

Urbanization and its Effects on the Consumption of Human Activities and Living Environment in Asia



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アジアでも各国で人口の都市集中が進んでおり、すでに都市部の人口は農村部を上回る。それに伴うエネルギー消費の増大や水不足などの諸問題を多角的に検討し、持続可能で快適な都市化の進め方を探った。

Abstract

This paper presents an overview of urbanization in Asian countries and regions, including urban population growth and economic growth, based on the publicly available data from national and municipal governments and international organizations. And we found that the rapid paces of urbanization have already caused significant effects on the consumption of human activities and living environment. These effects are highlighted in the factors of energy consumption, water stress, air pollution, health, settlements and infrastructure construction, even have a certain degree of influence on the level of Asian human development which can be reflected from the human development index (HDI). Therefore, we should focus on the overall quality of the city and the improvement of the environment, to maximize the sustainable development of a comfortable human living environment, which is the fundamental purpose of urbanization.

Keywords

urbanization, Asia, the consumption of human activities, living environment, human development index

Introduction

In the 1960s, twice as many people in the world lived between rural and urban. Though in 2007, the size of rural and urban populations was roughly equal. By 2017, the urban population has exceeded 1.2 times the rural population (Figure 1). The carrying capacity of the city will face unprecedented challenges in all perspectives, especially in Asia.

With the gradual acceleration of this urbanization process and the development of global economic integration, some of the risks and crises of developed countries have been passed on to Asian developing countries, especially the two Asian financial crises in 1997 and 2008, Asian cities (Jiang Wu et al 2018). The urban problems facing the Asian region are more significant, such as dense population, tight land use, environmental pollution, insufficient energy, shortage of resources,

traffic congestion, lack of public facilities, health impact and so on.

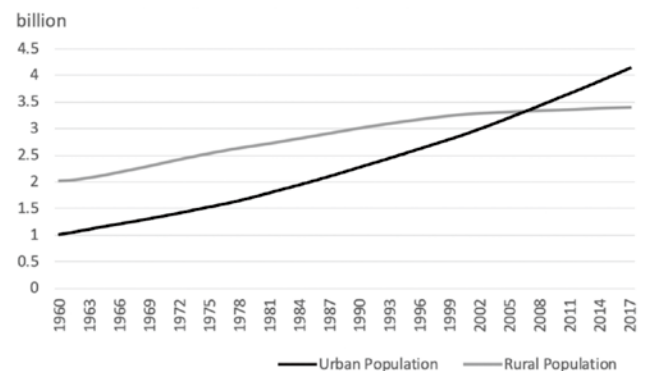


Figure 1. Urban population and rural population, 1960-2017

Source: World Bank. Changes added by authors

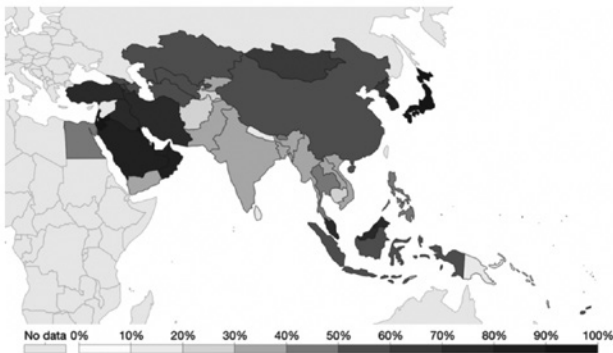


Figure 2. Urban population and rural population, 1960-2017

Source: World Bank. Courtesy Our World in Data. Changes added by authors

Urbanization in Asia

Population growth

By 2015, 16 of the world's 24 megacities (cities with more than 10 million people) will be located in Asia, according to the UN's World Urbanization Prospects: The 1999 Revision. Most of these megacities will be located in the population giants. (PRB, 2001)

As we have seen in Figure 2 and 3, there are many developed cities in the Americas, Europe, and Oceania in which industrialization and urbanization have developed earlier. So, the urbanization rate has basically reached a high level of more than 70%, but the speed of urbanization has been extremely slow as entering the

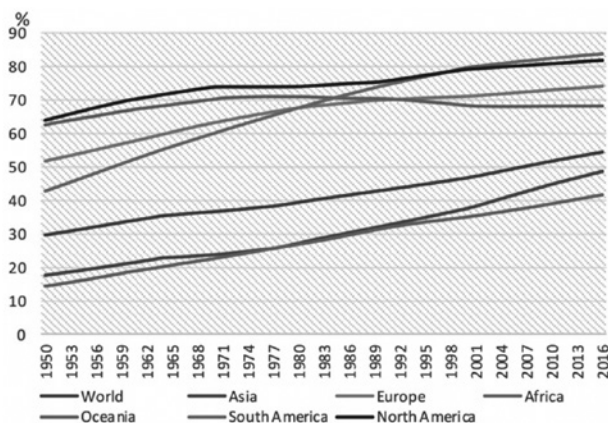


Figure 3. Urban population in the world, 1950-2016

Source: OWID based on UN World Urbanization Prospect 2018 and historical sources

stagnation period. And Asia and Africa show a clear upward trend.

In Asia, there are major disparities in the pace of urbanization within the region. The urbanization rate in West Asia reached a high level of 70%, followed by East Asia of which urbanization started at a slower rate but gained momentum during the 1970s and 1980s then gradually reaching 60%. Until 1970, due to the European immigration movement, Central Asia's urbanization rate was almost twice higher than that of South Asia. However, the urbanization rate slowed after the 1970s because of internal population movements, terrain and landform restrictions. The urbanization process in Southeast Asia is also steadily accelerating, basically equal to that of Central Asia now. The population of South Asia has increased steadily but is still in a stage of backward development. (Figure 4).

Economic growth

The link between urbanization and economic growth has been well-documented (Bloom, D. E. et al 2008, Henderson, V. 2003) and have a strong positive correlation relationship between urban population and GDP by analyzing the relationship between the share of the population living in urban areas on the y-axis and average income (gross domestic product per capita) on the x-axis in Asia.

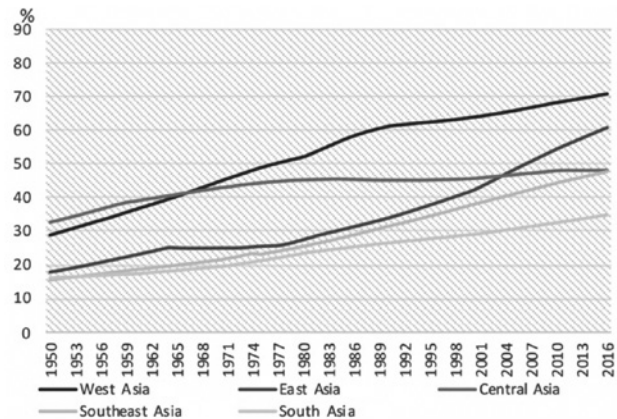


Figure 4. Urban population in Asia, 1950-2016

Source: OWID based on UN World Urbanization Prospect 2018 and historical sources

The main reasons for economic growth are manufacturing growth, such as promoting Japan’s industrialization; and implementing open economic policies, such as China’s reform and opening up in the 1970s, increasing economic openness and export-led growth models in Malaysia, the Philippines, Indonesia, India, and Thailand.

Especially since the 1980s, the economic growth of Asian cities has been catalyzed by increases in foreign direct investment (FDI) (Hidefumi I. et al 2005), including financial investment, technical assistance, public-private partnerships, innovative sharing and so on. This has been particularly pronounced in East and Southeast Asian countries (Singapore, Thailand, Indonesia, China, and Vietnam) but has also been evident in South Asia (India and Pakistan). The Asian currency crisis of 1997 produced only a short-term drop in FDI to most of these countries. It shows the trends in FDI in the major Asian countries in Figure 5. These FDI inflows which are described as “Pacific-Asia urban corridors” (Douglass 1995) are viewed as an additional driver of economic growth and the basis for making sound economic policies.

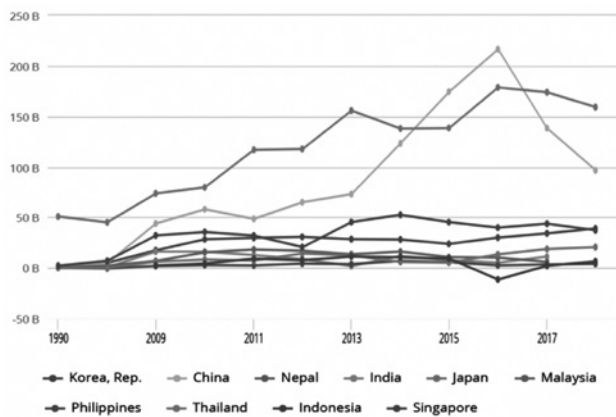


Figure 5. Foreign direct investment of Asian countries (Bop, current US\$), 1990-2017

Source: World Development Indicators

Urbanization effects on the consumption of human activities

Energy consumption

By contrast, rapid rates of urbanization and of economic growth are also considered as one of the major factors that could lead to environmental degradation (Anis Omri et al 2014).

Growing urbanization will lead to a significant increase in energy use, CO₂ and GHG emissions, particularly in non-OECD countries in Asia (OECD 2010). For example, in China, every 1% increase in the urban population relative to the total population, national energy consumption rose 1.4% shown from the data of 1980–2010 (Pengjun Zhao et al 2018).

In the Figure 6 and 7 below, we have plotted the CO₂

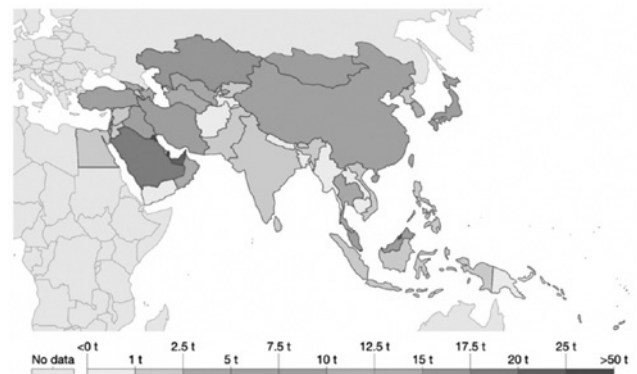


Figure 6. CO₂ emissions per capita of Asian region, 2017

Source: OWID based on CDIAC; Global Carbon Project; Gapminder &UN, Courtesy Our World in Data. Changes added by authors

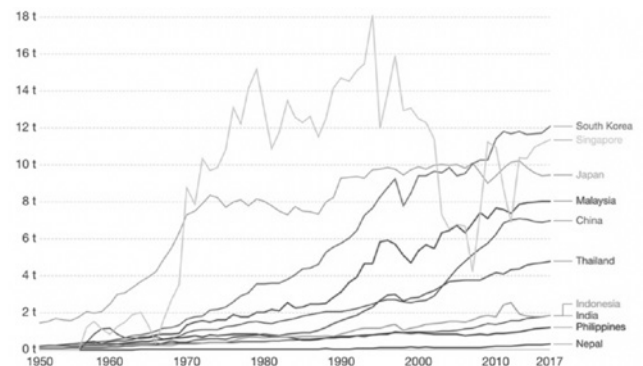


Figure 7. CO₂ emissions per capita of Asian countries, 1950-2017

Source: OWID based on CDIAC; Global Carbon Project; Gapminder &UN, Courtesy Our World in Data. Changes added by authors

emissions per capita of Asian region and selected countries from 1950 to 2017. We can find that countries with higher urban populations and economically developed countries have produce higher carbon emissions. Since the 1960s, East Asia and Southeast Asia have begun to develop labor-intensive processing industries and large-scale urban construction (Figure 8), so that the rapid rise of the economy but also led to a rapid rise in carbon emissions. At the same time, greenhouse gases are increasingly driven by industrial activities (Figure 9), and urban energy use is a key issue for greenhouse gas emissions (IEA, 2009).

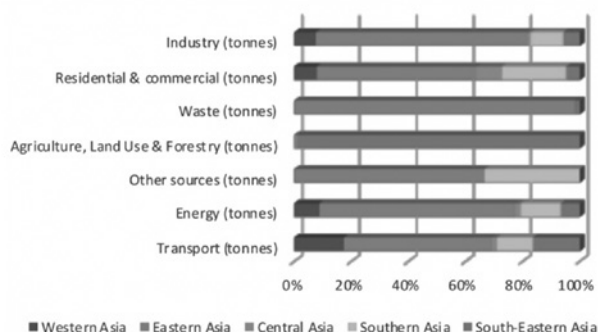


Figure 8. CO₂ emissions by sector of Asian region, 2010

Source: UN Food and Agricultural Organization (FAO)

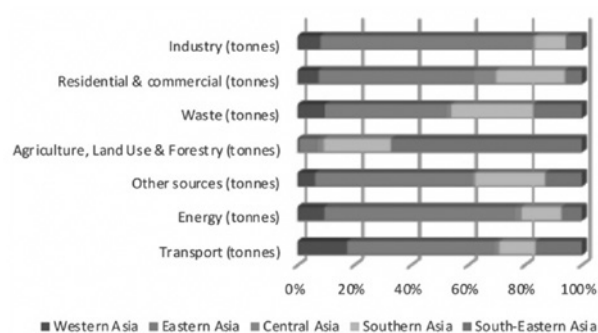


Figure 9. GHG emissions by sector of Asian region, 2010

Source: UN Food and Agricultural Organization (FAO)

Water consumption

The WHO and the United Nations Fund for Children (UNICEF) have shown that although absolute numbers of people with access to water supply have increased

due to rapid urbanization even a smaller portion of the total urban population is now covered (World Health Organization and UNICEF 2000, Hidefumi I. et al 2005).

Asia is facing the immense challenge and risks of water stress. By 2050, more than 60% of the Asia Pacific population will live in cities. However, we are facing an alarming 1.7 billion people who do not have access to basic sanitation 80% of wastewater is discharged in water bodies (rivers, lakes and oceans) with little or no primary treatment. For example, in Indonesia, only 14% Wastewater is treated in the Philippines, with a figure of 10%, India with 9% and Vietnam with 4% (ADBO 2016). Seven of the world’s 15 largest groundwater extracts are located in Asia and the Pacific. Bangladesh, India, Nepal, and Pakistan spend \$3.78 billion a year on water withdrawals. However, for example, Indonesia, which has a large population, is seriously underfunded and water resources are not balanced. Those above indicates a strong probability of future water scarcity (Table 1).

Table 1. Top 15 Countries with the Largest Estimated Annual Groundwater Extractions, 2010

Country	Population in 2010 ('000)	Estimated Groundwater Extraction (km ³ /yr)	Groundwater Extraction Breakdown by Sector (%)		
			Groundwater Extraction for Irrigation	Groundwater Extraction for Domestic Use	Groundwater Extraction for Industry
India	1,224,614	251.00	89	9	2
China, People's Republic of	1,341,335	111.95	54	20	26
United States	310,384	111.70	71	23	6
Pakistan	173,593	64.82	94	6	0
Iran	73,974	63.40	87	11	2
Bangladesh	148,692	30.21	86	13	1
Mexico	113,423	29.45	72	22	6
Saudi Arabia	27,448	24.24	92	5	3
Indonesia	239,871	14.93	2	93	5
Turkey	72,752	13.22	60	32	8
Russian Federation	142,985	11.62	3	79	18
Syria	20,411	11.29	90	5	5
Japan	126,536	10.94	23	29	48
Thailand	69,122	10.74	14	60	26
Italy	60,551	10.40	67	23	10

km = kilometer, yr = year.

Source: J. Margat and J. van der Gun. 2013. Groundwater around the World. Leiden, Netherlands: CRC Press/Balkema.

Urbanization effects on living environment

Air pollution and health problem

Air pollution in Asia is composed of a mixture of pollutants emitted in large quantities from many different combustion sources, because of rapid urbanization,

industrialization, and motorization. Several Asian cities in China, India, and Vietnam have the highest levels of outdoor air pollution in the world (Ta-Chen Su et al 2011).

The World Health Organization (WHO) highlights that air pollution might contribute to approximately 800,000 deaths and 6.4 million lost life-years worldwide in 2000, with two thirds of these losses occurring in rapidly developing Asian countries (WHO 2002). What’s more, in 2014, nine out of 10 people living in urban areas did not breathe clean air according to modelled data derived from satellite estimates. Air pollution has a range of negative impacts, including human health, damage to ecosystems, agricultural system and urban construction environment. So that air pollution is the greatest environmental risk to human health all over the world, especially in Asian and Africa countries, none of the urban areas met the world air quality guidelines (WHO 2014).

We can clearly see from Figure 10 that the death rate caused by ozone, PM and indoor pollution (per 100,000 people). In Asia, PM has the greatest impact on overall mortality (up to 65%). South Asia is more affected by three types of air pollution than other regions. The higher the level of urbanization, the less indoor fuel use, the better the indoor air pollution control, and the better the indoor air quality in high-income countries, almost no impact on health. Ozone exposure the death rate is higher in South Asia and Eastern Asia (more than 10%).

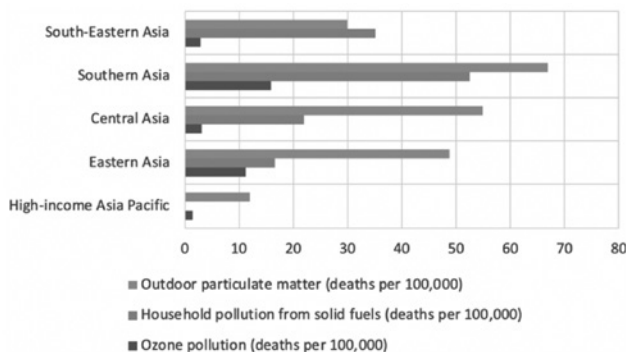


Figure 10. Death rates from air pollution in Asia, 2017

Source: IHME, Global Burden of Disease

Settlements and infrastructure construction

As more and more people migrate to urban areas, urban boundaries often expand to accommodate new residents. From 2000 to 2015, urban land expansion in all regions of the world exceeded the growth of urban population. This ratio increased from 1.22 in 1990 to 2000 in 2000 to 1.28 in 2015 (UNSD 2017). This means that unplanned urban expansion has a negative impact on the sustainability of urban development and has also led to pernicious levels of urban poverty in many Asian cities including growing numbers of slum dwellers, a lack of proper land and housing policies, inadequate basic services and infrastructure.

Here, we see that in the 2014 data, 10% to 30% of the urban population in slum households in most Asian countries. Western Asian slum families account for a relatively high proportion of up to 70%. (Figure 11) In addition, infrastructure construction is critical for millions of poor people and other vulnerable groups in the region. For example, in the construction of public transportation, in cities such as Bangkok, Jakarta, Manila and Mumbai, the mode of public transportation accounts for 40% to 60% of the total number of people traveling, far below the developed cities of the region, Hong Kong, Singapore and Tokyo. The share is 70% (AIT 2002; UN 2001).

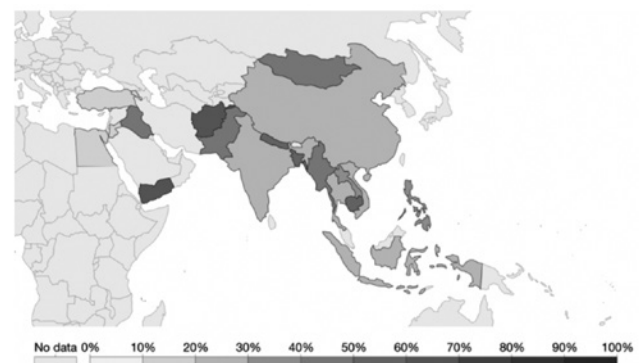


Figure 11. Urban population living in slums, 2014

Source: World Bank. Courtesy Our World in Data. Changes added by authors

Human development index (HDI)

The Human Development Index (HDI) is a summary

measure of average achievement in key dimensions of human development: a long and healthy life (life expectancy index), being knowledgeable (education index) and have a decent standard of living (GNI index), which is the geometric mean of normalized indices for each of the three dimensions (UNDP.org). The HDI is a composite and crucial indicator that measures key dimensions of a society level-of-development and human quality-of-life, which also be considered as the ultimate criteria for assessing the development of a country (Sharma, B. 2004).

The gap in human development levels in Asian cities is even more pronounced. Among the selected representative cities, as the Figure 12 and Table 2 shows below, the developed countries such as Japan, Singapore and South Korea have a human development index of more than 0.8, which is at a very high level of development. From 1990 to 2015, countries almost all steadily developed and crossed to a higher stage of development. The

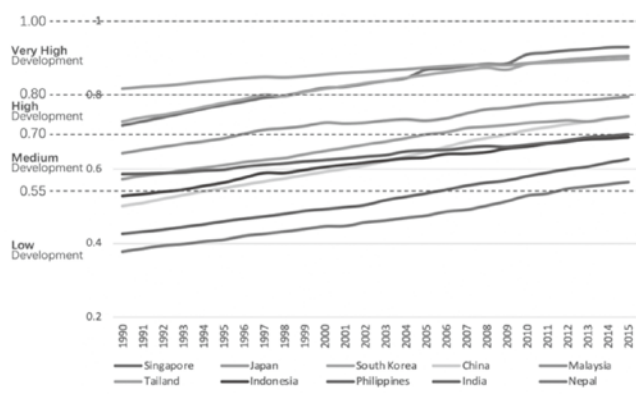


Figure 12. HDI of Asian countries, 1990-2015

Source: Human Development Reports, UNDP.org

Table 2. HDI and its components of Asian countries, 2015

Countries	Human Development Index (HDI)	Life expectancy at birth	Expected years of schooling	Mean years of schooling	Gross national income (GNI) per capita	GNI per capita rank minus HDI rank	HDI world rank
Singapore	0.929	83.2	15.4	11.6	78,162	-3	4
Japan	0.905	83.7	15.3	12.5	37,268	10	17
South Korea	0.898	82.1	16.6	12.2	34,541	12	18
Malaysia	0.795	74.9	13.1	10.1	24,620	-13	59
China	0.743	74.6	13.6	7.9	14,519	-11	88
Taiwan	0.741	76.0	13.5	7.6	13,345	-7	91
Philippines	0.693	68.3	11.7	9.3	8,395	-7	111
Indonesia	0.686	69.1	12.9	7.9	10,053	-8	113
India	0.627	68.3	11.7	6.3	5,663	-4	131
Nepal	0.566	70	12.2	4.1	2,337	19	144

Source: Human Development Reports, UNDP.org

biggest inequality is income, which have a significant long-term impact on urban development ability.

Conclusions

To some extent, the impact and challenges of urbanization are the same everywhere. Urbanization has brought about a certain improvement in life, increased economic opportunities for urban population, increased transportation infrastructure, increased provision of social services etc. By contrast, urban populations interact with their environment. More and more energy consumption, uncontrolled use of water and land are changing the environment. Conversely, a polluted urban environment can also affect the health and quality of life of urban populations.

Reducing energy use and promoting green energy in cities has become a key mission at different levels of government. In April 2014 the Government of Japan established the fourth Strategic Energy Plan for 2030 which stated the policies of reducing nuclear power dependency, reducing fossil resources dependency, and expanding renewable energy. At the same year, the Chinese government formulated the “Energy Development Strategic Action Plan” (2014-2020), which includes protecting the environment, saving energy, reducing emissions, building green and low-carbon cities, etc., The aim is to build a clean, efficient, safe and sustainable Modern energy system.

There is a need for Asian countries to promote international cooperation and collaboration, especially between developed and developing countries. For example, the Singapore government and its CLC are collaborating with the Andhra Pradesh government in India. The partnership is focus on sustainable and green infrastructure, including the development of natural waterways, green public spaces and efficient public transport (CLC 2018).

Faced with the impact of urbanization on the consumption of human activities and living environment, Asian countries and metropolitan governments have begun to recognize the need for urgent action to limit the urban environmental impact of urbanization. Various responses are being tried, including policy

measures and actions to offset current trends and move towards sustainable solutions.

References

- 1) Our World in Data. <https://ourworldindata.org/>
- 2) Jiang Wu et al. (2018). *Asian Cities: Planning and Development* (Shanghai: Tongji University Press) (in Chinese)
- 3) Population Reference Bureau. (2001) *Urbanization Takes on New Dimensions in Asia's Population Giants*
- 4) Bloom, D. E., Canning, D., & Fink, G. (2008). Urbanization and the wealth of nations. *Science*, 319(5864), 772-775
- 5) Henderson, V. (2003). The urbanization process and economic growth: The so-what question. *Journal of Economic Growth*, 8(1), 47-71.
- 6) Dutt, A.K. et al. (2003). *Challenges to Asian Urbanization in the 21st Century*. Kluwer Academic Publishers
- 7) Hidefumi I. et al. (2005) *Urban Environmental Issues and Trends in Asia—An Overview*. *International Review for Environmental Strategies*, 5(2), 357 – 382
- 8) OECD, 2010. *Cities and Climate Change*. Publishing, OECD.
- 9) Pengjun Zhao et al. (2018) The impact of urbanization on energy consumption: A 30-year review in China. *Urban Climate*, 24(6), 940-953
- 10) IEA, 2009. *World Energy Outlook 2009*. OECD, Paris.
- 11) Asian Development Bank. *Asian Water Development Outlook 2016*
- 12) United Nations Department of Economic and Social Affairs. *World Urbanization Prospects 2018*
- 13) Ta-Chen Su et al. (2011). Progress of Ambient Air Pollution and Cardiovascular Disease Research in Asia. *Progress in Cardiovascular Diseases*, 53(5), 396-378
- 14) World Health Organization: *The World Health Report 2002*. Accessed September 15, 2010
- 15) World Health Organization. *World Air Quality Guidelines in 2014*
- 16) Sharma, B., and Gani, A. (2004). The effects of foreign direct investment on human development. *Global Economy Journal*, 4(2), 1-20
- 17) United Nation Statistics Division. *Sustainable Development Goals Overview Report 2017*
- 18) Asian Institute of Technology (AIT). 2002. *Analysis of technical options for mitigating environmental emissions from the urban transport system in selected Asian countries*. Bangkok: Swedish International Development Agency-AIT.
- 19) United Nations. 2001. *Review of developments in transport and communications in the ESCAP region 1996–2001*. Bangkok: UN Economic and Social Commission for Asia and the Pacific (UNESCAP).
- 20) United Nation. *United Nation Development Programme. Human Development Reports*
- 21) Tran Van Nguyena et al. (2019). Trade-off between Environment, Energy consumption and Human development: Do levels of economic development matter? *Energy*, 483-493
- 22) The Centre for Liveable Cities. (2018) *From Singapore to Amaravati: Developing a Liveable City Together*
- 23) The State Council of the People's Republic of China. (2014-2020). *Energy Development Strategic Action Plan*
- 24) Japanese Cabinet. (2014). *The fourth Strategic Energy Plan for 2030*