

Rapid urbanization and the need for sustainable transportation policies in Jakarta

D Rukmana¹

¹ Urban Studies and Planning Program

Savannah State University, Savannah, GA, United States

Email: rukmanad@savannahstate.edu

Abstract. Not only is Jakarta the largest metropolitan area in Southeast Asia, it is also one of the most dynamic, though beset with most of the urban problems experienced in twenty-first century Southeast Asia. Batavia, colonial capital of the Netherlands Indies in the first half of the 20th century was a small urban area of approximately 150,000 residents. In the second half, Batavia became Jakarta, the 28 million megacity capital of independent Indonesia. Among many urban problems, one major problem plagued Jakarta in the last two decades is traffic congestions. This paper discusses the extent to which rapid urbanization in Jakarta has contributed to the need for sustainable transportation policies in Jakarta. The development of MRT could be viable solutions to alleviate the acute traffic jams in Jakarta. Jakarta will need to implement other innovative sustainable transportation policies including promoting active live through more walking and bicycling, carpool matching services, shuttle services, telecommuting and downzoning in downtown areas.

1. Introduction

Jakarta is the capital of Indonesia and the largest metropolitan area in Southeast Asia with tremendous population growth, land use change and new town and industrial estate development. The overall population of the Jakarta region grew in the 20th Century, from about 150,000 in 1900 to about 30 million in 2014 (Silver 2007; Firman and Fahmi 2017). This paper discusses urbanization and suburbanization in the megacity of Jakarta and analyzes the extent to which rapid urbanization in Jakarta has contributed to the need for sustainable transportation policies in Jakarta. The development and expansion of Mass Rapid Transit are documented and the use of private vehicles and the development of elevated toll roads and bike lanes also critically analyzed.

1.1. Population Growth of the Metropolitan Region of Jakarta

Jakarta has been the capital of Indonesia since the Dutch colonial era. The population of Jakarta in 1900 was about 115,000. In the first nationwide census of the Dutch colonial administration (1930), Jakarta's population increased to 409,475. In the next ten years, the population increased to 544,823 with an annual growth rate of 3.30%. After Independence, Jakarta increased by nearly three times to 1.43 million by 1950. It increased to 2.91 million in 1960 and 4.47 million in 1970. The annual growth rates of Jakarta's population are 10.35% and 5.36% (1950-1960 and 1960-1970 respectively) (Firman 1997 and Cox 2011).



Table 1 shows the population of the metropolitan region of Jakarta including Jakarta, the inner and outer peripheries of Jakarta, from 1980 to 2010. The Megacity of Jakarta increased from 11.91 million in 1980, 17.14 million in 1990, and 20.63 million in 2000 to 28.01 million in 2010. The megacity in 2010 was 11.79 percent of Indonesia's total population but this population resides in less than 0.3 percent of Indonesia's total area. The proportions of Jabodetabek's population to the total population of Indonesia have steadily increased from 8.07%, 9.56%, to 10.0% (in 1980, 1990, and 2000 respectively).

Table 1. Population of the Metropolitan Region of Jakarta in 1980-2010 (in millions)

Area	1980	1990	2000	2010
<i>Core</i>	6.50	8.26	8.39	9.60
Jakarta	6.50	8.26	8.39	9.60
<i>Inner peripheries</i>	n.a	n.a	4.93	7.22
City of Tangerang	n.a	n.a	1.33	1.80
City of South Tangerang	n.a	n.a	0.80	1.29
City of Depok	n.a	n.a	1.14	1.75
City of Bekasi	n.a	n.a	1.66	2.38
<i>Outer peripheries</i>	5.41	8.88	7.31	11.20
City of Bogor	0.25	0.27	0.75	0.95
Tangerang Regency	1.53	2.77	2.02	2.84
Bekasi Regency	1.14	2.10	1.62	2.63
Bogor Regency	2.49	3.74	2.92	4.78
<i>Megacity of Jakarta</i>	11.91	17.14	20.63	28.02

Sources: Rukmana (2014)

1.2. Transformation of Jakarta

The modern city of Jakarta was initiated by President Soekarno's strong vision to build Jakarta into the greatest city possible (Cybriwsky and Ford, 2001). He gave Jakarta, Monas – his most symbolic new structure the 132 m high national monument, spacious new government buildings, department stores, shopping plazas, hotels, the sport facilities of Senayan that were used for the 1962 Asian Games, the biggest and most glorious mosque of Istiqlal, new parliament buildings and the waterfront recreation area at Ancol.

Such constructions continued under the New Order regime that began in 1967. Under this regime, Indonesia enjoyed steady economic growth, along with a reduction in the percentage of the population living under the poverty line. Jakarta grew rapidly during this period of the New Order regime. During the thirty-two years of the New Order regime, Jakarta changed considerably. A generally rapid economic growth during this period allowed Jakarta to expand its modern constructions and develop into a modern city. Hundreds of new office towers, hotels and high-rise condominiums were built in many parts of the city.

The massive development on the outskirts of the megacity of Jakarta resulted from a series of deregulation and de-bureaucratization measures enacted by the Suharto government in the 1980s (Winarso and Firman 2002, p. 488). The subsidized housing finance program and municipal permit system for land development also contributed to policies that have most benefited some developers strongly linked to the New Order regime (Leaf, 1994). Winarso and Firman (2002) revealed almost all large developers were well connected to the President Suharto's family and inner circle including his daughters, sons, brother, in-laws and close friends. The connection to the Suharto family and inner circle became significant; closeness to the first family helped the large developers expand their business. Interlinking also occurred among the large developers through cross-shareholding, shared directorships and joint ventures; process which turned potential competitors into collaborators and created oligopolistic types of land and housing markets.

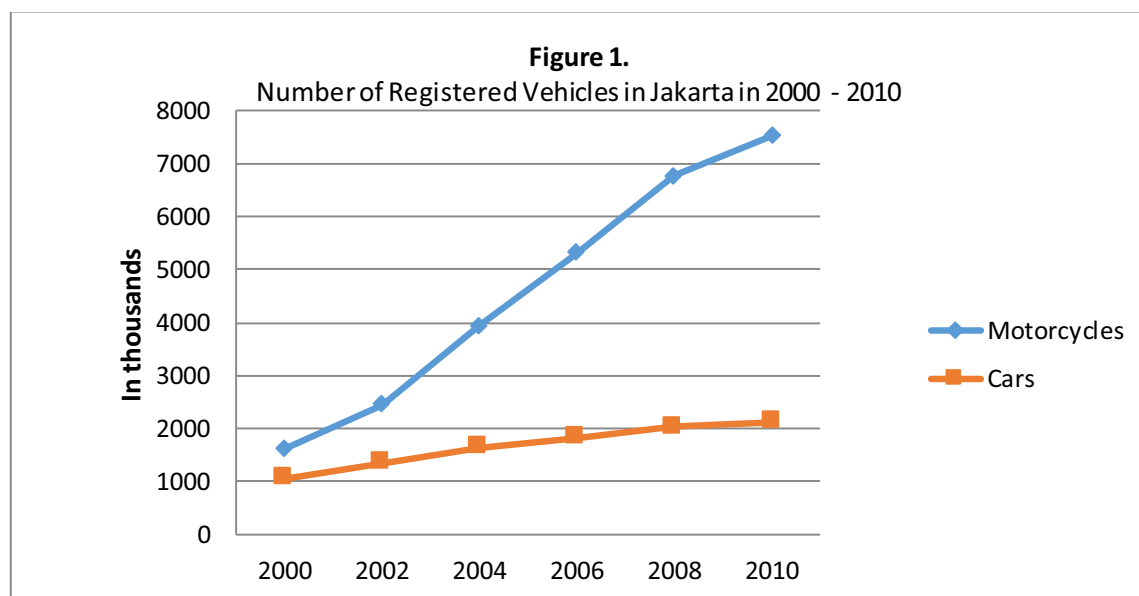
Continuing with the suburbanization; this was also caused by the development of three highways stretching from Jakarta to the peripheries - the Jagorawi toll road, the Jakarta-Cikampek toll road, and the Jakarta-Merak toll road (Henderson and Kuncoro 1996). The development of private industrial parks in the peripheries naturally followed the development of these highways (Hudalah et al 2013). Private industrial parks in the peripheries range from 50 to 1,800 hectares and on average the size is about 500 hectares (Hudalah et al 2013); major industrial centers are located in Cikupa-Balaraja of Tangerang Regency and Cikarang of Bekasi Regency. The industrial center of Cikarang with a total industrial land area of nearly 6,000 hectares is the largest planned industrial center in Southeast Asia (Hudalah and Firman 2011).

2, Jakarta's Transportation Problems

The urbanization and suburbanization in Jakarta are strongly associated with the traffic congestion in Jakarta. Jakarta is estimated to lose US\$3 billion a year because of traffic congestion which can't be separated from the high growth rate of vehicle ownership (9 to 11 percent per year), unsupported by road development (less than 1 percent a year). (Rukmana 2010)

Motorcycles are ubiquitous and can be acquired with a down payment of as little as \$30. The number of registered motorcycles in Jakarta grew exponentially from 2000 to 2010 as seen in Figure 1. The trend of the motorcycles growth will continue until a more sustainable transportation policy is implemented.

People who live in the outskirts of Jakarta can save as much as 30% of their transportation costs using motorcycles to work rather than public transport (HCC 2017). The daily jams in Jakarta are getting worse; the peripheries are a "bedroom suburb" for the daily commuters of Jakarta, the center of government and corporate offices, commercial and entertainment enterprises. The economy of Jakarta dominates its peripheral areas. In the daytime, the total population in Jakarta is much more than its population in the nighttime; the number of daily commuters in Jakarta is estimated 5.4 million (Rukmana 2014),



Source: JUTPI (2011) and BPS DKI 2011

The economy of Jakarta dominates its peripheral areas. In the daytime, the total population in Jakarta is much more than its population in the nighttime; the number of daily commuters in Jakarta is estimated 5.4 million. The level of services of public transportation in Jakarta is not reliable and accessible. People who live in the outskirts of Jakarta can save as much as 30% of their transportation costs using motorcycles to work rather than public transport (HCC 2017)

Commuters from the peripheries primarily used three highways including the Jagorawi toll road connecting Jakarta and the southern peripheries, the Jakarta-Cikampek toll road connecting Jakarta and the eastern peripheries and the Jakarta-Merak toll road connecting Jakarta and the western peripheries. Most commuters go to Jakarta to work in government and corporate offices, study in universities, receive high quality medical attention in the hospitals, and/or go for entertainment and cultural activities. The current public transportation systems have not been able to alleviate the acute traffic congestion; it is likely that Jakarta needs a Mass Rapid Transit (MRT) or also popularly known as Metro, in order to address this problem. The construction of the MRT project in Jakarta began on October 10, 2013. The first MRT tract will connect Lebak Bulus, South Jakarta and the Hotel Indonesia traffic circle with six underground stations, seven elevated stations and a capacity of 173,000 passengers per day (Rukmana 2014). By June 30, 2017, the completion of the MRT first tract was nearly 75 percent. The Jakarta city administration expected to launch the service of MRT to the public for trial purposes in August 2018.

Most metropolitan areas in the world with the population of over 10 million have operated metros for years. New York City opened the first underground line of its subway in 1904 and since then the subway has been the backbone of New York City transportation system. Two major cities in Japan, Tokyo and Osaka built their metros in 1927 and 1933 respectively. The Tokyo Metro is the world's most extensive rapid transit system with more than eight million passengers daily. The second largest city in the world, Mexico City, has had a metro since 1969 and now the Mexico City Metro is the second largest metro system in North America after the New York City subway. Two major cities in China, Beijing and Shanghai opened their metro systems in 1971 and 1995 respectively. Major cities in Southeast Asia with smaller populations than Jakarta have also had their metro systems for years, including Manila (1984), Singapore (1987), Kuala Lumpur (1995) and Bangkok (2004).

3. The Need for Sustainable Transportation Policies in Jakarta

Rapid urbanization in Jakarta has contributed to the need for sustainable transportation policies in Jakarta. The growth of registered vehicles in response to the growth of population in Jakarta and its peripheral areas has caused acute traffic congestions in Jakarta. This section will offer several ideas of sustainable transportation policy including reducing private vehicle uses, promoting bike lanes, and the development of MRT.

3.1. Reducing private vehicle uses

There are several possible solutions to eradicate traffic congestion problems and one of them is the reduction of private vehicle uses. The New York Times reported a suburb town without cars in Germany. Streets in this upscale town are completely car-free except the main thoroughfare and a few streets on edge of the town. The residents of this town are still allowed to own cars, but parking is relegated to two large garages at the edge of the development.

The Vauban town, is located on the outskirts of Freiburg, near the French and Swiss borders and home to 5,500 residents. The residents are heavily dependent on the tram to downtown Freiburg and many of them take to car-sharing when longer excursions are needed. Seventy percent of Vauban's families have no cars. They do a lot of walking and biking to shops, banks, restaurants, schools and other destinations that are interspersed among homes. The town is long and relatively narrow and provides an easy walking access to the tram for every home.

Creating places with more compact design, more accessible to public transportation and less driving is the envision of urban planners in the 21st century. The Vauban town is an exemplar of the 21st century urban design in response to the threats of greenhouse gas emission and global warming and the dwindling oil supply. The Vauban's urban design is the extension of the New Urbanism. The New Urbanism is a school of urban design arose in the U.S. in the early 1980s. This school of urban design promotes several key principles including walkability and connectivity, mixed land uses, and high density. There have been many the New Urbanist towns in several countries, but cars still fill the streets of these towns.

The Vauban town provides an example of the possibility of creating city without cars. The walkable and mixed-land-uses urban design, easy access to public transportation and excellent public transportation system as demonstrated in the Vauban town are the components for creating city without cars.

Cars are still a luxury item for many Indonesian families. Many urban residents, particularly those live in kampung kota, do not own cars and are used to living without cars. Streets (gang) in Indonesia's kampung kota are too narrow for cars and the residents are used to walking and biking to their destinations. Kampung kotas are located in the center of urban areas and relatively accessible to public transportations. In reference to the New Urbanism concept, the Indonesia's kampung kota has implemented the principles of walkability and high density.

Indonesian planners need to appreciate the existence of kampung kota in terms of lacking driving needs. Kampung kota residents will be less likely to have a demand for cars when their neighborhoods are accessible to public transportations and the streets in their neighborhoods remain narrow. Kampung kota residents need to remain lack of driving needs for reducing the car ownership rate in urban areas including Jakarta. For new developments in suburb areas, Indonesian planners can emulate the success of the Vauban town. Driving needs are profoundly affected by the urban design and the high access to public transportation. It makes sense to envision and is not all impossible to create a city without cars.

3.2. Promoting Bike Lanes

Many metropolitans in the world have developed dedicated bicycles lanes for years. Cities in developed countries, particularly in Europe, have integrated bicycle lanes into their transportation network systems. Those cities such as Amsterdam, Paris, Berlin, Copenhagen and Barcelona have been developed as bike-friendly cities. Safe and extensive bike route networks, promotion of pro-cyclist policies, and a bike culture have taken places in those cities. Cyclists in those cities are not second class residents and can safely ride their bicycles as the main mode for their daily commute to their workplaces. Copenhagen is an example of European bike-friendly city where about a third of workforce in this city commute to the office by bike.

The first Jakarta's dedicated bike lane stretching from Ayodia Park to Blok M was inaugurated in May 2011. It should be considered as a breakthrough in solutions for acute traffic congestions in Jakarta. The development of dedicated bicycle lanes is a good move from the Jakarta administration for promoting the use of bicycle as an alternative transportation mode. If the Jakarta city administration could encourage more motorists to shift to using bicycle to work, the city's chronic traffic woes could be eventually reduced.

The first dedicated bike lane in Jakarta is only a small step in developing Jakarta as a bike-friendly city. There are many challenges for Jakarta to be a bike-friendly city. The Jakarta city administration needs to have a strong commitment to build more dedicated bike lanes and integrate them with the city transportation network system. Dedicated bike lanes should be part of the city transportation network system and designed to accommodate the need of residents' mobility in the city. It is very essential to connect dedicated bike lanes with mass transportations including the Mass Rapid Transit (MRT).

It's not easy to build more dedicated bike lanes if the Jakarta city administration still focuses on building more elevated inner-city toll roads as the solution of addressing the chronic traffic woes in Jakarta. It is also important to note that the first dedicated bike lane was not initiated by the Jakarta city administration but the Indonesian Bicycle Community (Komite Sepeda Indonesia) that donated as much as 500 million rupiahs to build the bike lane. The Jakarta city administration needs to change the mindset of the possible solution for the chronic traffic congestion in the city. The solution is not building more roads, but reducing the use of cars through improving and expanding the use of mass transportations and bicycles.

Another big challenge for bike lanes in Jakarta is the lack of law enforcement. The Jakarta city administration should strictly enforce the dedicated bike lanes for cyclists. The dedicated bike lane cannot be used as parking spots and a lane for motorcyclists. A few days after the inauguration of the bike lane stretching from Ayodia Park to Blok M, the lane was overwhelmed by private cars, public minivans and three-wheeled vehicles bajaj. A number of private cars were also parking in the lane (The Jakarta Post, 27 May 2011). Without strict law enforcement, the dedicated bike lane will not be an effective way to reduce the Jakarta's traffic woes and will only be a failed initiative.

Despite the challenges for bike lanes in Jakarta, the inauguration of the Jakarta's first bike lane should be seen as a promising way of alleviating the acute traffic problems in Jakarta. I hope that the inauguration of the Jakarta's first bike lane could be the milestone for the Jakarta city administration in changing the mindset of how to address the chronic traffic problems in Jakarta. It is not building more toll roads but reducing the use of cars through encouraging more motorists to shift to cyclists or mass transportation riders.

3.3. Discouraging Elevated Roads

The development of new roads will never catch up to the growth rate of vehicle ownership. A new highway or a widened road only alleviates traffic congestion for a short period of time. After a few years, any new or widened highway fills with traffic that would not have existed if the highway had not been built, a phenomenon called induced demand. Because of induced demand, neither building new roads nor widening existing roads are viable long-term solutions to traffic congestion.

The new roads will also undermine the efforts to develop a mass transportation system in Jakarta. The main idea of developing a mass transportation system, including the TransJakarta busway and the monorail and Mass Rapid Transit projects, is to reduce the number of motorists and motorcyclists on Jakarta's streets. Drivers would be expected to use the mass transportation and reduce traffic, but new roads would only attract more motorists.

Not only would elevated roads stimulate induced demand and thus worsen traffic congestion, they could also jeopardize the livability of neighborhoods along them. In many cities in other countries, such as Seoul, New Orleans, San Francisco and New York City, elevated freeways have negatively affected livability. At the same time, in many developed countries, we have seen a shift in urban planning from enhancing mobility toward promoting livability.

The Cheonggyecheon freeway was completed in 1977 and was seen as a symbol of modernization and industrialization in South Korea after the war with the North. This elevated freeway was built above a 5.8-kilometer stream flowing through downtown Seoul. By 2000, the area was considered the most crowded and noisy part of the city and became an eyesore for residents.

In July 2003, the then-mayor of Seoul and the current president of South Korea, Lee Myung-bak, launched a project to tear down the Cheonggyecheon freeway and revitalize the surrounding area. During the demolition process, the city administration developed public transportation systems, including Bus Rapid Transit lines. Today, the Cheonggyecheon area has been revitalized and is one of Seoul's main tourist areas.

In 1973, New York City's West Side elevated highway collapsed and was never repaired but replaced by a surface boulevard of West Avenue. Similarly, two elevated freeways in San Francisco, Embarcadero and Central Freeways, were badly damaged by the Loma Prieta earthquake of 1989. The San Francisco city administration decided not to rebuild the elevated freeways, but replaced them with surface boulevards. The conversion of elevated freeways in both New York City and San Francisco did not cause traffic havocs. The traffic switched to the boulevards, nearby street or mass transit (James and Norquist 2010). Furthermore, a team of researchers from the UC Berkeley (Cervero, Kang, and Shively 2009) found that the conversion of elevated Embarcadero and Central Freeways with boulevard has stimulated reinvestment in the neighborhoods along the freeways without seriously sacrificing transportation performance. More recently, the residents of New Orleans have decided not to rebuild the damaged elevated expressway caused by the Hurricane Katrina, but replace it with an oak-lined boulevard (James and Norquist 2010).

The conversion of elevated freeways to surface boulevards in Seoul, New York City, San Francisco or New Orleans is evidence of a paradigm shift from a focus on expediting the movement of automobile to a focus on increasing the livability of neighborhoods. The livability of neighborhoods should be prioritized over the increase of mobility. Jakarta needs to learn from what has happened in Seoul, New Orleans, San Francisco or New York City regarding the elevated freeways. Not only is the proposed six elevated toll road projects the solution for the traffic congestion in Jakarta, but also they could cause the decline of livability of neighborhoods along the elevated toll roads. The Jakarta city administration should revisit their

decision to build the new elevated toll roads and instead they should focus their efforts on building mass transportation systems in alleviating transportation problems in Jakarta.

3.4. The Development of Mass Rapid Transit

In order to address traffic congestion, two flagship projects are underway including the development of Cilamaya Seaport and the Mass Rapid Transit (MRT) project. The Cilamaya Seaport is located outside of the Jabodetabek, but is connected with the Jakarta-Cikampek toll road. This planned seaport is located in Karawang Regency. All shipping activities of industrial parks in the megacity are currently using the Tanjung Priok port in Jakarta. The Cilamaya Seaport is designed to mitigate further traffic congestion caused by heavy traffic flowing from the eastern parts of the megacity to the Tanjung Priok port. This will be a new transportation hub for the megacity's industrial parks. The MRT project would become the most expensive public projects in Jakarta's history, but it is the answer to address acute traffic congestions in Jakarta.

For at least 20 years, the proposed MRT has been under discussion by the Jakarta administration and the government of Indonesia. Activists and non-governmental watchdogs have seen the MRT proposal as a possible bonanza for corrupt politicians and contractors (Economist, 4 February 2010). Eventually, the government secured a \$1.6 billion loan agreement with the Japanese International Cooperation Agency (JICA) in 2009 for funding. Vice President Boediono also asked the JICA to expedite the design and construction of MRT project; the first tract of the MRT project was to be completed in 2016 (The Jakarta Post, 20 October 2010). The construction of the MRT project began on October 10, 2013. Governor Joko Widodo launched the flagship project in a groundbreaking ceremony at Dukuh Atas, Central Jakarta (The Jakarta Globe, October 11, 2013).

One MRT train will consist of six cars and be able to transport a maximum of 1,200 passengers per trip. The MRT Jakarta will operate 16 trains and transport 1.5 million passengers a day. The first MRT tract will connect Lebak Bulus, South Jakarta and the Hotel Indonesia traffic circle with six underground stations, seven elevated stations and a capacity of 173,000 passengers per day.

4. Conclusion

The growth of registered vehicles in response to the rapid urbanization has caused acute traffic congestions in Jakarta. The Jakarta administration needs to find sustainable transportation policies to address the transportation problems in Jakarta. The development of MRT could be viable solutions to alleviate the acute traffic jams in Jakarta. The main idea behind developing a mass transportation system, including the TransJakarta busway and the monorail and Mass Rapid Transit projects, is to reduce the number of motorists and motorcyclists on Jakarta's streets. Drivers would be expected to use the mass transportation and reduce traffic, whereas new roads only attract more motorists. Jakarta needs to discourage the development of elevated roads that will stimulate induced demand and thus worsen traffic congestion. Elevated roads will jeopardize the livability of neighborhoods along them.

In addition, Jakarta will need to promote bike lanes and reduce the use of private vehicle. Jakarta needs to encourage the development and usage of the smartphone apps on its two-way ability to locate, coordinate and orchestrate both passengers and vehicles and encourage more biking and walking for its residents. Jakarta will also need to implement other innovative sustainable transportation policies including carpool matching services, shuttle services, telecommuting and downzoning and better parking management in downtown areas.

References:

- [1] BPS DKI Jakarta. 2011. *Statistik Daerah Provinsi DKI Jakarta*. Jakarta: BPS DKI Jakarta
- [2] Cervero, R., Kang, J., and Shively, K. (2009). From elevated freeways to surface boulevards: neighborhood and housing price impacts in San Francisco. *Journal of Urbanism* 2(1): 31-50
- [3] Cox, Wendell. (2011). *The evolving urban form: Jakarta (Jabotabek)*. <http://www.newgeography.com/content/002255-the-evolving-urban-form-jakarta-jabotabek>
- [4] Cybriwsky, Roman and Ford, Larry R. (2001). City profile: Jakarta. *Cities* 18(3): 199-210.

- [5] Economist, 4 February 2010
- [6] Firman, Tommy., & Fahmi, F. Z. (2017). The Privatization of Metropolitan Jakarta's (Jabodetabek) Urban Fringes: The Early Stages of "Post-Suburbanization" in Indonesia. *Journal of the American Planning Association*, 83(1), 68-79.
- [7] Firman, Tommy. (1997). Land conversion and urban development in the Northern Region of West Java, Indonesia. *Urban Studies* 34(7): 1027-1046
- [8] Human Cities Coalition (HCC). (2017). *Jakarta Urban Challenges Overview*. <https://www.humancities.co/2017/01/jakarta-urban-challenges-overview/>
- [9] Henderson, V., and Kuncoro, A. (1996). The dynamics of Jabotabek development. *Bulletin of Indonesian Economic Studies*, 32(1), 71-95.
- [10] Hudalah, Delik and Tommy Firman. (2011). Beyond property: Industrial estates and post suburban transformation in Jakarta Metropolitan Region. *Cities* 29: 40-48
- [11] Hudalah, Delik, Dimitra Viantari, Tommy Firman, and Johan Woltjer. (2013). Industrial land development and manufacturing deconcentration in Greater Jakarta. *Urban Geography* 1-22.
- [12] James, C. and Norquist, J. (2010). *Tearing down an expressway to restore a community*. http://www.nola.com/opinions/index.ssf/2010/08/tearing_down_an_expressway_to.html
- [13] JUTPI Technical Team. (2011). *Transportation in Jabodetabek*. A presentation to the Coordinating Ministry of Economic Affairs. Jabodetabek Urban Transportation Policy Integration Project. April 12, 2011
- [14] Leaf, Michael. (1994). The suburbanization of Jakarta: A concurrence of economics and ideology. *Third World Planning Review* 16(4): 341-356.
- [15] Rukmana, Deden. (2014). Peripheral Pressures: Jakarta. *Archeology of the Periphery of Megacities*. Roger Connah (Ed.). Moscow: Strelka Press. Pp. 158-167
- [16] Rukmana, Deden. (2010). Jakarta needs Metro to avoid traffic gridlock. *The Jakarta Post*. 24 October 2010. <http://www.thejakartapost.com/news/2010/10/24/jakarta-needs-metro-avoid-traffic-gridlock.html>
- [17] Silver, Christopher. (2007). *Planning the megacity: Jakarta in the twentieth century*. London and New York: Routledge.
- [18] The Jakarta Globe, October 11, 2013
- [19] The Jakarta Post, 20 October 2010
- [20] The Jakarta Post, 27 May 2011
- [21] Winarso, Haryo and Tommy Firman. (2002). Residential land development in Jabotabek, Indonesia: triggering economic crisis? *Habitat International* 26: 487-506