Spatial Analysis of Urban Poverty in Manila, Philippines

CRP5080 Introduction to Geographic Information Systems

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Map 7: Informal Settlements City of Manila

Map 6: 2002 Poverty Incidence and Poverty Gap City of Manila

Map 5: Percentage and Number of Informal Settlers

Map 4: Percent Poverty in Metro Manila

Legend
- Districts
- Hospitals
- Railways
- LRT 1
- LRT 2
- LRT 3
- Probability Score

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By presenting a number of maps created by using a GIS tool, this paper analyzes the spatial patterns of urban poverty in the City of Manila and Metro Manila, the Philippines. In the first part, the spatial pattern of the urban development in Manila is analyzed in light of population, poverty, and informal settlements. In the second part, using railways and hospitals as examples, the accessibility to transportation and social services in the central part of Metro Manila is analyzed. The following are the findings identified by the analyses:

- Population has been increasing mainly in the suburbs of Metro Manila.
- Poverty is concentrated in the areas facing Manila Bay.
- While the spatial pattern of poverty does not correspond to that of informal settlements, a couple of huge agglomerations of informal settlements are observed in the poverty area in the City of Manila.
- While transportation and social services are mostly available anywhere in the center of Metro Manila, their service areas do not cover the poverty area.

These findings suggest that while the population is sprawling, urban policies for poverty alleviation, particularly in informal settlements, are still needed.
Introduction

1. Background

At an unprecedented pace, urbanization has been accelerating in Asia. According to the Asian Development Bank, 38 percent of the total population in Asia (1.36 billion) now live in urban areas, and this number is predicted to double (2.64 billion) by 2030. In the Philippines in the year 2000, the urban population comprised of 48 percent of its national population, amounting to 36.7 million.

While contributing to the economic growth, urbanization also has widened inequality between those who live in rural and urban areas and among urban populations. The world’s 700 million people now live with less than one US dollar a day, and 400 million of them live in urban areas. Considering an ongoing and future rapid increase in the urban population, tackling urban poverty is an imminent issue in order to achieve a well-balanced sustainable urban development.

Urban poverty is a multi-dimensional phenomenon, ranging from income to the access of social services and political power, and slums are the place in which those varieties of poverty become visible. One third of the world’s population now lives in slums, and 60 percent of them, 554 million, live in Asia. In Southeast Asia, the urban population accounts for 38 percent of the total population in the region, and 28 percent are forced to live in slums. People living in slums have been excluded from the benefits of urban development, resulting in persistent urban poverty in developing countries.

While international development experts have focused on slums as the way to eradicate urban poverty, the relationship between poverty and slums is not necessarily clear. If slums are not a primary cause of urban poverty, it would be inefficient to allocate limited resources into policies for upgrading slums. This paper offers insight into the link between urban poverty and slums.

2. Methodology

This paper conducts spatial analysis by using several maps that are created by the author, using ArcGIS software. In part 1, the spatial patterns of population, poverty, and informal settlements in Manila are analyzed by comparing several thematic maps on both the metropolitan and the city level. In part 2, the networks of the service areas of railways and hospitals in the central part of Manila are analyzed by combining two rasterized maps into an overlay map.

The basic data of GIS layers are obtained from OpenStreetMap, courtesy of Cloudmade. Other thematic data, such as population, poverty, and informal settlements, are obtained from different sources, such as the Philippines national census, the unpublished report of the Housing and Urban Development Co-ordinating Council (HUDCC), and the 2003 City and Municipal Level Poverty Estimates (referred to as the Poverty Report, hereinafter), published by the National Statistical Coordination Board. Some of these data are modified by the author to correspond to each other for the purpose of comparison. In addition to these quantitative data, several pictures taken by the author in 2007 are presented as qualitative data.

The possibility of inaccuracy due to the limitation of data availability should be noted here. In part 2, the list of hospitals in Metro Manila is obtained from unreliable and possibly incomplete data. In addition, those hospitals are plotted on the map by the author by looking at Google Maps.

3 UN-Habitat, Global Urban Observatory. http://ww2.unhabitat.org/programmes/guo/
4 Cloudmade. http://downloads.cloudmade.com/
Part 1: Spatial Analysis of Urbanization, Poverty, and Informal Settlements

This part analyzes the spatial patterns of population, poverty, and informal settlements in Metro Manila and the City of Manila by using several GIS maps. In terms of population, the occurrence of urban sprawl is observed. Presented maps also indicate no distinct linkage between poverty and informal settlements in the metropolitan level, but some huge agglomerations of slums relate to poverty in the City of Manila.

1. Administrative System

The Philippines’ primary metropolitan area including its capital city, Metro Manila is located in Luzon, the largest island in the Philippines, and is bounded by Manila Bay to the west and Laguna de Bay to the southeast (Map 1). Due to its political importance, Metro Manila is specially administered as the National Capital Region (NCR), but it does not have any specific administrative organization representing the whole area. Metro Manila consists of 16 cities and one municipality and is divided into four districts. The first district is the City of Manila, the capital city of the Philippines, which is furthermore divided into 16 districts. However, this paper follows the way of subdivision adopted by the Poverty Report, which divides the City into 14 districts as shown on the left-hand side of the map.

2. Population

In this section, the population pattern in Metro Manila and the City of Manila is examined. GIS maps identify the occurrence of urban sprawl in Metro Manila and the extremely large population and high density of Tondo in the City of Manila.
Metro Manila

With its 11,553,427 citizens according to the 2007 national census, Metro Manila ranks as the 20th largest urban area in the world. While the population of Metro Manila accounts for 13 percent of the total population in the Philippines, its area is 617 km², accounting for only 0.2 percent of the national area.

Map 2 illustrates the population in 2003 and the annual population growth rate between 2000 and 2007 in each city in Metro Manila. Population data is based on the Poverty Report to make it correspond to its 2003 poverty data, which is discussed later in the next section. The data of annual population growth rate is obtained from the 2007 national census.

On this map, the areas with larger circles have larger populations. Quezon City has the largest population with 2,597,690, and the City of Manila and Kalookan City (or Caloocan City) follow with 1,772,612 and 1,263,236, respectively. On the other hand, the areas colored in red have high population growth rates: Taguig and Quezon City have a high growth rate of 3.82% and 2.92%. Following them are the City of Paranaque (2.88%) and the City of Pasig (2.80%). In contrast, the population growth rate in the City of Manila and its adjacent cities remains low. It is observed that the cities surrounding the City of Manila have high population growth rates, which clearly indicates the occurrence of urban sprawl.

City of Manila

Located at the mouth of Pasig River, the City of Manila has a population of 1,772,612, which is the seventh largest among the world cities. With an area of 38.55 km², the population density of the City amounted to 43,079/km² in 2007.

Map 3 shows each district’s population and population density in 2003 in the City of Manila. As their smaller circles illustrate, the central districts, such as Binondo, Quiapo, San Miguel, Intramuros, and Ermita, have fewer populations, while the surrounding districts have larger populations. In particular, Tondo and Sampaloc have quite large populations: 673,105 and 378,394, respectively.

Density has a similar pattern, as shown in the color scale with light green being the lowest and dark blue being the highest. The districts surrounding the central area have higher densities, among which are Tondo and Santa Ana with the highest densities: 77,804/km² and 56,549/km², respectively. Thus, Tondo has both the largest population and highest density, resulting from a great number of informal settlements, which is discussed later in this paper.

### 3. Poverty

This paper then analyzes the spatial patterns of poverty in Metro Manila and the City of Manila. Based on the data from the Poverty Report, several maps were created by the author, which indicate the concentration of poverty in the area facing Manila Bay.

**Definition**

2003 City and Municipal Level Poverty Estimates (the Poverty Report, in this paper), published by the National Statistical Coordination Board in cooperation with the World Bank, offers insightful findings by their comprehensive research about Philippines poverty incidences and the poverty gap in 2003 in the city and municipal level.

The Poverty Report measures the poverty by two kinds of standards: poverty incidence and poverty gap. Simply speaking, the former indicates the spread of poverty and the latter indicates the intensity of poverty. Poverty incidence is an indicator of the percentage of families/individuals whose incomes are below the poverty threshold, the minimum income to meet the basic food and non-food requirements. The 2003 annual per capita poverty threshold in Metro Manila is estimated to be 16,737 Philippine Pesos (309 USD), while nominal per capita income is 58,772 Philippine Pesos (1,084 USD). On the other hand, the poverty gap indicates the percentage of the amount of the shortfall of the incomes of the families/individuals to the poverty

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threshold.

The limitation of the Poverty Report lies in the fact that it measures poverty only by economic standards. To complement this, other aspects of poverty such as the lack of accessibility to transportation and social services are analyzed later in this paper.

**Metro Manila**

Map 4 illustrates the poverty incidence and poverty gap in Metro Manila in 2003 based on the data from the Poverty Report. Poverty incidence on the map changes from light blue to dark purple as the value goes up. The cities with higher poverty incidences are Navotas (7.41%), Taguig (5.23%), Kalookan City (5.16%), Malabon (5.10%), and the City of Manila (4.86%), all of which are located in relatively urbanized areas. In addition to the City of Manila, Taguig is the city where the many educational institutions and businesses are located. This indicates that the percentage of poor families is higher in such urban centers. In contrast, the cities with the lowest poverty incidences are San Juan (1.5%) and the City of Makati (1.86%), which are the newly developed financial centers of the Philippines with a large amount of gentrified residential buildings and skyscrapers (Figure 1 and 2).

In addition to poverty incidences, the map shows the poverty gap in each city. The data of the City of Manila is not shown on the map due to the availability. The larger orange circle indicates the larger poverty gap. The areas with a high poverty gap exactly correspond to the areas with high poverty incidence: i.e., Navotas (1.37%), Taguig (0.95%), Kalookan City (0.91%), and Malabon (0.90%). Therefore, it is found that the percentage of poor families is higher in the urban centers and the scarcity of income of each family is also larger there. However, as the Poverty Report clarifies, the poverty incidences in any of the cities in Metro Manila are quite lower than the national average: 37.5%. This is the reason why Metro Manila has been attracting people from other areas.
**City of Manila**

Map 5 shows the poverty incidence and poverty gap in each district in the City of Manila. One can find that the districts with high poverty incidences are mainly located in the northwest area, such as Port Area (13.17%), San Nicolas (8.93%), Intramuros (7.97%), and Tondo (6.73%). In contrast, Binondo and Sampaloc have a quite low percentage: 1.14% and 1.93%, respectively. With a number of Chinese merchants, Binondo is the area that had long been the financial center of Manila until Makati developed as a new financial hub. Sampaloc is the residence area for wealthier people where the president’s palace is also located.

As well as in metropolitan level, the poverty incidence and poverty gap correspond to each other in the City of Manila. The districts with high poverty incidences also have a high poverty gap: Port Area (2.71%), San Nicolas (1.71%), Intramuros (1.47%), and Tondo (1.25%).

In conclusion, Map 4 and 5 clarify that poverty exists mainly in the Manila Bay area, and, in particular, Port Area has both the highest poverty incidence and poverty gap.

### 4. Informal Settlements

This section presents the examination of the spatial pattern of informal settlements in Metro Manila and the City of Manila with the analysis of the relationship between the pattern of informal settlements and poverty, which is identified in the previous section. Based on the data derived from the report of the Housing and Urban Development Co-ordinating Council (HUD-CC), this paper presents a couple of maps created by the author in addition to the several pictures taken by the author in 2007.
**Definition**

Informal settlements (Figure 3 and 4), sometimes called slums, are defined by the Philippine government as “buildings or areas that are deteriorated, hazardous, unsanitary or lacking in standard conveniences.”

8 Ragragio (2003).

**Figure 3 & 4: Informal Settlements in Manila**

![Image of informal settlements in Manila](Taken by S. Nakamura)

**Metro Manila**

Map 6 illustrates the percentage and number of informal settlements in Metro Manila in 2002. The areas in darker green have a higher percentage of the informal settlements, calculated by dividing the number of the households living in informal settlements by the total number of households in the area. When it comes to the ratio, there seems to be no distinct spatial pattern. The cities with the highest percentages are Pasay City (73.5%), City of Muntinlupa (51.9%), and Mandaluyong City (42.5%), while the average percentage in Metro Manila is 33.4% with 701,753 informal settlements. Almost three-fourths of the households in Pasay City are estimated to live in informal settlements (Figure 5). As reasonably inferred, the numbers of informal settlements are larger in the cities with large populations, such as Quezon City (69,490), the City of Manila (99,548), and Kalookan City (67,292).

**Figure 5: Informal Settlements in Pasay City**

![Image of informal settlements in Pasay City](http://www.panoramio.com/photo/382390)

8 Ragragio (2003).
Table 1 shows the correlations between the percentage of informal settlements and total population. As the table clearly indicates, the cities with smaller populations have higher percentages of informal settlements.

<table>
<thead>
<tr>
<th>2002 Percentage of Informal Settlements (Map 6)</th>
<th>2003 Total Population (Map 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Pasay City</td>
<td>1 Quezon City 2,597,690</td>
</tr>
<tr>
<td>2 City of Muntinlupa</td>
<td>2 City of Manila 1,772,612</td>
</tr>
<tr>
<td>3 Mandaluyong City</td>
<td>3 Kalookan City 1,263,236</td>
</tr>
<tr>
<td>4 Navotas</td>
<td>4 City of Pasig 578,122</td>
</tr>
<tr>
<td>5 City of Las Pinas</td>
<td>5 Taguig 519,101</td>
</tr>
<tr>
<td>7 Quezon City</td>
<td>9 City of Las Pinas 441,471</td>
</tr>
<tr>
<td>10 City of Manila</td>
<td>10 Pasay City 403,941</td>
</tr>
<tr>
<td>13 Kalookan City</td>
<td>12 City of Muntinlupa 388,090</td>
</tr>
<tr>
<td>14 City of Pasig</td>
<td>14 Mandaluyong City 306,520</td>
</tr>
<tr>
<td>15 Taguig</td>
<td>15 Navotas 235,951</td>
</tr>
</tbody>
</table>

Similarly, Table 2 shows the correlations between the percentage of informal settlements and annual population growth rates. The cities with lower population growth rates by and large have high percentages of informal settlements. This finding is interesting in that it is against the typical explanation of the expansion of informal settlements. Generally, an increase in informal settlements occurs where the housing supply fails to meet rapidly increasing demand due to the population growth in urban areas. However, it turns out that many informal settlements exist in the areas with lower population growth in Manila, as indicated in Table 2. Thus, it can be inferred that the existence of informal settlements has become a persistent and stable phenomenon in Metro Manila.

<table>
<thead>
<tr>
<th>2002 Percentage of Informal Settlements (Map 6)</th>
<th>2000-2007 Population Growth (Map 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Pasay City</td>
<td>1 Taguig 3.82</td>
</tr>
<tr>
<td>2 City of Muntinlupa</td>
<td>2 Quezon City 2.92</td>
</tr>
<tr>
<td>3 Mandaluyong City</td>
<td>3 City of Paranaque 2.88</td>
</tr>
<tr>
<td>4 Navotas</td>
<td>4 City of Pasig 2.80</td>
</tr>
<tr>
<td>5 City of Las Pinas</td>
<td>5 City of Muntinlupa 2.48</td>
</tr>
<tr>
<td>7 Quezon City</td>
<td>9 Pasay City 1.77</td>
</tr>
<tr>
<td>9 City of Paranaque</td>
<td>10 City of Las Pinas 1.65</td>
</tr>
<tr>
<td>14 City of Pasig</td>
<td>11 Mandaluyong City 1.29</td>
</tr>
<tr>
<td>15 Taguig</td>
<td>15 Navotas 0.87</td>
</tr>
</tbody>
</table>
Finally, the data of the percentage of informal settlements and poverty incidence does not support the general assumption about their linkage (Table 3). Except for Navotas, none of the cities with high poverty incidences has a high percentage of informal settlements. As long as economic status is concerned, the living conditions of people living in slums turn out to be not as bad as expected. However, because poverty is a multi-dimensional phenomenon, other aspects of their living conditions need to be examined to conclude that they are better off. Part 2 in this paper analyzes those aspects.

<table>
<thead>
<tr>
<th>2002 Percentage of Informal Settlements (Map 6)</th>
<th>2003 Poverty Incidence (Map 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Pasay City</td>
<td>1 Navotas</td>
</tr>
<tr>
<td>2 City of Muntinlupa</td>
<td>2 Taguig</td>
</tr>
<tr>
<td>3 Mandaluyong City</td>
<td>3 Kalookan City</td>
</tr>
<tr>
<td>4 Navotas</td>
<td>4 Malabon</td>
</tr>
<tr>
<td>5 City of Las Pinas</td>
<td>5 City of Manila</td>
</tr>
<tr>
<td>10 City of Manila</td>
<td>8 City of Muntinlupa</td>
</tr>
<tr>
<td>13 Kalookan City</td>
<td>9 Pasay City</td>
</tr>
<tr>
<td>15 Taguig</td>
<td>11 City of Las Pinas</td>
</tr>
<tr>
<td>16 Malabon</td>
<td>13 Mandaluyong City</td>
</tr>
</tbody>
</table>

City of Manila

Although the district-level data of the number and location of informal settlements in the City of Manila is not available, it is assumed that they spread over the entire city. The typical locations are factories, under bridges, and in other public spaces, such as ports and railways (Figure 6, 7, and 8). These informal settlements are blended in the city’s fabric, but the contrast between the rich and poor living in the same proximity represents well the characteristic of urban poverty.

5. Summary

In Part 1, the spatial patterns of population, poverty, and informal settlements in Metro Manila and the City of Manila are analyzed with several GIS maps. In overall Metro Manila, the occurrence of urban sprawl is observed. While poverty is concentrated in the City of Manila and its adjacent cities facing Manila Bay, there is no distinct characteristic of the spread of informal settlements. In the City of Manila, population and density is higher in the outer districts. Poverty is concentrated in the bay area districts, such as Tondo and Port Area, which also have a huge number of informal settlements.

In conclusion, while there is no distinct correlation between poverty and informal settlements at the macro level (metropolitan level), extremely overcrowded informal settlements still relate to severe poverty at the micro level (city level).

Although this part measures poverty only by the income standard, urban poverty is a multi-dimensional problem, which requires a comprehensive approach. Thus, the next part analyzes other aspects of poverty: lack of access to transportation and social services.
Part 2: Spatial Analysis of Accessibility to Transportation and Social Services

To include other aspects of poverty in addition to income, this part analyzes the accessibility of the citizens in the central part of Metro Manila to transportation and social services. Taking railways and hospitals as examples, the analysis shows how access to those services is distributed and poor people are deprived of them.

1. Transportation

Background

People residing in and commuting to central Manila have multiple modal choices: cars, motorbikes, bicycles, buses, jeepney (Figure 12), railways, and, the most popular way, by foot. Aside from walking, poor people mostly rely on jeepney, which is the cheapest transportation in Manila. Jeepney runs through every road in Manila and picks you up anywhere and takes you to anywhere for only 7.5 Peso (approximately 15 US cents) for the first four kilometers.

Although the fee is relatively expensive, railway is becoming a popular mode of transportation among local people with its extensive network and comfort (Map 8). In the central part of Metro Manila, four types of railways are operated: Light Rail Transit 1 (LRT 1), LRT 2, Metro Rail Transit 3 (MRT 3), and Philippine National Railways (PNR). The fee is 12 Peso (25 cents) for the first four stations, and 15 Peso for more than five stations.
Transportation cost is a heavy burden for the urban poor in Manila. Among the monthly expenditure of urban poor households in Metro Manila, transportation is the second largest with 3 USD, accounting for 13.6% of the total expenditure (Table 4). Although further study is needed to identify what transportation the urban poor in Metro Manila usually use for commuting and for other purposes, this paper focuses on railways to examine how accessible transportation is in the metropolitan areas, including the high poverty areas identified in the previous part with thousands of informal settlements.

**GIS Analysis**

Maps 9 and 10 show the railway network and service areas in the central part of Manila. A two kilometer radius of a railway station is considered to be its service area in this analysis. On the map, the area in darker green is the place where the larger number of service areas overlap. The most intensely covered area is the center of the City of Manila, which has 13 stations within two kilometers at most. The area near the border between the City of Makati and Pasay City also has a larger number of stations. On the other hand, the southwest area of Quezon City is not covered at all. Tondo and Port Area are barely covered except for PNR Tutuban Station. In addition, comparing this map with Map 2 in the previous part, one can find that the population increase mainly takes place outside railway-covered areas.

![Map 5: Railway Service Areas with Hospitals in the Center of Metro Manila](image1)

![Map 10: Railway Service Areas with Municipality Boundaries in the Center of Metro Manila](image2)

<table>
<thead>
<tr>
<th>Table 4: Monthly Expenditure of Urban Poor House</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expenditure in USD</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>Food 14</td>
</tr>
<tr>
<td>Transportation 3</td>
</tr>
<tr>
<td>Electricity 1</td>
</tr>
<tr>
<td>Schooling 0.9</td>
</tr>
<tr>
<td>Water 0.8</td>
</tr>
<tr>
<td>Fuel 0.6</td>
</tr>
<tr>
<td>Health 0.45</td>
</tr>
<tr>
<td>Clothing 0.44</td>
</tr>
<tr>
<td>Rent 0.33</td>
</tr>
<tr>
<td>Others 1.18</td>
</tr>
<tr>
<td><strong>Total</strong> 22.7</td>
</tr>
</tbody>
</table>

Source: A Place To Call Home by Michael Alba, 1996
2. Social Services

Background

Metro Manila offers a wide variety of amenities and social services operated by both the public and private. Those facilities include hospitals, schools, libraries, and police and fire stations, which can be accessed through one of or a combination of the transportations mentioned above. Although these services should be offered to all citizens regardless of their income and addresses, certain people, particularly the poor, are sometimes excluded from access to the services. Among a number of amenities and social services, the most important are hospitals. According to the available data, 78 hospitals exist in the center of Metro Manila. This paper focuses on these hospitals to analyze their service area network by using a GIS tool.

GIS Analysis

In the same way as the transportation analysis, the maps below (Map 11 and 12) illustrate how the service areas of hospitals cover the central part of Manila. The central districts of the City of Manila and Quezon City are painted in darker yellow, which indicates the concentration of hospitals. These areas have 20 hospitals within two kilometers at most. It is noted that the northwest of Tondo and Navotas are not covered while virtually all other areas in the central of Metro Manila are covered by at least one hospital.

3. Overlay Analysis

Based on the maps presented above, overlay maps are created to show how the service areas of railways and hospitals are overlapping in the central of Metro Manila (Map 13 and 14). These maps are created by adjusting the values of the railway-map and hospital-map into 0-10 scales and adding those values with equal weight. The areas with higher scores, which are the places in which people have good access to both railways and hospitals, are colored in darker red.

The results clearly show that the following areas have better access: the central districts of the City of Manila, the southwest of Quezon City, the area near the border between Makati City and Pasay City, San Juan, and Mandaluyong City. Most of these areas correspond to the less poor areas indicated by Maps 4 and 5. In contrast, poverty concentrated areas such as Port Area and Navotas relatively lack the access to transportation and hospitals. Although the area closer to the center of the City of Manila is fairly covered, Tondo has an uncovered area in the northwest where numbers of informal settlements exist.

4. Summary

In Part 2, the service area networks of railways and hospitals are analyzed to examine how local people, in particular those who live in informal settlements, are given or are deprived of the access to transportation and social services. The results of spatial analysis indicate that while most of the City of Manila is extensively covered by both the railway and hospital services areas, the northwest Tondo and Navotas are excluded from those services. Although this fact only indicates the correlation between the formation of informal settlements and the lack of infrastructures, it is assumed that the agglomeration of informal settlements makes it more difficult to build infrastructures, thereby leading to further widening their isolation and exacerbating their living conditions.
Conclusion

The spatial analyses of urbanization, poverty, and informal settlements in the City of Manila and Metro Manila (Part 1) and the accessibility to transportation and social services in the central part of Metro Manila (Part 2) identifies the following findings:

- Population has been increasing mainly in the suburbs of Metro Manila.
- Poverty is concentrated in the areas facing Manila Bay.
- While the spatial pattern of poverty does not correspond to that of informal settlements, a couple of huge agglomerations of informal settlements are observed in the poverty area in the City of Manila.
- While transportation and social services are mostly available anywhere in the center of Metro Manila, their service areas do not cover the poverty area.

These findings suggest that while the area is sprawling, urban policies for poverty alleviation, particularly in informal settlements, are still needed.
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<th>Growth Rate</th>
<th>Population Gap (sq.km)</th>
<th>Households (has)</th>
<th>Settlements (sq.km)</th>
<th>Population (Original)</th>
<th>Population (Modified)</th>
<th>Area (sq.km)</th>
<th>Poverty Rate (%)</th>
<th>Total Population</th>
<th>Poverty Population</th>
<th>Residents (Households)</th>
<th>Percentage Change</th>
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<tbody>
<tr>
<td>NCR 1st District</td>
<td></td>
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**Summary Data Table**


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Population Growth Rates (%)
- 0.00
- 0.01 - 1.29
- 1.30 - 1.91
- 1.92 - 2.48
- 2.49 - 2.92
- 2.93 - 3.62

Population
- 100,000
- 500,000
- 1,000,000

Created by Shohei Nakamura  Date: April 19, 2009
Source: 2007 Census of Population, 2003 City and Municipal Level Poverty Estimates, Cloudmade, OpenStreetMap
Projected Coordinate System: WGS_1984_UTM_Zone_61N
Projection: Transverse_Mercator
Map 3: 2003 Population and Density, City of Manila

Legend

Density
- 4,167 - 8,000
- 8,001 - 19,500
- 19,501 - 32,000
- 32,001 - 56,600
- 56,501 - 77,816

Population
- 10,000
- 100,000
- 1,000,000

Created by Shohei Nakamura  Date: April 19, 2009
Projected Coordinate System: WGS_1984_UTM_Zone_51N
Projection: Transverse_Mercator
Map 4: 2003 Poverty Incidence and Poverty Gap
Metro Manila

Legend

Poverty Incidence
- 1.50 - 2.03
- 2.04 - 3.03
- 3.04 - 3.73
- 3.74 - 4.40
- 4.41 - 5.23
- 5.24 - 7.41

Poverty Gap
- 0.26 - 0.34
- 0.35 - 0.58
- 0.59 - 0.73
- 0.74 - 0.95
- 0.96 - 1.37

Note:
The data of poverty gap in the City of Manila is not available

Created by Shohei Nakamura     Date: April 23, 2009
Source: 2007 Census of Population, 2003 City and Municipal Level Poverty Estimates,
CloudMade, OpenStreetMap
Projected Coordinate System: WGS_1984_UTM_Zone_51N
Projection: Transverse_Mercator
Map 6: 2002 Percentage and Number of Informal Settlements, Metro Manila

Legend

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# of Informal Settlements

- 1,000
- 10,000
- 100,000

Created by Shohei Nakamura  Date: April 19, 2009
Source: 2007 Census of Population, 2003 City and Municipal Level Poverty Estimates,
CloudMade, OpenStreetMap
Projected Coordinate System: WGS_1984_UTM_Zone_51N
Projection: Transverse_Mercator
Map 8: Railway Network in the Center of Metro Manila

Legend
- Roads
- Railways Lines
- LRT 1
- LRT 2
- MRT 3
- PNR

Stations
- LRT 1
- LRT 2
- MRT 3
- PNR

Source: CloudMade, OpenStreetMap
Projected Coordinate System: WGS_1984_UTM_Zone_51N
Projection: Transverse_Mercator

Created by Shohi Nakamura  Date: April 23, 2009
Map 9: Railway Service Areas with Hospitals In the Centerl of Metro Manila

Legend
- Roads
- Hospitals
Railways
- LRT 1
- LRT 2
- MRT 3
- PNR
Service Areas of Railways
# of Stations
- High: 13
- Low: 1

Service Areas:
2 km Radius of Railway Stations

Created by Shohei Nakamura Date: April 27, 2009
Source: CloudMade, OpenStreetMap
Projected Coordinate System: WGS_1984_UTM_Zone_51N
Projection: Transverse Mercator
Map 10: Railway Service Areas with Municipality Boundaries In the Center of Metro Manila

Legend
Railways
- LRT 1
- LRT 2
- MRT 3
- PNR
Service Areas of Railways
# of Stations
High: 13
Low: 1
Metro Manila Boundaries

Service Areas:
2 km Radius of Railway Stations

Created by Shohei Nakamura  Date: April 27, 2009
Source: CloudMade, OpenStreetMap
Projected Coordinate System: WGS_1984_UTM_Zone_51N
Projection: Transverse_Mercator
Map 11: Hospital Service Areas with Railways In the Center of Metro Manila

Legend
- Hospitals
- Roads

Railways
- LRT 1
- LRT 2
- MRT 3
- PNR

Service Areas of Hospitals
# of Hospitals
- High: 20
- Low: 1

Service Areas:
2 km Radius of Hospitals

Created by Shohei Nakamura
Date: April 23, 2009
Source: CloudMade, OpenStreetMap
Projected Coordinate System: WGS_1984_UTM_Zone_51N
Projection: Transverse Mercator
Map 12: Hospital Service Areas with Municipal Boundaries in the Center of Metro Manila

Legend
- Hospitals
- Service Areas of Hospitals
- # of Hospitals
  - High: 20
  - Low: 1
- Metro Manila Boundaries

Service Areas:
- 2 km Radius of Hospitals

Created by Shohei Nakamura
Date: April 27, 2009
Source: CloudMade, OpenStreetMap
Projected Coordinate System: WGS_1984_UTM_Zone_51N
Projection: Transverse Mercator
Map 13: Accessibility Analysis with Railways and Hospitals
In the Center of Metro Manila

Legend
- Roads
- Hospitals

Railways
- LRT 1
- LRT 2
- MRT 3
- PNR

Accessibility Score
- High: 9
- Low: 0

Created by Shohei Nakamura  Date: April 27, 2009
Source: CloudMade, OpenStreetMap
Projected Coordinate System: WGS_1984_UTM_Zone_51N
Projection: Transverse_Mercator
Map 14: Accessibility Analysis with Municipality Boundaries In the Center of Metro Manila

Legend
Accessibility Score
High: 9
Low: 0
Blue: Metro Manila Boundaries

Created by Shohai Nakamura Date: April 27, 2009
Source: CloudMade OpenStreetMap
Projected Coordinate System: WGS_1984_UTM_Zone_51N
Projection: Transverse Mercator