Fast-forwarding Transport Infrastructure: Resilient and Adaptable Wins the Race

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1. Introduction

Many cities address the issue of rapid urbanization through providing for personal automobiles. It is often perceived that growth in automobile use is an indicator for economic development, though this perception has been proven wrong by the European cities. Emphasis needs to be given on how existing transport infrastructure can be adapted and integrated to accommodate a wide variety of modal choices. In the spirit of fast-forwarding the process and maximizing efficiency, existing transport technologies can be reconfigured to have synergies with one another and create a harmonized and integrated urban transport system. For example, integrating public transport with the other modes in terms of fare and physical structures would yield greater benefits than investing in a new system without integration. Existing plans and infrastructure can be adapted to meet higher standards and accommodate intermodality. Taking advantage of existing infrastructure also helps to maintain urban identity and character while integrating more sustainable aspects into the existing system.

Divisive highways can be reconsidered as public transport corridors when implementing a system such as a Bus Rapid Transit (BRT); similarly, large parking lots as parks and community spaces. Preserving pedestrian friendly public and social spaces, while creating new spaces to promote social inclusion, can be part of rapid planning and decision making processes. In order for plans and infrastructures produced in “fast forward” situations to have an inherent resilience and adaptability, an understanding of the relation between the built environment and transport is required. Neglecting urban design in order to hasten the implementation of infrastructure systems will ultimately harm a project. While working quickly is important, equally important is considering city projects at district or neighborhood scales. This paper explores lessons that can be learned from various rapid urbanization phases, cases, and planning systems, while explaining the benefits of working within existing systems so that they can respond to the evolving needs of later phases.

2. Adapting existing transport infrastructure to shape sustainable transport patterns

The significant role of transport in the formation and growth of cities is well established. Existing transport infrastructure can be adapted and integrated to accommodate a wide variety of transport modes. Without complex planning or acrobatic engineering skills, decisions can be taken by proper prioritization of the users. Often, adapting to more sustainable transport patterns does not require an entire infrastructural overhaul, and can be initiated quickly by a simple act such as substituting zoning regulations, for example. Planners can act effectively in dynamic situations by taking note of the existing infrastructure and using innovative techniques to adapt it, rather than trying to create a sustainable system from scratch. Planners must take into account a whole spectrum of modes of movement, focusing on the needs of people, rather than the needs of vehicles (Marshall, 2005). To provide for sustainable modes of transportation, planners must ensure an infrastructure that acknowledges the existence of these modes. Every mode of transport has its own role in urban mobility, from car to pedestrian, from public to private, from collective to individual. In many cities, multiple modes are used to traverse the area; therefore, the ease of transitioning between modes is crucial. Can a bike be loaded onto the bus? Is a bike share system linked

to the public transit? Do bus services connect to the light rail system in a way that facilitates swift movement? Coordination of modes and services is mutually beneficial. Mobility issues must be viewed with a holistic perspective that combines a range of modes as well as their economic, technological, political, and behavioral components. This approach can lead to faster and innovative solutions, and can help cities manage existing capacity more effectively. Synergies among different modes of transportation allow seamless travel and encourage the use of non-motorized options, especially for shorter trips. The current section will specify the most important road user groups and mention areas for improvement.

2.1 Pedestrian

Every road user in a city is a pedestrian at once stage or the other in a trip. Catering for pedestrians should be the first priority for any transport infrastructure project. Potential pedestrian infrastructure is abundant. Stopping through traffic, reducing the number of car parking spaces, setting aside more space for pedestrian activities, are often quick, low-cost strategies for making an area more walkable.

Car free streets and pedestrian priority streets and squares, especially in the city center, make walking feel safer and more enjoyable. Allowing freedom of movement for pedestrians, rather than barriers enforced by busy roads bridged by the occasional underpass or crosswalk, makes a space more lively which in turn attracts more pedestrian traffic. If cars are present on a street, speed restrictions are a good way to ensure that they do not inhibit pedestrian mobility. Speed is a key determinant of which modes may coexist along a street (Marshall, 2005). It can be unsafe and inefficient to have mixed speeds on the same road or street, without some degree of separation or segregation. Lower speed limits and general traffic calming effects will reinforce the perception of streets being city streets for people, rather than thoroughfares (Gehl, 2011).

The most common factors that deter more pedestrian activity are the quality and quantity of pedestrian infrastructure available. Often cities have more paved space for automobiles than for pedestrians. Providing unobstructed footpaths with coherent width will improve the walking conditions in various cities.

2.2 Bicycle

Like walking, cycling can help reduce pollution and traffic congestion. Bicycles have low energy consumption and bring health to their users. It can also provide quick, affordable access to parts of cities that are more difficult to reach by public transportation or large vehicles. In many cases, trips made by car are short enough in distance to be made by bicycle instead. Making cycling and walking easy makes a city people-friendly rather than car-friendly.

To be more accommodating to both cyclists and pedestrians, cities would be advised to complete the public space network by connecting pedestrian routes and making bike lanes continuous. Reformatting existing roads to accommodate bicycle lanes is a crucial first step to increasing bicycle ridership. In many cases, multi-lane roads can spare a lane to be separated for cyclists, or street parking can be minimized to accommodate a bike path. Bike lanes that are physically separated from car traffic are often safer, but the process of constructing them is not as quick. For rapid planning purposes, bike lanes can initially be indicated by street markers and painted lanes, and the physical barrier to cars swerving into the lane can be implemented afterward to improve quality.

Furthermore, beyond appropriate lanes and roads, proper bicycling parking facilities at various destinations is a quick way to encourage people to come by bicycle. Such techniques do not require overhauling existing transport infrastructure, but rather merely adapting it to be more accommodating of sustainable modes.

2.3 Public Transportation

Public transport becomes the core for developing a transport system in any city. In many developing cities, public transport is the basis for large groups of people to access their jobs and their errands. Providing affordable, dependable, and comfortable public transport will increase the likelihood of more people using the public transport system and thus increase the revenues as well. Public transport planning has a multifaceted effect. Since transport and land-use are closely linked aspects, proper public transportation will affect the land use around the area of implementation. In cases there will be a positive economic benefit around the corridor of implementation. The main emphasis while implementing public transport has to be on the service delivery and affordability, both to the user and the city government. Public transport networks are more favorable than a single corridor. While, equally important is integrating public transport with other modes such as walking and cycling. Ideally, the pedestrian and bicycle networks should be able to feed into the public transport system, thereby forming a synchronized intermodal network (Marshall, 2005).

3. Creating urban design to shape sustainable transport patterns

In the earlier section we have argued that the three most important aspects for a city to consider when planning for sustainable transportation are pedestrians, cyclists, and public transport users. We have also mentioned that transport and land use are closely linked. In this section we will try to argue that considering a proper urban design is equally important for providing a transport infrastructure that will be tested by time.

The structure and urban design of a city shape affect the transport patterns. Large, sprawled cities have longer routes than compact and high density cities. Providing for cycling and public transport in large cities is cumbersome and costly when compared to compact cities. In this way, a compact city fulfills two environmental objectives: reducing emissions and protecting open countryside (Breheny, 1997).

One of the most precious sources in a city is land. Both due to rapid urbanization and improper transport choices many cities are depleting this finite resource. Urban spaces are also the principal areas for recreation on a working day. Cities with more public areas have more physical activity, than car dependent cities.

Attractive walking routes and open and inviting building facades that are at a human scale height make an urban space feel more accessible for pedestrian and cyclists. Better signs and wayfinding for cyclists and pedestrians also make an area a more desirable place to pass through or access by these modes. Additionally, creating multifunctional spaces, improving the feeling of safety at night, and encouraging diversity of people and functions are all urban design measures that can be taken to promote sustainable transport patterns.

Schwanen, Dieleman, and Dijst (2001) reviewed previous literature and devised a study analyzing the ways that urban structure affects choice of travel mode and travel distances for different purposes. Referring to the different types of urban structure as “monocentric” or “policentric,” the authors concluded that the decentralization of urban land use leads to more private car use for all purposes and discourages use of public transportation as well as bicycling and walking. However, travel distances to work were not necessarily greater for residents of such policentric areas than for residents of monocentric areas, and in fact, commuters who cross municipal borders in monocentric regions travel farther on average than those who live in policentric regions. Even with its policentric quality, meaning that commuter travel patterns are tangential rather than radial and fewer people commute to the central downtown from suburban areas, many Los Angeles inhabitants commute great distances, several hours a day, to different parts of the metropolitan area.

The way cities are planned and developed has changed dramatically over the span of a half century (Gehl, 2011). Cities used to develop where there was need for development, shaped by the residents of the city in a direct city-building process (Gehl, 2011). Cities did not develop based on plans but rather evolved through a process that took many hundreds of years, because this slow process permitted continual adjustment and adaptation of the physical environment to the city functions. It is this process that gives many older cities distinctive urban design and shapes the cultural heritage that gives a city its unique character. The city was “not a goal in itself, but a tool formed by use” (Gehl, 2011, p.41). In present day, we have the benefit of reflecting on this manner of development, as well as the functional planning methods that later came to be. While it is relatively straightforward to recreate traditional planned urban layouts, it is significantly more challenging to consciously recreate patterns that were never consciously planned in the first place. However, combining these techniques, we can fast-forward urban design and the development of transport infrastructure.

Creating optimal urban design for sustainable mobility involves attentive planning of public spaces. Reducing the speed of movement and creating streets where people will assemble and activities will occur to create vibrant communities. Interaction between the physical environment and activities in outdoor public spaces is often a feature of cities with sustainable transport patterns. In addition, if a diverse range of activities to be done in public space, more people will use that space. This in turn will draw more people to the lively area, thus getting people out of their cars and on their feet and bicycles to have a more direct experience with their surroundings.

Cities get as much traffic as space will allow. Thus, dismantling large road systems reduce capacity and reduce the amount of traffic. For example, when an earthquake in San Francisco destroyed the freeway that passed along the waterfront, the city opted to turn the area into a “complete street,” with cycling and pedestrian paths as well as public transport running along the waterfront. This choice revitalized the area and established new neighborhoods and attractions. Transit ridership in the corridor increased and the area is often bustling with pedestrians and cyclists. This example makes a case not only for transit, cycling, and pedestrian infrastructure development, but also against the expansion of freeway capacity as a way to combat car traffic congestion.

Similarly, if proper infrastructure for bicycle lanes is developed, the better conditions for cyclists will lead to more cyclists on the streets. The same goes for pedestrians; if better city space is provided, use will increase. Supply creates demand. Good new transport infrastructure stimulates people into new habits and provides new ways to travel to and from destinations.

Urban design influences the structure of the transport system, and both influence behavior. This is simply illustrated by the contrast between dense cities with centers shaped by medieval designs and sprawling cities with wide boulevards and freeways. In the latter, it is difficult to walk or cycle to get around the freeway is a barrier and destinations are spread out. In the narrow, often pedestrianized streets of a medieval city center, walking is often the easiest way to get around, and a car can be an inconvenience.

4. City cases

In the current section we will try to justify our earlier mentioned arguments with practical example where cities have benefitted by catering for pedestrians, cyclists and public transport users in an integrated way. Some city cases with examples of where improvement is needed will also be described. The purpose is to illustrate the challenges and opportunities in existing infrastructures and analyze the effects in cities that have already begun to implement sustainable transport infrastructure.

4.1 Copenhagen, Denmark

Closing Strøget, the main downtown shopping street, to car traffic in 1962 resulted in a 35% increase in pedestrians in the first year alone. The decision was initially criticized, but it quickly proved to be a success, bringing more business to shops and more street life to the city. Adapting a road that was previously filling up with the city's increasing automobile traffic was a bold move for the city to take, but it did not require any building of new roads or widening of existing roads. It was merely a decision to change the purpose and usage patterns of a street that already existed, and in doing so, the way people moved about the city was changed.

The separated bicycle paths of Copenhagen are flooded with commuters daily and the city's prioritization of cycling—adding new lanes, widening cycle lanes, and constructing bicycle highways—has led to increased ridership. The city currently has a target to achieve 50% bicycle ridership by 2015 and also become a carbon neutral city by 2020. A major way for addressing this goal is through transport.

4.2 Jakriborg, Sweden

Rapid urbanization coupled with the urban sprawl that often accompanies it is often at the expense of valuable ecosystems and land space. The neighborhood town of Jakriborg was a response to the sprawling apartment complexes that spread across Sweden in the construction boom of the 1960s and '70s. The developers of Jakriborg saw such complexes as lacking human warmth and historical charm, so they turned to the past for inspiration. Jakriborg was constructed to embody the principles of more traditional high-density urban patterns, as opposed to the more modern, sprawling suburbia of neighboring towns.

The developers sought to create an integrated community of shops and businesses. The neighborhood is insulated by its buildings and by the town walls that function mostly as a barrier to the train tracks. All roads within the town walls are for pedestrians and bicycles only. This feature combined with the town's aim for self-sufficiency in everyday shopping activities may reduce car dependency and encourage walking, cycling, and public transport.

Jakriborg appears to be an interesting mixture of urban and suburban features. It has the appearance of a medieval city center, but not the history, shops, or amount of people that create the atmosphere of cities. A study by Tweed and Sutherland (2007) indicates that heritage is seen as a major component of quality of life and that built cultural heritage makes a major contribution to the social well-being of the inhabitants of growing towns and cities.

To accomplish the goal of creating a coherent small town, there must be a sense of a cohesive community. Though there is a town square as well as several courtyards, more gathering areas would be beneficial, especially if they involve more nature within Jakriborg's walls. A swing set and other scattered areas for children exist, but a proper playground may also add livelihood to the neighborhood. If individuals feel a sense of involvement with Jakriborg, they will likely see it as a place to live more permanently. In turn, if Jakriborg becomes a place of permanent residence for its inhabitants, they will be more invested in ensuring that it is a safe, lively, environmentally sustainable place.

4.3 Los Angeles, USA

The relationship between urban structural characteristics and travel activity is often complex and Los Angeles is an exemplary case of how complicated commuting patterns can get. Externalities of the transport system such as accidents and congestion are especially prevalent in Los Angeles, indicating the lack of sustainability of the areas arrangement. Currently, the most significant constraint on travel is not distance but rather

travel time. Consequently, planners have attempted to construct an escape from traffic congestion by building bypasses and freeways connecting suburbs with urban centers. The result was an increase in the length of inhabitants' trips, but a decrease in the travel time.

Approachable only by freeway, the downtown "center" of Los Angeles feels cut-off from livable and recreational areas. In his book City of Quartz, Mike Davis explores the history of the development of Los Angeles and describes with distain the urban sprawl and the social divides created by the vast system of freeways and boulevards. Socio-economic and attitudinal factors play a role in traveling patterns (Næss & Jensen, 2004). The arrangement of roads in Los Angeles allows people to bypass poorer areas and often restricts the inhabitants of poorer areas to those locales (Davis, 1992).

Despite these significant infrastructural barriers, the city has been improving its transit system, implementing a bus rapid transit system with parallel bicycle paths, and devising plans to extend the subway lines. If these plans can increase in pace and in ambition, the city could be well on its way to alleviating its congestion problems.

4.4 Lyon, France

Lyon is actively supporting smaller shops in the inner city by stopping all further development of out-of-town shopping centers. The city has succeeded in renovating the urban public spaces in the historic districts and redefining suburban spaces to create new types of public spaces. The city of Lyon also introduced a public bike sharing scheme and also has integrated their transport system with their bicycle initiative. The success of the bike sharing scheme is underscores the assertion that supply creates demand. The availability of shared bicycles was all the incentive that people needed to start using them. The integration of the bike share system with public transport hubs and particularly sought out destinations makes the system convenient and thus, attractive.

4.5 Melbourne, Australia

Melbourne devised a Strategy Plan that called for the city to build on its existing strengths in a manner that reflected Melbourne's local character, while diversifying uses within the central city to transform it from a central business district to a central activities district, existing strengths and physical patterns were identified and later elaborated upon. The city has worked to lead rather than just manage the city's transformation.

The city transport planners have a primary objective of reducing car dominance in the street while establishing a more inviting public realm to people. This involves incremental but consistent process of pedestrianization by increasing the areas of pedestrian space. Planners have done this by expanding sidewalks, adding city furniture to public spaces, planting 500 new trees to provide shade and greenery, and opening pedestrian lanes, arcades, squares, and promenades (Gehl, 2010). Pedestrian traffic has increased in step with the many urban improvements.

4.6 New York, USA

Providing an excellent example of fast-forwarding transport infrastructure, New York has demonstrated a will to adapt by closing traffic lanes and turning intersections into public squares. Coloring the asphalt of streets and putting out street furniture is relatively easy and inexpensive to implement, and it rapidly creates the desired pedestrianization effects. This technique is showcased as an example offering immediate improvements before the commencement of later processes that will include more permanent materials. Already one of the more prominent walking cities of the USA, the city is now even more pedestrian-

friendly, which further encourages not only walking, but the use of bicycling or public transit for longer trips.

New York has also been taking measures to improve biking infrastructure in the city. Recognizing the challenges that the city faces and the need to fast forward urban processes to improve conditions in the city has yielded a rapidly growing network of painted lanes. The rapid installation of pedestrian plazas and bicycle lanes has not been without opposition, but the network of such facilities continues to grow, as do the number of users.

5. Concluding remarks

This paper is meant to demonstrate that a range of strategies at multiple scales is necessary for devising a resilient and adaptable urban design that will shape sustainable transport patterns. Planners can be effective in such dynamic situations be understanding the relation of the built environment and transport. In fast forward urban planning, an awareness of the range of modes by which people may travel may be effectively combined with a comprehension of the ways infrastructure adaptation can create opportunities for a sustainable mode of mobility to emerge. Ensuring compatible infrastructure for a variety of modes creates a flexible and resilient transport system, and the fastest, most efficient way to get there begins with an understanding of the existing infrastructure.

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