How neglecting walking increases socio-economic inequalities

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HOW NEGLECTING WALKING INCREASES SOCIO-ECONOMIC INEQUALITIES

Impeding Urban Sustainable Mobility: Insights from Jakarta

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ABSTRACT

Walking in Jakarta, Indonesia, is often regarded as inconvenient, unsafe, and associated with limited mobility and accessibility. These attributes are the manifestation of Jakarta's socio-spatial structures over time (path dependence) of spatial development events in the past, which considered walking as less important in comparison to vehicular movement. In this paper, we explore Jakarta's trajectory by analysing and interpreting the results of mathematical street network models using space syntax at a metropolitan scale for three discrete time steps (1940, 1959, 2018). We juxtapose the computational analysis with Jakarta's history of urban development and selected transport data. Our findings indicate that vehicular dominance (i.e. car-oriented development) has been inadvertently imposed in Jakarta's socio-spatial structure over time. This structure highly penalises those without access to private motorised vehicles, thus entrenching the existing socio-economic inequalities; especially for the potentially marginalised groups (e.g. urban poor, immigrants, those with disability, elderly, children). For them, this structure influences the accessibility to key functions such as schools and health care services. In light of sustainable urban mobility and the United Nation's sustainable development goals (SDGs), our findings highlight the influence that socio-spatial structures have on transport mobility practice. Moreover, our results provide insights for understanding and addressing mobility inequality. We further link our results to current planning policies in Jakarta. This application of space syntax contributes to urban strategic and transport planning by emphasising the need to change the conventional urban planning practices, which heavily prioritises road infrastructures while neglecting the socio-spatial structure and intertwined land use of the city.

KEYWORDS

Mobility inequality, path dependence, space syntax, Jakarta

1. INTRODUCTION

In most Southeast Asian metropolitan cities, walking is often neglected in contrast to vehicular movement dominance. This can be understood from the heavy investment on road expansion rather than improving and providing public transport and pedestrian facilities (Cybriwsky & Ford, 2001; Barter, 2004; Lo, 2010). This policy incentivises car-oriented development, which provides a convenient environment for those travelling by private vehicle, while posing difficulties for those who walk (e.g. inconvenient walking environment, risk of getting into traffic accidents, street crime risks, high exposure to air pollution). On the urban scale, road expansion along with low-density development of suburban housing enclaves and construction of shopping centres with large parking lots creates an automobile dependent society (Newman & Kenworthy, 2000; 2015; Kenworthy, 2003). In the absence of good public transport, these could generate mobility inequality, whereas limited mobility of socially disadvantaged population groups (e.g. urban poor, immigrants, elderly, those with disabilities, children) would lead to a lack of accessibility to key functions for them (e.g. school, health care service, workplace) and further lessen their chances of socio-economic opportunities (Wachs & Kumagai, 1973).

In a recent publication, Althoff et. al. (2017) ranked Indonesian cities at the bottom of 46 countries surveyed for low walkability. For Jakarta, this puts more than 60% of those with income less than IDR 1,000,000, or around US$70 per month, in a disadvantaged position as they are at high risk of transport related social exclusion (Church, et. al., 2000; Kenyon, et. al., 2002; Lucas, 2012) and furthermore, transport injustice (Martens, 2012).

In transport and mobility discourse, these chains of consequences (i.e. the impacts that previous transport policies have had on current spatial structure and social inequalities) are often explained as a path dependent course (Barter, 2004; Bertolini, 2007; Pflieger, et. al., 2009). In current literature, this path dependent trajectory is mostly explained from an institutional perspective, highlighting the causal relation between contingent events, in which their chain reaction is likely to be irreversible (Martin & Sunley, 2006; Sorensen, 2015). For instance, current automobile dominance can be explained by how transport planners have already become accustomed to road expansion as a "business as usual" solution for transport problems (Low, et. al., 2005), in addition to disproportionate power of road transport institutions over public transport in decision making process (Low & Astle, 2009). This approach, however, is rarely supported by spatial evidence, thus making it difficult to visualise the path dependent urban change.

Consequently, this paper aims to understand Jakarta's urban transformation over time, focusing on how the neglect of walking and the prioritisation of vehicular movement have arisen and to provide an initial overview of Jakarta's urban transformation from a socio-spatial perspective. Therefore, we make use of "postdicting", to describe social aspects and urban configurations through time. To build spatial evidence, we analyse Jakarta's street network in three discrete time steps: 1940, 1959 and 2018. To provide an in-depth understanding, each time step is juxtaposed with historic events and policies in relation to pedestrian and vehicular movement.

2. DATASETS AND METHODS

Jakarta's urban development is analysed by comparing street network models from three different time periods using the following maps and data: 1940 (*Plattegrond van Batavia* by G. Kolff & Co., Amsterdam), 1959 (*Djakarta:North* and *Djakarta: South*, both developed by the US Army Map Service) and 2018 (OpenStreetMap data). Each time period represents significant government regimes. The 1940 map describes Jakarta's (known as *Batavia* at that time) urban development in the late stage of Dutch colonialization; the 1959 map depicts Jakarta after Indonesia had gained its independence and current day Jakarta is portrayed through the 2018 data set.

This paper integrates the application of space syntax analysis into historical research using the framework outlined by Griffiths (2011; 2012); thus the spatial analysis complements the historical narrative (Can et. al., 2015; Aleksandrowicz et. al., 2017) laid out by a path dependence argumentation line. As such, we apply space syntax's normalised angular choice analysis (NACH) with different radii for each time period. For the 1940 and 1959 street network models, we use an axial map whereas for the 2018 model road centre lines are used. There are no significant differences between the NACH results from using manually traced axial lines and road centre lines (Turner, 2007). All maps are scaled using the 2018 map as the base map.

3. RESULTS

3.1. Jakarta's Historic Narrative

Throughout history, Jakarta has been a main trading hub in the Southeast Asian region, known by different names. In the 14th century, the city port was known as *Sunda Kelapa,* a part of the Sunda Kingdom. In 1511, the Portuguese arrived and a decade later, claimed the 4-km^2 city, which had around 10,000 to 50,000 inhabitants (Kompas, 2009). In 1527, the city was renamed *Jayakarta*, meaning "city of glorious victory" under the rule of the Demak Kingdom, a Javanese-Islamic kingdom. In 1619, the city was taken over by the Dutch as one of the main ports for the Dutch East Indies Company (*Vereenigde Oostindische Compagnie*) and was renamed *Batavia*. The city was renamed (again) as Jakarta (*Djakarta* in old Indonesian spelling) after Indonesia gained its independence. In 2015, Jakarta's population stood at 10 million with an administrative area of 662 km^2. Greater Jakarta has an estimated population of 27.9 million (census of 2010) and includes in addition the cities of Bogor, Depok, Tangerang and Bekasi.

Under Dutch rule, the main city was located around the mouth of the *Ciliwung* River in close proximity to the port. Rapid growth from 1800 onwards led to a southeast urban expansion along the *Ciliwung* River. This expansion was connected to health problems caused by silted up canals in the north, forcing the inhabitants to move south for a healthier environment. This urban transformation is clearly identifiable on the 1940 map, depicting two main north-southeast street axes: (1) *Rijswijkstraat* (now *Hayam Wuruk-Gadjah Mada Street*) which connects the port in the north and the city square (now National Monument), and (2) *Mataramanweg* (now *Kramat-Mataraman Raya Street*) which connects the city square to the southeast part (see Figure 1).

The route of *Rijswijkstraat-Mataramanweg* was served by trams, connecting the *Pasar Ikan* quarter (literally translated as 'fish market', referring to how the area started to develop) in the north to *Meester Cornelis* district (now *Jatinegara*) in the southeast. The tram line connected offices and commercial areas located in the north and around the city square to wealthy residential areas in the south. Poor local settlements, coined *kampong*, are mostly remotely located from main streets and public transport. Since the tram service applied ethnic and economic segregation for boarding the carriages, it seemed to have served as an early transport-related social exclusion strategy, excluding poor locals from participating in wider socio-economic activities. The tram ceased its operation in the early 1960s because the government accused it of being the main cause of traffic jams.

Starting in the late 1940s, urban growth towards the southwest and east took place, *inter alia,* due to the establishment of the New Town *Kebayoran Baru*. This was in addition to infill developments across the city. The population burst from the mid 1940s onwards is associated with development policies, which were enacted after Indonesia proclaimed its independence in 1945. The first presidential regime, the "Old Order", urged the building of national identity by constructing mega infrastructure projects (e.g. highways, monuments), which also served as international displays (Cybriwksy & Ford, 2001). These projects triggered immigration of workers from rural areas whom many of whom had settled in kampongs or founded new ones by squatting on vacant land next to the rivers (such as Ciliwung River) or railway tracks.

In the following three decades, Jakarta expanded in west, east, and south directions (Alzamil, 2017) doubling in size between 1980 to 1990 (Maru & Ahmad, 2015). This was related to the growing economy in real estate and road construction that opened the way to the establishment of large estate enclaves in peripheral areas and road construction to connect those enclaves (Ford, 1993; Leaf, 1996). From the social political perspective, these massive constructions were attributed to development policies during the second Presidential era, the "New Order", which gave more freedom to private developers and contractors; although, some of the road construction projects were closely associated with corruption alleged to be linked to the President dynasty (Hook & Replogle, 1996).

During this period, transport and urban mobility policies were mainly focused on a road profile for car-oriented movement and did not take into consideration pedestrian movement. Evidence for this is the ratio of overall road length compared to the overall sidewalk length. During the 1960s and 1970s, the road length was only around 800 km (Sedyawati, et. al., 1986) but this expanded to 6,543 km in 2008 (Wismadi, et. al., 2013) of which only 8.65% of those roads were equipped with sidewalks (Jakarta Statistic Board, 2017). Moreover, the prioritisation of private vehicles over public transport is implied in Jakarta's development master plan from 1974/1975-1978/1979. The master plan perceives public transport development as a hindrance for road traffic and further suggests that public transport services should be improved through taxi services and the banning of trishaw. Moreover, Arif (2002) documented that there were 25 public transport studies from 1975 to the 1990s, but none came to implementation during this period. These put more pressure on existing traffic and created a high dependence on private car ownership. For Greater Jakarta, the absence of well-functioning public transport and the lack of pedestrian facilities has paved the way for an automobile dependent trajectory (Barter, 2004). After the second Presidential regime fell in 1998, urban policies aimed to reduce transport demand for private motorised vehicles; until today, they had been ineffective. Currently, a rail-based mass rapid transit (MRT) system is being built and is expected to be finished and should begin operating in 2019.

Departing from Jakarta's urban history, we applied a path dependence framework (Martin & Sunley, 2006; Tasan-Kok, 2015). Therefore, we identified system and critical junctures/events which had an impact on Jakarta's urban development (Table 1). This in conjunction with three main historical events: the Dutch colonisation, the post-independence (Old Order regime and New Order regime) and the post-reformation (after 1998). During the Dutch era construction of the north-southeast axis was

implemented. In the post-independence period, Jakarta grew exceedingly fast, at first as a symbol of national identity and an international showcase of sovereignty, and later as the manifestation of economic growth. This era, however, set the basis for automobile dependence while at the same time neglected walking and public transport provision. The post-reformation era tried to implement change by disincentivising the use of private vehicles (e.g. fuel subsidy reduction) and the development of public transport; however, the road expansion strategy and construction of large estate enclaves in peripheral area still remains.

Table 1. Overview of Jakarta's path dependence framework

Period	Critical Junctures/Events	Changes on trajectory of	
		Transport Network Development	Spatial Pattern
Dutch colonization 1600-1945	• Dutch fort establishment followed by Dutch occupation • Urban health crisis followed by the moving of administrative centre to the southern part	To connect key functions with wealthy residential settlement (i.e. the north-south axis)	North-southeast axis: northern area mostly for port, fishery, and offices, while south-eastern area mostly for residential.
Post-independence	The Old Order (1945-1967) • "*Nationalisation*" policy to build national identity, including the erasing of tramways, construction of infrastructure projects (i.e. roads, monuments)	To connect mega-projects in Jakarta as part of internationalisation display	• *New town* settlement (*Kebayoran*) in southwest part. • *Kampong* in-fill development, mostly built by the construction worker. • Urban expansion toward south and east direction.
	The New Order (1967-1998) • Construction of "*large scale gated estates*" (e.g. Bumi Serpong Damai) due to more freedom given to private developers • Priority on road transportation (i.e. highway construction projects)	To connect suburban enclaves	Sprawl; expansion of urban areas to surrounding peripheries (*Jabotabek* region)
Post-reformation 1998-now	• Fuel subsidy reduction • Development of public transport (e.g. Bus Rapid Transit *TransJakarta* fully operated in 2004, started construction of Mass Rapid Transit in 2013)	Continuation of road-based expansion to cater for the current demand	Continuation of urban expansion to peripheral area and infill development

3.2. Spatial Analysis of Jakarta's Urban Development

The historical narrative on path dependency depicts how the street network development over time influenced by previous policies (see Table 1) has accumulated effects on the neglect of walking. The following spatial analysis highlights the tendency towards car-oriented development from two main indications. *First*, the transformation of foreground network through time by comparing normalized angular choice analysis (NACH) with radius n of 1940, 1959, and 2018 models (Figure 1). NACH radius n analysis represents city-wide movement and therefore highlights streets which are most likely comprised of vehicular movement (1959 and 2018 map). Due to the lack of good public transport in Jakarta, most people depend on car ownership. Those who do not have access to a private vehicle (mostly the urban poor) are likely to be excluded (Lo, 2010). *Second*, changes in the networks supporting pedestrian movement by comparing NACH with low metric radius of 1940, 1959, and 2018 models (Figure 2). The local radii analyses indicate the potential for sustainable modes such as walking, and further correspond to sustainable mobility discussion.

NACH radius n analyses depict not only changes in values for the main streets as the urban system grows over time, but also a rapidly increasing number of streets with high values (Table 2). Previous main streets in the 1940 map such as *Gadjah Mada* Street and *Abdul Muis* Street (previously *Rijswijkstraat*), *Mataraman Raya* Street and *Kramat Raya* Street (previously *Mataramanweg*) are becoming less important in following years as can be inferred from a decrease in NACH value. *Sudirman* Street, which was not present in the 1940 map, appears in the 1959 map as a new road connecting the city centre to *Kebayoran Baru* new town with the NACH value of 1.477. At present, *Sudirman* Street is one of Jakarta's main roads, traversing the main commercial area and offices. On the contrary, streets that connect Jakarta city centre to peripheral enclaves have become more significant. For instance, the NACH value of *Raya Pantura* Street (previously *Priokweg*) that connects Jakarta to *Tanjung Priok* port increased from 1.299 in 1940 to 1.396 in 1959 and slightly decreased to 1.359 in 2018 analysis. *Letjend Suprapto* Street, which connects to Bekasi as part of Greater Jakarta, has the NACH value increased from 1.318 in 1940 to 1.469 in 1959. The value then dropped to 1.184 in the 2018 analysis as the road was extended to the east as *Raya Bekasi* Street with the value of 1.386.

Table 2. Syntactic measures of main streets

		NACH (n radius)		
		1940 map	1959 map	2018 map
	System minimum	0.000	0.000	0.000
	System average	0.875	0.811	0.829
	System maximum	1.601	1.522	1.974
1	*Gadjah Mada* Street	1.546	1.423	1.282
2	*Abdul Muis* Street	1.496	1.415	1.134
3	*Sudirman* Street	-	1.477	1.324
4	*Mataraman Raya* Street	1.510	1.508	1.327
5	*Kramat Raya* Street	1.596	1.517	1.312
6	*Raya Pantura* Street	1.299	1.396	1.359
7	*Letjend Suprapto* Street	1.318	1.469	1.184
8	*Raya Bekasi* Street	-	-	1.386

In the 1940 analysis, the global flow connects the north part of Jakarta, which consisted of port, fisheries, and office quarter, traversing the central part that mainly commercial functions, and the southeast part that consisted of wealthy residential areas. The 1959 analysis depicts the emergence of a grid-like structure, which connects Jakarta city centre with new developments in the peripheral areas. On the 1959 map, main roads (as shown on the 1940 map) are extended following the growth of urban settlements, such as *Kebayoran Baru* in the southwest. This road extension introduced a new mobility lifestyle which offered convenience by use of motorised vehicles. Later, this lifestyle internalised the social narrative which associates ownership of and access to motorised vehicles with high socio-economic status.

The 2018 NACH high metrics analysis depicts a deformed wheel structure emerging from Jakarta urban growth over time. This pattern is commonly found in European cities, which corresponds to Jakarta historical narrative as a former Dutch colony. The city centre is connected to the edge (the suburban enclaves) through major roads, whereas some radials seem to be the extension of previous main roads, and two ring roads (the inner and the outer ring road). The inner ring road was meant to allow trucks and containers to access *Tanjung Priuk* Port in the northeast without traversing the city centre. This inner ring road was completed in the 1960s and induced another urban expansion, as can be seen from urban settlements in *Cempaka Putih* and *Senen* districts (Merrillees, 2015). Later, as Jakarta's urban area expanded, the outer ring road was constructed in the 2010ss to connect suburban

enclaves in neighbouring cities (Bogor, Depok, Tangerang, Bekasi). These road expansions supported by policies of fuel subsidy, easy credit schemes for vehicle ownership, and lack of investment for walking and public transport, have increased private vehicle sales, especially of motorcycles. Statistical records in 2014 stated that 62.12% of Jakarta households own a motorcycle, 4.98% own a car, 13.89% have both car and motorcycle and 18.75% do not own any private vehicle (BPS, 2016). Jakarta's inhabitants who have seen the conveniences of having unlimited urban mobility and easy access to key functions across the city, adapted their mobility behaviour accordingly and heavily rely on motorised vehicles.

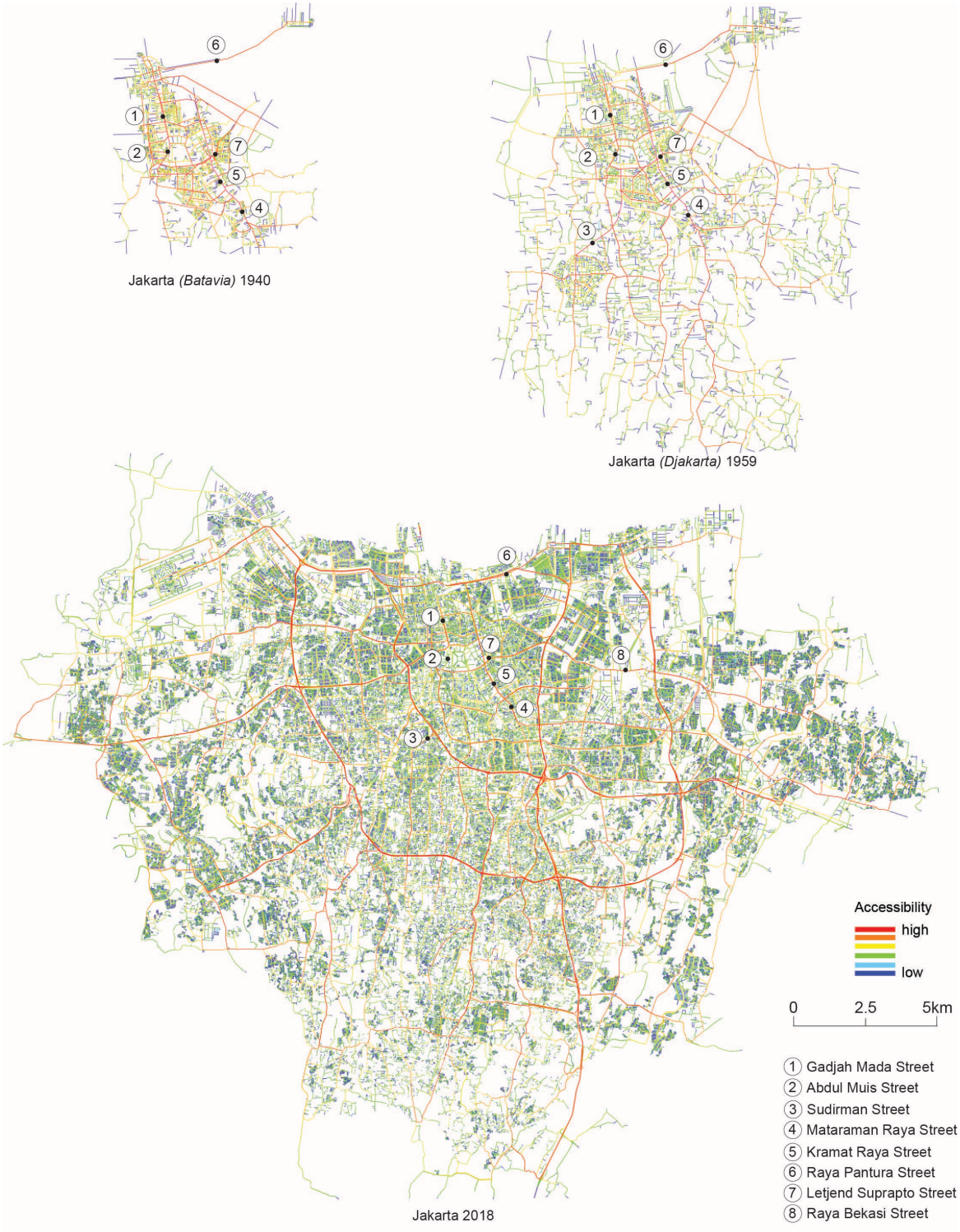

Figure 1. Normalized Angular Choice (NACH) analysis of Jakarta (1940, 1959, 2018) at radius n

The prioritisation of vehicular movement in Jakarta has led to the rise of motorcycle ownership (Table 3). This is to such an extent that nearly every household in the urban poor settlement (*kampong*) has more than one motorcycle to fulfil daily mobility demands. In relation to the socio-spatial structure, this trend is likely to be a socio-economic response to the spatial island behaviour of *kampong* and the lack of walking and public transport provision as alternate transport options.

Table 3. Private Vehicle Ownership in Jakarta

Year	Number of Cars	Number of Motorcycles
2008	2,295,644	3,968,749
2009	2,355,354	4,333,559
2010	2,505,133	4,835,650
2011	2,665,988	5,313,995
2012	2,801,918	5,650,925
2013	3,046,434	6,211,367
2014	3,215,542	6,687,375

Source: BPS, 2015

Contrary to the rise of private vehicle ownership, the highly dense network supporting pedestrian movement dissolved over time. In Figure 2, the NACH low metrics analysis depicts this spatial change over time. In the 1940 analysis, Jakarta appears to be pedestrian friendly since the street network is locally well-connected. The network for local movement became less dense in 1959 and remained fragmented as patches in the 2018 analysis. These patches are not uniformly distributed throughout the city but are instead along the inner ring road and follow the *Ciliwung* River, which later formed the north-south axis.

These patches represent *kampongs*, highly dense settlements and mostly not equipped with adequate infrastructure such as water and sanitation. For instance, *kampong Angke* in the north, *kampong Pulo* and *kampong Menteng* in *Manggarai*, Central Jakarta and other high dense settlements such as *Cenpaka Baru*, *Utan Kayu*, *Kramat Jati*, and *Kalisari* (Figure 2). In these kampongs the urban poor live. They appear to be highly integrated locally but are globally fragmented (Figures 1 and 2), which indicates a spatial island behaviour. This finding is similar to Budiarto's (2003) analysis of three types of *kampong* in Jakarta; the inner-city *kampong*, the peripheral *kampong*, and the woodland *kampong*. As such, *kampong* inhabitants can fulfil their basic needs such as buying groceries and household supplies, by walking within their neighbourhood. However, the island behaviour makes them less connected to more sophisticated functions, such as modern supermarket located outside the neighbourhood which are difficult to reach by foot. Inadequate and discontinuous sidewalks, unsafe walking environment (due to street crime or traffic safety), and urban barriers (such as rail tracks or highways which create walking detours) are among the factors that hinder pedestrian movement and isolate *kampongs* from the outside.

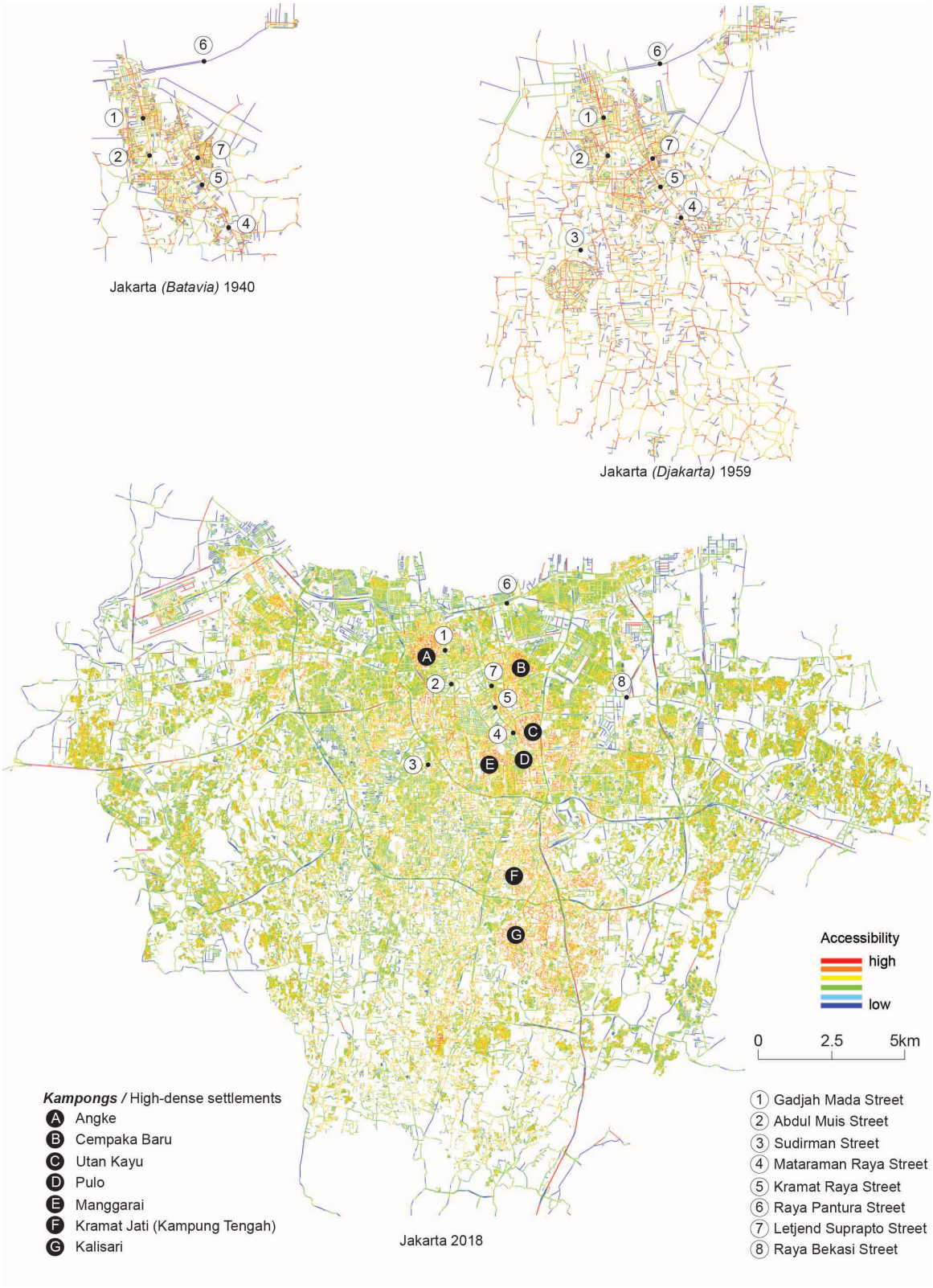

Figure 2. Normalized Angular Choice (NACH) analysis of Jakarta (1940, 1959, 2018) at low metric radius

To overcome the spatial limitation of this island behaviour in terms of mobility, *kampong* inhabitants are likely to cope by purchasing a motorcycle through cheap credit. Besides being cheaper, a motorcycle is quite flexible to navigate through the narrow alleys which are typical of *kampongs*. As a result, the use of motorcycle is more common in *kampong*, even to only cover distances as small as 100 metres (Figure 3). This creates a cycle whereby the use of motorcycles becomes a habit and society becomes more dependent on private vehicles. This dependency is implied in our interviews

conducted in December 2018 with the "heads of neighbourhoods" in two *kampongs* (*Kampong Angke* and *Kampong Menteng,* near *Manggarai*). Both "heads of neighbourhoods" revealed that it has become more common for one household to have more than one motorcycle; although, conflicts have arisen due to reckless motorcycle use in *kampong* (e.g. accidents involving children who were playing in the alley). *Kampong* inhabitants still opt for this transport mode because it can travel faster and cover more distance, thus allows them to access wider socio-economic opportunities that were previously inaccessible or difficult to access due to the island behaviour of the *kampong* and lack of pedestrian and public transport facilities.

Figure 3. The common use of motorcycle in *kampong Angke, Tambora*, in Jakarta

However, the impacts of vehicular oriented street networks do not only foster the vehicular use but also affects neighbourhood safety and social interaction. There are several cases of children being run over by motorcycle while playing in the alleyway in such *kampongs*. Excessive use of alleyways as motorcycle shortcuts have resulted in conflicts between *kampong* inhabitants and outsiders to the extent of blocking certain alleyways to non-residents. Further, the relation of vehicular oriented configuration and automobile dependent society also impacts accessibility to key urban functions, such as schools and health care services. Most of Jakarta's best-performing schools are located close to streets that are highly accessible by motorised vehicle and those who walk have to resorted to mediocre schools, which later decrease their chances for better education performance and job offers (The Jakarta Post, 2018). Transporting patients to health care facilities is highly dependent on private vehicles, which makes it difficult for the urban poor. Statistical records in 2017 stated that there were around 37,000 Jakarta inhabitants who were unable to access health care services due to either a lack of transport means or were unable to afford transport cost (BPS 2017). For the potentially marginalised groups such as those in wheel chairs, the blind, or children under the eligible age for obtaining a driving license, have to travel in an unsafe environment to reach key urban functions. During an interview in *kampong* Banjarsari, a wheelchair user mentioned how he feels unsafe as:

> "*...(I) feel unsafe especially at night when the alleyways get crowded (with people riding motorcycles), (I) have to be dependent to someone else to move around*."

4. CONCLUSIONS

In this paper we demonstrated how policies that neglect walking (e.g. road expansion, easy credit scheme for car and motorcycle ownership, fuel subsidy) are related to a socio-spatial structure that incentivises vehicular movement and penalises pedestrians. Penalising pedestrians implies creating an unsafe environment whereby other street users and activities become inferior as they compete with fast vehicular movement. In the context of *kampongs,* where streets and alleyways also serve as social spaces, the vehicular-oriented environment will also result in less social interaction.

Jakarta's urban narrative and the development of its street network over time has illustrated this path dependent impact. The NACH analyses revealed that the foreground network expands and becomes more dominant over time. This expansion connects major key functions channelled by vehicular movement. In contrast, the background networks becomes less dense and only appears in high dense

settlements (*kampongs*), forming patterns of island behaviour. As a result, *kampong* inhabitants can be more excluded from city-wide movements, unless they have access to private vehicle. To overcome this accessibility limitation caused by spatial configuration, *kampong* inhabitants follow a coping strategy by depending on private vehicle, particularly motorcycles, as they offer a flexible navigation in narrow alleys and thus allow them to access city wide key urban functions. This leads to the vicious cycle of private vehicle dependency, which is already indicated even in the urban poor settlements by multiple motorcycle ownership in one household. This coping strategy, however, is an inapt solution due to the safety issues it entails. While the dominant use of motorcycles has increased accessibility and mobility for its user, it has increased the safety risk for potentially marginalised groups (e.g. children, elderly, those in wheel chair, or the blind) who use the same streets. This is in addition to Jakarta street profile that does not support organised movement flow (e.g. non-continuous sidewalk, separate lanes for different modes) and irresponsible driving behaviour (e.g. enforcing the right of way to slower or 'less powerful' modes).

These findings suggest that spatial structure can impose private vehicle dependency and thus, vehicular movement dominance. Changing the existing urban fabric is a long-term process that also requires institutional change. Having a better understanding of how the socio-spatial structure and the urban transport policies are path dependent, with an understanding of mobility inequality, can help in planning and implementing a pedestrian friendly environment. A city-wide pedestrian friendly environment would lead to a more equal access to transport services and key urban functions, as it warrants safety, improves mobility and accessibility for marginalised groups. Thus, such an environment addresses mobility inequality as mandated by sustainable urban mobility and United Nation sustainable development goals (SDGs). Further, we identify two institutional changes to shift the path dependent trajectory of vehicular dominance: (1) changing the conventional transport planning paradigm whereby road expansion is a "business as usual" solution, for instance, by starting to improve pedestrian networks in *kampongs* and connecting *kampongs* to the city-wide network, and (2) changing the habit of high dependence on private vehicles, for instance, by providing a convenient walking environment, improving public transport options, and discouraging the use of private vehicles (e.g. through high parking cost, odd-even license plate policy).

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