



A TALE OF TWO CAR-FREE NEIGHBORHOODS:

Comparing the development of Culdesac and Merwede through planning cultures

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Cover left: Merwede. (Merwede, n.d.)

Cover right: Culdesac. (Culdesac, 2024)

Right: Merwede. (Merwede, n.d.)

Below: Culdesac. (Culdesac, 2024)



ABSTRACT

Over the past 70 years, the evolution of urban form and the rise of automobile dependence have been closely intertwined. As the car grew and became a dominant feature of modern life, its drawbacks have led to the recognition of its role as a nuisance. One response to this is car-free or reduced-car neighborhoods that have developed in various locations worldwide. These experimental car-free neighborhoods demonstrate straying from the status quo, often requiring additional negotiations and working through different political and cultural barriers. **This thesis investigates how planning cultures influence, facilitate, or hinder the development of two car-free neighborhoods: Culdesac in Tempe, Arizona, USA and Merwede in Utrecht, Netherlands.** This thesis hypothesized that the planning culture in Tempe presents greater challenges to implementing community-oriented, reduced-car neighborhoods compared to Utrecht, the Netherlands stemming from a combination of factors, including car-centric urban development patterns, institutional and political barriers, site-specific constraints, regulatory and policy differences, prevailing public attitudes, and distinct economic and market conditions. However, through expert interviews with stakeholders, civil society, owners, and planners, this thesis concludes that planning culture does not simply enable or inhibit car-free development but rather shapes the type of challenges encountered—whether spatial, financial, or political. Securing funding, neighbor protests, an external amenities, for example, all contributed to the successes and challenges these neighborhoods faced in Dutch and U.S. contexts.

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Top: Merwede. (Merwede, n.d.)
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INTRODUCTION

The city and its relationship the automobile have gone through several different planning traditions from the rise of the car to present day. These planning traditions, defined as dominant approaches used by city planners to shape urban form and mobility in response to societal needs and values, cycled through a series ideas for each generation: from the postwar suburbia boom in the 50s, to environmental awareness in the 70s, then to new urbanism in the 90s, and finally to sustainable mobility and smart city planning in the 2010s and beyond (Blanke, 2018). These waves of planning traditions, coupled with the rise of automobile use in the city, were supported by systems such as zoning, civilian and neighborhood voices, local governments, and developers, all having a multilayered impact in the evolution of cities.

In just around 70 years, urban areas and spatial planning have changed profoundly (Getimis, 2012). Cities have transformed from compact and dense urban cores to rapidly sprawling suburban areas, many of which are now heavily car dependent. With the rapid acceptance and adoption of the car, the labeling of the car as a nuisance followed shortly after. Beginning in the 60s in Europe, the car was thought of as destructive to the urban fabric, and efforts were made to shift back towards alternative transport modes and reduce dependency on the automobile (Halpern & Orlandi, 2020). This resistance, however, is not global in its reach—complex social and political factors lead to the behavioral acceptance and rejection of the automobile. The complexity of cars being both privately owned but reliant on public infrastructure and institutions, holds heavy weight in both the public and private spheres, making this dependency an interesting topic of discussion (Mattioli et al., 2020).

These social and political factors surrounding the prevalence of the car can be operationalized by looking at efforts attempting to shift away from car dependency. One example of these efforts is through the development of car-free neighborhoods. Throughout the past two decades there have been several attempts at designing neighborhoods for car-free living. Prominent neighborhoods like Vauban, Freiburg, Germany have set the example for car-free living using physical aspects to filter cars out of the neighborhood. Smaller-scale permanent car-free zones like the city center of Brussels, Belgium or the superblocks in Barcelona, Spain have created car-free or low-car districts by modifying existing infrastructure and traffic flows. Improvisational and temporary car-free zones were enacted during COVID across cities in the U.S. More recent examples like the Sluisbuurt district in Amsterdam are planned to be car-free with limited parking spaces available only for those with priority, like a physical disability.

Two new car-free neighborhoods are currently under construction and serve as case studies for this thesis: Culdesac in Tempe, Arizona, USA (part of the Phoenix metropolitan area), and Merwede in Utrecht, Netherlands. **The development of car-free neighborhoods is described as a transition experiment, addressing several societal challenges at once, while incorporating radical changes of (planning) practices, cultures, and structures** (Schröder & Klinger, 2024). The development of these neighborhoods shows a shift in traditional car-dependent mindset, moving away from car dependency towards smaller, alternative-transport focused living.

Rather than debating whether car-free neighborhoods may or may not work—especially in places where public transit is lacking, like many U.S. cities—it's more revealing to look at the planning systems and cultural attitudes that shape how these neighborhoods come to exist.

Planning systems are the institutional, legal, and technical arrangements through which public authorities allocate development rights and regulate land use. They combine political processes of governance with technical planning functions to control spatial development (Berisha et al., 2021). These systems reflect national legal traditions, administrative cultures, and planning histories, and can be understood as fields shaped by power relations and knowledge exchanges (Stead et al., 2015; Zimmermann & Momm, 2022). Getimis (2012) writes comparative studies on planning systems tend to overemphasize the governmental, institutional and legal structures, while neglecting cultural aspects, highlighting the importance of including planning cultures in addition to planning systems when discussing one or the other.

Planning culture refers to the practices, values, interpretations, beliefs, attitudes and collective ethos of actors that shape planning decisions (Getimis, 2012; Stead et al., 2015). Planning culture is influenced by historical, political, and legal factors. This includes things like institutions that either work with or counter the development such as government bodies or planning commissions; financial systems enabling project funding; public participation; local legislation; consumer mindset; and public-private collaborative efforts. This also includes opposing systems such as bureaucratic inefficiencies, conflicting interests (i.e. environmentalists or competing developers), power imbalances, or corruption.

This thesis compares the development of experimental car-free neighborhoods, Culdesac and Merwede, by looking at how different planning cultures impact their development. **This thesis hypothesizes that the local planning culture in the Phoenix Metropolitan Area presents greater challenges to implementing community-oriented, reduced-car neighborhoods compared to Utrecht, the Netherlands.** These challenges stem from a combination of factors, including car-centric urban development patterns, institutional and political barriers, site-specific constraints, regulatory and policy differences, prevailing public attitudes, and distinct economic and market conditions. For example, car-dependent planning culture in Arizona has historically deemphasized investments in public transit infrastructure, making a challenge to build neighborhoods like Culdesac that prioritize transit over cars (Kane et al., 2014).

The objective of this thesis is to determine how planning cultures impact these developments—hindering or moving forward progress, aiming to answer the following **research question**:

How do planning cultures impact developments with low-car ambitions such as Culdesac in Tempe, Arizona, USA and Merwede in Utrecht, Netherlands?

RESEARCH GAP

This thesis aims to fill several research gaps. First, as Fürst (2009) describes, “planning culture is the neglected dimension in comparative studies on planning systems” (Fürst, 2009). More often, comparative studies on planning systems focus on the technical aspects of planning, like governmental, institutional, and legal structures at the national level, while the cultural and social dimensions that influence decision-making are less frequently explored (Fürst, 2009; Getimis, 2012). Several articles link the two case studies together—such as Bicycle Network’s “Car-free neighbourhoods are a thing” published March 24, 2025 (Bicycle Network, 2025)—yet these two neighborhoods haven’t been studied from the angle of planning culture. Comparing planning systems is a way to make an inventory of what’s appealing, what’s unrealistic, what works, what doesn’t, who is making decisions, or who is creating hurdles. Western Europe

planning systems are known to share commonalities in post-war economic times, yet in a global context, there is more variation of institutional frameworks, political legacies, and socio economic conditions, justifying the international context of this thesis' scope (Zimmermann & Momm, 2022). Getimis (2012) writes there is no systematic comparison of planning cultures, with analysis remaining at level of experiences of planners and no other important actors in the planning process. Although this thesis continues the trend of not being part of a systematic comparison of planning cultures, this study does interview a variety of actors, not just planners. As Schröder and Klinger (2024) wrote “while there are several studies on car-reduced and car-free neighborhoods in terms of behavior and design, academic output on the planning practices and governance of these developments is rare” highlighting the literature gap for this thesis.

The structure of this thesis is as follows. The literature review section traces the historical institutionalization of car-centric planning, the societal and environmental impacts of car dependency, and a growing movement toward car-free urbanism. The methodology section outlines the research design, which centers on a qualitative comparison of the two developments using interviews, planning documents, and site analysis. The case study section provides background context for each site. The findings section is organized thematically around the neighborhood beginnings, site conditions, business economics, and political processes. Throughout the findings section is a discussion on broader planning culture dynamics, highlighting the conditions at play in both contexts. The paper concludes with a discussion reflecting on the role of developers, institutions, and public attitudes in shaping the viability of car-reduced urban futures.

LITERATURE REVIEW

This literature review begins with a historical perspective of the rise of the automobile and simultaneous urban planning trends seen in the U.S. and the Netherlands. It covers the evolution from the early 20th century, using the history to explain the current car-centric landscape. Over time, these trends show increases in the automobile are related to changes in land-use patterns, ultimately leading to urban redevelopment and sprawl (Verlaan, 2021). While it's clear city planning and car dependency are interdependent, one can still question whether urban planning adapted to the car (thanks to things like car lobbies), or if dependence on the automobile stemmed from urban planning decisions (EEA – European Environment Agency, 2006). Following the historical overview, the literature review examines car dependency and its consequences, including a section on when cities and citizens began to view automobiles as a nuisance, as well as the challenges posed by car-centric urban planning.

URBAN PLANNING AND RISE OF THE AUTOMOBILE

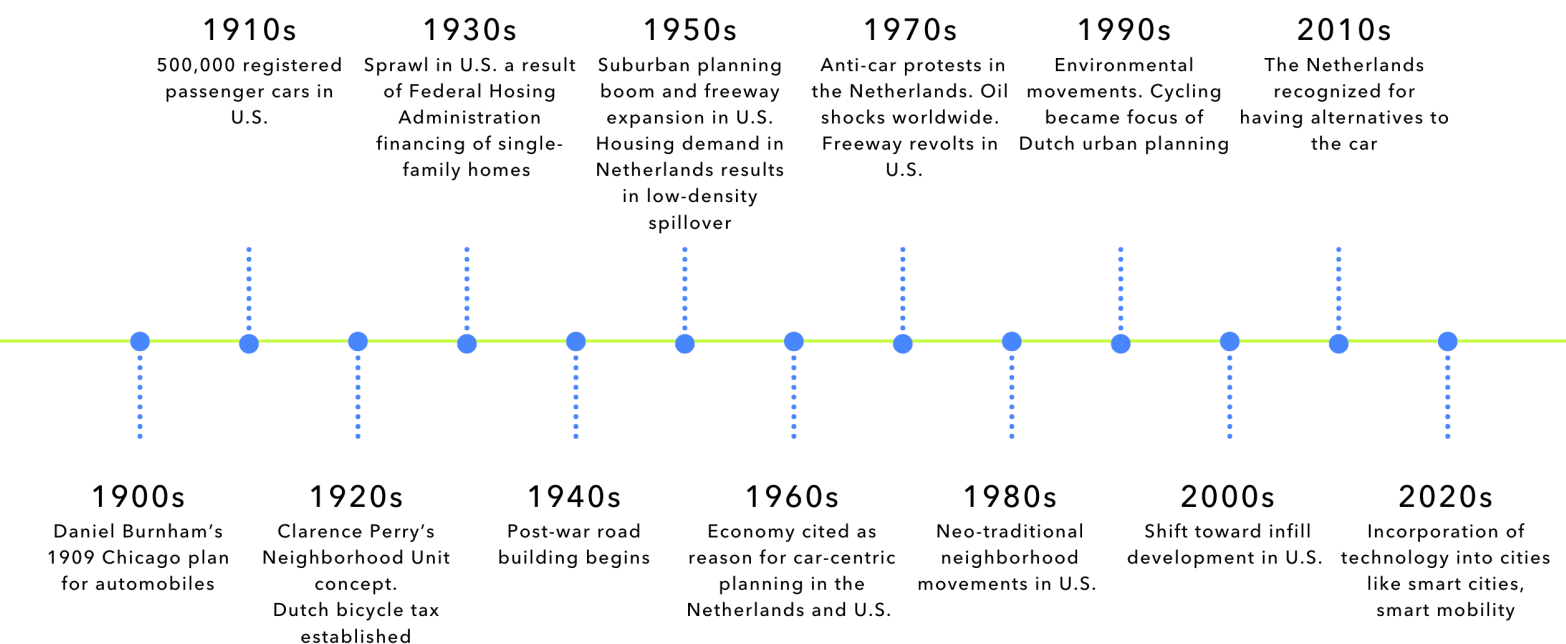


Figure 1 Timeline of major planning concepts. Source: Author

1900s–1920s

In the early 1900s, cities in the U.S. and Netherlands were designed for pedestrians, horse carriages, and streetcars with dense, walkable grids. This landscape changed shortly after the turn of the century when mass production and adoption of the car began especially in the U.S. The U.S. was an early adopter of the car compared to countries like the Netherlands due to readily available systems such as efficient car manufacturing, loan credit availability, and gas subsidies making it easy and inexpensive to obtain a car. In 1910, the number of registered passenger cars in the U.S. was around 500,000 (Seo, 2019). By 1925, that number became nearly 18 million, showing a 35 times increase in just 15 years (Seo, 2019). In the 1920s, eighty percent of all cars in the world were in the U.S. (Perot, 2023).

Just years after the introduction of the automobile, traffic congestion became a concern and city planning reacted quickly. Daniel Burnham proposed the 1909 Chicago plan whose main goal was “providing roads for automobility” (McShane, 1994). In *Policing the Open Road*, Seo (2019) emphasizes the inevitability of planning for the automobile in urban planning, citing a 1916 observation that “if the automobile had existed fifty years ago, our city ‘dads’ would have looked at the laying out of a city from an entirely different angle.”

High car usage was also supported by Clarence Perry’s 1929 Neighborhood Unit concept: a plan with the goal of merging cars and neighborhoods, creating walkable communities with cars on the perimeter of smaller ‘blocks’ (Perry, 1929). This design included a core, often a school, with other amenities like shops and parks nearby separating residences from work, as shown in Figure 2. Perry emphasized social benefits that could be achieved with the physical layout and design of the neighborhood, although the superblock layout of these neighborhoods was criticized for reducing walkability outside the given block, increasing car dependency (Sharifi, 2016). Additionally, Perry’s idea to separate work and home is considered to be a principle that encouraged widespread suburban sprawl in the U.S. following WWII (Sharifi, 2016). Henry Ford, automotive pioneer, was a strong advocate for decentralization of industrial activities as early as the 20s (Mumford, 2008). His ideas were backed by President Franklin Roosevelt which caused migration to automobile-dependent suburban residential development for decades, replacing the mixed-use urban America with single-family settlements, and boosting car sales and dependency (Mumford, 2008).

While the car was taking hold in the U.S., bicycles were rising in popularity in the Netherlands. In 1910, the Netherlands was already the country with the highest bicycle use in the world (Rekers, 2024). In 1924, a bicycle tax was established which helped to fund the expansion of the Dutch road network for cars, leading to an eventual prioritization of cars (Perot, 2023). In 1929 it was decided that all roads would include a separate cycling path with contributions from the funding (Perot, 2023).

1930s–1940s

In the U.S., the Great Depression slowed down the growth of the car industry. In response, several New Deal programs were implemented to support economic recovery in the U.S. One of the most influential for urban planning and suburban expansion was the Federal Housing Administration’s (FHA) financing program for single-family homes (Gonzalez, 2006). This became a key moment in rise of the automobile, because the government-backed loans were guaranteed

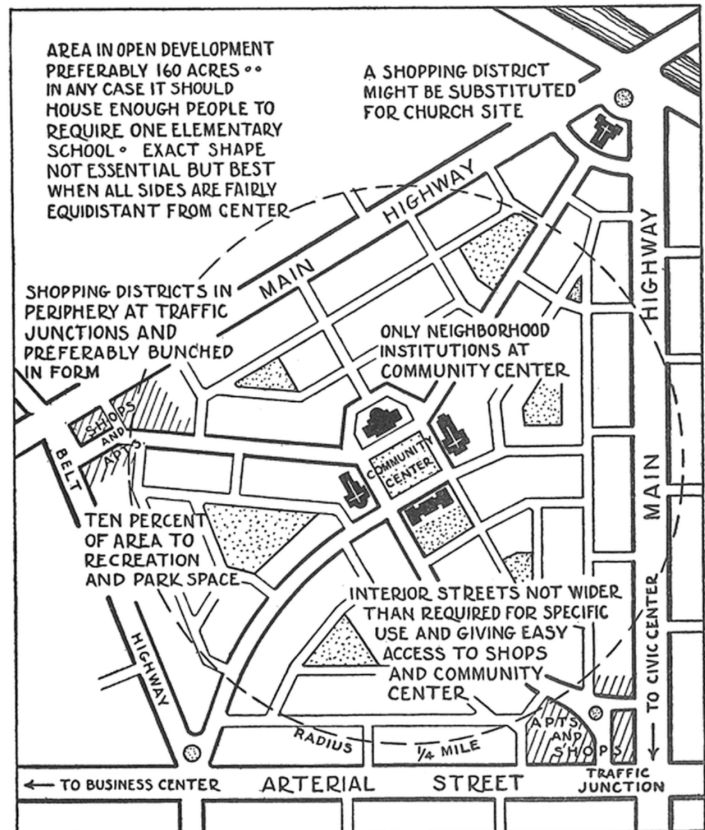


Figure 2 Clarence Perry’s Neighborhood Unit. (Perry, 1929)



Figure 3 Levittown, Pennsylvania, a product of FHA financing programs.
Source: Public Domain

for single-family homes on the urban periphery outside of densely populated city centers, necessitating car ownership for transportation (Gonzalez, 2006). The program favored and supported expanses of vast single-family dwellings, with few nearby amenities like corner grocery stores. Hanchett (2000) describes “if there were any stores at all, they would be grouped into a single shopping center” with suburbs being arranged with strict separation of land uses. An example of this can be seen in Figure 3 of Levittown, Pennsylvania, USA, a community built with the help of favorable financing terms in the postwar era.

Other noteworthy plans from Frank Lloyd Wright’s Broadacre City neighborhood plan was

proposed in 1935, combining an abundance of land per household with cheap energy and car ownership (Sharifi, 2016). He believed that this urban design would return humans to nature and give them freedom. These ideas led to further promotion of suburban development and sprawl. While not to quite the same extent, this separation of residential and commercial areas was also seen in the Netherlands around this time.

With the building of these sprawling neighborhoods outside of dense city centers, came the need for more connectivity to visit the city for jobs or shopping resulting in an emphasis in planning trends to get the automobile back into the city often via superhighways (Mohl, 2012). In a 1943 U.S. post-war planning document, the chief of research for the Planning and Information Public Roads Administration states “the city... is the place where the highway can perform its particular task most grandly, and where it now fails most miserably. It is the place where, in the post-war period, we shall look for a great new cycle of road building to reach its height” (Fairbank, 1943). He argues for the highway in connecting people short distances, not for cross country journeys and cities begin to start getting torn up to build these highways through them.

1950s–1960s

The following years in the post war era were marked by mass production and mass consumption. Economic growth coupled with rapid motorization in the post war era accelerated automobile dependency and passenger auto trips increased exponentially (Alpkokin, 2012). While credit to buy cars in the U.S. was readily available in the early 1900s, access to credit in the Netherlands didn’t become widely accessible and acceptable until the 1960s (Seo, 2019; Verlaan, 2021). Ownership of the automobile boomed in the Netherlands, including the growth of car commuter traffic by 500 percent. Post-war planning in the Netherlands prioritized

highways and infrastructure for cars. Before the second world war, car infrastructure like parking garages, motorways, and ring roads were virtually nonexistent (Verlaan, 2021). When the country was in the midst of rebuilding after the war, ‘the car is the future’ mentality dominated, resulting in infrastructure modernized to fit the needs of the car. This was coupled with a decline in public transport ridership from 53 percent in 1955 to 18 percent in 1975, bringing similar congestion concerns from the 1900s in the U.S. to the Netherlands (Verlaan, 2021).

Just like in the U.S., the post-war period in the Netherlands was also marked by population growth and housing demand and a ‘booming economy’ with planners rethinking the future of urban and rural areas (Verlaan, 2021). During this time, the first spatial planning document was published in the Netherlands with goals to develop the urban fabric and leaned towards car-centric planning (Verlaan, 2021). Connecting the suburbs with central areas became a theme across the Netherlands although the physical planning ministry did attempt to contain development into designated growth nuclei to prevent urban sprawl (Verlaan, 2021). Similar efforts were evident in the U.S., where the expansion of freeways and highways continued to meet growing car demand and integrate them into existing urban landscapes (American Society of Planning Officials, 1955). Cities were zoned for residential, shopping districts, and industrial areas with highways facilitating connectivity between these zones. Both in the U.S. and in the Netherlands, government investment was used to cut arteries through city centers because car-centric planning was seen as essential to maintain economic growth (Perot, 2023). In this decade, the promotion of urban highways was a priority to promote the economy with direct access to city centers that prioritize flow of traffic and capital. Neighborhoods and other local communities were bulldozed to create urban highways resulting in severe negative impacts for residents.

Anti-car protests were beginning, especially in the Netherlands. Colin Buchanan’s 1963 report *Traffic in Towns* started the beginning of widespread published criticism of the car. In this report, Buchanan describes how environmental conditions in urban areas would deteriorate due to increases in car ownership and traffic congestion, calling for new forms of traffic and urban management (Buchanan, 1963). The U.S. was portrayed in an especially bad light in these reports, Buchanan writing “everything I saw in America convinced me that the motor vehicle is an insidious destroyer of most of the things we have previously valued in towns” (Buchanan, 1963; Ward, 2017).

1970s–1980s

The 1970s built upon the start of resistance against the car in the U.S. and the Netherlands. Dutch protests were effective, including one on June 4, 1977 where 9000 cyclists staged a die-in in front of Amsterdam’s Rijksmuseum (Reid, 2017). Additionally, the Stop de Kindermoord movement, prioritizing protection of children and other vulnerable road users occurred in the early 1970s (Reid, 2017). Furthermore, the 1973 oil crisis brought awareness to the evident issues of urban sprawl like economic and geopolitical vulnerability (Gonzalez, 2006). Freeway revolts occurred across North America between the 1970s and 1990s (Mattioli et al., 2020). In Arizona, for instance, the proposed Papago Freeway in Phoenix—an elevated structure over 100 feet high running through the city center—faced strong public backlash (The New York Times, 1973). The *Arizona Republic* newspaper led much of the opposition, ultimately contributing to a public vote that rejected the plan (The New York Times, 1973). Other notable freeway opposition include revolts against the elevated Embarcadero freeway in San Francisco; Lake Shore Drive in

Chicago, expressways into Manhattan proposed by Robert Moses; and the Trans-Texas Corridor plan (Mohl, 2004, 2012).

Concerns over adverse effects of the car like traffic safety, environmental damage, and the oil crisis prompted scholars to pay more attention to the increase of the car in society (Van Eenoo, 2025). In the 1980s, neo-traditional movements started in the U.S. emulating traditional American neighborhoods, before the car's dominance and suburban overhaul (Sharifi, 2016). These neighborhoods were a response to problems like deterioration of business districts, regional stagnation, social segregation, crime, traffic congestion and pollution. Neo-traditional principles later evolved into other names including Transit-Oriented Development (TOD), New Urbanism, and Smart Growth. The negative effects of car-centric development led to reevaluation of urban planning with a push for human scale environments. New Urbanism ideals started gaining traction in the Netherlands including walkable blocks and streets, housing and shopping close together, and accessible public spaces, focusing on human-scaled design.

While many Western countries embraced urban modernism and technocratic planning in the 1950s and 60s, Verlaan (2021) argues that the Netherlands began to diverge from this path relatively early. Dutch planners and citizens adopted a postmodern mindset, favoring compromises between top-down planning and grassroots urban action. This shift became evident in how the government responded to political and citizen-led movements, contributing to a turning point in the perception of the car. Unlike the U.S., the Netherlands began rethinking car-centric planning after only a short period of postwar expansion. This divergence is visually represented in Figure 4.

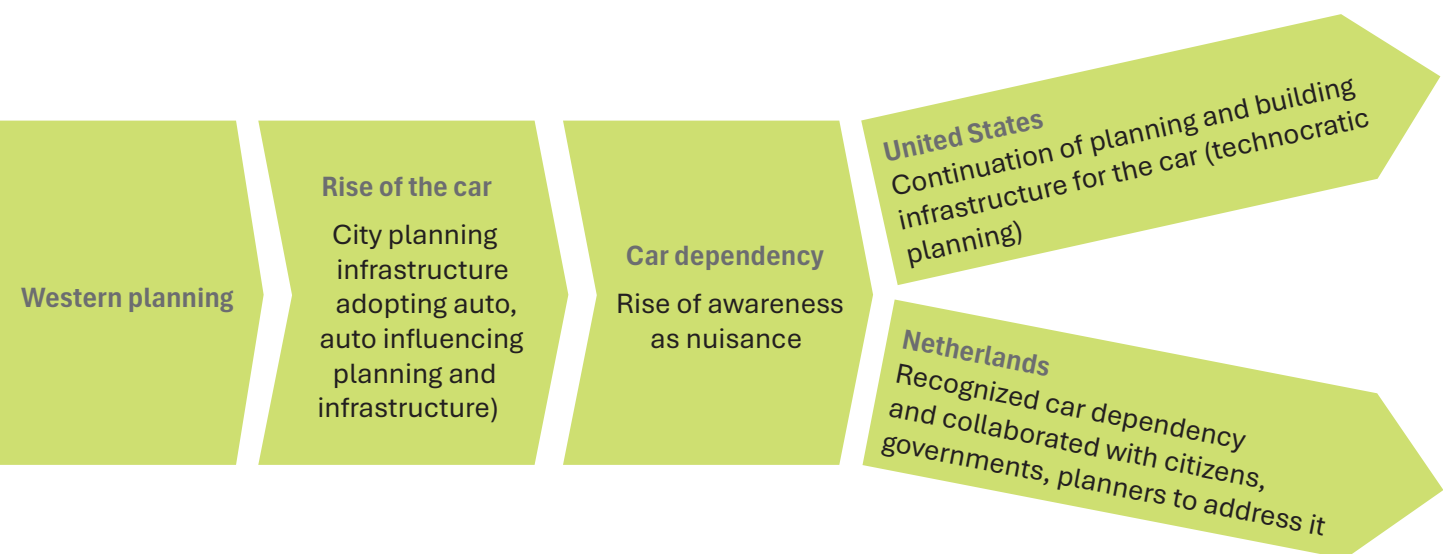


Figure 4 Diverging mindsets on car use in the U.S. and the Netherlands. Source: Author

1990s–2000s

The 1990s in the U.S. continued to emphasize economic growth as part of its transportation strategy, focusing on freight and intermodal connections, as well as air quality and transport efficiency. Environmental justice movements continued the idea of ecotowns advocating for more sustainable and sometimes car-free communities. The rise of New Urbanism was also introduced which showed an interest in walkable neighborhoods, mixed-use areas, and traffic calming while neotraditional designs such as interconnected street grids were implemented

to reduce travel time extend public transit networks and lessen car dependency. However the increase in automobile accessibility on minor residential streets raised concerns about cut-through traffic and excessive speed, presenting challenges to pedestrianization and social interaction in neighborhoods (Ben-Joseph, 1997). Cities built around the automobile replaced cities that relied on public transportation (Glaeser & Shapiro, 2001). Smaller neighborhoods with local streets and cul-de-sacs were seen as beneficial in reducing accidents and crime while having higher property values (Ben-Joseph, 1997).

In the 1990s, Dutch cities continued efforts undoing damage caused by years of planning for the car. The governments collaborated with local advocacy organizations and cycling became a strong central focus of urban planning.

2010s–2020s

In the U.S., the interstate system remained essential for mobility and the economy, with cars still deeply embedded in daily life—particularly in sprawling urban areas (Gonzalez, 2006; Mohl, 2012). Despite attempts by urban planners to reduce car dependency through initiatives like road diets, bike lanes, and pedestrian improvements, there was still resistance to change especially with attachment to cars. In contrast, the Netherlands is recognized internationally for extensive traffic-calming measures such as bike lanes, raised intersections, and car-free zones as well as the promotion of alternatives to the car. In the city centers, cycling is a way of life. In the legislation, bicycles are treated as superior to the car. If the automobile ceased to exist tomorrow, life would not come to a grinding halt thanks to the developed lifestyle embracing transportation such as cycling and public transport with a well-developed train and bus network.

Very recently, changes in transportation have started to impact cities and urban planning such as the introduction of electric and hybrid cars and development of technology for autonomous vehicles has also started to transform transportation. The U.S. also started to shift focus from suburban expansion and increased fuel consumption to infill development near city centers, where existing amenities are already located (Jama et al., 2025).

The preceding historical overview traced the parallel rise of the automobile and urban planning trends over the past century, culminating in today's car-centric environments across much of the U.S. and parts of the Netherlands. Haghani et al. (2023) describe these developments as iterative, with each generation of planning building upon the last. Although gradual, these shifts have profoundly shaped society, creating a sense of inevitability around car dependency due to the compounding effects of past planning decisions. In recent years, however, growing awareness of the drawbacks of car-centric planning has sparked renewed academic and policy interest. Increasingly, researchers are examining car dependency not just as a planning outcome but as a societal challenge and as a growing urban nuisance.

CAR DEPENDENCY (AS A NUISANCE)

Interest in car dependence research is growing: a review by Sierra Muñoz et al. (2024) found that two-thirds of all publications on the topic appeared in or after 2013, highlighting an upward trend in scholarly attention. A review by Van Eenoo (2025) describes car dependency as a non-neutral, highly normative and subjective issue, showing the relevance of this research topic. This growing interest in car dependency is also linked to contestation of the car, as it is increasingly regarded as a nuisance in urban environments.

Car dependency occurs where transport and societal structures are heavily reliant on private automobiles, resulting in broad implications on urban planning and public life. Car dependence has been described in various ways, starting with Newman and Kenworthy's 1989 book titled *Cities and Automobile Dependence: An International Sourcebook*, sharing the concept of car dependency with the research and urban/transport planning communities. Merom et al. (2018) describe car dependency as exclusively driving with no walking trips at all. Car dependency is a spectrum, spanning those who must use it, contrasted with those who have other options, including behavioral, subjective, and objective options (Sierra Muñoz et al., 2024). Hunter et al. (2021) describe it as high levels of per capita car travel, car-oriented land use patterns, and reduced transport alternatives, where, for some, there is no choice, and for others alternatives exist but far less attractive. Sierra Muñoz et al. (2024) write it's also understood to be caused by a lack of accessibility and proximity. Urry (2004) describes car dependency via a "system of automobility" consisting of cars, highways, automobile companies, government policy and car culture which has the "exceptional power to remake time-space" and the ability to generate its own self-expansion, thereby making car dependence an inevitable outcome of automobility (Urry, 2004; Van Eenoo, 2025). The systemic dependence on cars has radically changed people's daily lives, aspirations, culture, built environment, and people's relationships with each other (Seo, 2019). One example of this is reframing the idea that urban environments are for cars, not where people should live their lives.

Car dependency has permanently changed the urban fabric of cities, especially in city centers and urban cores. This was especially seen in the highway era in the U.S., building roads through urban centers (Mattioli et al., 2020). Car dependency is path-dependent, meaning the continued use and development of automobiles and infrastructure for those automobiles perpetuates the reliance, reinforcing it and necessitating its existence (the car and the infrastructure) (Schröder & Klinger, 2024). Some describe this path dependency as a self-reinforcing process, while others describe it as a vicious downward cycle that leads to a process of car-related infrastructure expansion, urban sprawl, spatial dispersion, and traffic growth (Levinson & Krizek, 2018). Mattioli et al. (2020) describe how the "automobile affords great flexibility of movement and temporal coordination, but it also requires it, causing motorists to reshape their lives, their obligations, and their expectations around it. This points to an 'elective affinity' and a recursive relationship between social modernization and car use growth."

Car dependency is impacted by policymakers who feel politically pressured to continue the dependency. Grin et al. (2010) describe it as a persistent problem, hard to overcome due to various actors involved pursuing divergent interests. Political and professional elites, for example, feared the growing political influence of car drivers, and felt the only way to maintain growth and power was to invest heavily in road networks contributing to car dependency simply because they felt pressured to appease drivers, not because they felt it was right (Verlaan, 2021).

Additionally, Mattioli et al. (2020) describe how roadbuilding and maintenance can be seen as a matter of basic political common sense, and a neutral indication of policymakers' competence—giving off the same sentiment: continue building car infrastructure or risk political image. Fifty years ago, journalist Fyfe Robertson pointed out the social consequences of car dependency, such as congestion and pollution, and criticized the political pressure that discouraged reform (BBC One, 1975). Even then, Robertson questioned whether leaders had the courage to act, asking, “Will any government have the bloody nerve to do anything about the [traffic] jams?” (BBC One, 1975).

The institutions of car culture are also tied up in car dependency (Mattioli et al., 2020). In some cities, drivers continue to drive cars despite cities having public transit, walkable streets, and cycle lanes because driving is seen as a status symbol. Mattioli et al. (2020) describe cars as a “critical part of the frictionless mobility that has come to be an important part of social privilege, integrated into people’s lives in diverse ways.” The rise of private cars has undermined public transportation, resulting in inadequate transit options. This, in turn, drives more people to rely on private vehicles, creating a cycle of congestion with no viable alternatives. An example of this is how local transit operations in U.S. have been in decline since 1920s and 1930s due to ineffective management, service, declining profits, along with the preference the freedom and flexibility from cars (Mohl, 2012). This cultural contrast can be seen in emerging countries that have developed public transit yet car dependency is on the rise, the idea that a car-free lifestyle can be exemplary is not widely embraced due to it being viewed as a status symbol (Boussauw et al., 2023).

Another contributing factor to the sweeping dependency on cars is thanks to hidden subsidies systemically built into the automotive industry. Things like free parking and minimum parking requirements arguably constitute a hidden tax on building development to subsidize cars (Mattioli et al., 2020). Mattioli et al. (2020) describe how these hidden subsidies are so prevalent and normalized that pushing back on parking restrictions is viewed as harming local development. Since car travel is both privately and publicly funded, subsidies to car travel are more politically defensible, compared to public transport which is solely publicly funded (Mattioli et al., 2020).

Car dependency in America has led to an acclimatization to the violence associated with automobility, with road violence and poor environmental health increasingly accepted as inevitable aspects of modern life (Perot, 2023). Collisions and casualties from the introduction of cars increased alongside the automobile resulting in calls for more regulations of motorists (Norton, 2007). The highly-influential car industry, however, was able to shift the narrative of these calls for regulation away from cars being killers, to pedestrians being in the way, ‘socially reconstructing city streets for the automobile (Norton, 2007). Cars also negatively impact population health in ways other than collisions and accidents, such as pollution, which affects population groups unevenly (Loorbach et al., 2021). In Rotterdam, for example, lower income groups living in neighborhoods closer to highways are exposed to more pollution resulting in a life expectancy seven years lower than the Dutch average—two of which are attributed to air pollution (Loorbach et al., 2021). Another health issue associated with car dependence is how reliance on the car can lead to isolation. Studies have found that reliance on a car for more than 50 percent of out-of-home activities is associated with decrease in life satisfaction (Saadaoui et al., 2024).

Peter Pelzer, professor of Spatial Planning and Strategy, talks about an interesting phenomenon in the language surrounding car dependency themes—an observation that we are using negative definitions to talk about our futures, “defining where you want to go by describing where you do not want to go” (Janssen & van der Linden, 2019). He says this is problematic because it is defining something by what it’s not. When you say ‘car-free neighborhood’ it is implying that cars do belong in cities, and car-free is an exception from the norm, rather than implying neighborhoods are a place for people to live and interact. Continuing these cultural themes is the concept of motonormativity, a shared bias in which motorized mobility is judged differently from comparable issues (Walker & Brömmelstroet, 2025). This highlights how deeply embedded car use is in our culture, where the automobile is rarely questioned as a societal construct and instead widely accepted (Walker & Brömmelstroet, 2025).

All the above describes how car dependency is rooted into modern society—politically, physically, culturally, and economically. Some have the choice to live with a car while others do not. Underlying problems associated with cars were more pronounced and earlier recognized in Netherlands than the rest of the western world, influencing policy and urban development (Verlaan, 2021). A review of primary sources by Verlaan (2021) concludes that “the Dutch have always explicitly discussed the car as a spatial problem with grave consequences for the physical fabric and social cohesion of urban settlements,” setting the Dutch apart from anglophone countries with values such as consumerism and liberation attached to the automobile (Verlaan, 2021). Despite how deeply embedded car dependency is in modern life, there have been notable efforts to challenge and reduce this dependence.

CAR DEPENDENCY REDUCTION ATTEMPTS

Although awareness of environmental, social, and spatial effects of car dependency has grown, the efforts to shift away from cars in urban planning remain experimental in nature. As Schröder and Klinger (2024) write, “a fundamental change from car-oriented to car-reduced planning is far from main-stream”. Auto-centric urban development continues to be embedded into planning legally, spatially, culturally, and politically. As Harvey (2008) writes, “the suburbanization of the United States was not merely a matter of new infrastructures [...] it entailed a radical transformation in lifestyles and produced a whole new way of life”. Despite this entrenchment of the automobile, a wide range of strategies have been trialed to counteract this dependency such as freeway teardowns and revolts, congestion pricing, protests, various planning strategies, and car-free neighborhoods.

The freeway revolts were an early example of pushback against highways that penetrated cities and the power that state and federal highway engineers held building them. Beginning in San Francisco, the revolts protested destruction of entire communities, severe relocation problems, and subsequent environmental damage (Mohl, 2004). The revolts resulted in some teardowns, and prevention of other freeways getting built. While some saw these revolts as an opportunity for reduced car use, others argued it simply located the expressway in a different location (Mohl, 2012). These protests showed a shift in transport politics and urban consciousness. Arguments for freeway removal draw on the theory of induced demand; the idea that building more roads encourage more driving and reducing road space can reduce demand, encouraging alternative transit, fewer trip or modal shift (Mohl, 2012). This idea can be paralleled with residential parking spaces: building apartments with parking lots invites car ownership, reinforcing dependency.

Congestion pricing is another avenue of reducing car dependency, especially when tolls go towards transit upgrades. A noteworthy and timely example is the 2025 New York City congestion pricing. In just a few months of tolls to enter Manhattan, the pricing is achieving its two main goals so far: reducing congestion and raising revenue for transit improvements (Badger et al., 2025). Although this congestion pricing doesn't fundamentally reduce car dependency, particularly those living further out of the city who lack reliable transit alternatives, the congestion tolls are on track to generate millions, which will finance critical transit upgrades in New York City, which then contributes to a reduction in car dependency by providing an updated transit system (Badger et al., 2025). After a few months of these tolls, public transit ridership is also up across all modes, showing demand, which therefore has the ability to create reinvestment in public transit (Badger et al., 2025).

Dutch people have worked to reduce car dependency by reframing advocacy for people over cars via successful protests. Beginning in the 1970s this wave of protests was sparked by a surge in child traffic fatalities where communities demanded safer, more livable cities. Advocates emphasized the human cost of car dominance: cars kill people (Perot, 2023). By removing car culture from political and economic viewpoints, they showed a root issue swaying to help make cycling infrastructure the priority over automobiles. These protests reframed car violence not as a byproduct of modern life, but as a preventable consequence of political and planning choices that prioritized automobility over human safety ultimately influencing the Netherlands' shift toward pedestrian- and cyclist-friendly infrastructure that today sets it apart from most other Western nations.

Different planning techniques are also ways to reduce car dependency. Densification, for instance, especially when integrated with transit-oriented development, can reduce reliance on cars by clustering amenities and services within walking distance. Van den Hurk et al. (2021) argue for understanding urban mobility as a configuration of land use, services, and mediating platforms, not as isolated planning categories. Similarly, Wiersma et al. (2017) identified spatial conditions conducive to car-independency, including mixed-use development and compact urban forms. Van Eenoo and Boussauw (2023) describe how efforts to reduce cars need to incorporate more thoughtful planning of the built environment, such as avoiding large-scale suburban developments that perpetuate car-dependent practices. They emphasize a focus on developing closer to public transport and implementing measures to counteract urban sprawl (Van Eenoo & Boussauw, 2023). One example of development close to public transport is Bay Area Rapid Transit (BART) in California with initiatives to provide apartments, retail, and office spaces within walking distance of the stations (BART, n.d.). Hunter et al. (2021) say car dependency reductions need to be systems-oriented and must factor in the different levels through which car dependency is shaped. For example, the individual, social norms, socio-economic factors, capital, and political environments all need to be considered when trying to shape a reduction of dependency (Hunter et al., 2021). Van Eenoo (2025) summarizes the concept of car dependence noting we can't just "simply 'plan' our way out of car dependence by improving accessibility for low-carbon modes and hope that people will adapt behavior. Addressing this issue requires acknowledging the systemic nature of car-dependent transport systems and avoiding the tendency to individualize car dependence. It should be understood as a social and political problem" (Van Eenoo, 2025).

A formidable example of further reduction attempts that go beyond protest and infrastructure adaptations can be seen in the form of car-free or car-light neighborhoods like Vauban, Freiburg,

Germany; Lincoln, Darmstadt, Germany; Culdesac, Tempe, USA, and Merwede, Utrecht, Netherlands. Schröder and Klinger (2024) “understand the conception and implementation of car-reduced neighborhoods as a transition experiment that addresses several societal challenges at once, is characterized by uncertainty and learning, and incorporates radical changes of (planning) practices cultures, and structures”. However, this isn’t a new concept. As Jacobs wrote in her famed *The Death and Life of Great American Cities* “the car-reduced planning of new neighborhoods deviates from conventional urban development due to its transformative implications” (Jacobs, 1961).

Car-reduced neighborhoods reflect a deliberate shift in planning practices, integrating urban development and transport through both restrictive (push) and incentive-based (pull) factors to support car independency (Schröder & Klinger, 2024). These neighborhoods represent a specific type of a sustainable mobility transition where a fundamental transition of planning and governance is needed, but has rarely been studied so far (Loorbach et al., 2021). These areas function as experimental niches that question the global dominance of the private car and the planning routines that uphold it (Schröder & Klinger, 2024). Rather than isolated interventions, they represent a broader shift involving a broad range of public and private actors, institutions, and technological elements redefining what urban life without car dependency can look like (Schröder & Klinger, 2024). Private developers are often overlooked in urban historiography, playing a key role in this transformation, translating material resources into new social structures and helping to realize car-reduced futures (Verlaan, 2019).

At first glance, car dependency may appear to be merely an issue of transportation, mobility, and urban space, but as this literature review reveals, it is deeply rooted in systemic, political, and economic powers that shape planning cultures and urban development. This thesis examines two contrasting neighborhoods, each situated within distinct contexts to explore the how planning cultures influence the creation of car-free neighborhoods and how such developments are facilitated, or constrained, by their respective environments.

RESEARCH QUESTION AND METHODOLOGY

RESEARCH QUESTION

This thesis evaluates the development of car-free neighborhoods: Culdesac and Merwede. It specifically compares the planning cultures and systems that either facilitate or hinder such developments. This thesis addresses the research gap in comparative planning studies where planning culture is often an overlooked dimension (Fürst, 2009). This thesis aims to share values, practices, and institutional/legal frameworks that shape these neighborhoods including cultural, legal, and systemic factors, as well as the challenges and opportunities they present. This research goes beyond published literature by looking at real-world dynamics, decision-making processes, and lived experiences of those involved the development of car-free neighborhoods. This thesis compares the challenges to implementing community-oriented, reduced-car neighborhoods stemming from combination of factors, including car-centric urban development patterns, institutional and political barriers, site-specific constraints, regulatory and policy differences, prevailing public attitudes, and distinct economic and market conditions.

This thesis aims to answer the following **research question**:

How do the planning cultures impact developments with low-car ambitions such as Culdesac in Tempe, Arizona, USA and Merwede in Utrecht, Netherlands?

METHODOLOGY

This thesis uses a comparative case study approach to explore the complexities and differences in the development of car-free neighborhoods. Drawing on desktop research, semi-structured expert interviews, and site analysis, the methodology reflects the multifaceted nature of land development and aims to capture the cultural and decision-making processes involved, rather than the resident experience of the neighborhoods. Case studies often incorporate multiple data sources alongside extensive document analysis, and the comparative aspect offers insights into factors achieving cohesion, leading to results of great interest to policymakers (Krehl & Weck, 2020; MacCallum et al., 2019). By selecting two cases from different national contexts, this study examines how divergent planning cultures shape the development of car-free neighborhoods. Krehl and Weck (2020) emphasize the value of methodological diversity in comparative studies and the importance of transparency in research design to enable critical evaluation.

Case study selection

In comparative case study research, Krehl and Weck (2020) suggest projects answer the following questions: *How have cases been chosen? Within each case, what constitutes the case, the objective of comparison?* The two cases for this thesis were deliberately and pragmatically selected due to their prominence as car-free developments. Both neighborhoods self-identify and are externally recognized as leaders in car-free urbanism. The cases were selected based on a mix of similarities—both being both car-free neighborhoods with similar visions—and a mix of differences including national context, geographic scale, density,

governance structures, funding, and role of public and private entities. These similarities provide a basis for comparison while the differences have the potential to highlight differences in planning approaches. Additionally, practical factors such as accessibility to English-speaking stakeholders for interviews contributed to the case selection. Case study research gives insights into why and how things happen in a particular context making the comparison relevant between these two cases (MacCallum et al., 2019). Further rationale for the comparison between an American and Dutch context is described by Verlaan (2021), noting how international literature on motorization and influence on society logically focuses on U.S. because of early adoption and large road network. Verlaan (2021) writes, “placing the Dutch case study into the broader context of postwar urban change will reveal a specific approach to modernity, which departed from Anglophone models of urban planning” giving the case studies a diverging trajectory.

Desktop research

The desktop research consists of a literature review of work related to urban planning and car dependency. Additionally, planning documents, media articles, and academic studies were analyzed to obtain information about the case studies. This research provides a foundation and often went beyond the scope, providing information on which to base results. Sources were selected from peer-reviewed journals, official municipal documents, and reputable media outlets ensuring credibility. Limitations of the desktop research included translations of Merwede documents into English. Internet translators like Google Translate and DeepL were used, however there is a loss of nuances of original meaning when translated.

Site Analysis

A concise site analysis was performed to examine the siting of the case studies and their land use configurations. A general inventory of both case study sites was conducted using imagery from Google Earth to compare and make general observations about nearby amenities. Maps were prepared and analyzed using QuickOSM in QGIS. QuickOSM was used to extract OpenStreetMap (OSM) data, allowing for quantitative comparisons of amenities. By looking at neighborhood maps, a spatial view of the planning culture is revealed providing additional insight beyond policy documents. Both Google Earth and QGIS were selected due to their open availability. OpenStreetMap data is open source and updated by the public, so there is potential for inaccuracy.

Cycling infrastructure was also compared using visual cues comparing general densities and presence or lack of presence of available infrastructure. Limitations of the site analysis include reliance on secondary sources, lack of real-time observation, and discrepancies in online mapping tools. However site analysis remains important because it describes a high-level perspective on the built environment: where is the context as well as why (MacCallum et al., 2019).

A site visit to Merwede was conducted, during which notes and photographs were taken to capture insights on the neighborhood’s scale and its integration within the city. However, a comparable site analysis of Culdesac was not possible due to travel constraints, limiting direct observational data for that case.

Semi-structured expert interviews

To gain a deeper understanding of the planning cultures, individuals were interviewed using a semi-structured format. A semi-structured approach was chosen for consistency across

interviews, as well as the flexibility to explore emergent themes. These interviews allowed a further deepening of knowledge than online information, gaining histories, expert opinions and attitudes. These interviews also enabled learning more than what might be found in published literature, looking at real-world dynamics, decision-making processes, and lived experiences of those involved the development.

Participants were drawn from public, private, academic, and civil sectors. They were identified from referrals, LinkedIn searches, and websites of affiliated organizations, ensuring a diversity of perspectives. Overall, 21 potential experts were contacted via email or LinkedIn, resulting in ten confirmed participants, as seen in Table 1. Eight interviews were conducted over video call, while data from two participants was collected informally—one via email and one through email and phone conversation. Online interviews were set up and conducted via Microsoft Teams using an interview guide tailored to each participant’s background. The general interview guide can be found in the Appendix. The interviews were recorded with verbal consent. To preserve anonymity as requested by three participants, all participants are referred to by their coded name such as M1. Three current Culdesac team members were contacted for interviews, but all declined, citing an “extremely busy season” and a need to “focus on core business priorities.” As an alternative, three former Culdesac employees were interviewed. However, the data may be biased, as participants were cautious about sharing sensitive details, likely due to reputational concerns or previous non-disclosure agreements. One interviewee described the Culdesac team as generally “tight-lipped,” reiterating these limitations. These interviews took place between December 2024 and March 2025.

Table 1 List of study participants

Code	Occupation	Sector	Project	Formal Interview
M1	City of Utrecht, Mobility Team	Public	Merwede	Yes
M2	City of Utrecht, Merwede Developer	Public	Merwede	Yes
M3	Kleine Boten Club Utrecht	Civil Society	Merwede	Email
C1	Former Culdesac Employee	Private	Culdesac	Yes
C2	Former Culdesac Employee	Private	Culdesac	Yes
M4	Researcher/Professor of Spatial Planning	Academic	Merwede	Yes
C3	City of Tempe, Director Planning Division	Public	Culdesac	Yes
C4	Former Culdesac Employee	Private	Culdesac	Yes
M5	BURA, Merwede Project Manager and Designer	Private	Merwede	Yes
C5	Tempe Bicycle Action Group	Civil Society	Culdesac	Email, Phone

Data analysis and coding

Interview data was transcribed using the automatic transcription feature in Microsoft Teams and/or Notta, an online AI transcription service. After transcription, the data was manually coded into thematic categories using inductive coding: developing codes directly from the data. Quotes and themes were organized by category and color-coded by speaker in a separate document. A simplified process of these main themes can be seen in the coding tree in Figure 5. Along with handwritten notes taken during interviews, the themes were processed and analyzed to identify patterns relating to the differences in planning cultures and then written in to the analysis section based on theme.

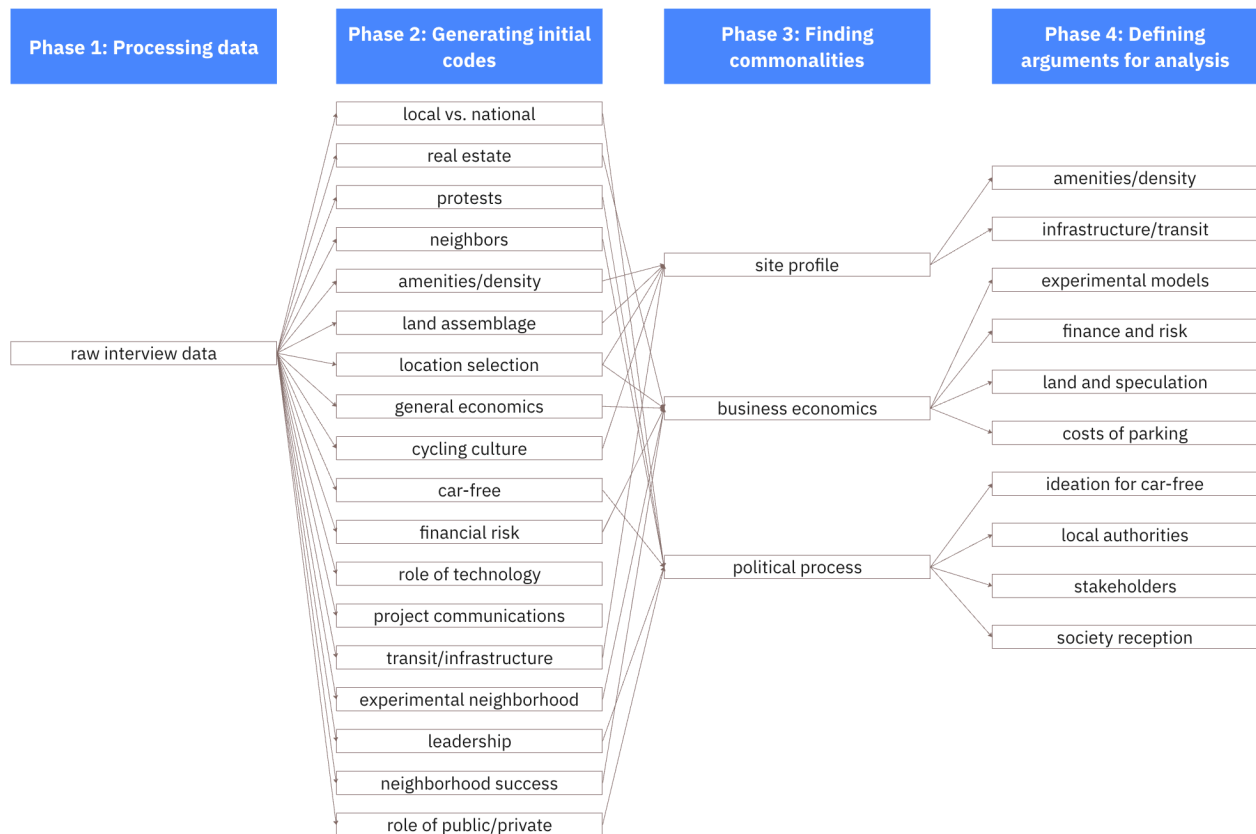


Figure 5 Coding tree of collected data. Source: Author

CASE STUDIES

The transition from car-oriented planning to car-reduced planning through the development of car-free neighborhoods is viewed as a transition experiment. The conception and implementation of these neighborhoods address several social challenges, characterized by uncertainty, and incorporating radical changes of planning practices (Schröder & Klinger, 2024). Culdesac and Merwede are just that—neighborhoods pivoting from car-friendly to car-reduced planning as part of a paradigm shift.

When introducing these case studies, it is important to clarify that in both neighborhoods, the term “car-free” does imply the complete absence of cars. Both case study neighborhoods provide parking spaces for visitors and car-sharing services. While Culdesac has no allotted parking places for *residents*, Merwede has 0.3 parking spaces per residential unit. These neighborhoods are heavily branded as car-free, yet the realities of modern life—such as accommodating deliveries—make a completely car-free environment mostly impractical. Throughout this thesis, the term “car-free” is used with the understanding that it is more of a “car-light” approach.

MERWEDE Utrecht, Netherlands

Merwede is a planned 60-acre mixed-use neighborhood in Utrecht, Netherlands, developed through a public-private partnership. Just a short distance from the city center, the site sits on a central brownfield and is part of the city’s broader strategy to address rapid population growth and rising housing demand. Utrecht has estimated a need for 60,000 new homes between 2019 and 2040 and Merwede plays a key role in delivering that housing in a way that aligns with the city’s “Healthy Urban Living” agenda (Gemeente Utrecht, 2024). This project aims to have all necessary amenities for its residents within its boundaries including things like schools, shops, doctors, and well-designed public spaces. There will be no cars in the interior of the neighborhood with inner mobility strictly for pedestrians and cycling.

Under development since 2004, the vision of what Merwede will become has evolved from early visions of individual developers to a collaborative and comprehensive urban district supported by the municipality of Utrecht. Initially, eleven landowners across seven different plots began drawing up their own individual plans. Eventually, through conversations and coordination, a more collaborative effort began to take shape. An urban plan was developed to build a cohesive vision, with support from the City of Utrecht, who also owns approximately 30% of Merwede’s land. The resulting process ran in parallel: while the plan was being developed, stakeholders worked on the vision. After nearly two decades of back-and-forth, the project officially broke ground in March 2025.

When completed, Merwede is planned to have 6000 units for rent and sale with 1800 car parking spots and 21,500 bike parking spaces. This project density averages 167 residents per acre. Merwede will have a mix of home styles: 30% of the homes will be social housing, 25% be for rent and purchase in the middle segment and 45% of the homes will be private sector for rent and sale.



Figure 6 Rendering of Merwede. Source: (VenhoevenCS architecture + urbanism, n.d.)

From the start, Merwede was more than just a housing project. The neighborhood was designed with a set of ambitions: sustainability, affordability, community, and mobility all working together. The plan centers around alternative transport, with cars physically excluded from the core of the district. Instead, there are mobility hubs on the perimeter where residents can rent, but not own, parking spaces.

Merwede is a product of Dutch planning culture. In the Netherlands, planning is characterized by a conceptual, long-term approach with strong emphasis on stakeholder engagement. Utrecht has a reputation for progressive planning, even if the national government is often more conservative (Alpkokin, 2012). An interesting characteristic of the Dutch system is that while planning is decentralized, financial dependence on national government transfers can sometimes limit local autonomy. Despite this, Utrecht leaned into participatory planning for the Merwede development, hosting sessions with citizens, investors, and other stakeholders to make sure the vision stayed grounded and inclusive. As Bossert & Middelkoop (n.d.) write, Utrecht often takes a “learn by doing” approach, and Merwede is a clear example of that mentality in action.

The development of Merwede was facilitated through technology to enhance the mobility options for residents due to the neighborhood’s low car ambitions. The municipality of Utrecht and the developers set up a mobility technology company who is responsible for selection and purchasing of shared mobility services. They also aim to improve air quality and reduce noise pollution, promoting alternatives to car use—such as physical activity—through innovative mobility management strategies. This mobility technology was key to make the low car goals a reality for the project.

Not everyone sees Merwede as a perfect model. Some critiques have flagged potential issues with affordability and access, especially when it comes to who can afford to live there or pay for a car parking space in an indoor garage. With any large-scale development, questions around

gentrification and equity are part of the conversation. While the project checks a lot of boxes from a sustainability and mobility perspective, its success will depend on how it's lived and used by actual residents, something that will be unearthed in several years.

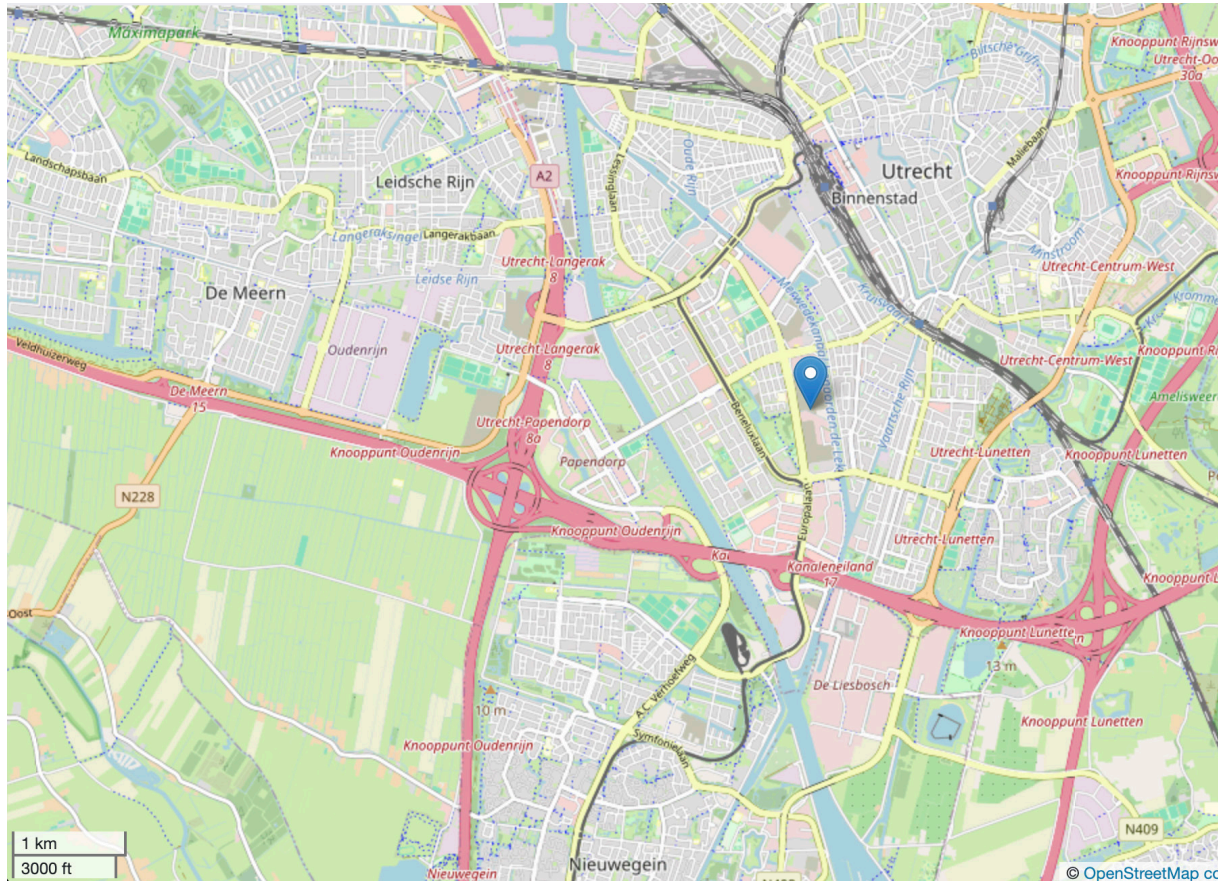


Figure 7 Location of Merwede in central Utrecht. (OpenStreetMap contributors, 2025)

MERWEDE KEY FACTS

Size: 60 acres (24 hectares)
Units: 6000 units
Residents: approx. 10,000
Density: approx. 167 people per acre
Parking spaces: 1800 residential, guest, visitor and retail spaces
Bicycle parking spaces: 21,500
City of Utrecht Population: 374,374 (2024)
City of Utrecht Size: 93.77 km²
City of Utrecht Density: 3992 people /km²

► **Figure 8** Rendering of the Merwede Project. (Merwede, n.d.)





Figure 9 Rendering of the Merwede Project. (Merwede, n.d.)

CULDESAC Tempe, Arizona, United States

Culdesac Tempe is a privately developed 17-acre car-free mixed-use development in Tempe, Arizona, USA. It is the first fully car-free neighborhood built from scratch in the U.S. and represents a break from the conventional auto-dependent American neighborhood. Developed by a startup that blends technology and real estate, Culdesac aims to “build cities for people, not cars.” By eliminating residential parking and integrating commercial spaces, green corridors, and transit connections, Culdesac leans into the idea that mobility and lifestyle are connected, and that removing builds community. At its core, the neighborhood isn’t just about design, it’s a mission-driven attempt to reframe urban life in a car-dominated country and provide consumers options on how to live their life.



Figure 10 Culdesac retail and apartments. (Culdesac, 2024)

Culdesac initially broke ground in November 2019, and welcomed its first residents in the first phase of buildings in 2021 (Opticos Design, n.d.). As of March 2025, the project has completed two construction phases, with phase three currently under review by the City of Tempe. Once completed, the project will consist of 1000 residents throughout 636 apartments. While the neighborhood has no allocated parking spaces for residents, it has 125 parking spaces, for visitors, guests, and retail. Despite this limited on-site parking, residents are prohibited through their lease contract from parking a car within ¼ mile of the neighborhood. The project is estimated to have cost \$140-170 million, backed by investors through various means of funding. Units at Culdesac are rented, with no units for sale only lease. This project is considered an example of Transit Oriented Development (TOD) and was built on an existing brownfield previously owned by the city who acquired the land during construction of the Valley Metro light rail.

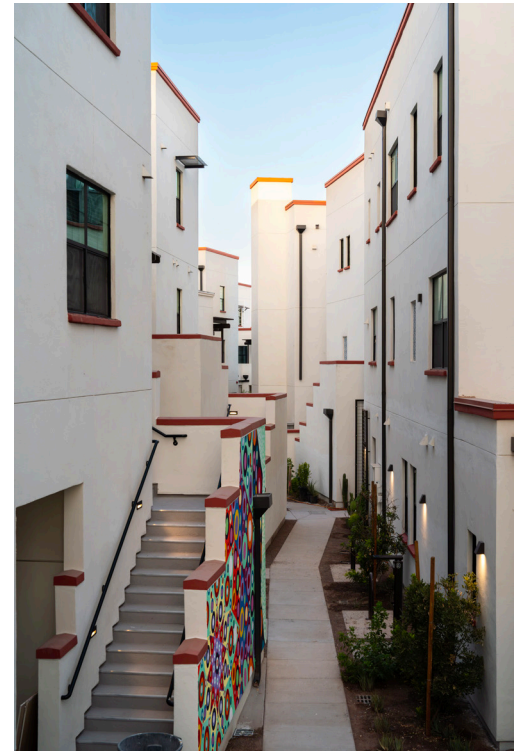
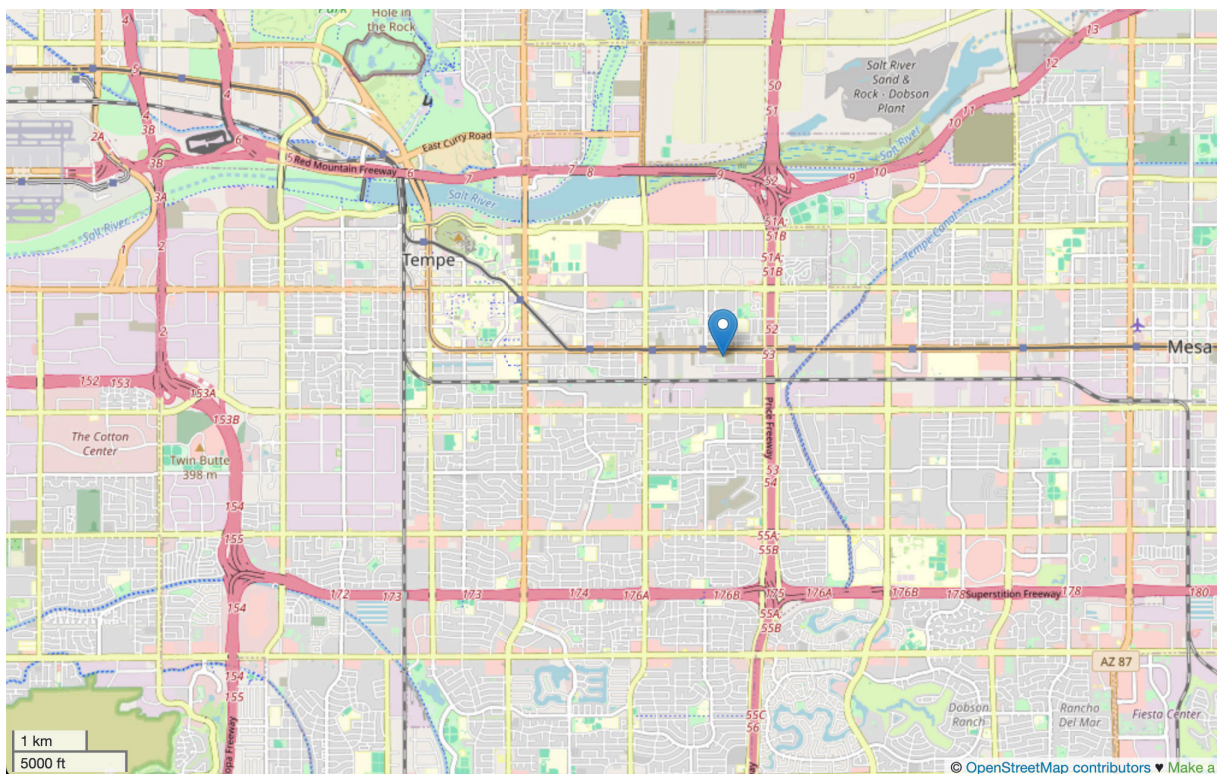


Figure 11 Culdesac walkway. (Culdesac, 2024)

Culdesac is a deviation from the typical “5-over-1” apartment complexes commonly found in the United States. The 17 acres are designed in a way to “focus on urbanism and placemaking” inspired by Greek and Italian historic villages with irregular, narrow meandering paseos and exterior facing doors, averaging three floors (Opticos Design, n.d.). Since infrastructure for the car didn’t use space within the development, the design had room for things like courtyards and community plazas. This was a strategic placemaking approach, with design pushing back on the typical sprawl and separation that defines postwar American suburbia.



CULDESAC KEY FACTS

Size: 17 acres (6.9 hectares)
Units: 636 units
Residents: 1000
Density: approx. 59 people per acre
Parking spaces: 0 residential, 125 guest spaces
Bicycle parking spaces: 1000+
Cost: approximately \$170 million
Opened: 2021 (Phase 1)
City of Tempe Population: 189,834 (2023)
City of Tempe Area: 104 km²
City of Tempe Density: 1825 people/km²

Mobility is a central focus of the project, not just as infrastructure, but as a lifestyle shift. Residents receive unlimited Valley Metro passes and are encouraged to rely on shared mobility, biking, walking, and transit. The developers emphasize the role technology has played in the feasibility of this neighborhood. Ride-hailing, car-sharing, and autonomous vehicles enable a personalized and convenient approach to mobility at Culdesac.

Tempe is part of the sprawling Phoenix metro area cited as one of the most car-dependent regions in the U.S. (Kane et al., 2014). Arizona's lax annexation laws, cheap land, and postwar

construction boom created what some call "sunbelt morphology" consisting of wide, spread-out, low-density development (Reft, 2013). Still, urban areas like those in the City of Tempe are trying to shift the narrative. The city has adopted more transit-oriented planning through documents like Tempe Tomorrow and the 2050 General Plan, and its commitment to light rail is part of a broader strategy to reduce car reliance (Iwaniec & Wiek, 2014). Culdesac fits into this as a private project that intersects with public infrastructure and evolving planning goals.

Culdesac has been widely covered and generally celebrated in the media, with features in The New York Times, The Guardian, Dwell, Strong Towns, and others. It's often described as a bold move, or a glimpse into what post-car American neighborhoods could look like. That said, it's not without critique. Some argue that it caters to a narrow demographic consisting of young, tech-savvy, often childless renters who work remotely or have flexible jobs. Just like Merwede, others raise concerns about affordability and access.



Figure 13 Rendering of Culdesac restaurant. (Culdesac, 2024)

RESEARCH FINDINGS AND RESULTS

Research findings on local planning systems supporting or counteracting developments with low-car ambitions are presented in this section. The results and analysis are broken down into four sections, arranged and designed to follow a logical pattern of development. The first section discusses how the neighborhoods were shaped to be car-free. This is followed by a site profile, analyzing and identifying key contexts of each case study site, providing characteristics of the projects and differences between the two. Amenities and cycling infrastructure are analyzed as part of the site analysis. Next comes findings on the business economics of the two case studies including viability perspectives, and developer logic regarding these case studies, touching on real estate market conditions. The last section of the analysis includes insights on the political process describing how actors are involved in the realization of final plans. While there are commonalities between these case studies, the differences are emphasized over similarities, using the case studies to learn more about the effects of planning systems on the neighborhoods' development.

CONCEPTUALIZATION OF CAR-FREE

This section details the early stages of development, focusing how Culdesac and Merwede each came to adopt a car-free model. While both neighborhoods share this concept, the idea of becoming car-free took shape through different processes in each case. The creation of car-free neighborhoods can be described and supported by the idea of development from above (top-down) and from below (bottom-up). Top-down development refers to decisions made by central authorities or policymakers, often imposing policies on communities without their direct involvement (Arnstein, 1969). In contrast, bottom-up development emphasizes grassroots participation, where local communities and individuals play an active role in shaping their environment and policies, advocating for more inclusive decision-making processes (Harvey, 1989; Jacobs, 1961).

Culdesac is an example of a neighborhood shaped more so from below than above. This is seen in the ambitions of the team and supported by planners and literature. Co-founder Ryan Johnson aimed to build a strong sense of community, reduce car dependency, and lower household costs—goals that required Culdesac to be car-free by design. He also emphasized a bottom-up approach, focusing on resident needs and grassroots involvement from the beginning (Ride AI, 2022).

Culdesac's approached development by finding a site with existing infrastructure that supports a car-free lifestyle, then they worked on modifying policy to bring their idea to life (Mile High FI Podcast, 2024). At the time of negotiations, for example, the City of Tempe had required parking minimums in the city code and Culdesac worked with the city to lower the required parking minimums. The team established a good design and created a market for an area that's walkable and presented these ideas to city planners, successfully securing support from the city. C3 described this as a collaborative effort, necessitating commitment from the City Council to develop an agreement outlining the code reliefs. Another example is how Culdesac was able to also change the zoning designation for some units to have a live/work classification, allowing retailers to live and operate a business in the same unit, an arrangement uncommon in Tempe and much of suburban U.S. (Culdesac, 2022). C3 said the Culdesac team's

commitment and objectives of attaining a car free community helped make the idea become reality. Schröder and Klinger (2024) write the “courage and perseverance of engaged planners, politicians, and citizens is needed to deviate from established planning practice” and the team surrounding the development of Culdesac proves this.

Culdesac pushed through boundaries of zoning and planning frameworks, with local planners and policymakers reacting to market demands. When discussing the development of car-dependent versus car-independent districts, C4 noted that the architects of car-dependent America thought boldly and broadly, reshaping the world on a massive scale. In response, C4 argues, today’s developers of car-free neighborhoods must embrace in a similarly bold and broad vision, one that reimagines cities in a fundamentally different direction, reinforcing the argument of Culdesac being bottom up. C4 describes the Culdesac vision of creating people-oriented neighborhoods that fill a core human need currently not getting met in America.

Meanwhile, the implementation of a no-car/car-light mandate in Merwede is more top-down, though there is some room for flexibility within this characterization. **From early discussions of Merwede’s development, it was mandated by the City of Utrecht that the neighborhood district would need to be low car to be developed.** Following an Environmental Impact Assessment (EIA) report, the city laid the stipulation that the neighborhood could not bring any more traffic, nor noise pollution, to the arterial streets. If it were to have followed a “conventional development scheme for homes with one parking space each,” the project would not have been feasible for city approval; it only became possible with a combined innovative mobility arrangement that limits traffic generation (Riemens et al., 2021; Van Den Hurk et al., 2021). M5 explained that during the early phases of development, there were debates over the exact number of parking spaces—ranging from completely car-free to 0.7 spaces per unit. Ultimately, the decision settled at 0.3 spaces per unit. **This outcome was shaped by technical requirements built in the EIA report and mandated by city authorities, reflecting top-down**

decision-making. However, the process still allowed room for negotiation within the broader low-car framework, even if the development teams were not fully involved in setting the initial parameters.

Figure 14 shows a tweet with commentary from Peter Pelzer, an academic who has researched Merwede, on this legal mandate showing that the decision from above was presented with other messaging, possibly as a distraction.

M2 describes the initial process of Merwede

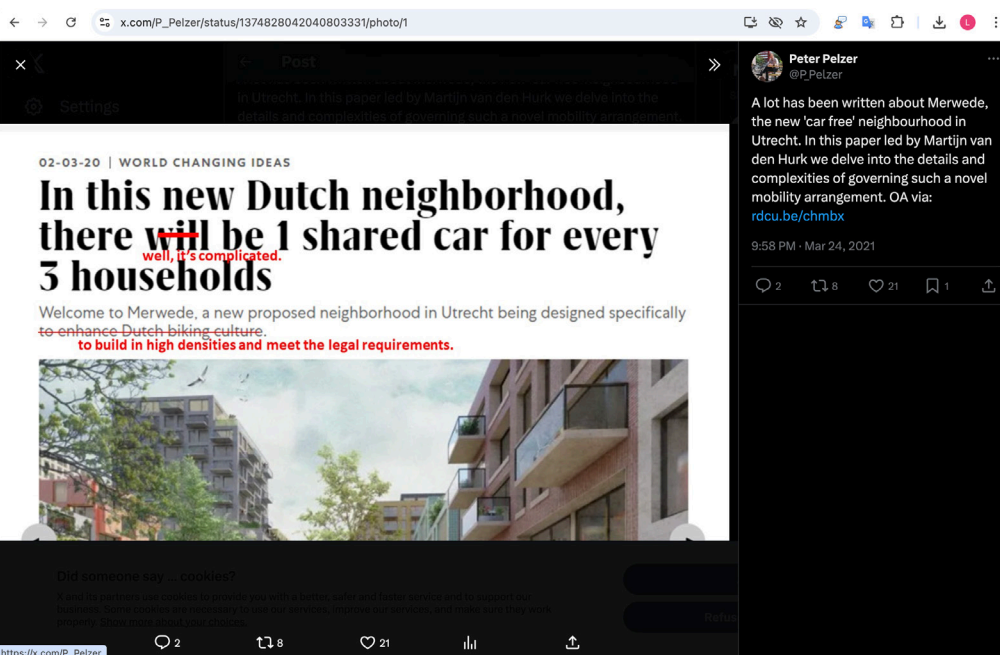


Figure 14 Tweet critiquing Merwede. (Pelzer, 2021)

as straying from how typical Dutch development goes. They describe how it is common in the Netherlands for a solo project developer to acquire land, create a plan, and work out negotiations with the city. But in the case of the Merwede site, with so many landowners and developers, if this were to happen, it would lead to a very unpleasant neighborhood. The unique combination of landowners forming a consortium, along with the unified urban plan and the city's dual role as both landowner and municipality, created a unique positioning—allowing the project to be developed both from a top-down perspective and as a regular stakeholder.

These contrasts in development highlight differences in planning cultures. In the U.S. case, the private sector shows a willingness to innovate, pushing for a car-free vision and navigating challenges with persistence. Meanwhile, Merwede reflects a public sector approach focused on maintaining livability by preventing traffic congestion and limiting parking, while still meeting housing needs of a growing city. A key distinction is seen in ownership and control: in the Netherlands, housing is publicly developed and owned by the city, whereas in the U.S., it is predominantly privately owned. Dutch planning tends to be more centralized, with clear mandates from city planners and policymakers to align with efforts from Utrecht's broader vision of healthy urban living, reflecting urban sustainability and climate action from a more liberal government.

SITE PROFILE

A site profile looking at the material element of the case studies show where the neighborhoods are situated in their greater urban context and how the location impacts nearby amenities and transportation infrastructure. To understand planning cultures surrounding the two different case studies, a land use inventory was conducted on how neighborhoods are embedded in the urban fabric, analyzing present-day morphology. Prevalence and location of amenities are explored, as well as how density impacts them. Following the amenities section is an overview of the cycling infrastructure, how it is impacted by local planning cultures, and how it all connects to the development of car-free neighborhoods.

LAND USE

A simple land use inventory of the two case studies was conducted using observations from Google Earth and city zoning plans, supplemented by findings from expert interviews. These inventories examine how nearby land is used to understand the site conditions and the local planning cultures contributing to existing land use. The findings of this inventory for Culdesac and Merwede are summarized on annotated maps, Figure 15 (Culdesac) and Figure 16 (Merwede).

The land use inventory of Culdesac is marked by multi-family residential apartment complexes to the east and west, single family residential homes to the north, and industrial and commercial uses to the south. The AZ State Route 101 beltway is one block east of the site. The light rail runs directly north of Culdesac along Apache Blvd. There is an elementary school nearby and a small park. Tempe is a desert climate, resulting in not much vegetation. There is some vacant and undeveloped land nearby the site. C3 revealed the industrial corridor along Apache boulevard is in the process of renewal, with new growth kick-started thanks to the installation of the light rail, which opened in 2008. C3 said the city has tried to attract high-density developments that rely less on automobiles to build along the light rail. While the inside of the Culdesac neighborhood

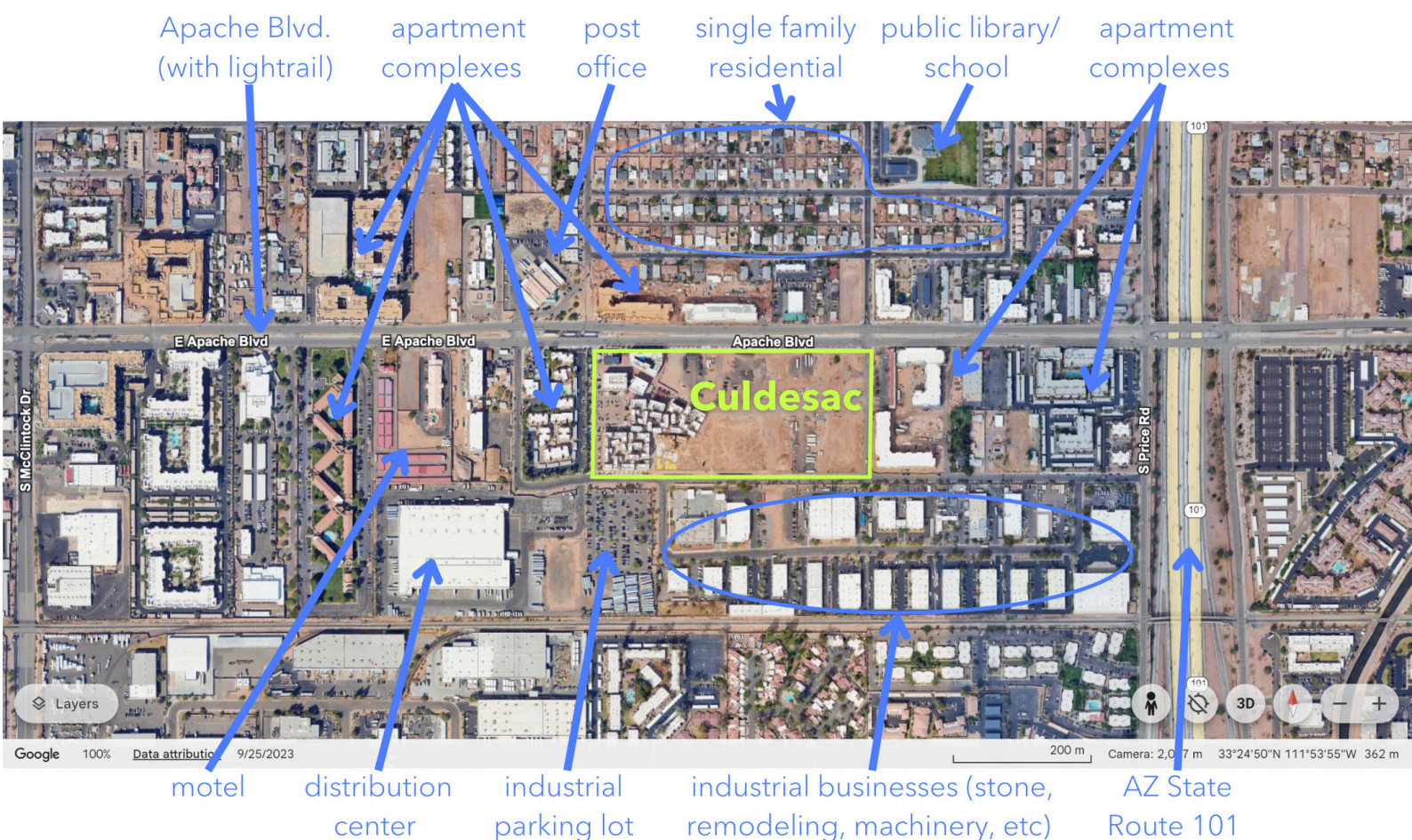


Figure 15 Culdesac neighboring land uses. Source: Author, Google Earth

is designed for car-free living, it's clear that the environment immediately outside of the neighborhood was not. The City of Tempe's investment in the light rail along Apache Boulevard has brought connectivity, but in immediate proximity, it is primarily surrounded by residential, industrial functions.

The land use inventory of Merwede (Figure 16) tells a different story. There are nearby high-density apartment complexes to the north-west and south, and medium-density terraced houses (rijtjeshuis). Schools, shops, and pharmacies interspersed in neighborhoods to the east of the Merwedekanaal. There are essential amenities like a medical center, park, and existing grocery stores nearby. A set of office buildings and more apartment buildings are just south of Merwede. The neighborhood is situated on a canal with multi-use path with cycle connectivity to different paths around the city. Directly to the west is the Transwijk Park, providing ample access to recreational open space. There is vacant land to the north of the site, although this land is planned to become an expansion of Merwede in the future. Utrecht Central Station and Utrecht city center are also not far from the site.

These differences in land use surrounding the two neighborhoods can be attributed to zoning, which contributes to how land is used in both the U.S. and the Netherlands. Zoning plans in the U.S., especially in suburban areas, typically divide the land into single, segregated uses. **The City of Tempe zoning plans reveal that Culdesac is zoned for mixed-use, and is situated**

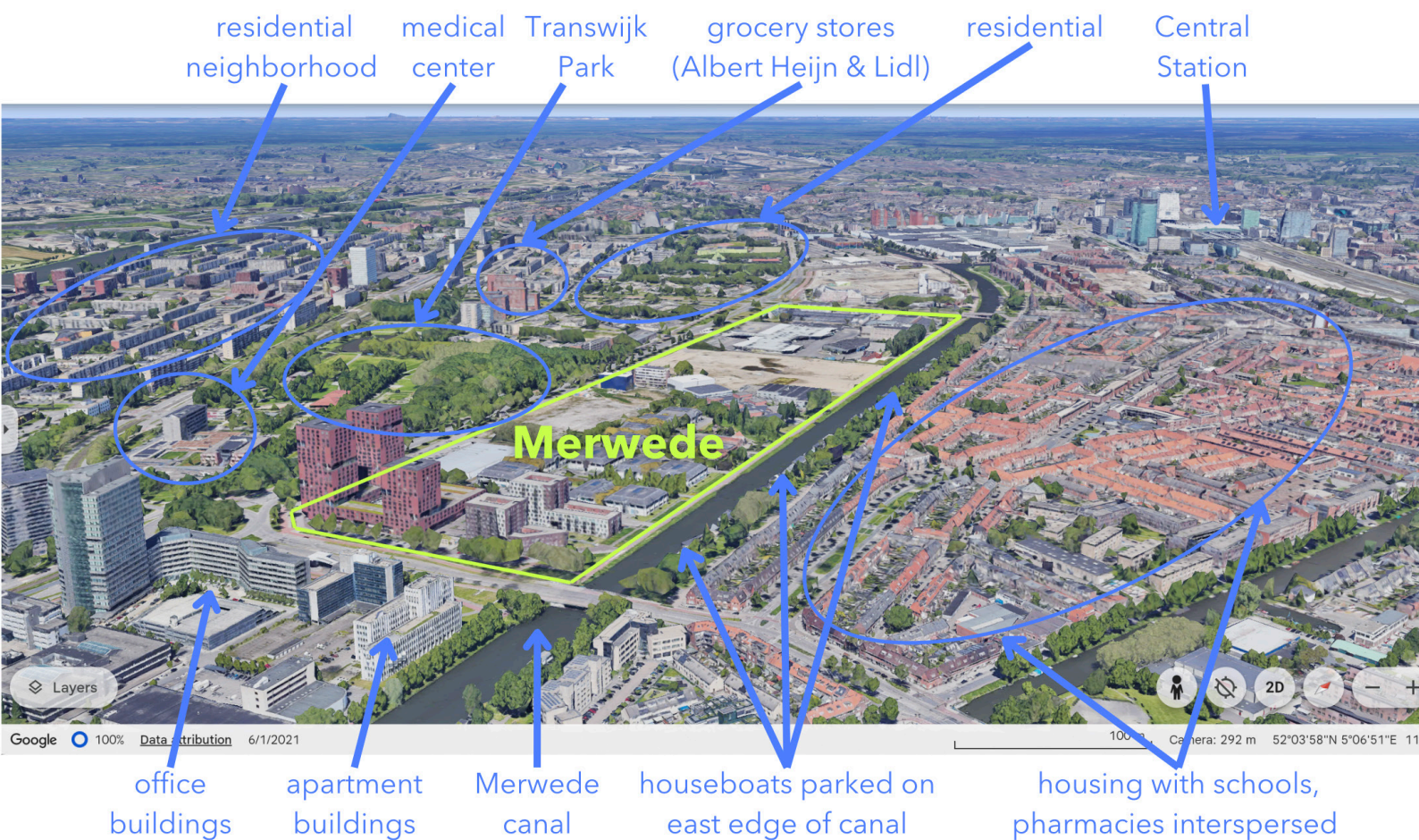


Figure 16 Merwede site situated in greater Utrecht context. Source: Author, Google Earth

in the middle of mixed-use, commercial, and general industrial districts all along Apache Blvd., with low-density residential just to the north and south of this corridor (Figure 17). Kane et al. (2014) note there is a lack of effective institutional controls on land use in postwar Phoenix, which can result in an urban landscape where industrial uses create a nuisance for higher order residential or retail uses (Kane et al., 2014). On the other hand, zoning in the Netherlands is generally far more flexible and integrated. **The Netherlands uses function-based and mixed-use zoning, particularly under the new Omgevingswet (Environmental Planning Act). Dutch zoning is comprehensive, adaptive, and sustainability-driven, contrasting with the U.S. model that often separates functions rigidly and, when coupled with limited public transport, continues car dependency.** These planning cultures show differences in how zoning and land use are thought of in the two contexts.

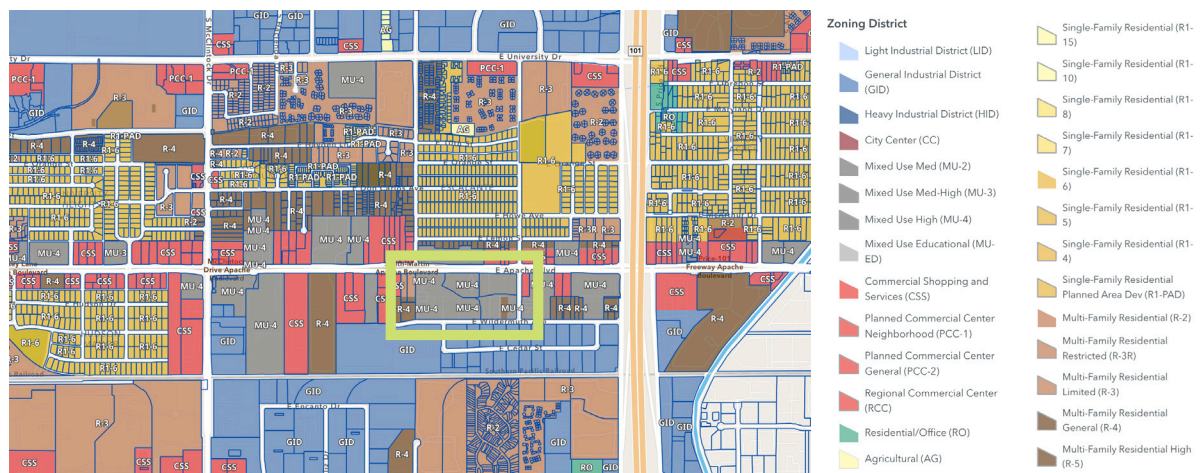


Figure 17 City of Tempe Zoning Plan along Apache Boulevard. Culdesac outlined in green. (City of Tempe, 2025)

NEARBY AMENITIES

After conducting a simple land use inventory of the two case studies, a dedicated amenity map was created in QGIS (Figure 18) highlighting the presence of nearby schools, theaters, grocery stores, and doctors. The presence of nearby amenities such as grocery stores, doctors, and schools are what make places attractive for living and working and is linked to the goal of urban livability (Allen, 2015; Jama et al., 2025). Furthermore, the diversity, location, and quality of urban amenities has a critical impact on quality of life, making this an important metric to analyze (Kaufmann et al., 2022). Opportunities for people living in urban areas with scarce access to amenities often lose attractiveness and cause relocation to areas with more attractive amenities (Kaufmann et al., 2022). These amenities were identified using QuickOSM. One- and two-kilometer radii from the project centers were added for scale and easier interpretation. Table 2 shows the number of amenities surrounding the case study neighborhoods.

Table 2 Approximate number of basic amenities in Tempe and Utrecht

	Tempe, Arizona, USA	Utrecht, Netherlands
School	12	33
Theater	3	4
Grocery Store	11*	19
Doctor	1*	15

*including those built by Culdesac

Building off the initial land use inventory of the Culdesac neighborhood, the amenity map highlights a contrast in the availability of essential services between the two sites. The data suggests that Tempe has fewer amenities within a walkable distance, particularly in categories like medical and grocery stores. Before Culdesac built its own grocery store, the nearest one was over one kilometer away, reinforcing the car-dependent nature of the urban fabric. **This spatial diversity is influenced, again, by zoning separating residential and commercial uses, making amenity-rich neighborhoods less common in the U.S. than the Netherlands from as early as the 1930s.**

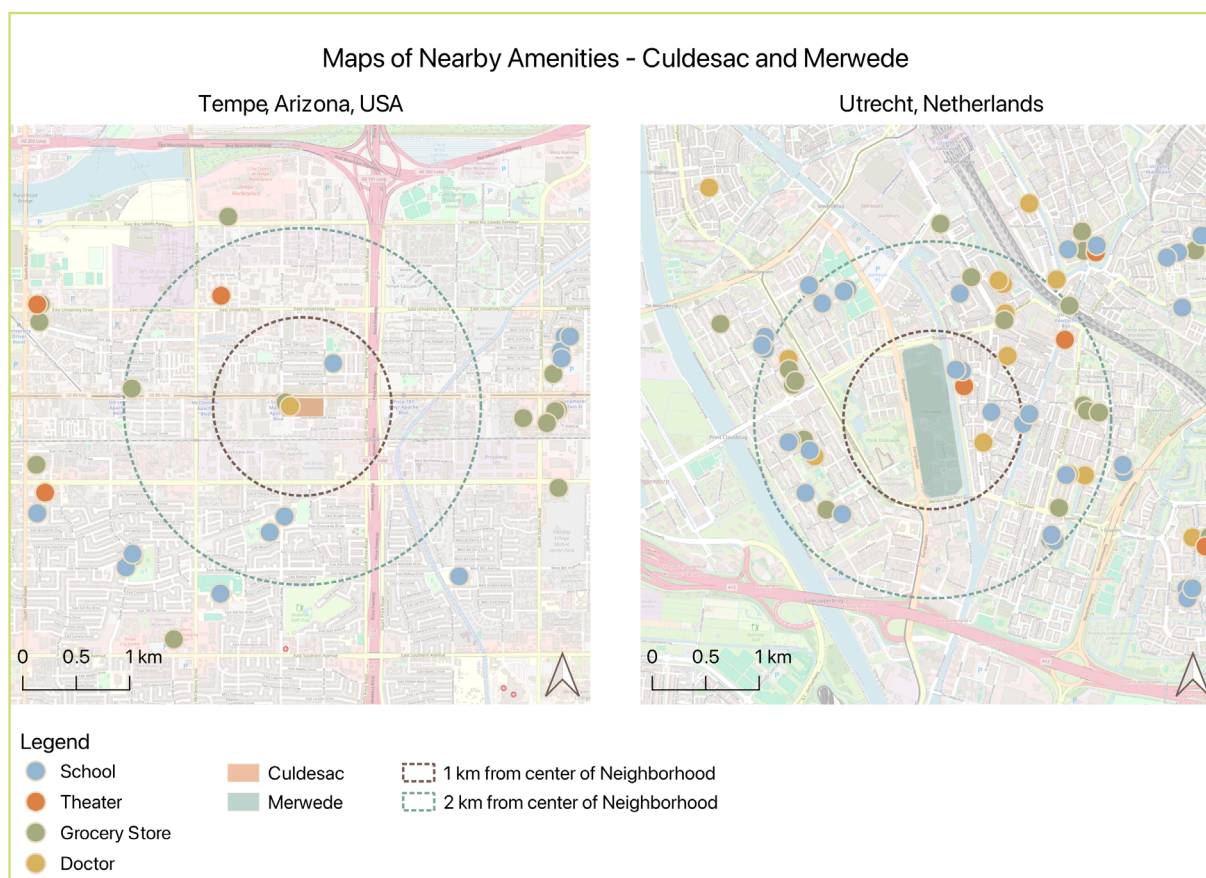


Figure 18 Maps showing nearby amenities. Source: Author

One factor important to consider when looking at prevalence of amenities in neighborhoods is the population density. Although there is no clear consensus on the effect of density on the goal of achieving diverse urban amenities, high density is believed to be the main tool to achieve amenities, which contributes to urban livability (Jama et al., 2025). Given that Utrecht (3991 people/km²) is more densely populated than Tempe (1825 people/km²), the initial findings align with expectations as higher densities typically have a higher concentration of amenities within walking distance (Jama et al., 2025). However, adjusting these numbers for population density, as seen in Table 3, shows a more nuanced picture. When adjusted for density, the availability of amenities in Tempe appears comparable to Utrecht in some categories—such as grocery stores and theaters, suggesting the disparity may be attributed to differences in land use planning. The existing car culture in the U.S. results in amenities more spread out, despite having the same number of amenities per person. **While the number of amenities per person may be similar when adjusted for density, the spatial distribution shaped by low-density urban planning and car-oriented development in the U.S. has led to a landscape with dispersed amenities, reinforcing automobile dependency, in stark contrast to the compact, high-density planning in Utrecht.**

Table 3 Number of basic amenities in Tempe and Utrecht (adjusted for density)

	Tempe, Arizona, USA (Adjusted)	Utrecht, Netherlands
School	25	33
Theater	6	4
Grocery Store	23	19
Doctor	2	15

This comparison alone does not explain the structural differences where planning culture plays a significant role. In the Netherlands, urban planning policies prioritize compact, high density, mixed-use development with interspersed services, which is evident in Merwede. While location is permanent for these neighborhoods, the developers of the neighborhoods had the opportunity to choose what amenities went into the neighborhoods. Interviews revealed that proximity to amenities and site considerations were key during the planning process.

M5 emphasized from the beginning the project was to be more than just a residential development—it was designed as a self-sufficient district supported by the City of Utrecht where daily needs such as schools, shops, and recreation could be met within walking or cycling distance. This reflects planning culture where infrastructure and amenities are seen as essential components of livability and sustainability and not zoned to separate areas. In contrast, Culdesac, as a privately led development within a larger car-oriented city, does not have the same level of municipal coordination and integration. C4 noted that because the project is smaller in scale and integrated into an existing city, it relied on pre-existing external amenities rather than incorporating extensive infrastructure within its boundaries. **The differences between building a complete urban district vs. knowing the project will rely on external amenities also show a contrast in developer mentalities and perceived responsibilities, which can be attributed to the differences in public vs. private development.**

While Culdesac benefits from proximity to the light rail, it remains dependent on external factors beyond the control of developers. As C4 described: “The further you are from those amenities, the more you need to build them yourself. Are you going to be able to take that risk? Will you have enough residents?” Culdesac remains attached to the limited light rail transit system, which does not provide comprehensive coverage to the region revealing constraints of car-free living in an environment built for the car. In contrast, Merwede’s approach recognizes the necessity of embedding amenities into the plan from the beginning, reducing the need for outward travel, showing a holistic model of community-focused urban development.

Culdesac co-founder Ryan Johnson commented on the presence of nearby amenities and the tendency of the U.S. to build on green fields, which are hard to “start cold” as car-free neighborhoods due to car dependency (Mile High FI Podcast, 2024). He said that the U.S. has forgotten how to build new cities, besides the standard rinse and repeat developer tracts (Mile High FI Podcast, 2024). This analysis of the nearby amenities shows differences in how services are integrated into Merwede and Culdesac’s plans and surrounding urban fabric. The surrounding contexts significantly influence the accessibility of daily necessities. **The Netherlands’ mixed-use zoning and higher density naturally support more essential services, while Tempe’s lower density and zoning constraints show a reliance on further external services, continuing dependence on car-based infrastructure.**

CYCLING INFRASTRUCTURE

When looking at the site profile of car-free neighborhoods, it's important to consider the surrounding transportation infrastructure, especially cycling infrastructure which is not just a convenience, but a necessity. Both the Culdesac and Merwede teams emphasize cycling as a critical part of supporting a car-free lifestyle. C4 mentioned developing a strong transportation plan is key to making these neighborhoods work and both Culdesac and Merwede include comprehensive mobility strategies as central parts of their overall neighborhood plans. This section evaluates the cycling infrastructure of Tempe and Utrecht, looking at local planning cultures, to see how cycling is integrated into the neighborhoods' development.

A visual analysis shows the difference in built infrastructure between the two neighborhoods. Figure 19 and Figure 20 show the cycle routes in Tempe from OpenStreetMap and the City of Tempe. Presented at roughly the same scale, Figure 21 shows cycle routes in Utrecht from the same layer in OpenStreetMap. A stark contrast is seen between the quantity of cycle routes in Utrecht and Tempe, where the city of Utrecht appears to have an entire additional layer of bikeway infrastructure. There is potential for the bikeways in Tempe to connect more of the city, but it is not quite there yet. Furthermore, many of the bike lanes in Tempe are just pavement markings at a minimum of four feet (1.2 meters) wide, while the lanes in Utrecht are separate, protected cycle paths (City of Tempe, 2023). Utrecht is well developed and connected, much more than just the potential as seen in Tempe.

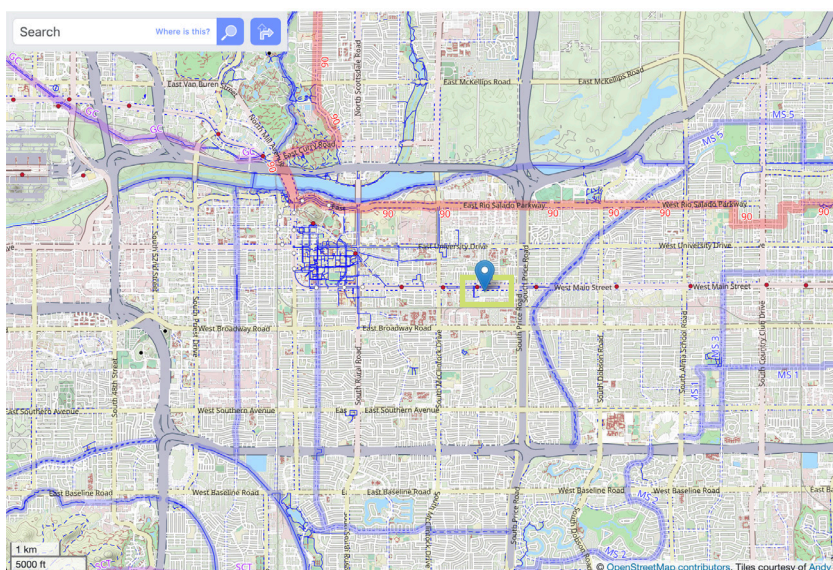


Figure 19 Cycling map of Tempe, Arizona. Culdesac outlined in green. (OpenStreetMap contributors, 2025)

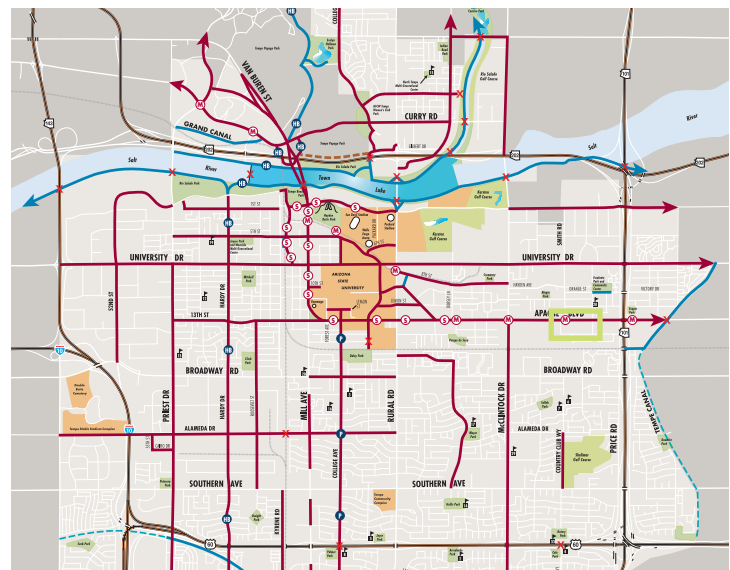


Figure 20 Tempe Bikeway Map. Culdesac outlined in green. (City of Tempe, 2023)

In Culdesac's communications, cycling (especially on electric bikes) is pushed as an almost-perfect alternative to the car, claiming it's availability is just like that of a private car, always being there when you need it. However, with this selling of the e-bicycle as the alternative to the car in a car-dominated landscape, the cycling landscape doesn't quite make it a perfect alternative. Phoenix has been described as representative of a "20th century form of American urbanism described as rapid decentralized suburban growth, often at expense of urban planning" (Kane et al., 2014). The metropolitan area has a long history of building for the car as sprawling city. Cycling on roads with heavy car traffic isn't the safest for the cyclists. Culdesac

recognized this need for improvement in existing cycle pathways so residents and other cyclists feel safe getting around town.

C2 described the Culdesac team’s awareness of a need for improved bike lanes in Tempe. The former employee said the team took a grassroots approach and went door to door speaking with nearby residents on their interest in more bike lanes in the neighborhood, garnering support. C2 said these efforts didn’t result in more bike lanes being built immediately, but it was reassuring to the Culdesac development team that neighbors were receptive to the idea of more lanes. C5, a member of Tempe Bicycle Action Group, said Culdesac had “outsize influence” on bike lane improvements on Smith Road—a collector road that goes from the neighborhood to a commercial area with grocery stores and other shopping. C1 described how the planning design of bike lanes in Tempe is not the same planning process for bike lanes in the Netherlands. “They’re more incorporated into the greater urban fabric [in Utrecht] and not just slapped on a major through street as an afterthought because one new development wants door-to-door access,” they said, in acknowledgment of the differences.

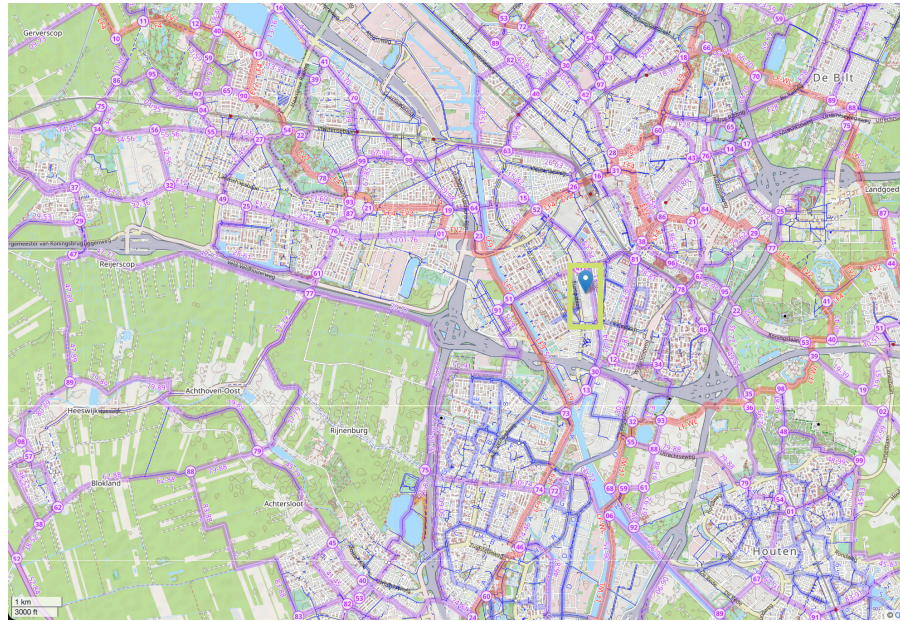


Figure 21 Cycling map of Utrecht, Netherlands. Merwede outlined in green. (OpenStreetMap contributors, 2025)

A key difference between planning cultures is the protection of cyclists through dedicated bicycle paths, but also in the legal framework. Cyclists and pedestrians are protected legally in the event of an accident with motor vehicles as more vulnerable users. The City of Utrecht actively promotes cycling through initiatives such as dedicated programs that teach residents how to ride. M1 described how the city leads these programs, typically for lower income people, and helps provide them with bicycles and workshops for repairs. This can be considered intangible cycling infrastructure that contributes to the cycling culture, and therefore planning culture. Furthermore, M1 also described how adding bike parking won’t necessarily make any city into a cycling city overnight. It takes small steps over a long time. Applying this to Culdesac for example, adding a few more lines on the road doesn’t make drivers more accepting or people more willing to hop on a bike. While the City of Tempe doesn’t have an in-house cycling mobility program as a governmental initiative like Utrecht, it does partner with groups like the Tempe Bicycle Action Group on cycling events and education workshops at a much smaller scale.

It’s well known that present-day Netherlands has a strong cycling culture and extensive, developed cycling infrastructure. Merwede developers assumed that the existing cycle culture would successfully contribute to the project’s mobility plan. Several Merwede interviews said one of the reasons the project can work where it is planned to be built is thanks to the high biking culture and high bike/motor split. M4 noted without the existing Dutch cycling culture, the project of Merwede would’ve been much more difficult. M1 mentioned that the City of Utrecht is an international example of a cycling city. They said international delegations are coming to

Utrecht to see how it's done as well as the Dutch cycling embassy being in Utrecht, which is a public-private partnership centered around positioning the Netherlands as a cycling country and bicycle inclusive mobility.

Merwede is counting on its existing cycle culture to be a contributing factor for its success, while Culdesac is anticipating that new technologies will provide some of its mobility solutions. C4 described these differences in anticipated transport modalities between Merwede and Culdesac. The Culdesac team predicts people will move around the city in rental, ride-shares, or autonomous (Waymo) vehicles. Culdesac developers anticipate that the residents will continue to use the existing car infrastructure despite not necessarily using a private car. This leads to questions: Will the city still be car dependent but with more alternatives like autonomous vehicles already present in the city? Will they park in a lot outside of town to save urban space? Developers in Utrecht understand that even if Merwede residents still have a car and park it in a garage on to the city's ring road, they will still access it via bicycle, which shows the continuing dominance of the cycle culture.

There are stark differences between the established cycling infrastructure in Tempe and Utrecht, showing a clear difference in planning culture priorities. Despite these differences, the important thing is that cycling infrastructure exists on the present-day sites—in Merwede as a mobility foundation for the project, and Culdesac as a potential for increasing. The Culdesac team's grassroots initiatives, combined with the increase in cycling that comes from residents living without cars, will likely lead to more people on bikes. This growing demand could, in turn, drive the development of additional cycling infrastructure to support and sustain the shift. The induced demand theory proves that the more cycling infrastructure there is, the more people will use it. Now that the sites have been critically analyzed in terms of land use, amenities, and cycling infrastructure, the next section will examine additional factors, such as economic considerations, to further compare the planning cultures of the two case studies.

BUSINESS ECONOMICS

Economic forces play a significant role in the production of urban space, shaping how and why developments like Culdesac and Merwede come to life. As professor in real estate development Richard Peiser wrote in 1990, "it is developers, working within existing political and economic institutions who plan America—at least its built environment" and this still rings true 35 years later (Peiser, 1990). Historically developers have been overlooked in the transformation of space, yet they are central actors navigating a variety of intricacies such as risk and regulatory environments (Verlaan, 2019). Planning cultures surrounding the context of the development of these two case studies are strongly tied to the business economics underpinning them, whether that be the startup ambitions of tech-minded urbanists, or long-term investment strategies of large developers in high-demand markets. This section compares the business economics of each case, exploring the role of finance and risk, how density and speculation shape land value, and the neighborhoods' positions as experimental urban models. While there are many intricacies of business economics, such as real estate finance, this section focuses broadly on topics as they came up in interviews, rather than exploring the technicalities at a granular level.

PROJECT PROFITABILITY AND FINANCING

Developers have a financial stake in their projects, whether their goals are short-term or long-term. As Harvey (2008) explains, capital flows into and through land with the expectation of returns—investment demands reward. Developers are unlikely to build unless there is something to gain in return. Although the Culdesac neighborhood is marketed as a car-free urban oasis, it's clear the development team wasn't just focused solely on promoting a vision of car-free living in America; they were also pursuing it as a business venture. Culdesac is a startup real estate and technology company, of which primary motivations are often making a profit in addition to providing a service. The founders of Culdesac previously launched a digital platform selling real estate online, generating over \$1 billion in revenue. Given their success, it only makes sense their next move is to innovate further in the real estate sector, leveraging existing skills, connections, and reputation. This time, they turned their attention to a physical neighborhood, designed to offer residents a lifestyle based around alternative transportation.

In Merwede, with a bigger consortium of developers and landowners, the story is slightly different. Before the landowners came together under one unified plan, individual landowners were initiating development on their land, not necessarily to create a car-free oasis, but presumably because a profit could be made thanks to the growing demand for housing in Utrecht as well as the desirable, central location. Through oversight from the city and teamwork from planners and designers like the BURA team who designed the cohesive urban plan, a final product was created that aligned with all owner and developers' aspirations to have a profitable outcome as well as meet the project ambitions.

During interviews, M2, C1, C2, C3, and M5 all mentioned financing as a primary challenge for the development of these car-free neighborhoods. More specifically, C3 mentioned despite the financing aspect of development often being the biggest challenge, it doesn't receive much public attention because these conversations are not a part of the 'public' development process. Developers usually follow established market norms, government regulations, and investor expectations—like minimum parking requirements—and projects that stray from these standards often face increased scrutiny from all stakeholders. Both Culdesac and Merwede deviated from traditional market norms by proposing (Culdesac) or requiring (Merwede) the project to have little or no resident parking, making funding more difficult to secure. Culdesac, a private development, had to rely on project financiers for their funding. Merwede had some funding from the city as a private/public initiative but also utilized funding from private investors working with owners. Fallon (2022) writes private sector developers are increasingly relied upon to mobilize the necessary resources to produce the commercial and residential properties that make-up the built environment, and this was seen in both case studies.

In Merwede, there was initial enthusiasm from developers on the car-free concept, despite it being an experimental concept. Developers and investors bought into the concept early on and signed on for the new challenge, as there was no other option to develop the land with more cars. However, practical challenges came up with developers later. Developers realized that having units for sale with leased parking spots might be a hindrance to selling the units—even though they initially agreed to 'low-car with leased parking' upon the initial conception of plans. M2 described while developers signed on to the project knowing of the car-free conditions, they didn't learn about the specific challenges until after the plans were well underway and they started preparing to sell units. This left them 'locked in' and forced to come to terms with these

conditions. The developers learned through experience about friction in implementing these visions of car-light neighborhoods.

Example: cost of parking

An interesting example relating to profitability and financing, highlighted by participants from both Culdesac and Merwede, is the cost of parking despite being car-free and car-light neighborhoods. This shows how the economics of car storage have played a critical role in shaping planning and execution. In Culdesac, the decision to eliminate parking infrastructure saved an estimated \$28 million in construction costs, which was frequently pitched to investors and to the public. The developers utilized this cost savings to create more walkable, human-centered urban design and build momentum around an alternative to car-dominated lifestyles. In their pitch, Culdesac also presented a management plan to ensure residents wouldn't park personal cars within a specific radius surrounding the neighborhood, ensuring no parking spillover burdening surrounding neighborhoods. After Culdesac got the parking minimum requirements waived by the city, C3 described how other developers caught wind and started to pitch similar projects to the City of Tempe to cut costs on their own future developments. What these developers lacked, however, was a commitment to managing and enforcing the resident requirement of being car free—they were looking to cut corners on paying for parking infrastructure, without then having to manage and enforce parking long term, unlike Culdesac. This shows a snapshot of the typical approach of short-term developers: they plan, build, develop, and then exit without engaging in long-term management. Culdesac breaks from this model by remaining involved as a rental housing provider and (parking) community manager as part of their business model.

In Merwede, the costs of parking, both during and after development, raised concerns. The costs of building, managing, and maintaining parking garages are much higher than on-street spots, which results in higher costs for leasing spaces. The shift from free on-street parking to indoor garages introduced not just higher upfront construction costs, but also higher perpetual operational expenses, fundamentally reshaping the cost structure. For higher-income residents, this was not a problem. Those who would have bought a space regardless could afford the €200–250 per month cost. But for lower-income groups, these costs are exclusionary. As M2 described, this disparity created equity concerns that clashed with the project's broader ambitions for inclusion and affordability. In terms of financing, subsidizing parking for social housing residents was discussed but doing so would have meant compromising on other priorities like green space, building quality, or public amenities. "All these sorts of aspects change the way the neighborhood can function and thereby change the way that the project developer bubble reacts to it as well," says M2, while asking questions about how many competing ambitions a development can realistically support before becoming unprofitable.

PROJECT RISK

Real estate development, and on top of that car-free development, involves significantly more risk than the relatively straightforward process of buying or selling property. Furthermore, experimental projects such as car-free developments, are viewed as even higher risk, making it harder to secure the funding needed to bring them to life. The project teams, especially the Culdesac team, had to find financiers who were willing to take a risk on the project. Lenders and developers do their best to reduce risk for all parties yet not every risk can be mitigated. Examples of risk in development are outlined in Figure 22.

Market risk

Location, demand, pricing, buyer sentiment

Developer risk

Developer experience, historical reliability

Construction risk

Delays, unforeseen costs, labor shortages

Legal risk

Contract disputes, zoning challenges, title issues

Regulatory risk

Codes, environmental regulations, approval delays

Site risk

Soil conditions, environmental contamination

Reputation risk

Public perception, media coverage, stakeholder trust

Leasing risk

Occupancy rate, tenant quality

Financial risk

Financing access, interest rates, cost, cash flow

Figure 22 Types of risk for property developers. Source: Author

Weber (2016) writes developers often respond to the supply of capital rather than future markets, leaving innovative developments at the whim of financiers. C4 describes the dynamic of financiers calling the shots, often in the form of risk aversion, as a form of path dependency—the idea that decisions and outcomes in the present are strongly shaped by choices made in the past, even if no longer optimal. In Arizona, they explained, contractors, developers, and lenders have long histories of building apartment buildings with big parking garages in the core of town and single-family homes on the edge of town, and retail strip centers throughout. These players are accustomed to this formula and aren't inclined to step out of it. According to C4, this makes it especially difficult to get financial support for more 'non-traditional' developments in the state.

This reflects a broader U.S. planning culture where private-led development, fragmented zoning, and investor-driven norms shaped by postwar suburban expansion still dominate.

C3 explained that financiers often dictate what they believe the market demands, such as requiring one parking space per unit. If the project doesn't meet these conditions, it won't be financed. However, C3 highlighted how Culdesac effectively convinced financiers to support the car-free concept by aligning with a shared vision and working with forward-thinking investors.

In contrast, development in the Netherlands tends to be more state led, with the government helping to manage risk conditions like market fluctuation and providing budgets for things like social housing incorporated into the plan. While Merwede interviews didn't go into specifics on the risk profile impacting investor funding for the project, the city's support, coupled with the prime central location, owners' own initiative to develop the land, and central location all added up to a low risk profile for financiers and investors of the project.

C4 described how financing and risk dictates planning outcomes more than city policy. "I can say without any hesitation that in the modern day, financial parties, lenders, capital providers are going to enforce parking requirements more than cities will by and large," they said. If a non-traditional development—like a car-free neighborhood—fails, there are different attached risks to different parties. If a project fails, cities may lose some development fees, but the loss is usually minimal. This is especially true when they own the land, as in the case of Culdesac, where the city sold the property to developers with the potential for future development. Lenders on the other hand, may lose tens of millions or hundreds of millions if a project fails, possibly resulting in the entire business going bankrupt. **In the U.S., financial markets**

have much greater influence in development, whereas in the Netherlands, municipal landownership and proactive state/local planning norms can react and respond to market pressure resulting in projects that are able to take on more risk from a financier's perspective.

Culture also shapes perception of market risk and the tone of data from interviews generally leaned toward lenders being conservative for the two case studies, especially Culdesac. C4 described how Culdesac's investors don't want to tolerate an enormous amount of risk with new types of development where the financial success hasn't yet been proven. In addition to the financial risk on paper, the biases and lived experience of financiers may make them less inclined to go out of their comfort zone for things like car-free development. Lenders and financiers in places like Phoenix are probably car dependent, so they are going to speak from their experience—not being able to imagine a life lived without a car. The challenge is getting lenders to a point where they understand there is a demand for a car-free neighborhood. According to C3, the Culdesac team succeeded in selling their program and vision to financiers, securing funding for the project. They accomplished this through creative marketing, spreading the word nationally and internationally, and utilizing strategies like a waiting list and pre-lease sign ups. **The existing cycling culture in the Netherlands makes the idea of car-free neighborhoods feel less risky financially thanks to existing cultural and physical infrastructure.** This is in contrast with financial risk in the U.S., which is viewed through car-centrism, making the deviation from that norm feel riskier to investors.

OWNERSHIP MODELS

Another related factor in development business economics was the decision between leasing or selling the housing units. Participants from both Culdesac and Merwede revealed several reasons for deciding the type of housing produced, all of which were strategically selected. In Tempe, a lease-only model was implemented as a lower-risk strategy to 1. test viability and 2. make the units available sooner. In a podcast, Ryan Johnson mentioned they decided to go the leasing route because it was a faster path to get to opening (Ride AI, 2022). Merrill (2020) writes how leasing minimizes the risks that either lessees or lessors associate with owning assets; although leasing also creates risks, in which various lease modifications have been developed to manage these derivative risks. Leasing also allows the developer to maintain a semblance of control in terms of things like resident selection and maintenance by allowing the neighborhood to have a cohesive feel and preserving the neighborhoods as a sellable product, tying back into the themes of risk tolerance and aversion.

In Merwede, units are both leased and for-sale, broken down into different categories for different income groups, including social housing. The for-sale model represents a slower, more cautious approach. Furthermore, a consideration to the design and longevity of the units, both for sale and leased was a consideration. M2 described how there were some investors who were producing units for sale, while some were producing units for sale and for lease, and these different kinds of developers have different attitudes with different stakes in the game—short vs. long term. The Merwede developers who were producing for lease units were not just concerned with something they could sell; there is also the need to keep making a return. The neighborhood needs to function well, to support this profitability. Developers who are there to stay and continue to manage the community long after its completed are more inclined to make it a nice neighborhood, due to the long-term commitment.

An example of how the ownership model relates to the bigger business economics case can be seen in the project budget. If a developer plans to build and then sell right after construction, they have a different mentality of the project budget. M1 described how durability of building materials was a consideration, higher quality materials that cost more but last longer were prioritized in Merwede. M1 points out that in this situation, the developer has an incentive to cut corners or use up any wiggle room in the budget to make things cheaper—even if that means delivering less than originally promised. But if the developer plans to rent the units out instead of selling, their mindset changes. They're less likely to cut corners because, as M1 says, "they will have to deal with those in a decade." **In the U.S., these lease-first models, reflect a cautious approach, showing the financing sector's hesitation to try something new—testing it cautiously. In contrast, the Dutch development with heavy public-private led collaboration leads to more security and trust in the process, showing how planning culture connects to business.**

Culdesac's cautious lease-first model is closely tied to its phased development strategy, which includes built-in safety valves. For instance, plans for Phase 3 were deliberately left flexible in case the car-free concept proved inviable—leaving room to add parking and shift the overall vision if needed. According to C3, they are now implementing design changes in Phase 3 in response to market feedback. These include adjustments to building layouts based on input from renters, creating a more systematized design with a townhome-like appearance, while still maintaining a car-free environment. These safety mechanisms prove the influence and necessity managing uncertainty for the purposes of finances. The support is critical and if the units aren't selling or renting, things need to change, even if that means straying from the original mission, to make the bottom line. So, safety tools are built in to the development process in the American private sector, while Dutch developments are supported by longer-term state support for housing developments needing less of these financial safety tools.

LAND, DENSITY, AND SPECULATION

Land, density, and speculation all play a role in the development of car-free neighborhoods in the bigger picture of business economics. As mentioned in the site amenity section, the site for Culdesac was selected due to its location along the light rail. What was not mentioned in that section is the Culdesac team also selected the site due to anticipation of forecasted area growth. Culdesac anticipated nearby growing business hub and technology market called Tempe Town Lake would attract people who might be interested in living a car-free lifestyle. Culdesac shared many initial residents of Culdesac are from out of state, confirming the project holds value in providing the option of car-free living, not available in this fashion elsewhere in the U.S.

In the Netherlands, there is a principle in Dutch planning known as self-realization. This means if you own land and zoning changes in your favor, you have the right to develop it yourself, rather than the government reallocating that opportunity to another party. In the case of Merwede, there was speculation on the land prior to its development. The city of Utrecht's prioritization of functional zoning for the last several decades, which focuses on mixed-use developments promoting the convenience and reducing the need for car travel, made the Merwede site a clear candidate for high-density development for existing landowners and interested investors. M2 detailed how the site was owned by several landowners, some holding the land for previously for many years, while others who purchased and sold the land in the short term. For example, it is rumored that U.S. property investment firm Greystar made a €14 million profit buying and selling

land long before the project even broke ground. This is common in the Netherlands—speculative strategies depend on timing, market conditions, and investor profiles. They described how investors buy land and either wait for zoning to change, or heavily lobby for zoning to change, garnering a profit without even having to build. With the growing promotion of functional zoning by the city, and the development of a unified plan for the Merwede site, M2 described how a land swap was conducted to give developers a viable, coherent piece of land, making both short- and long-term landowners satisfied with their parcel for development.

In Merwede, density was tied to profitability, environmental conditions, and overall livability. High density encourages more compact urban development, reduces sprawl, improves transportation connectivity, and create more vibrant and efficient communities (Cervero & Kockelman, 1997). From a developer's perspective, higher density allows for more units, therefore increasing potential revenue. The idea of having higher density also makes investment in land acquisition and infrastructure more financially viable. In Merwede, high density was a deliberate response to Utrecht's growing housing needs. Initially planned for 4000 homes, the project ultimately increased to 6000 units to accommodate demand within limited land, while staying within financial and physical constraints. According to Riemens et al. (2021), these growth forecasting and resulting adjustments were made possible by the city's active involvement and ownership of the land. M5 described Merwede's density as high, especially for Dutch standards, though the city and developers didn't want to build too high of density because it would be out of context in the city of Utrecht. The city's height limit of 80 meters ensured density remained in check with the surrounding urban fabric, though most buildings in Merwede are lower, with designers and developers making a deliberate decision to prioritize livability and feel over maximizing profits with the highest density possible. Most importantly, the high-density design enabled the creation of livable public spaces. This freed-up space was used for infrastructure like green areas, rainwater buffering, and biodiversity corridors.

In contrast, according to C1 and C4, the density of Culdesac was limited by construction costs and funding from financiers. The price of a building per square foot and how much you can rent apartments and retail for is driven by local economics, land values and demand. Density can be as high as land values allow. The original proposal for the land Culdesac was built on was a bid on through a public RFP published by the city. The previously entitled project included more conventional U.S. urban typologies—five-story buildings in a street grid layout with internal parking, as seen in Figure 23. The project stalled due to insufficient financial backing, possibly impacted by broader economic conditions, according to C3. When Culdesac took over the site, the planned number of homes was adjusted down from the previously entitled development showing a shift from standard development. When Culdesac presented plans to the City of Tempe, they proposed a new kind of project, with moderate density, a bit lower scale, relying less on space needed for parking and, just like Merwede, focusing on how the space is used for residents instead of space used for cars, all while costing less than the previously entitled project.

If land value is high, developers can build higher density and deliver more in an area because its a place where people want to do business and experience the urban environment. If the only reason for having high density is because the land price is high, and developers won't be able to recoup their investments without it, building high density is not a good reason. The neighborhoods need to be livable despite high density and both Merwede and Culdesac made the livability a priority despite their ability to go higher density than they did with city code



Figure 23 Culdesac and evolution from high density to lower density. (Parolek, 2023)

regulations. However, due to funding, they have had to scale back or make compromises on things like setbacks. Financiers and investors sometimes buy land and are not willing to sell or develop unless recouping costs used to acquire land—a form of financialization of land and speculation (Aalbers, 2019). While these density decisions reflect planning cultural differences between the two contexts, around land use, speculation and governance. **In both Merwede and Culdesac, density was balanced with livability goals, carving out space for human-scale infrastructure, maintaining the project ambitions.** The developers recognized density needs to be paired with thoughtful design, in order to make sure the high densities don't just become a financial tool in the development of these urban neighborhoods.

EXPERIMENTAL MODELS

A recurring theme in interviews about the business model and economics of these projects was the perception of car-free neighborhoods as prototypes, experiments, or model cities. Participants expressed a wide range of perspectives on what these neighborhoods signify and how they shape the future of this experimental concept. Again, these neighborhoods represent a transition experiment, as described by Schröder & Klinger (2024), experimenting with mobility-related planning resulting in a paradigm shift away from car-friendly planning, proposing new ideas and being part of a shift in these practices.

Both the Culdesac participants and various online posts and documents expressed a desire for the neighborhood to be seen as a model for future car-free living in the U.S. They want to be copied and replicated by other developers building for this alternative lifestyle. C2 described how the developers want to scale the principles and lessons learned in these experimental walkable villages, despite the neighborhood not being fully realized yet. From the investor standpoint, there may be a willingness from investors to make initial losses in order to prove the concept and attract attention for future neighborhoods by 'selling the vision' to investors and the public. C2 mentioned part of their role while working at Culdesac was to do research for future expansion sites and mentioned a set of criteria such as looking at cities with in-migration, public

transit infrastructure, existing embracing of micro mobility, and lower new-construction costs. **This can be viewed as an export product, also a form of creating a product to market and sell, highlighting differences in the business model of Culdesac and Merwede—creating housing for people vs creating a product to replicate.**

Despite the Tempe neighborhood not being fully built yet, the Culdesac team has already pursued expansion in Atlanta, Georgia. They attempted this expansion using the original Culdesac brand but adapting the concept for climactic and cultural contexts. This proposed development was planned to not be car-free but car-light, similar to Merwede, with some residential parking on-site. Additionally, the project was designed to be more high density to make the project financially feasible. Just like Culdesac in Tempe, the project site was located next to budding transit: on the Atlanta Belt line, a multi-purpose trail and transit system with a proposed light rail line—all the criteria that C2 mentioned during research expansion. In February 2025, Atlanta Beltline announced they would no longer be moving forward with Culdesac, citing unexplained costs and long timelines. Culdesac countered with misinformation during procurement process about easements on the site making project feasible. This example shows a little bit of all the complexities of car-free development and how it will vary based on context, even if you have the same, experienced leadership team. **Securing project funding, project density, project location, timelines, working with stakeholders and local authorities are all variable from site to site.**

When asked about replicability of Merwede in other contexts, M1 said it wouldn't make sense to copy the neighborhood outright, and that one should to look at what would work for a local context and go from there (Culdesac didn't include this in their proclamations of scaling and copying). M4 described how the City of Utrecht is already viewed as a model city, thanks to international attention received for things like its cycling culture. M4 also argues that, unlike Culdesac, Merwede being a 'model' city has never been a reason for the municipality to build it. M4 says the attention is nice, and the alderman of course likes to receive that kind of news, but being a model city was not the driver. M4 says the driver is a fast-growing city, an area not developed yet, close to the city center, makes a lot of sense to develop here.

Continuing on the theme of a model and experimental neighborhood, C1 described how it is essential that Culdesac is a success. They said "this will show the rest of the country that its economically feasible for real estate investors to put their money in walkable neighborhoods, because when it comes to real estate, you need to appease real estate investment." C1 described the drive to get it right the first time because of the pressure to reproduce these concepts. C1 didn't mention the built-in safety mechanisms described by C3 if something isn't working quite right with initial residents living car-free and they need to embrace parking after all. In a stark contrast, M4 describes Merwede as an experimental neighborhood, and one thing that experiments do is fail. They describe how Merwede is an experiment in nearly every sector—from energy, to trash, and mobility. "I think it's good that we go through this, that we learn, and we will fail," they said. "This will fail. This will not be a perfect neighborhood, but next time we will learn." They said maybe in 10-15 years developers will have worked out the kinks in car-free development, and from then on it might be rinse and repeat, but for now? It's a learning experiment.

Looking at these comments critically with C1 saying it is critical Culdesac is a success, while M4 pronouncing Merwede will fail, provides interesting cultural and institutional and economic

contexts. The Culdesac team portrayed a strong sense of pride and excitement, framing themselves as trailblazers, embracing flexibility, and being relentless in their mission. Their tone was dynamic and promotional. In contrast, the Merwede team was more measured and realistic. While just as engaged in a forward-thinking project, their approach to communicating its novelty was more understated. The Merwede participants focused on practicality and rationale beyond being the ‘first’ or a ‘model city.’ This contrast highlights different project dynamics as well as how the projects are framed and valued in the different cultural contexts. Thinking about the scales of these projects and the differences in mindsets—if a project with 10,000 were to fail, that would be a huge cost not only financially, but also going back to the risks mentioned previously—developer risk, reputational risk, but also at the detriment of the 10,000 people who decided to move into this experimental neighborhood.

In both Merwede and Culdesac, developers were not just implementing their plans, they were actively negotiating planning culture with economic decisions. Whether the cost of parking, density consideration, land value speculation or realities of securing financing, these economic factors shaped the development outcomes. **Developer decisions were influenced by pressure from financiers, showcasing how financial ecosystems shape what urban development is possible. Planning culture is not just formed by policy or design, it is shaped through investments, risk mitigation, and capital returns.** M2 described how innovative neighborhoods like Culdesac and Merwede will be experimental for the next 10-15 years. Both projects illustrate the trade offs between innovative design and real-world economic constraints.

All in all, as C4 noted, financiers often shape development more than policy, echoing Peiser’s 1990 observation that projects must conform to existing financial institutions. For example, modifying plans to include parking spaces to appease lender preferences is not just a fiscal necessity, but a reflection of the planning culture itself. **In the U.S. context, development is largely driven by market logic and investor expectations, financial feasibility is the barrier to innovation. On the other hand, finance and risk in the Netherlands is still viewed as a challenge and a risk but lenders are more lenient thanks to existing culture supported by things like stronger municipal backing and long-term planning initiatives, as well as state-wide policy like social housing.** What gets built depends on not only the flow of capital, but deeper cultural and institutional frameworks defining what is seen as viable and fits the risk tolerance.

POLITICAL PROCESS

This section outlines the political process surrounding the development of Culdesac and Merwede, focusing on the key actors involved, the concerns they expressed, and how these influenced the final realization of each project. There is no established playbook for building a car-free neighborhood from the ground up. Both Culdesac and Merwede are experimental urban developments that deviate from conventional housing and neighborhood models, requiring extensive collaboration and coordination among a wide range of public and private stakeholders to get to where they are today (Schröder & Klinger, 2024). This section explores the role of local authorities, stakeholder collaboration, and the societal reception of these case studies. Attention is given to the involvement of local voices and leaders—highlighting the extent of their support or opposition—to better understand what factors facilitated or hindered progress.

LOCAL AUTHORITIES

Local authorities play a critical role in the development of car-free neighborhoods. Without their support and collaboration, these projects would not be feasible. Interviews revealed that backing from support from progressive and ambitious local authorities was essential during the development process.

Local leadership varies in terms of flexibility and views from municipality to municipality. These differences can be seen at a very local scale. Prior to Culdesac choosing the site along the light rail in Tempe, the Culdesac team was in talks with nearby town of Gilbert, Arizona for a different location. C1 said, “Gilbert was pushing back on them and saying, ‘well, you’ll need some parking’ while the City of Tempe was more willing to explore the idea of a car free neighborhood.” C3 described how the City of Tempe provided many waivers or reliefs in codes, and creation of development standards. C3 also said it is not very common for the city to give out waivers, although more common for mixed-use development that’s looking for general plan amendment for greater height or density. This willing to compromise and not be strictly married to the code ‘just because that’s the way it’s always been’ shows these forward-looking mindsets of one city over another.

When asked why they think the City of Tempe staff are so forward thinking, C3 describes the team as being well educated, located in a university town (Arizona State University has ranked #1 in innovation since 2016), used to thinking out of the box, willing to take a chance on new ideas and concepts, and a desire to be trailblazers. C3 mentions there aren’t too many leaders afraid of development or redevelopment which has helped the city grow into what it is today. The mayor of Tempe, Corey Woods, was mentioned in several news articles speaking positively of Culdesac and was also highly regarded during interviews. C1 described how he was open to the ideas of Culdesac, and the support of a mayor was invaluable to the development. C1 believes the importance of local leadership because it can transcend national political barriers, describing how cities benefit from local policymakers who are open to change.

The local leadership in Utrecht was also important for the development of Merwede. M2 describes how the alderman responsible for the project was adamant about sticking to project ambitions. The alderman didn’t want to stray too far from the original ambitions though to would be easy to let it slip and do a more “traditional style neighborhood that’s high density and poor quality” resulting in the realization in 10-15 years down the line that hey maybe it wasn’t such a good idea after all. This shows that the local leadership is future thinking about sustainability and building something that will continue to function for years to come.

During Culdesac’s development, the team hosted several community-building events. These efforts can be viewed as strategic business development and relationship building. C2 described the Culdesac’s hands-on grassroots efforts to connect with city officials and build a case for the success of the neighborhood. The team partook in miscellaneous community improvements such as tree plantings, hosting events, and even paying for its own crosswalk to the light rail station. These efforts may have been political convincing to sell the city on their car-free idea to make it more likely to get approved. When asked about this, C3 said if Culdesac didn’t do these community improvement projects, it wouldn’t have impacted the progress or negotiations much. This was contested by C5, who described a similar situation regarding cycle lane improvements on Smith Road, a road that connects the Culdesac neighborhood

to a commercial shopping area. C5 described the bicycle lane improvements on this road as getting expedited—the city was planning to upgrade these cycle lanes, but the process got moved forward due to the presence of Culdesac. C5 described it as an 800-pound gorilla in the room, subtly putting political pressure on local government to get what they were looking for. C3 described how Culdesac’s reputation of being known to bring forward good projects as well as the overall convincing and selling to the city convincing the city authorities that it was crazy enough to work. C3 describes how the “overall buy-in of the concept [of Culdesac] was able to grow and mature with the City of Tempe leadership.”

The Culdesac team had to actively build a strong relationship with local authorities, while the Merwede team benefited from a preexisting relationship due to their dual role as a landowner and project initiator. Culdesac heavily emphasized civic and community building, as well as stakeholder engagement throughout the development process. C2 mentioned that this engagement required considerable care and patience, describing it as a deeply human process that is not easily transferable nor replicable across different sites. The Merwede team has done similar community building events, but for reasons other than getting more political buy-in, since they already had those existing political connections.

STAKEHOLDER COLLABORATION

Interviews from both the Culdesac and Merwede teams described a sort of ‘game’ or ‘dance’ between the developers and stakeholders. In both cases, the development process diverged significantly from conventional projects due to their reduced-car natures. This complexity is in part from the varying roles developers play—in the Netherlands, the developers are a mixture of public and private, while in Culdesac, the developer is strictly private. At the root, **the process is less about simply building a neighborhood, and more about creating alignment between stakeholders, ensuring everyone works together towards the project vision.**

Authorities involved with Merwede faced a different situation, as they held a dual role as both landowner and developer, with a vested interest in the project’s success. It was revealed through several interviews that this dual role left the city in a better position to negotiate—creating the plan but also giving out permits to build, changing zoning, and tendering out their own piece of land. M4 describes the critiques of cities that own land where they develop, describing how things get complicated when cities start developing places that profit them. There is tension because they have more power in negotiations. M2 described how the dual role “forces the city to think from a developer perspective including things like feasibility, ambitions, and making sure it’s all doable in terms of cost and benefit.” M2 described the relationship between the city and developers in Merwede as being “basically married to each other.” Since the city owns the land, already secured financing, and had a strong incentive to increase housing supply due to a broader housing shortage, all stakeholders shared a common vision for the project’s success. This alignment created a dynamic of mutual dependence, where parties were compelled to reach agreements through ongoing negotiation. M1 emphasized the iterative nature of this process, describing it as a series of back-and-forth compromises, with each stakeholder continually reassessing what was realistically achievable within the project scope.

M2 contrasted the Merwede case with typical Dutch development, having previous experience working for the City of Amsterdam. Land in Amsterdam, for example, is generally owned by the city and when the city wants to develop it, it’s generally tendered out with prescriptions on what can be built. The city doesn’t need to think about constraints or consequences until

it is tendered. This is different from how Merwede was developed because the ambitions and plans for the site are collaborative and ongoing. M5, who helped to develop the urban plan, described how the Merwede development process was different than the norm. They describe how typical projects start with a vision and then the urban plan is developed afterward. In the case of Merwede, the vision and urban plan were developed in parallel. This was a challenging process, allowing for iterations and sharpening of ambitions, like the safety-mechanisms in the phasing of Culdesac. M5 describes how this process took longer than a normal urban plan development due to this process but thinks it's a very well-thought-out plan due to the change in the development norm.

In both Tempe and Utrecht, it was clear that certain responsibilities remained in the hands of the municipalities. For example, managing parking in surrounding neighborhoods was something that needed to be introduced in surrounding neighborhoods. It was evident that Culdesac as a private developer could not take on this authority to regulate parking permits, so the City of Tempe had to act. Same with Merwede where the entire consortium of developers couldn't regulate the permits for surrounding neighborhoods, so the city of Utrecht took on that responsibility as well. Another example of this is trash collection in Merwede. Due to the neighborhoods car-free design, a special trash collection system had to be developed, resulting in collection costs being nearly four times higher than costs in other neighborhoods. The municipality was required to take ownership of these costs, due to both legislation and general municipal responsibility that the developers aren't accountable for.

In both cases the role of the city was essential for ensuring adjacent communities were not negatively impacted with parking or taking on greater costs than normal for a successful project management. These shared efforts show that regardless of local governance structures, ambitious developments require cities to step up alongside the developer and all parties need to collaborate for a comprehensive end product.

RECEPTION OF SOCIETY

New development is often met with passionate reactions from members of society and Culdesac and Merwede are no different. Sentiments against new development from neighbors, businesses owner, and car owners were expressed. This section describes themes revealed during interviews and from desktop research regarding the perception of Culdesac and Merwede and the larger conversation about car dependency.

New development often brings resistance due to concerns about increased congestion. Although interviews with Culdesac stakeholders did not reveal any formal protests or complaints specifically about traffic, both C1 and C3 noted that a common concern about new development is the influx of more people, especially their cars. Existing residents are often resistant to new development because they don't want to spend even more time sitting in traffic. As C4 explained, cities everywhere are dealing with congestion—they've reached their traffic capacity, and congestion is widely viewed as having no cure. Development is associated with more cars, which need parking, which is often reinforced with city-mandated parking minimums, fueling a self-reinforcing, path-dependent cycle of car dependency, shown in Figure 24. C4 argues that car-free neighborhoods offer a solution to these cycles: they introduce new residents without adding to traffic. They emphasized the importance of communicating these solutions—it's not about bringing more traffic but about adding new amenities and building

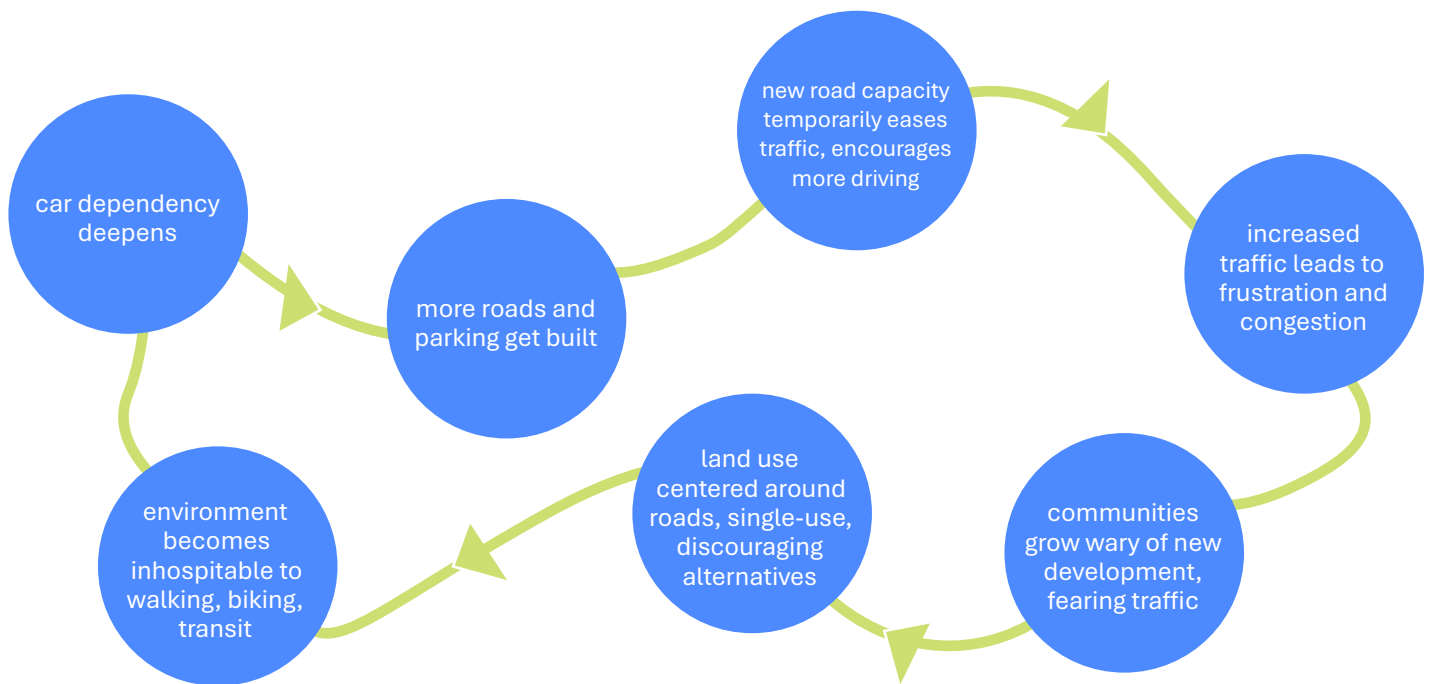


Figure 24 Car dependency vicious cycle. Source: Author

community. Once this is explained, people are generally receptive to the idea of a car-free neighborhood in their community.

Merwede is located along the Merwede Canal and currently has only two bridges—one at the north end and one at the south end of the neighborhood. As part of the neighborhood’s design, several new bridges were planned to accommodate the expected increase in bicycle and pedestrian traffic. However, these plans sparked concerns from residents in surrounding neighborhoods and pushback from local boating clubs that use the canal for rowing practice. M2 noted that many residents were afraid of the influx of cyclists, fearing a sharp increase in bicycle traffic and lobbied strongly against it. M2 said it was “basically a lot of NIMBYism.” Additionally, houseboats docked along the canal would be impacted by the new bridges, with some residents protesting the need to relocate. Despite these protests, communication from the project team helped residents recognize the potential benefits, such as easier access to nearby cafés, supermarkets, and other amenities across the canal. Ultimately, the protests resulted in a reduced number of bike bridges showing their effectiveness as well as the project developers’ willingness to collaborate with local residents.

Height and density also raised concerns for Merwede’s neighbors. M4 described the fear of skyscrapers right outside their doors, and M2 said many neighbors assumed 10,000 new residents meant skyscrapers would ruin the neighborhood’s character. However, several interviews and online communications emphasized how Merwede’s architecture was designed to be human scale. M5 described how these buildings were to be designed and prioritized with insets and other features that cost more but make it feel more livable despite having a higher density. Just like Culdesac, this shows the power of communication—once these things are communicated properly, people are understanding and more accepting of the changes.

M2 described complaints from the owner of a nearby supermarket and shopping center. The owner claimed, “people will have more cars than you think” and “people won’t be able to shop

at the shopping center,” arguing that the development would harm his business by removing parking and creating congestion. These complaints against the Merwede developers were taken to the high courts, but ultimately reinforced the need for developers to clarify to stakeholders that the development would not only increase competition but also attract more customers. These protests over the bridges and grocery store caused significant bureaucratic delays, extending the project timeline to the tune of two years. **This reflects a key aspect of Dutch planning culture, where public concerns are taken seriously and addressed through legal processes, even if it leads to delays.** While not as extreme, these sentiments echo historical movements like the Stop de Kindermoord protests, where the public’s voices were heard and changes were made at the governmental level.

While not directly about Culdesac, comments from the public written in to a Maricopa Association of Governments meeting, show sentiments of a select population in the Phoenix metropolitan area are very anti-transit and pro-car. Erin Boyd, Culdesac’s Government and External Affairs lead, presented the Culdesac project to a Maricopa Association of Governments meeting where she discussed the project, progress updates, and initiatives to promote active transportation culture (Maricopa Association of Governments, 2023). The meeting minutes for this meeting included comments from the public. Charmon Phulmann from Mesa, AZ commented: “For my hard-earned money to go towards such an ugly and ineffective form of transportation as the light rail is disheartening to say the least. [...] No one wants to use this public transit when they have a much more reliable and effective mode of transportation sitting in their driveway.” Kathleen Liles from Mesa, AZ commented, “Forcing people to move by foot, bike, or transit will keep people in their homes. [...] And what about the elderly, the infirm, the disabled? Leave us our freedom to move!” **These pro-car opinions reveal a strong cultural attachment to personal vehicles and a deep skepticism toward public transit, which poses a significant barrier to the acceptance of car-free developments like Culdesac.**

In Utrecht, the shift toward reducing car usage was viewed by some residents as politically driven. While not to the same level of passion about the car as comments in Arizona, M3 describes the threat of anti-car policy. They wrote in an email the “politically left-wing majority in the city council wants to minimize the use and possession of cars in the whole city. They assume that nearly everyone can take a bicycle or rent a car at every moment.” M3 continued by writing “many not left-wing inhabitants claim they need a car for their activities further away from their neighbourhood, work, luggage, etc. Also family visitors coming from other regions do need parking spaces for free or affordable. Keep in mind the price of car ownership in Nederland is one of the highest in Europe already.” M2, also mentioned social problems. For example, if you work a job with non-traditional hours or at a location not accessible with public transportation, you need a car. These sentiments, coupled with an increase in parking problems, makes the Merwede appear to be “only suitable for young people, students, and expats in a city already crowded by those groups,” M3 wrote, revealing demographic tensions. Similar themes surfaced in Tempe, where Culdesac’s car-free design largely caters to young, mobile residents, raising questions about inclusivity and long-term viability as briefly touched upon in the cycling infrastructure section.

Despite Culdesac not having any formal protests its development, a comparison can be drawn with Merwede’s 2-year delay. When interviewing C4, they said if things came up that hindered progress of the development, the team would work night and day to avoid any delay—often at the expense of their personal weekends and holidays. As C4 noted, “you have to put out

fires over weekend, if you don't, come Monday project might be dead. A weekend can make a difference in years in the project." C4 described how these long days and nights were inevitable to keep progress moving forward. When asked if the Merwede urban development team worked long hours like those at Culdesac did, M5 said no, and if they did, it was very infrequently. **This shows a difference in work culture—in the Utrecht, it is expected and accepted that these things will take a long time, but in the Tempe, any sort of delay is worked through quickly to drive progress forward.**

Resistance in Utrecht rarely translated into outright opposition to development itself. As M4 reflected, most critics weren't against new housing in Merwede—they just didn't want it to be as high-density or disruptive to existing communities. Issues such as the displacement of houseboat residents and the construction of new cycle bridges sparked protest, but these challenges were ultimately outweighed by the broader societal imperative: housing for 10,000 people versus the needs of a few. As the project moved forward, political leaders had to adopt a utilitarian lens, prioritizing the greater good over local dissent. However, even symbolic protests demanded significant attention from city officials and political parties, highlighting how seriously community feedback is taken in Dutch planning culture. As M2 put it, "the bridge protests were never going to be a showstopper. But it took a lot of effort to get everybody, especially local political parties to not lean too far into the unrest from the neighborhood on the other side."

These contrasts reveal fundamental differences in planning culture. **In the Netherlands, community engagement is more deeply embedded in the development process, and public voices, though not always decisive, are more empowered.** Dutch citizens, connected to their neighborhoods through daily street life rather than car-dependent routines, often feel more invested in shaping their urban environments. While resistance to change often stems from fear or exclusion, it rarely halts progress entirely. Instead, they became part of a negotiation where civil society, developers, and city leaders all play a role in navigating the complex balance between visionary planning and lived reality. Would similar resistance in the U.S. have the same impact? Do American residents have the tools, or even the civic momentum, to challenge or delay a major urban development through legal or political channels?

DISCUSSION AND CONCLUSION

This thesis set out to research how planning culture shapes the development of car-free neighborhoods through a comparative case study of two projects: Culdesac in Tempe, Arizona, and Merwede in Utrecht, Netherlands. The aim was not to evaluate whether car-free neighborhoods are successful, but to investigate how local planning cultures influence the conception and execution of these transition experiments. The research began with a literature review, detailing the evolution and intertwining of the car and urban form. The two co-evolved for decades, with one shaping the other and vice versa. After a gradual tipping point with events like Stop de Kindermoord, the Netherlands recognized car dependency as a detriment and started to plan away from the car being central to urban life. In contrast, the U.S. continued its reliance on car-oriented development, in part thanks to powerful actors like the automobile lobby. The literature review describes a growing interest in research on car dependency, including definitions, systems, and how it impacts daily life as well as a growing interest in the car as a nuisance for daily life, which led into the introduction of the car-free neighborhood case studies as a reaction against this car dependency.

From a blend of expert interviews, planning literature, and site analysis, this thesis investigated how each neighborhood is embedded in distinct spatial, political, and economic contexts. Planning culture was used as a lens to compare different actors, norms, and structures that shaped the outcomes of these developments. Four key themes emerged through the comparative framework: conceptualization, urban form, business economics, and political process.

- **Conceptualization** - Culdesac is a developer-driven project, with no institutional precedent, while Merwede was a municipally-supported effort to formalize car-free living and to house a growing population.
- **Urban form** - Culdesac is located in a relatively low-density, car-oriented area, whereas Merwede benefits from being embedded within a well-connected, mixed-use district. The presence of cycling infrastructure and local amenities were shown to be both a product of and a contributor to planning culture, describing contextual differences.
- **Business economics** - Culdesac's private financing showed risk tolerance and preferences of investors while also demonstrating the potential of market-led innovation paired with supportive local governance. Merwede's public-private partnership faced different challenges, like investors realizing difficulties of selling units with no parking after they had signed on. Cultural expectations about success and failure arose, with Culdesac framing success as essential, while Merwede took a more realistic and grounded approach, acknowledging that failure is inevitable yet can be instructive for the future.
- **Political process** - Tempe's local government showed flexibility, adjusting parking management and cooperating with Culdesac's new ideas. Utrecht remained responsive to public concerns, even with the delays lasting over a year. This tension between top-down ambition and civic pushback was especially evident in the elements of Merwede's plan.

To answer the research question ***How do the planning cultures impact developments with low-car ambitions such as Culdesac in Tempe, Arizona, USA and Merwede in Utrecht, Netherlands?***, this thesis argues that planning culture acts as an enabling and structuring force in the development of car-free neighborhoods. It also shows that car-free neighborhoods are not a standard formula, but context-dependent processes. In Culdesac, the neighborhood emerged

through a bottom-up, private-sector initiative in a car-centric landscape. Success depended on risk-taking and flexibility from local governance. In contrast, Merwede is more top-down and state-facilitated, rooted in Dutch tradition of integrated planning and civic engagement, shaped by ambitions and constraints of institutional processes. **These cases show that planning culture influences not just feasibility, but also the form, process, and trajectory of car-free development. Overall, this thesis reveals that planning culture does not simply enable or inhibit car-free development but rather shapes the type of challenges encountered—whether spatial, financial, or political.** A summary of themes presented throughout the research findings and results section is presented in Table 4.

Table 4 Summary Table of Planning Cultures

Topic	Culdesac	Merwede
Car-free conceptualization		
Car-free/car-light	• Bottom-up, developers chose to try something new in car-dominant landscape • Site first, policy second • Market driven housing development	• Top-down, driven by EIA • Government-led housing development • Strays from typical Dutch development process norms
Site profile		
Land use/zoning	• Embedded in fragmented, car-oriented zoning • Lower density, sprawl • Zoned for mixed-use but surrounding areas zoned mono-functionally	• Embedded in mixed-use/functional zoned area • Medium/higher density • Holistic planning via municipal coordination
Nearby amenities	• External amenity-rich neighborhoods less common • Few internal amenities • Spread out external amenities, reinforcing car-dependency • Dependent on external amenities	• External amenities within walking distance • Internal amenities incorporated into neighborhood plan • Self-sufficient
	• Same number of external amenities, but at different spatial scale	
Cycling infrastructure	• Primarily lanes on roads, not dedicated paths • Grassroots support for movements • Cycle culture growing but car-mindset prevails	• Extensive, protected, normalized infrastructure • Strong legal and cultural support • Cycle infrastructure part of planning for decades
Business economics		
Financing	• Need to align with and sell product to investor expectations • Innovation constrained by financial feasibility	• Public-private partnership with municipal and private backing • Less investor risk due to state-led support
Project risk	• Financiers/market demands dictate things like parking minimums more so than local authorities	• Idea of car-free more comprehensible due to existing cycling culture and infrastructure

Tenure model/ developer approach	Lease-only model enables developer control and faster project delivery	- Mix of rent/buy options for all demographics - Durability of building materials considered
Land, density, speculation	Opportunistic, developer-led, density is market-driven (available financing)	- Speculation of and lobbying for zoning changes - Guidance from public-sector
Experimental urbanism and replication	- Replication part of larger business model - Strategic convincing of investors, future residents of project viability	Exact replication discouraged, context-sensitive
Planning mindset	“Project must be a success” - Entrepreneurial, bold, market-facing	“Project will fail” - Pragmatic, realistic, cautious, diligent
Political Process		
Local authorities	- Flexible, supportive local leadership - Strategic efforts to build relationships	- Supportive local leadership - Prioritized specific ambitions like sustainability
Stakeholder collaboration	- Developer efforts to align stakeholders: financiers, government, civic society - Developer efforts to reduce delays	- City married to developers, preexisting relationship - Ability to drive project forward despite protests (although sometimes at a delay)
Societal reception	- Civic society not bothered by development, but bothered by talk of anti-car - Communication strategies to build community - Anticipated demographic to live at Culdesac	- Many protests, neighbors empowered to speak up; voices heard, changes made - Developer and city would move progress forward regardless - Car-free ideals rejected as non-inclusive of certain classes

This comparative approach shows ways U.S. and Dutch planning cultures could learn from one another. The Netherlands could consider adopting some of the bottom-up risk taking seen in Culdesac to accelerate innovation. On the other hand, the U.S. cities could benefit from adopting more holistic frameworks used for neighborhood planning, or integrating cycle networks more strongly into the urban fabric. These cases also show that the car-free transition experiments do not follow just one single model. For example, many of the previous car-free trials have been in Europe and the Culdesac model breaks this mold, starting in Arizona and with expansion plans to move to other states.

This thesis faced a limitations, including a relatively limited interview sample and timeline. Interviewing current Culdesac employees, for example, would have enriched the data. Another limitation was the linguistic barrier, relying on google translate and English interviews. The timeline of both projects also proved to be a limitation, with the development's started but not fully realized at the time of this publishing. The development strategy has potential to change before full completion as seen with Culdesac's phased approach.

This thesis contributes to the intersection of planning culture and transition experiments, helping to bridge a gap identified by Fürst (2009) and others. Many avenues remain open for further research such as:

- How do financial institutions perceive and quantify the risk of low-car developments across different planning contexts?
- What methodologies best capture the norms, values, and “unwritten rules” of planning cultures?
- How do cultural attitudes toward cars and mobility shift in car-free or car-light neighborhoods?

To conclude, this thesis argues that car-free projects are not determined simply by technical designs or visionary plans, but also by planning cultures that shape how stakeholders negotiate, collaborate and adapt. The urban fabric has changed in the last 70 years developing for the car, and the next 70 will tell a different story with experiments like Culdesac and Merwede, blending walkability, sustainability, and livability into new developments, shifting back to community. These projects demonstrate that sustainable, low-car futures are not delivered by technical solutions or ideals alone, but through the alignment of actors and institutions. In this way, reaffirming Harvey’s (1989) insight that “... the real power to reorganize urban life so often lies [...] within a broader coalition of forces within which urban government and administration have only a facilitative and coordinating role to play.” It is a sum of the planning cultures coupled with cooperation between developers, governments, financiers, and communities from which the future of urban mobility and urban living will be produced.

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APPENDIX

INTERVIEW GUIDE

The following interview guide was used to conduct expert interviews. Slight iterations were prepared depending on the participant's background.

Research introduction:

I'm looking at the development of car-free neighborhoods – specifically Merwede in Utrecht and Culdesac in Tempe, AZ – and the planning cultures/systems that either support or discourage the development of these neighborhoods. I'm hoping to learn about the values, practices, and institutional/legal frameworks that shape these neighborhoods including cultural, legal, and systemic factors, as well as the challenges and opportunities they present. I'm specifically interested in learning more than what might be found in published literature, looking at real-world dynamics, decision-making processes, and lived experiences of those involved the development of car-free neighborhoods.

Recording/interview consent:

- For this interview, is it ok if I record this conversation?
- Do you consent to reuse of quotes in my thesis? I will pseudonymize or anonymize names if mentioned.
- Findings from this may be published as part of my master's thesis and results of the research are available upon request.

Questions:

1. Can you give me a brief overview of your career history and current role?
2. Can you describe the history of Culdesac/Merwede as you understand it?
3. What do you think was the biggest challenge for the development of Merwede/Culdesac?
4. How do think local planning habits support (or impede) car-free developments, and has this has changed over time?
5. How have stakeholders been involved, supported, or perhaps have taken critical stance against Merwede?
6. Do you know anything about the position of the real estate sector? (Do they support it, find it commercially viable, accept imposed low-car regulations? Or is this sort of scheme only working in projects where the lead is being taken by the public sector?)
7. How 'public' is this project? Do you think it would it look very different in case the development would have been private sector led?
8. Did you observe any social or political challenges during the development of Merwede such as protests, legislation, concerns in the real estate sector, etc.?
9. Do you think other cities/developers are realistically taking note and will create their own car-free neighborhoods? Do you think that replications will feel like test models?
10. Did the cultural or societal context of Tempe/Utrecht shape how the car-free concept was marketed or received?
11. Were there any unique approaches or compromises in the early phases of Merwede's development? Anything the city or project wanted but couldn't get or developers? Or had to work extra hard for?

12. Do you know of any specific policies or incentives that encouraged Merwede/Culdesac as a car-free neighborhood? In your opinion, do these reflect typical urban planning policies in the Netherlands/America?
13. Are there specific policies or aspects of Dutch/American planning culture that would be challenging to replicate in a different context, especially relating to the car?



Top: Culdesac
(Culdesac, 2024)
Left: Merwede
(Merwede, n.d.)

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