Healthy City Capacity Mapping: Resilient Management in the Aftermath of the COVID-19 Pandemic - Case Studies of Yogyakarta City, Indonesia and Marikina City, the Philippines

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COVID-19のパンデミックに東南アジアの諸都市はいかに立ち向かったか。本稿ではジョグジャカルタ（インドネシア）、マリキナ（フィリピン）の両市における実践例を検証し、公衆衛生面のレジリエンス管理の諸課題を探った。

Abstract

Cities are facing the complexities of urban challenges, particularly with the COVID-19 pandemic, in which cities across the globe need to adapt in terms of health management not only to recover from the pandemic situation but also to build resilience and preparedness for the possibility of future public health crises. Related to this, Indonesia and the Philippines are countries that initiated the Healthy City project in Yogyakarta City and Marikina City, respectively. In Indonesia, Yogyakarta City won the highest award, i.e., Swasti Saba Wistara, seven times in a row for Healthy City implementation. Meanwhile, in the Philippines, Marikina City was cited by the World Health Organization as one of Asia's healthiest cities. This study aims to discuss Healthy City implementation in the two cities. The six dimensions of Healthy City capacity mapping were used as determinants in this study, which are: (1) demographic and geographic profile, (2) policies and regulations, (3) governance and organizational structure, (4) participatory planning and budgeting, (5) urban facilities and infrastructure, and (6) urban environment. Data collection of this comparative study involved desk review and spatial observation through optimization of GIS technology. Mixed methods of qualitative and quantitative analysis were employed for data processing and analysis. The study's implication is expected to be evidence-based on healthy city program implementation, which could be widely adapted both non- and physically in urban built environments. Furthermore, the lesson learned also could be used as strategies of resilient management incorporating urban health elements in facing the COVID-19 pandemic.

Keywords Resilience, Healthy City, COVID-19, urban planning, urban built environment

Introduction

Rapid city growth affects various aspects, not just limited to physical problems such as strained basic infrastructure but also those related to the economy, society, culture, politics, and health. The COVID-19 pandemic has shown immense possibilities in worsening this urban living environment. Urban resilience needs to be leveraged to overcome these urban challenges, one of which is through adopting the Healthy City approach. The concept of a Healthy City is continuously creating and improving physical and social environments to enable healthy living (Lee & Nakamura, 2021). The World Health Organization (WHO) introduced this concept in 1980 as a comprehensive approach aimed at facilitating and creating a healthier urban environment (Fitry et al., 2020). In short, the Healthy City approach is a holistic perspective that seeks to improve physical, environmental, economic, and social developments in urban areas. Many countries have been implementing this approach, including Indonesia and the Philippines.

Despite its capability to assess needs and improve Healthy City development, Healthy City capacity mapping is rarely undertaken (Lowe et al., 2019). However,

more evidence from low- and middle-income countries on how urban planning contributes to public health is still needed, especially in the post-COVID-19 landscape (Luo et al., 2022). In Indonesia, Healthy City has been implemented since the early 2000s through its incorporation in the Ministry of Health regulations and policies (Palutturi et al., 2015). One of the healthiest cities in Indonesia is Yogyakarta City which won the highest award Swasti Saba Wistara for Healthy City implementation seven times in a row. As the impacts of the pandemic were felt, the Yogyakarta City Government and its communities responded well. Thus, the city has been chosen as the site of the pilot project to bolster the Healthy City concept, particularly in implementing Kampung Tangguh Nusantara, Wellness Destination, and Healthy Family Program. In the Philippines, Marikina City, a suburb of the capital city Manila, was cited by the WHO as one of Asia's healthiest cities. The city received recognition for promoting a healthy environment for children and for making the city safe through emergency preparedness planning. The Healthy City initiative in Marikina was implemented in the early 2000s that was dominantly infrastructure-driven and focused on environmental and health concerns. Since the creation of the Healthy Cities Management Task Force, the city has embarked on various programs and projects such as Dust-Free Marikina, Bicycle-Friendly City, Healthy Tourist Park, Clean Food Laboratory, Urban River Rehabilitation, Jogging Lanes, etc. (Yu & Sajor, 2008).

The two cities incorporated the Healthy City concept into many of their policies with high levels of commitment from their governments. As a result, they were awarded for their innovations in implementing the concept. This paper aims to probe the elements of urban health in both cities using the six determinants of the Urban Health Index (UHI) and identifying programs and policies that promote Healthy City development. This study is significant because it could serve as an evidence-based reference of Healthy City for other cities to bolster resilience management for further development, alongside other specific problems such as the COVID-19 pandemic.

Literature Review and Framework

To promote the good practice of Healthy City implementation, the WHO announced ten criteria for it in 1996, which required healthy cities to provide quality environmental health, harmonious social health, and others (Li, et al., 2020). In 2004, the WHO introduced helpful tools to promote health through capacity mapping to help planners and decision-makers. According to LaFond et al. (2002), mapping is the first step in designing capacity-building interventions and providing a valuable framework to monitor and evaluate the effectiveness of a program. Mapping urban health could link planning inputs and health outcomes (Green et al., 2009). The measurement of urban dwellers' health is linked to various characteristics and circumstances, physical settings, living and working conditions, environment, quality of services, and community organization, among others (Hanzl & Bezzera, 2019). Many researchers develop and generate indicators for Healthy City. Webster and Sanderson (2012) developed one of the recognized indicators, which provided sets of health assessment factors. Another prominent measurement that considers health within a given urban geographical boundary is the WHO's UHI. The UHI gives insights on various health indicators to enable temporal and geographical comparisons. Depart from these fundamental indicators, the six main umbrellas upon which indicators are based upon has been similarly used, which is a succession of improvements on predecessor HCI, with the detail determinants as follows:

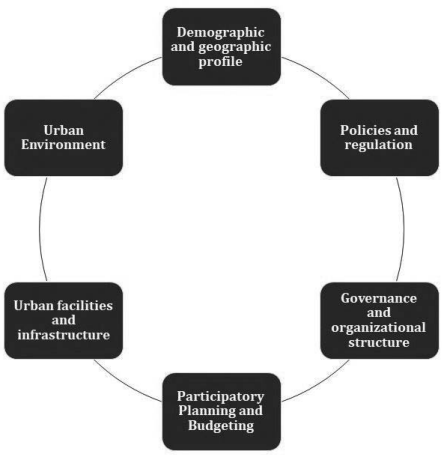

Fig. 1. Conceptual Framework of Healthy City Capacity Mapping

Methodology

This research applies mixed methodology, i.e., qualitative, quantitative, and spatial analyses, in order to explore and produce holistic depictions. These methods were applied simultaneously to identify the elements of a healthy city and their manifestations in resilience to be able to determine how the Healthy City concept could be an alternative approach to addressing the impacts of pandemics. The qualitative content analysis methodology was utilized to identify Healthy City initiatives' policies, programs, and activities in Yogyakarta and Marikina. Various documents, including existing regulations, planning documents, reports, or related studies about Healthy City in Yogyakarta and Marikina, were reviewed to identify the integration and synergy through the lens of resilience.

Statistical techniques were employed to quantify and analyze variables. Graphs and raw data tables were constructed to make it easier to analyze the results. Quantitative analysis techniques were used to score and weigh the capacity of both cities based on the six determinants of UHI. Each determinant was measured by a specific indicator shown in Table 1. The indicators index was obtained from the UHI adopted by WHO (2018) and several scientific journals' literature reviews. For indicators which has no standard, the index was determined by Sturges formulation with three levels of classifications i.e., low, medium, and high categories, where the highest observation value was derived from the highest national average value of indicators vis-à-vis the lowest national average value of indicators which was obtained from the lowest observation value. The following is the formula:

$$c = \frac{Xn - Xi}{k}$$

Where :
C = estimated class size
k = number of classes
Xn = highest observation value
Xi = lowest observation value

Spatial analysis was also carried out to extract information from the spatial data. This process includes examining the locations and attributes of features in the spatial phenomenon performed using Arc GIS 10.5. The spatial analysis of geospatial data is about spatial geometry's statistical and structural characterization (Bishop & Giardino, 2021), which includes various types of spatial analysis such as overlay, raster, contiguity, surface, and linear analysis (Paramasivam & Venkatramanan, 2019). This research adopted surface analysis to map green open spaces in Yogyakarta and Marikina.

Results and Discussions

Healthy City: A Response to the COVID-19 Pandemic

As COVID-19 spread across the world, cities acted as centers of its community transmission, as well as entry points into the further country-wide transmission through national and international travels and trades. Some cities became national epicenters of the pandemic, amplifying the spread and transmission of infection, while also often serving as healthcare surge points.

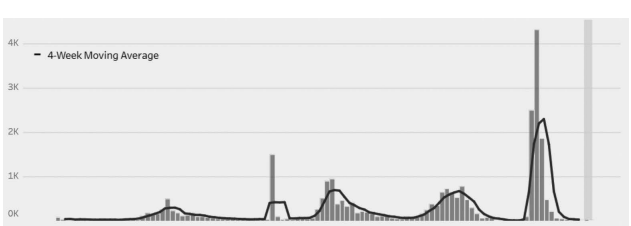

Fig. 2. Pattern of Positive COVID-19 Confirmed Case in Marikina

Source: Department of Health, Republic of the Philippines

Cities were very much affected by the COVID-19 pandemic during the years 2020-2021, including Yogyakarta and Marikina. As of March 2022, Yogyakarta and Marikina recorded 33.791, and 39.277 total confirmed pandemic cases, respectively. Urban dwellers live in a higher concentration inside urban perimeters, which expose them to contagious diseases, like epidemiological outbreaks, that are prone to crowding (Hanzl & Bezerra, 2019). Health services played major indispensable roles in this unprecedented situation. Health service is a fundamental factor for urban health and typically includes hospitals and healthcare centers (Luo et al., 2022). Health services and infrastructure availability in both cities have resulted in an average of 96% of people affected who have recovered from the disease, where 32.365 and 37.932 people recovered in Yogyakarta and Marikina, respectively.

Table 1. Demographic, and Geographic Profiles of Yogyakarta and Marikina (2020)

Determinants	Yogyakarta	Marikina
Geographic		
Population density per square km	12,781 people/km^2	21,192 people/km^2
Total area	32.50 km^2	21.52 km^2
Number of sub-districts/ *barangay*	14 sub-districts	16 barangays (2 districts)
Demographic (Health Status)		
Urban population	373,589 people[1]	456,059 people[2]
Population growth per year	-0.38%[1]	0.73%[2]
Infant mortality rate	11.22[3]	19.77[4]
Maternal mortality ratio	64.14[3]	122.90[4]
Morbidity rate (by type of disease – diarrhea)	270[3]	613[4]

Source: [1] Yogyakarta City in Figure Year 2021 by Central Bureau of Statistics Yogyakarta City (BPS)
[2] 2020 Census Population and Housing Report by the Philippine Statistics Authority (PSA)
[3] Yogyakarta Health Profile Year 2021 by Yogyakarta City Health Agency (DOH)
[4] Field Health Services Information System Annual Report by Department of Health Republic of the Philippines (DOH)

Healthy City Capacity Mapping in Yogyakarta and Marikina

Demographic and Geographic Profiles

Demographic and geographic are essential in portraying urban structures. This baseline information could be used in order to assess needs and improve healthy city development (Palutturi, 2015). According to Sutcliffe et al. (2015), the health of urban populations is essential to be regularly reported and monitored, even though, somehow, the data sets that link this concept are largely lacking, especially on a small scale. The general characteristic of the demographic and geographic profiles of Yogyakarta and Marikina are shown in Table 1 below.

Yogyakarta is located in the central south of Java Island, Indonesia, while Marikina is in the eastern part of Metro Manila, called the "Gateway to the East." Marikina is categorized as a highly urbanized city dominated by residential and industrial areas. Residential and tourism areas also dominate Yogyakarta. In terms of demographic components pertaining to the health status of city inhabitants, morbidity and mortality rate are used as benchmarks in measuring urban health (Webster & Sanderson, 2012 & WHO, 2018). Both cities' morbidity and mortality rates show that Yogyakarta performed better than Marikina in comparative national-level values. However, both cities underperformed vis-a-vis their national averages.

Policies and Regulations

In implementing and developing programs, countries and organizations must provide a policy framework that explains the objective to be achieved and the means by which it will be achieved (Palutturi, 2015). Regarding Healthy City implementation, the notion of Healthy City was incorporated and embodied in Indonesia's health development policies in the early 2000s. Indonesia already has its National Policy and Guideline that explains the Healthy City application, classification, and criteria, evaluation and award systems, capacity building, coordination, supervision, and budgeting, as well as forms for Healthy City assessment. Even though Yogyakarta has no special regulation addressing Healthy City implementation directly, such as Healthy City laws or guidelines, the implementation of Healthy City is manifested in several sectoral regulations that promote the establishment of a Healthy City. Below are some of the regulations and city/sector plans that intersect with the Healthy City concept, as shown in Table 2.

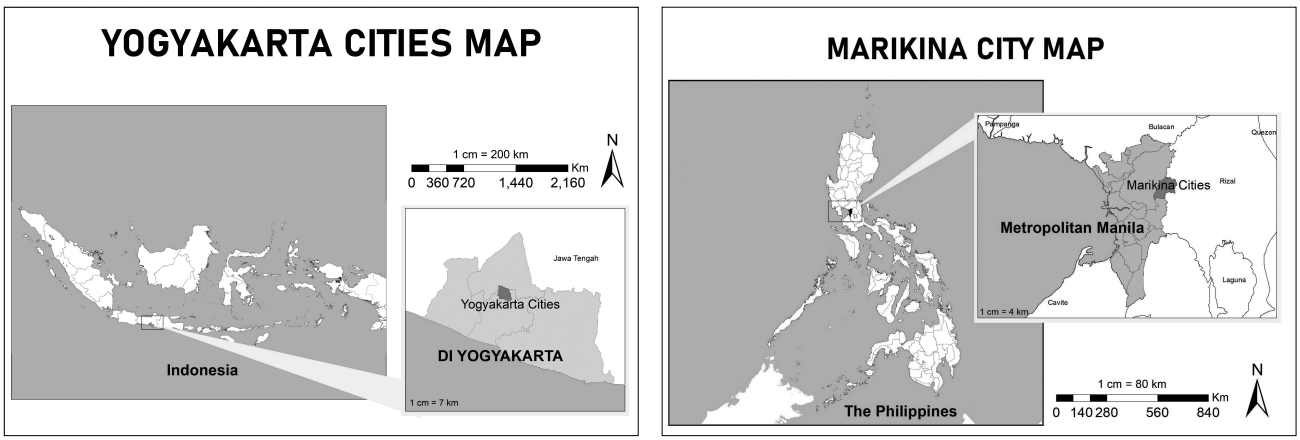

Fig. 3. Yogyakarta City Map in Indonesia (Left) and Marikina City Map in The Philippines (Right)

Source: Indonesia Geospatial Portal & Database of Global Administrative Areas (GADM)

Table 2. Existing Regulations Intersecting with Healthy City

Yogyakarta	Marikina
National Level	
1) Joint Regulation of Minister of Home Affairs and Minister of Health Number 34 of 2005 about guidelines for the implementation of Healthy Cities 2) Minister of Health Decree Number 574 of 2000 concerning Health development policies especially for supporting Indonesia Healthy Program (2010)	1) Republic of the Philippines, Department of Health (DOH) Administrative Order (AO) Number 2011-0008 about Guidelines on Urban Health Systems Development
Provincial/ HUC Level	
1) Governor Ordinance Number 44 Year 2017 regarding Regional Action Plan of Yogyakarta for Sustainable and Healthy Living Movement	
District/City/Local Level	
1) Regional Ordinance Number 11 Year 2017 regarding Medium-Term Development Plan (RPJM) of Yogyakarta City Year 2017-2022 2) Regional Ordinance Number 2 Year 2017 regarding Smoke-Free Area 3) Mayor Ordinance Number 50 Year 2017 regarding Healthy Living Movement 4) Mayor Ordinance Number 3 Year 2016 regarding Resilient Urban Village 5) Regional Ordinance Number 10 Year 2010 regarding Health Assurance System 6) Mayor Ordinance Number 61 Year 2013 regarding Healthy Elderly Care Center in Yogyakarta	1) Ordinance Number 075 Series of 2019 regarding Nutrition (Bread) Program for Undernourished Kindergarten and Grade One 2) Ordinance Number 48 Series of 2010 regarding No Smoking Areas in Marikina City 3) Ordinance Number 035 Series of 2016 regarding Free Medicine to Senior Citizens of Marikina City 4) Ordinance Number 078 Series of 2019, regarding offering of medical scholarship grants to qualified residents who aspire to become a doctor 5) Ordinance Number 15 Series of 2016 regarding the promotion and development of urban gardening to develop a sustainable food production 6) Ordinance Number 63 Series of 2003, requiring all food eatery owners and helpers in public markets to undergo a comprehensive food safety personal hygiene training

In regard to the Healthy City implementation, The Philippines also has a guideline at the national level about urban health systems development. In July 2011, the Department of Health (DOH) issued Administrative Order (AO) Number 2011-0008. Based on the AO, the DOH encourages the development of a healthier urban environment as rapid urbanization in the Philippines became unmanageable. The order created the Urban Health System Development (UHSD) program, which consists of three developmental components as follows:

1) Developmental programs for urban areas, including Healthy Cities Initiative (HCI), Reaching Every Depressed Barangay (RED), and Environmentally Sustainable and Healthy Urban Transport (ESHUT);
2) Planning tools and framework, which comprise of Urban Health Equity Assessment and Response Tool (Urban HEART), and City-wide Investment Planning for Health (CIPH);
3) Capacity building through a short course on Urban Health Equity (SCUHE).

Healthy City implementation at the regional and local levels in Metro Manila and Marikina is similar to those in Indonesia, which does not have special regulations directly addressing it. However, the city governments of Yogyakarta and Marikina have many initiatives in the form of regulations that intersect with Healthy City implementation. The implementations are through city development and other sectoral plans that promote a healthier urban environment.

Governance and Organizational Structure

The organizational level is an essential aspect of mapping health capacity (LaFond et al., 2002). This relates to structures, processes, and management systems, including personnel and resources, that improve organizational performance. Organizational form influences mechanisms that are needed for implementation and what roles need to be played (Palutturi, 2015). Intersectoral participation is significant for establishing a healthy city (Kenzer, 2000; O'Neil, 2006). Healthy City in Yogyakarta is handled and coordinated by the Yogyakarta City Health Agency. In 2020, Yogyakarta focused on ten settings/types of Healthy City, where each setting is managed by a department (Table 3).

Table 3. Healthy City Settings or Type and Agency in Charged for Yogyakarta City

Settings	Agency in Charge
Mandatory Settings	
- Healthy settlement areas and public facilities	- Housing and Settlement Area Office
- Self-reliant community, food and nutrition security	- Health Office and Food Crop Agriculture Office
- Market	- Industry and Trade Office
- Education	- Education Office
Additional Settings	
- Healthy community life and disaster resilience	- Social Office and Regional Agency for Disaster Management
- Healthy transportation services and traffic regulation	- Transportation Office
- Healthy industry/home industry and office areas	- Industry and Trade Office, Cooperative and Small-Medium Enterprise Office, and Manpower and Transmigration Office
- Tourism	- Tourism Office
- Place of worship	- Public Administration Department
- Smart city	- Communication, Informatics, and Public Relations Office

According to The National Guideline of Healthy City, a technical working team and a citizen forum should be formed to boost the implementation of the Healthy City concept. Cities should endeavor to form a technical working team as the representative of the government sector and a Healthy City forum as the representative of the citizens. According to an author, effectively addressing challenges to urban health requires engagement from multiple actors at multiple levels, including citizens (Stevens, et al., 2020). The Yogyakarta City Government has involved various stakeholders from non-governmental institutions to cooperate in generating more local-level results and with community contributions at the urban village level (Figure 4).

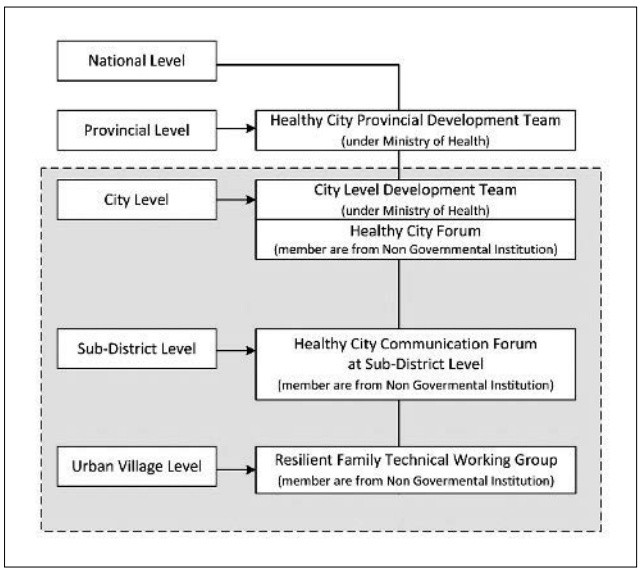

Fig. 4. Governance and Organizational Structure of Healthy City Implementation in Yogyakarta City

Source: Indonesian Ministry of Health

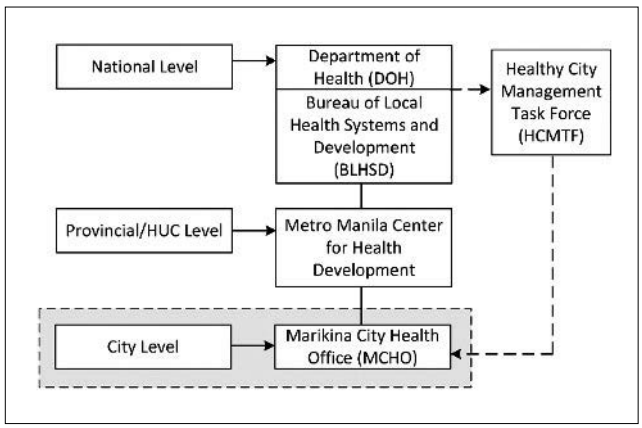

Fig. 5. Governance and Organizational Structure of Healthy City Implementation in Marikina City

Source: Department of Health, Republic of the Philippines

In the Philippines, the UHSD Program was initiated by the DOH. The DOH is assigned to a specific bureau and several centers to ensure the program is well implemented. The Bureau of Local Health Systems and Development manages the UHSD Program at the national level, while the centers assist in its implementation in provinces and highly urbanized cities (HUCs) like the Metro Manila Center for Health Development. At the local level, the Marikina City Health Office is the one responsible for ensuring the consistency of the local Urban Health System (UHS) with the national policy on UHSD (Figure 5). Similar to those in Indonesia, other city agencies are also assigned responsibilities for various Healthy City projects, which are included in the city plans and sectoral development plans and programs.

At the local level, both cities operationalize their health programs through the city or sectoral development programs in collaboration with collaborating national and international private sectors or organizations. For example, Marikina signed an agreement with Clean Air Asia, an international non-governmental organization, on Integrated Program for Better Air Quality in Asia as one of its ways toward development of the Marikina Clean Air Action Plan. This indicates that Indonesia and the Philippines created engagements with every stakeholder from the government sector, citizens, the private sector, and national and international organizations to participate in their Healthy Cities program.

Participatory Planning and Budgeting

Community participation is an essential part of the process of good local governance, and empowerment remains at the heart of effective health promotion. Municipal governments must work closely with people as an entry point to reach and engage them as part of the solution (Lee & Nakamura, 2021). As mentioned before, community participation is the core principle underpinning the Healthy City movement.

The practice of participatory planning in Yogyakarta has been realized through the Healthy City Forum (FKS), and Resilient Family Technical Working Group. The FKS forum played a crucial role in accommodating community participation and empowerment. It also facilitated discussions and dialogues to gather community ideas, inputs, and considerations related to priority

agendas on Healthy City. To complement this, Yogyakarta Mayor Regulation Number 3 Year 2016 about Resilient Urban Village was enacted to ensure that community commitment and participation are channeled in micro-scale work area, including integrated public health development, as well as healthy society development.

The efforts of building a healthy community should involve its citizens, even though the programs emanated from the government. The "whole-of-society" approach is about engaging the national and local governments, academe, business, and private sector in Healthy City programs and giving them with some degree of influence to perform certain responsibilities. One avenue is through community associations. Unlike Yogyakarta, there are no specific forum concerning Healthy City implementation in Marikina. The Marikina City Government encourages and urges their citizens to be involve in all Healthy City activities. Some of the Healthy City programs and activities in both cities are listed in the table below.

Table 4. Healthy City Programs and Activities

Yogyakarta	Marikina
Waste Management (Jaripolah)	Marikina Healthy City Center.
Green Village Program	Marikina Health Zone
Kampung Tangguh Nusantara	Healthy Market / Clean Food Laboratory
healthy family program	Nutrition Center
Wellness Destination	Walkable sidewalks
	Healthy public market with zero sidewalk vendors
	Bicycle Friendly City
	Disciplines on the Sidewalk
	Debris - free waterways
	Marikina River Park
	Animal Quarantine
	Free Health Care
	Efficient Solid Waste Management
	Senior Citizens Healthy Lifestyle Center
	Diagnostic and Specialty Center

Source: Indonesia and The Philippines Government's Website

Sufficient budget is needed for Healthy City projects to be successful. Considering that Healthy City is a public policy, one of the key requirements in order for it to succeed is to secure sufficient budgets (Park, 2021). Regarding this matter, Yogyakarta and Marikina have not allocated special budgets for their Healthy City programs/projects. The budgets are integrated with any other health projects. Based on the Budget Revenue and Expenditure of Yogyakarta City in 2022, IDR 374,702,254,362 out of IDR 1,794,427,166,854 (20.88% of the yearly budget) was allocated to the health sector. In 2020, Marikina appropriated PHP 144,384,757.04 out of PHP 4,652,582,452.39 (3.10% of the yearly budget) for Health, Nutrition, and Population Control.

Urban Facilities and Infrastructure

For healthy urban planning, data are needed that are not only linked to socio-demographic and environmental factors related to the health of its population but the quality of urban structures as well (Sutcliffe et al., 2015). Mapping urban structure with health data is a helpful tool to identify characteristics at multiple levels, which will be essential for the formulation of evidence-based health strategies and for urban planning (Sutcliffe et al., 2015).

Health service is a fundamental factor of urban health because accessibility of health services is a key issue for health provision (Luo et al., 2022). According to the Yogyakarta City Health Agency, in 2021, a total of 133 health facilities were available in over 14 sub-districts comprising of 15 hospitals (12 general hospitals and 3 specialized hospitals), 4 maternity hospitals, 28 units polyclinics, 15 public health centers, 8 subsidiaries of public health centers, and 43 pharmacies. The number of beds available was 1,584 from the combined 15 hospitals.

Marikina has 85 health facilities with 621 total number of beds (National Health Facility Registry v2.0 - Department of Health Republic of the Philippines). These health facilities include 1 hospital (300-bed capacity), 1 city-managed health building with clinical laboratory, drug testing center, sputum microscopy, social hygiene clinic (HIV testing and care services), birthing homes, dialysis clinics, drug abuse treatment and rehabilitation centers, general clinic laboratories, infirmaries, psychiatric care facilities, rural health units, social hygiene clinics, and COVID-19 testing laboratories. Apart from health facilities, other infrastructure related to urban health are: access to water supply, solid

waste management service, and electricity supply. The households in both cities are already supplied by clean water and household wastes collection service.

Urban Environment

The WHO stated that environmental factors and lifestyle are major determinants that affect human health, accounting for 17% and 60%, respectively (Li et al., 2020). More green spaces close to where people live and better accessibility to green areas have been shown to be useful for improving human health and for tackling health inequalities (Rostang, 2021). According to the Indonesian Government Regulation Number 6 of 2007, a city should have at least 30% of their total land area reserved for green open space composed of 20% public green open space, and 10% green open space.

Table 5. Urban Environment of Yogyakarta and Marikina

Determinants	Yogyakarta	Marikina
Green Coverage of Urban Built-up Area		
Green space areas	263.63 Ha[1]	39.53 Ha
Urban Walkability		
Kilometers of bicycle paths and lanes per 100,000 population	41.2 km	82 km
Air Quality		
Concentration of NO_2 $\mu g/m^3$	6 μg/Ncm	20.80 μg/Ncm[2]

Source: 1 Regional Development Planning of Yogyakarta City
2 The Philippine Realtime Ambient Air Quality Monitoring

The Yogyakarta Central Bureau of Statistic reported that significant land use change have occurred in the city. This is mainly attributed to conversion of agricultural lands to built-up areas approximately around 17.5%-27% in a span of 25 years. Yogyakarta City, with total land area of 3,250 Ha, has 263.63 Ha of green open space (Bappeda Kota Yogyakarta, 2021), which only covers 8% of the total land area. Compared to those in Yogyakarta, Marikina, with the total land area of 2,150 Ha only has 39.53 Ha of green open space (Government of Marikina City, n.d.), which only covers 1.83% of the total land area of the city.

Crowned as a bicycle-friendly cities, both Yogyakarta and Marikina have designated bicycle paths and lanes to support the safety of their cyclists. However, it is noted that less than 10% of cyclists use their bicycles as a means of transportation for work, except for people in the informal sector. Yogyakarta also has the total of 41.2 km long bicycle path to support its tourism. However, compared to Marikina, the length of the bicycle lane in Yogyakarta is only a half of the total length in Marikina City, which in 2015, had 82 km long of bicycle lane. In terms of air quality standards in Indonesia, the concentration of NO_2 must not exceed 100 μg/m3. As for the air quality in Yogyakarta and Marikina, both performed poorly with concentrations of NO_2 6μg/m3 and 20.80 μg/m3, respectively, which fall below the NO_2 pollution standard.

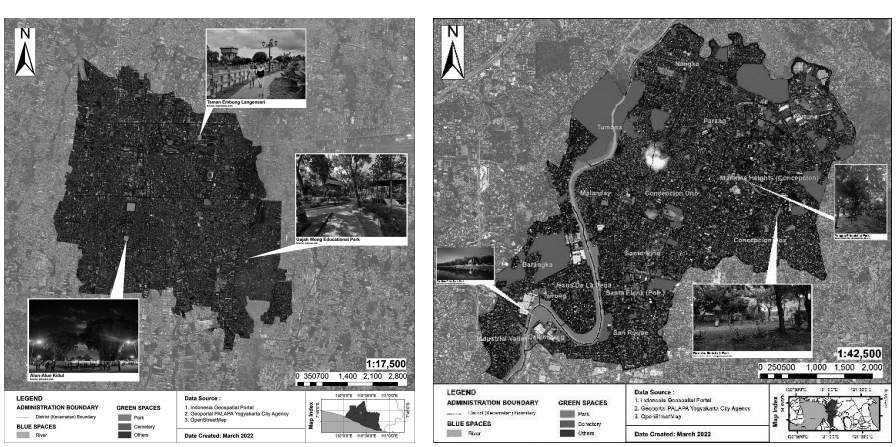

Fig. 6. Yogyakarta City Green Open Spaces Areas (Left) and Marikina City Green Open Spaces Areas (Right)

Source: Indonesia Geospatial Portal & Database of Global Administrative Areas (GADM)

Healthy City Approach as Assessment Tools in Building Resilient Management

The assessment of Healthy City capacity in this research was carried out with six determinants comprised of 11 components and 15 indicators derived from a comparative framework sourced from the UHI that was published by the WHO in 2018. The indicators were chosen based on data availability in both cities. The scoring of each component could be seen in Table 6 below.

As a result, Yogyakarta and Marikina demonstrate similarities in the governance and organizational aspects as well as policies and regulations. Achieving the ideal Healthy City concept demands explicit political commitment, leadership, organizational and institutional capacity, intersectoral partnerships, involvement of the local population in the decision-making process, and community development (Alves, 2019). Both cities are well maintained in terms of management, and have various Healthy City initiatives or programs, which involve communities. These programs could be used as models for other cities to emulate Healthy City implementation. However, there are also a lot of aspects that still need to be improved and further developed, whether in Yogyakarta or Marikina. On a positive note, most of their indicators performed better compared to their national average values. Technically, cities, and urban environment, are critical moderators of the interplay between human health and sustainability (Siri, 2016). The current moment of urban transformation due to pandemic offers a unique opportunity to consider how to live healthier lives on a healthier planet.

Table 6. Healthy City Capacity Assessment in Yogyakarta and Marikina

Determinants	Components	Indicator	Scoring Value		Indicator Source
			Yogyakarta	Marikina	
Demographic and Geographic	Geographic	▪ Population density (population per km^2)	3	2	WHO (2018), Lee & Nakamura (2021), Palutturi et al. (2015), Tingting Li (2020)
	Demographic (Health Status)	▪ Infant mortality rate	3	3	
		▪ Maternal mortality ratio	3	2	
		▪ Morbidity rate (by type of disease)	2	1	
Policies and Regulation	Adopted policies to improve urban health	▪ The availability of policies to improve urban health in All Level	3	2	WHO (2018), Palutturi et al., 2015 Pineo et al., 2019
Governance and Organizational Structure	Multisector engagement and organizational structure	▪ The availability of specific institution in charge for Healthy City program and activities	3	3	Palutturi et al., 2015 Stevens et al., 2020
		▪ Stakeholders' involvements in Healthy City program	3	3	
Participatory Planning and Budgeting	Program and activities addressing urban health challenges	▪ The city-wide activities or specific program or activities derived from policy or initiated by the regional autonomy	2	3	Palutturi et al. (2015) Lee & Nakamura (2021)
	Community involvement	▪ Community initiatives or activities related to Healthy City program	3	2	
	Funding for Healthy City implementation	▪ Indicative ceiling for health according to Regional Revenues and Expenditures Budget	2	1	
Health Facilities and Infrastructure	Health services and infrastructure	▪ Total number of hospitals or other health facilities	3	2	WHO (2018), Tingting Li (2020), Hanzl & Bezerra (2019)
		▪ Total number of beds in health facilities	3	2	
Urban Environment	Green Coverage of Urban Built-up Area	▪ Hectares of green spaces area per 100,000 population (Green Space per capita)	2	1	WHO (2018), Yue et al. (2016), Lee & Nakamura (2021), Lowe et al. (2019)
	Urban Walkability	▪ Kilometers of bicycle paths and lanes per 100,000 population	2	3	
	Air Quality	▪ Concentration of NO_2 $\mu g/m^3$	2	1	

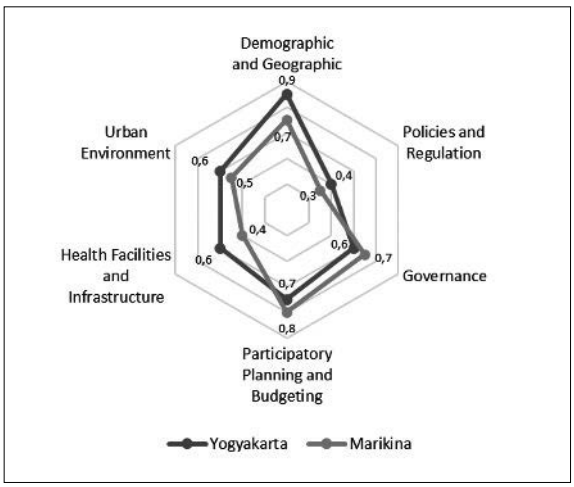

Fig. 7. Healthy City Capacity Assessment in Yogyakarta and Marikina

Resilient Management in the Aftermath of the Pandemic

The complexity of urban health poses enormous challenges which the cities in this study were able to overcome even in the midst of the unprecedented public health emergency, i.e., the COVID-19 pandemic. The degree to which urban system functions to deliver services for human health and well-being depends on the human capability to manage complexity and create healthy urban environments (Elmqvist, et al., 2019). Resilience management must be based on a deep understanding of the complexity of urban systems and the functions that they provide. Healthy City capacity mapping could be used as a first step in understanding the complexities of urban areas. Furthermore, managing resilience in urban systems requires adaptive and flexible governance styles on several scales in order to enhance the multi-functionality of systems and functions that support Healthy City implementation.

Conclusion

Complex urban systems are not only multi-dimensional, but also multi-sectoral. Healthy City capacity mapping is one of the tools to assess the complexity of the urban system through the lens of health perspective. As Yogyakarta and Marikina were awarded the healthiest cities in their respective countries, both cities could be used as models for others in regard to their innovations, initiatives, and programs for Healthy City implementation, even though the results show that some aspects still need to be improved. Urban green areas and the greening of other types of infrastructure need to be planned and managed to respond to the increasing health risks in these cities. To sum up, various programs on health helped Yogyakarta and Marikina save their communities from the COVID-19 pandemic by providing adequate health infrastructure. This is proven by the percentage coverage of affected people that recovered from the COVID-19 sickness. Furthermore, resilience management for urban health needs to respond to some inherent features of complex urban systems. As part of resilient management, Healthy City could be one of the milestones that could tackle the challenges of complex urban systems.

Notes: 'Healthy City' is used when referring to the approach or concept, meanwhile 'healthy city' referring to the city that has attained the vision of healthful living for its residents.

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