5. Capital Expenditure on Health (% of GDP)

6.1.3. Public Housing in China

China's experience in developing public housing for its citizens is quite interesting. When the CCP started its reign in 1949, housing stock in the urban parts of China was predominantly owned by private parties or individuals. Although the situation was not coherent with socialist ideology, the dominance of private ownership in housing stock across the urban parts of China continued until the mid-1950s. In the late 1950s, the Chinese government changed its policy by implementing massive nationalisation of property ownership across all urban areas in China. The cost of housing development and maintenance was now covered directly by the state, including the cost of land acquisition.

Approaching the 1970s, China's budget started to show its incapacity to support all housing development programmes. Investment in housing was consistently low and the housing shortage in urban areas across China became worse. To solve the problem, the Chinese government launched a market-oriented housing reform at the beginning of the 1980s that involved six main components: the commoditisation of housing goods, the monetisation of housing consumption, the marketisation of housing allocation, the commercialisation of housing provision, the privatisation of public housing stock and the socialisation of housing management. The reform continued to face strong resistance until the early 1990s. In 1998, the Chinese State Council drastically abolished the work-unit-based public housing system, which assigned municipal housing authorities as the major providers of public housing. This 1998 housing reform has resulted in the massive privatisation of public housing in China and improved housing conditions for urban residents. The government now provides affordable housing by subsidising commercial housing purchases or offering low-rent public (social) housing to middle- and low-income families. At the same time, it relies on the private commercial housing market to meet the needs of higher-income groups.

Housing in urban areas across China is currently provided through a multilevel provision system. Table 6.3 summarises the types of public housing in urban areas across China after the housing reform of 1998. Furthermore, Table 6.4 summarises all authorised documents related to housing policy in post-housing-reform China.

Affordable housing is often measured in terms of median values and buyer incomes, but the concept is relevant to both renters and purchasers of all income bands. Affordable housing in China is designed to be available for middle- to low-income households, including public sector employees. The CCP generally sets policies and mandates with respect to affordable housing. Meanwhile, subnational governments—particularly those of cities—are responsible for constructing, financing and managing that housing. The central government does not provide financial support to provincial and local governments for affordable housing through its budgetary spending or intergovernmental transfers except to a few subnational governments in the fiscally strained and underdeveloped central and western regions of the country. Local governments are required to provide free land, reduce government charges and fees, and control developers' profits to lower housing prices for those who are qualified per government eligibility standards.

Table 6.3 Types of Public Housing in Urban China after Housing Reform

Type		Description	
Old public housing		Housing built by the state between 1949 and 1998	
	Privatised	Sold to sitting tenants at heavily discounted prices	
	Non-privatised	Remained under control of local housing authorities	
New public housing		Housing built or subsidised by the state after 1998	
		Target Group	**Eligibility Requirement**
For sale	*Economic Comfortable Housing (ECH)*	Low-income "house-poor" urban households	Residence permit (*Houkow*), income and asset threshold, living space per person threshold
	Copper-Price Housing (CPH)	Low- to middle-income urban households	Residence permit (*Houkow*), income threshold, without owned home
	Shantytown Renovation Housing (SRH)	Households relocated due to urban revitalisation and major construction projects	Owner of expropriated home
For rent	*Cheap Rental Housing (CRH)*	Low-income "house-poor" urban households	Residence permit (*Houkow*), income and asset threshold, living space per person threshold
	Public Rental Housing (PRH)	Wide range of urban population, including new migrants	No residence permit required, low or no income threshold

Source: Chen et. al (2013)

There are three serious challenges that have been faced by the current affordable housing system. First, demand for affordable housing in China is enormous. Chinese labour statistics indicate that there is a "floating population" of around 147 million in urban areas across China, most of whom are migrant workers with relatively low incomes. Current rates of urbanisation predict an annual increase of about ten million people in Chinese cities. Most of them

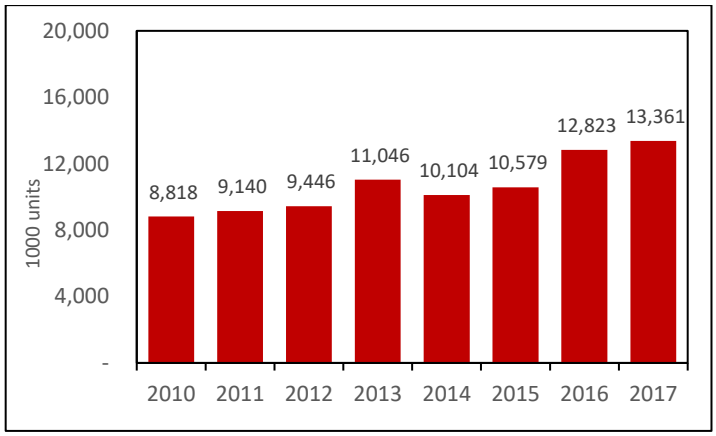
are expected to be low-skilled workers in the middle- or low-income group who will need housing assistance. Second, affordable housing accounts for only a small portion of the total housing stock, underscoring inadequate government support for middle- and low-income households in urban China. One third of cities had less than five percent of their affordable housing in the total housing stock, indicating an inadequate supply of affordable housing for low- and middle-income urban households. The underdeveloped private rental market in China further exacerbates this problem. Third, local governments in China lack incentives and financial means to provide affordable housing. The fiscal reform of 1994 left subnational governments with the obligation to provide nearly 80 percent of total government expenditure but directly receive only 47 percent of total government revenue. Such fiscal imbalances plus many unfunded central government mandates and expenditures related to inter-jurisdictional competition have driven many local governments to rely on land-leasing fees for revenue to finance infrastructure investment and economic development. Local governments prefer offering developers state-owned land to the highest bidder through an auction process so it can be used for the construction of affordable housing.

Table 6.4. Legal Documents on Housing Policy in Post-reform China

Date	Issuing Authority and Policy Document	Objectives and Implications
July 1998	State Council: Notification on deepening the urban housing reform and accelerating housing construction (SC [1998] No.23)	The welfare-based public housing system to be completely abolished; ECH designed to dominate the whole housing system
August 2003	State Council: Notification on continuing accelerating healthy and sustainable development of real estate market (SC [2003] No.18)	Market solutions dominate the housing sector; ECH and other public housing programmes downgraded to marginal sectors
August 2007	State Council: Opinions on tackling housing difficulties of low-income families in urban areas (SC [2007] No.24)	The government would again intervene in the housing sector through public housing; CRH chosen as the premier public housing scheme; ECH scheme significantly modified
December 2008	State Council General Office: Opinions on promoting steady and healthy development of real estate market (SCGO [2008] No.131)	Strive to solve the housing difficulties of 7.47 million low-income “house-poor” urban families by 2011
June 2009	MOHURD: Notification on the 2009–2011 development plan of CRH (MOHURD [2009] No.91)	Detailed annual plan to solve the housing difficulties of 7.47 million low-income “house-poor” urban families by 2011 with a set target for each province
January 2010	State Council General Office: Notification on steady and healthy development of real estate market (SCGO [2010] No.4)	Strive to meet the housing needs of 15.4 million low- to middle-income “house-poor” urban families by 2012
September 2011	State Council General Office: Guidelines on the construction and management of public housing (SCGO [2011] No.45)	Public housing planned to host 20% of urban households by 2015; growing attention shifted to PRH
May 2012	MOHURD: Regulations on public rental housing (MOHURD [2006] No.11)	Regulation details set on the construction and operation of public rental housing

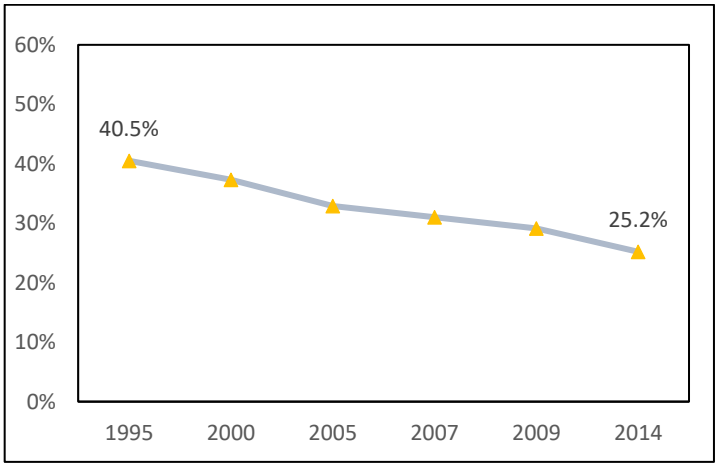
Source: Chen et. al (2013)

China’s housing market issues are similar to those of other countries with large metropolitan areas. They are dominated by higher demand in urban areas. Figure 6.5 depicts the number of residential units sold per year in China between 2010 and 2017. The figure indicates a steady increase in housing demand in China. This number, however, may not perfectly reflect China’s public housing needs, particularly for poor and lower-income households. This study uses the percentage of people living in slums (Figure 6.6) as a proxy for reflecting the needs of public housing in Asian countries, including China. Although the percentage of the population living in slums has been declining since 1995, the proportion is still high for China. Until 2014, one in four people in China were still living in a slum. Therefore, providing affordable housing remains a challenge for China’s government to fulfil its social infrastructure needs. Figure 6.7 depicts government investment in economic housing from 2002 to 2011. In less than a decade, government investment almost tripled from 33 billion USD to 94.5 billion USD.



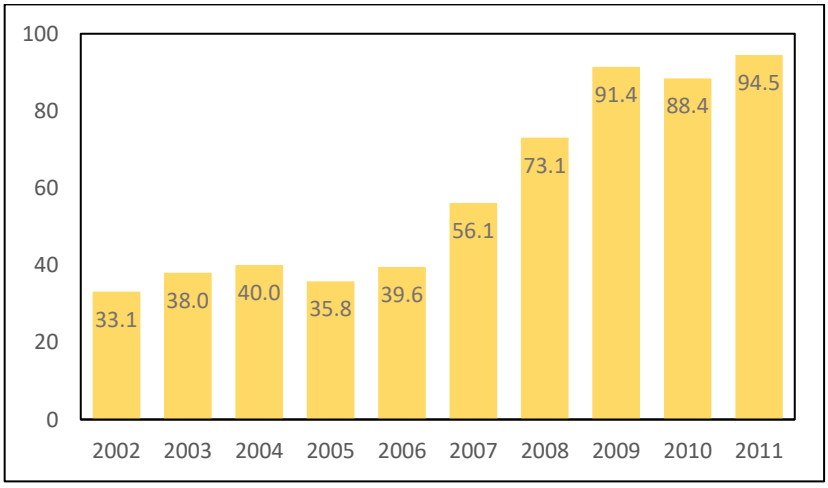
Source: Chinese Statistical Yearbook, 2018

Figure 6.5. Number of Residential Units Sold (1000 Units)



Source: World Development Indicators, 2018

Figure 6.6. Percentage of Population Living in Slums (%)

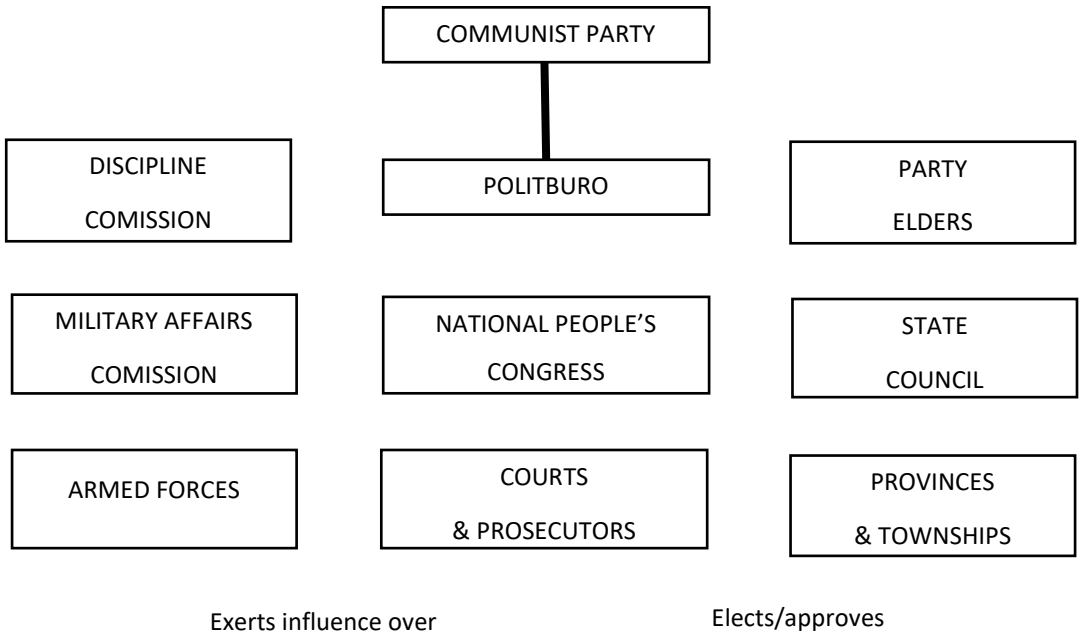


Source: National Bureau of Statistics China, 2019

Figure 6.7. Real Estate Investment in Economic Housing (USD Billions)

6.1.4. Government System in China

The governmental administrative structure in China can be illustrated as follows:



Sources: Dumbaugh and Martin (2009), Brødsgaard and Chen (2009)

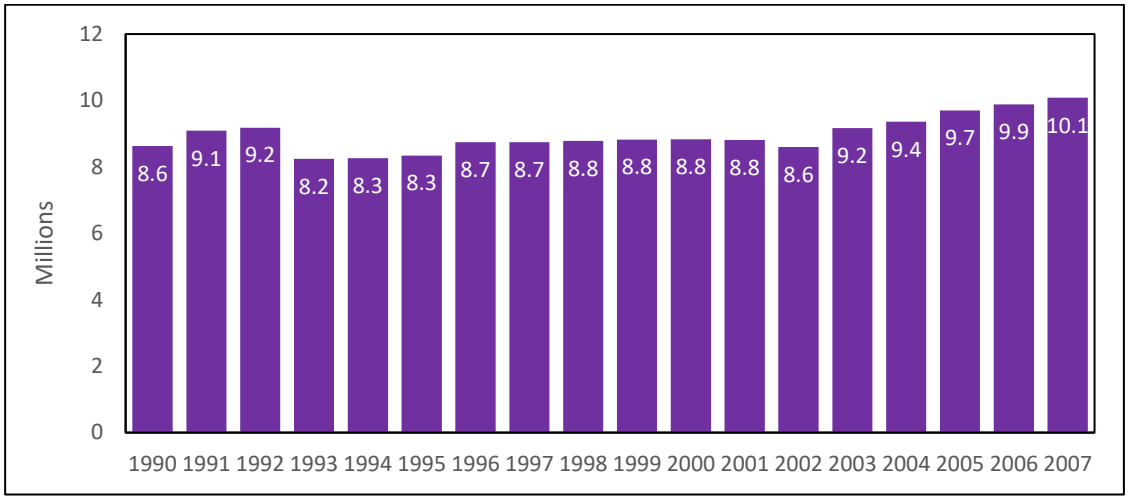
Figure 6.8. Governmental Administrative Structure in China

Since 1949, the Chinese mainland has been a communist state ruled by the CCP. Several minor political parties exist, but they are authorised by and operate under CCP leadership. As such, their existence is effectively powerless and mainland China is essentially a one-party state. The most important formal political institution in China is the Political Bureau (Politburo). It is led by the CCP's general secretary. The Politburo acts as the chief political decision-making body for the CCP. The NPC is China's legislative body and has the ultimate power of the Chinese government. The NPC has the authority to appoint the president, premier, cabinet-level officials, judiciary officials and military affairs commission. Provincial and township leaders are under State Council supervision, led by the premier.

Based on the new Civil Service Law, Chinese "civil servants" are personnel who perform public duties and whose wages come from the state's public finances. Civil servants are part of a system of established posts called the *bianzhi*. The term is often translated as "establishment" and it refers to the number of established posts in a unit, office or organisation. The *bianzhi* is formally controlled by the state; in practice, the Party is involved in setting *bianzhi* targets. It is important to note that those considered civil servants in China are not only career bureaucrats who enter the bureaucratic system at the bottom of the hierarchy and work their way up the career ladder—they are also state leaders and cabinet members who would otherwise be considered politicians in political systems with competing political parties and elections.

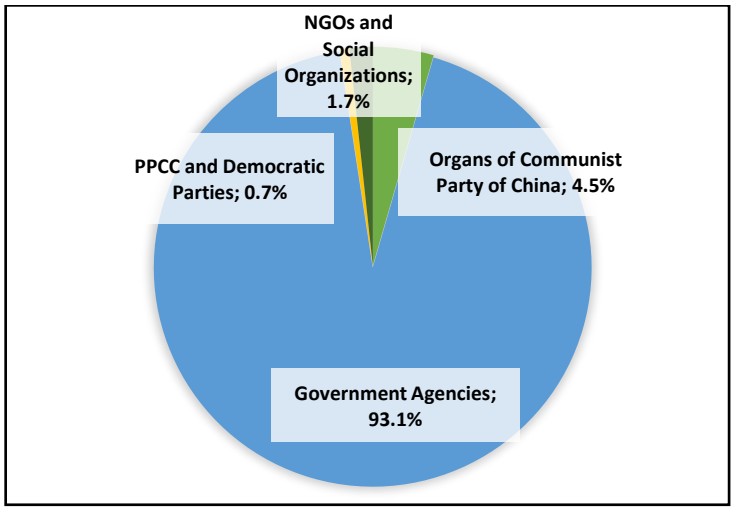
It is difficult to estimate the number of civil servants in China. Not even the Chinese authorities appear to know. In official Chinese statistics, one can find numbers for employees in "government agencies, party agencies, and social organizations" (*guojia jiguan*, *zhengdang jiguan* and *shehui tuanti*) between 1978 and 2002. Currently, the numbers appear under the category of "public management and social organization" (*gonggong guanli* and *shehui zuzhi*). This category covers "employees in organs of the Communist Party of China, government agencies, People's Political Consultative Conference, democratic parties, non-governmental organizations, and religious organizations". Employees in service organisations (*shiye danwei*), such as schools, universities and hospitals, are not considered part of the civil service system and therefore fall under a different classification and remuneration system.

In 2007, the number of people working as civil servants in China surpassed 10 million. Most of them worked in government agencies and departments. About 93 percent worked in government agencies, about 4.5 percent in organs of the Communist party and about 1.7 percent in non-governmental organisations and social organisations. Less than 1 percent worked in the Political Consultative Conference and in the eight so-called democratic parties.



Source: Brødsgaard and Chen (2009), modified by research team

Figure 6.9. Number of Civil Servants in China, 1978–2007



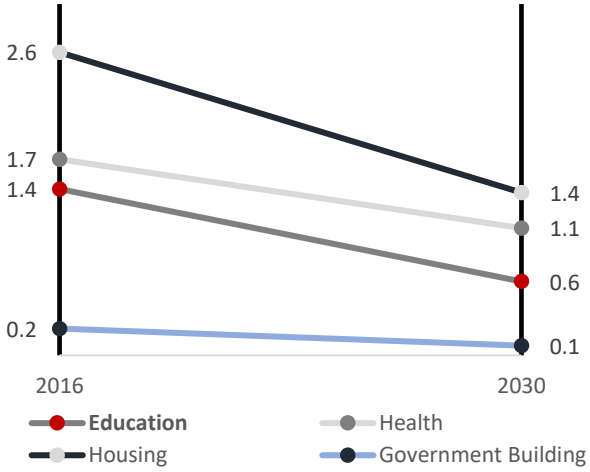
Source: Brødsgaard and Chen (2009), modified by research team

Figure 6.10. Distribution of Civil Servants by Institution (%), 2007

6.1.5. Demand for Social Infrastructure in China

6.1.5.1. Social Infrastructure Needs in China

In estimating China's social infrastructure needs, this study considers various of the country's socio-economic indicator dynamics. China is expected, by various studies, to be the largest economy in 2030. The government's policy to control birth rate, on the other hand, will potentially lead to reduced population growth in the future. Figure 6.11 depicts our estimated social infrastructure needs in China in 2030. Our estimation projects that, until 2030, China will need to allocate USD 904 billion per year—or almost 4.4 percent of its GDP—to finance its social infrastructure needs. The proportion of social infrastructure needs to GDP will be lower over the years due to the changing dynamics of China's economic growth and population size. In 2030, China is expected to spend 3.2 percent of its GDP on financing social infrastructure needs, equal to USD 1.241 billion.

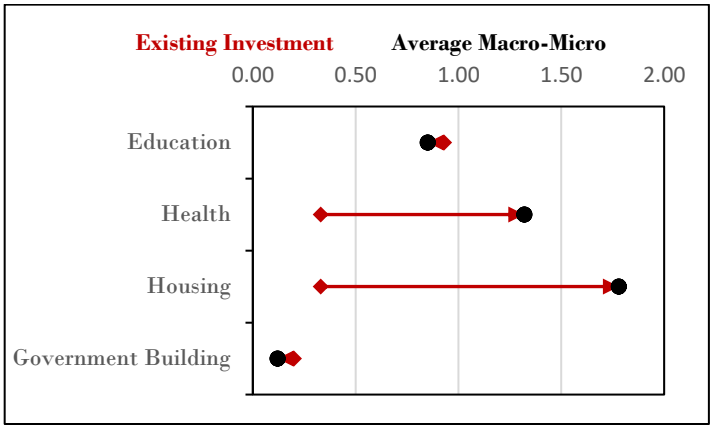


Source: authors' calculation

Figure 6.11. Social Infrastructure Needs in China (% of GDP), 2016–2030

Investment in the housing sector has consistently made up the largest proportion of social infrastructure investment for China. Massive rural-urban migration, the cost of construction and considerably high levels of existing urban slums are several reasons behind this number. Chinese labour statistics indicate that between 1990 and the end of 2015, the proportion of people living in China's urban areas rose from 26 percent to 56 percent and there are estimated to be more than 200 million rural migrants working in China's primary economic centre. China needs to spend on average 1.9 percent of its GDP—equal to USD 411 billion USD—per year between 2016 and 2030 to fulfil the needs of providing decent housing to its citizens, particularly the poor and lower-income groups. In other sectors, China needs to allocate 0.9 percent, 1.4 percent and 0.1 percent of their GDP annually to provide physical infrastructure and services for the health sector, education sector and government building, respectively.

For financing the social infrastructures, China has been able to meet the estimated financing needs for the education sector and government building. Our estimation indicates that current investment in those sectors has exceeded the estimated financing needs. The gap of the health and housing sectors, however, remains quite large. Until 2030, the financing gap for the health and housing sectors were 1 percent and 1.5 percent of GDP respectively. Having the health and housing sectors financed solely by the government would require a huge commitment and a significant portion of the government's budget. Thus, government of China needs to explore various forms of financing, including public-private partnership (PPP) schemes, to allow infrastructure development in China to run sustainably. Figure 6.12 summarises the social infrastructure gaps of China until 2030.



Source: authors' calculation

Figure 6.12. Financing Gap (% of GDP)

6.1.5.2. Lesson Learned from China: Achieving Universal Health Coverage in China

China's path to universal health coverage (UHC) has been long and complicated. China has implemented many changes in its health care system since the 1950s. As a communist country, they first adopted a fully government-controlled health care system. The government took over private ownership of health facilities and medical practices, making all physicians employees of the state. As such, the health care system is now owned, funded and run solely by the government. Not until the early 1980s, along with the economic reform, did China shift its health care system to a market-led system, largely due to the strong influence of privatisation and marketisation practices in the economy. Most public hospitals and clinics turned into private enterprises, enabling them to earn profits from medical practices. The change from a government-led health care system to a market-based system increased China's total expenditure on health. Prior to 1978, total health expenditure accounted for less than 3 percent of GDP. This number has grown 11 percent per year since the implementation of the market-based health care system. The expenditure, however, has fallen more on the shoulders of Chinese citizens. The share of out-of-pocket (OOP) expenditure increased from 20 percent in 1978 to 60 percent in 2001. At the same time, insurance coverage dropped from more than 90 percent in the 1970s to less than 40 percent in the 1990s.

The decrease in positive health outcomes caught the Chinese government's attention. At the end of the 1990s, the Chinese government launched a series of health care reforms in line with the concept of universal health coverage. The Chinese government launched a multi-level health security system consisting of three levels of medical-financial protection. The first level is Medical Financial Assistance (MFA). It covers basic health services for extremely poor citizens. The second level is the basic health insurance systems consisting of three main schemes: the UEBMI for urban employees, the URBMI for urban residents and the NRCMS for rural residents. The third level is additional insurance for citizens in certain areas of employment who are willing to pay higher premiums for additional protection provided by a health insurance package. Therefore, after half a decade of changing health policies, China is currently providing a mixed model health insurance plan where government, private institutions and individuals.

China's long history of providing health care services and insurance is a great case study for other countries in Asia and the Pacific. Its dramatic shifts from a command health care system to a market-based scheme and the ability to adjust health care policies based on health outcomes to eventually achieve the universal health coverage is something that policy makers should learn from. China's case suggests that there is no one extreme policy that can perfectly cover health care services for all citizens. A fully government-led system leads to low economic incentives for medical employees, while a fully privately run system has proved to escalate OOP expenditure enough for citizens to decide to cancel their health insurance plans. Under the new scheme after the health care reform, the Chinese government has continued to expand its coverage. Most recently, it has started to fully cover severe diseases such as cancer and kidney disease, which were previously only reimbursed to a certain ceiling.

Case study: The impact of the NRCMS on the activities and financial structures of township health centres in Weifang prefecture.

As briefly discussed in the previous section, China's health insurance reform in the 2000s generated some substantial changes. One of them is how the insured population is grouped. The population is now grouped according to their residences rather than their professions. In the previous scheme, the government employees were covered by GIS, SOEs employees by LIS, and agricultural workers by CMS. Under the new regime, the urban employees are covered by UEBMI, the urban residents without employment are covered by URBMI and the rural households are covered by the NRCMS. The NRCMS covers the largest population and receives many government subsidies. Two thirds of NRCMS funds come from the government budget; as such, an evaluation of the impact of the NRCMS can offer important information about the performance of government investment.

Township health centres (THs) play an important role in the rural health referral system. They supervise the quality of services delivered at village health stations while filtering needed patients to upper-level hospitals. Since the economic reform, THs have experienced financial hardships. Due to the shortage of public financing, THs have tried to compensate for the budget deficit by participating in market competition. However, due to their less qualified medical staff and worse equipment, patients prefer county hospitals. Through the NRCMS, the government allocated preferential reimbursement to THs to help divert patients to first-level health facilities. However, the effectiveness of this policy depends on whether the insured rural population are indeed choosing THs (in line with their insurance benefits).

A case study by Huang (2014) aimed to estimate the impact of the NRCMS reform on TH activities and financial structures in Weifang prefecture. Weifang is a prefecture-level city of Shandong province in the northeast of China with 73 percent of its total population being rural and covered by the NRCMS. Five outcome variables were selected. As indicators of TH activities, Huang selected the number of outpatient visits, the number of discharged patients (inpatients), the average length of stay (ALOS) and the bed occupancy ratio. Changes in financial structures were proxied by the income from the sale of drugs. Some important results confirmed by his study are:

1) The NRCMS has a significant impact on inpatient services. In the township where the NRCMS is implemented, the number of inpatients is 58 percent higher than that of the non-NRCMS zone.
2) The NRCMS has a greater impact on the inpatient activities and bed occupancy ratios in THs in poor townships than in non-poor ones.
3) The NRCMS may influence TH activities in the long term; however, the marginal impact is decreasing over time.

These results confirm that implementing the NRCMS, to some extent, increases medical activity in THs. Although it had relatively small samples and its results cannot be generalised for other regions in China, the case study on Weifang prefecture offered an early indication that health insurance reform, in the form of the NRCMS, is beneficial for the rural population.

6.2. India

6.2.1. Education System in India

India has a long history of education dating to since antiquity. It developed its own scientific and mathematical concept independently of western civilizations. Nevertheless, the modern education system in India is primarily based on the UK system. The British education system, brought to India by missionaries and then sanctioned by the colonial administration, was geared toward members of higher castes to prepare elite Indians to be administrators for colonial power and to legitimize the colonial power as a civilizing influence. Most early formal educational institutions are therefore privately run and/or religiously affiliated.

Thus, early modern education in India copied the prevailing model of education in the UK at the time. Post-colonial governments, while trying to increase access to education, still share the degree progression of 10 years of primary and lower secondary education and 2 years of pre-university/junior college. It is the same model used by other former British colonies such as Singapore, Pakistan, and Bangladesh.

India's education system today consists of three main stages. Students that wish to complete a tertiary degree are expected to go through 10 years of schooling, 2 years of junior college, and 3 to 4 years of university. The complete primary degree progression of 10+2 years of pre-university education are shown in Table 6.5.

Table 6.5. Indian Education System

Age	Years of Schooling	Level
>22	> 17	Higher education
21	16	
20	15	
19	14	
18	13	
17	12	Senior secondary school
16	11	
15	10	High school
14	9	
13	8	Upper primary school
12	7	
11	6	
10	5	Primary school
9	4	
8	3	
7	2	
6	1	
5		Pre-school and kindergarten
4		
3		

Students are not expected to attend school before they begin primary education, and this policy is reflected by relatively low attendance of primary education. The gross enrolment ratio in pre-primary education is still low, although it has risen considerably over the last few years because of the increasing number of the urbanized middle class in India who have more resources and are willing to enrich the quality of their children's education.

Primary education (both primary and upper primary) is free and compulsory for all age-eligible children, as outlined by the Right of Children to Free and Compulsory Education Act in 2009. Such policies also mandate attendance by school-aged girls and young women, who traditionally were less likely to have access to education by Indian society. As such, gross enrolment for females in primary education has been rising steadily since 2009, from around 110% to more than 120%.

Access to secondary education and tertiary education, while not free and compulsory, also has been on the rise. The increase in secondary and tertiary education enrolments are driven by the rising affluence of the Indian population through two channels. First, higher disposable income in urban areas reduced the need for children to drop out of school after their primary education; it allows parents to invest more in their children's education. The emergence of high-paying service-sector jobs, such as business process outsourcing (BPO) and information technology (IT) jobs in cities like Mumbai and Bangalore also increased the return to education, thus incentivizing both students and parents to enrol in secondary and tertiary education and driving demand for more educational infrastructure in these areas.

After leaving high school at (around year 10 and age 14), students enter upper secondary level according to the streams that they wish to take. Their options include the senior secondary academic stream, the senior secondary

vocational stream, and technical education training. The academic stream is generalist in nature and geared toward those who wish to continue their education and obtain tertiary degrees. The vocational stream is geared toward those who wish to obtain the skills needed for more specialized jobs directly after graduation. Technical education training is offered in polytechnic. Students are granted a diploma upon completion of this study, while the senior secondary vocational stream is able to grant only senior secondary certificates upon graduation.

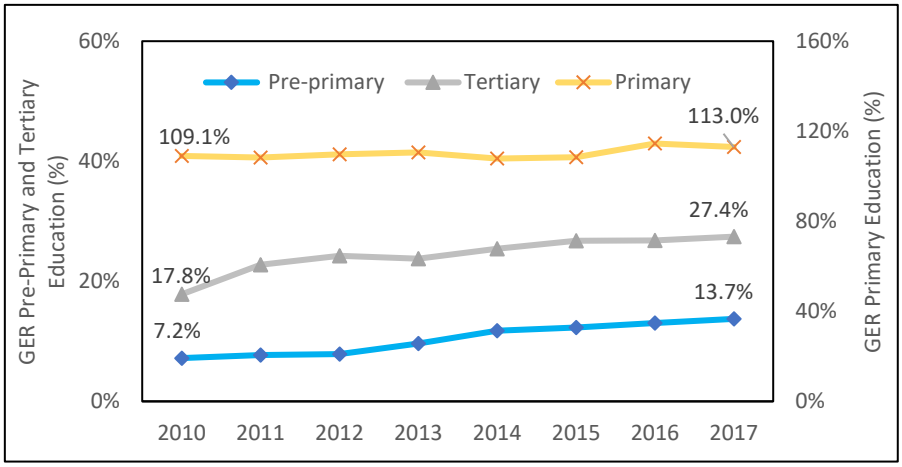
University degrees in India also largely follow the British tertiary education system, in which higher education degrees comprise bachelor's degrees (4–6 years of education), master's degrees (2 years of education) and doctoral degrees (2 years of education). There are both public and private universities, and several institutions, particularly universities in the Indian Institute of Technology system, have world-class reputations.

Education policies, particularly the provision of public education, falls under the concurrent jurisdiction of central, state, and local governments. Funding for public education and decisions about school standards are also divided across those three layers of government. The basic feature of concurrency on education between the powers of the central government (called the union) and state powers is that the constitution sees them as partners working together instead of the state being subordinate to union government.

In practice, the Constitution of India framed education as predominantly a state matter (Tilak, 2017). Central government reserves overriding power; union legislation prevails over state legislation if there are contradictory positions. The roles of union government are more confined to shaping the overall direction of national curriculum standards, enabling the state government by extending assistance and support of various kinds, and operating several key institutions such as the University of Delhi and the Indian Institute of Technology. Another limit to the state purview on education is the union government's roles in compulsory education as mandated by Right of Children to Free and Compulsory Education Act in 2009 and its role in affirmative action for members of scheduled castes and tribes (historically-disadvantaged castes, tribes, and religions, such as Dalit).

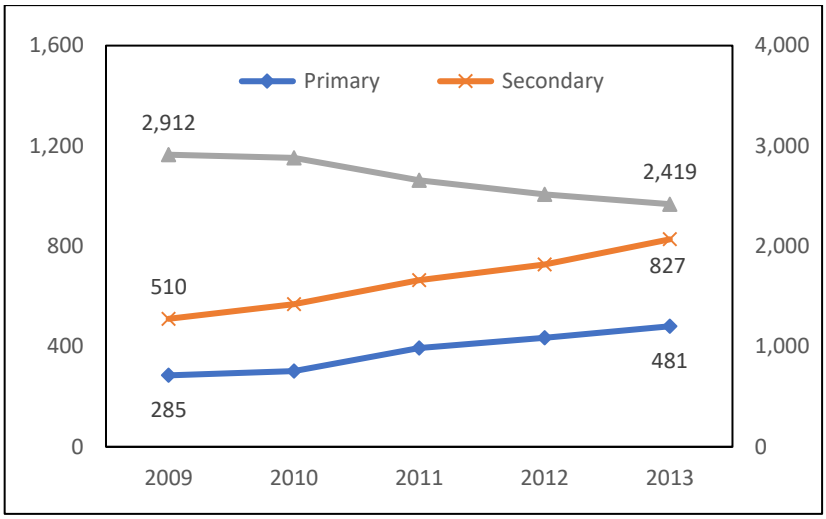
India's gross enrolment rate (GER) for primary education remains above 100 percent over the last eight years. This means that India is still expanding its primary education coverage beyond children of primary school age. Tertiary education GER also has increased. This growth, however, is slower than rates in similar countries like China. A similar trend occurred in pre-primary education. The pre-primary GER increased by only 5.5 percent for the last eight years. Thus, penetration to higher education and early childhood education remains a challenge for India's government.

In terms of education expenditure, government spending per student for primary and secondary education in India has been steadily rising over the years. Government expenditure per student for primary education rose from 285 USD (in PPP) per student in 2009 to 481 USD in 2013. The growth is higher for government expenditure for secondary education, which increased from 510 USD per student in 2009 to 827 USD per student in 2013. By contrast, government expenditure per tertiary student declined from 2.912 USD per student in 2009 to 2.419 USD in 2013. Total government spending on education for India during the same period increased from 3.28 percent of GDP to 3.84 percent.



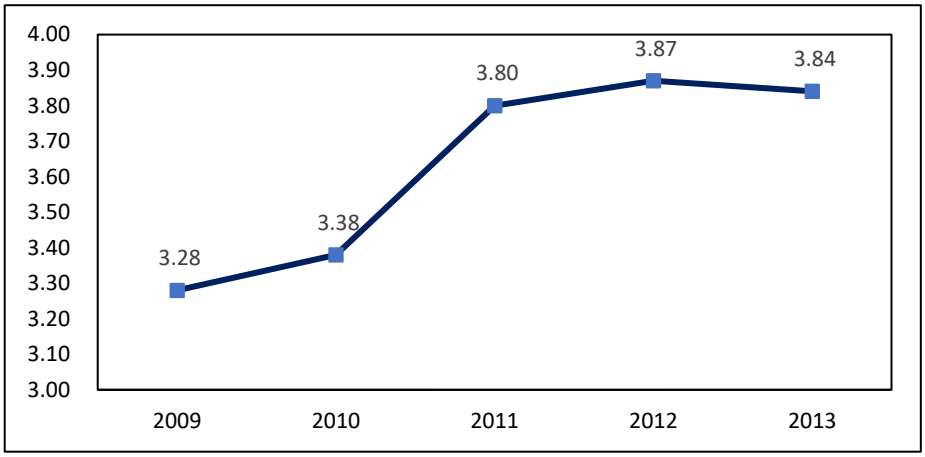
Source: UNESCO Institute for Statistics, 2019

Figure 6.13. Gross enrolment ratio for pre-primary, primary, and tertiary education



Source: UNESCO, 2019

Figure 6.14. Government expenditure per student by level of education (in PPP USD)



Source: UNESCO, 2019

Figure 6.15. Total government spending on education (% of GDP)

6.2.2. Health Care System in India

Healthcare services in India are served by both public- and private-sector operators. Public healthcare facilities are usually geared to be affordable to the poorest segments of the population, whereas private-sector healthcare providers, particularly for-profit ones, tend to cater to middle-class and affluent segments of the population.

The public healthcare infrastructure and facilities in India comprise the following:

- *Sub-centres*

  Sub-centres are designed as outposts in areas with a population of around 5,000 (3,000 in hilly/difficult-to-reach/tribal areas), and they are usually the first point-of-contact between the community and healthcare providers.

- *Primary health centres*

  Primary health centres are designed as referral units for sub-centres. They provide curative and preventive healthcare to the rural population, with an emphasis on the preventive and promotive aspects of health care. PHCs usually serve populations of around 30,000 (20,000 in hilly/difficult-to-reach/tribal areas).

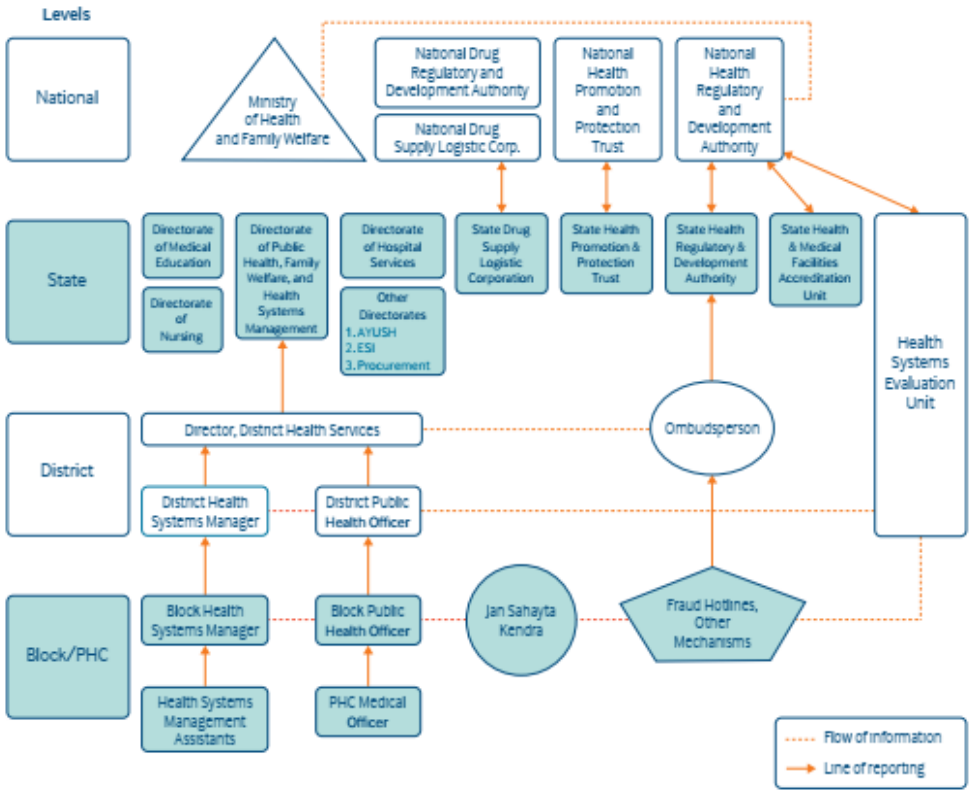
- *Community health centres*

Community health centres are designed as referral units for primary health centres. They are the first tier of public healthcare delivery, employing specialist doctors, offering more extensive services than PHCs, and performing essential surgeries. CHCs usually serve a population of around 120,000 (80,000 in hilly/difficult-to-reach/tribal areas).

- *Sub-district hospitals*

  Sub-district hospitals are designed as the first referral unit for patients from CHCs and have an important role to play in providing emergency obstetrics care and neonatal care. A sub-district hospital is

- *District hospital and Medical college hospital*



Source: The Commonwealth Fund

Figure 6.16. Indian Health Care System

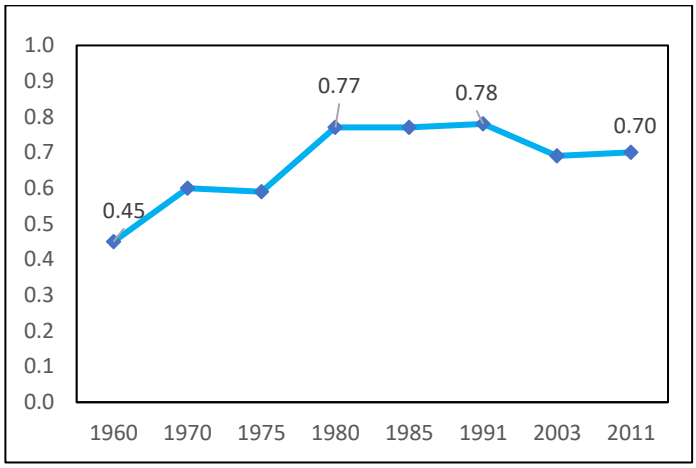
Prior to the introduction of the new universal healthcare program called *Ayushman Bharat* in 2018, the publicly provided and subsidized healthcare program was voluntarily run by states and depend entirely on the states' budgetary capacity. Not all states introduced subsidized healthcare programs, and those that did had wide variations in schemes. *Ayushman Bharat* was launched as recommended by the National Health Policy 2017 to provide universal health coverage (UHC) for all Indian citizens. It was also designed to meet sustainable development goals (SDGs). The UHC will target 107.4 million "poor and vulnerable" families—at least 500 million individuals or around 40% of the total population. This will be the largest government-funded scheme in the world.

Ayushman Bharat adopted a continuum of care approach, comprising two inter-related components, Health and Wellness Centres (HWCs) and *Pradhan Mantri Jan Arogya Yojana (PM-JAY)*. In early 2018, the Government of India transformed the existing sub-centres and primary health centre into HWCs aiming to deliver comprehensive primary health care for the citizens. The HWCs provide maternal and child health services and services for non-communicable diseases, including free essential drugs and diagnostic services. The HWCs are also designed to emphasize health promotion and prevention by engaging and empowering individuals and communities.

The *PM-JAY* aim at providing health insurance coverage at Rs. 5 lakhs per family per year for 40 percent of the poor and vulnerable populations. *PM-JAY* is completely funded by the government, and the cost of implementation is shared between central and state governments. *PM-JAY* provides cashless access to health care services for the beneficiary at the hospital. Benefits of the scheme are portable across the country and the services include approximately 1393 procedures covering all the costs related to treatment, including drugs, supplies, diagnostic

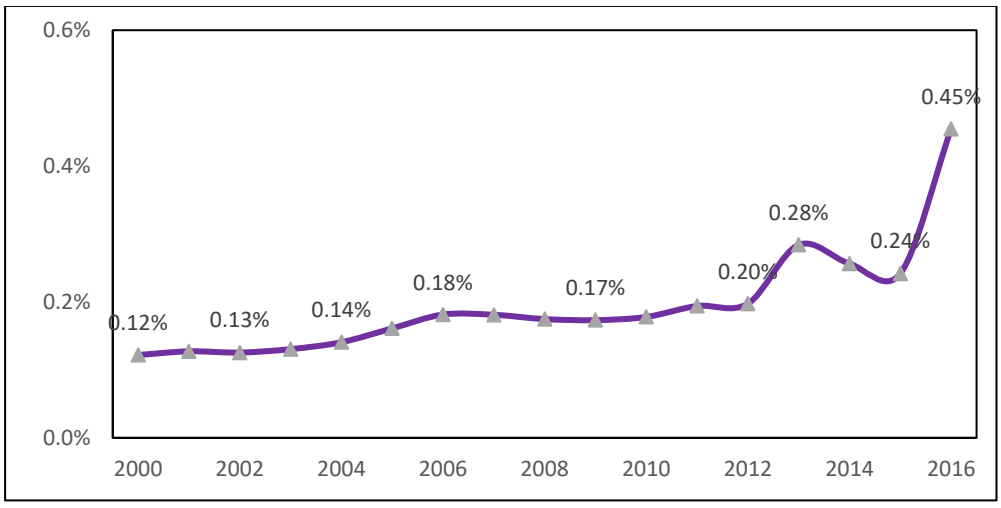
services, room chargers, physician's fees, and surgeon and ICU charges. Before introducing universal health coverage under *Ayushman Bharat*, India had below-average health expenditures. Total health expenditures in India for 2013–2014 were only 4 percent of GDP, far below the global average of 10 percent of GDP. The level of public spending at just 1.4 percent of GDP is significantly lower than the global average of 6 percent of GDP.

Providing decent health infrastructure remain a challenge in India. Despite growing significantly from 1960 to 1980, the number of hospital beds per 1000 population has stagnated since the 1980s. The number has even declined since 1991. India's hospital beds were 0.78 per 1000 population in 1991. Two decades later the number is down to 0.70 beds per 1000 population. Insufficient health infrastructure is an issue for India, in addition to the disparity of healthcare delivery in rural and urban areas. In terms of health financing, in the 10 years prior to 2016, capital expenditure on health stagnated between 0.18 percent and 0.28 percent of GDP. The number, however, increased sharply in 2016, and it doubled from 0.20 percent in 2013 to 0.45 percent in 2016.



Source: World Bank, 2019

Figure 6.17. Hospital beds per 1000 population



Source: World Bank, 2019

Figure 6.18. Capital expenditure on health (% to GDP)

6.2.3. Public Housing in India

The Indian government has defined affordable housing as any housing that meets some form of affordability criterion, which could be the income level of the family, the size of the dwelling unit, or affordability in terms of the equated monthly instalment (EMI), or the ratio of house price to annual income. In addition, the house price should be not

exceeding 30–40% of the buyer's gross monthly income. According to the Ministry of Housing and Urban Poverty Alleviation (MoHUPA), affordable housing in India is further defined by the following income groups:

a. For the economically weaker section (EWS) or a person with an income up to Rs 300.000, the size of the house ranges between 9 and 30 square meters.

b. For the low-income group (LIG) or a person with an income between Rs 300.000 and Rs 600.000, the size of the house ranges between 30 and 60 square meters.

c. For middle-income group - I (MIG-I) or a person with income between Rs 600.000 and Rs 1.200.000, the size of the house ranges between 60 and 120 square meters.

d. For middle income group-II (MIG-II) or a person with income between Rs 1.200.000 and Rs 1.800.000, the size of the house ranges between 120 and 150 square meters.

MoHUPA has estimated a housing shortage of 18.78 million houses, with 99 percent in the economically weaker and lower-income groups. Slums and informal tenements are estimated at 65 million based on Census 2011. In India, affordable housing is a term largely used in the urban context. At the national level, the rural housing sector is the jurisdiction of the Ministry of Rural Development, while housing and human settlements in urban areas are under the jurisdiction of the Ministry of Housing and Urban Poverty Alleviation.

The latter ministry has spearheaded affordable housing as a concept and policy. In addition, there are some non-ministry agencies involved in the development of the housing sector, such as The National Buildings Organization (NBO), the State Housing Board (SHB), and the National Housing Bank (NHB). The NBO is was established in 1954 as an attached office under the Ministry of Housing and Urban Affairs (then called the Ministry of Works and Housing) for technology transfer, experimentation, development and dissemination of housing statistics. NBO was restructured in March 2006 with a revised mandate based on requirements under the National Housing Policy and various socioeconomic and statistical functions connected with housing and building activities.

The SHB is responsible for organizing the direction and for preparing and executing housing improvement schemes and for coordinating the various housing schemes in the states. The NHB's function is to operate as the principal agency promoting housing finance institutions at both the local and regional levels and to provide financial and other support to such institutions and for matters connected therewith or incidental thereto.

At the national level, the Government of India estimated a shortage of more than 18.78 million urban homes at the beginning of 2012 and about 30 million by 2022, of which 95% were in the EWS and LIG. The demand increases by 6 percent per year.

The policy framework for affordable housing is provided by:

a. The National Urban Housing & Habitat Policy (NUHHP-2007). The NUHHP 2007 lists several objectives that include urban planning, land availability, special provisions for women, public-private partnerships, and management information systems. It aims to accelerate the pace of development of housing and related infrastructure, to create adequate rental and ownership housing stock while improving affordability through capital or interest subsidies, and to use technology to modernize the housing sector for energy and cost efficiency, productivity and quality, and green and intelligent building, and to mitigate the impacts of disasters.

b. The Jawaharlal Nehru National Urban Renewal Mission (JNNURM 2005). JNNURM 2005 was launched with the objective of encouraging and expediting urban reform. It included within its ambit construction of 1.5 million houses for the urban poor in 65 mission cities between 2005 and 2012.

c. Basic Services for the Urban Poor (BSUP). BSUP is managed by the Ministry of Urban Development and seeks to provide seven entitlements: security of tenure, affordable housing, water, sanitation, health, education and social security to low-income segments in 65 mission cities.

d. Integrated Housing & Slum Development Program (IHSDP). IHSDP covers those cities and towns that are not covered by BSUP. It conceives of an 80:20 ratio between the national and state governments on the one hand and urban local bodies (ULBs) or beneficiaries on the other hand.

e. The *Pradhan Mantri Awas Yojana (PMAY*-2015). Launched in June 2015, it aimed to address the challenge of housing shortages among individuals in the EWS and LIG categories in cities. It envisages building 20 million houses by 2022. A rural component has been added to *PMAY*, which aimed at building or upgrading 10 million houses by 2019. To address the shortfall, *PMAY* planned to tackle the issues through four models:

in situ slum redevelopment, affordable housing in partnership, subsidy for beneficiary-led individual house construction, and credit-linked subsidies. In addition, it has suggested policy reforms to implementing agencies

To provide financial support for the development of an affordable housing sector, the Indian Government applied the following mechanisms:

a. External Commercial Borrowing (ECB) was allowed in 2012 for affordable housing projects to enable lower-interest costs for developers and to ensure better capital availability for developers of low-cost housing. In 2013, the parameters for extending ECB to slum rehabilitation projects were outlined.

b. Opening Foreign Direct Investment (FDI) for development of townships, housing, building up infrastructure and construction development.

c. The Central Board of Direct Taxes (CBDT) has extended the benefits of section 35AD of the Income Tax Act of 1961 (which permits 150% of capital expenditure as a tax deduction) to be in effect starting with assessment year 2012–2013 to promote affordable housing.

d. Construction of the following has been exempted from service tax from 1 March 2016:
   - Low-cost houses up to a carpet area of 60 square meters in a housing project under the 'Affordable Housing in Partnership' component of Housing for All (Urban) Mission/*Pradhan Mantri Awas Yojana*.
   - Low-cost houses up to a carpet area of 60 square meters in a housing project under any housing scheme of the state government.

e. Efforts to increase the ease of doing business, especially in obtaining construction permits in urban areas, has been stepped up and several initiatives have been undertaken. For example, Single Window clearance has been initiated through an integrated online portal in select cities.

f. Recent amendments to the Finance Act (2016) have introduced a 100% tax holiday for affordable housing, subject to certain conditions.

The number of people living in slums for India has been decreasing over the years. In the last decade, India has cut the number by more than half from 48.2 percent in 1995 to 24 percent in 2014. The government's effort to provide affordable and decent housing, particularly for the EWS and LIG, using the above-mentioned policies might further lower the percentage of people living in slums. In terms of expenditures for public housing, data from Housing and Urban Development Corporation (HUDCO) shows that the general trend of housing load approved in India is increasing. After experiencing a decrease in house loans approved between 2007 and 2009, the number of loans approved rose from 0.37 billion USD per year in 2009 to 1.53 billion USD in 2014. To fulfil the needs for housing infrastructure, it is expected that the number will keep increasing in the coming years.

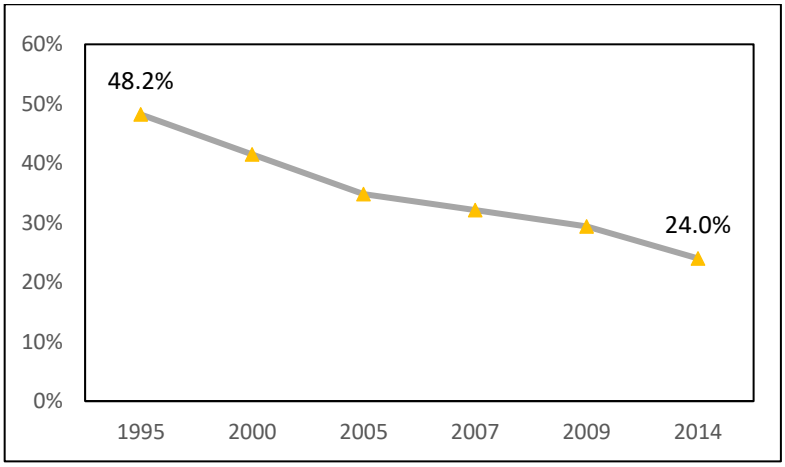
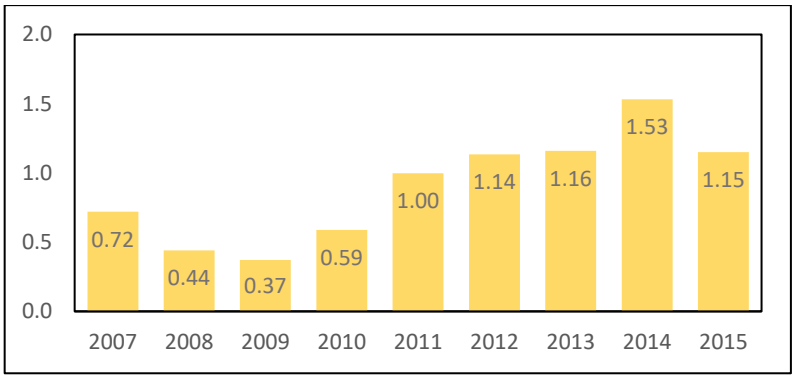


Figure 6.19. Percentage of population living in slums (%)

Source: World Development Indicators, 2018



Source: Housing and Urban Development Corporation (HUDCO), 2018

Figure 6.20. Housing loans approved (USD Billions)

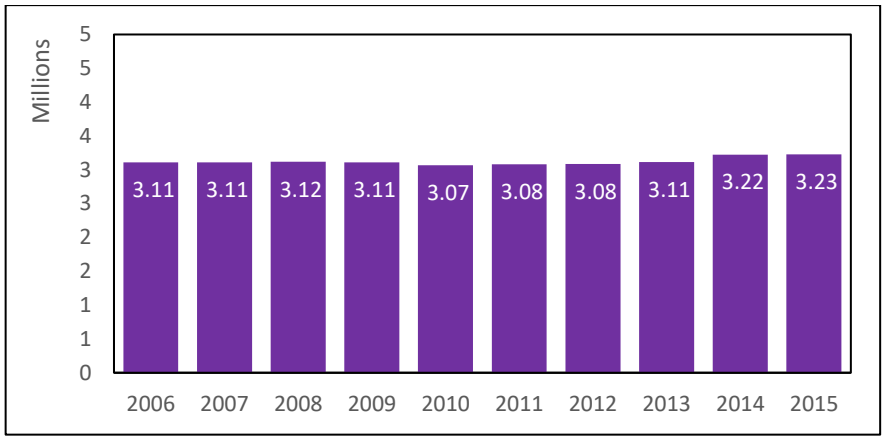
6.2.4. Government System in India

India is a federal republic comprising three levels of government, central, state, and local government. Under the 73rd and 74th constitutional amendments, each state has its own legislation. As of 2017, there were 267.428 local governments, of which 262.771 were in rural areas, and 4.657 were in urban areas. Urban local bodies include municipal corporations for cities, municipalities for larger towns, and town panchayat for smaller towns. Local rural bodies comprise the *zila parishad* (district level), *panchayat samaiti* (block level), and *gram panchayat* (village level).

India has a parliament of two houses, *Lok Sabha* (lower house) and *Rajya Sabha* (upper house). India is led by a president, elected for five years by an electoral college made up of members of both houses. The president then appoints the leader of the majority party as prime minister and appoints the council of ministers from other party members. On the state level, each state is led by a governor who is advised by a council of minister led by a chief minister.

To enhance the role of rural local governments, in 1989, the central government of India implemented direct funding for rural local governments. The objective was to give responsibility to local governments to enhance economic development and create jobs directly. The ministry of housing and urban affairs (MoHUA) and the Ministry of *Panchayati Raj* (MoPR) are responsible for urban and local governments respectively, while on the state level, there are also ministers responsible for both rural and local government. Under extraordinary circumstances, the state government, through the minister, may dissolve local government bodies and govern them up to six months until they have new local government.

To finance urban infrastructure projects, there are two sources of funds. The first is locally raised revenue from the state and the second is the Pooled Finance Development Fund. This fund is developed by the central government to enable the state government to access market borrowing for investment in urban infrastructure projects. However, the XII Central Financial Commission report indicated that less than half of municipal expenditures are financed through the municipalities' own sources. Direct transfer from the central government to urban and local governments consists of two kinds of grants, basic grants and performance grants. There is an 80:20 division between basic and performance grants. The allocation of grants to urban and local government is conducted by the Central Finance Commission (CFC). Local government staffs are recruited by the state government, not the central government. There is a special commission appointed to recruit local government staff. The staffing structures differ from state to state, depending on their local laws. Figure 6.21 depicts the number of government employees in India. Currently, India's government employs around 3.2 million people as civil servants in the three levels of government.



Source: Statistical Yearbook of India, 2018

Figure 6.21. Number of civil servants in India, 2006-2015 (Millions)

Table 6.6. Summary of public services provision in India

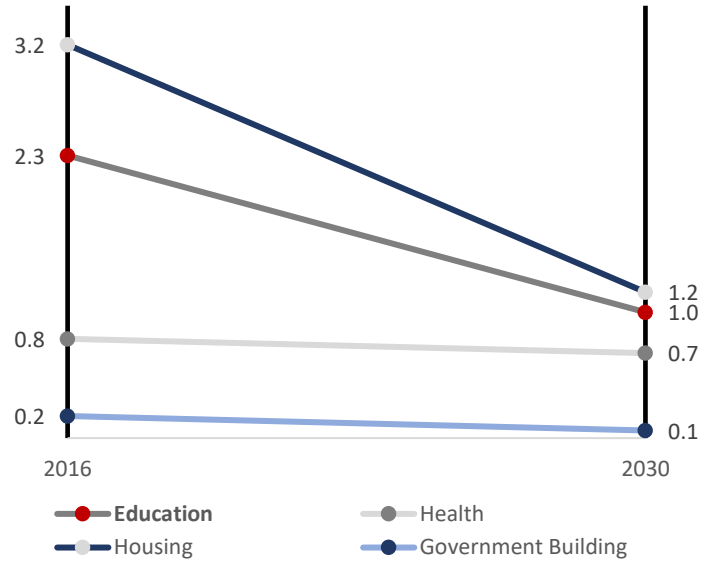
Service	Delivering authority				
	Central government	State	Urban local bodies	District	Village
General Administration					
Police	O	O			
Fire protection		O			
Statistical office	O				
Education					
Pre-primary		O	O	O	O
Primary		O			
Secondary		O			
Vocational and technical		O			
Higher education	O	O			
Health					
Primary care		O	O		
Hospitals		O			
Health protection		O	O		
Housing					
Housing		O			
Town planning		O			
Regional planning		O			
Transport					
Roads	O	O	O	O	
Urban rail	O				
Ports	O	O			
Airports	O	O			
Others					
Water supply	O	O	O	O	O
Heating		O			
Electricity		O			
Tourism	O	O			

Source: Commonwealth Local Government Forum (CLGF)

6.2.5. Social Infrastructure Needs in India

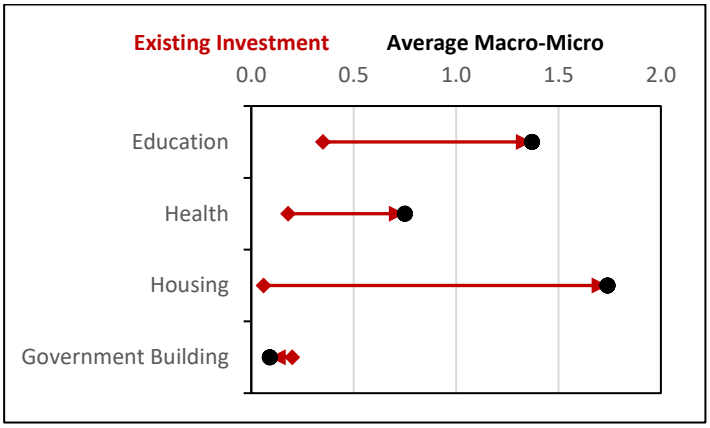
Although India's government has already doubled the investment in infrastructure during the Twelfth Plan Period to 10%, some challenges remain. These include providing affordable housing and universal compulsory education and making health services more accessible for the poor and people in remote areas. By 2030, India is projected to allocate approximately 3.400 billion USD or about 4.4 percent of GDP for investment in social infrastructure. Such investment is dominated by spending on public housing because of the great shortage of housing, particularly for people in the economically weaker sections (EWS) and low-income groups (LIG). Investment in public housing is estimated to be around 1.491 billion USD in 2030 or approximately 2 percent of India's GDP annually.

Investment in human capital is vital for India, the second most populated country in the world. Between 2016 and 2030, India needs to allocate 1.174 billion USD to finance its education sector. This is equal to 78 billion USD per year for 15 years or about 1.54 percent of GDP annually. For healthcare and government building, the needs are rather small compared to the housing and education sectors. India is expected to invest around 0.8 percent and 0.1 percent of its GDP per year to fulfil its healthcare and government building needs respectively.



Source: authors' calculation

Figure 6.22. Social infrastructure needs in India (% of GDP), 2016–2030



Source: authors' calculation

Figure 6.23. Financing Gap (% of GDP)

As we have for China, we estimate that India has been able to meet its financing needs for government building. The gap for other social infrastructures, however, remains high, particularly for the housing sector. Our estimation shows that India's investment in public housing was around 0.06 percent of GDP in 2016, or 1.68 percent short of average annual investment needed (about 1.74 of GDP). India's policies to lessen its housing shortage, however, are already in place. One of them is the government's flagship program, the *Pradhan Mantri Awas Yojana (PMAY),* which was launched in 2015. Through this program, it is expected that the government will be able to accelerate its investment in public housing and reduce the number of people living in slums. The gaps for the education sector and the health sector, on the other hand, are estimated to be around 1 percent and 0.6 percent of GDP per year, respectively.

6.2.6. Lessons Learned from India: Public Housing Financing in India

The housing shortage, especially in urban areas, has been a major issue in many developing countries, including India. A report by the technical group of urban housing in India estimated a shortage of approximately 19 million residential units in urban areas and almost 44 million units in rural areas. Housing needs are also higher for people in lower-income groups. The economically weaker sections (EWS) and the lower-income group (LIG) contributed to 96 percent of housing needs in urban areas or the equivalent of 18 million houses.

To overcome this problem, one of the major policies taken by the Indian government is to provide housing subsidies for state government, the private sector, and eligible individuals. This policy, known as the *Pradhan Mantri Awas Yojana (PMAY),* aims to provide housing for all Indian citizens. It consists of four major programs, (i) slum redevelopment, (ii) credit-linked subsidies for EWS and LIG, (iii) affordable housing in partnership, and (iv) subsidies for individual house construction or enhancement.

1. 'In-situ' slum redevelopment

   This approach aims to bring slum dwellers into the formal urban settlement. This program enables state government to develop land which had been occupied by slum dwellers into formal neighbourhoods. The development plan, including identifying eligible slum dwellers, building quality, and ensuring ownership rights should meet certain standards determined by the state government or union territory and the Ministry of Housing and Urban Poverty Alleviation (MoHUPA).

2. Credit-linked subsidies for EWS and LIG

   The credit-linked subsidies to provide low-interest home loans for the eligible urban poor (EWS/LIG). These subsidies are channelled through the Housing and Urban Development Corporation (HUDCO) and the National Housing Bank (NHB) as central nodal agencies (CNAs). CNAs are responsible for ensuring the implementation and monitoring of the scheme, and they give regular monitoring updates to MoHUPA. This scheme gives preference to certain groups such as manual scavengers, women, indigenous people, minorities, and persons with disabilities.

3. Affordable housing in partnerships

   This scheme provides financial assistance for houses built under different schemes outside the *PMAY* programs. The partnership enables a state government or union territory to decide an upper ceiling on the sale price of houses to make them affordable to the intended beneficiaries, provided this causes no loss for the project and it is conducted through a transparent process of factoring incentives for project owners.

4. Subsidies for individual house construction or enhancement

   This scheme is available for individuals in EWS categories to construct new houses or improve existing houses to meet a certain standard of decent housing set by MoHUPA.

   It is believed that *PMAY* will not only increase the supply of houses in India but also improve the quality of housing for its citizen. This program enables MoHUPA to demand certain housing standards should the beneficiaries want to receive the subsidy. Although the sustainability of the funding has not yet been evaluated by the government or academics, the *PMAY* program gives hope for people in the low-income group to have access to decent housing in India.

Box 3. Case Study: Rent Control in Mumbai, India

The first-generation rent control, also called standard rent, is fixed at the time of first letting and allows restricted annual increases at a rate well below the inflation rate. This scheme ignores the effect of inflation rates, incentives for maintenance of rental properties and minimal returns to landlords. The first generation of rent controls was introduced in cities of Western Europe and North America in the 1940s. The rent is typically kept at a level below market rent. This scheme protects the tenants from eviction and allows them and their descendants to live in the properties almost forever. The second generation of rent control, introduced during the 1970s and 1980s, was a milder version of rent control. It allowed an annual percentage increase over the rent to compensate for maintenances costs and for the landlord to gain a reasonable rate of return. This scheme allows the controlled rent to converge with market rent over time.

The city of Mumbai is known for its large and densely packed population, limited availability of land, and high concentration of business and financial activities. It is a primary driver for the state of Maharashtra, contributing around 21 percent to Maharashtra's gross domestic product. It is also one of the richest local governments in the country with a budget larger than most Indian states. Currently, the increasing demand for housing is not being met by an increase in supply. A lot of slums were created because of the inability of poorer households to afford rental housing.

Rent control in Mumbai was regulated by the Bombay Rents, Hotel, and Lodging House Rates Control Act of 1947. Under that act, rents in rent-controlled properties were to remain below standard rents. The act restricts the growth of rents and provides a minimal increase for repair and improvement of the houses. The act was extended repeatedly until 1999. The 1999 Act provides an annual adjustment of rent as much as 4 percent. This act, however, has not brought relief to the landlords since there is still a gap between the controlled rents and the market rents.

Year of construction	Other than self-occupied (including leave and licences)		Self-occupied (including vacant properties)		Protected by Rent Control Act	
	Area[a]	Units	Area	Units	Area	Units
Situation as of 1961	-	-	59.3%	49.7%	40.7%	50.3%
Added between 1962 and 2010	-	-	96.8%	95.3%	3.2%	4.7[b]%
Situation as of 2010	0.7%	0.5%	86.7%	82.4%	12.6%	17.1%

Table above presents the proportion of residences under different tenure agreements from 1961 to 2010. As of 1961, the proportion of residents living in self-occupied houses was 49.7 percent, almost equal to those who lived under controlled rent (50.3 percent). On the other hand, from 1961 to 2010, the level of self-occupied housing added in Mumbai was 95.3 percent, much higher than the growth of rental housing which was less than 5 percent. As of 2010, the proportion of self-occupied properties was 82.4 percent, while the controlled-rent properties contributed only 17.1 percent of total properties. The rest (under 1 percent) is short-term rental housing.

There are three main implications of the rent control regime in Mumbai. First, it deteriorated the quality of rent-controlled properties. The low return to landlords adversely affected their incentives to maintain their properties. Second, the rent controls resulted in unclear property rights. With eviction being difficult, it created a situation where rent-controlled properties were hardly transferred in the formal market. Third, the diminishing profitability from stagnant low rents also led to a declining rate in the provision of new rental housing, causing new formal rental housing to come to a standstill.

To overcome the problem of a rent-control scheme, policies should be focused on two objectives: improving the existing rental housing stock and providing incentives for new investment. Some reforms include removing protection for those who do not require it, making agreements between tenants and landlords for housing maintenance, and moving the policies towards second-generation rent controls.

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CHAPTER 7
CONCLUDING REMARKS

Investing in both physical and social infrastructure is one of the necessary conditions to foster inclusive economic growth. Despite improvements in social infrastructure provisions, some parts of Asia should continuously increase social infrastructure investment to further support more sustainable economic growth. Social infrastructure is both the goal and the tool to achieve the 2030 agenda's SDGs. The housing infrastructure considerably influences the SDGs' targets of no poverty and sustainable cities and communities (SDG 1 and 11). Hospitals, health centres, and schools are linked with effective means to combat poverty, achieve good health and wellbeing, and provide quality education (SDG 1, 3, and 4). Government building infrastructure is responsible for managing the achievement of the SDGs' targets.

Asia, where more than half of the world's population (4.96 billion) resides, has very diverse and dynamic characteristics. Countries in Asia range from lowest to highest income and from the least to the most highly industrialised. Some countries have hundreds of millions of people, while others measure only in the thousands; some have a predominantly young population, while others' population is ageing rapidly. This rapid population growth, as well as the urbanisation trend, have caused the proportion of elderly people in Asia to change rapidly, while the proportion of urban population in 2030 is projected to be 57%—in 2015, it was just 48% (UN, 2017).

Dealing with diverse and dynamic Asia, then, the question is how much social infrastructure investment is needed in Asia to facilitate and boost economic growth, as well as to address economic and population dynamics? Considering various challenges in data and methodological approaches, this study then estimated the social infrastructure demand and financing gap. This study used two strategies to estimate social infrastructure needs in Asia during 2016–2030 by considering population dynamics, changes in the standard of living, and the economic condition. The first approach was the macro-approach, a top-down methodology regarding social infrastructure needs as a function of economic and demographic factors. The second approach was the micro-approach, a bottom-up methodology that calculated needs based on changes in the number of beneficiary or population dynamics.

Over the next 15 years, we estimated that Asia Pacific will need approximately $26-27 trillion, or $1.8 trillion annually, to meet its social infrastructure needs. This number is equivalent to 4.5%-4.6% of the projected GDP. East Asia dominates investment needs, which account for 68%-71% of their total needs. They are mainly driven by China's demand, given its economic condition, population size, and stage of development. In the education sector, the total investment needed for University level is the highest, with the needs of investment being approximately 0.4%–0.6% of Asia's GDP from 2016 to 2030, followed by secondary education (0.3%–0.4%) and primary education (0.2%). In terms of geographical location, East Asia is the region with the highest total investment needed, with China as the main driver with its massive population. In terms of countries' phases of development, low-income countries need an investment of approximately 5%-5.9% of their GDP; high-income countries only need approximately 0.1-0.6% of their GDP

The investment in health infrastructure from 2016–2030 would need approximately 1.1% of Asia's GDP. Among Asia's regions, East Asia contributes the most to health investment due to China leading 71.6%-81.0% of health investment needs, while Asia Pacific contributes the least. However, in terms of health investment per GDP, the Pacific, on average, has the second-highest contribution. The trend of health investment to GDP in this period in Central Asia and East Asia should decrease, while in South Asia, South-East Asia (albeit quite flat), and Pacific Asia, the trend should increase.

In public housing, the total investment needs ranged from $13.3-13.4 trillion. These amounts are approximately equal to 2.3% of Asia's GDP. Comparing countries based on income level, both macro- and micro-estimations show that the largest investment portion for public housing infrastructure should be allocated to countries categorised as upper-middle-income countries, while the least portion of investment should go to low-income countries. The trend of the share of public housing investment to GDP in almost all Asia's regions during the period of 2016–2030 should increase except in Central Asia, which is likely to decrease. Moreover, the total investment for government building infrastructure will be approximately 0.1- 0.2% of Asia's GDP. The government then have to search innovative and creative financing schemes for dealing with the resource constraint to fulfil the demand of social infrastructure to promote a sustainable and inclusive economic growth and prosperity.

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APPENDICES

App. 1 Cost per unit in 14 Asia Countries

No	Indicators	Country		Cost in 2015	source
A	Education (Primary School) - Building Cost per Meter Square	1	Afghanistan	437.9	a
		2	Bangladesh*	247.3	b
		3	China	864.3	l
		4	Fiji	602.3	c
		5	India	283.9	d
		6	Indonesia	741.9	l
		7	Malaysia	572.0	l
		8	Myanmar	149.7	e
		9	Pakistan	512.8	f
		10	Papua New Guinea	608.6	g
		11	Philipina	680.9	l
		12	Thailand	736.3	l
		13	Uzbekistan	517.8	h
		14	Vietnam	540.9	i
		15	Japan	557.0	bg
B	Education (Secondary School) - Building Cost per Meter Square	1	Afghanistan	450.9	j
		2	Bangladesh	247.4	k
		3	China	775.5	l
		4	Fiji	633.7	m
		5	India	290.5	n
		6	Indonesia	659.4	l
		7	Malaysia	420.5	l
		8	Myanmar	147.4	o
		9	Pakistan	512.8	p
		10	Papua New Guinea	608.6	q
		11	Philipina	722.3	l
		12	Thailand	755.6	l
		13	Uzbekistan	999.9	r
		14	Vietnam	540.9	s
		15	Japan	662.3	bg
C	Education (University) - Building Cost per Meter Square	1	Afghanistan	1,213.1	t
		2	Bangladesh	237.3	u
		3	China	1,645.8	v
		4	Fiji	596.7	w
		5	India	354.5	x
		6	Indonesia	718.8	y
		7	Malaysia	990.2	z
		8	Myanmar	200.0	aa
		9	Pakistan	761.5	ab
		10	Papua New Guinea	683.6	ac
		11	Philipina	805.2	l
		12	Thailand	821.0	l
		13	Uzbekistan	1,488.8	ad
		14	Vietnam	691.4	ae
		15	Japan	1,430.0	bg
D		1	Afghanistan	326.0	af

No	Indicators	Country		Cost in 2015	source
	Health (General Hospital) - Building Cost per Meter Square	2	Bangladesh	1,651.8	ag
		3	China	2,683.1	l
		4	Fiji	784.6	ah
		5	India	501.3	ai
		6	Indonesia	934.2	l
		7	Malaysia	884.7	l
		8	Myanmar	188.4	al
		9	Pakistan	563.5	am
		10	Papua New Guinea	754.4	an
		11	Philipina	1,271.6	l
		12	Thailand	1,360.6	l
		13	Uzbekistan	391.8	ao
		14	Vietnam	637.3	ap
		15	Japan	3,676.7	bg
E	Housing (Public Housing) - Building Cost per Meter Square	1	Afghanistan	104.3	aq
		2	Bangladesh	241.4	ar
		3	China	677.4	l
		4	Fiji	484.1	as
		5	India	307.4	at
		6	Indonesia	401.5	l
		7	Malaysia	455.0	l
		8	Myanmar	121.6	l
		9	Pakistan	201.7	l
		10	Papua New Guinea	266.2	au
		11	Philipina	391.2	l
		12	Thailand	303.5	l
		13	Uzbekistan	418.1	av
		14	Vietnam	429.9	ax
		15	Japan	2,606.6	bg
F	Government Building - Building Cost per Meter Square	1	Afghanistan	626.1	ay
		2	Bangladesh	254.1	az
		3	China	1,610.7	l
		4	Fiji	567.2	ba
		5	India	398.8	bb
		6	Indonesia	536.7	l
		7	Malaysia	610.1	l
		8	Myanmar	1,182.4	l
		9	Pakistan	836.6	l
		10	Papua New Guinea	1,138.1	bc
		11	Philipina	757.1	l
		12	Thailand	531.4	bd
		13	Uzbekistan	468.3	be
		14	Vietnam	667.4	bf
		15	Japan	3,676.7	bg

Note: These 14 countries are the reference countries for the rest Asia Countries. The detail reference countries are in table app 3.

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Appendice 2 Variables used in estimation and projection

Variable	Time Period	Data Source	
		Regression	Projection
Number of hospital beds	1993 - 2017	World Development Indicator, World Bank	
Number of primary, secondary, and university student	1993 - 2017	World Development Indicator, World Bank	
Number of populations living in slum area	1993 - 2017	World Development Indicator, World Bank	
Number of civil servants	In general: 2011 – 2017 *China*: starts from 1993 *Bangladesh*: starts from 1997 *Indonesia*: starts from 2002 *India, Azerbaijan, Kyrgyztan*: starts from 2006	Statistical Yearbook (various countries & years) and ILOSTAT	
Population size, age 0-5	1993 - 2017	World Development Indicator, World Bank	World Development Indicator, World Bank
Population size, age > 65	1993 - 2017	World Development Indicator, World Bank	World Development Indicator, World Bank
Enrollment rate (secondary school)	1993 - 2017	UNESCO Institute for Statistics (UIS) Database	UNESCO Institute for Statistics (UIS) Database
Agriculture, forestry, and fisheries' share in GDP	In general: 2011 – 2017 *China*: starts from 1993 *Bangladesh*: starts from 1997 *Indonesia*: starts from 2002 *India, Azerbaijan, Kyrgyztan*: starts from 2006	World Development Indicator, World Bank	World Development Indicator, World Bank
Life Expectancy	1993 - 2017	World Development Indicator, World Bank	World Population Prospects, UN
GDP per capita	1993 - 2017	World Development Indicator, World Bank	Real GDP, GDP deflator, Inflation rate: World Economic Outlook, IMF Population size: World Population Prospects, UN
Population density	1993 - 2017	World Development Indicator, World Bank	World Population Prospects, UN
Manufacturing's share in GDP	1993 - 2017	World Development Indicator, World Bank	World Development Indicator, World Bank
Unemployment Rate	In general: 2011 – 2017 *China*: starts from 1993 *Bangladesh*: starts from 1997 *Indonesia*: starts from 2002 *India, Azerbaijan, Kyrgyztan*: starts from 2006	World Development Indicator, World Bank	World Economic Outlook, IMF
Urbanization rate	1993 - 2017	World Development Indicator, World Bank	Long-term Urban Population, *Our World in Data*
Population size of respective age in each education level	1993 - 2017	World Development Indicator, World Bank	Self-computed by using proportion from World Population Prospects, UN

Urban poverty headcount ratio	1993 - 2017	World Development Indicator, World Bank	World Development Indicator, World Bank

App 3 Reference Countries list

	Target Countries for Social Infrastructure Demand Estimate (the Same as ADB's Estimate for Economic Infrastructure. 45 ADB Developing Member Countries)	A. Reference Country	B. Countries Where the study Apply the Data of Reference Country	Reference country for the countries B.
1. Number of Countries Covered	**45**	**14**	**32**	
Eastern Asia	√	√		
China	●	●		-
China, Hong Kong SAR	●		●	Japan
China, Taiwan Province of China	●		●	Japan
Mongolia	●		●	Uzbekistan
Republic of Korea	●		●	Japan
Japan		●		
South-Central Asia	√	√		
Central Asia	√	√		
Kazakhstan	●		●	Uzbekistan
Kyrgyzstan	●		●	Uzbekistan
Tajikistan	●		●	Uzbekistan
Turkmenistan	●		●	Uzbekistan
Uzbekistan	●	●		-
Southern Asia	√	√		
Afghanistan	●	●		-
Bangladesh	●	●		-
Bhutan	●		●	Afganistan
India	●	●		-
Maldives	●		●	Fiji
Nepal	●		●	Afganistan
Pakistan	●	●		-
Sri Lanka	●		●	India
South-Eastern Asia	√	√		
Brunei Darussalam	●		●	Malaysia
Cambodia	●		●	Vietnam
Indonesia	●	●		-
Lao People's Democratic Republic	●		●	Vietnam
Malaysia	●	●		-
Myanmar	●	●		-
Philippines	●	●		-
Singapore	●		●	Malaysia
Thailand	●	●		-
Timor-Leste	●		●	Indonesia
Viet Nam	●	●		-
Western Asia	√	√		
Armenia	●		●	Uzbekistan

	Target Countries for Social Infrastructure Demand Estimate (the Same as ADB's Estimate for Economic Infrastructure. 45 ADB Developing Member Countries)	A. Reference Country	B. Countries Where the study Apply the Data of Reference Country	Reference country for the countries B.
Azerbaijan	●		●	Uzbekistan
Georgia	●		●	Uzbekistan
Australia/New Zealand	√	√		
Melanesia	√	√		
Fiji	●	●		-
Papua New Guinea	●		●	Indonesia
Solomon Islands	●		●	Fiji
Vanuatu	●		●	Fiji
Micronesia	√	√		
Kiribati	●		●	Fiji
Marshall Islands	●		●	Fiji
Micronesia (Fed. States of)	●		●	Fiji
Nauru	●		●	Fiji
Palau	●		●	Fiji
Polynesia	√	√		
Cook Islands	●		●	Fiji
Samoa	●		●	Fiji
Tonga	●		●	Fiji
Tuvalu	●		●	Fiji