Technical Note on the Estimation of Social Infrastructure Investment Needs
---*Case Study of Japan*---

"Bridging the Infrastructure Gap in Asia" ADB-JICA Joint Side Event at the 50th Annual Meeting of the ADB Board of Governors"

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1. Introduction

Social infrastructure, such as schools and hospitals, is a key capital investment area for the maintenance of social services and securing the economic development of a region where population is expected to increase. The financial impact of this investment on public finance is also enormous. The Japan International Cooperation Agency (JICA) has agreed with the Asian Development Bank (ADB) to conduct research on Asia's social infrastructure needs estimates for the same period 2016-2030 as the ADB used to estimate economic infrastructure needs in its recently published report (ADB 2017).

The financial burden derived from infrastructure investment is not limited to the construction stage; new infrastructure requires subsequent expenditure to cover the costs of operation and maintenance, rehabilitation and replacement during and at the end of the facility's lifecycle. The problem of securing financial resources for infrastructure rehabilitation and replacement arises in a country such as Japan, where the population is aging and the financial deficit is expanding. Other Asian countries where a decline in birth rates in the future is projected will also follow the same path.

This paper therefore tries to build a methodology to estimate the demand for social infrastructure in Asia by holistically considering its lifecycle and applying it to the case of Japan. For this trial estimate, two specific social sectors in which urgent needs for investment are observed in the region were selected: education (schools) and health care (hospitals and other medical facilities). This case study is expected to contribute to the development of an estimation model for social infrastructure needs in the whole region.

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2. Methodology

The academic literature on social infrastructure investment needs estimate is however limited. In Japan, where the deterioration of existing infrastructure and its replacement has become social problem, Nemoto (2017) and the Ministry of Education, Culture, Sports, Science and Technology (MEXT) (2013) have estimated replacement costs by identifying the social infrastructure stock which needs to be replaced on a yearly basis. On the other hand, a regression analysis using time series data, the methodology used in the above-mentioned ADB report on economic infrastructure, can also be extended to the analysis of social infrastructure.

Based on the above-mentioned studies and other inputs from academic experts[2], this paper proposes a new methodology for estimating social infrastructure investment needs covering the whole lifecycle of infrastructure: construction, operation and maintenance, rehabilitation and replacement. In this methodology, the following two approaches are applied to estimate each year's social infrastructure stock, and the pros and cons summarized as shown in Table 1:

1) A micro approach that builds a picture of each year's needs by multiplying the projected number of beneficiaries by official construction standards (square meter per beneficiary); and
2) A macro approach that estimates each year's demand using regression analysis to apply time series data of possible demographic/economic factors.

Table 1: The pros and cons of micro and macro approaches

Approach	Overview	Pros	Cons
1. Micro	Build up each year's needs by multiplying the projected number of beneficiaries (e.g. students for schools) by the official construction standard (e.g. square meter per student)	Needs can be estimated without considering constraints on the supply side (e.g. government budget ceilings, construction industry capacity)	Volume of data required for estimates would be relatively large (e.g. official construction standards), and may be difficult to apply to all countries in the region.
2. Macro	Estimate each year's demand (dependent variable) by regression analysis, applying time series data of possible demographic/economic factors (independent variables).	Relatively efficient in analyzing the chronological trends and differences among countries.	As the analysis is based on time-series data for past infrastructure stock (equilibrium of demand and supply), potential needs of the demand side cannot be incorporated.

[2] Technical inputs and advices to this research were provided by Professor Yuji Nemoto, Professor Kazuyasu Kawasaki and Assistant Professor Yu Namba of Toyo University.

2-1. The Micro Approach

For the micro approach, each year's infrastructure stock measured as the area of facilities is estimated by multiplying the projected number of beneficiaries by the official construction standards. As long as the five specific data sets (a. construction unit price, b. projected number of beneficiaries, c. official facility standards, d. given O&M proportion, and e. official lifetime standard) can be obtained, each year's infrastructure needs in any country or locality can be estimated as the sum of: 1) new investment demand; 2) operation and maintenance demand; 3) replacement demand; and 4) rehabilitation demand; as shown in Table 2.

Table 2: Overview of the micro approach estimation method

Feature	Formula	Necessary Data
1) New Investment Demand	Construction unit price x Change in number of beneficiaries (e.g. student for school) x Official facility standard (square meter/person)	a. Construction unit price b. Projected number of beneficiaries c. Official facility standard (square meters/person)
2) Operation and Maintenance Demand	O&M unit price (Construction unit price x Given O&M proportion) x Infrastructure stock (Projected number of beneficiaries x official facility standards)	d. Given O&M proportion (the division of annual O&M cost by construction cost)
3) Replacement Demand	Construction unit price x Infrastructure stock/Official lifetime standard	e. Official building lifetime standard (the number of years for the use of facility).
4) Rehabilitation Demand	Construction unit price x 60%[3] x Infrastructure stock/Official lifetime standard	

2-1-1. Data used to study the Education Sector

For the education sector, most of the data necessary for the needs estimates can be obtained from the Japanese government's official statistics. The applied figures and sources for the estimation are summarized in Table 3.

Regarding b. Projected number of beneficiaries, the core of this estimation approach, the Japanese government's population projections by prefecture, age and sex (National Institute of Population and Social Security Research 2013) were used. As school enrollment rates have not radically changed in recent years, a fixed figure can be applied throughout the period from 2016 to 2030. A single exception is the school for handicapped children; its school enrollment rate

[3] The proportion of 60% is derived from the assumption that the construction cost of a building can be divided into four categories (30% for building frame, 30% for equipment such as electricity and ventilation, 30% for interior decoration and 10% for others), and that the replacement of equipment and interior decoration (only) is necessary for its rehabilitation at the middle of the life cycle. This is the standard applied in *Foundation for Regional* V*iltalization* (2016), and used by Japanese local governments for their social infrastructure management.

has been increasing, and this trend is assumed to continue until 2030.

Table 3: Data used for the education sector estimation

<table>
<tr><th colspan="2">Data</th><th>Applied Figure</th><th>Source</th></tr>
<tr><td colspan="2">a. Construction unit price</td><td>0.33</td><td>Japan Foundation for Regional Vitalization（2016）</td></tr>
<tr><td rowspan="6">b. Projected number of beneficiaries (multiplication of Japanese government’s population projection[4] and school enrolment rates are shown in the right column)</td><td>Kindergarten & Nursery</td><td>0.93</td><td>Cabinet Bureau (2012)</td></tr>
<tr><td>Elementary School</td><td>1.00</td><td>Assumed to be 100% (Obligatory education)</td></tr>
<tr><td>Junior High School</td><td>1.00</td><td>Ditto</td></tr>
<tr><td>High School</td><td>0.96</td><td>MEXT (2015a)</td></tr>
<tr><td>University</td><td>0.56</td><td>Ditto</td></tr>
<tr><td>Special School for Handicapped Children (Tokubetsu Shien Gakkou)</td><td>0.0083</td><td>Ditto
<u>Assumed to increase by 3.39% per year based on the past 15 years’ trend</u></td></tr>
<tr><td rowspan="6">c. Official facility standard (square meter/person)</td><td>Kindergarten & Nursery</td><td><u>11.97</u></td><td>MEXT (2015b)</td></tr>
<tr><td>Elementary School</td><td><u>15.48</u></td><td>Ditto</td></tr>
<tr><td>Junior High School</td><td><u>17.36</u></td><td>Ditto</td></tr>
<tr><td>High School</td><td><u>22.15</u></td><td>Ditto</td></tr>
<tr><td>University</td><td><u>43.55</u></td><td>MEXT (2015c)</td></tr>
<tr><td>Special School for Handicapped Children (Tokubetsu Shien Gakkou)</td><td>76.35</td><td>MEXT (2015b)</td></tr>
<tr><td colspan="2">d. Given O&M proportion</td><td>0.01</td><td>Building Maintenance and Management Center (2005)</td></tr>
<tr><td colspan="2">e. Official lifetime standard</td><td>60</td><td>Japan Foundation for Regional Vitalization（2016）</td></tr>
</table>

Regarding c. Official facility standards, the national government’s standard for the disbursement of subsidy to local governments for construction of public schools was used. The total necessary area calculated using this standard for public schools is available from official statistics (MEXT 2015 b, c). The division of this figure by the number of public school students is applied to create the needs estimation.

[4] National Institute of Population and Social Security Research (2013).

2-1-2. Data used for the Health Care Sector

For the health care sector analysis, the applied figures and sources for the estimations are summarized in Table 4.

Table 4: Data used for health care sector estimation

Data		Applied Figure	Source
a. Construction unit price		0.33	Japan Foundation for Regional Vitalization (2016）
b. Projected number of beneficiaries (the multiplication of Japanese government's population projection and medical treatment rates (proportion of persons under medical treatment) are shown in the right column)	Hospital (20 or more beds): Medical treatment rate (inpatient) (reference: average of all generation) Proportion of hospital inpatients	0.01038 0.97	Ministry of Health, Labor and Welfare (2014a) Ministry of Health, Labor and Welfare (2014a)
	Clinic (less than 20 beds): Medical treatment rate (outpatient) (reference: average of all generation) Proportion of clinic outpatients	0.05696 0.77	Ministry of Health, Labor and Welfare (2014a) Ministry of Health, Labor and Welfare (2014a)
	Health Care Facility for the Aged (*Kaigo Roujin Hoken Shisetsu*): Facility usage rate (reference: average of all generation)	0.00255	Ministry of Health, Labor and Welfare (2013)
c. Official facility standard (square meters/person)	Hospital: Area (Square meters)/Number of beds Number of beds/Number of beneficiaries	110.89 89.04 1.25	Japan Institute of Healthcare Architecture (2017) (Average of 651 hospitals constructed in the past 10 years) Ministry of Health, Labor and Welfare (2014 b)
	Clinic: Area (Square meters)/Number of beds Number of beds/Number of beneficiaries	53.88 2,207.12 0.02	Japan Institute of Healthcare Architecture (2017) (Average of 141 clinics constructed in the past 10 years) Ministry of Health, Labor and Welfare (2014 b)
	Health Care Facility for the Aged (*Kaigo Roujin Hoken Shisetsu*): Area (Square meters)/Number of beds Number of beds/Number of beneficiaries	97.94 89.04 1.10	No statistics. Assumed to be the same as for hospitals. Ministry of Health, Labor and Welfare (2013)
d. Given O&M proportion		0.01	Building Maintenance and Management Center (2005)
e. Official lifetime standard		60	Japan Foundation for Regional Vitalization (2016）

Regarding b. Projected number of beneficiaries, official population projections by prefecture, age and sex (National Institute of Population and Social Security Research 2013) were also used in the health care sector estimations. Medical treatment rates for hospitals and clinics, and facility usage rates for health care facilities for the aged are different according to generation (data by 10 years). The past trend of the change in medical treatment or facility usage rate is also assumed to continue until 2030.

Regarding c. Official facility standards, the data on the number of beds and facilities is available in official statistics. For the data on area (square meters) of facilities, the average provided in hospitals and clinics constructed in the past 10 years was calculated based on data provided by the Japan Institute of Healthcare Architecture, and applied to this needs estimation.

2-2. Macro Approach

For the macro approach, the number of facilities[5] in each facility was estimated from 2016 to 2030 by regression analysis, using time series data based on the past trend of infrastructure stock. Note that in our use of a regression formula for the projection from 2016 to 2030, our interest was to obtain the best fit possible and the highest explanatory power. Thus, we included the lagged value of the dependent variable in the regression to increase explanatory power. The lag length for each regression formula was selected by means of information criteria such as the Akaike Information Criterion (AIC) and the Bayes Information Criterion (BIC).

For the calculation of the infrastructure demand for each year, we regarded the increment from the previous year's infrastructure stock as "New Investment Demand," and adopted the methodology used in the micro approach to calculate for "Operation and Maintenance Demand," "Replacement Demand," and "Rehabilitation Demand."

2-2-1. Regression Equation on Education Sector

Since it was difficult to acquire long-term data on the area of educational facilities, this was estimated using the time series data from 1960 to 2015 of the number of each type of educational facility; classified into (a) preschool educational facilities (kindergartens), (b) early secondary educational facilities (elementary and junior high schools), (c) late secondary educational facilities (high schools), and (d) higher education facilities (universities and junior colleges).

Equation 1 was adopted for each type of educational facility:

[5] In the case of demand estimation for hospitals, the number of beds was adopted as the dependent variable for the regression analysis.

$$I_t = \alpha_0 + \alpha_1(I_{t-i}) + \alpha_2 y_t + \alpha_3 Urban_t + \alpha_4 Pop_t + \epsilon_t \quad . \; . \; . \qquad 1$$

Where: all variables are in natural logs to linearize the model; I_t is demand for infrastructure stock at time t; (I_{t-i}) is the lagged value of the infrastructure stock; y_t is income per capita; $Urban_t$ is the urbanization rate; Pop_t is the population of target age [6]for each educational facility; and ϵ_t is an error term.

Income per capita, one of the independent variables, has led to an increase in the number of educational facilities, since enrollment rates increase with improvements in income. However, we excluded income per capita as an independent variable in the case of early secondary educational facilities, because this group's enrollment ratio has been 100% according to the constitution. The progress of urbanization, which is an independent variable in the estimation of economic infrastructure demand estimation by the ADB, is assumed to be related to increases and decreases in the number of necessary educational facilities.

2-2-2. Regression Equation on Health Care Sector

Demand estimates were made separately for hospitals and clinics using time series data from 1975 to 2014. The number of beds in hospitals and the number of facilities in clinics were adopted as dependent variables in the regression equation on hospitals and clinics respectively, in line with the method of demand estimation used in the micro approach.

Equation 2 was adopted for the demand estimates of hospitals and clinics:

$$I_t = \alpha_0 + \alpha_1(I_{t-i}) + \alpha_2 y_t + \alpha_3 Urban_t + \alpha_4 Pop05_t + \alpha_5 Pop65_t + \epsilon_t \quad . \; . \; . \qquad 2$$

Where: all variables are in natural logs to linearize the model; I_t is demand for infrastructure stock at time t; (I_{t-i}) is the lagged value of the infrastructure stock; y_t is income per capita; $Urban_t$ is the urbanization rate; $Pop05_t$ is the number of people from 0 to 5; $Pop65_t$ is the number people above 65; and ϵ_t is an error term.

Higher income per capita has led to an increase in the number of health facilities through improvements in the communities' ability to pay for medical expenses. In addition, the progress of urbanization affects the management of hospitals and clinics and encourages increases or decreases in the number of facilities. The number of beds in hospitals and of facilities in clinics is affected by the number of hospitalized patients and the size of the diseased population,

[6] (a) preschool educational facilities: age population from 3 to 5, (b) early secondary educational facilities: age population from 6 to 14, (c) late secondary educational facilities: age population from 15 to 17 and (d) higher education facilities: age population from 18 to 21.

therefore the age groups of the infants and elderly, who are more likely to be candidates for treatment, were adopted as independent variables.

2-2-3. Growth Projections relating to the Independent Variables

Estimates of infrastructure needs are based on projections of change in the independent variables as discussed in Sections 2-2-1 and 2-2-2 for the period 2016-2030. First, this paper used linearly interpolated data for each age group in the population up to 2030; based on the forecast data published by the National Institute of Population and Social Security Research of Japan. Second, projections of gross domestic product (GDP) were calculated from annual GDP growth rates published by the OECD. Finally, the annual increase rate of urbanization from 2014 to 2015, extrapolated to 2030, was used for projection purposes.

2-2-4. Infrastructure Unit Cost

For the education sector analysis, we put together data on the total area of educational facilities divided by the total number of facilities (square meter per facility), and multiplied this with the unit price (0.33 million JPY per square meter). For the health care sector, we used a pre-condition of the micro approach: 89.04 square meters per bed for hospitals; and 2,207.12 square meters per facility for clinics, and multiplied these data with the unit price (0.40 million JPY per square meter). The results of this estimation gave the following unit costs that could be used to calculate infrastructure investment requirements for each facility.

Table 5. Facility construction unit cost used for Macro approach

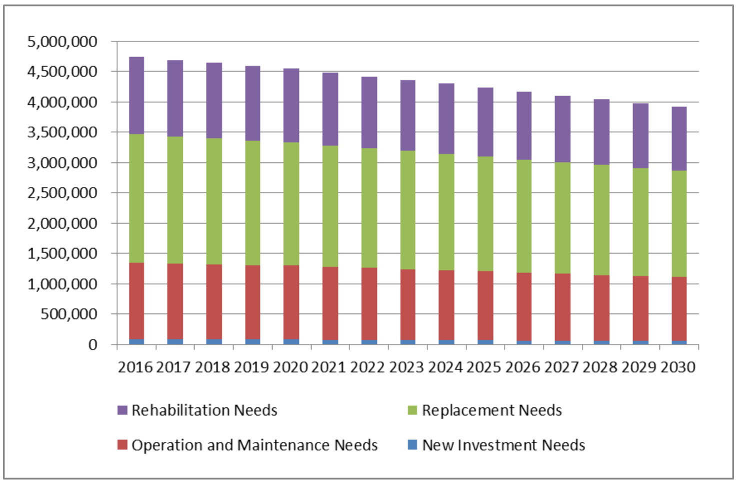
Type of Facility	Unit cost (million JPY, 2016 price level)	Unit
(a) Kindergarten	343.53	Facility
(b) Elementary and junior high school	1,761.54	Facility
(c) High school	4,345.11	Facility
(d) University and junior college	22,551.54	Facility
(e) Hospital	35.616	Bed
(f) Clinic	882.848	Facility

3. Estimation Results

3-1. The Micro Approach

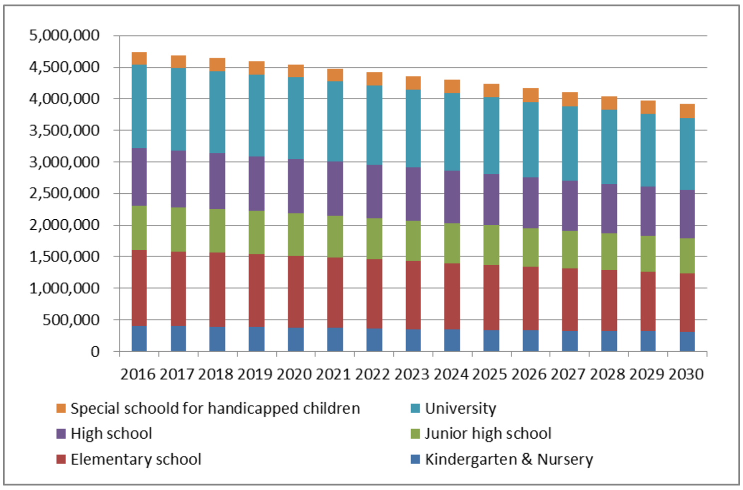
As a result of estimating each year's infrastructure needs based on the projected number of beneficiaries (the Micro approach), Japan's education infrastructure requires investments of **65,197,462 million JPY** in the period 2016-2030 (an average expenditure per year of 4,346,497 million JPY), and the country's health care infrastructure requires **102,947,978 million JPY** for the same period (an average expenditure per year of 6,863,199 million JPY). The detailed results by type of needs (new investment needs, operation and maintenance needs, replacement needs and rehabilitation needs), and by type of facility are shown in Figures 1 to 4.

Figure 1: Education sector estimation result (by type of needs, million JPY)



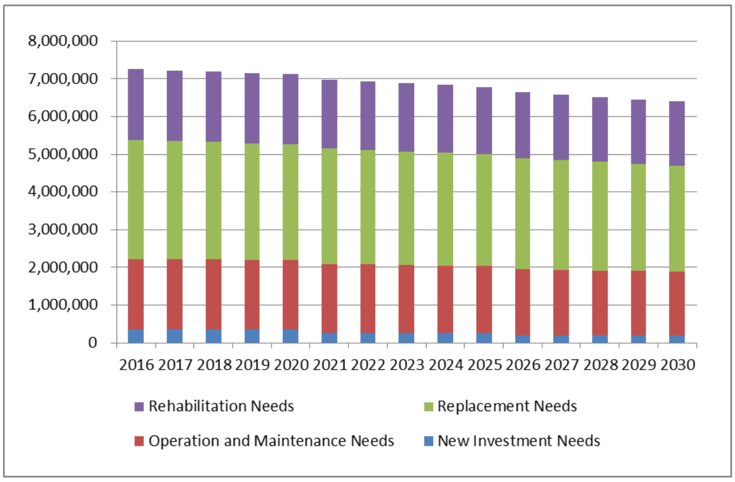
Type of needs	
as % of Total needs	
New investment	1.62%
Operation and maintenance	26.83%
Replacement	44.72%
Rehabilitation	26.83%

Figure 2: Education sector estimation result (by type of facility, million JPY)



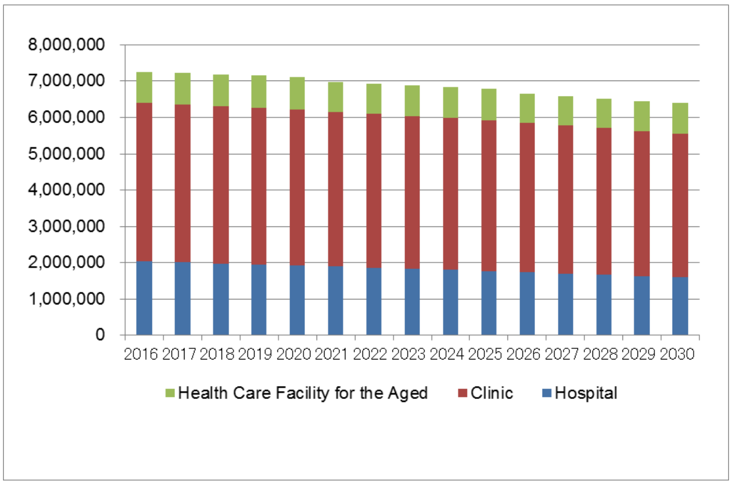
Type of facility	
as % of Total needs	
Kindergarten & Nursery	8.17%
Elementary school	24.61%
Junior high school	14.72%
High school	19.20%
University	28.42%
Special school for handicapped children	4.87%

Figure 3: Health care sector estimation result (by type of needs, million JPY)



Type of needs as % of Total needs	
New Investment	3.86%
Operation and maintenance	26.22%
Replacement	43.70%
Rehabilitation	26.22%

Figure 4: Health care sector estimation result (by type of facility, million JPY)

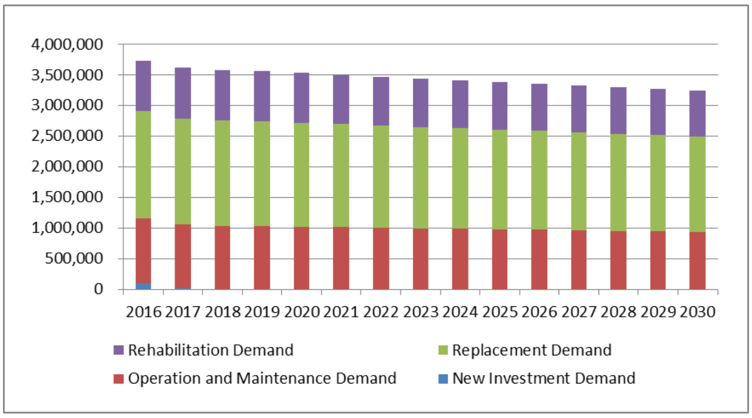


Type of facility as % of Total needs	
Hospital	26.59%
Clinic	61.10%
Health Care Facility for the Aged	12.31%

3-2. The Macro Approach

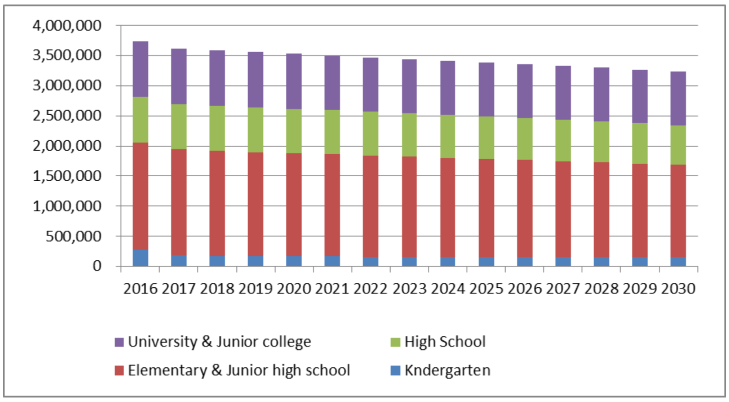
The regression analysis using time series data (the Macro approach), suggests that Japan's education infrastructure demand will be **51,719,073 million JPY** for the period 2016-2030 (average per year: 3,447,938 million JPY), and that the country's health care infrastructure demand will be **85,792,463 million JPY** for the same period (average per year: 5,719,498 million JPY). The detailed results by type of demand (new investment demand, operation and maintenance demand, replacement demand and rehabilitation demand) and by type of facility are shown in Figures 5 to 8. The results of estimated regression are also indicated in the Annex.

Figure 5: Education sector estimation result (by type of demand, million JPY)



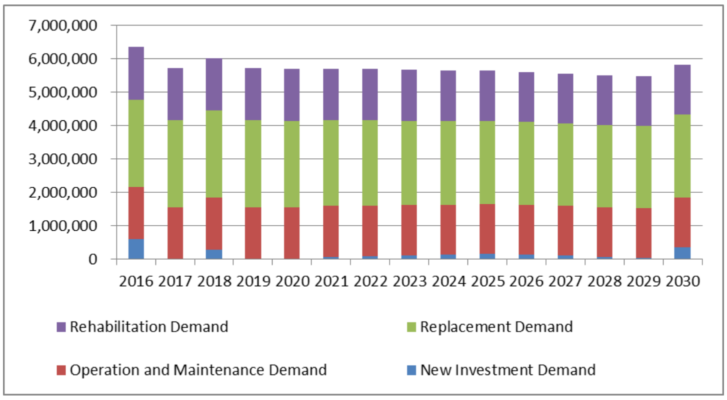
Type of demand as % of Total demand	
New investment	0.22%
Operation and maintenance	28.82%
Replacement	48.03%
Rehabilitation	22.93%

Figure 6: Education sector estimation result (by type of facility, million JPY)



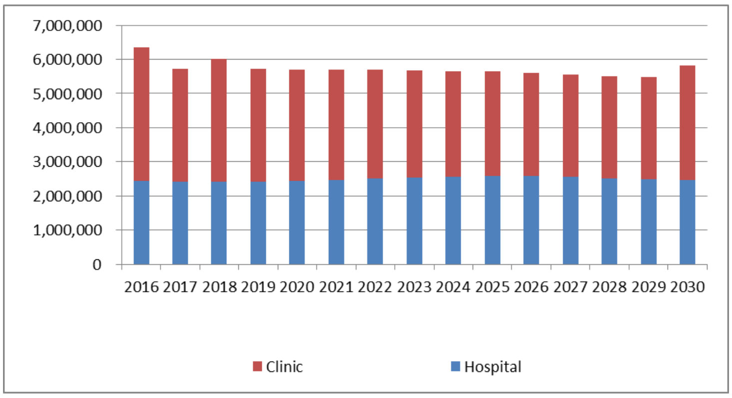
Type of facility as % of Total demand	
Kndergarten	4.93%
Elementary & Junior high scho	48.11%
High School	20.76%
University & Junior college	26.20%

Figure 7: Health care sector estimation result (by type of demand, million JPY)



Type of demand as % of Total demand	
New investment	2.48%
Operation and maintenance	26.60%
Replacement	44.33%
Rehabilitation	26.60%

Figure 8: Health care sector estimation result (by type of facility, million JPY)



Type of facility as % of Total demand	
Hospital	*43.59%*
Clinic	*56.41%*

4. Conclusions

The results of using the Micro and Macro approaches are summarized in Tables 6 and 7. The differences in the results between those two approaches may be understood from the differences in their nature. The micro approach does not consider constraints on supply side, while the macro approach is based on the past equilibrium of demand and supply of infrastructure. For the education sector, the estimated figures are nearly consistent with the past replacement needs estimation exercises conducted by Nemoto (2017), and the Ministry of Education, Culture, Sports, Science and Technology (2013)[7].

Table 6. Summary of estimation results for education sector (million JPY)

Educational Sector	Micro Approach	Macro Approach
Kindergarten	5,326,058	2,551,519
Nursery		—
Elementary school	16,047,109	24,883,437
Junior high school	9,598,572	
High school	12,520,545	10,735,345
University	18,532,116	13,548,772
Junior college	—	
Special school for handicapped children (*Tokubetsu Shien Gakkou*)	3,173,062	—
Total (2016-2030)	65,197,462	51,719,073
Annual Average	4,346,497	3,447,938

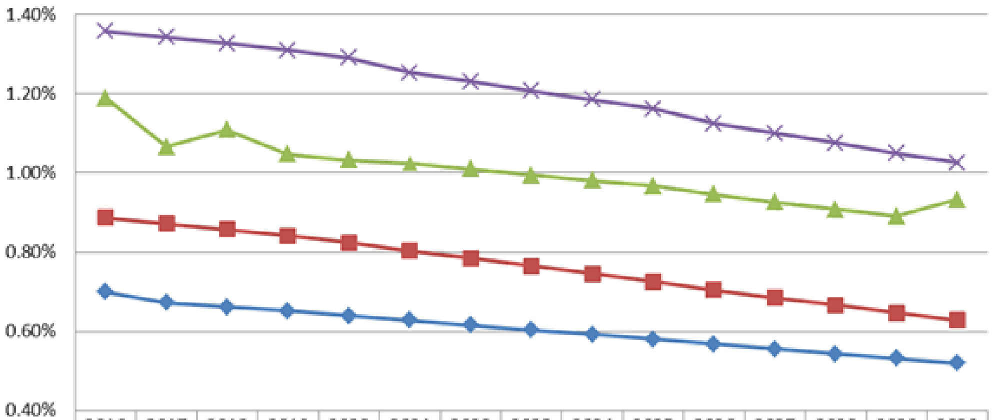
Table 7. Summary of estimation results for health care sector (million JPY)

[7] Nemoto (2017) estimated the annual replacement needs of public school (mostly elementary school and junior high school) to be 1.5 trillion JPY. The Ministry of Education, Culture, Sports, Science and Technology (2013) estimated the annual replacement needs of public elementary schools and junior high schools to be 1.3 trillion JPY.

	Micro Approach	Macro Approach
Hospital	27,371,627	37,397,807
Health care facility for the aged (*Kaigo Roujin Hoken Shisetu*)	12,671,759	
Clinic	62,904,592	48,394,655
Total (2016-2030)	102,947,978	85,792,463
Annual Average	6,863,199	5,719,498

According to these estimations, the volume of social infrastructure investment required is significant; investment as much as 0.52-0.89% of GDP for education, and 0.89-1.36% of the annual GDP of the country is required to meet social infrastructure needs in the coming 15 years, as shown in Figure 9. As noted though, those figures are only for education and health care facilities, and would become larger if other social infrastructure such as public housing and government buildings is included.

Figure 9: Japan's social infrastructure investment needs per GDP (%)



	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Education (Macro)	0.70%	0.67%	0.66%	0.65%	0.64%	0.63%	0.62%	0.60%	0.59%	0.58%	0.57%	0.56%	0.54%	0.53%	0.52%
Education (Micro)	0.89%	0.87%	0.86%	0.84%	0.82%	0.80%	0.78%	0.76%	0.75%	0.73%	0.70%	0.69%	0.67%	0.65%	0.63%
Health (Macro)	1.19%	1.07%	1.11%	1.05%	1.03%	1.02%	1.01%	0.99%	0.98%	0.97%	0.95%	0.93%	0.91%	0.89%	0.93%
Health (Micro)	1.36%	1.34%	1.33%	1.31%	1.29%	1.25%	1.23%	1.21%	1.18%	1.16%	1.13%	1.10%	1.08%	1.05%	1.03%

From this estimation for Japan, three findings may be observed. Firstly, the current stylized estimate model for economic infrastructure (ADB 2017) was found to be unsuitable for social infrastructure demand estimates. It is important to note that we need to adjust the equation according to the specific nature of social infrastructure. Secondly, it was observed in bottom-up exercises that the number of beneficiaries is the most important explanatory valuable for both schools and hospitals. Japan has sometimes changed its criteria on the allowable number of students in one classroom, and the standard space for classroom accommodation. Also, enrollment ratios in higher education increase according to economic development, and then levels off at a certain point. We need to consider how we reflect such elements when we extend the estimates to all Asian countries. Finally, the impact from policy changes such as the introduction of universal health coverage, which occurred in 1961 in Japan, affects the demand estimate, so we need to examine how we reflect these factors in future demand estimates for Asia.

From this trial estimation for Japan's education and health care facilities, it is acknowledged that the estimation of holistic infrastructure investment needs including new investment, operation and maintenance, replacement and rehabilitation, is possible if the specified five data (the Micro approach), or the time series data for dependent and independent variables (the Macro approach) can be obtained. In the next stage of this research project, the authors plan to estimate investment needs for other Asian countries, and to propose policy recommendations to fill the gap between the estimated needs and current modes of infrastructure investment.

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Annex

RESULTS FROM EMPIRICAL ESTIMATION

	Kindergarten	Elementary & Junior high school	High school	University & Junior college	Hospital	Clinic
Lagged Dependent Variable (-1)	-1.452358	1.339647	1.065244	1.7188	1.368956	0.7763015
	7.06(*)	9.96(*)	24.67(*)	12.84(*)	7.87(*)	5.88(*)
Lagged Dependent Variable (-2)	-0.5494045	-0.3441017		-1.113371	-0.476102	-0.1112965
	-3.08(*)	-2.48(*)		-4.08(*)	-2.62(*)	-0.62(*)
Lagged Dependent Variable (-3)				0.1568996		0.6806142
				0.58		3.85(*)
Lagged Dependent Variable (-4)				0.1343689		-0.8014549
				*1.13		-7.47(*)
Urbanization Rate	0.1257699	0.033735	0.2753223	-0.1832494	-0.3803307	-0.2634689
	1.19	3.01(*)	3.56(*)	-1.48	-1	-1.45
GDP per capita	0.0144013		-0.081674	0.0687548	0.0668318	0.0494384
	0.36		-3.92(*)	2.7(*)	1.09	2.14(*)
Population of target age 3-5	0.0655057					
	1.64					
Population of target age 7-14		0.024242				
		4.23(*)				
Population of target age 15-17			0.0152094			
			1.15			
Population of target age 18-21				0.0183971		
				1.46		
Infant Population age 0-5					-0.0707302	0.1521145
					-0.52	2.99(*)
Elderly Population age above 65					0.0026239	0.1984968
					0.12	3.55(*)
Constant	-0.8139091	-0.4927546	-0.7135891	0.1691475	3.198522	-0.1963375
	-1.28	-1.98	-3.22(*)	0.58	0.74	-0.13
Observations	65	65	65	65	49	49
R-aquared	0.9974	0.9957	0.9845	0.9974	0.9981	0.9994

t>2.0(*)
All relevant variables in logarithms.