



Is the Solution to Climate Change Better Urban Planning?

The role of urban infrastructure in driving individual carbon footprints

Lela Cooper

Abstract: Historical environmental movements have often placed great emphasis on the actions individuals can take to create positive impacts. This strategy works well for pinpointed environmental issues. However, climate change is an incredibly global, and complex concern, and the individual responsibility approach does not produce the results necessary to address current and future risks. While individual actions are critical, it is necessary to evaluate the role of widespread societal infrastructure in directing individual carbon footprints. The United States' urban development patterns necessitate the use of motor vehicles, often increasing individuals' carbon footprints in profound ways. Alongside this, the modernist approach to development has led to low density developments, and large stand alone, single family residences, that greatly increase a household's carbon dependency. This paper evaluates the ways housing and transportation development drives carbon footprints in Seattle, one of the United States' most environmentally conscious cities, to the infrastructure of Copenhagen, a world-renowned sustainability epicenter. Through these comparisons, assessments are made of Seattle's future efforts to become more sustainable, and uses Copenhagen as an example on how to implement better planning practices that help to address climate change in distant locations, but in a localized setting.

Picture: Cycleslangen source:
<https://en.wikiarquitectura.com/building/cykleslangen-by-cycle-snake/>

Introduction:

As climate change gains increasing prominence in both mainstream media, and academic communities, especially under the IPCC's new recommendations that global average temperature increases should be limited to 1.5 degrees Celsius, there is a very tangible need for rapid social changes to reduce global greenhouse gas emissions (Summary for Policy Makers, 2018). As much of the developing world, including both China and India encounter great economic progress and rapidly growing middle classes, it is especially necessary that the developed world, being responsible for most of historical greenhouse gas emissions, makes dramatic societal changes (Summary for Policy Makers, 2018). While it often seems easy to determine what areas of our society are contributing to national and global carbon footprints, (i.e., road transportation emissions), much of what contributes to both individuals' and national carbon footprints come from widespread societal features and infrastructure, that cannot be quickly amended. However, despite this, areas of the developed world have very different infrastructure that can greatly impact cumulative and individual green house gas emissions.

The United States notoriously falls greatly behind much of Europe in implementing infrastructural changes to reduce fossil fuel dependencies and greenhouse gas emissions This has caused the United States to lead the world in cumulative greenhouse gas emissions since 1850, as well as the current title of second greatest emitter only behind China (Lavelle, 2013). While the US is second in terms of overall emissions now, the United States still remains to have the second highest per capita greenhouse gas emissions, trailing very closely behind Australia (Lavelle, 2013). While much of our individual emissions in the United States are dependent on personal consumption habits and choices, our emissions are also heavily driven by the infrastructure of our communities. While President Eisenhower's multi million dollar investment

into the interstate system lead to many features that almost now seem quintessential of modern American culture, including fast food drive ins, and suburbs, it has also unfortunately meant that today, for most Americans, our life is heavily dependent on road transportation. This influence spreads into nearly every aspect of Americans' lives whether we are aware of it or not, and meanwhile, rapidly increases our carbon footprints, even if we try to embrace other environmentally friendly behavior, like vegetarianism, or reduced consumption. With this in mind, it only makes sense that in order for the United States to reduce its greenhouse gas emissions, we must not only make individual changes but also redevelop the ways in which our communities are built.

Europe is notably ahead of the United States in policy efforts to address climate change, and likewise has a significantly lower per capita carbon footprint. However, despite this, the EU still ranks as the second highest global emitter of carbon historically (since 1850) and is the current third highest emitter, trailing China, and the United States respectively (Lavelle, 2013). So while in the United States we sometimes idolize Europe, seeing it as some sort of environmental utopia, Europe will still need to greatly reduce greenhouse gas emissions in order for us to achieve the IPCC's new guidelines. Nevertheless, just as certain cities in the United States have drastically different political and socioeconomic demographics and environmental values, so do various countries in Europe.

Seattle consistently ranks as one of the United States' most environmentally friendly cities, and the cultural value of conservation and sustainability is almost tangible to an outside viewer, as evidenced through herds of electric cars, expensive, high-tech, waterproof outerwear on nearly every pedestrian, and countless cafes serving foods preceded by terms like "local", "organic", "vegan", and "sustainable". Despite all of this cultural greenery, (as well as an actual

abundance of greenery due to the wet climate), the average Seattle household's carbon footprint still remains high on a global standard, at approximately 21.6 metric tons of CO₂ annually (Feiser, 2015). This is at least double the size of the *average* global household carbon footprint (Carbon Footprint, 2008). So while Seattleites may consider themselves to be eco-conscious, and make lifestyle changes that address climate change, we still often have extremely high environmental impacts.

Likewise, Copenhagen is often considered to be one of the most environmentally friendly cities in Europe and the world. In Copenhagen, similar to Seattle, there is clear evidence of a

sustainability culture, but on larger development scales, such as the city's nearby wind farm, efficient public transportation system, and most notably, almost glaringly noticeable, bicycle infrastructure. The biking culture in Copenhagen is so omnipresent that bikes actually outnumber cars (Cathcart-Keyas, 2016). In Seattle, one of the United States' most bike friendly cities, only 3% of commuters indicate getting downtown by bike. In comparison, Denmark's total carbon footprint is low compared to other European countries, even those that are more densely populated (Jex, 2017).

While generally much of historic environmental activism is focused on individual actions, and making small behavioral changes, it is extremely important to realize that much of

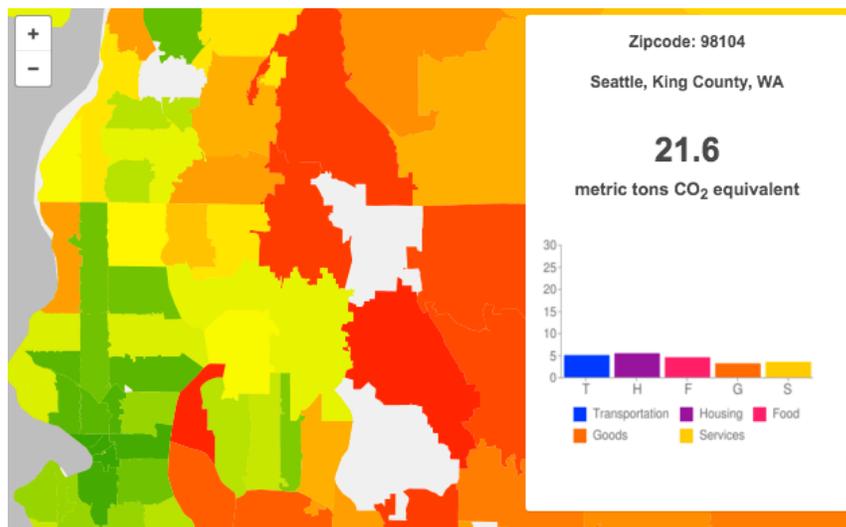


Figure 1 : This figure shows the average carbon footprint for the 98104 zip code. The two greatest contributors, which switch between each other depending on specific zip code is "Transportation" and "Housing" (Carbon Footprint, 2008)

our previous and current environmental concerns are not really due to individual decisions, but rather large scale, societal norms. A good example of this phenomenon can be seen through the 1970's infamous "Keep America Beautiful Campaign" urging Americans to take control of the country's growing litter problem (Dunaway, 2017). While this is a clearly worthwhile cause, this campaign was funded by America's biggest beverage manufacturers, including Pepsi-Co, who through this campaign were effectively able to shift the blame from themselves as the manufacturers of millions of single use cans and bottles, to the consumers, imploring Americans to take action on what is really a societal norm enacted by major corporations, not individual choices.

As there are now more Americans living in cities than rural areas, our urban infrastructure is one of the most critical ways in guiding our individual carbon footprints, acting as something we generally have very little control over, at least on a per person level. Through this paper, I will be evaluating how the current and future urban planning of Seattle and Copenhagen compare, as both have an environmentally friendly reputation but entirely different development histories. From this, I will explore what aspects of our urban surroundings most positively and negatively influence our individual carbon footprints. I will also evaluate Seattle's future development plans and attempt to make suggestions that address both climate mitigation and sustainability concerns for the rest of the 21st century.

The way we move, and what we should be moving towards in the future

As mentioned earlier, Americans' transportation choices have a large impact on our carbon footprints. We all generally know that cars are bad for the environment, and major contributors to climate change, and there have recently been many inventions based off this knowledge, including higher efficiency engines and electric cars. But how bad are cars really? In

Seattle it is estimated that 40% of our cumulative greenhouse gas emissions go towards road transportation, with approximately 22% going towards non-road transportation, such as air and marine travel (Performance Monitoring, 2018). And while for a city that prides itself on being environmentally conscious, 40% is still a very high figure; and this is unfortunately better in comparison to many other urban areas across the country. With this in mind, it is also important to realize that the majority of both Seattleites' and Americans' driving trips are very short, with 41% of American driving trips reported to be less than 3 miles, and with 84% of Seattle households owning at least one vehicle (Guy, 2017). Despite recently enacted behavior changing policies (i.e., increased toll bridge fees, and expanded HOV lanes) it is very evident that Seattle still has a major transportation issue, as traffic often seems unending, road infrastructure seems inadequate, and our carbon footprints slowly rise. And the car problem doesn't stop there. Where are we going to put all of cars? Parking appears to be a frequent hot topic in Seattle, as residents complain about lack of residential street parking, and affordable parking within the heart of the city, often, looking for parking in Seattle sometimes seems like an uphill battle. However, it turns out Seattle has 1.6 million parking spots, or enough for each resident to have two of their very own spots, or even 5 spots for every household (Gutman, 2018). This lends itself to the question if Seattle actually doesn't have proper road infrastructure, but maybe has a car problem instead.

A solution to our car wars and the 'Mercer Mess' might not lie in further road construction, but on different construction instead, construction that makes alternative transportation, such as biking, walking and public transit more accessible and convenient. After all we don't drive in our cars to deal with traffic, air pollution, rude drivers and impossible parking because we like it, but because it is easier, and more convenient for us. So just as

Americans don't buy those single use plastic bottles of soda because they want the bottles, but rather the product packaged inside, the same goes for our transportation. Cars are the plastic bottle of our commutes, and are often forced onto us due to the ways our cities are built, as the most convenient, and safest mode of getting from point A to B.

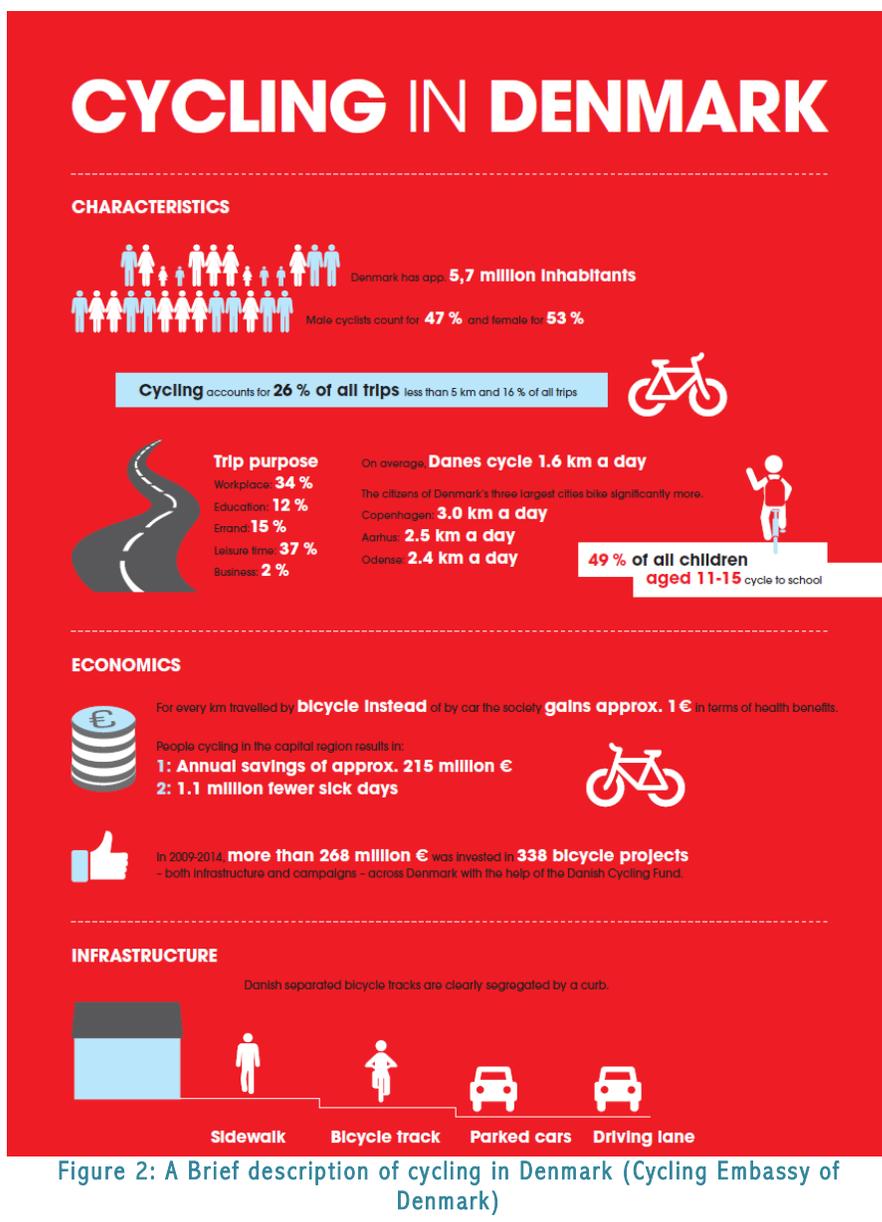
Currently, it is estimated that only 2% of American commutes are done by bike, one of the lowest bicycling rates in the world. In Seattle, despite a plethora of bike shares and bike shops, only 2.8% of Seattleites indicate biking to work, which also is a ten-year low (U.S. Census, 2014). Denmark in comparison has one of the highest rates of bike ridership, with over 16% of all commutes being by bicycle (Facts about Cycling in Denmark, 2018). This also equates to only four out of ten Danes owning a car, and nine out of ten owning a bicycle.

Long-term solutions (and challenges) for more effective bike infrastructure

While Seattle is working to expand its bicycle infrastructure, the process is very lengthy, and extremely expensive. As Seattle faces a multitude of divergent development issues, such as unaffordable rents and homelessness, it is unfortunately possible voters will also begin to experience tax fatigue before the city government is able to get the substantial funding it needs. It has been estimated in 2018, that one mile of bike lane in Seattle costs approximately \$12 million to build (Lindholm, 2018). While it is legal in Washington State for bikes to drive in car lanes, as bikes are classified as "vehicles" many bicyclists in Seattle do not feel safe doing this (Fucolom, 2018). Even with bike lanes, many Seattleites still do not feel safe, as there nevertheless remain too many bike and car collisions. So even if we do spend the next 50 million dollars in the recent city bicycle transportation levy on expanding several miles of bike lanes, it alone probably won't rapidly increase Seattle's bike commutes (10 Most Prominent Transportation Initiatives, 2017).

In Copenhagen, undoubtedly one of the leading reasons as to why bike ridership is so high is due to the city's three-lane transportation pattern, which is safer for pedestrians, bicyclists, and drivers alike. Copenhagen has a large amount of these multi lane segregated cycle tracks, which are defined as separated cycling lanes that are adjacent to the road way, but exclude all motorized vehicles. Seattle almost entirely has separated in-road bikeways that typically consist of painted lanes within the roadway, which are

designated for bikes. However, as mentioned earlier, in Washington this gets a little more convoluted as well, since bikes are classified as vehicles, so bikes can also cycle among car traffic, when there are no available bike lanes. Multi lane segregated cycle tracks are designed to prioritize the bicyclists' needs, and in Copenhagen this is easy to see, as bicycle routes often are faster than car travel, and are most convenient to get around (A Nation of Cyclists, 2018). Copenhagen has approximately 400 kilometers of these separated bike lanes, which is literally



miles ahead of Seattle's ten year "Move Seattle" transportation levy that calls for the construction of "60 miles of protected bike lanes, and 50 miles of neighborhood greenways" and is already falling behind its goals, despite a \$930 million dollar budget (Faiser, 2015). This levy doesn't focus on the same exact bicycle infrastructure as what is common in Copenhagen, but does call for an increase in protected bike lanes, which also increases rider safety, as well as the implementation of 100,000 more street trees (Laird, 2018). It is worth noting though, that much of this transportation levy focuses strongly on improving public transit infrastructure.

Investments in public transit infrastructure certainly help to get people out of their cars, but doesn't necessarily equate to a large increase in bike ridership. Because of this, Seattle may not become the bike forward city that Copenhagen is, and may rely more on a wide range of transportation modes instead. However, this of course is still excellent progress, as biking itself isn't a necessary end all be all in sustainable transportation. Even with Copenhagen's extensive bike infrastructure, the city still has to rely on pedestrian, train, bus and car transportation, and changes can still be made to make the city even more bike friendly.

While Copenhagen currently is considered one of the most bicycle friendly cities in the world, urban planners are nevertheless designing more effective bicycle infrastructure to add alongside its bicycle track system, as the city's goal is to secure the title of most bike friendly city in the world (The Netherlands' Amsterdam and Utrecht consistently compete and trade off with Copenhagen for this coveted spot each year) (The Copenhagenize Index, 2017). Currently, Copenhagen is expanding its "cycle superhighways" in which "a cycle route must comply with a set of quality measures such as air pumps, footrests, safer intersections, green waves and traffic lights timed to average cycling speed" (A Nation of Cyclists, 2018). These superhighways are designed in an effort to make bicycling even easier, by focusing not only on rider safety, but also

convenience as well, as these routes have fewer stops, and better connect urban and residential areas.

It is also worth noting that Copenhagen has had a long history of urban biking that Seattle does not genuinely share, despite the city's eco friendly identity. Bicycles began to become popular in Copenhagen in the late 1800s, and grew in popularity over the next several decades (A Nation of Cyclists, 2018). However, just as Seattle and the rest of the United States experienced major economic growth in the 1950s, so did Denmark, and cars became increasingly popular in Copenhagen. In the United States, this translated to investments in extensive highway systems and suburban developments, which still dominate our current urban design, and of course, further necessitate cars. As cars continued to grow in popularity, in the 1970s the United States and Denmark began to diverge even more. The 1970s worldwide OPEC oil crisis put pressure on Denmark to begin limiting its investment in automobile based urban planning, and initiatives were even started to get Danes out of their cars, like "Car Free Sundays" in Copenhagen. This led to a rapid increase in investment in alternative forms of transportation. However, as this was happening in Denmark, in the United States we instead moved more towards a goal of energy dependence, and began increasing American fossil fuel extraction. This in turn has meant that Denmark also has a much stronger bicycle culture than we do in the United States.

Even without extensive bike infrastructure, Seattle faces some seemingly minor detriments that actually do affect personal transportation behavior greatly. Of course, previous American urban planning patterns are one of the main reasons for this, as the city is not very densely populated or compact, and often means we live somewhat far from our most frequented establishments (i.e., place of work, grocery stores). Geographically, the Seattle area is also

marked by steep north south oriented hills from the previous glacial period that does make biking much more strenuous for many residents. This in common with approximately 150 rainy days a year, likely makes the case for bicycle based transportation even less likely. Perhaps however, with the recent influx of electric share bikes, eco conscious residents may stop attempting those notorious 20 block detours to avoid ominous features like Phinney Ridge.

The Role of share bikes in Greening Seattle (both literally and figuratively)

Even though now it may be difficult to envision a Seattle without it's seemingly signature ubiquitous green and yellow accented bikes, these share bikes have only been a part of the city's landscape since June 27th, 2017, with a measly 500 bikes citywide (LimeBike End of the Year Report, 2017). LimeBike, now rebranded as Lime, in about a year and a half has increased casual bike ridership in Seattle drastically. In Lime's first five months in Seattle, the company reported 103,000 riders in Seattle, which equates to 220,000 miles, or approximately 9 laps around the earth (LimeBike End of the Year Report, 2017). This is especially notable given that Lime is only one of Seattle's three bike share companies (albeit the most popular) and more recent evaluations have put Seattle's Lime bike ridership to over 1 million trips as of July 2018. While this is impressive, Seattle's hills remain equally daunting no matter if you are on citrus colored bike or not. Perhaps with this very notion in mind, Lime has also indicated that they hope to make 40% of their Seattle bike fleet electric. This would potentially equate to several thousand e-bikes in Seattle. This undoubtedly would make bike riding easier in Seattle, but would also make it more accessible.

However, while it is easy to see a sustainable, green Seattle through lime-colored glasses, share bikes alone cannot be seen as the solution to get people out of their cars. Ultimately, share bike companies generally target a specific customer. Share bikes capitalize on short distance last

minute transportation needs, not our most consistent, daily trips. So while Lime advertises statements that it can save customers “\$19+ a day rather than driving a car” the bikes’ \$1 per 30 minute time block still is nowhere as cost efficient in the long run as owning your own personal bike, especially if the goal is to actually get more Seattleites doing their daily travels by bicycle. In order for this to happen, there must be a cultural shift to increased bike ridership, as share bikes like Lime have helped to spur in the past year and a half, but there must also be the major bike infrastructure changes such as increased protected bike lanes, Of course, these changes will not be easy or come overnight, but perhaps with time Seattle will begin to more accurately represent the eco oriented biking identity it has held for some time now.

The way we live and the way we should live

Aside from transportation systems that we have somewhat limited control over, there are several other factors rapidly driving our carbon footprints that are also fixtures of societal values. Most notably, the houses and buildings we live in often greatly impact our individual and collective carbon footprints, generally for the negative. As homeowners and apartment dwellers we have varying control over the environmental impacts of our homes, but even some of the features that on the surface that seem like we may have more control over, often have somewhat hidden ecological implications. Currently, in Seattle housing is the biggest contributor to residents’ individual carbon footprints, just ahead of transportation (Feiser, 2015). Undoubtedly, there is a strong trend currently that calls for more sustainable residential development, but there are still ways in which our society’s urban design and residential construction values fall short.

I’ll take a McMansion with side of bad zoning please

The concept of the American Dream is central to United States culture, as it often ties us together in stories of adversity, prolonged hard work, freedom, and success. What this success

equates to, varies from individual to individual, but generally, in the United States, this is associated with financial well being or stability, and often as a result, the consumption of goods. Beginning in the 1950s, just as post war affluence got us into cars more, in the United States, it also got us into bigger houses, in which the saying, “a mans house is his castle” was truly embraced. Under this era, the United States began to embrace relatively large, single family homes, often pushing us into suburbs. So while Seattle itself is not a suburb, it still faces a slightly scaled down version of what many suburbs began to face (Suburban Growth, 2018). As suburbs are now dominated with “McMansions, commonly defined along the lines as being mass produced, generally architecturally lacking large single family homes, Seattle hosts a much smaller amount of such houses, but still faces the woes of single family housing and zoning (Stone, 2016).

Single-family homes nevertheless dominate most residential areas in Seattle, with the exceptions of specific neighborhoods in the urban heart of Seattle, like Belltown, South Lake Union, Pioneer Square and Westlake. As of 2010, the average house size in Seattle proper is 1,460 sq. feet (Arnold, 2010). In 2010, the United States census indicated that the median house size on the west coast was 2143 sq. feet, while the national average was just slightly higher at 2,169 sq. feet (McLennan, 2015). So while this is significantly less than the average US house size, it is also worth noting that the average Seattle household size is notably smaller than the national average as well, with an average size of 2 individuals, vs. the national average of 2.6 (Arnold, 2010) (2017 USA Average Household Size). So while small single-family homes are definitely better for the environment than larger ones, there are still many environmental costs associated with the sheer amount of single-family housing in Seattle. It is also important to realize, that while Seattle’s houses may be growing at a smaller rate than the rest of the country,

we have still rapidly increased the size of our houses since 1950, in which the average home size was 938 sq. feet (McLennan, 2015).

One of the biggest issues with single-family housing is not just the house's actual physical footprint, but also the amount of energy it takes to be heated and cooled. Low-density housing is much less efficient at heating and cooling than high-density buildings like apartment complexes. In single-family homes, excess energy produced is lost, and often expelled outside. Meanwhile, in multifamily housing, heat expelled from individual units can help to heat its adjacent units, expelling less of the energy outdoors. While this concept seems simple, and unimportant, it equates to a large difference in energy usage. According to the United States Department of Energy, apartments use approximately half the amount of energy than freestanding homes (Fillipsen, 2014). Of course, while apartments and condos are generally smaller than free standing houses, 65% of US dwellings are freestanding homes, yet consume 74% of cumulative household energy, while apartments, make up 17% of US housing, and consume only 9% of nationwide household energy production (Fillipsen, 2014). In Seattle, this concept is often amplified, as freestanding homes in the area are generally older, therefore being constructed with less efficient heating and cooling technologies, and sometimes facing more frequent damages (i.e., leaks, siding or roof degradation) that only intensify the loss of energy.

Single-family houses often are also placed in overwhelmingly residential parts of Seattle's various neighborhoods. This of course is not coincidental, as property owners of such houses have historically wanted to protect their rights to safe, pleasant neighborhoods against encroaching commercial developments, or lower value housing developments that would lower the values of their own properties. Also, of course much of Seattle's houses were built before the dot com boom, let alone the current Amazon frenzy that has leant itself to a lack of available

building space in Seattle. Before Seattle's economic boom, the need for high-density housing was much less, but now, as Seattle faces both rapid economic growth and population growth, low-density housing developments are not adequately addressing consumer needs anymore.

Massive changes in zoning will be needed in Seattle if the city wants to address its carbon footprints. Largely residential, single family zoning will no longer be viable, as it produces less energy efficient communities while also keeping us far from many of our most important and frequented societal features, like work, grocery stores, and other commercial establishments. Mixed use zoning, that integrates high-density housing, with commercial establishments will help Seattleites lower their homes' carbon footprints, by embracing smaller living spaces, with typically far better energy efficiency. Meanwhile, an increased integration of commercial use in our immediate neighborhoods will help individuals rely less on transportation to fulfill some of their most basic needs. Currently, there are many housing developers in Seattle that are trying to embrace this model as the city slowly changes its zoning restrictions. An excellent, somewhat experimental interpretation of this mixed use community based planning can be seen through Northgate Mall's current overhaul efforts to turn into a residential, commercial, and industry center (Stubbs, 2018). The proposed plans call for a rapid restructuring of the mall, integrating current commercial shopping resources with increased housing developments, hotels, urban green spaces, and office buildings in an effort to draw both new residents and companies to the same development, something, which is often difficult to achieve.

However, even if developers and the city start to embrace mixed use zoning more, it is possible that Seattle may be somewhat forced into creating higher density neighborhoods as residential market demand continues to remain so high. Of course, there are many environmental downsides to increased residential housing demands, as such issues as air, light, water, and noise

pollution will likely increase, but coincidentally it will also force us into more environmentally friendly housing in the long run, as dwellings are forced to become smaller, and more efficient with space.

Copenhagen's design and what we can learn from it in Seattle

Copenhagen has a much longer history of urban development, and therefore, the development patterns seen are very different from those of Seattle. Most notably, Copenhagen has a great amount of multistory, densely packed buildings, as common with many European cities, the standard American stand-alone house and spacious yard does not really exist in Copenhagen. However, surprisingly, it is possible that Copenhagen could have had some more American flair without the opposition of some of the city's prominent urban planners in the 1960s. In the United States, our urban planning is heavily influenced by the modernist movement, which took place in the 1960s and 1970s. The movement looked at cities like Copenhagen, with narrow streets and tightly packed buildings and thought this is unhealthy, and instead moved to create wide roads that would prioritize easy car transportation, and demolish high density neighborhoods, seeing what some might refer to as lively, as dangerous. While the movement was born in the United States, it did spread to Europe at the time, and Copenhagen eventually came under pressure to adopt some of these planning trends. However, the city did not adopt these trends full heartedly (besides the Bispeengbuen motorway, a six lane expressway, built in this era) and incidentally because of the lack of modernist planning, Copenhagen is considered one of the most livable places in world (Cathcart-Keays, 2016). Along with being livable, since Copenhagen is densely built, and its car infrastructure is greatly inefficient if all of its citizens decided they wanted to embrace driving, it also indirectly makes individual's carbon footprints much lower. Longtime Copenhagen planner Søren Elle explains

however that this seeming act of environmental foresight was not so much an intelligent long term plan, but rather due out of financial necessity. He explains after the war, the city didn't have the money to embrace modernism, "We thought we were unlucky and very poor. We were actually lucky, but still very poor." (Cathcart-Keays, 2016).

While Seattle is victim to many cornerstone pieces of modernist urban planning, like sky high nests of freeways that indirectly raise our carbon footprints, it doesn't mean that we cannot try and "Copenhagenize" the city moving forward. Most importantly, we need to recognize the benefit of alternative transportation, as Copenhagen has done for decades, and prioritize designing cities that work for people, not cars. With designing cities that work for people, it is necessary that we not only create cities that are livable, but are also worth living in as well, by developing vibrant communities and investing in important community resources. In Copenhagen, this is often seen in ample public art installations, parks, and cutting edge playgrounds. While of course these features don't address our carbon footprints (besides maybe carbon sequestration) they do encourage us to explore our own neighborhoods and be able to safely and easily recreate. It is also worth noting that research by the University of British Columbia suggests that spending time outside leads to increased environmentally conscious attitudes (as well as many other personal health related benefits) (Nace, 2017). Of course this shift will not be easy, and it will require a great deal of social, financial, and political support, but collectively, we can make Seattle what we often wish it were.

What's next? Is Seattle on track to reduce its carbon footprint?

As transportation and housing contribute the largest share of an average Seattleite's carbon footprint, it is crucial that we start recognizing the necessity of rethinking the ways our city works. While government notoriously runs slow, it is worth observing that Seattle currently

has some major changes underway to address both of these issues, and while far from perfect, these projects will undoubtedly change the way the city functions. Perhaps most notably, Sound Transit's decadal scale light rail expansions will begin to make marked changes in connecting the Seattle metropolitan area. Despite the Northgate expansion being over a decade later than what was originally proposed (as well as millions of dollars more costly as well) the 2020 expansion, as well as the 2023 Bellevue link will greatly connect areas otherwise really only easily accessible by car. These continued expansions, as well as what is highlighted in the aforementioned transportation levy, should make alternative transportation much safer and accessible within the next several decades. With these projects, it remains vital that there is private investment as well, as government money has proved to be rather inefficient in infrastructure projects in Seattle.

Voter-Backed Measures Increase Ridership

SINCE THE LAST SURVEY: Sound Transit added three new Link Light Rail stations, leading to a 91% jump in ridership over 2015. The Seattle Transportation Benefit District enabled SDOT to fund frequency and reliability improvements, dramatically increasing the share of residents within a 10-minute walk of a bus or train with 10-minute or better frequencies. These investments were underwritten by public votes in 2008 and 2014.



Figure 3: This figure shows increases in Link ridership since 2010. The figure on the right depicts the percentage of Seattle Residents near frequent transit. Both of these figures show the influence of recent voter initiatives to expand Seattle public transit. It can be assumed that as the Link continues to expand, so will the reported average weekly riders, gradually moving the city further away from driving dependency. (Commute Seattle, 2018)

Moreover, Seattle is facing a zoning crisis, and is being forced to implement more high density, mixed-use developments, in order to meet residential demands. However, as the housing market appears to be stabilizing, it is pertinent that Seattle also get its gentrification and homelessness problem under control, as many sustainability scholars believe that you cannot truly have a sustainable society when there is poverty (Buoma, 2013).

Meanwhile, as poor urban planning can account for some of our environmental behaviors, it is also necessary that as individuals we choose to make sustainable choices as well. As we may not have control over the fact that we have to drive along freeways to get to our place of work, or that our neighborhood is widely laid out, we do have control over our small everyday choices. Diet and consumption are still massive parts of both the average American and European carbon footprint, and we often have almost complete control over this behavior. More so, we can make the large-scale changes we want to see on a societal level as well, through increased civic engagement, especially in our current national political climate. With these ideals in mind, while maybe optimistic, Seattle's neighborhoods can become as "green" as the nature that surrounds them.

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