
2018
JP
URBAN
PERFORMANCE
SEMARANG

Introduction

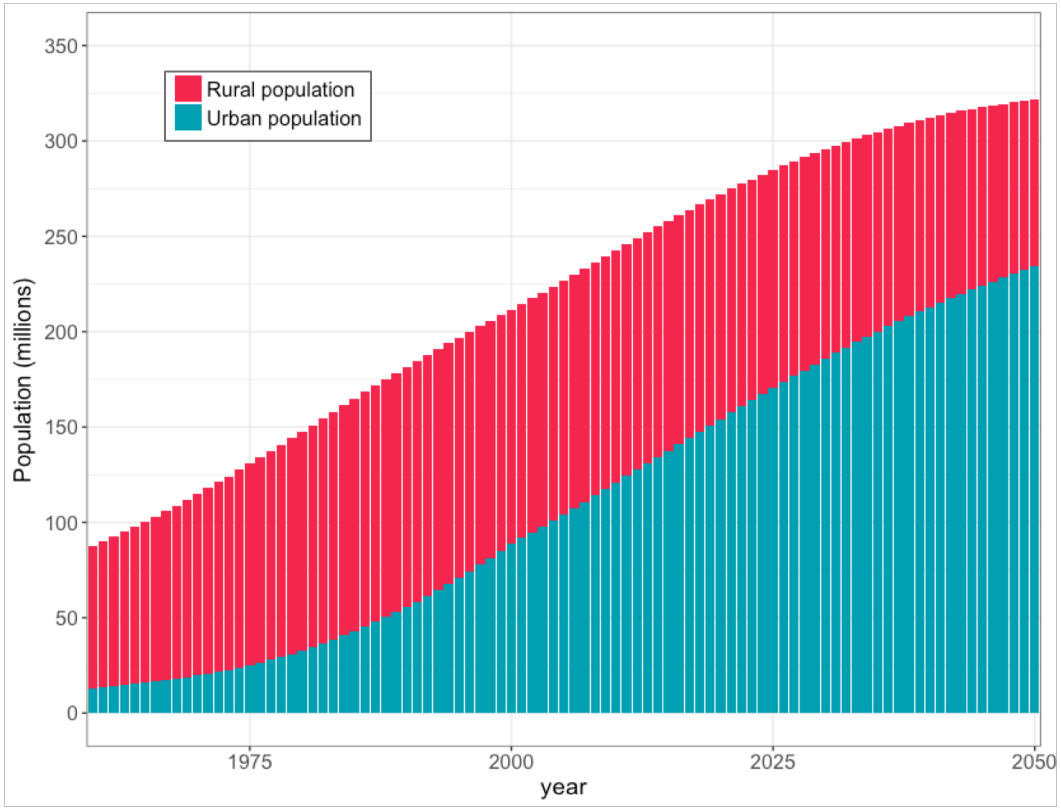
Cities of today serve as a hub for opportunities. Although, they face an important challenge of serving this purpose tomorrow, due to the world's rapid urbanization process. This fast-paced change in the urban environment has left decision-makers with little time to assess and agree on integrated solutions that address this situation.

6.3 billion people living in cities by 2050

In 2016, 4 billion people inhabited urban areas. However, that number is expected to reach 6.3 billion by 2050, representing an increase from 44%, in 2016, to 66%.[1]

The absence of urban planning strategies, frameworks, and coordination has resulted in less dense and more inefficient land use patterns. Furthermore, "these horizontally sprawling cities are not sustainable over the long-term, owing to overwhelming negative externalities such as traffic congestion, infrastructure issues, pollution, and social disaggregation".[2] This is particularly relevant in developing countries, such as Indonesia, where most of the world's growth of urban population is expected to happen.

Expected urban and rural population growth in Indonesia



[1] World Bank Group, (2017) World Bank data,
[2] UN Habitat, (2016) Planning & Design

72% **of Indonesians will live in urban areas by 2050**

It is estimated that, from 2018 till 2050, Indonesian cities will need to support an additional 86 million people [3]

Due to the fast-pace rhythm at which cities are changing, the incorporation of data-driven analytics into urban design, as well as policy and investment decision-making, is of utmost relevance.

Indonesia

With a high urban population growth, compared to other Southeast Asian countries (around 5% per year), projections estimate that in 2025 urban population will reach 60% in Indonesia. Urbanization brings with it increased accessibility to services, and more economic opportunities, as can be seen in other countries in the region, which have achieved 6-10% GDP growth per 1% of urbanization. However, due to a deficit in urban infrastructure, slow gains in labor productivity, high inequality and important shortages of affordable housing in Indonesia, the potential benefits of urbanization, such as growth and poverty reduction, are being inhibited.[4]

Within this scope, the analysis of Semarang through Urban Performance was developed as part of the World Bank's City Planning Labs (CPL) program in conjunction with the Indonesian government.

[3] World Bank Group, (2018) World Bank data,
[4] World Bank Group, (2015) National Affordable Housing Program in Indonesia

Semarang

Kota Semarang, is amongst the biggest cities in Indonesia with approximately 1.6 million people as of 2016.[5] The city of Semarang, located along the north coast of the island of Java, is the capital of the Central Java Province. Due to its geographic characteristics, Semarang is subject to particular challenges in addition to everyday city issues. The city is vulnerable to natural disasters of varying nature, such as landslides, land subsidence, as well as tidal and flash floods. These deteriorate housing, buildings and other infrastructure, badly affecting the quality and sanitation of the living environment, as well as social and economic conditions of affected families. [6]

Despite these obstacles, Semarang has been developing and expanding during the last decades, although most of its growing population has been distributed in previously settled areas.[7] This process has resulted in an higher population density. Furthermore, the densification of the city, joined with a slow road infrastructure development and a lack of integration in public transport [8] has translated into traffic congestion.

[5] Central Statistics Agency of Indonesia (2018) Badan Pusat Statistik (BPS)
[6] Abidin, H. Z., et al. (2013). Land subsidence in coastal city of Semarang (Indonesia): Characteristics, impacts and causes.
[7] Global Human Settlement through European Commission (2017) EAS-GHS data
[8] Mudiyono, R. (2017). Bus Rapid Transit Operations To Reduce Traffic Congestion On Kaligawe Road In Semarang,

Mobility in Semarang...

In Semarang, the slow road infrastructure development and lack of integration in public transport has encouraged people to opt for private vehicles. An increment from 113,755 private vehicles in 2005 to 304,389 in 2014 has resulted in traffic congestion issues for the city. Attempts to alleviate the mobility problem in Semarang have been made through the construction of the Trans Semarang BRT and the planning of several ring roads across the city, amongst others. The Trans Semarang BRT currently has 7 corridors operating across the city with the next phase (Corridor VIII) programed for 2019. However, the lack of a confined lane, non-optimized departure frequency, as well as a low quality of the vehicles and the stations, remain as obstacles for the system to reach its full potential.

What we did

In this project the vision for Semarang was gathered from key stakeholders in order to develop a set of scenarios for 2030 which describe the possible outcomes and challenges to reach such vision.

For the development of the scenarios Urban Performance (UP) was used. UP is a tool that, through the analysis of geospatial data, forecasts the city's future performance. The tool is designed to present hundreds of possible forecasts or **scenarios** in a range of **indicators** that evaluate the city in social, economical and environmental aspects within minutes. It simplifies complex planning and urban management processes by providing evidence and methods for comprehensive assessments, agile communication and coordination in decision-making processes.

Specific initiatives proposed by Semarang's stakeholders were included in the UP tool. The location for the proposed projects was defined using Semarang's Suitability* dataset and tool.

The development of Urban Performance for Semarang followed the next methodology:

01

Understanding the city

Urban concerns, relevant indicators and public policy projects are defined alongside city stakeholders

02

Characterizing the city through data

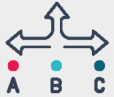
Data relevant to the city's context is gathered and processed to portray the city's current status

03

Simulating the city into the future

Hundreds of scenarios are modeled and refined according to the defined public policy projects

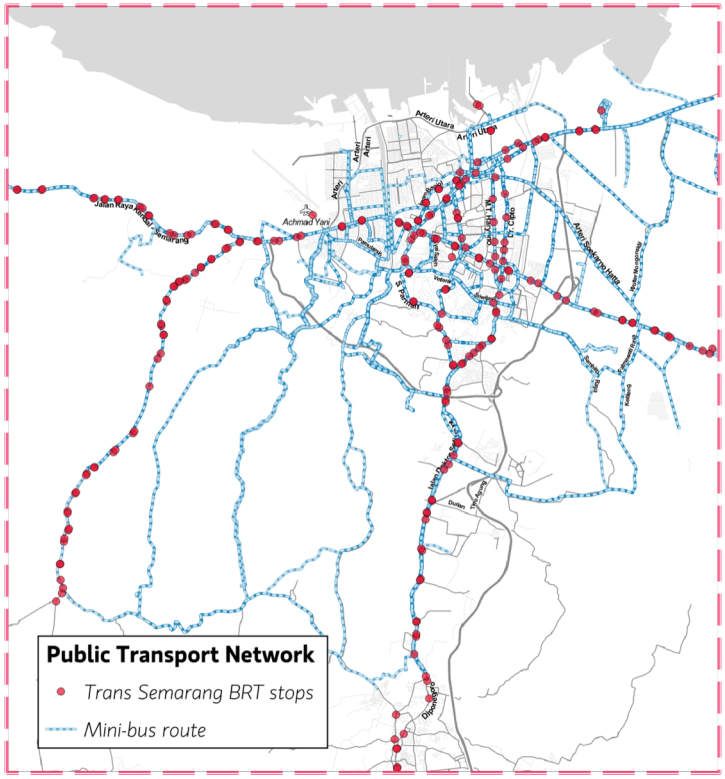
04



Results & recommendations

Results are analyzed and selected scenarios are presented to the stakeholders

* For more information on the Suitability tool visit suitability.in



TOD scenario. Existing public transport network in Semarang, along which densification was modeled.

What we did

More than 100 possible scenarios were modeled and analyzed with a range of 14 indicators, including social, economical and environmental aspects. From all scenarios, we identified one that minimizes investment costs and significantly contributes to stakeholders vision. We named it the **Transport Oriented Development or TOD scenario** (2030). For comparison purposes we included in the assessment two more scenarios: **Base** (2016), and **RDTR** (2030).

BASE

This scenario serves as our point of reference, as it reflects conditions of the city in the base year (2016). It summarizes the population, employment density, landmarks, and other characteristics of the city. The base year is defined by the latest available data to characterize the city of study.

RDTR

The RDTR (or Detailed Spatial Plan) scenario portrays the city's detailed spatial plan for the 2011-2031 period. It models the expansion of the city into the future, considering new settlements in areas that are meant to be urbanized, according to the spatial plan.

TOD

The TOD scenario focuses on mobility by developing areas near existing public transportation infrastructure. It considers the following:

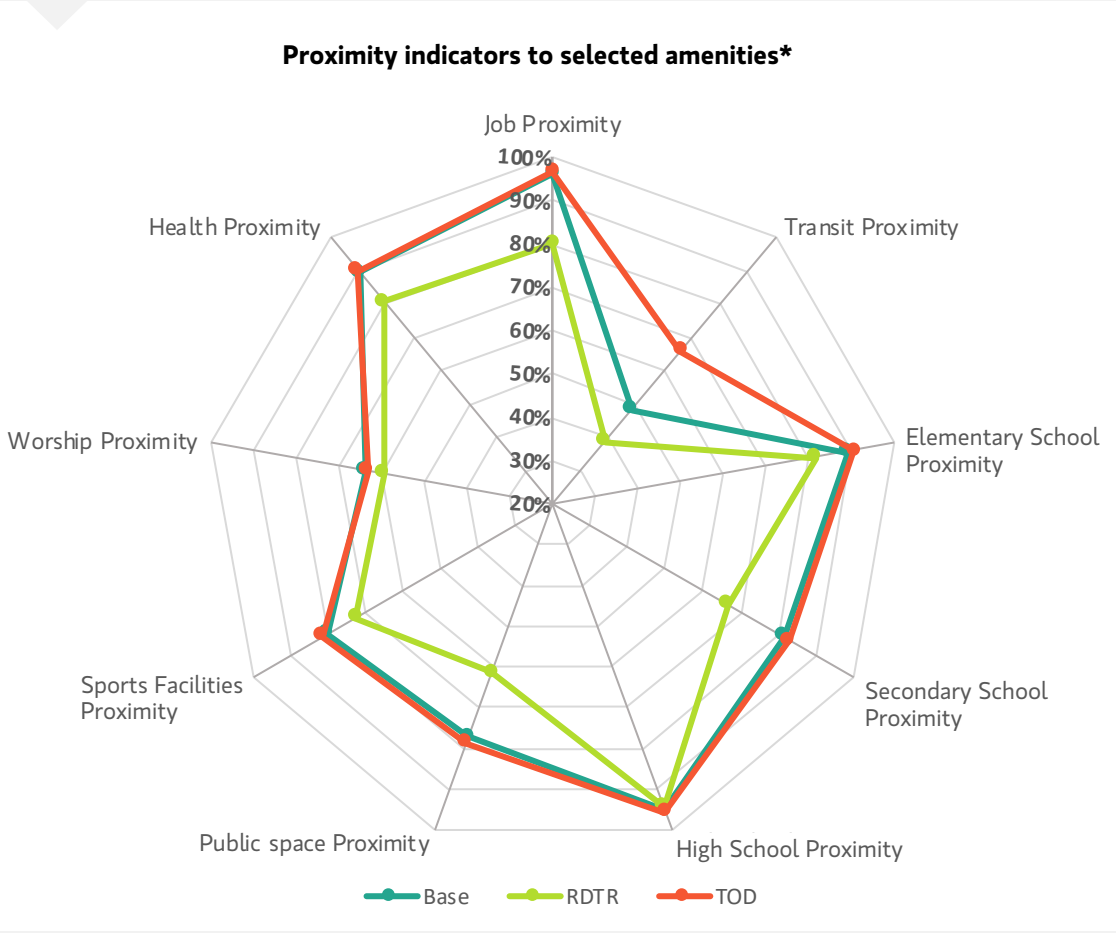
- Quality improvements to existing BRT lines, such as lane confinement.
- Densification in **optimal locations*** near the existing public transport network.
- Implementation of rain water harvesting in new housing.

* Locations for densification were identified with the **Suitability** tool. The chosen locations were the ones with the best accessibility to basic urban services, such as hospitals and education facilities.

What we found

The densification modeled in the TOD scenario near the existing transport network results in an increased access to urban services as compared to both: RDTR and Base scenarios. The most important improvement can be observed in transit proximity with an increase of almost 20% compared to the Base scenario. It's important to note that the TOD scenario includes densification of population in strategic locations, but does not include the development of new amenities or public transport infrastructure. However, results show an overall improvement in access to amenities. This is a consequence of an increased number of people living in areas with a reasonable access to amenities.

In an opposite way, the RDTR scenario considers the development of many new urban areas according to the spatial plan. As a consequence population living in these newly settled areas, that have yet to be developed and lack access to amenities, would have to travel longer distances to access urban services.



*Proximity is described as the percentage of population within the access radius specified in the Indonesian National Standards.

What we found

In addition to increased proximity to urban services, the strategic compact growth modeled in the TOD scenario also resulted in a significant impact on indicators related to costs and the environment. In contrast with the RDTR scenario, the TOD scenario implies **no infrastructure costs** whatsoever. This indicator depicts the required investment to build the necessary infrastructure; such as roads, electricity grid and water and sewer network; in areas in which the city is **predicted to expand**. It also includes the required investment in capacity improvements of infrastructure in areas with significant population increase. Regarding **municipal service costs**, the TOD scenario reflects savings of 13% on expenses incurred in the Base scenario.

This indicator estimates annual per capita expenditure to **provide services** such as potable water, solid waste collection, public lighting and maintenance to city roads. Furthermore, energy consumed in housing as electricity, for commuting, and to provide municipal services also present an improvement in the TOD scenario against the RDTR scenario. This decrease in energy consumption reflects on its associated GHG emissions by almost 9%. This would represent the achievement of **a third of Indonesia´s National Commitment** in GHG emissions reduction through urban planning.

	Urban Footprint *[km²]*	Population Density *[inhabitants/km²]*	Infrastructure Costs *[Million IDR]*	Municipal Service Costs *[IDR/capita]*	GHG Emissions *[kgCO₂eq/capita/year]*	Energy Consumption *[kWh/capita/year]*
BASE	317	7,682	-	950,428	2,355	6,444
RDTR	413	6,961	7,779,543	1,031,548	2,560	7,244
TOD	317	9,083	-	828,866	2,248	6,041

**IDR : Indonesian Rupiah*

What we learned

The fast-pace at which population shifts towards urban areas is taking place has made it increasingly difficult for city planners to adapt to these current trends. In this regard, Urban Performance can provide support to Semarang's city planners on their decision-making processes through just-in-time spatial analytics. According to the results, the following recommendations were presented:

- Spatial planning is a long-term tool which can play a key role towards more sustainable and inclusive cities. Strategic compact growth and urban sprawl containment policies represent a viable option for maximizing existing infrastructure, as well as reducing costs and natural disaster-risk.

- A densification in line with a Transit Oriented Development shall have to be accompanied with several enhancements for optimal results. Namely, better sidewalks for increased pedestrian mobility; improvements to public transport system, such as lane-confinement of BRT and upgrading of stops; and a mixed-use zoning pattern, amongst others.

- Semarang's current RDTR considers large expansion areas, which are bound to be urbanized if no reassessment or containment policy is enforced. The results observed in Urban Performance make evident this is an important subject to keep in mind and discuss during the next revision of the RDTR.

- The tool's output is limited by the quality and availability of the inputted data. Therefore, it is important to maintain Kota Semarang's effort regarding high quality, up-to-date data and its accessibility, for improved evidence-based decision-making.

- For more information on the Urban Performance tool, its indicators as well as on all the modeled scenarios, please visit www.urbanperformance.in/indonesia
- Spatial implications of policy projects modeled for Semarang can be found on the backcover

Boulevard Manuel Ávila Camacho 118, office 1604
Lomas de Chapultepec, Miguel Hidalgo
Mexico City, 11000
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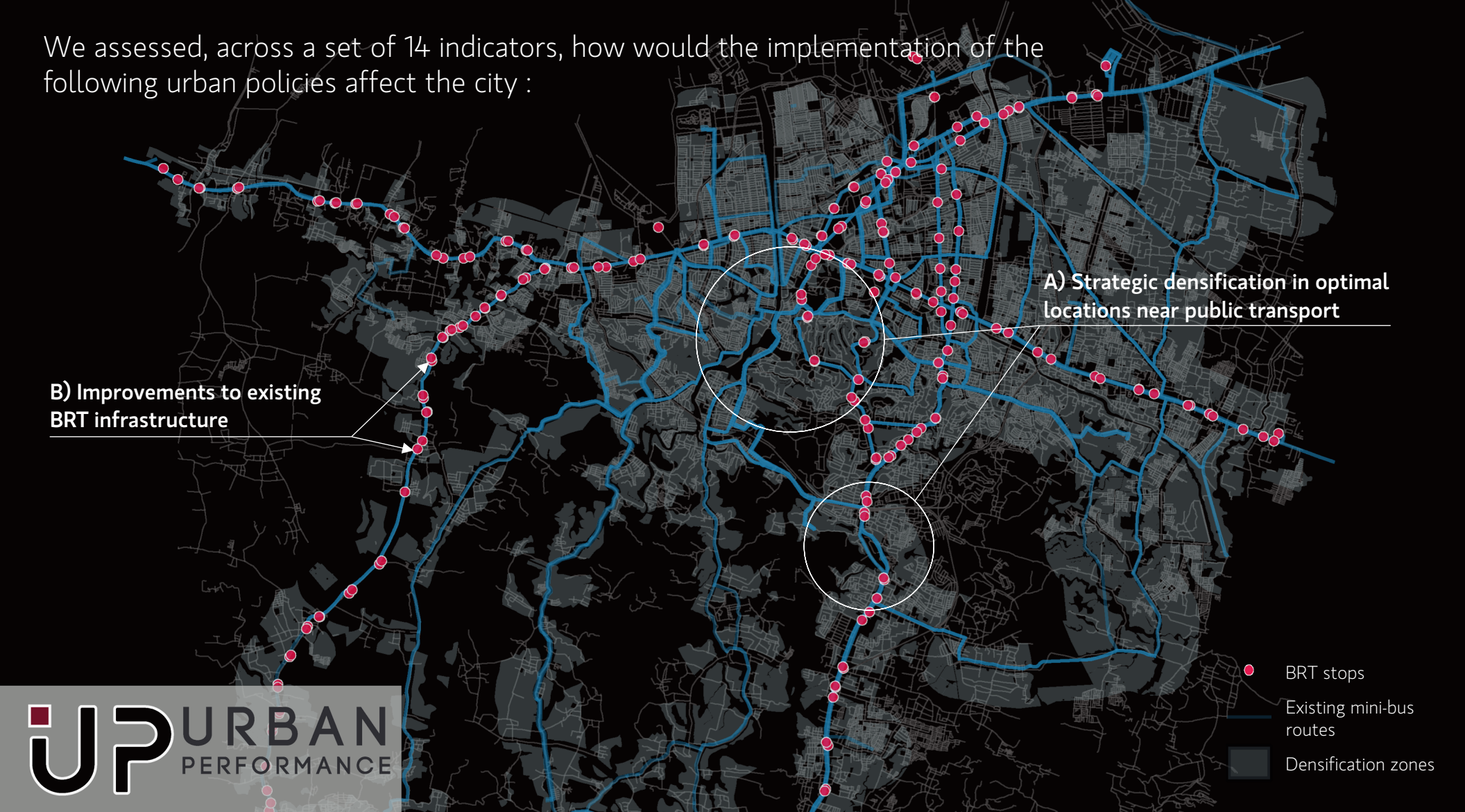
We assessed, across a set of 14 indicators, how would the implementation of the following urban policies affect the city :



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