

Chapter 5

Manila Metropolitan Area

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Abstract Metro Manila, the national capital region of the Philippines, is one of the megacities in Asia. This chapter traces its origin and examines its urban primacy. It also examines the recent (1993–2014) and potential future (2014–2030) urban land changes, i.e., changes from non-built-up to built-up lands, in Metro Manila and its surrounding areas using geospatial tools and techniques. Some of the possible key factors influencing the urban development of Metro Manila and the potential implications of its rapid population growth and urban land changes to its future sustainable urban development are discussed. The analysis showed compelling evidence for Metro Manila’s urban primacy over the other metropolitan areas and regions in the country based on population and gross domestic product. Over the past 21 years (1993–2014), the area of built-up lands has increased almost twofold, transforming the landscape of Metro Manila and its surrounding areas. The relatively small land area of Metro Manila, its geographic characteristics and population and economic growth, the concentration of key urban functions/services and opportunities in the area, and its accessibility are hypothesized to be among the key factors influencing the spatiotemporal patterns of urban land changes and the overall urban development of the region. The simulated urban land changes indicated that built-up lands would continue to expand in the future (2014–2030) under the influence of infill and sprawl development patterns. The intensifying pressure of urbanization due to rapid population growth and urban land changes poses many challenges that need to be considered in sustainable urban development and landscape planning.

5.1 Origin and Brief History

Metropolitan Manila (Filipino: *Kalakhang Maynila, Kamaynilaan*), commonly known as Metro Manila and the National Capital Region (NCR) of the Philippines (Fig. 5.1), is the seat of government and the economic and political center of the

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country. It is one of the megacities in Asia. Metro Manila is composed of Manila, the capital city of the country, Quezon City, the country’s most populous city, the Municipality of Pateros, and the cities of Caloocan, Las Piñas, Makati, Malabon, Mandaluyong, Marikina, Muntinlupa, Navotas, Parañaque, Pasay, Pasig, San Juan, Taguig, and Valenzuela (Fig. 5.2).

There are various accounts on the origin of the word “Manila”. One of which is that Manila was derived from two Tagalog words: “may”, meaning “there is”; and “nilad”, the name of a shrub that originally grew abundantly along the shores of the Pasig River and Manila Bay (www.aenet.org/philip/manila.htm) (see Fig. 5.2a).

The history of Manila may date back to the year 900 AD based on the Laguna Copperplate Inscription, from which the first reference to “Tondo” is found and thought to be referring to the present-day district of Manila City (Fig. 5.2a) (Postma 1992). Before Miguel Lopez de Legaspi established the capital of Spanish colonization in Asia for the next 300 years (1565–1898), Muslim people were living at the mouth of the Pasig River by the Manila Bay, located in the present-day Metro Manila (Porio 2009) (Fig. 5.2a). The Spanish built the walled city known as *Intramuros* (within the walls) to serve as the seat of their colonial government (Fig. 5.2a).

Due to its central location in the vital Pacific sea trade routes, the richness of the country, its vast undeveloped resources and the opportunities for profitable investment, Manila was called “*The Pearl of the Orient*” (Manila Merchants’ Association 1908). The Manila-Acapulco galleon was among the first known commercially traveled trade routes in the world, which lasted from 1565 to 1815

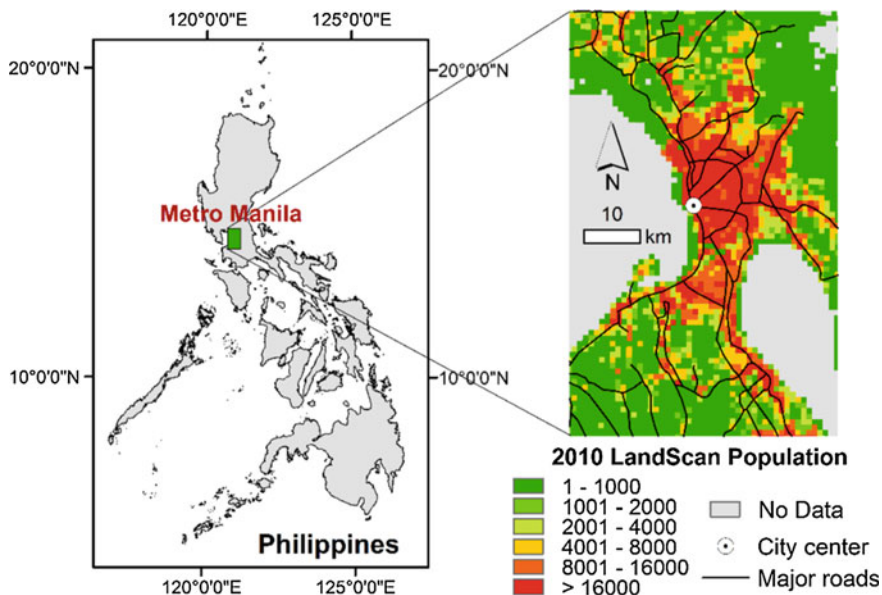


Fig. 5.1 Location and LandScan population of Metro Manila, Philippines

(Fish 2011). This makes Manila as one of the original “global cities”. Today, Tondo and Intramuros are among the six districts of the city of Manila (Fig. 5.2a).

The British occupied Manila from 1762 to 1764. At this time, Bacolor, Pampanga became the headquarters of the exiled Spanish colonial government. The British occupation ended by virtue of the Treaty of Paris of 1763. The signing of the Treaty of Paris of 1898 ended the Spanish–American War in the same year (1898). It also ended the Spanish colonial rule in the Philippines. During the Philippine Revolution against Spain (1896–1897) and the Philippine–American War (1898–1902), several places became the headquarters of the revolutionary government, including San Miguel and Malolos in the Province of Bulacan. In 1898, Marikina also became the capital of the then Province of Manila. The American occupation in the Philippines started in 1898 and ended in 1946 (Caoili 1988; Porio 2009).

On August 7, 1901, Manila became a chartered city. In 1905, due to the small area of Intramuros, the American colonial government commissioned the famous American architect and urban planner Daniel H. Burnham to design a plan for the development of Manila. Both the Spanish and American colonial governments initiated the development of Manila as a primate city (Caoili 1988; Porio 2009). However, according to Felino Palafox, Jr., a prominent Filipino architect, an urban planner and environmentalist, Burnham’s grand plan for Manila, i.e., grand scale, wide radial boulevards, landscaped parks, and pleasant vistas, was not followed, and this is one of the major loopholes in the urban development of Manila (Macas 2014). In Burnham’s grand plan, Manila was envisioned to cope with population growth to an anticipated level of 800,000 people (Alcazaren 2004; Morley 2011). However, in 1948, this population level had already been surpassed when Manila recorded a population of 983,906 people (Stinner and Bacol-Montilla 1981).

During the Japanese occupation (1942–1945), Manila remained the capital city of the country. However, on July 17, 1948, the Congress approved Republic Act No. 333, declaring Quezon City as the capital of the Philippines in place of Manila. On May 29, 1976, the stature of the nation’s capital was transferred back to the city of Manila by virtue of Presidential Decree No. 940 under President Ferdinand E. Marcos, Sr. This was made a few months after the creation of the present-day Metropolitan Manila under Presidential Decree No. 824 (November 7, 1975). In 2012, a Quezon City councilor passed a resolution urging the Philippine Congress to enact a law, declaring Quezon City as the “new” capital of the Republic of the Philippines. As of writing, Manila City remains as the capital of the country.

Since the creation of Metro Manila 40 years ago, its member local government units (LGUs) have grown and all of them, except one (Pateros), have been converted into cities. The cityhood of each of these LGUs provides an overview of the spatiotemporal pattern of the socioeconomic growth and urban development of Metro Manila (Fig. 5.2a). Figures 5.3, 5.4, and 5.5 provide a glimpse of the present-day Metro Manila.

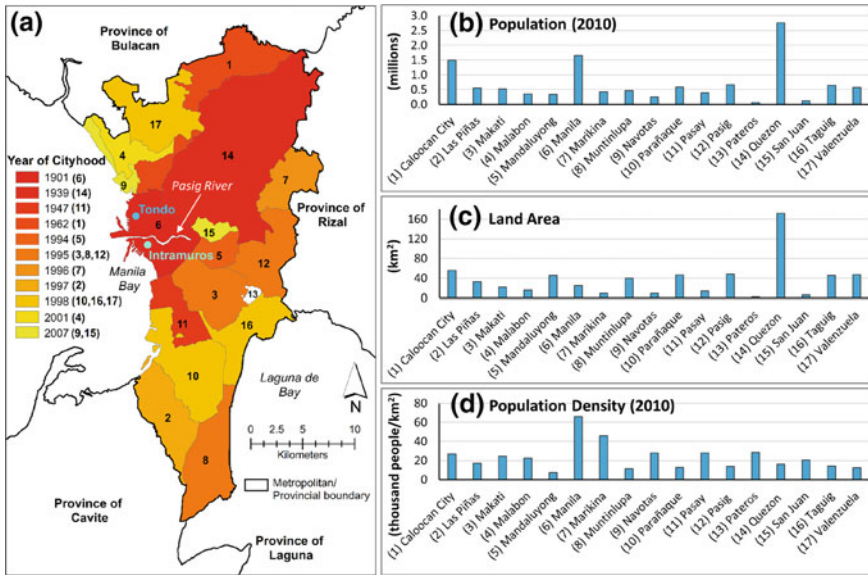


Fig. 5.2 a Cityhood of the member local government units (LGUs) of Metro Manila; b 2010 population; c land area; and d 2010 population density. *Source* The data on land area (2007) and population (2010) were consolidated from the Philippine Statistics Authority-National Statistical Coordination Board (<http://nap.psa.gov.ph/>; <http://www.nscb.gov.ph/>); the boundary map was downloaded from the Philippine GIS Data Clearinghouse (<http://philgis.org/>), with some updates from the author on the boundary of Manila City on the bay area, i.e., western part

5.2 Primacy in the National Urban System

5.2.1 The Philippines and Its National Urban System

The Philippines is one of the 11 sovereign states or countries in the southeastern region of Asia. In terms of land area, it is ranked 73rd worldwide and 6th in Southeast Asia (UN 2013). With a population of 100.10 million as of 2014, the Philippines is ranked 12th worldwide and second in Southeast Asia (World Bank 2015a). In terms of population density, the Philippines, with 336 people per km², is ranked 32nd worldwide and second in Southeast Asia (World Bank 2015b). In general, the Philippines is considered a highly urbanized nation (ADB 2014), with 45.3% of the country’s 2010 total population of 92.34 million living in urban areas (UN 2015).

The Philippines is an archipelago composed of 7107 islands, with a total land area of approximately 300,000 km². The country is divided into three island groups —Luzon (north), Visayas (middle), and Mindanao (south) (Fig. 5.6a), and into 18



Fig. 5.3 Inside Binondo district (the world’s oldest Chinatown) in Manila City, Metro Manila, Philippines. *Source* Author’s fieldwork (2015)

regions¹ based on cultural, ethnological, and geographical characteristics (Fig. 5.7). Under a democratic-presidential form of government, the Philippines is politically and administratively divided into 81 provinces, 144 cities, 1490 municipalities, and 42,029 barangays (PSA 2015a). The provinces are the primary administrative and political divisions in the country, while the barangays are the smallest administrative units. As provided by the 1987 Philippine Constitution and the subsequent laws enacted by the Philippine Congress, the country is also divided into legislative districts allocated among the provinces, cities, the Metropolitan Manila area, and the registered national, regional, and sectoral parties and organizations.

In the National Framework for Physical Planning: 2001–2030, 12 metropolitan areas are identified as the country’s leading industrial, financial, and technological centers that serve as the main hubs for international trade (NEDA 2002, 2007; ADB

¹Region I—Ilocos Region; Region II—Cagayan Valley; Region III—Central Luzon; Region IV-A—CALABARZON; Region IV-B—MIMAROPA; Region V—Bicol Region; Region VI—Western Visayas; Region VII—Central Visayas; Region VIII—Eastern Visayas; Region IX—Zamboanga Peninsula; Region X—Northern Mindanao; Region XI—Davao Region; Region XII—SOCCSKSARGEN; XIII—Caraga; ARMM—Autonomous Region in Muslim Mindanao; CAR—Cordillera Administrative Region; NCR—National Capital Region (Metro Manila); NIR—Negros Island Region. See also Fig. 5.7.



Fig. 5.4 Inside Makati City, Metro Manila, Philippines. *Source* Author's fieldwork (2015)

2014). These include Metro Manila, Metro Cebu, Metro Davao, Metro Cagayan de Oro, Metro Angeles, Metro Iloilo-Guimaras, Metro Bacolod, Metro Naga, Metro Baguio (BLISTT²), Metro Batangas, Metro Dagupan (CAMADA³), and Metro Olongapo (Fig. 5.6).

According to the United Nations (UN), the territorial spread of cities of different sizes across the whole territory of one country constitutes a national urban system (UN 2015). Such a system can be linked to the organization of the government at various levels: national, regional, and local levels (Kim and Law 2012; UN 2015). For the case of the Philippines, the spatial distribution of its 12 metropolitan areas (Fig. 5.6a) provides an overview of its national urban system and the regional, social, and economic agglomerations in the country.

²BLISTT—Acronym for the city of Baguio and municipalities of La Trinidad, Itogon, Sablan, Tuba, and Tublay in the province of Benguet (see Estoque and Murayama 2013a). See also the 'note' section in Fig. 5.6.

³CAMADA—Acronym for the municipalities of Calasiao, Mangaldan, and Dagupan in the province of Pangasinan.



Fig. 5.5 A glimpse of the urban development (high-rise buildings and urban green spaces) of Bonifacio Global City (also known as The Fort), Metro Manila, Philippines. *Source* Author's fieldwork (2015)

5.2.2 Primacy of Metro Manila

Urban primacy indicates the degree of dominance of one urban area (e.g., city or region) based on population, economy, and urban functions and services. This section examines the urban primacy of Metro Manila by comparing its population, which has been classified as 100% *urban population* (PSA 2013), and its gross regional domestic product (GRDP)⁴ with the other metropolitans and regions in the country.

Figure 5.6b shows that Metro Manila is not the “largest” metropolitan in the Philippines in terms of land area. It has a land area of 638.55 km², which is much smaller than Metro Cebu, Metro Iloilo-Guimaras, Metro Naga, and Metro Baguio, but more especially Metro Davao and Metro Cagayan de Oro (Fig. 5.6b). However,

⁴Gross Regional Domestic Product (GDP) is the aggregate of gross value added of all resident producer units in a region. It includes regional estimates on the three major sectors and their subsectors, namely the (a) agriculture, fishery, and forestry sector, (b) industry sector (mining and quarrying, manufacturing, construction, and electricity, and water), and (c) service sector (transport, communication and storage, trade, finance, ownership of dwellings and real estate, private services, and government services) (<http://nap.psa.gov.ph/>).

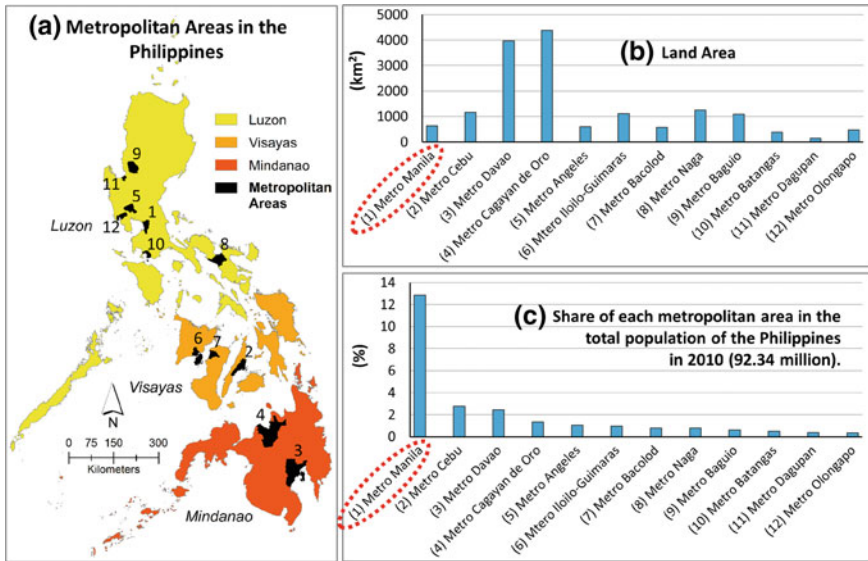


Fig. 5.6 Metropolitan areas in the Philippines. **a** spatial distribution of metropolitan areas across Luzon (with seven), Visayas (with three) and Mindanao (with two); **b** land area distribution among the metropolitan areas; and **c** individual share of the metropolitan areas in the total population of the country (2010). *Source* The data on land area (2007) and population (2010) were consolidated from the Philippine Statistics Authority-National Statistical Coordination Board (<http://nap.psa.gov.ph/>; <http://www.nscb.gov.ph>). *Note* In this article, the cities and municipalities included in each metropolitan are based on latest updates. In NEDA (2002, 2007), the municipality of Tublay in the province of Benguet was not yet included in Metro Baguio, and the municipality of Carmen in the province of Davao del Norte was not yet included in Metro Davao

in terms of population, as of 2010 it has the largest percentage share, accounting for 12.84% (11.86 million) of the total population of the country (92.34 million). Its share is more than four times the share of the second highest, that is Metro Cebu with 2.76% (Fig. 5.6c). In fact its share is even higher than the share of all other metropolitan areas combined with 11.95%. This shows how dominant Metro Manila is among the metropolitans in the country in terms of population, despite having a much smaller land area.

As mentioned earlier, Metro Manila is also called the National Capital Region (NCR), one of the 18 regions in the country. Figure 5.7a shows the population density of the Philippines based on regional boundary. In 2010, Metro Manila (NCR) had the highest population density with 18,567 people/km², followed by CALABARZON (IV-A) (770 people/km²) and Central Luzon (III) (471 people/km²). The Cordillera Administrative Region (CAR), where the summer capital of the country, Baguio City, is located, and MIMAROPA (IV-B) had the lowest population density with 84 and 93 people/km², respectively. This shows that Metro Manila’s density in 2010 was 24 and 220 times the density of CALABARZON and CAR, respectively.

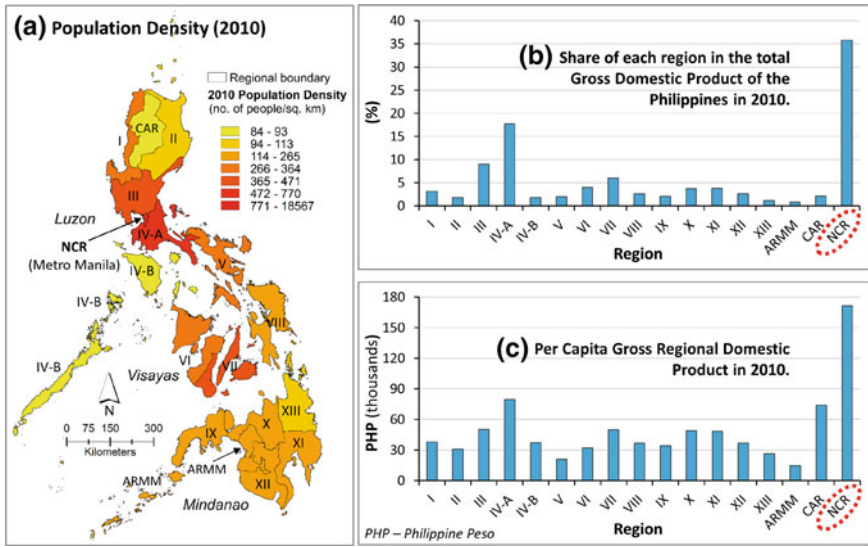


Fig. 5.7 Regions of the Philippines. **a** population density of the regions (2010); **b** individual share of the regions in the total gross domestic product of the country (2010); and **c** per capita domestic product of the regions (2010; at constant 2000 prices; In 2000, 1 USD = 29.47 PHP). *Source* The data on land area (2007), population (2010), and GRDP (2010) were consolidated from the Philippine Statistics Authority-National Statistical Coordination Board (<http://nap.psa.gov.ph/>; <http://www.nscb.gov.ph>); the boundary map was downloaded from the Philippine GIS Data Clearinghouse (<http://philgis.org>). In this figure, the Negros Island Region (NIR), which was created on May 29, 2015, under Executive Order No. 183, is still merged with Regions VI and VII

In terms of GRDP, in 2010 Metro Manila (NCR) had the highest share, with 35.75%, followed by CALABARZON with 17.70% and Central Luzon with 8.96% (Fig. 5.7b). ARMM had the lowest share with 0.84%, followed by Caraga (XIII) with 1.13% and Cagayan Valley (II) with 1.75%. This shows that Metro Manila’s (NCR’s) GRDP share in 2010 was more than two times the share of CALABARZON and 42 times the share of ARMM. Metro Manila (NCR) also had the highest per capita GRDP in 2010 (171,442 PHP), followed by CALABARZON (79,699 PHP), CAR (74,104 PHP), and Central Luzon (50,207 PHP) (Fig. 5.7c). ARMM also had the lowest per capita GRDP (14,588 PHP), followed by Bicol Region (V) (21,004 PHP) and Caraga (26,504 PHP).

The land area of Regions IV-A (CALABARZON) and III (Central Luzon) is more than 16,000 and 21,000 km², respectively, that is about 25 and 33 times the area of Metro Manila (NCR). This is the reason why, as of 2010, CALABARZON, with 12.61 million people, and Central Luzon, with 10.14 million people, have the largest and third largest population among all regions in the country, respectively, with Metro Manila in between, with 11.86 million people. In fact, these two regions have been part of the various current development plans for Metro Manila because of their potential critical roles in the national urban system and in influencing the

future development of the country's capital region (more discussion on this issue in Sect. 5.5).

Overall, based on population and GRDP, the urban primacy of Metro Manila (or the NCR) in comparison with the other metropolitans and regions in the Philippines is evident and overwhelming. The case of Metro Manila provides evidence for a positive relationship between concentration of people and economic growth. However, the primacy of Metro Manila creates an imbalance in the urban hierarchy and development processes in the country. Nevertheless, the identification and inclusion of other metropolitan areas in the national framework for physical planning for the whole country (NFPP: 2001–2030) promotes countryside developments and a more balanced national urban system. Metro Manila and its governing agency, the Metropolitan Manila Development Authority (MMDA), were both created by law. However, the other metropolitan areas in the country still lack a legal framework and governing structure. The absence of such legal framework and governing structure impedes metro-wide urban development planning and implementation (e.g., see Estoque and Murayama 2013a).

5.3 Urban Land Use/Cover Patterns and Changes (1993–2030)

This section discusses the observed and projected urban land changes, i.e., changes from non-built-up to built-up lands, in Metro Manila and its surrounding areas. Remote sensing-derived urban land use/cover maps and spatial metrics were used to detect the temporal and spatial patterns of urban land changes. The details of the urban land use/cover mapping, change detection and simulation modeling, and spatial pattern analysis are described in the methodology chapter (Kamusoko 2017). Estoque and Murayama (2017) provide a comparative analysis of the trends and spatial patterns of urbanization in Asia and Africa.

5.3.1 Observed Changes (1993–2014)

The urban land change analysis revealed that the area of built-up lands in Metro Manila and its surrounding areas has increased almost twofold over the past 21 years (1993–2014) (Fig. 5.8; Table 5.1). It increased from 455.5 km² in 1993 to 848.6 km² in 2014 (Table 5.1). This increase translates to an annual rate of change (increase) of 18.7 km²/year. The annual rate of change during the 1993–2001 period was slightly higher than during the 2001–2009 period (Table 5.2). During the 2009–2014 period, it increased substantially. It is also worth noting that built-up expansions in the area have been occurring and “moving” beyond the boundary of Metro Manila (Figs. 5.8 and 5.9). This is indicative of a sprawl urban development pattern.

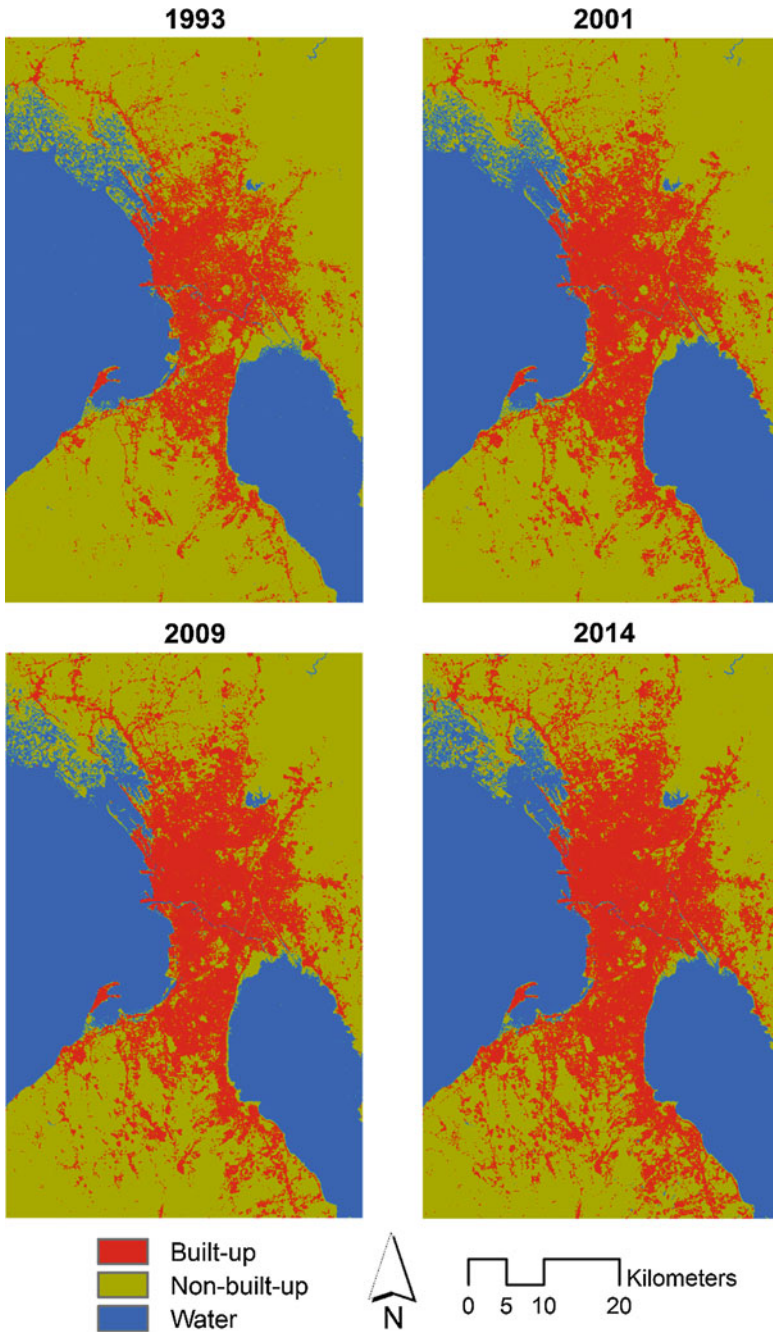


Fig. 5.8 Urban land use/cover maps of Metro Manila and its surrounding areas classified from Landsat imagery

Table 5.1 Observed urban land use/cover of Metro Manila and its surrounding areas (km²)

	1993	2001	2009	2014
Built-up	455.50	594.28	716.94	848.63
Non-built-up	1981.58	1831.10	1704.43	1554.47
Water	1147.12	1158.82	1162.83	1181.10
Total	3584.20	3584.20	3584.20	3584.20

Table 5.2 Observed urban land use/cover changes in Metro Manila and its surrounding areas (km²)

	1993–2001	2001–2009	2009–2014
Built-up	138.78	122.65	131.69
<i>Annual rate of change (km²/year)</i>	<i>17.35</i>	<i>15.33</i>	<i>26.34</i>
Non-built-up	–150.48	–126.66	–149.96
<i>Annual rate of change (km²/year)</i>	<i>–18.81</i>	<i>–15.83</i>	<i>–29.99</i>
Water	11.70	4.01	18.27
<i>Annual rate of change (km²/year)</i>	<i>1.46</i>	<i>0.50</i>	<i>3.65</i>

Table 5.3 shows the spatial metrics for the built-up class. The percentage of landscape (PLAND) metric measures the proportion of a particular class at a certain time point relative to the whole landscape. In 1993, the built-up class had a PLAND of 18.7%, which increased to 24.5, 29.6, and 35.3% in 2001, 2009, and 2014, respectively (Table 5.3). The patch density (PD) metric is a measure of fragmentation based on the number of patches per unit area, in this case per 100 ha or 1 km², in which a patch is based on an 8-cell neighbor rule. The PD of the built-up class decreased from 3.8 in 1993 to 2.6 in 2009, indicating that the patches of built-up lands in the study area became less fragmented and more aggregated. However, built-up lands in 2014 were more fragmented than in 2009 as indicated by the increase in PD between these two time points. This suggests that densification/infill development was more dominant during the 1993–2009 period, while sprawl/diffusion of new built-up patches was more active during the 2009–2014 period.

The Euclidean nearest neighbor distance (ENN) metric is a measure of dispersion based on the distance of a patch to the nearest neighboring patch of the same class. For the study area, the mean ENN of the built-up patches increased from 103.62 m in 1993 to 105.65 and 111.19 m in 2001 and 2009, respectively. In 2014, it decreased to 103.07 m. The increase during the 1993–2009 period can be due to the aggregation of neighboring built-up patches as indicated by the increase in PLAND and the decrease in PD during the same period. The increase in PLAND and decrease in PD redefined the average distance between neighboring built-up patches (Table 5.3). The decrease in mean ENN from 2009 to 2014 can be due to the expansion of the old built-up patches and the development of new patches in between but not necessarily connected to the old patches, as indicated by the increase in PLAND and PD during the same period.

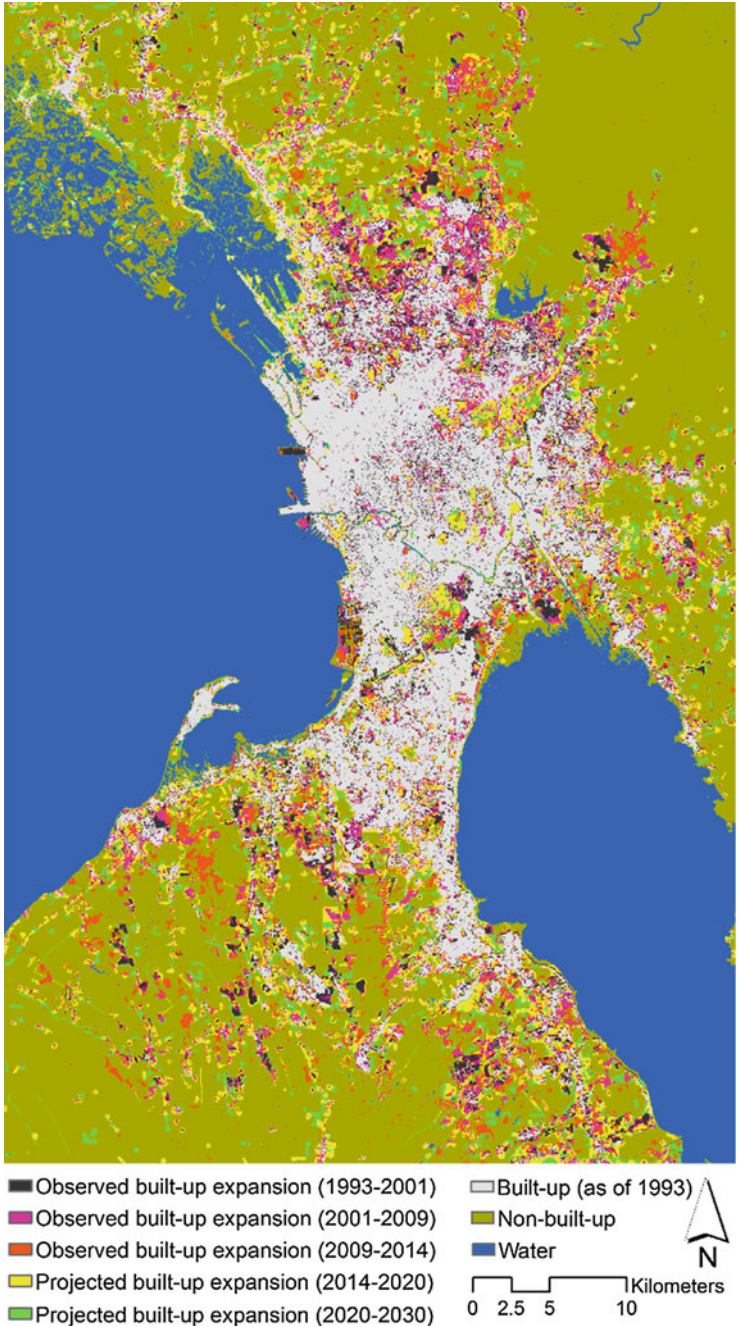


Fig. 5.9 Observed and projected urban land use/cover changes in Metro Manila and its surrounding areas

Table 5.3 Observed landscape pattern of Metro Manila and its surrounding areas

Class-level (built-up) spatial metrics	1993	2001	2009	2014
PLAND (%)	18.69	24.50	29.61	35.31
PD (number per km ²)	3.82	3.12	2.58	3.19
ENN (mean) (m)	103.62	105.65	111.19	103.07
CIRCLE (mean) ($0 \leq \text{CIRCLE} < 1$)	0.33	0.34	0.37	0.35
SHAPE (mean) ($1 \leq \text{SHAPE} \leq \infty$)	1.26	1.26	1.28	1.25

The related circumscribing circle (CIRCLE) metric measures the circularity of patches. The value of CIRCLE is 0 for circular or one cell patches and approaches 1 for elongated, linear patches one cell wide. For the study area, the mean CIRCLE value of the built-up patches showed an increasing trend during the whole 1993–2014 period (Table 5.3), indicative of the development of more elongated patches exhibiting a linear pattern. It can be noted that built-up expansion at the outer portions of Metro Manila, especially during the later periods, followed the road network (Figs. 5.8 and 5.9). The increasing trend can be due to the aggregation of much smaller, circular isolated built-up patches.

The shape index (SHAPE) metric is a measure of complexity. This metric has a value of 1 when the patch is square and increases without limit as patch shape becomes more irregular. For the study area, the mean SHAPE value of the built-up patches ranged from 1.25 to 1.28 across the whole 1993–2014 period (Table 5.3), indicating complexity in the shape of the built-up patches. Although the mean SHAPE value increased slightly between 2001 and 2009, it also decreased between 2009 and 2014, suggesting that the complexity of the built-up patches was more or less stable across the whole 1993–2014 period.

Figure 5.10 presents all the metrics for the built-up class of the study area along the gradient of the distance from the city center across all time periods from 1993 to 2014. PLAND decreases as the distance from the city center increases, indicating that the proportion of built-up lands near the city center was relatively higher. By contrast, PD increases first as it approaches the 25-km distance from the city center and then decreases in farther distances. This implies that there were more patches of built-up lands in middle distances. Built-up patches were relatively more dispersed in farther distances, as shown by the increasing trend of the mean ENN across the distance from the city center. The figure also shows a slightly increasing trend of the mean CIRCLE value along the gradient of the distance from the city center, indicating that the patches of built-up lands were slightly more elongated or linear in farther distances. However, despite the variability of these metrics along the gradient of the distance from the city center, the complexity of built-up patches was almost uniform or stable as indicated by the mean SHAPE value.

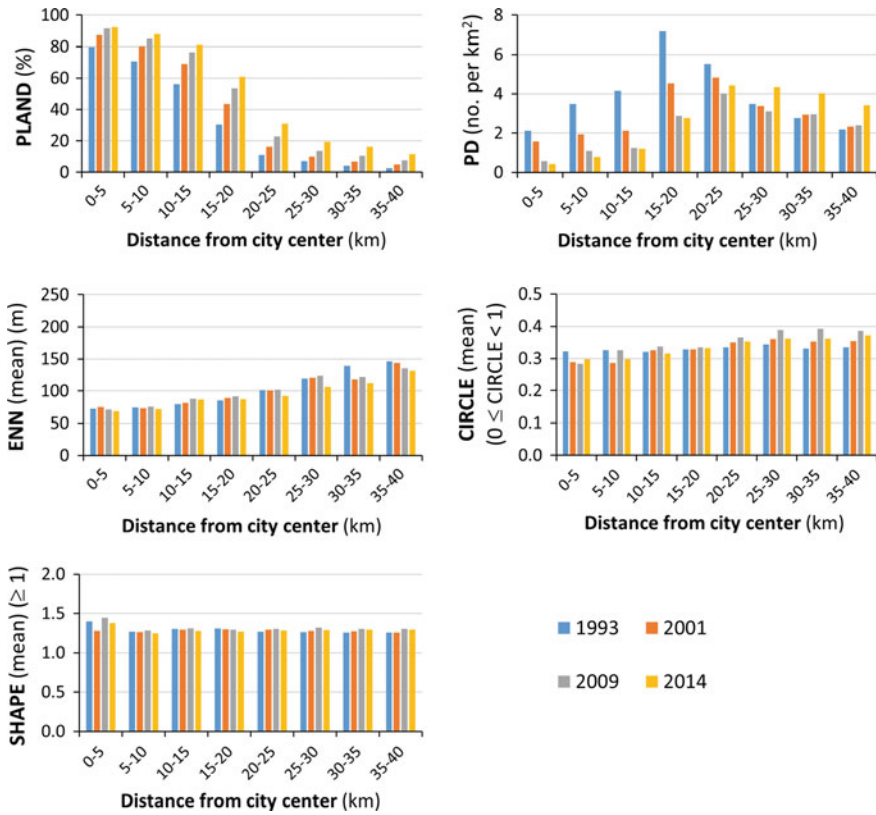


Fig. 5.10 Observed class-level spatial metrics for built-up along the gradient of the distance from city center of Metro Manila. *Note* The y-axis values are plotted in the same range as those in Fig. 5.12

5.3.2 Projected Changes (2014–2030)

The results of the urban land change simulation revealed that the area of built-up lands would increase from 848.63 km² in 2014 to 978.34 km² in 2020 and 1112.27 km² in 2030 (Figs. 5.9 and 5.11; Table 5.4). It would increase at the rate of 129.71 km²/year from 2014 to 2020 and 133.92 km²/year from 2020 to 2030 (Table 5.5). The spatial pattern analysis also revealed that the simulated built-up patches in 2020 and 2030 would be more aggregated as indicated by the simulated increase in PLAND and decrease in PD (Table 5.6). The simulated increase in mean ENN also indicates that more neighboring built-up patches would become connected. This simulated aggregation of built-up patches would redefine the average distance between neighboring built-up patches. The simulated increase in the average values of CIRCLE and SHAPE indicates more connected, elongated/linear, and complex patches of built-up lands, respectively.

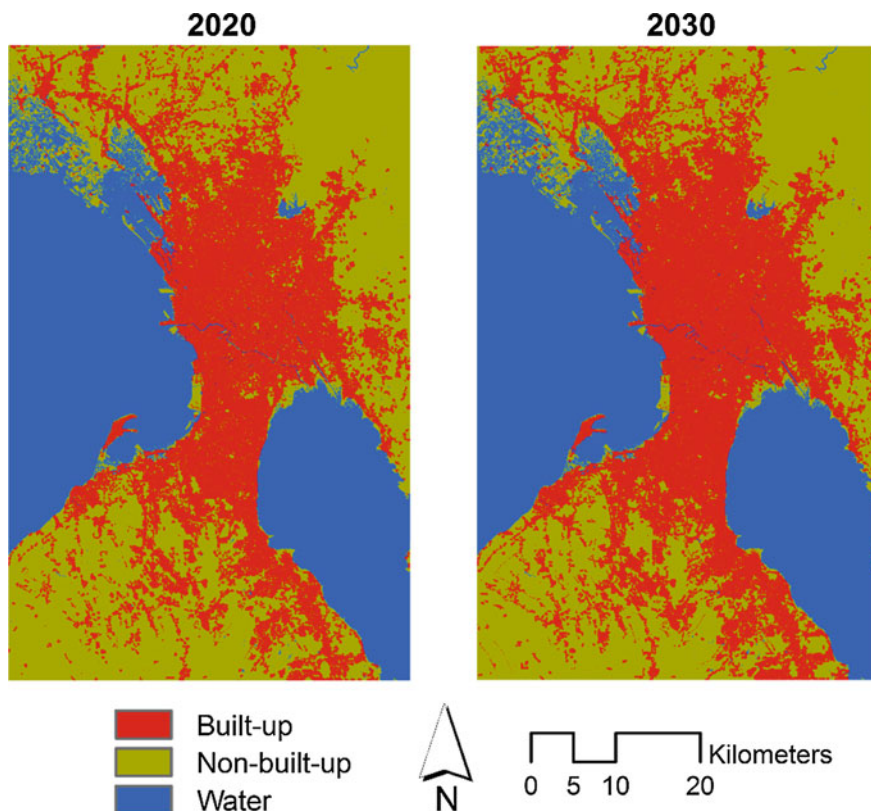


Fig. 5.11 Projected urban land use/cover maps of Metro Manila and its surrounding areas

Table 5.4 Projected urban land use/cover of Metro Manila and its surrounding areas (km²)

	2020	2030
Built-up	978.34	1112.27
Non-built-up	1424.76	1290.84
Water	1181.10	1181.10
Total	3584.20	3584.20

Along the gradient of the distance from the city center (Fig. 5.12), the PLAND of the simulated built-up in 2020 and 2030 would also be higher at distances closer to the city center. PD would decrease dramatically in 2020 and 2030, but would still be relatively higher in middle distances. By contrast, the mean ENN would increase dramatically, though it would still follow the pattern, i.e., mean ENN increases along the gradient of the distance from the city center, especially for the 2020 simulated built-up patches. The mean CIRCLE value would also increase in 2020 and 2030, especially at 0–5 km and 20–40 km distances from the city center. The mean SHAPE value would also increase, but would also be relatively more uniform or stable along the gradient of the distance from the city center (Fig. 5.12).

Table 5.5 Projected urban land use/cover changes in Metro Manila and its surrounding areas (km²)

	2014–2020	2020–2030
Built-up	129.71	133.92
<i>Annual rate of change</i> (km ² /year)	21.62	13.39
Non-built-up	-129.71	-133.92
<i>Annual rate of change</i> (km ² /year)	-21.62	-13.39
Water	0.00	0.00
<i>Annual rate of change</i> (km ² /year)	0.00	0.00

Table 5.6 Projected landscape pattern of Metro Manila and its surrounding areas

Class-level (built-up) spatial metrics	2020	2030
PLAND (%)	40.71	46.28
PD (number per km ²)	0.69	0.48
ENN (mean) (m)	168.37	181.92
CIRCLE (mean) ($0 \leq \text{CIRCLE} < 1$)	0.37	0.42
SHAPE (mean) ($1 \leq \text{SHAPE} \leq \infty$)	1.43	1.56

5.4 Driving Forces of Urban Development

As discussed above, the urban land changes in the study area over the past 21 years (1993–2014) have been remarkable, with most of the changes occurring at the outer parts of Metro Manila and in its surrounding areas (Sect. 5.3.1). It can be observed that during the early 1990s, a large portion of Metro Manila’s landscape had already been covered with built-up (Fig. 5.8). Thus, the space for future development was very limited and located mostly in the northern and southern parts of the region. Metro Manila is located in between two main bodies of water: Manila Bay on the west and Laguna de Bay on the southeastern side (Fig. 5.2a). Thus, since the 1990s, although there were some infill developments in the central area, the spatial expansions of built-up lands in the region have been mostly toward the northern and southern directions because of this geophysical feature (Figs. 5.8 and 5.9).

Population growth is probably the most important common driver of urbanization elsewhere in the world. Since the formal creation of Metro Manila in 1975, the number of its member LGUs has remained the same; its population, however, had grown rapidly. In 1970, Metro Manila only had 3.97 million population, but in 2010 it already had 11.86 million (Stinner and Bacol-Montilla 1981; Ortega 2014; Estoque and Murayama 2015; <https://psa.gov.ph>), resulting in an almost threefold increase over a 40-year period. This population increase could have also raised the need for various urban services including housing and commercial and business centers, which means that more non-built-up lands had to be converted into built-up. The urban land change analysis from 1993 to 2014 (Sect. 5.3.1) provides some evidence for this proposition. The rapid population growth of Metro Manila is the result of the combined effect of natural birth and migration. Between 2005 and

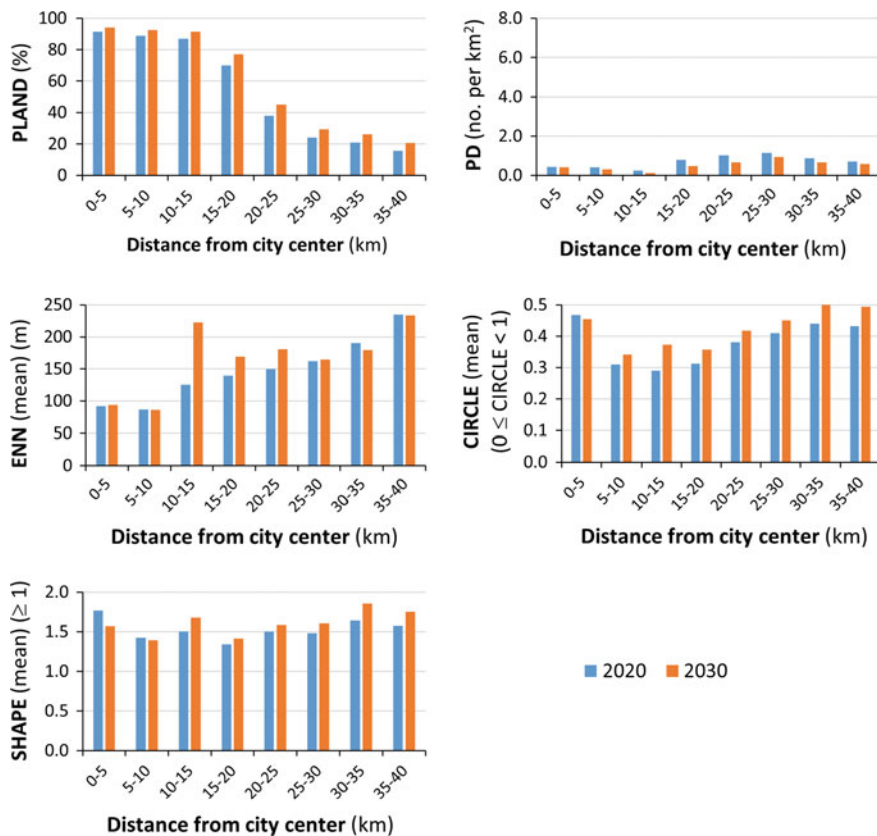


Fig. 5.12 Projected class-level spatial metrics for built-up along the gradient of the distance from city center of Metro Manila. *Note* The y-axis values are plotted in the same range as those in Fig. 5.10

2010 alone, Metro Manila had a total of 284,000 domestic and 19,000 foreign migrants (PSA 2012).

Metro Manila, being the country’s capital region, houses most of the national government offices responsible for the three major sectors of the national economy: the agriculture, fishery, and forestry sector, the industry sector, and the service sector. The country’s central business districts, international airport, and most of the Philippines’ prime educational and research institutions, and cultural, sports and healthcare centers are also located in Metro Manila. The concentration of these urban functions and services and various socioeconomic opportunities such as employment in Metro Manila is a major factor why people flock to the area.

Economic growth is another important driver of rapid urbanization. In fact, population and economy influence each other. A large and healthy population can provide the manpower needed for the economy: production, distribution, consumption, and resource maintenance. In return, a vibrant and productive economy

can create various socioeconomic opportunities for the people. It can also attract more investments and people. As of January 2015, Metro Manila has an employment rate of 90.7% (PSA 2015b); 3.5% higher than the July 2008 employment rate of 87.2% (NSO 2010).

Gross domestic product (GDP; called GRDP when it is measured per region) is among the most important indicators of the size and vigor of an economy. The time-series statistical data (see <http://nap.psa.gov.ph>) show that Metro Manila's GRDP and per capita GRDP have been continuously increasing over the past 14 years (2001–2014). Metro Manila's share of 30.59% to the country's total GDP in 2001 increased to 36.29% in 2014. Its per capita GRDP of 30,000 PHP in 2001 also increased to 42,000 PHP in 2008 (based on constant 1985 prices), and from 162,000 PHP in 2009 to 203,000 PHP in 2014 (based on constant 2000 prices).

Among some other physical factors, accessibility is an important physical factor for the urban development of Metro Manila. Metro Manila is accessible by land, air, and water. Its accessibility and relative position promotes and enables high interaction with neighboring provinces and regions in the country, as well as with other Asian cities. The pull factor of Metro Manila due to its primacy seems to have outweighed the risk factor inherent to its geographic location. With its location in a low-lying coastal area and the presence of the west valley fault on the eastern part, Metro Manila is vulnerable to various natural hazards such as floods, earthquake, and tsunami, among others. However, despite all these environmental hazards, Metro Manila has been continuously growing. People continue to flock to the area to seek for better opportunities and socioeconomic progress.

In general, the relatively small land area of Metro Manila, its geographical characteristics and population and economic growth, the concentration of key urban functions/services and opportunities in the area, and its accessibility are considered to be among the key factors influencing the spatiotemporal patterns of urban land changes (Figs. 5.8, 5.9, and 5.10; Tables 5.1, 5.2, and 5.3) and the overall urban development of the region. In addition, there are also a number of urban development-related legislations that guide urban development planning and implementation in the country, including Metro Manila, the country's prime urban center (see ADB 2014).

5.5 Implications for Future Sustainable Urban Development

5.5.1 Sustainability, Population Growth, and Urban Land Changes

Sustainability is one of the important concepts to emerge in the Earth's current geological epoch, the Anthropocene, also known as the "Age of Man". This concept encapsulates three important dimensions known as the triple bottom line, that

is, people (social justice), planet (environmental quality), and profit (economic prosperity) (Elkington 1997; Estoque and Murayama 2014). Sustainable urban development, characterized by a well-balanced relationship between environmental quality, social justice, and economic progress, is an important component and an indispensable part of the sustainability goal of humankind. According to the Sustainable City Agenda of the International Council for Local Environmental Initiatives (ICLEI), “sustainable cities ensure an environmentally, socially, and economically healthy and resilient habitat for existing populations, without compromising the ability of future generations to experience the same” (<http://www.iclei.org/activities/our-agendas.html>).

The socioeconomic conditions in Metro Manila have improved over the years. However, its overall sustainability, including its environmental sustainability, remains an important issue. This section examines the potential implications of Metro Manila’s population growth and built-up expansion pattern to its socioeconomic and urban environment. A brief overview of some of the current major urban development plans for Metro Manila is also provided.

To a great extent, the strength and primacy of a city lie on its population. At 18,567 people/km² density in 2010, Metro Manila is one of the densest urban agglomerations in the world. The large population of Metro Manila, which has also been projected to reach 16.8 million by 2030 (World Bank 2015a), has been a major factor to its primacy over all metro areas and regions in the Philippines (Figs. 5.6 and 5.7). However, its high and continuously increasing population density also causes various socioeconomic problems, such as congestion (including traffic congestion) and urban poverty (urban poor and slum areas, including those living in informal settlements or squatter areas) (Mathur 2013; ULI 2013; Porio 2015). To address these issues, the national government has to keep up the pace on the delivery of the needed urban services to the rapidly growing population of its prime urban region.

In Sect. 5.4, population increase and economic growth have been discussed as among the many possible factors that influence the rapid urbanization of Metro Manila. It has also been highlighted that the GRDP of Metro Manila has been increasing, and that despite the increase in population, the per capita GRDP has also been increasing. However, whether this economic growth has been translated into various basic socioeconomic services for the local population is another important issue.

In other words, Metro Manila’s increasing population has a critical implication to its future sustainable urban development particularly to its per capita socioeconomic condition. Both the local and national governments need to make sure that the issue on congestion and urban poverty in the region are taken into consideration in landscape and urban planning.

The implications of the spatiotemporal patterns of built-up expansions in Metro Manila and its surrounding areas can be further examined using the diffusion-coalescence urban growth theory (Dietzel et al. 2005; Wu et al. 2011; Estoque and Murayama 2015, 2016). The theory suggests that urbanization exhibits a cyclic pattern in time and space driven by two alternating processes: *diffusion*, in which new urban patches are dispersed from the origin point or seed location, and *coalescence* or the union of individual urban patches, or the growing together of the

individual patches into one form or group (Dietzel et al. 2005; Wu et al. 2011; Estoque and Murayama 2015, 2016).

As discussed in Sect. 5.3, the patches of built-up lands in the study area, in general, have become more aggregated over the years. This is one indication that built-up expansion, especially in Metro Manila, has been moving toward the coalescence phase, and this observation is consistent with previous findings (e.g., Estoque and Murayama 2015). From 2009 to 2014, the PD of the built-up class increased, and this was due to the diffusion of new built-up patches, especially on the outskirts of Metro Manila (Table 5.3; Figs. 5.8 and 5.9). The urban land change simulation indicated that built-up lands would continue to expand and again undergo the process of aggregation or coalescence in the near future (Tables 5.3 and 5.6; Figs. 5.9 and 5.11). The process of coalescence can result in an infilling growth pattern, whereas the process of continuous diffusion and expansion can result in a sprawl development pattern (Estoque and Murayama 2015). The urban land changes in Metro Manila and its surrounding areas are characterized by both infilling and sprawl urban development patterns.

While an infilling growth pattern has some potential advantages, e.g., the use of existing infrastructures, the promotion of walkable neighborhoods, and the prevention of the associated external costs of sprawl development, it also has some potential disadvantages, e.g., increased traffic congestion and pollution, limited open space, potential loss of urban green spaces, and crowded services (Estoque and Murayama 2015, 2016). For Metro Manila and its surrounding areas, infilling pattern poses a threat to their remaining urban green spaces, which are important sources of various urban ecosystem services⁵ and valuable elements for sustainable urban development, especially if such pattern will continue undisrupted. That said, this should not be a problem if future urban development will follow the concept of “sustainable cities”, where urban green spaces are kept, improved, restored, or introduced. On the other hand, the sprawling pattern detected in the area also has various important implications (e.g., higher urban development costs, greater disturbance or loss of natural habitat, etc.), and thus requires landscape and urban planning in a wider scale.

5.5.2 *Current Major Development Plans*

In a recently published project report, *Ten Principles for Sustainable Development of Metro Manila's New Urban Core*, by the Urban Land Institute (<http://uli.org>), a new urban core for Metro Manila has been identified. Metro Manila's urban core is composed of Manila City and Makati City, but in this newly identified urban core, Taguig City replaces Manila City (ULI 2013). Urban Land Institute (ULI) is a nonprofit research and education organization, whose mission is to provide

⁵Ecosystem services refer to the benefits that ecosystems (cropland, forest, etc.) generate for and provide to people. Such benefits can be tangible (goods, e.g., cropland for providing food) or intangible (services, e.g., forest for absorbing CO₂), large or small, and direct or indirect (MEA 2005; Estoque and Murayama 2013b, 2016).

leadership in the responsible use of land and in creating and sustaining thriving communities worldwide. In the said project report for Metro Manila, ULI proposes ten principles for the sustainable development of Metro Manila's new urban core (ULI 2013, p. 21):

1. *create one Metro Manila*, which should be the common goal and vision of its member LGUs and the national government;
2. *improve urban mobility*, where an integrated transport and infrastructure must be put in place;
3. *make beautiful places* by establishing business improvement districts and high-quality public spaces;
4. *work together* through collaboration and partnerships, such as with private sector;
5. *establish good governance* through a streamlined regulatory framework and effective development control;
6. *engage everyone* in an inclusive, participatory, and transparent process;
7. *empower people* by establishing community improvement districts to enhance education, awareness, and employment opportunities;
8. *be prepared*—disaster preparedness and resilience;
9. *restore human dignity* through affordable housing policy and delivery; and
10. *go beyond smart communities* by aiming for more livable and sustainable communities.

Landscape and urban development planning in a wider scale has also been the subject of various major development plans for Metro Manila. Such development plans include the *Metro Manila Greenprint 2030* by the Philippine national government through the MMDA in partnership with the World Bank, AusAID and Cities Alliance, and the *Mega Manila Dream Plan*, formally titled the *Roadmap for Transport Infrastructure Development for Metro Manila and Its Surrounding Areas*, by the Philippine national government through the National Economic Development Authority (NEDA) and Japan International Cooperation Agency (JICA).

The Greenprint is a 20-year development and spatial plan, envisioned to provide an overall framework and recommendations on the use of land and other resources in Metro Manila (MMDA 2012). The four main goals of the Greenprint are as follows: (i) to provide an urban environment that is more conducive for investors, entrepreneurs, and innovators, as well as creative minds that will enhance competitiveness vis-à-vis other cities in Asia; (ii) to improve coordination among key players, especially the 17 LGUs of Metro Manila; (iii) to guide the future urban form of Metro Manila, taking into consideration its neighboring areas in Region III (Central Luzon) and Region IV-A (CALABARZON) (see Figs. 5.7a and 5.13); and (iv) to be a primary infrastructure, providing green systems and the clustering of economic activities to improve livability (JICA and NEDA 2014; Estoque and Murayama 2015).

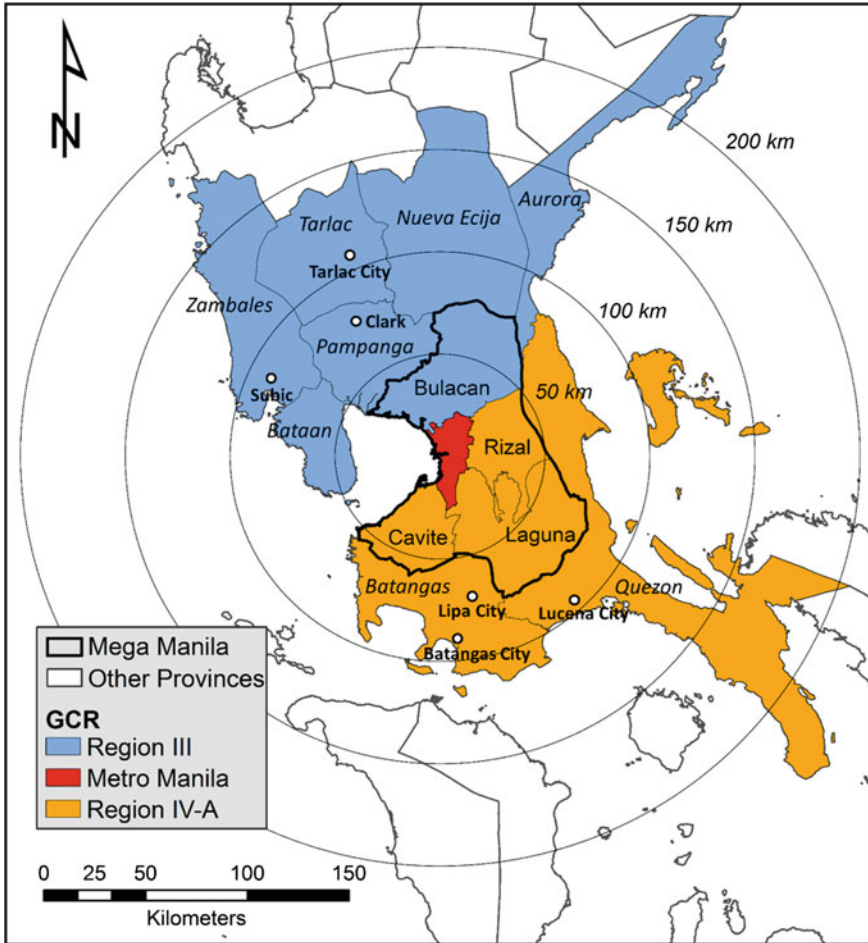


Fig. 5.13 Map of the proposed Mega Manila and Greater Capital Region (GCR). *Source* Author’s own elaboration based from JICA and NEDA (2014)

In connection with the new urban core concept (Makati City and Taguig City), ULI (2013) suggests that, in order to achieve a more livable and sustainable community, Greenprint 2030 should include provisions for reducing pollution, improving the pedestrian environment, making Metro Manila more environment-friendly, and for promoting the use of public transportation, as well as walking and biking. However, ULI (2013) also points out that although these provisions are promising, a well-crafted interventions plan is needed.

The Mega Manila Dream Plan, on the other hand, is an integrated plan for improving the transport system in Metro Manila and its surrounding areas, and for addressing the pressing, interlinked problems on transportation, land use, and the environment (JICA and NEDA 2014). In this plan, Mega Manila will be composed

of Metro Manila and the provinces of Bulacan (part of Region III), Rizal, Cavite and Laguna (parts of Region IV-A) (Fig. 5.13). In addition to the list of short term and medium-long term priority projects on transport system (including airports and seaports) and industrial development, the plan also presents a spatial development strategy, aiming to expand the national capital region (NCR) of the Philippines into a “Greater Capital Region” (GCR), with the integration of Metro Manila (or the NCR), Region III, and Region IV-A (Fig. 5.13). It can be noted that these three regions have the largest population and GRDP share among all regions in the country today (Fig. 5.7).

The Mega Manila Dream Plan highlights the need for regional integration in order to achieve a tri-engine growth for the GCR: (i) gate to wellspring of hope; (ii) place for livable communities; and (iii) space for dynamic business centers. Moving away from a monocentric to a polycentric urban development, five primary growth centers are envisioned to be established and spatially distributed from north to south: three in Mega Manila, in which Metro Manila will remain as the central function area (the other two are in the provinces of Bulacan, and Cavite-Laguna); one in the north (Subic-Clark-Tarlac); and one in the south (Batangas-Lipa-Lucena) (Fig. 5.13). The Mega Manila Dream Plan has been evaluated of its feasibility from the economic, financial, social, and environmental perspectives by comparing it against a “do nothing” scenario. JICA and NEDA (2014) concluded that if a set of proper interventions are made, traffic congestions can be removed from most of the road sections. Compared to the present situation, the overall transport cost will decrease by 13% and the air quality in Metro Manila will improve. The socio-economic conditions in adjoining provinces will also improve.

5.6 Concluding Remarks

History tells us that Manila is one of the original global cities, i.e., as part of the Manila-Acapulco galleon, one of the first known commercially traveled trade routes in the world. The analysis showed compelling evidence for Metro Manila’s urban primacy over the other metropolitan areas and regions in the country based on population and gross regional domestic product. Over the past 21 years (1993–2014), the area of built-up lands has increased almost twofold, transforming the landscape of Metro Manila and its surrounding areas. The relatively small land area of Metro Manila, its geographic characteristics and population and economic growth, the concentration of key urban functions/services and opportunities in the area, and its accessibility are hypothesized to be among the key factors influencing the spatiotemporal patterns of urban land changes and the overall urban development of the region.

The simulated future urban land changes indicated that built-up lands would continue to expand in the future (2014–2030) under the influence of infill and sprawl development patterns. The intensifying pressure of urbanization due to rapid population growth and urban land changes poses many challenges that need to be considered in sustainable urban development and landscape planning. The region’s

natural environment, an important asset toward sustainable urbanization and comfortable urban life, needs to be protected and conserved. There is also a need to address the other key urban issues, including urban poverty, congestion, limited urban green spaces, and disaster preparedness, among others. To overcome these issues, both the local and national governments, including all sectors of the society, need to implement and observe the ten principles outlined above (ULI 2013) and support development plans that can promote sustainable urban development, such as the Metro Manila Greenprint 2030 and Mega Manila Dream Plan. If these principles are observed and if these plans are realized, this primate city in the Orient will have a better prospect of becoming a high-ranking world-class city.

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