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Comparing methods of transport in an age of social distancing

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Abstract

This article explores the new urban mobility paradigm in an after COVID-19 world. The pandemic has dramatically changed the conditions under which users access and use public transportation. Analysing mobility in cities across the world – New York, Mexico City – the study highlights the dense demand for public transportation solutions in those two different megalopolises. The experience of COVID-19 pandemics has shed the light on the necessity of rethinking the current offer and creating a new set of adaptive solutions which replace sanitary safety as a central element of assessment. To what extent are COVID-19 and the possibility of other spreading of viruses affecting how common modes of transportation are thought about and used? The article revises first the modes of transportations. Emphasizing the unique challenge of social distancing imposed by the pandemic, the study covers its consequences for users, cities authorities as well as operators. While it appears as a condition to contain the spread of the virus, it is also part of an economic equation for operators, who might struggle soon to cover growing operational costs, while running their networks with a smaller number of travellers. Finally, the study opens the discussion on the opportunity offered by the pandemic to redesign and rethink our mobility more adaptively and sustainably.

Keywords: Design, Social Design, Social Change, Sustainability, Innovation, Technology, Social Enterprises, Social Awareness, Social Responsibility

Introduction

The tragic spread of COVID-19 nationally has resulted in disparate impacts across cities and sectors. INRIX analytics allows for the analysis of movement in each of the country's cities, and movement within cities, to provide an accurate representation of the dramatic changes observed. Several overlying trends have emerged: First, consumer trips are down massively while freight trips have decreased to a much lower degree. Second, trip reductions in metros closely track official guidance regarding work from home, social distancing, and shelter in place restrictions. As this crisis progresses, it is likely more cities will come to resemble those most impacted.

INRIX Trip Analytics provides a powerful means to measure and describe just how these changes are manifesting across the country and world which we're providing access to in the free dashboard below. To better capture the re-emergence of cities and businesses, INRIX has also developed metrics and visuals to measure activity, regardless of the mode using INRIX Visit Analytics metadata. We call this, "Activity Re-Emergence Trends".

To what extent are COVID-19 and the possibility of other spreading of viruses affecting how common

modes of transportation are thought about and used? When common methods such as subway, private automobile, bicycle, and bus are not able to function at their peak capacity, leaving them unable to focus on density and efficiency, are they capable of adapting? What circumstances are lost and what new opportunities are created? In asking these questions we will look to current narratives of transportation strategies and struggles.

“A modal shift occurs when one mode has a comparative advantage in a similar market over another. Comparative advantages can take various forms, such as costs, capacity, time, flexibility or reliability.” (Ronrigue, 2020)

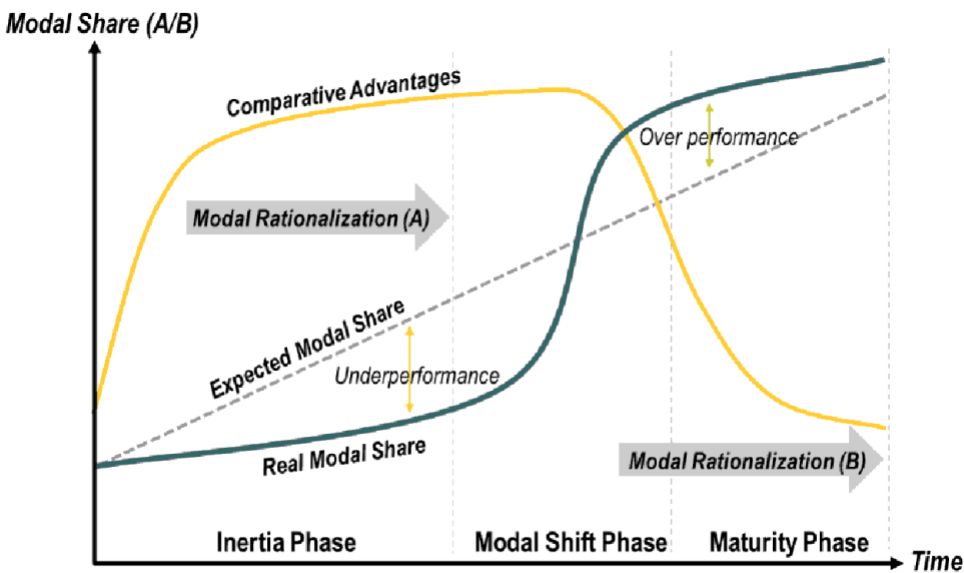


Image 1: Principles of Modal Shift | The Geography of Transport Systems.

Precedents

New York, United States

The daily work commute in New York City offers a wide range of modes of transportation. Although most New Yorkers work within the same Borough that they live, from the subway to the ferries, there are many options to their daily destination.

New York City’s mean travel time to work is 33.3 minutes (U.S. Census Bureau, 2018). Of all people who commute to work in New York City, 39% use the subway, 23% drive alone, 11% take the bus, 9% walk to work, 7% travel by commuter rail, 4% carpool, 1.6% use a taxi, 1.1% ride their bicycle to work, and 0.4% travel by ferry (U.S. Census Bureau, 2017). 54% of households in New York City do not own a car and rely on public transportation (U.S. Census Bureau, 2009). With roughly 50% of the population using public transportation and 50% taking private transportation, New Yorkers have heavily relied on transportation that uses density as its main form of efficiency.

The pandemic has had a massive impact on M.T.A. ridership and is even seeking a \$4 Billion virus bailout. This is because ridership has fallen 60 percent on the subways, 49 percent on the buses and as much as 90 percent on commuter railways (Goldbaum, 2020). As the largest transportation system in the United States, New York’s early trends are telling of what is to come for other large metropolitan areas in the country.

Even before the pandemic, New York has seen an uptick in bicycle usage. Because of an increase of bicycle deaths in the past few years, safety measures have come into place including a plan called the “Green Wave”. The plan calls for “installing 30 miles of protected bike lanes every year, as well as 2,000 new bike parking spaces on an annual basis” (NYCDOT, 2019). Recently, there have been new talks of building the first bridge from Queens to Manhattan in decades, with access to only pedestrians and cyclists (Hu, 2020). The Queens Ribbon, designed by former city traffic commissioner Samuel I Schwartz would be much narrower than the adjacent Queensboro Bridge.

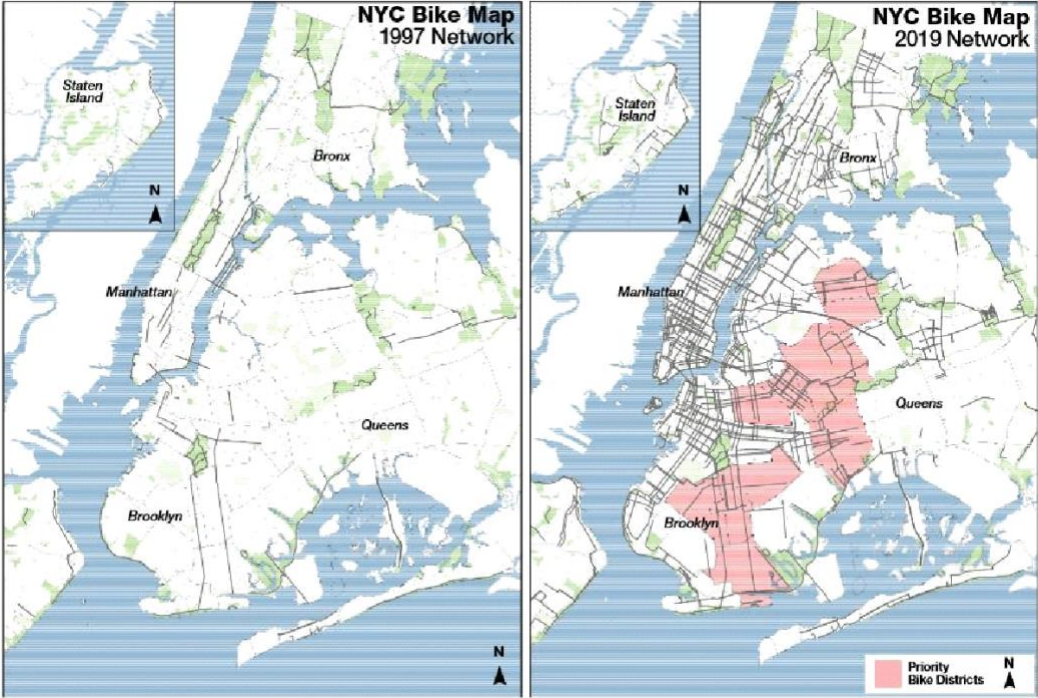


Image 2: NYC Bike Map 1997/ 2019 | Green Wave: A Plan for Cycling in NYC.

The trend of bicycle usage will likely continue to trend upward, with some bicycle shops in Brooklyn selling up to twice the normal amount. By the end of April, many distributors all over the United States have sold out completely.

There is a question as to whether the transportation trends of pre-COVID-19 will return to what it once was. With many people still working from home, according to a study by Global Workplace Analytics,

estimates are that “25-30% of the workforce will be working from home multiple days a week by the end of 2021.” So maybe social distancing on trains will not be so much of a health concern, but an economic one.

Mexico City, Mexico

Basic Statistics of Federal Motor Transport go up to 2018. However, INEGI records 444,350,000 passengers in the subway monthly, and almost 213,000,000 monthly passengers for the MetroBus (RBT). These numbers may illustrate most passengers in the city, but the reality is not such. Today, in Mexican cities, transportation is dominated by automobile use, and it outweighs the economic and social benefits of living in a city. This is predominantly because car users only cover their private costs related to the use of their cars, but not the social costs of increased congestion and poor air quality generated because of it. Local pollution generated by gasoline combustion is estimated to be linked to the almost 14 thousand deaths in 2008 due to poor air quality, according to the World Health Organization (WHO, 2012). 24,000 deaths a year and 40,000 wounded are caused by road accidents and cost 126 billion Pesos a year, or, approximately 1.3% of GDP (Ministry of Health, 2008; Cervantes, 2009).

Recent estimates point to an alarming trend in increased car use in the last two decades, as the kilometres travelled by vehicles in the country (VKT – Vehicle-Kilometre Travelled) have practically tripled, moving from 106 million VKT in 1990, to 339 million VKT in 2010 (Medina, 2012). This growth, given the conditions of public transportation and urban development, means that urban mobility becomes so inefficient that not only does it not contribute to the country’s economic development, but it affects the quality of life of its inhabitants, due to the serious costs it generates and that are not covered by those generating them. The increase in automobile use has also upset Mexico’s trade economics. 30 percent of Mexico’s income comes from the production and export of oil (OECD, 2010). With the increase in automobile use and increased need for gasoline, Mexico has begun importing gasoline and it has become the principal import in the country (147 billion pesos in 2010). National gasoline price stabilisation mandates international price comparison, resulting in a 76.6 billion pesos subsidy in 2010 and estimated to be 169.5 billion in 2011. This is more than the amounts spent on national poverty alleviation programmes combined. This policy is regressive, as 70% of this subsidy supports the wealthiest third of the population (Scott, 2010; 2011). This not only contributes to the external fragility of the economy but puts pressure on public finances and creates social inequality. (ITDP Mexico, 2012). More remains to be said after the development of Uber in Mexico City. Because of the health contingency, the new Secretary of Mobility, Andrés Lajous, enhanced the definition of emerging bike lanes, installed in the country's capital running parallel to the central routes of transportation.

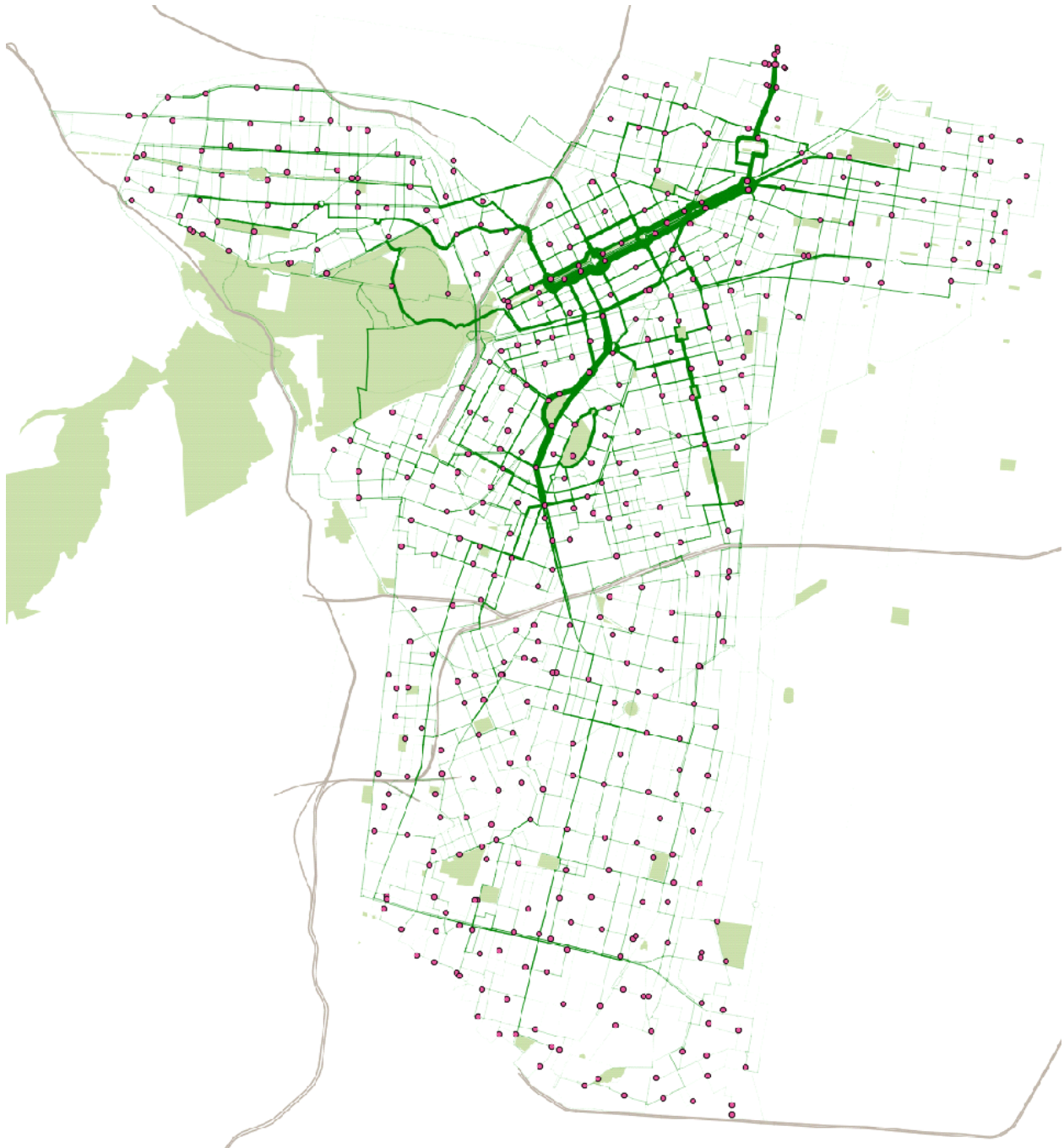


Image 3: Ecobici is a shared bicycle system in Mexico City, complementing the city's public transportation network. Implemented in 2013, with 276 stations with 4,000 bicycles with an average of 25,000 users per day and 95,780 registered members.

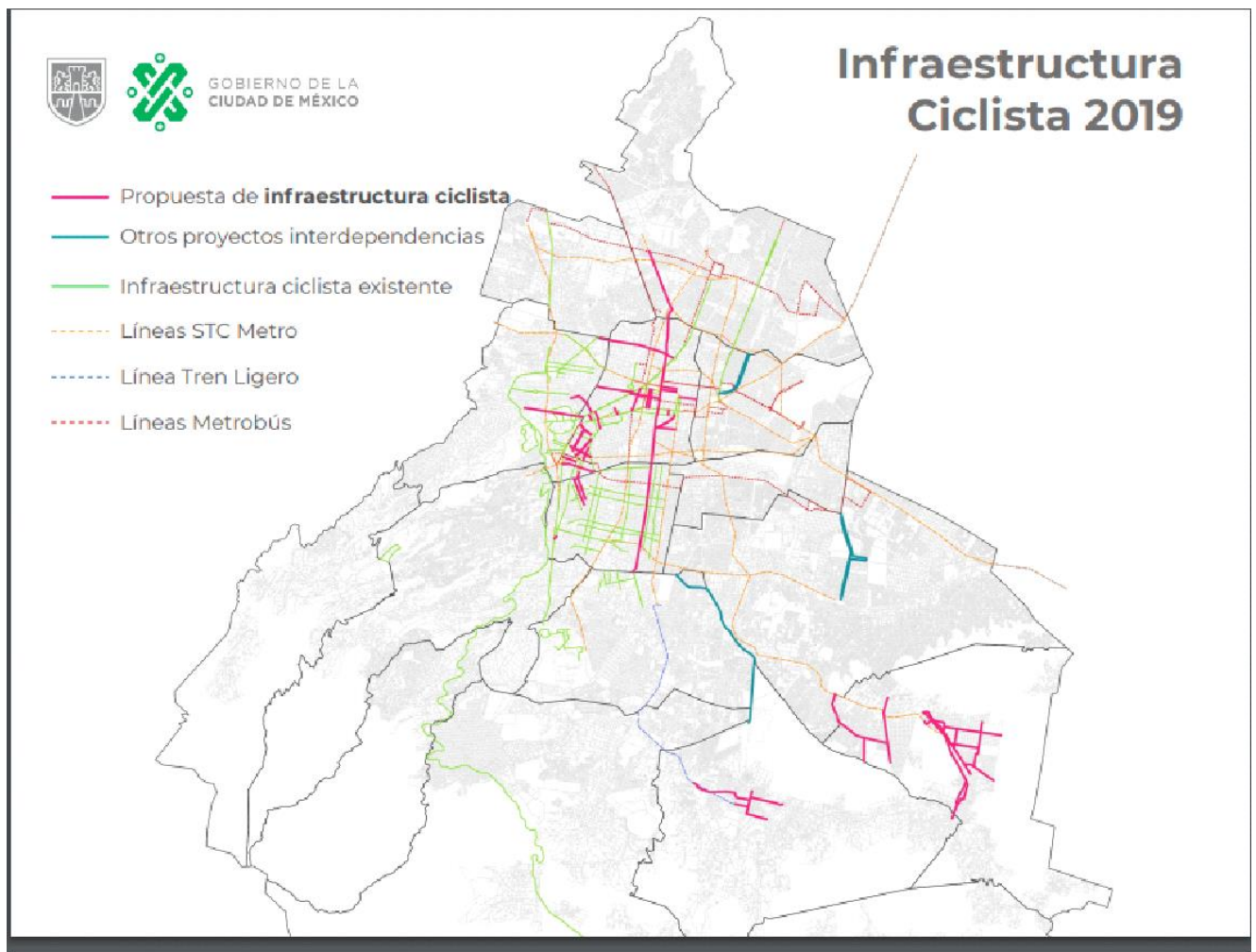


Image 4: Green lines represent existing cycling infrastructure; dashed red the rapid bus transit system; dashed orange the subway system. [Pink: cycling infrastructure proposal; blue: other interdependent projects; green: existing cycling infrastructure; dotted yellow: subway lines; dotted blue: light train; dotted red: BRT system]

Cities such as Copenhagen, Denmark have an outstanding bicycle infrastructure. Around 45 percent of the inhabitants commute to work, school or university by bike, covering around 1.4 million kilometres every day. According to a study, even more people in the Greater Copenhagen area bike to work every day than in the entire USA (Herrmann, 2020). Its target is that 75% of all movement will be on foot, by bike or by public transport (Kobenhavns Kommune). Copenhagen has been ranked as one of the most liveable cities in the world (Mercer, Forbes, Copenhagen Capacity); it might not be an assumption that much of this has to do with connectivity, accessibility and transportation within short distances, as well as walking and cycling as main transportation modes.

ANALYSING MODES OF TRANSPORTATION

Urban mobility is in most cities worldwide the result of a complex system. It is (i) shaped by policies and

regulations, (ii) highly dependent on the availability of land and its integration into a wider city design strategy, and finally (iii) fully relying on consumer preferences and behaviours. In a study published in 2018, Mckinsey was analysing transportation in 24 cities around the world. Aiming at apprehending the relationship and causality link between urban transportation and quality of life for the users, Mckinsey's experts identified five factors which they believed model the user's experience. These factors were: availability, affordability, efficiency, convenience and sustainability. While this study was still relevant two years ago, COVID-19 outbreak has completely changed the paradigm and has brought back travellers' safety as the core element of the mobility scheme.

Half across 2020, cities are showing a decrease in mobility due to the pandemic. For example, landing in mid-April, a report written by an MIT economics professor concluded that New York's subway system was "a major disseminator—if not the principal transmission vehicle" in the city's COVID-19 outbreak. Urban populations have opted for avoiding mass transportation systems when needed to mobilize. As a result, one can already anticipate the long-standing fears of sharing urban spaces and more especially public transportation, that might outlive durably the virus.



Image 5: Santiago Arau, Pantitlán subway station in mid-April at 6pm, 2020.

In reflecting what currently exists in these cities, the modes of transportation can be analysed not only in terms of what is traditionally measured but now also in terms of sanitary safety. This includes social distancing, and sanitary conditions, recurrent disinfection, use of masks for travellers, etc. An unprecedented concern, as transportation densely mobilised millions of people daily before the pandemic. How can safety be guaranteed by government and mobility strategies, if crowds cannot be avoided? How can this affect satisfaction with modes of transport? Satisfaction can be defined as "the

comparison between a traveller’s experience and his or her expectations, and the affective response related to this. (Soest, 2019).

As people are increasingly returning to work and their pre-COVID lifestyle, governments and city authorities are facing the challenge of reassuring the users of the safety of public transport. In a recent survey run by Oliver Wyman, 52% of respondents shared their discomfort in using public transportation. As the lockdown was eased in Paris, authorities willing to avoid crowded situations had established a set of rules to enable the users to travel safely. The chosen solution was a required permission form justifying the reason for the journey. A few acceptable reasons were listed, amongst which medical appointments, urgent family reasons, or the necessity to work from the office. However, as highlighted in the Oliver Wyman study, on the long haul, public transport operators need the flow of passengers to return to a minimal level for them to be able to maintain their networks.

COVID-19 CONTINUES TO MAKE CONSUMERS WARY OF SOME ACTIVITIES

After the COVID-19 outbreak ends and travel restrictions are lifted, how comfortable will you feel doing each of these activities?¹
Percent of respondents, (n=4,594)

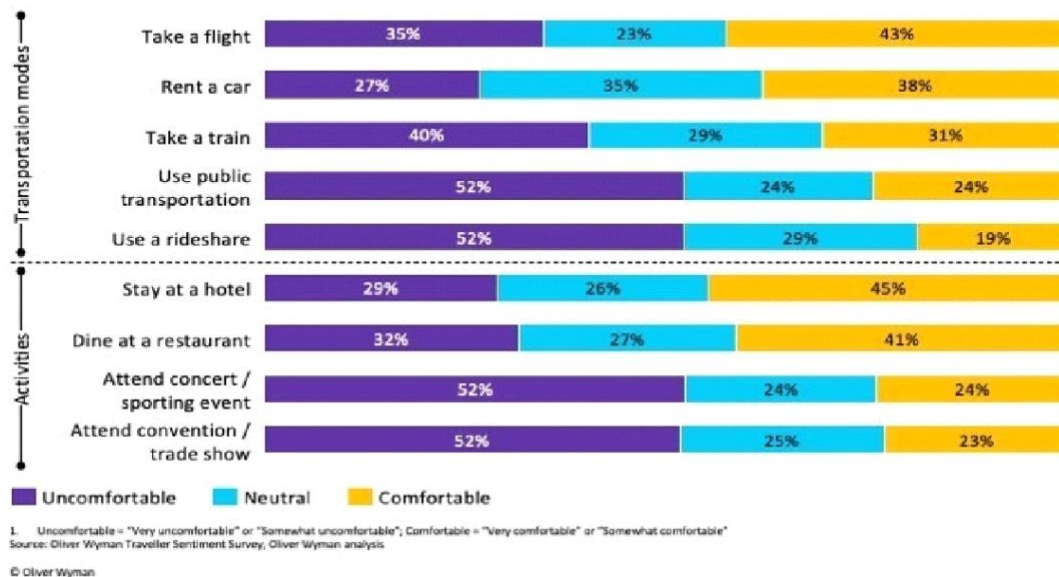


Image 6: Oliver Wyman, Traveller Sentiment Survey, Comfort after COVID-19. [At the bottom: 1. Uncomfortable: “very uncomfortable” or “somewhat uncomfortable”; “Comfortable: “very comfortable” or “somewhat comfortable”. Source: Oliver Wyman Traveller Sentiment Survey, Oliver Wyman analysis.]

In an article released in April 2020, The New York Times was sharing the conclusions of the Harvard University T.H. Chan School of Public Health: a link can be established between COVID-19 deaths and air pollution. Ironically, COVID-19 could result in increased use of private means of transportation, amongst which cars. This glooming perspective would consequently generate more traffic congestions in urban areas, energy consumption and most of all pollution and eventually deteriorate the air quality.

In fact, in terms of energy consumption, modes of transportation can be discussed in both direct and indirect factors. Direct factors range from fuel, charging, etc, while indirect factors include such things as maintenance of both the vehicle itself and of infrastructure (Pérez-Martínez & Sorba, 2010).” The average energy consumption rates from passenger transport by car are about three times higher than from transport by bus. Aircraft are 23 times less efficient than high-speed trains and 16 times less than bus transport. In other studies, cars have been found to consume 2.4 more energy per passenger-kilometer than buses, and aircraft consume 27 times more than rail transport. (Pérez-Martínez & Sorba, 2010).

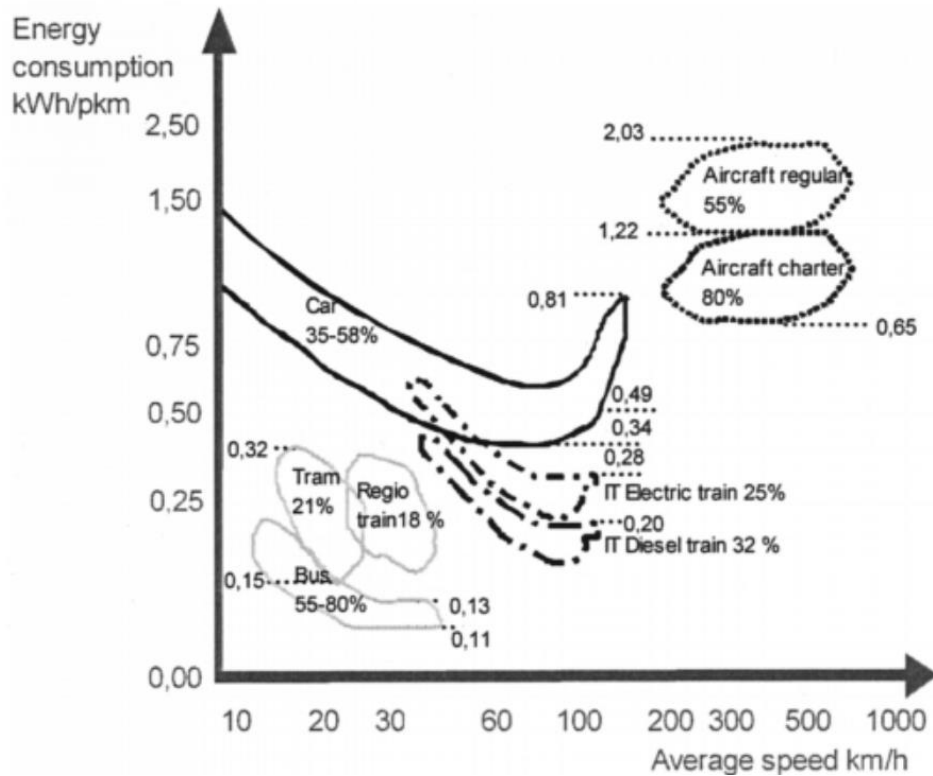


Image 7: Energy consumption of passenger transport modes, average speed and occupation rate: Aircraft: scheduled airlines and charter, intercity train (IT): eclectic and diesel tractions: regional train (electric traction), tram, bus and car (ITF, 1990, Pérez-Martínez, P., & Sorba, I. (2010).

While many of these modes are developing new technologies, the shift in usage and therefore energy consumption also means a development in how cities look at efficiency. With health concerns being placed at the forefront, other factors must be utilized to curb the drops in public transportation.

Table 1: Energy consumption factors and rates for different modes of passenger transport

Transport mode	Seats	Average speed (km h ⁻¹)	Occupancy (%)	Energy consumption		
				(kWh vkm ⁻¹)	(kWh pkm ⁻¹)	(kWh skm ⁻¹)
Regional train ^a (RT)	724	59	37	35.21	0.13	0.05
Intercity train ^a (IT)	190	71	36	6.28	0.09	0.03
Intercity express train ^a (IET)	189	89	70	10.81	0.08	0.06
High-speed train ^a (HST)	350	160	66	17.00	0.07	0.05
Middle-class car ^b (high-low occupation)	5	100	58-35	0.96-0.86	0.33-0.49	0.19-0.17
Standard bus ^b (high-low occupation)	50	45	80-55	4.59-3.61	0.11-0.13	0.09-0.07
Aircraft ^b (high-low occupation)	266	700	80-55	262.17-299.04	1.22-2.03	0.99-1.12
Train ^b (medium-long distance)	190	100	36-31	15.70-16.82	0.23-0.28	0.08-0.09

Source: ^a García (2005a), ^b ITF (1990). Note: RT, IT, IET, HST, mean values are for Spain. Mean values for medium-long distance trains are for Europe.

Image 8: Energy consumption factors and rates for different modes of passenger transport (Pérez-Martínez, P., & Sorba, I. (2010).

Positively, COVID-19 could represent an opportunity for authorities and citizens to redesign mobility within cities, and reshape it towards a healthier mode. An example of this would be the growing trend of cycling, already started a few years ago, who has known unprecedented acceleration these last weeks. To accompany the growing interest in this way of transportation, local governments across France have been urged to create new bike lanes. Therefore, Paris under the leadership of its Mayor Anne Hidalgo, has been provided with an additional 650km of lanes for cyclists during the pandemic.

CONNECTION CURRENT INFRASTRUCTURE AND SOCIAL DISTANCING TRENDS

As social distancing trends take hold over cities, and travel, private automobile utilization has become a greater factor than normal. In the United States, as the typical vacation season approaches, the national VMT is approaching new lows.

According to a study by INRX, “Nationally, VMT (Vehicle miles travelled) fell to its lowest level for the seven days beginning April 6, 2020, where it fell 48% below the baseline, pre-COVID level of travel. These, along with other indicators, reveals that the summer travel season will not be as large as in years past. IHS Markit estimates that travel by car, though increasing mode share by 10% over last year, will still be more than three percent lower overall (Pishue, 2020).”

If private automobile travel is up 10% of mode share, what does this mean for other areas of transportation within the US? The correlation between metropolitan areas and their corresponding state are sometimes linked, however, cities such as Dallas and Houston are in the bottom 33% of VMT growth while the state of Texas placed in the middle tier (Pishue, 2020). This disconnect between city and state brings questions into borders and the separation of the urban and the rural.

Interventions of policy and urban design may be able to curb the trends to realign with the current built-in infrastructure, but questions remain on how to make that shift. “To design effective interventions to bring about a shift in modes of transport that better aligns with the carbon reduction and health agendas it is particularly useful to explore how transport systems are currently perceived (Soest, 2019).” An example of this stems from an academic study from the Pennsylvania State University studied four towns in France regarding making a shift from private automobile to bus and had significant findings towards behavioural change. The reason for the study is a hypothesis of the psychosocial theories of behavioural change.

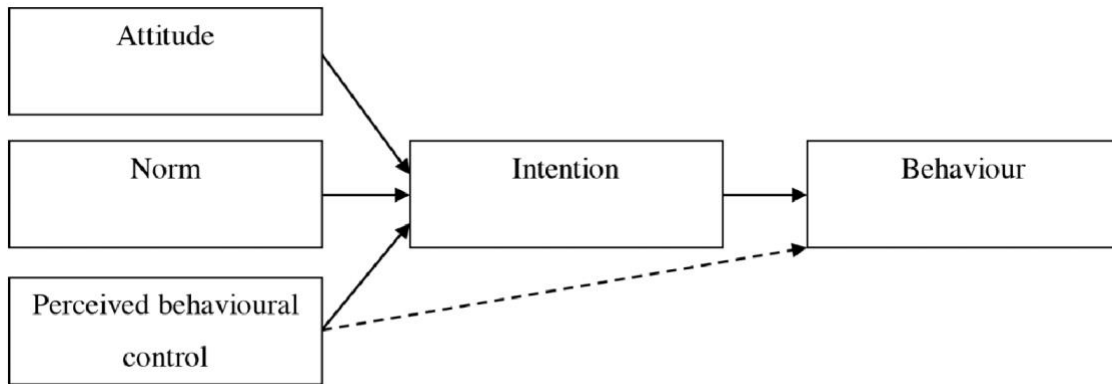


Image 9: Theory of Planned Behaviour (Yoshinori & David, 2019).

“To be effective, travel policies need to go along with techniques to break inertia. At the same time, changing mobility behaviours requires a competitive and effective bus network. Both are complementary. When taking the bus becomes objectively attractive compared to driving a car, such a program can lift barriers that would hinder a potential massive modal shift (Yoshinori & David, 2019).”

If looking to similar current users to modal patterns, the applicability of the shift to various modes of transportation can be implemented with a similar rationale to various cultures of travel and commuting.

DISCUSSION

The meaning of this shift is rooted in the idea that as people adapt to new working and lifestyle conditions, their mindset on transportation must also adapt to completely make the cultural change. What are the drivers in this shift? Some modes of transportation are proving to be more adaptable than others with plans of expanded access and applicability while some are only limited to changing singular factors such as distance and regularity. In July 2020, Chicago Department of Transportation added 66 new stations, and 3,500 additional bikes into the far South Side in direct response to the pandemic (Clafey & Hofer, 2020). Meanwhile, the speed at which we adapt differs from city to city, being driven by a multitude of both non-political and political factors.

“A generalist top-down approach to urban planning involves consultation with a wide range of senior stakeholders, such as those responsible for city governance, leaders of the different communities within the city and those for whom cities provide a focus of their professional activities (Rogers, Shipley, Blythe, Braithwaite & Brown, 2014).”

Can the immediate need of adaptability meet the needs and speed of a forced rapidly changing lifestyle? Comparing current precedents of cities and cultures and their willingness to adapt as both the outcome of public and governing bodies can potentially lead to a response that shifts the culture of transportation for the better.

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