

An Analysis on Transforming Walkability in Virginia

A Research Paper Submitted to the Department of Engineering and Society

In STS 4500
Presented to
The Faculty of the
School of Engineering and Applied Science
University of Virginia

In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Your Major

By

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Spring 2022

On my honor as a university student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

In recent years, many different street redesigns started to catch popularity due to the Covid-19 Pandemic. Covid-19's Pandemic urge for social distancing was a significant factor for which most of the cities in the world were in desperate need of open areas that will help preserve the day-to-day flow of cities (Engel, 2020). The reduction of traffic during this time was an essential part in why many cities were able to transform into open spaces by establishing parking and vehicle lanes; citizens could see themselves walking, biking, dining while also practicing social distancing. The emergency status Covid-19 created worldwide gave local leaders the power to take immediate action to manage street areas.

This STS research paper focuses on investigating the idea of walkability in the United States concentrating on the state of Virginia and how in comparison with others it can implement, conceptualize, and battle over walkability; How come most of the cities in the United States are designed to increment driving rather than to create a more walkable infrastructural space. I am not seeking to make a city like Lynchburg, VA resemble New York, NY due to the magnitude of differences between them, ranging from people to infrastructure. This research paper made me realize the room for improvement available in many cities in Virginia and has influenced me to utilize a Sustainable Transition framework in which technology and powerful influencers work together by enforcing rules changes that would shape the design of cities into walkable ones.

Even though walkable cities bring multiple benefits, they are not easy to achieve. One of the biggest challenges that impede a walkable environment are the zoning laws, from which the state of Virginia suffers the consequences. How can powerful influencers and technology help Virginia counteract these laws, and as a result, promote pedestrian activities over the coming years? Throughout my paper, I will explore the writings of many prominent scholars who have discussed how Virginia has become more walkable.

Over the past two decades, US cities started to redesign urban spaces to allocate motor vehicles and bikes and improve community spaces and the pedestrian infrastructure (via street markings). The first meaningful redesign projects started in Portland, Oregon and focused on enhancing traffic flow caused by merging non-motor vehicles with motor vehicles in the streets. This was possible by repurposing curbside parking (e.g., adding walk signs to cross the street, bike racks, seats) and street sections (e.g., adding more open plazas that will encourage outdoor dining and foster outdoor sharing). These projects have remarkably increased healthy public interaction worldwide while also easing traffic congestion. In 2020 we saw an increase in the approval of these projects and paying attention to them is vital to increase their popularity.

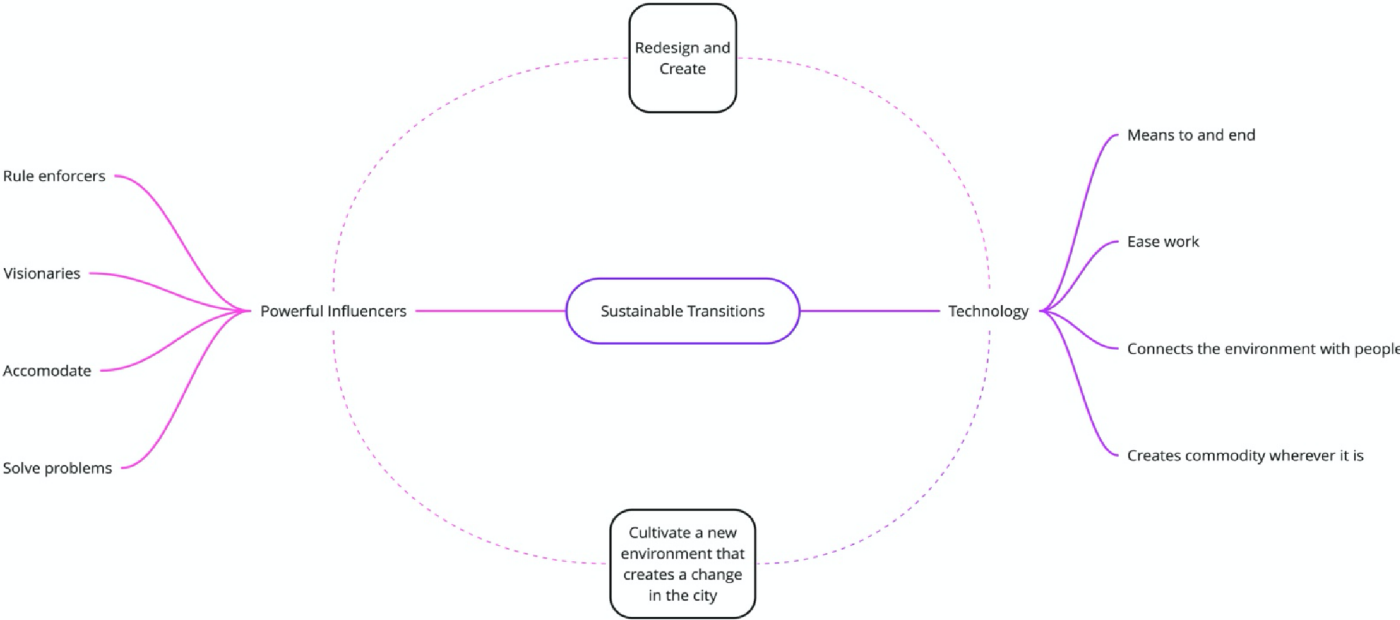
Literature Review: An exploration of the impact of Walkability

The overall goal to analyze the power technology and leaders have in shaping society comes from the Covid-19 Pandemic, in which I was able to see how city Mayors and local leaders oversaw creating sustainable ways of enforcing social distancing along fighting to keep urban spaces open; leaders were able to do this by enforcing small but game-changing guidelines such as removing curbside parking, digital menus, facemasks, and many more. On top of this, the United States was also able to see how CO2 emission rates fell by 6.4% (Tollefson, 2021). These beneficial changes that arose from the pandemic are examples of how technology and leaders can contribute to a sustainable transition framework for forming walkable cities. I will investigate different case studies in which driven cities have adopted specific guidelines for walkable cities.

A sustainable Transition (figure1) will have a significant effect if leaders are focused on convincing citizens that it is safe to dine outside or that it is safe to walk on the streets. New York's Open restaurant program serves as an excellent example; this program concentrates on outdoor dining and achieves it by suspending specific zoning locations (O'Conner et al., 2021). This program is impressive because it flourishes during the pandemic as a temporary solution for an ongoing problem. However, the citizens enjoyed it to the extent that the NYC Department of Transportation is working towards making

this program permanent. (O’Conner et al., 2021). Local leaders are influential figures with the power to transform a city and, along with technology, make up for the essential instruments of a Sustainable Transition. In my opinion, technology is an essential element of the infrastructural development of cities.

Figure (1) Shows how Technology works along Powerful Influencers to achieve a Sustainable Transition in the built environment.



As the scholar Robert D. Atkinson said (1998), "Technology has always shaped U.S. cities. For example, in the first part of the 20th century, the wave of new technologies included: Transportation technologies for automobiles and airplanes, infrastructure technologies, including widespread diffusion of electricity, highways, water systems, and mass production manufacturing technologies (p.131). "Throughout the years, technology has allowed the widespread of the population in the United States by making relocations to urban land areas more affordable and efficient. "During 1950-1980, U.S. population grew 72 percent, but the density in cities decreased by 62 percent due to 146 percent increase in urban land areas" (Kim et al., 2009, p.70). These arguments imply how technology has been able to shape cities in recent years.

On the other hand, I question that a big part of the evolution of a city follows the human behavior of constant changes in preferences. That being said, my reasoning stands with considering that the technological advances that were accomplished from the early-mid '90s to early '00s created a dependency on motor vehicles, and today we are experiencing the consequences of these past innovations. Today, we can see the increased popularity of walkable areas (Brown, 2017). In the same way, technology helped shape our past; with the help of Leaders and policy actions, technology can help redesign the current infrastructure of cities to allow a walkable environment.

Pedestrian-friendly areas are attracting popularity around well-spread cities in the United States, such as New York City or Washington D.C (Brown, T.M, 2017), but what is the problem with the rest of the cities in the United States? First of all, walkable cities are considered all cities and neighborhoods that, with the help of planning and design, minimize the presence of driving motor vehicles and increase the pedestrian presence in the environment (Hawken, 2017). The significant factor preventing the growth of walkable cities is the arrival of automobiles. Cities were able to see a massive investment in highway systems to make it "feasible for people to settle many miles away from work" (Nady. R). Yes, this was a solution for many years, but fast-forwarding to today, we can see the issues it has created. This has resulted in two big problems: One being that the average greenhouse emissions (in million metric tons of CO2 from 1990-to 2019)

by passenger cars in the United States was 700 (Tiseo, 2021), and the other genuinely remarkable one is a term called "single-use zoning" or "zoning," which refers to when in a particular land only one kind of use is allowed in each zone depending on the function of each; for example, when retail stores have to be allocated with retail stores and cannot be allocated next to institutional areas or multi-family homes. The problem with this urban planning design idea is that it prevents a person from having the privilege of going to lunch, to the doctor, and back home, all by walking (Aditi A, 2018). This is the problem for the majority of the small to medium cities that have adapted to the designs brought by the automobile boom era.

Living in a walkable town has many pros, such as: reducing the number of fatal accidents in the area, controlling gas emission rates, creating an environmentally sustainable place, resulting in a healthier lifestyle, do significant growth in the economy. Providing an attractive, walkable area will only significantly increase property values in the area and create job opportunities. The upcoming generation of millennials is commanding this transition. The executive director of the Chicago Metropolitan Agency for Planning, Joe Szabos, emphasized during a board meeting that "62 percent of millennials would choose a city in where they do not have to own a car", and thus accepting these starts molding the city into having an optional use for motor-vehicles and high accessibility of close walks to jobs and recreational places (Greenfield et al., 2017, Culliton, 2019). A perfect example of what I just mentioned is Manhattan in New York City, where it can be seen as a hub for millennials, providing them with high prices but high paying jobs (Culliton, 2019). Millennials' desires are just an example of what will be followed by the upcoming generations. In Conclusion, all generations seek to move to a place where economic success, personal and public health, safety, and accessibility are met (Gilson, 2021). In my opinion, accessibility to these qualities increases the perception of the walkability of a given city. Over the last few years, the United States started receiving an increase in demand for walkable cities; as a result, many cities around the United States have started to enact changes to their current design practices to increase their level of walkability; the level of walkability of a city can be seen in (table 1) where cities are ranked based on their given walkable score. A walkable score refers to a number that ranges from 0-

100, measuring the walkability of an address in relation to how easy it is to walk to essential amenities (Castro, 2020). A score above 70 indicates a very walkable city, a score between 50-69 shows a somewhat walkable city, and below 50 indicates a car-dependent city (WalkScore 2021).

Table 1: Top 10 most walkable cities 2015 vs. 2021. (Florida, R., (2015), Gilson, D., (2021))

2015 Rankings			2021 Rankings		
Rank	City	Walk Score	Rank	City	Walk Score
1	New York, NY	87.6	1	New York City, NY	89.2
2	San Francisco, CA	83.9	2	San Francisco, CA	86
3	Boston, MA	79.5	3	Boston, MA	80.9
4	Philadelphia, PA	76.5	4	Miami, FL	79.2
5	Miami, FL	75.6	5	Philadelphia, PA	79
6	Chicago, IL	74.8	6	Chicago, IL	77.8
7	Washington, D.C.	74.1	7	Washington, DC	77.3
8	Seattle, WA	70.8	8	Seattle, WA	73.1
9	Oakland, CA	68.5	9	Oakland, CA	72
10	Baltimore, MD	66.2	10	Long Beach, CA	69.9

In this comparison, I am trying to illustrate how the rise of public engagement and demand in recent years has forced big cities to provide their citizens with a more enhanced pedestrian and non-motor experience. Moreover, creating a positive relationship between a city's walk score and public engagement.

Driven cities are controlled by wide streets that often exclude the availability of bikes in the area. From my point of view, a city should be designed to allow citizens to complete most of their errands walking rather than forcing them to jump from parking spaces. This is the case for a typical American city

such as Lynchburg, Virginia, where most people own cars and need to drive them due to its lack of public transportation, bike lanes, and street interactions. However, small cities have been able to overcome these challenges.

Evidence/ Case Studies

Case Study 1: Rural success in Hillsboro Virginia.

Hillsboro, VA, is a small rural town in western Loudon County located 50 miles west of Washington, D.C. For many years residents in this town had their plans limited due to a 1 mile stretch of Virginia State Route 9 that accounts for 17,000 vehicles daily. This thoroughfare was not equipped with sidewalks, and therefore residents had to drive everywhere. Children in this neighborhood were forced to ride the bus to school even though it is located a few blocks away from most of their houses. Residents said that it was becoming hard to preserve their neighborly spirit and that walking across or down the street to local stores was not an option as thousands of cars were constantly flying through (Lazo, 2021). One resident expressed his frustration and said, “I can guarantee you nobody had ever walked from one end of the town to the other. There is no place to walk except right on the shoulder.”

For two decades, Hillsboro Mayor Roger L. Vance and Vice Mayor Amy Marasco failed to get funds to allow significant improvements of the main street and downtown area with aging infrastructure. Vance and Marasco submitted over 30 applications in order to receive federal funds. Still, they were rejected by multiple programs until the Northern Virginian Transportation Authority director, Monica Backmon, approved support in the funding. She mentions how the residents “were everywhere” and how “They brought out half the town” to a hearing held by the transportation authority to consider the funding. With perseverance, eventually, the two leaders, with the help of the locals, were able to secure 34 million

in financial support that would help transform this entire town. Then, the pandemic arose, and this neighborhood was able to finally see how the traffic flow of the two-lane road with little to no shoulders lulled. This gave time and open space necessary to conduct the multimillion-dollar street changes.

Who led this project, and how was the money distributed? Local leaders Vance and Marasco became the project managers of the entire job, saving the town millions of dollars in extra expenses. Their strategy involved targeting many infrastructural projects simultaneously and, as a result, gathering more money from different funding sectors. Vance and Marasco were able to successfully tear up the road once and fix many problems, such as installing a new conduit to deliver fiber, upgrading the stormwater system of the town, connecting the water system of the city to a new source, ending a persistent problem of boiling water and redesign streets with stone sidewalks, crosswalks, curbside parking's, and roundabouts at the entrance and exit of the town that impedes the possibility of speeding (Lazo, 2021).

The 269-year-old city of Hillsboro reopened in the spring of 2021, and the positive effects have taken effect immediately. Nowadays it is not all about getting in and out of the car when going somewhere; these changes have brought life to this town, and residents are finally able to safely walk across the street, make outside gatherings, and reconnect with nature. This environment has invited many people to stop by and enjoy the experience of walking through a neighborhood full of new local businesses. The positive results of this project have lived to support the case that “an investment in town infrastructure was an investment in the region” (Backmon, 2021).

Case study 2: Fairfax County roads weren't made for walking.

Fairfax county accounts for 406 square miles and has a population of 1.2 million people. This county borders the City of Alexandria, VA, and Arlington, VA, forming part of the suburban area of Washington, D.C. As of today, Fairfax does not count with streets owned by everyone as they favor only cars; therefore, their use is unequal (Flynn, 2022). The reason why many cities became car controlled is because of the automobile industry. Their strategy to push the sales of their vehicles was to campaign to make streets that served their company's purpose, drive. If people cannot walk in the streets, they are forced to use a vehicle. People had to buy cars, and mayors made streets that worked for a while until too many vehicles were on the street, resulting in traffic congestion.

Deputy County Executive Rachel Flynn noted that prioritizing thoroughfares, shopping centers, and big projects resulted in connecting roads that prevent the interactions of pedestrians (Taube, 2021). Today, this is a big problem Fairfax is facing as the traffic projections for the county have been unexpectedly increasing since 2020. Flynn desires to create places where people want to reside while making them enjoyable destinations (Flynn, 2021).

In the past couple of years, many projects in Fairfax have successfully developed by using a mixed-use strategy that balances the desires and needs of the road users. This strategy removes the zoning laws, creating free space for pedestrians to walk, shop, play, and engage in other enjoyable activities. As Flynn says, "Whenever you see people just walking in the street, you know you've a great street. You know it's safe." It is a successful strategy because it is useable for moving from point A to point B and as a place where one can conduct day-to-day activities and enjoy the open space. The success of these projects gives the developers a reason to invest time and money into new ones.

In need of a solution, Fairfax created a "complete streets" project in which citizens gain safety and mobility, making it convenient and enjoyable for citizens to choose walking rather than using a vehicle. The experience must be as enjoyable as possible for this strategy to work. Therefore, planners

placed extra effort in making streets beautiful with boulevards and markets, enhancing their city and making their citizens closer to nature.

Discussion

These two case studies were chosen to show the challenges faced by different sectors in Virginia, especially these two that diverge in size. In Hillsboro, a small county, one can see how even though they desperately needed a solution, no one was willing to help. On the other hand, the big county of Fairfax had the funding. However, it was used on shopping meccas and thoroughfares among other things that would make money but at the same time increase the problem because it caused the city to be more spread out, thereby increasing the need for cars and creating congestion. Both cases show that the opposition to making Virginia walkable does not rely on the citizens of Virginia.

In the small town of Hillsboro, there was a desperate need for open and walkable spaces. No one helped them until the powerful local influencers backed up by their citizens could get the federal funding needed to transform the village into what it is today.

In the big county of Fairfax, they had the support of the developers and governments; therefore, they were able to produce change without many challenges. Fairfax has slowly started to see how many of the sectors in the county began to develop into mixed-used developments. These projects' success has impulse local leaders to explore the redesigning of current ones. The Boro at Tysons Corner is a project that has effectively developed in the heart of northern Virginia. Fairfax County counted with 71% of citizens driving alone to work in recent years. Like Boro, these developments attempt to bring this number down to less than 50% (Flynn, 2021). The opposition in this county is the amount of money invested in previous projects that force the use of cars from point A to point B.

Thanks to the pandemic, many of these redesigns were possible, and during these challenging times, many local leaders realized the power they had and how to use it. The involvement and attention these projects are gaining is the force that will keep them growing soon. This is a constantly changing world; way back at some point in time, pedestrian towns were in control until motor vehicles quickly took over. Getting back as close as possible to this point in time is something only time will tell.

After all, walkable cities bring many good qualities to a society that constantly seeks beneficial changes. Pedestrian friendly communities promote sustainability in that built environment by providing their members with quality living. My main takeaway from this research paper is that any good transition requires good guidance. When technology and influential voices work together, they can achieve healthy transformations. In another perspective, powerful influencers in Virginia should utilize technology to endow the needs of the people related and as a result, achieve a sustainable transition.

References

- Abdullah, M., Dias, C., Muley, D., & Shahin, M. (2020, November 04). Exploring the impacts of covid-19 on travel behavior and mode preferences.
- Baldassini, A., Krieger, V., Munroe, K., & Schwab, K. (2021, July 21). NYC is moving towards creating a permanent open restaurants program. Retrieved
- Brooklyn make way: Manhattan's Financial District is NYC's Millennial Hotbed. (2019, July 2).
- Brown, T. (2017, May 17). The most walkable cities in America.
- Castro, D. (2021, July 16). Making cities more walkable with better data and Technology.
- Combs, T. (2020). Local Actions to Support Walking and Cycling During Social Distancing Dataset
- Combs, T., Pardo, C.F., Streetplans, Epiandes, MobilityWorks, & Datasketch (2020). The "Shifting Streets" Covid-19 mobility dataset.
- Culliton, K. (2019, July 02). This NYC neighborhood is the city's top 'millennial hotbed'.
- Dalton, R. (2020, June 11). Making cities more walkable by understanding how other people influence our journeys.
- Engel, A. (2020, May 21). NACTO releases streets for pandemic response and recovery.
- Florida, R. (2015, April 7). 2015's Most Walkable U.S Cities.
- Fraser, J. S. (2020, June 1). Revise the Covid-19 Declaration of Emergency and Closures and Public Use Limits.
- Gilson, D. (2021, July 16). Streets built for people [2021 walkability benefits in cities].
- Greenfield, J., Schmitt, A., Freemark, Y., & Jacobsen, S. (2017, May 12). If the future will be walkable, how do we make sure everyone benefits?
- Hawken, P. (2017, April 18). Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming.
- Lewis, R. (2017, November 03). Metro areas are getting more walkable, one foot at a time.
- Mohn, T. (2020, June 04). The Traffic Trade-Off.

Nady, R. (2020, April 30). What Makes Walkable Cities.

"Shifting Streets" Covid-19 Mobility Dataset. (2021, September).

Shrikant, A. (2018, October 26). Why walkable cities are good for the economy, according to a city planner.

Tiseo, I. (2021, May 11). U.S. Passenger Car Emissions 1990-2019.

Tollefson, J. (2021, January 15). Covid curbed carbon emissions in 2020 - but not by much.

Viola, R., Roe, M., & Shin, H. (2010, August). The New York City pedestrian safety study & action plan.

Walk Score. (n.d.). Retrieved November 04, 2021, from <https://www.walkscore.com/livemore/canada/>

Lazo, L. (2021, July 22). *As infrastructure debate lingers, \$34 million and a new sidewalk are bringing life to a small Virginia Town.* The Washington Post. Retrieved March 16, 2022,

Taube, D. (2021, December 13). *Fairfax County roads weren't made for walking, but planning leaders want to fix that.* FFXnow. Retrieved March 16, 2022,

Castro, D. (2021, July 16). *Making cities more walkable with better data and Technology.* GovTech. Retrieved April 25, 2022,

authors, A., & Kim, T. J. (n.d.). *Technology and cities: Processes of technology-land substitution in the twentieth century.* Taylor & Francis. Retrieved April 26, 2022,

Atkinson, R. D. (1998). *Technological change and cities - JSTOR.* Retrieved April 26, 2022,