International Growth Centre

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Data-Jam: Could data reduce road congestion in Dhaka?

Agglomeration effects and productivity gains are among the most desired of urbanisation outcomes. The less desirable outcomes, lagging infrastructure, elevated crime rates, and greater congestion require more evidence to understand what does and does not work to be effectively addressed. This blog examines the challenges of congestion and traffic in Dhaka, and it explores the potential for data to uncover evidenced-based policy designs that can effectively mitigate the downsides of congestion.

Congestion and urban mobility

Developing countries are urbanising at impressive rates with trends set to continue. Urbanisation is an instrumental stepping stone for countries moving from poverty to prosperity. In fact, the relationship between urbanisation and income is stronger today than it was in 1960. As Figure 1 illustrates, on average, higher levels of urbanisation in 1960 are associated with faster growth rates. This might reflect the impact that higher density has on productivity and employment.

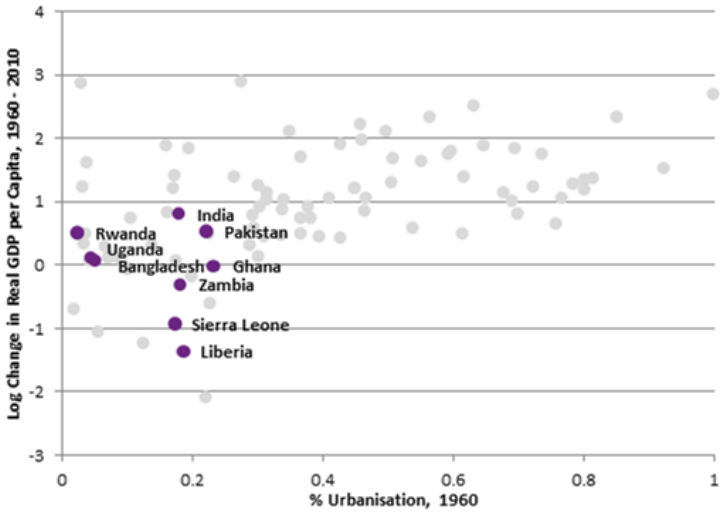


Figure 1: Urbanisation and the log change in real GDP per capita

Despite the potential to drive growth, one cannot ignore the

considerable downsides that come with increased density, including congestion, public health and environmental challenges, and insufficient affordable housing stocks. In the recent decades, Dhaka has faced challenged all of these challenges.

Tackling these downsides require effective urban governance with a better understanding of the scope and magnitude of the gaps and limitations of existing infrastructure and public service delivery.

Economic density of Bangladesh's urban areas (GDP or value-added per square km) is low in comparison to global averages. One of the reasons for the economic under-performance is the urban congestion which constrains local productivity.

According to the Bangladesh Road and Transport Authority (BRTA), every year around 37,000 cars are added to Dhaka's roads, of which 80% are private cars. The number of private cars is likely to grow further given that currently only 10% of Dhaka's commuters own one. The road network in Dhaka is nearly 3,000 km with 200 km primary, 110 km secondary, 50 km feeder, 2640 km narrow roads and few alternative connector roads. The proportion of road surface to built-up area is approximately 7%, much lower than the 25% recommended for a good city planning. Policies are limited and enforcement is even weaker. There are more than 100 open street markets 3,000 shopping malls all built alongside roads without adequate parking provisions.

Richer data produces more in depth analysis that can better pinpoint of congestion

Congestion is not an exclusively developing country problem – London and New York have traffic jams just as severe as those in Delhi and Lagos. Without proper planning, congestion worsens as incomes rise, as increasing proportions of the population begin affording vehicles.

At minimum, an effective public sector should invest in and maintain a basic systems of public transportation infrastructure and implicitly (or explicitly) establish usage rules and pricing. This requires balancing accessibility and sustainability of transportation.

> “Better data would equip planners to understand the composition of traffic flows, seasonal and other drivers of congestion, all of which should shape policy priorities for road investment and expenditures.”

The richness of the data that can be collected allows for analysis and sheds light on the causes of congestion in Dhaka, potentially could spearhead an open evidence-based discussion on the potential solutions. Daily data can be merged with socio-economic and event data to pattern travel mode choices and evidence the potential causes of traffic jams. This evidence can be used to tailor policy interventions and assess implementation feasibility.

Data and policy – a promising partnership

The following tables and graphs, created for a collaborative project between the IGC and BRTA and serve as an example of the kinds of congestion data that can be collected and analysed as evidence of the gaps within existing transport infrastructure. The map in Figure 2 identifies the location of the RFDI towers – traffic data collector sensors that count the number of vehicles – and illustrates traffic volumes observed 1 January, 2014. The most trafficked areas are New Airport Road, Mohakhali, Farmgate, the main arteries of the city.

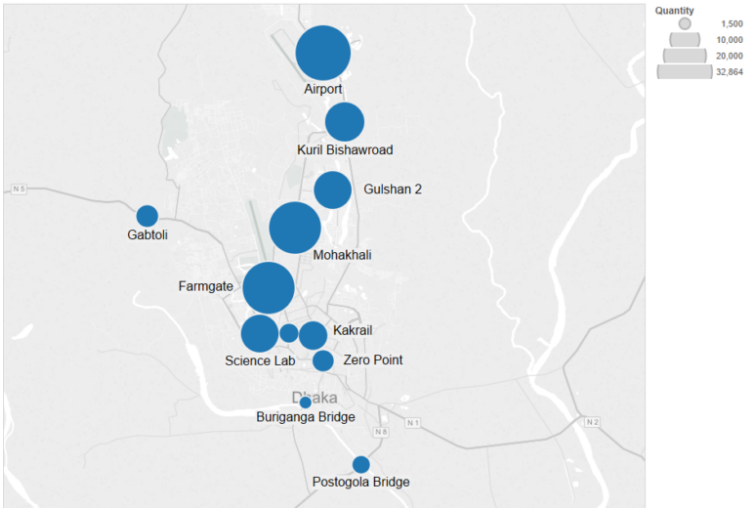


Figure 2: Traffic Densities around Dhaka, 1 January 2014

Note: The diameter of the circles correspond to traffic volumes

Hourly traffic volume data in Figure 3 (below) provides a more granular analysis of traffic flows on the same day. The volume peaks during the two main commuting times, 9 am and 6 pm.

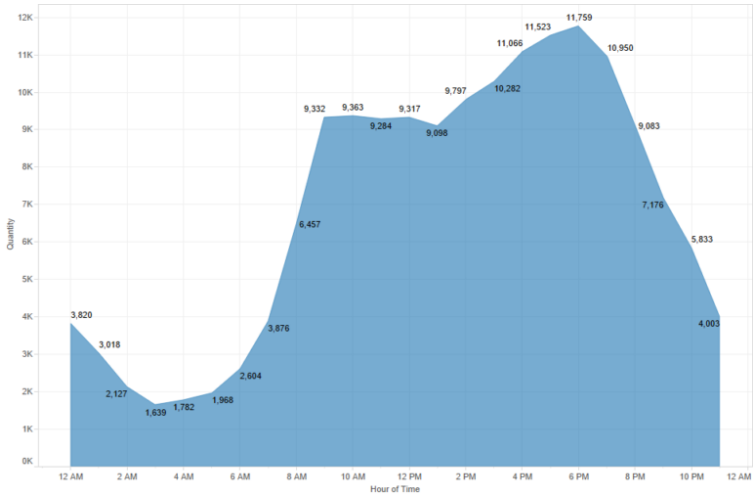


Figure 3: Hourly traffic volumes in Dhaka, 1 January 2014

Traffic congestion, contributions by vehicle type

The traffic flow data can also be decomposed by vehicle type, as in Figure 4, to better define preferred modes of travel of Dhaka commuters. Taking into consideration CNGs (three-wheeler commonly used as taxis), their traffic volume is at its minimum around 2 am, and increases steeply around 5 am and 6 am reaching the morning peak by 9 am, decreases at 1 – 2 pm

during lunch time, and increases again to reach its daily peak at 6 pm.

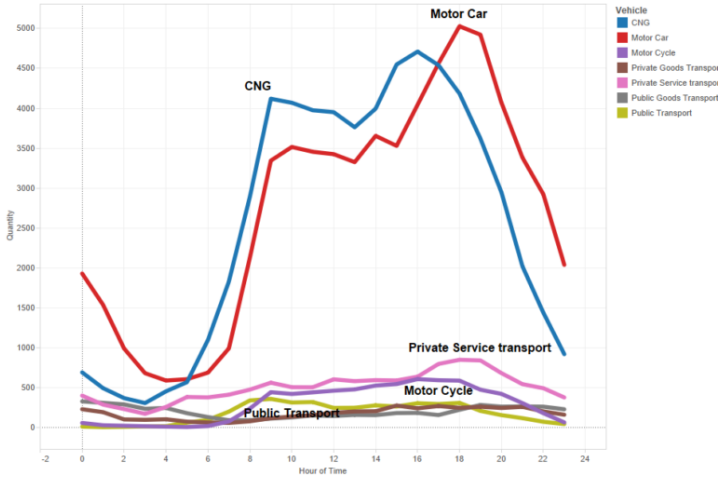


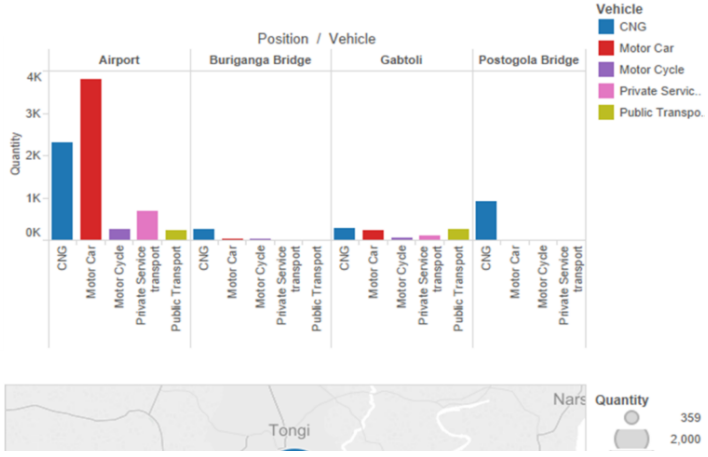
Figure 4: Traffic flows by vehicle type

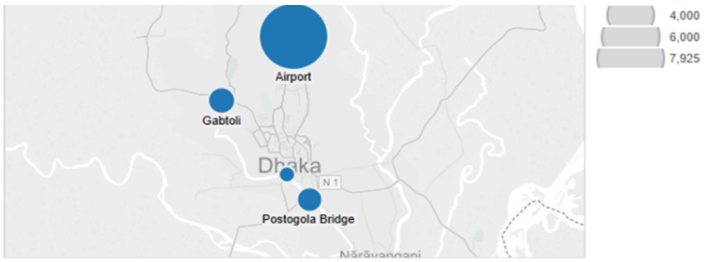
Data can be used to infer commuters' characteristics

Congestion data can also provide insights on commuters' characteristics, including transport and travel mode preferences. Figure 5 captures commuter preferences from the four main entry and exit arteries around Dhaka (New Airport Road, Buriganga Bridge, Gabtoli Bridge, Postogola Bridge).

Data was collected during the main commuting hours (8 and 9 in the morning and 5 and 6 in the evening). The graphs only include vehicles used for public and private commuting.

As illustrated by the map, Airport Road is the most heavily trafficked road during peak commuting hours, followed by Gabtoli Bridge, Postogola, and Buriganga Bridge. Vehicle data from the table can be used to infer differences in socio-economic characteristics of commuters. Airport road commuters are on average wealthier, average commuters use cars and private transports services. The preferences in modes of transport of Gabtoli commuters appear to be more disparate relative to Postogola and Buriganga Bridge commuters. Airport Road and Gabtoli commuters also have a greater supply of public transport services than Buriganga and Postogola Bridge, where supply is minimal. Gabtoli commuters are wealthier than Postogola and Buriganga Bridge commuters, as highlighted by the relatively higher proportion of private transport vehicles, including motorcycles and cars.





More systematic data gathering could lead to better policy designs

Very little of the existing research on transportation choices in Dhaka use such comprehensive empirical data. Gathering this data more systematically can support better congestion policies if it can be more systematically gathered. There are however, limitations some of which could be addressed with basic statistical tools, but others might require more effort with data sharing and collection processes.

> “One of the reasons for the economic under-performance is the urban congestion which constrains local productivity.”

Better data would equip planners to understand the composition of traffic flows, seasonal and other drivers of congestion, all of which should shape policy priorities for road investment and expenditures. Improving coverage and collection of congestion data will be particularly important in improving predictive models.

RFID stations currently only capture data from vehicles with digital plates (only ~35% of vehicles in Dhaka have digital plates). As might be expected, some types of vehicles are more likely to carry digital plates which will bias collected data. More information is needed on the proportion of vehicles out of the total population that have digital plates. Weighted data better captures the composition of vehicles in the total population.

Capturing data at a regular frequency can identify weekly, monthly and seasonal determinants of traffic congestion. Weekly data collected for each month will provide more granular variations in congestion.

Intensity of congestion affects the efficacy of measurements

Higher congestion may lead to under-counting – traffic jams increase immobility, reducing the number of times a vehicle pass through RFID sensors. Data on average hourly travelling speeds (measured as the time a vehicles travels between two proximate RFID stations can better depict the actual severity of congestion. Comparing this data to non-congested times or against other factors such as large public events and weather conditions can potentially answer to questions on how big of an impact other factors can have on congestion levels.

Conclusion

Cities are today the main engines of economic growth. However, failure to address the downsides of urbanisation may deter the ability of cities to achieve their full growth potential.

> “ Improving coverage and collection of congestion data will be particularly important in improving predictive models. ”

Congestion is a significant detractor of Dhaka’s productivity. There is a lot that the research community can do, but we need data to help us to be clear- sighted about the problems if we are to help effectively.