

Informal Settlements and Public Transportation in Cape Town, South Africa

Background



Figure 1: Cape Town is located in the Western Cape Province of South Africa.

In 1994 Nelson Mandela—running on the platform of equality and freedom for all—became President after the first democratic elections in post-apartheid South Africa. Yet, almost 20 years later inequality—now distinguished by class rather than race—persists throughout South Africa, and particularly in large urban areas. The most economically vulnerable populations of urban South Africa generally live in informal settlements. Cape Town—South Africa’s third largest city—houses many informal settlements. To measure the accessibility of a city, many use mobility and freedom of movement as a strong indicator of inclusion or exclusion. Mobility corresponds with equality because if lack of accessible transportation impedes certain populations from occupying certain spaces then these groups are unable to fully participate

in a city’s economic and social life. When focusing on residents in informal settlements, it is important to measure the accessibility of public transportation because the majority of these residents do not own personal vehicles, and consequently their mobility—and their inclusion in Cape Town’s city-life—hinges on public modes of transportation. Therefore, this analysis seeks to answer how well public transportation serves residents of informal settlements. It hopes to highlight where public transportation is densest and which informal settlements are the least and most served by the systems currently in place. Based on these classifications I will highlight which areas need more access to public transportation in order to make Cape Town an inclusive city for its most marginal communities.



Figure 2: Photo of the city of Cape Town. Taken from: <http://www.trulycalifornia.com/travel-ideas/cape-town-south-africa-2.html>

Methodology

To investigate public transportation accessibility, I started by identifying the major modes of public transport. I chose to include in my analysis railway stations, bus stops, and informal taxi routes because these are the three most commonly used transport modes in Cape Town. The data I acquired from the Cape Town Government included exclusively vector data. From this vector data, I used the kernel density tool to create a density map of bus stops and a density map of railway stations (Figure 7 and 5 respectively). I used the line density tool to create a density map of the taxi routes (Figure 6). From these density maps, I reclassified the densities from 1 to 5 (Figure 3). After these reclasses, I used the raster calculator tool to create an additive model that combined these reclassified values and made a raster map having values ranging from 3-11. Looking at the distribution of these numbers, I

grouped these values into categories with 3 as Unacceptable, 4-5 as Acceptable, 6-7 as Suitable, and 8-11 as Excellent (Figure 9). I then reclassified 8-11 as 1 and everything else as no data. From this reclassification, I ran the raster to polygon tool to transform the highest transportation density areas into polygons. I ran the Euclidean distance tool using these polygons to create a raster map representing these different distances (Figure 10). Finally, I ran the near tool from informal areas to these high transport density polygons. This tool wrote these distances directly into the informal settlements attribute table, and from this data I used symbology to represent how close each informal settlement is to these polygons (based off of different walking distances), and thus identified the informal settlements with the least access to transportation (Figure 4).

Layers	1-Low	2	3	4	5-High
Taxi Density	0 - 0.001	0.001- 0.03	0.03-0.06	0.06-0.1	0.1-0.22
Bus Density	0-0.000003	0.000003-0.000008	0.000008-0.00001	0.00001-0.00002	0.00002-0.000043494
Train Density	0-0.0000002	0.0000002-0.0000006	0.0000006-0.000001	0.000001-0.000002	0.000002-0.000003

Figure 3: Chart of the reclassification of each different density maps’ density to numbers ranging 1 through 5.

Informal Settlements and their Distance from High Transport Density Areas

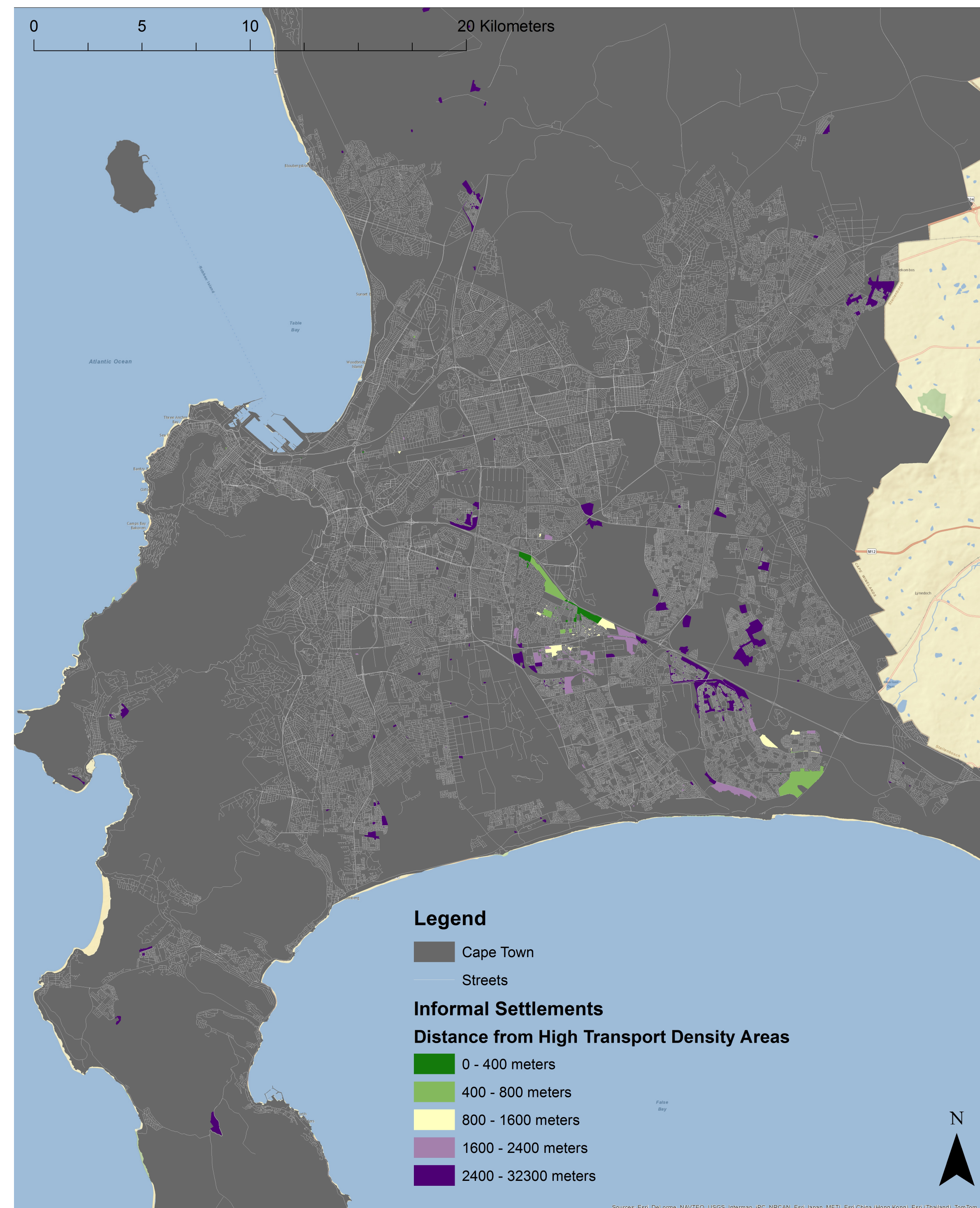


Figure 4: This map classifies each informal settlement by their distance from high density transportation areas. The different distances are chosen based off of different acceptable walking distances (with 400 meters around 1/2 a mile). This map shows that the informal settlements closer to the city center have the most access to public transportation and those informal settlements towards the edge of Cape Town have the least access to public transportation.

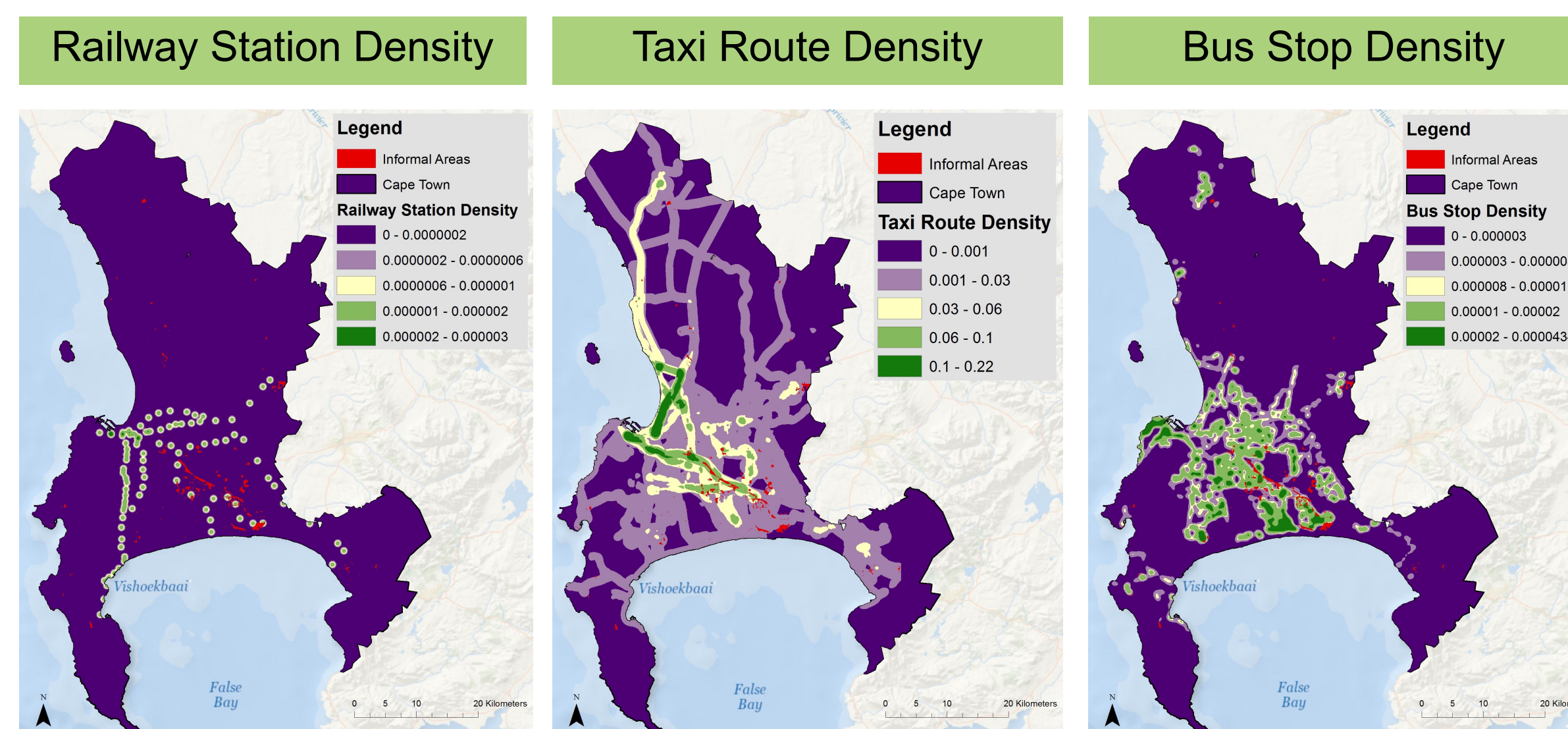


Figure 5: Raster map showing the density of railway stations in the greater Cape Town area.

Figure 6: Raster map showing the density of taxi routes in the greater Cape Town area.

Figure 7: Raster map showing the density of bus stops in the greater Cape Town area.

Results & Conclusions

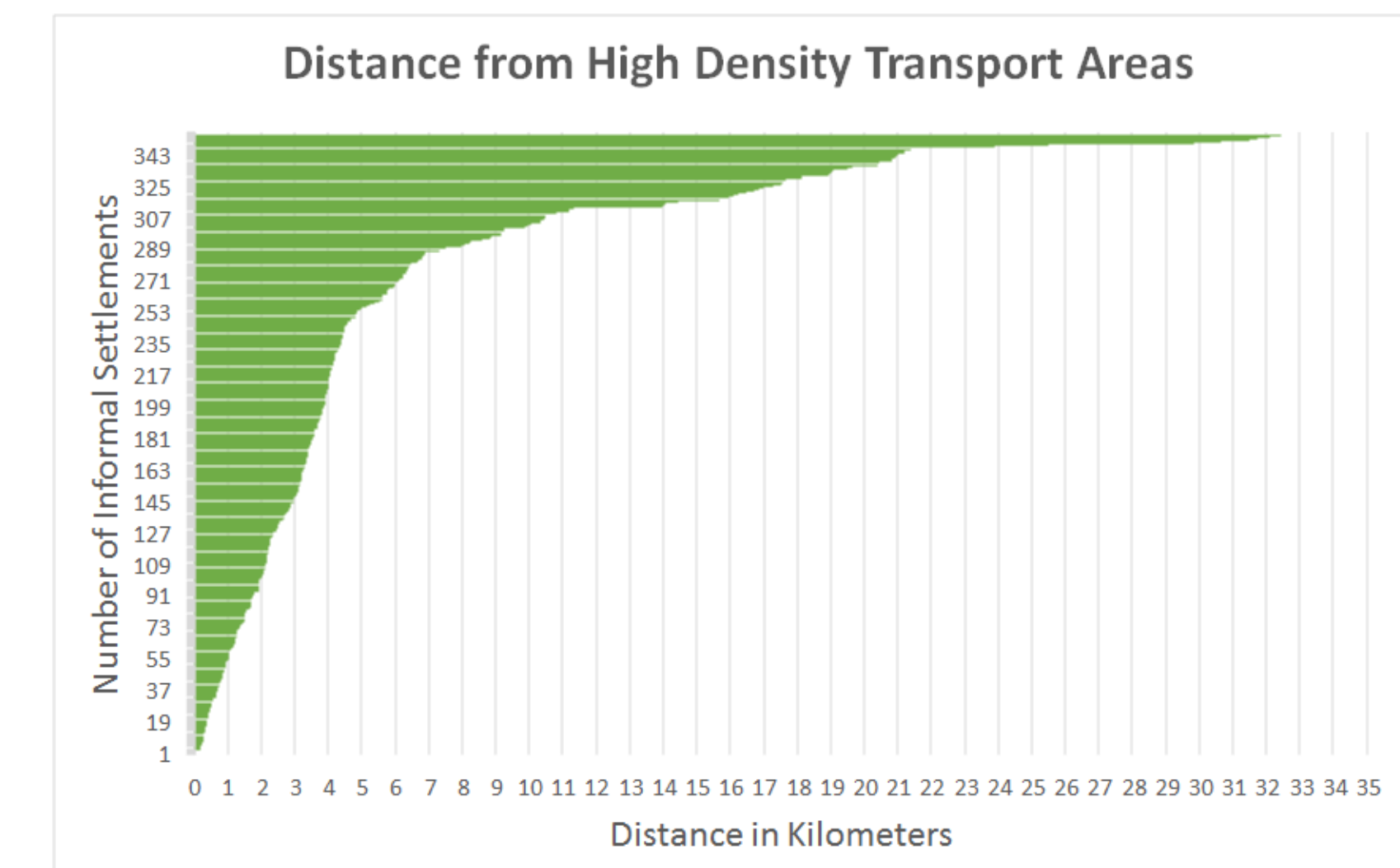


Figure 8: Graph of the number of informal settlements within each distance (in kilometers) from the high density transportation areas.

Through this analysis I highlight which informal settlements are the least and best served by public transportation (as seen in Figure 4). Specifically, when comparing each transportation mode’s density maps (as seen in figures 5, 6, and 7), the taxi service serves the outer edges of Cape Town better than both the bus and train services. Further, the railway service is the least accessible to residents of informal settlements because its densest areas are not near most informal settlements. Further, I intended to highlight informal settlements distance from high density transportation areas using different walking distances ranging from 0-400 meters (less than half a mile) to 2400-32300 (more than one and a half miles). An important result of my analysis is that only around 100 informal settlements reside within a distance of 2 kilometers (2000 meters) to these high density transport areas (as seen in Figure 8). Further, the informal settlements closest to high density transportation areas are located toward the city center. The settlements least accessible to public transportation are located towards the outskirts of the city (as seen in Figure 4). Given these results, I would suggest that these transportation modes should expand their service towards the outer extent of the city in order to fully fulfill the transportation needs of the residents of informal settlements. Consequently, this transportation expansion will better include these residents in the economic and social life of Cape Town.

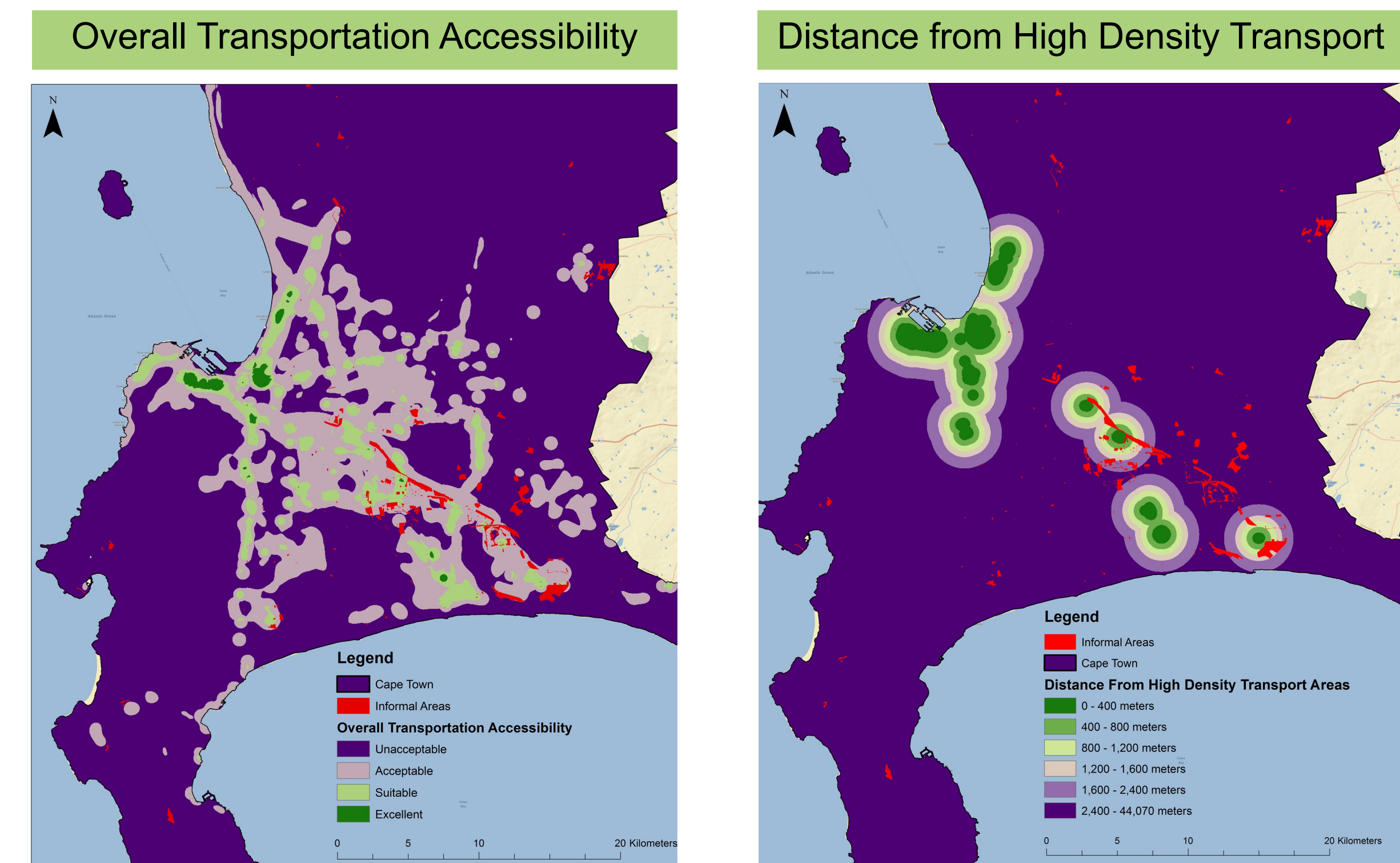


Figure 9: This map represents the combined density of bus stops, taxi routes, and railway stations. It classifies these densities from unacceptable to excellent.

Figure 10: This map shows the distance from high density transportation areas and the location of informal settlements.

Scale (Figures 5, 6, & 7): 1:181,613

Scale (Figures 4, 9, & 10): 1:99,939

Projection: WGS_1984_Transverse_Mercator

Data Source: Cape Town Government GIS

Map Creator: Paige Bollen

GIS 101

12/11/13