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Building a Healthy Urban Environment in East Asia

AUTHORS
Hugo Wai Leung MAK &
Keumseok KOH

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Contacts of Authors of this Report:
Hugo Wai Leung MAK at hwlmak@hku.hk
Keumseok (Peter) KOH at peterkoh@hku.hk

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About JLFC and the JLFC Report Series

The Joint Laboratory on Future Cities (JLFC) was set jointly by the Faculty of Engineering and the Faculty of Social Sciences at the University of Hong Kong in July, 2019. It is a joint effort among a group of researchers from different disciplines to establish a platform that facilitates studies on future cities: the people that live in them; the natural environment that they must coexist with; and the technologies that will enable these activities.

As urbanization sets to become a global trend in the coming century, an increasing portion of the Earth's population are going to be migrating into cities on a global scale. Such massive increase in urban population not only put significantly stress on their existing infrastructure, but they are also challenging every aspect of the human-environment relationship. To ensure the sustainability and resilience of future cities, there is a genuine imminent need to develop fundamentally new way of constructing and conceiving the ways in which future cities will operate. It is clear that any solutions to the challenges faced by future cities are going to require talents from a wide range of disciplines to innovate in an interdisciplinary environment.

The JLFC is formed with the goal to incubate such environment through a series of interdisciplinary projects, symposiums and workshops that involve academics, the industry, as well as the government. JLFC was made possible by the generous support by the Prosit Philosophiae Foundation. We work in partnership with the Global Future Cities AI Lab.

The JLFC Report Series aim to provide state-of-the art reviews of key urban theories/concepts and real-life experiences. A particular focus is placed on the experience of Hong Kong as a high-density and compact city, and its relevancy to other metropolitan cities around the world. All reports in the JLFC Report Series are free for download by the general public. Comments and suggestions either on specific reports or the series may be directed to jlfc@hku.hk.

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1. The Latest Health Crisis - Coronavirus (COVID-19)

Since Dec 2019, the outbreak of COVID-19 has induced global health crisis on humans, and has caused unavoidable disruptions to the normal lifestyle of local citizens, both in physical and psychological perspectives. In particular, as at 7 Aug 2020, COVID-19 has led to more than 700,000 deaths all over the world. Figure 1 shows the time series of daily new confirmed COVID-19 cases of 5 main places (China, Japan, Mongolia, Taiwan, South Korea) from 23 Jan 2020 – 28 Feb 2021, based on the database of European CDC. The health risk of COVID-19 in most of these countries has been decreasing in May 2020, but has become more obvious recently. Thus, many countries were forced to impose partial lockdown policies and a series of precautionary measures to minimize the contact between one another within a community.
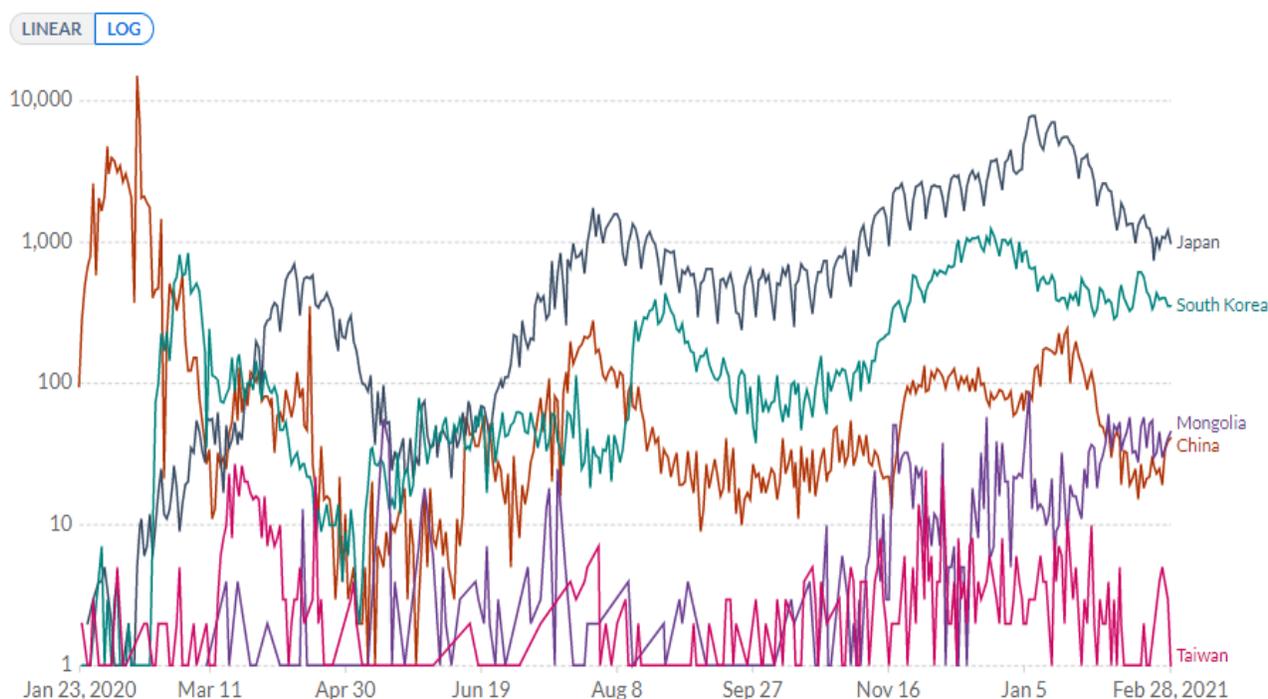
Figure 1. Time series of Daily new confirmed COVID-19 cases (from Jan 23, 2020 – Feb 28, 2021)-based on European CDC datasets (Note: *y* axis is in log-scale)
(Link:
https://ourworldindata.org/coronavirus-data-explorer?yScale=log&zoomToSelection=true&time=earliest..2021-02-28&country=CHN~TWN~KOR~JPN~MNG~HKG&region=World&casesMetric=true&interval=daily&hideControls=true&smoothing=0&pickerMetric=location&pickerSort=asc, accessed February 2021)

Based on the report of O. Wyman (2020), East Asian countries are taking aggressive roles in imposing strict restrictions on social distancing, travel restrictions and preventive acts, for example quarantine orders and temporal closure of schools [1]. Though these acts reach success in managing the spread of the disease, several socio-economic problems were taking

place, for example insufficient face-to-face social interactions with peers and colleagues under the Work-From-Home (WFH) policies, psychological depression and the lack of motivation to resume work during the critical period, as well as economic recession and disruption to industries, factories and business activities in inter- and intra-city point of views. Such mental and social stress vary among individual age groups, and is more significant among teenagers and the working population.

Despite its possible negative consequences and risks, COVID-19 is actually a good opportunity for us to review existing healthcare systems, local social and physical environment that affect our psychological well-being, hence our physical health and personal daily habits, at the same time increases our social awareness and attention towards maintaining good physical health, healthy lifestyle and building risk-free environment and neighborhood around.

COVID-19 = Health Crisis + Socio-economic Crisis
+(*Opportunities for seeking Physical and Psychological Improvement*)

Central Question: How should we move forward and "build" a healthy city in the long run?

This report emphasizes on (1) highlighted social determinants of health and healthy lifestyle in physical and psychological sense for different population groups; (2) Infrastructural changes in urban planning processes and connection with health; (3) Favorable socio-economic, environmental and physical conditions and development that promote health in major countries within East Asia and highlighted case studies. We hope to build a resilient and sustainable smart city that incorporates the participation of different stakeholders in our society, integrates active design of landscape within local community, and provides more opportunities that foster smart mobility and maintain physical and psychological health status.

2. What Constitutes a Healthy City?

Building a healthy city incorporates the conceptualization and construction of a spatial region such that its geographical space, facilities and resources can be enjoyed by citizens in different means, that is:

- to maintain human lives, provide basic necessities and favorable lifestyle [2]; and
- to cope with changes in needs and requirements of urban land use and city development.

The campaign of Healthy Cities movement has actually been launched in 1986, and the Ottawa Charter for Health Promotion has identified 5 common goals for promoting good health [3]:

(1) Building healthy public policies;
(2) Creating supportive environments;
(3) Strengthening community actions;
(4) Developing personal skills; and
(5) Re-orienting health care services toward illness prevention and health promotion.

Such campaigns actually highlight the importance of developing new approaches to public health through social, geographical and political means, with the following aims:

(1) Reducing spatial inequalities of health;
(2) Achieving health equity;
(3) Fostering a sense of belonging and mutual support within local community;
(4) Maintaining good psychological health and well-being; and
(5) Minimizing the health risk of large scale infectious diseases, for example Severe Acute Respiratory Syndrome (SARS) and the recent COVID-19.

In particular, the following points are noteworthy:

(a)   A "healthy city" is a community that continually creates and improves physical and social environments, at the same time expands its community resources that enable people to mutually support each other in performing all functions of life, and developing to each person's maximum potential [4]. (Hancock, T. and Duhl, L., 1988)

(b)   Spatial transformation is a direct consequence of social transformation [5]. Global development and environmental changes will motivate social mobility and restructuring of social habits in life, therefore modern smart cities should strengthen and design appropriate land user plans and related initiatives that enhance existing built environment. (Lang, T., 2012)

(c)   The process of planning a smart city is intrinsically connected with "health", as the development of urban facilities cause changes to the original built environment, on one side improve psychological well-being and standard of living of local citizens, at the same time more useful information and health advice can be provided at a regular basis [6]. (JSI Projects)

However, large-scale infrastructural changes will induce environmental threats like air pollution due to transportation, noise pollution produced by construction, worsening air quality. Possible pros and cons of specific type of infrastructural changes will be proposed in Section 7. Then, the recent urban land use and infrastructural changes that enhance health equity and better lifestyle at selected East Asian countries will be discussed in Section 8. All these depend on demographic trends, life expectancy of population and long term development goals of a country.

3. Geographical Focus and Smart Use of Technologies

With the advancement of technology and the capabilities of providing instantaneous information to public, websites and platforms with graphical visualization were set-up in many countries. The Hong Kong SAR government has established a website with spatial display of the latest situation of COVID-19 in Hong Kong [7], showing the status and report date of cases, building list of confirmed and suspected cases, geographical locations of quarantine centres and waiting time of Accident and Emergency (A&E) services within different districts etc. More importantly, the information on this website will be updated every 15 minutes. Figure 2 shows the cover page of the official COVID-19 website released by the HKSAR government, updated as at 27 February 2021.
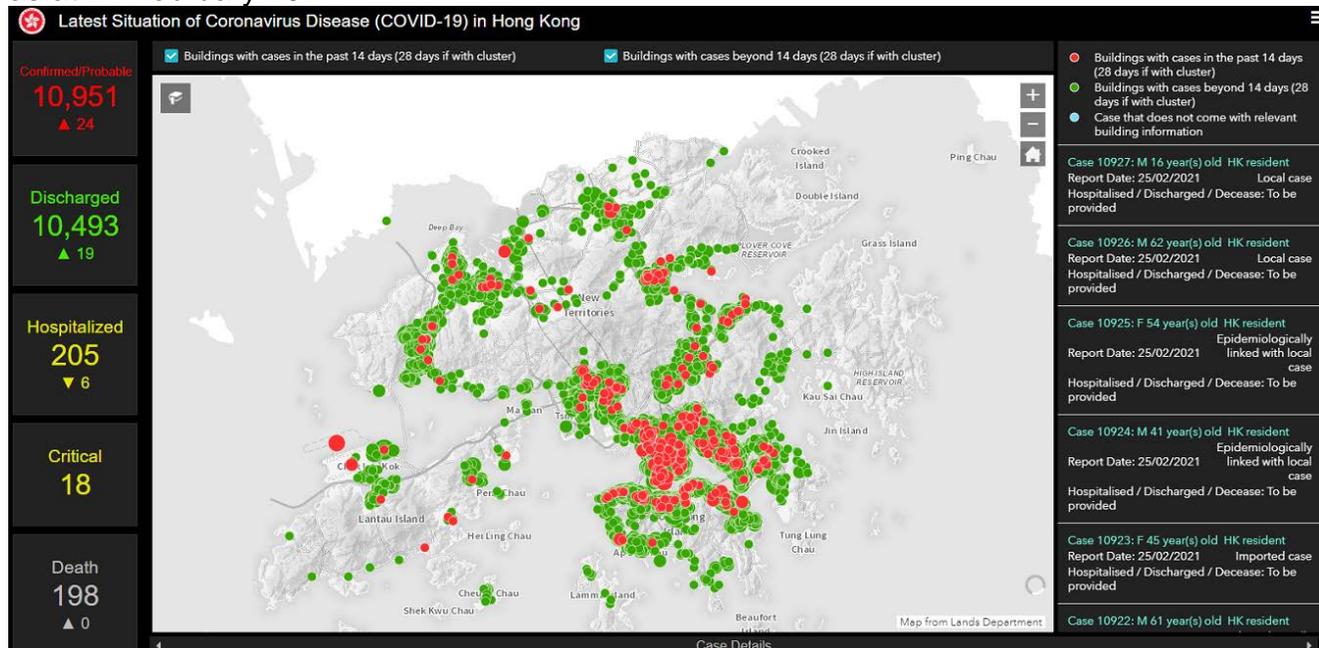
Figure 2. Official Website of COVID-19 in Hong Kong, with information released by Department of Health, HKSAR Government
(Link: https://chp-dashboard.geodata.gov.hk/covid-19/en.html, accessed February 2021)

Currently, Asia is the fastest-growing and dynamic one among all continents, people will travel across borders for conducting business, industrial and academic activities, thus they will suffer from various health risks more often. Almost all East Asian countries have set-up national and/or local air quality network and release real time Air Quality Index (AQI) (or Air Quality Health Index (AQHI)) and major pollutant concentration information to public. These are presented based on spatial plots and temporal trends obtained from air quality forecasting models, multilevel modeling and statistical algorithms (e.g., data assimilation means). For example, Brajer, V. *et al.* (2006) has developed a health effect function to assess the averted mortality and morbidity (measured by hospital admission) with the aid of exponential function, by predicting the additional case of premature mortality (quantified by cardiovascular and respiratory diseases) due to change in ambient pollutant concentration (mainly $PM_{2.5}$ and NO_2) based on available epidemiological information [8]. Proper use of latest technology will improve health qualities of citizens, enhance health awareness, productivity and economic growth within East Asia.

4. Social Determinants of Health

Social determinants of health are generally classified as three categories, namely (1) social environment and conditions; (2) physical environment and conditions, and (3) health services and support, based on the grouping of NCHHSTP, which aims at promoting health [9]. Some essential background is provided below:

- Social determinants of health are conditions and environments which an individual is born, grow, live, learn, work and age, which have both direct and indirect linkages with socio-cultural features, social norms, social engagement, availability of services and networks, economic and leisure activities, sense of security of individuals, which eventually affect personality development and psychological health [10]. (World Health Organization – WHO)
- Psychological health conditions of individuals have two possible effects: (1) combination of dysfunction and distress due to social, behavioral and psychological unhappiness; (2) "motivate" and "arouse" perceived environmental threats and responses to oneself and to the neighborhood, which cause perceptions of risk, social amplification of health risk and lack of ability to cope with these potential risks when it actually takes place [11]. (Elliot, S.J., 2009)
- There are many factors that constitutes to good health, for example socioeconomic and political context, governance, national and local policies [12]. (Solar O. and Irwin A., 2007)
- Intrinsic health determinants affect population health or physical conditions to get adapted to environmental challenges, including genes, sex, physical shape, individual habits and behaviors.
- Many resources are of better quality in socially advantaged areas, therefore people can enjoy better social and physical environment, hence of better health qualities [13]. (Macintyre *et al.*, 1993)
- Social determinants of health can potentially link to social disparities and area deprivation of opportunities and rights to obtain health-related resources [9].

Figure 3 shows the "rainbow model" developed by Göran Dahlgren and Margaret Whitehead in 1991, which includes sampled social determinants of health, ranging from social influences to individual lifestyle factors. Corresponding factors are put in respective layers.
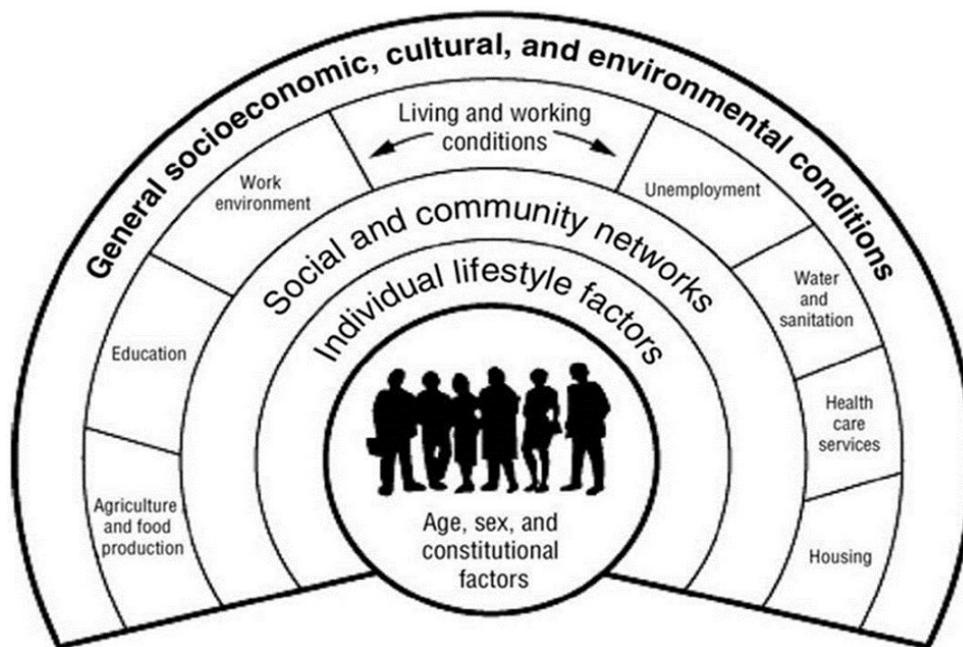
Figure 3. Dahlgren and Whitehead's "rainbow model" in 1991, which connects the relationship between social environment, individual lifestyles and health factors
(Source:
https://www.gov.uk/government/publications/health-profile-for-england/chapter-6-social-determinants-of-health)

5. Categorization of Social Determinants of Health

5.1. Social Environment and Conditions

The respective factors include, but not limited to the followings:
- Economic and social policies and systems of national and local governments
  Examples: Social Capital and Access to different opportunities, like education and job opportunities
- Social position and economic status of individuals
  Examples: Power and Post within Local Community or even organizations, Quality of Education, Literacy and Occupation, Income and Socio-economic position
- Socio-cultural features of neighboring environment
  Examples: Role of women, Ethnicity, Religion, Degree of Community Integration [14]
- Social norms and attitudes
  Examples: Area deprivation, Racism, Social Network and Peer Support, Trusts in governments and leaders
- Development agendas and Plans of the government
- Social Engagement
  Examples: Citizens' involvement in environmental and urban design, as well as health investigations
- Access to latest information and technologies
  Examples: social media, entertainment, worldwide news and updates

- Sense of security and Public safety
  Examples: exposure to social disruption, violence and crimes within community, police teams to maintain peaceful living environment
- Availability of community-based resources
  Examples: recreational and leisure activities, supermarkets, uniform and well-designed transportation network
- Marital status & Social cohesion with neighbors

5.2. Physical Environment and Conditions

The respective factors include, but not limited to the followings:
- Built environment and surrounding facilities
  Examples: buildings, roads, spaces, transportation systems, parks and bike lanes
- Natural environment
  Examples: environment without toxins, greening areas and favorable weather conditions
- Availability of healthy environment near home and workplace [14]
  Examples: stable and satisfactory worksites or schools, comfortable and safe recreational facilities nearby, decent housing condition and community design, walk lanes and bike lanes near home
- Favorable physical setting of environment and Aesthetic Elements
  Examples: trees, grass, flowers, benches, rest-areas, sufficient lighting and air cleaners
- Sufficient physical barriers and supporting facilities for disabled and handicapped
- Religious facilities
  Examples: church, temples and religious community
- Safe and sustainable housing-design elements
  Examples: Estate facilities, common areas and bridges

With aforementioned physical environmental conditions and built areas, the followings unfavorable situations are effectively reduced:
- Crowding community (provided that appropriate land use takes place)
- Heat stress due to environmental changes and high dense environment
- Exposure to toxic substances, like air pollutants, poor water and sanitation

5.3. Health Service and Supports

The respective factors include, but not limited to the followings:
- Access to healthcare services
  Examples: Physiological and psychological medical centres
- Access to local emergency services
  Examples: The Accident and Emergency (A&E) services, Hospital Authority (HA) in Hong Kong
- Availability of healthy foods and nutrition

- Access to public health facilities (e.g., supports in transports, activities and platform) and updated information from relevant authorities (e.g., Food and Health Bureau in Hong Kong)
- Status and conditions of medical insurance

As indicated in one of the project grants reports by US Environmental Protection Agency (EPA): Project Grant EPA-G2017-STAR-D1 [15], social determinants of health are determined by many factors, including inherent characteristics, social environment and conditions, physical environment and conditions, as well as health infrastructures and services, Holistic environmental and health research must take all these crucial factors into consideration, so that a sustainable urban environment and healthy lifestyle can be obtained.

6. Factors that affect Health Conditions of Different Age Groups

Apart from spatial and environmental factors that affect physical health, as mentioned in Section 5, people of different age groups likely suffer from varieties of pressures and concerns in life. Negative perception of neighborhood will reduce the amount of physical activities, as a result lead to poor psychological health, or even stresses. The following is a list of psychological concerns, individual perception and personalities that would ultimately affect the health conditions of independent age groups.

6.1. Teenagers (from 12 to 18 years old)

- Moral values and education received regarding personal growth and lifelong planning, as a result affecting their acts and attitude toward life
  Examples: Teenagers without proper education and moral values will likely suffer from alcohol-related morbidity, lung diseases due to prolonged smoking and casual sexual relationships
- Getting pressurized due to worrying of academic results, in particular public exam results that affect future studies and career planning
- Peer pressure or bullying that affect self-esteem
  Examples: Teenagers who suffer from bullying in schools hardly find their role, position or value within the society, and will likely have psychological health problems
- Misunderstanding and social stigma related to success imposed by the social media, due to immature personal development

6.2. Adults and the Working Population

Adults are defined as over 18 years old; and the working population is defined as 18 to 65 years old. Some countries have slightly different definitions for the working population. The key issues are:

- Level of acceptance of individual social status
- Whether their social and economic status result in discrimination and hatred from public or even from their peers?
  Examples: Working population with lower socio-economic status usually have less motivation to enrich themselves, and may not possess grand vision for future development.
- Thoughts and views toward their own country and sense of belonging to the place / district
  Examples: Whether they feel optimistic or pessimistic regarding the future of their birthplace and work place respectively
- Social inequalities of health
  Examples: Discrepancies in personal resources, social deprivation, whether they can get access to top-class community facilities and service
- Unhappy marital life, family burdens and lack of supports from relatives

6.3. Elderlies

- Sufficient medical support and care from government, charity organizations and healthcare communities
- Independence and dignity in front of the next generation
- Sense of home and comfortable neighborhood environment for activities
- Whether they have a fulfilling retiring life?
  Examples: Social cohesion, social interactions, understanding and support from family members, sufficient freedom and respect of privacy within personal life, economic conditions
- Access to necessities and facilities within their communities
  Examples: Supermarkets, restaurants and recreational facilities

The idea of "Ageing in Place (AIP)" has been promoted within the elderly community. It is a recent concept and practice that enhances healthy and active ageing of elderlies, helps them to develop positive and optimistic views toward retirement life, and to possess an enjoyable and fruitful golden age via staying in their familiar communities and homes [16]. For achieving successful AIP and longevity, different kinds of socio-economic supports are essential, including the enhancement of private and long-term care management, medical and health advice and managements, the provision of home health services, and the establishment of home modifications and community groups.

7. Pros and Cons of Spatial Planning and Infrastructural Changes within Urban Environment

Spatial planning and setting up different types of infrastructures within a community can improve welfare of people and make better allocation of land use to meet citizens' needs for healthy human settlement. It also promotes physical, environmental and social development within the spatial area. Some definitions of built environment are summarized below:

Roof, K. & Oleru, N. (2008): "Built environment" represents the man-made environment that provides human activity settings, ranging from buildings to neighborhoods and cities, and beyond. It is connected to the space and manner that people live and work, as well as the supporting infrastructure in daily life basis [17].

Barton, H. (2009): "Built environment" includes not only hard infrastructure, but also the physical elements that contribute to the setting up of these human settlements. Blue and green space, transportation systems and rehousing programmes are examples of these physical elements [18].

7.1. Advantages

Starting from the 19th century, planners realize the inseparable connection between favorable environmental conditions and human health, thereafter infrastructural changes and spatial planning have been focusing on alleviating human's health concerns and reducing spatial inequalities of health. As outlined in VicHealth's report (Butterworth, I., 2000), good spatial planning leads to the following 4 advantages with respect to improving human health conditions [19].

- Reducing spatial inequalities in housing, facilities and transportation for different socioeconomic groups in the society;
- Reducing air and water pollution, greenhouse gas emission, alleviating threats induced by climate changes, as a result improving population health;
- Increasing the frequency of physical activities of citizens within the district, enhancing walkability and access to sport facilities, which directly leads to healthy body conditions;
- Improving community cohesion, increasing communication between citizens, as well as providing safe living conditions and neighboring street environment to people living in that district

In recent years, the concept of "built environment" also covers several beneficial outcomes, apart from improving physical health conditions of local citizens, namely (1) healthy food access; (2) walkability; (3) green space and community gardens [20] and (4) mental health [21].

7.1.1. Healthy Food Access

Living closer to healthy food amenities leads to intake of more nutritious food, good eating habits, greater consumptions of fresh produce for working population [22], which results in decreased risk for obesity and atherosclerosis risks.

Figure 4. Greater proximity to healthy grocery and vegetable stores improves human health (Source: EvaK, CC BY-SA 2.5, https://commons.wikimedia.org/w/index.php?curid=2437380)

7.1.2. Walkability

The degree of walkability is often measured in a "place" – a destination where people conduct recreational activities. Walkability consists of several important concepts:

(a) Providing comfortable and safe environment that support and encourage citizens to walk from one venue to another;

(b) People within the same neighboring can be connected via some infrastructures (e.g., footbridges, stairs, escalators etc.), and these connections can provide visual interests to passengers, and can shorten the time of travel of most pedestrians;

(c) The facilities and conditions are suitable, accessible and comfortable for everyone regardless of age groups.

The report from Civic Exchange has summarized the above points into 4-criteria framework for good walkability [23], namely (1) Possible to Walk; (2) Efficient to Walk; (3) Comfortable to Walk and (4) Interesting to Walk.

Wang, H. *et al.* (2019) highlighted the following points regarding walkability [24]:

- Built environment attributes that encourage high walkability leads to lower proportion of obese people within the community;
- Density of street trees and landmark buildings lead to lower BMI;
- Walking reduces risk of suffering from obesity, chronic diseases and diabetes.

In Hong Kong, high residential density and intersection density within an area and mixed land use pattern are often found, especially in older districts, where the G/F (and perhaps the 1/F) is normally used for business purposes, while the upper floors are for residential use. Figure 5 shows a typical example of buildings with mixed land use in Mong Kok.

Figure 5. Bute Street located in Mong Kok, Hong Kong

(Source: https://commons.wikimedia.org/wiki/File:HK_Mong_Kok_Bute_Street_evening_corner_buildings_Tong_Lau_shop_signs_Okashiland_Sept-2012.JPG)

7.1.3. Green and Blue Assets

According to the definition provided in [25], a "green-blue city" refers to an urban area that incorporates natural systems to enhance the ecological and amenity values derived from urban greening, at the same time provide stormwater management. These systems and resources include, but not limited to gardens, country and public parks, trees, wetlands, rivers, harbor and reservoirs [25]. Local greenspace and social facilities, as well as walkways and cycling routes have positive influence on public health and well-being [18]. Apart from promoting physical health, these green and blue assets possess different environmental and ecological advantages, like improving air quality, mitigating urban heat island effect, providing comfortable neighboring environment and public open space that reduces thermal load of the city [26]. As a result, the city's competitiveness is enhanced. Figure 6 shows the Devil's Park hiking trail in Hong Kong, which consists of both blue and green assets.

Figure 6. Devil's Peak hiking trail in Hong Kong (with both green and blue assets in surrounding environment)
(Source: https://zh.m.wikipedia.org/zh-tw/File:Devil%27s_Peak_hiking_trail.jpg)

7.1.4. Mental Health

Making better use of surrounding built environment does not only encourage physical activities, enhance accessibilities and lead to better physical health of individuals, but also influences mental health by changing one's psychosocial processes with mental health sequelae [27]. Increasing physical activities can help to reduce feelings of anxiety and depression [18]. Better-quality housing condition and safe neighboring environment will reduce one's psychological distress, especially for women and young children [27]. Moreover, the low-income, elderlies and ethnic minorities groups are more vulnerable to psychological health impacts of physical environmental conditions, thus better social infrastructures are indispensable support for their mental well-being. Some examples of social infrastructures include economical transportation systems, development of community groups and local services, as well as the setting up of proper communication platforms between isolated elderlies.

Figure 7 shows the Harbour North in North Point, Hong Kong that consists of promenade in front of the shopping mall, greenspaces surrounding the building, and a shopping mall close to residential areas of North Point. Such built up environment enhances walkability and mental health of residents.

Figure 7. Surrounding views and facilities of Harbour North, North Point, Hong Kong (Source:
https://commons.wikimedia.org/wiki/File:HK_%E5%8C%97%E8%A7%92_North_Point_%E7%B3%96%E6%B0%B4%E9%81%93_Tong_Shui_Road_%E5%8C%97%E8%A7%92%E5%8C%AF_Harbour_North_n_%E6%B5%B7%E5%8C%AF%E9%85%92%E5%BA%97_Hotel_VIC_facade_Dec_2018_SSG_05.jpg)

7.2. Possible Drawbacks

In spite of numerous technological innovation and benefits that infrastructural changes within a community can potentially bring and contribute, inappropriate spatial planning and changes in urban land use will lead to several devastating consequences and unwanted environmental effects. Here are some possible examples of these drawbacks:

7.2.1. Environmental Pollution caused by Changes in Exposure Patterns and Transportations

Newman, P.W.G. and Kenworthy, J.R. (1996): 3 distinct phases of urban development will increase the demand of traveling from one place to another, therefore the use of different transportation has become more frequent when compared to the time when walking was the dominant mode of transportation [28].

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Molina, M.J. and Molina, L.T. (2004): The demands for automobile travel are tremendous for countries that are experiencing economic development and large-scale infrastructure redevelopment, for example China and India in the 2000s, which result in environmental exposures within air, land and water [29]. Environmental pollution caused by changes in exposure patterns and emission of toxic chemicals increase health risks of local citizens.

7.2.2. Excessive Noise Sources and Mental Distress

Evans, G.W. (2003): Large-scale infrastructural development within a city induces excessive exterior noise sources and noise pollution, as a result leading to psychological distress and depression. For example, people living near the airport or construction sites will suffer from construction noise, while people in residential areas near main roads will suffer from traffic noise, as well as noise from commercial and industrial premises. All these will possibly lead to mental illness [27].

7.2.3. Inappropriate Migration of Population and Decentralization

Jerrett, M., Gale, S. and Kontgis, C. (2009): Urban development motivates migration of population from countryside or less favorable living environment to places with favorable neighborhood environment. However, this will easily lead to several social problems, including residential crowding, sprawling landscapes, homogeneity in land use pattern, segregation of land use [30], and decentralization and deconcentrating issues.

7.2.4. Sacrifice of Natural Environment and Loss of Biodiversity

Jerrett, M., Gale, S. and Kontgis, C. (2009): A lot of land and natural resources are needed for urban development, thus huge amount of natural habitat, farmlands, blue and green assets have to be sacrificed during spatial planning. This results in loss of aesthetic value of a city, inefficient use of energy resources and loss of biodiversity [30].

Evans, G.W. (2003): Insufficient daylight will have direct association with depressive symptoms, for example the construction of high-rise buildings within communities may block sunlight from entering a particular region [27].

7.2.5. Climatic Risks in both Environmental and Personal Perspectives

Jerrett, M., Gale, S. and Kontgis, C. (2009): Sprawling landscapes and increased use of automobile will lead to increased usage of energy and resources, which affect local and regional ecosystems, where individuals will become more susceptible to environmental toxins and chemicals around their living areas. Citizens will fail to get adapted to exposed stress due to environmental challenges [30].

7.2.6. Behavioral Disturbances due to Poor Air Quality

Evans, G.W. (2003): Some chemical toxins like lead will result in psychological depression and behavioral disturbances, for example commuting stress, aggression, self-harming behaviors and autism [27].

Upon the completion of urban development, roadways will be in proximity to residential areas, therefore the air quality within the concerned districts will likely get worse. Unfavorable environmental conditions in recreational areas will result in decreased physical activities of children and elderlies, as well as other social problems like self-isolation.

Figure 8. Urban development will lead to increase in transportation (mostly automobile) and traffic jam within the spatial area, as a result increasing air pollution and gas emission on road that causes devastating impact on human health
(Source:
https://commons.wikimedia.org/wiki/File:HK_Central_footbridge_view_Queen%27s_Road_Des_Voeux
_Road_traffic_jam_Sept-2010.JPG)

8. Case Studies in selected East Asian countries

In this section, some selected good examples and practices from several major countries of East Asia are provided, which will improve health conditions of its local citizens in both short run and long run.

8.1. China

Urban living conditions in different cities of China have significant improvements during the past 4 decades, after the beginning of mass construction of basic infrastructure and sanitation enhancement in around 1980s.

Wong, T.C., 2015: Most slum-like residence have been removed in 2010 in China, which were replaced by modern and high-rise residential buildings [31].

Recent urban planning schemes also focused on aesthetics aspects and promoted green urban living in the long run. The Chinese government has identified the benefits of greenspace and open space in improving quality of life of residents and alleviating risks of climate changes and public health.

Song, X. *et al.,* 2016: By 2015, greenways, parks and urban conservation constructions have increased in 97% of prefecture-level cities in China [32].

Usman W. C., 2014: In Sept 2013, the Chinese government has published a plan to deal with national-wise air pollution problems, that is to reduce coal consumption in industries and replace coal by other eco-friendly energy resources [33]. Annual action plans for combating air pollution problems are also announced.

8.1.1. Example 1: Healthy City Campaign in 2016 and Health China 2030 Plan

In 2016, the National Patriotic Health Campaign Committee Guidance regarding the development of healthy cities, townships, and villages was released, which focused on developing healthy cities within China via 5 main goals and 6 key tasks, in order to cater the health needs of residents and achieve coordinated development of infrastructural changes and human health [34]. The 5 goals and the 6 tasks are summarized as follows.

5 goals of Healthy City (Due to [35])
1. Constructing Healthy Environments
2. Building Healthy Society
3. Optimizing Health Services
4. Fostering Healthy People
5. Developing Healthy Culture

6 key tasks to achieve the above 5 goals (Due to [35])
1. Setting up healthy schools, institutions and communities
2. Establishing health governance models
3. Improving environmental and sanitary infrastructure

4. Enhancing safety management of drinking water
5. Improving environmental quality
6. Improving public security systems

On top, the Healthy China (HC 2030) blueprint was released in Oct 2016, which encourages every Chinese citizen to take part in this campaign. The overall concept "Health for All, and All for Health" aims at enhancing health level, popularizing healthy life, optimizing health services and securities, fostering environmental health and developing health industry [36]. Table 1 shows the framework of the HC 2030 blueprint, with its detailed goals, principles and core indicators. Details and the following "table" are extracted from [37].

Table 1. Detailed framework of HC 2030 Blueprint (Goal, Principles, China's vision for health care and the 13 Core Indicators) – based on [37]

Goal

Put health on the priority list of development to a strategic position; promote the concept of health in the whole process of public policy implementation; enable everyone to be involved health and everyone to share health care services; focus on the health of all the people all their life in China

Principles

| Health Priority | Reform and Innovation | Scientific Development | Justice and Equity |

HC 2030: China's vision for health care

1. Health Level   2. Healthy Life   3. Health Services and Health Security
4. Environmental Health   5. Health Industry

The 13 Core Indicators

1. Health Level	2. Healthy Life	3. Health Services and Health Security	4. Environmental Health	5. Health Industry
A. The average life expectancy B. The mortality rate of infants C. The mortality rate of children below 5 years of age D. The mortality rate of pregnant women and mortality E. The proportion of those meeting the national physique determination standard among urban and rural residents	A. The level of health literacy among residents B. The number of people taking part in physical exercise	A. Premature mortality as a result of major non-communicable diseases B. The number of registered doctors per 1000 residents and registered nurses per 1000 residents C. The proportion of personal health spending in the total health expenses	A. Good air quality rate of all cities at prefecture level or above B. The rate of surface water quality better than III	A. The total investment scale of health services

The framework of Health China 2030 vision

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8.1.2. Example 2: Commitment to Green Urban Living and Infrastructure

The Chinese government also proposes 3 important concepts in its urban construction and planning process, which aims to develop a modern and sustainable city, and maintain economic growth. This include (1) *Green Buildings*; (2) *Green Cities* and (3) *Energy Efficiency.*

UBS (2019): Public buildings like schools and hospitals should align with the Green Building Evaluation Label, which considers proper use of land, energy and water, indoor environmental quality, efficiency of resources and operational management. In particular, 28% of office buildings in 10 major Chinese cities were ranked Grade A in United States' Leadership in Energy and Environmental Design (LEED) system [38].

Idea of "Forest City": Practiced in Shenzhen, Shijiazhuang, Liuzhou and Nanjing etc. The concept of "vertical forest" buildings alleviate high levels of air pollution, absorb sufficient amount of CO_2 and pollutants from atmosphere.

Wang, C.N. (2019): China has extended the "green" concept to public transportation development in the Green Travel Action Plan (2019-2022) [39]. Further promotion of use of green vehicles and transportation network will be conducted, for example Chinese high-speed rail (HSR) network, high-speed trains and smart subway systems in different cities. Shenzhen is the first city in the world to deploy and implement the use of electric buses as means of public transportation [39], and this marks a milestone for green transportation development in China.

8.2. Hong Kong, China

Hong Kong, China is an international financial centre, as well as a centralized business hub in Asia. It has maintained a top-tier position in many global city rankings, for example the 1st in World Competitiveness Yearbook (2016), the 2nd in Global Opportunity Index (2015), and the 9th in Global Competitiveness Report (2016-2017) [40].

In terms of infrastructure and spatial planning, Hong Kong is well known for its high-rise buildings, compact urban morphology, mixed land utilization, high urban mobility [40], efficient, convenient and celebrated public transportation system [41]. It also possesses a lot of green spaces, cultural heritages and entertainment facilities. In particular, based on the data obtained from the Asian Green City Index (2011), the green space per capita of Hong Kong (105.3 m^2) is much higher than many metropolitan cities like Seoul (23.4 m^2), Shanghai (18.1 m^2) and Tokyo (10.6 m^2), and is even higher than Singapore (66.2 m^2) [42], which comes the 2nd in the world's best city based on the Expat Experience Report (2014). Most regions of Hong Kong have changing land use patterns, and nowadays, residential, commercial or business infrastructures and utilities are situated everywhere.

Foreseeing the potential challenges in upcoming years, the HKSAR government has conducted a comprehensive and strategic study named "Hong Kong 2030+: Towards a Planning Vision and Strategy Transcending 2030" to identify these challenges, then provide spatial planning framework and suggestions on built environment beyond 2030, via action-oriented, proactive and visionary manners [40]. Related challenges include, but not limited to the following:
- Shrinking labour supply and labour force [43];
- Speeding up of population and infrastructural aging in upcoming 20 years [43];
- Poor outdoor comfort, insufficient experience of nature and community;
- Performance in terms of liveability and innovative thinking within high-density urban context [40];
- Lacking of readiness for climate changes [40];
- Arising of environmental issues like pollutions in densely populated regions [40].

Some highlighted practice to cope with health and demographic challenges are shown in the examples below:

8.2.1. Example 1: Open Space and Rooftop Gardens near Infrastructures

Open space and rooftop gardens on top of many infrastructures of Hong Kong enhance physical activities of local citizens and visitors, thus result in better health conditions. Based on Plan D presentation materials of the Planning Department, here are some selected examples:

(a) Rooftop Open Space on top of West Kowloon Railway Station Bus Terminus (near Kowloon MTR station):
(1) Outdoor Rooftop Garden and Gradual Stairs named "Sky Corridor" [44];
(2) Public Walkway and Open Space surrounding the garden [44].

Figure 9. The Outdoor Rooftop Garden – "Sky Corridor" on top of West Kowloon Railway Station Bus Terminus (Source: https://commons.wikimedia.org/wiki/Category:Exterior_of_Hong_Kong_West_Kowloon_Station#/media/File:HK_%E8%A5%BF%E4%B9%9D%E9%BE%8D_West_Kln_%E8%A5%BF%E4%B9%9D%E9%BE%8D%E7%AB%99%E7%B6%A0%E5%8C%96%E7%A9%BA%E9%96%93_Green_Plaza_%E5%A4%A9%E7%A9%BA%E8%B5%B0%E5%BB%8A_Sky_Corridor_January_2019_SSG_13.jpg)

(b) Rooftop Garden of DOMAIN Mall (next to Yau Tong MTR Station):
    (1) Contains viewing decks with wide stairs nearby;
    (2) Garden and Play Facilities for children.

Figure 10. The rooftop garden of DOMAIN Mall
(Source: https://www.housingauthority.gov.hk/en/commercial-properties/shopping-centres/list-of-shopping-centres/details/domain/index.html)

(c) Concrete design of Clubhouse Mong Kok Skypark (Near Mong Kok MTR Station) [45]:
(1) Communal Clubhouse, Outdoor Landscaped Garden, Staircase, BBQ and picnic areas on 28/F (top floor) of the building;
(2) Greenery elements, Open Space, Comfortable seating spaces embedded into the stairs.

8.2.2. Example 2: "Aging in Place" Facilities in Public Rental Housing Estates

Wiles *et al.* (2012) mentioned that community and neighborhood elements are the most important factors in the elderlies' ability to stay put, apart from home settings and conditions [46], for example recreational facilities and social infrastructures. Therefore, incorporation of "age-friendly" living environment and universal design principles into elderly districts are necessary [47].

Comprehensive Structural Investigation Programme (Housing Authority (HA), 2005)

Identified 22 Public Rental Housing (PRH) estates for potential re-development, in terms of structural safety and economic repairs [48]. Some selected examples are as follows:

Upper Ngau Tau Kok Estate: Focus on enhancing accessibility, comfort level and social interaction between elderlies – Add in basic safety infrastructures like handrails, expanded passageways and doorways, non-slip floor tiles, common and public space areas, sitting-out areas and physical exercise facilities [49]
Upper Wong Tai Sin Estate: Focus on improving accessibility of elderlies – Add in sufficient number of escalators within the estate [49]

Shek Kip Mei Estate and Lower Wong Tai Sin (II) Estate: Focus on promoting safety of elderlies and walkability – Add in non-slip flooring, grab bars and conduct in-flat modifications for safety reasons [49]

11 residential blocks/towers of Un Chau Estate, Sham Shui Po from 1998-2012: Focus on the followings, as listed in [50]:

- Interior design of housing (depend on individual needs and health concerns);
- Design of estate and neighborhood (set up common recreational facilities and social network for elderlies); and
- Community care (e.g., specific transport facilities, healthcare and personal care system)

8.2.3. Example 3: Accessibility and Sustainability features within The Headquarters of HKSAR government

With reference to [51], The Headquarters of the HKSAR government situated in Tamar, Admiralty consists of different accessibility features, for example pedestrian footbridge that connects Exit A of Admiralty MTR station and Tamar, as well as to neighboring open spaces, ancillary facilities and Tamar Park. The connecting footbridge is shown in Figure 11(a).

The Headquarters have incorporated many sustainable features within office environment and facilities nearby, including, but not limited to:

(1) LED light fittings and computerized sensors for lighting control;
(2) Light pipes for the Government Complex and nearby open spaces;
(3) Greening and Landscaped facilities and environment (e.g., Green roof, wall, open space, water features, trees, temperature controlled ventilation for specific rooms);
(4) Visual and physical connectivity to neighboring waterfront.

Figure 11(a). The connecting footbridge between Exit A of Admiralty Station and the Headquarters of the HKSAR government in Tamar
(Source: https://hkbus.fandom.com/wiki/%E5%A4%8F%E6%85%A4%E9%81%93?file=Admiralty-HarcourtRoad-1093.jpg)

Figure 11(b). Overview of the Headquarters of the HKSAR government and its neighboring greening environment (Source: https://en.wikipedia.org/wiki/Central_Government_Complex_(Hong_Kong))

8.3. Japan

Balancing population within different cities, developing better land user patterns, coping with ageing society and infrastructures, and responding to sudden risks like earthquakes and tsunami are some sociodemographic and health visions of modern Japan. Projection has shown that Japan's urban population will reach 85% of the total population by 2030 [52], thus there is a genuine need to create health-supportive environment in all cities and prefectures of Japan. In recent decades, there are two highlighted national health initiatives in Japan, which emphasized on the importance of creating harmonious health environment and a uniform health care system to deal with human health challenges. These initiatives are "Healthy Japan 21" launched by the Japanese Ministry of Health, Labour and Welfare in 2000 [53], and "Japan Vision: Health Care 2035" released by Health Care 2035 Advisory Panel in June 2015 [54].

"Healthy Japan 21" was released in 2000. This initiative focuses on how environment supports human health, and encourage participation of local residents to promote health, as well as deliver relevant knowledge and skills to all citizens of Japan.

Stage 1: Emphasizes on incorporation of infrastructural elements like roads and bridges within a city
Stage 2: Focuses on safe food and good air quality in environment
Stage 3: Enhances the health promotion activities and campaigns within society
Stage 4: Provides local medical services

For example, separate smoking areas in selected public places like train stations, enterprises and even streets are created, public areas for physical exercises are built, lessons that educate citizens on improving dietary habits and nutrition are conducted [55].

Other relevant government departments concentrated on Stages 1 and 2. In particular, The Japan's Ministry of Land, Infrastructure and Transport promoted barrier-free urban development based on "universal-design" concepts [56], in accordance with Japan's Traffic Barrier-Free Law. Moreover, each local government implemented measures that improves health status of all local residents [55], for example adding elevators and escalators in large-scale malls and buildings, designing low-floor buses, wider sidewalks and securing wheelchair space for elderlies and disabled, eliminating level differences in pavements, and creating urban green spaces for comfortable walking [57]. All these have brought positive health impacts to citizens.

"Japan Vision: Health Care 2035" was released in 2015. The caption is "Leading the world through Health", that is to set up a healthcare system that all sectors of the Japanese society can be engaged for health and well-being development. Each person utilizes one's potential in shifting social environment and values, and delivering unmatched health outcomes to others via advanced medical technologies [54]. Apart from safeguarding health status of Japan, one should create a sustainable and prosperous country that promotes global health and international cooperation [54]. The 5 focuses of this document are "Quality", "Value", "Autonomy", "Care" and "Integration", where its visions and actions are outlined based on 3 key principles as follows:

(1) "Fairness" of the healthcare system that supports all patients and individuals in the society;

(2) "Solidarity built on autonomy" that ensures everyone receives social benefits of well-being;

(3) "Shared prosperity for Japan and the world" that fosters economic and social stability of healthcare system, and enhances global connection and collaboration.

There are short-term plans to be achieved by 2020. The key measures are as follows:

- Establishment of the community-based healthcare and emergency management system, support clinical trials, health technology assessments, healthcare and disease management
- Improvement in quality of healthcare service
  Examples: Reducing medical errors, Preventing excessive care, Slowing down outspread of diseases, and Reducing associated costs in health care
- Prohibition of smoking for youth via increased taxation and public education
- Training capable professionals in medicine and public health
- Evaluating existing health technologies and developing health care innovations with the Bureau for Medical Innovation

For the long-term plans up to 2035, the key directions are as follows:

- Creating a portable information infrastructure that contains long term care information, holistic health and lifestyle services, and evaluating related health technologies based on its efficacy
- Achieving a "Tobacco-free" Japan
- Strengthening the role of Japan as epicenter of innovation
  Examples: Creating global health governance structure, Encouraging teamwork to combat global infectious diseases and natural disasters, Developing a foundation in medical and social welfare aspects
- Taking leading roles in global health policy development, developing policy evaluation process and data network on health care, diagnosis and treatment
- Reducing regional health disparities by promoting health to all individuals

The infrastructural planning and development of Japan consists of measures that are suitable for different time period, based on Murayama, A. (2016) [58].

Short-term Plans: Focus on strengthening of buildings and infrastructures to cope with natural hazards

Mid-term Plans: Modify land use regulations, relocate facilities and prepare for urban development

Long-term Plans: Aim at creating safe, comfortable and sustainable living environment via urban transformations

The City Planning Act of 1968 laid down solid foundations for today's urban planning and development, for example the establishment of zones and districts, introducing district, prefectural and local master plans, development of facilities and public spaces that enhance walkability and mobility of citizens [58]. In 2014, the concept of "Networked-Compact City" was proposed in the Location Improvement Plan - Ricchi Tekiseika Keikaku [59]. Such concept aims at improving existing built environment, maintaining population density within city centres, and providing public transit infrastructures.

Overall, urbanization of Japan has affected both medium- and small-sized cities, while citizens living outside urban areas will have to get adapted to the changing conditions to maintain health and comfort status. Here are two selected examples.

8.3.1. Example 1 (Shizuoka City)

Shizuoka is the capital city of Shizuoka Prefecture, and comes the second within the prefecture in terms of population and spatial area. It has around 691,000 people in approximately 106,000 households [60], and was forecasted to decrease to 600,000 within 20 years from now [58].

In 2015, the Draft Shizuoka City Master Plan categorized areas based on concepts of density and envisioned citizens' lifestyles [61]. Urbanization Promotion Area that corresponds to "Dwelling Attraction Area" in Ricchi Tekiseika Keikaku (2014) consists of "Convenient Urban Zone" and "Spacious Urban Zone".

"Convenient Urban Zone": represents the high-density urban centers situated around public transportation network, and will likely increase its density in terms of housing areas in the future. **"Spacious Urban Zone":** represents the mid-density housing areas that will decrease its density and population in upcoming decades, which aims at achieving environmental sustainability in the long run, with sufficient facilities, greenery areas and natural environment nearby [57].

Highlighted examples extracted from the Shizuoka city planning master plan [62] are as follows:

- **Kiyomi lagoon Park**: Promote active living by maintaining natural environment, cycling and walking routes
- **Ihara districts and Okitsu districts**: Maintain favorable living environment that harmonizes with natural environment and green spaces
- **Shimizu Port**: Promote "all and color plan" within neighborhood by creation of artificial and natural sceneries near the habor
- **Former Tokaido and Yasakakitas of Iida district**: Keep cityscape sceneries, historic sightseeing places and residential areas in good conditions

8.3.2. Example 2 (Suzuka City)

Suzuka City is situated in northeastern Mie Prefecture of Japan. It mainly emphasizes on extending its industrial markets, for example automobile and textile plants [58]. The city itself has varieties of urban structures, thus may not fit well into Tekiseika Keikaku of Japan. The Draft Suzuka City Plan in 2015 consists of 5 focuses, with the following goals connected to citizens' physical health conditions and mental well-being [58, 63]:

- Impose vibrant urban development by changing existing land use pattern, so that interaction and communication of citizens between neighborhood regions are enhanced
- Encourage higher mobility by the following means
  (1) Building a safe road network
  (2) Adopting "universal design" in streets and bicycle lanes, as well as routes to schools and neighboring facilities
  (3) Improving better transportation network designs and providing better services
- Intensify urban attractions in centre of Suzuka City, at the same time conserve existing settlements for local citizens
- Conserve and utilize natural environment, green spaces and agricultural land within the city, promote greening in all public facilities

In recent few years, several more plans are implemented in Suzuka.

March 2012:	The happiness environment basic plan aimed at creating a comfortable living environment for all citizens, providing better supports regarding individual's health [64]
September 2014	The influenza measures action plan focused on protecting citizens' health conditions, minimizing the influence and disruptions of new influenza or sudden diseases to normal living conditions within the city [65]
April 2018	The 2nd National Health Insurance Data Health Plan and the 3rd Medical Checkups Plan aimed at providing more medical care information and health tips, and focused on causes and syndromes of lifestyle-related diseases like diabetes [66]

All these active participatory health planning measures bring stimuli to enhance environmental conditions that promote good health and high quality of lives.

8.4. South Korea

South Korea was placed No. 22 in the 2019 United Nations Human Development Ranking in the world and No. 4 in Asia, with Hong Kong as No. 4, Singapore as No. 9 and Japan as No. 19 in the world [67]. Since 2000, a single national health insurance program titled the "Korean National Health Insurance Service (KNHI)" is offered for all local citizens, after merging employment-based and location-based national health insurance programs. Compared with other countries that belong to the Organisation for Economic Co-operation and Development (OECD), although citizens' expenditure on health is only 8.1% of national GDP (lower than OECD average of 8.8%), the healthcare qualities are within the top in many aspects, for example obtaining the 1st in terms of Colorectal cancer 5-year survival rate, Cervical cancer 5-year survival rate, as well as Stomach cancer 5-year survival rate [68].

In terms of national effort in promoting good health, the first mid-long term national health plan named "Health Plan" was released in 2002, and the national government is required to revise every 5 years under Health Promotion Law. Under the current 4th Health Plan (2016-2020), there are 6 major tasks and 26 sub-tasks to enhance "healthy life years" and health equity, as shown in Table 2.

Table 2. The Overview of the 4th Health Plan (2016-2020) in Korea
(Source: Korean Ministry of Health and Welfare (2020),
http://www.mohw.go.kr/react/policy/index.jsp?PAR_MENU_ID=06&MENU_ID=06330101&PAGE=1&topTitle, accessed February 2021)

Goal	Healthy society for all
Objective	To enhance 'healthy life years' and health equity

↑

Major Tasks				
1. Healthy Lifestyles	2. Chronic Diseases	3. Infectious Diseases	4. Occupational Safety and Health	5. Subpopulation Health
(1) smoking (2) alcohol (3) physical activity (4) nutrition	(5) cancer (6) health screening (7) arthritis (8) Cardio - cerebrovascular health (9) obesity (10) mental health (11) oral health	(12) vaccination (13) infectious disease surveillance (14) hospital-acquired infection (15) Tuberculosis (16) HIV/AIDS	(17) food safety (18) occupational health	(19) maternity health (20) infant health (21) elderly health (22) worker health (23) solder health (24) school health (25) vulnerable family health (26) disabled health

↑

6. Task Management

8.4.1. Example 1: Provision of Public Health Information and Statistics Figures

In terms of collecting and sharing health data online, South Korea is doing better when compared to other East Asian countries. Three systems have been set up in recent years:

(1) **Public Health Information System (PHIS) (1998):** An efficient public health administration and management system. The data are incorporated from all governmental public health centres, hospitals and research institutes

(2) **National Health Insurance Sharing Service (2015):** to provide national health insurance data to researchers

(3) **Healthcare Big Data Hub (2015):** A national health online data portal that provides national health insurance data, patient data, API, statistics, and analysis tools to public

The Korean government is now planning a new national data system that combines PHIS and information related to social work and services. On top, it collects and releases a series of international standard public health surveys online, which have adopted the American and WHO guidelines, for example Korea Community Health Survey, Korea National Health and Nutrition Examination Survey, Korea National Healthcare Usage Survey, and Korea Health Panel Study respectively.

Most of these collected health data are available upon application. One drawback is that some data and relevant websites only have Korean version, thus may cause inconvenience to foreign scholars and citizens. Figure 12 shows a sample of these websites.
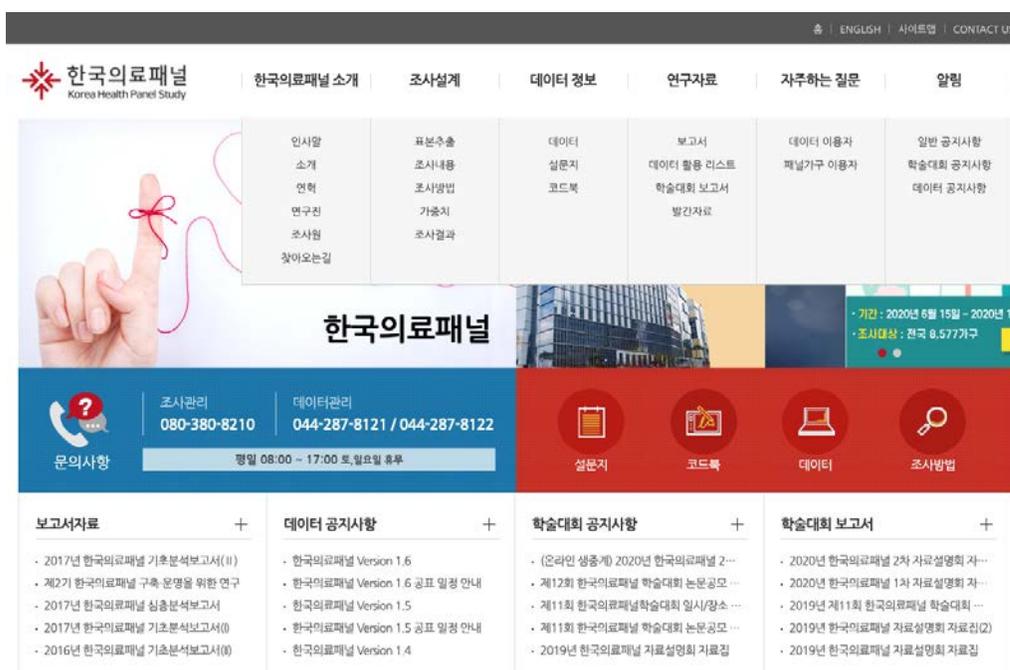

Figure 12. The website of the Korea Health Panel Study
(Source: Korea Health Panel Study (2020), https://www.khp.re.kr:444/eng/main.do)

8.4.2. Example 2: Korea Healthy Cities Partnership (KHCP)

The concept of healthy cities has actually been introduced in Korea in early 1986, and the City of Gwacheon was the first pilot city conducted in 1996, which utilizes the concept of healthy cities as suggested by WHO.

Since 2006, local governments joint effort and built an inter-city organization named "Korea Healthy Cities Partnership (KHCP)" for promoting healthy cities. As in 2020, 81 out of 243 local governments (including metropolitan city, self-governing provinces, and self-governing local governments) are members of this organization. Its main goal is to promote population health, quality of life and sustainable city development, via sharing information and public policies among local governments, as well as with governments from overseas partners. 4 tasks have been set-up by the KHCP, which are stated as follows, and a photo of the meeting in 2019 is shown in Figure 13.

(1) Organizing annual meetings among member governments
(2) Conducting public health research
(3) Implementing common health interventions
(4) Building up network with governments overseas and international organizations like WHO and Alliance for Healthy Cities

Figure 13. An annual meeting of KHCP
(Source: KHCP(2020), http://www.khcp.kr/hb/main)

8.4.3. Example 3: Building Smart Cities within South Korea

Two national pilot smart cities project have been implemented in South Korea, namely Busan National Pilot Smart City (Eco-Delta Smart City) and Sejong National Pilot Smart City (Smart City Korea, 2020) [69].   On top, other local governments like Seoul Metropolitan Government and the City of Bucheon Government are also implementing individual smart city initiatives. All these targeted at a common theme – "Smart" health.

In particular, Seoul's Magok Smart City has launched a pilot project for health, called the Magok Musculoskeletal System Smartcare, as shown in Figure 14. This project has the following goals and features:

(1)   The developed technologies aim to maintain the musculoskeletal health of residents and employees in Magok;
(2)   A patient can diagnose one's own musculoskeletal health conditions at office or at home, by using a smartphone or tablet app, and a wearable device;
(3)   The patient data is automatically stored, and delivered to healthcare professionals via block chain technology;
(4)   Healthcare professionals can provide each patient with customized health services, and the government can collect relevant information for future healthcare needs and policy implementation.
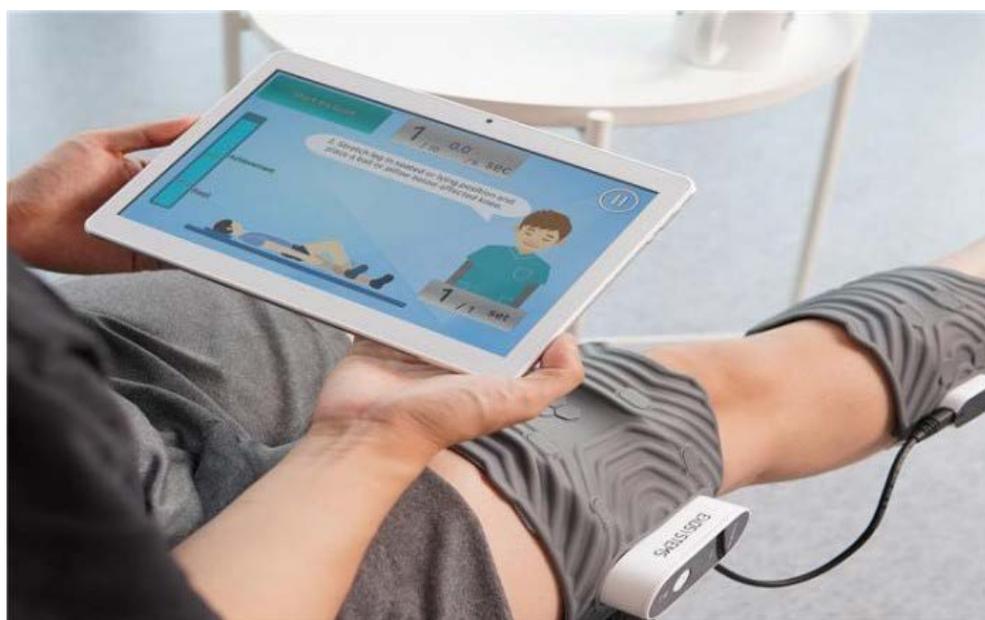

Figure 14. The Magok Musculoskeletal System Smartcare
(Source: Hanui Shinmun Daily (2020),
http://www.akomnews.com/bbs/board.php?bo_table=news&wr_id=39806)

9. Summary and Conclusions

Building a healthy and sustainable city is a perpetual process that all members of the society should actively get involved. This report stresses that all factors from the social and physical environments at any level will potentially influence population health, though the exact influences and processes vary by age groups. While East Asia is among the regions with the highest life expectancy, and is properly equipped with well-developed medical service across the world, it has now confronted with a variety of public health challenges posed by the acceleration of population ageing, together with rapid urbanization processes and development.

After conducting a review on the concepts of healthy cities, determinants of health, and urban environmental health, this report has also examined various public health initiatives and blueprints on which the governments in Mainland China, Hong Kong, Japan, and South Korea have been working and implementing in recent years. Although individual country or city may have its unique contexts, there are several common characteristics in their approaches: (1) Embracing smart technologies and big data for urban planning; (2) Enhancing governance in public health policies and interventions; and (3) Promoting the public's engagement in public health aspects. The case studies and selected examples from the East Asian region, as a front runner, to promote public health in urban settings will be of tremendous importance. They also act as ignitors to enhance the practical applications of innovation approaches, which ultimately contribute to healthy community around the globe.

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