Woonerf Concept and its Application in Istanbul

Yousra Al Houssein*
Istanbul Aydin Universitesi
Yousrahoussein@stu.aydin.edu.tr
ORCID No: 0000-0002-3192-7584

Submission Date: 13.11.2023 / Acceptance Date: 22.01.2024

ABSTRACT
In the past, streets were dominated by pedestrians. Over time, automobiles dominated the streets and urban planning, as planners and designers started to design cities car- and highway-centered. Some concepts and ideas started forming to improve the situation in this context. One of these movements was the Woonerf Concept, whose main aim was to make neighborhoods social places for residents that give priority to people without completely rejecting cars. It aimed to make some coexistence between pedestrians and automobiles with some simple regulations. In this frame, the aim of the study is primarily to make a general explanation of the structure of the Woonerf system in the context of the sharing of urban space with vehicles, especially private cars, and to make an evaluation of the one application of this vehicle/space sharing system in Istanbul, in addition to a practical application of the Concept in one of the streets of Istanbul. The study's method is to review the theoretical background of the Woonerf system and examine a semi-Woonerf example in Istanbul. The study concludes that many traditional streets in Turkey and other countries are very similar to the Woonerf Concept, as they share space between humans and vehicles, and that applying such a principle to newly developing places in Istanbul, for example, helps add vitality to the place while respecting pedestrians. The importance of the study comes in light of the large number of redevelopment projects in Istanbul. It is an opportunity to seize these projects to build a city that focuses on people and their quality of life.

KEYWORDS
Woonerf, Shared Places, Urban Redevelopment, Pedestrians, human-centred design.

INTROCUCTION

Cities have been designed with a heavy focus on automobile transportation, resulting in car-centric urban planning that prioritizes car traffic over other modes of transportation. This has led to the proliferation of sprawling suburbs, urban cores' degradation, and people's displacement from their communities.

In order to address the problem of car dominance in urban places, it is essential to focus on designing cities and transportation systems that prioritize and encourage sustainable modes of transportation, such as biking, walking, and public transit. This includes developing safe and accessible infrastructure for non-car modes of transportation, providing convenient and affordable public transportation options, and promoting active transportation through policies and programs incentivizing walking and biking.

Most of our cities today are loaded with all kinds of different automobiles. It almost became normal to see cars everywhere in the city, even where they should not exist—planning automobile-oriented cities widely contributed to this situation. That kind of planning helped create urban environments where mobility is needed to reach activities, and it is hard to move without a vehicle (Litman, 2021).

The dominance of automobiles has resulted in automobile-oriented planning approaches, and these both led to several problems in urban environments, including:

* **Corresponding author.**

* Congestion.
* Air pollution.
* Safety.
* Urban sprawl.
* Social exclusion.
* Equity: Automobile-dependent planning approaches can be exclusionary, as not everyone can access a car or drive (Litman, 2021).
* Direct and indirect costs: Automobile dominance can result in high direct and indirect costs to individuals and society, including the cost of building and maintaining roads and highways, the cost of owning and operating a car, and the economic costs associated with traffic congestion and accidents (Litman, 2021).
* Eroding public spaces in favour of parking lots.
* Noise pollution.
* Expensive infrastructure is another problem of automobile dominance. Furthermore, the cost of maintaining automobile infrastructure can be ongoing, with repairs and maintenance required regularly (Litman, 2016).
* Safety hazards.

As automobile dominance poses many problems, it is necessary to try to overcome them. In response, various movements have emerged to counter auto dependence.

One such movement is the Neighborhood Unit. It emphasizes self-contained, walkable neighborhoods designed to meet residents' daily needs within a short distance. Planners such as Clarence Perry first proposed the approach in the early 20th century.

Applying the Neighborhood Unit concept did not solve the problems caused by cars. So, new movements continued to appear. An example of such a movement is New Urbanism, which advocates for the design of walkable, mixed-use communities that prioritize people over cars.

While these concepts included vehicular traffic restrictions, they did not propose mixing vehicles with slower-moving road users (e.g., pedestrians and cyclists) in the same space (Karndacharuk, 2014).

Also, this movement could not overcome the adverse results of automobile dominance. So, we need to try to live with cars. Here, the Woonerf concept seems a possible solution, as it does not reject vehicles but accepts them with conditions. The Woonerf Concept is more about coexisting between pedestrians and automobiles but reclaiming respect and priority for pedestrians.

WOONERF CONCEPT

DEFINITION AND CHARACTERISTICS

Woonerf is a Dutch word that means "Living Street or Residential Yard". It considers the street a social space, not just a way for cars to move from one point to another (Sunday, 2017).

Woonerf Concept first appeared in Delft city/Netherlands in the 1960s as a response to the cars` takeover of the streets, its high speeds, the large number of parking places and the insecurity of the roads for humans. It aimed to give the people/pedestrians, public life, and children safety priority in their streets (Collarte, 2013) without eliminating cars but making them work according to human scale.

The idea started when the residents of a 50-meter-long street decided to end the automobiles taking over their street, making it unsafe for them and their children. So, they installed barriers and planted trees at the two entrances of their street. Then the Concept of Woonerf arose (Bruntlett et al., 2021). Figure 1 below is an example of a Woonerf neighborhood.

Figure 1. *An example of a Woonerf neighborhood. Photo by Dick Van from Tactical Urbanism. The photo shows planted trees used as barriers.*

The Concept was introduced in 1965 by Niek De Boer, a professor of Urban Planning in the Netherlands. He considered the street a living area for its inhabitants (Karndacharuk, 2014). However, some researchers believe that The Buchanan Report played a significant role in developing the Woonerf Concept (Karndacharuk, 2014), and he (Buchanan) is seen as the "father of traffic calming" in the Netherlands and Germany (Ben-Joseph, 1995). Nevertheless, unlike Woonerf's Concept, Buchanan's report design approach, in some examples, contained complete segregation between traffic and pedestrians, but it saw no severe harm in mixing traffic and pedestrians "up to a point" (Karndacharuk, 2014). However, Boer was inspired by German city planner Walter Schwagenscheidt and British traffic specialist Colin Buchanan (Nio, 2018).

De Boer considered that the street has social importance as a place for meeting, habitation, connecting, spending time and all other human activities (Nio, 2018). Moreover, the street must be protected from cars (both stopped and moving) to achieve that. So, Boer's main goal was to create Woonerven, where human connections can be evolved (Nio, 2018).

Although De Boer was the first to call the Concept Woonerf, his Woonerf, first applied in Emmerhout/Netherlands, differed from the Woonerf as we know it today. De Boer's Woonerf had segregation between pedestrians and vehicles (Nio, 2018). Moreover, our Woonerf was introduced by his student, Joost Vahl, at Delft in 1969. De Boer designed his Woonerf at Emmerhout with a cul-de-sac, considered pedestrian zones with little parking places; he connected Woonerf to the community centre by footpaths and cycle lanes (Nio, 2018).

In contrast, Vahl's main idea was to mix children's play areas with vehicle` lanes and to make the two places on the same level without segregation. However, De Boer did not accept this concept and always found it an undesirable solution (Nio, 2018). Anyway, in the Netherlands, the Woonerf Concept is still

basically a concept to be applied to residential neighbourhoods. It aims to attract families with children mainly. For that, it is rare to find it inside Amsterdam; it can be found further from the city centre (from a personal interview with a local from a Wonnerf neighbourhood in the Netherlands. The Municipality of Delft adopted Boers's and Vahl's points of view, planning them in low-income neighbourhoods without playground space (Ben-Joseph, 1995, Collarte, 2014). The positive impacts of these ideas led to the adaptation of the Woonerf Concept by the Dutch Government in 1976 (Ben-Joseph, 1995, Collarte, 2014).

Regarding functionality, Guttenberg considers Woonerf more than just a design to control automobiles. He sees it as a "social invention in urban structure". It is an invention because it rearranges known elements (houses, streets, parking spaces). On the other hand, it is social because it aims to preserve traditional practices and human relations from extinction (Guttenberg, 1982).

So, Woonerf Concept is about making the street more livable for its residents. It is about integration. It aims to change the way of using the roads and improve their safety by limiting through traffic to improve the quality of life in the street and consider it a public space (Collarte, 2013). De Boer designed the roads to make drivers feel the other street users, balancing the streets` different uses (children's play and car use, etc.) (Collarte, 2014). Figure 2 below, shows some of Woonerf street social possibilities.

Figure 2. *A screenshot is taken from the YouTube short film "Life on a Dutch Woonerf (Living Street)."*

The essential characteristics of the Woonerf Concept contain (URL-1):

*Priority for pedestrians to use the entire road.

*The beginning and the end of the street are clearly marked.

*Drivers have to drive slowly (not faster than walking speeds).

*Little separation (no clear segregation) between vehicles and pedestrians` paths, and the surface is continuous with a unique pavement.

*Traffic speeds are limited by street design (obstacles which slow down the speed and cut off the vision).

*Street furniture to encourage people to stay. Figure 3 below is an imagined example of Woonerf. Figure 4 shows how to distribute obstacles on a Woonerf street.

Figure 3. *Source (URL-2). The illustration shows an imagined example of Woonerf. It shows parking places, planting trees as obstacles, and how pedestrians use the whole street.*

Figure 4. *A sketch shows how obstacles and parking places can be distributed on Woonerf Street. Source (Collarte, 2012).*

Woonerf's Concept also has many positive effects (Biddulph, 2001):

*Increasing safety levels by reducing car speeds.

*Encourage effective use of the space and turn the street into a public space safe for all.

*Increasing socialization and making people stay longer in the streets. It also increases the connection between drivers and residents.

*Contribute to making attractive streets and giving a pleasant feeling during a walk through them.

*Increase street surveillance (the essential feature in the street, according to Jane Jacobs).

*Better access for older adults within their street.

*Improve the quality of the street, and therefore the quality of life in it.

*According to some studies, using Woonerf systems could help reduce noise and pollutants and improve the environment (anyway, Biddulph does not think so).

Of course, it also has negative aspects. For example, it may cause a rise in property values (Collarte, 2013), leading to gentrification. It also limits the parking space (it could be seen as a negative or positive effect). In addition, some studies highlighted that implementing and maintaining the woonerf concept could be more expensive and need more complicated engineering and design practices (Steinberg, 2017). It also could be challenging for drivers unfamiliar with the Woonerf Concept to navigate streets with it (Steinberg, 2017). However, if not appropriately designed, it can cause obstacles to the movement of emergency vehicles (Collarte, 2013).

PRINCIPLES

The Dutch government published the first design standards for Woonerf on 17 September 1976 (Guttenberg, 1982). Nevertheless, each country uses a modified scheme of Woonerf according to its needs and the local culture (Collarte, 2014).

According to Steinberg, Ben-Joseph 1995 identified 11 principles of a Woonerf Concept. However, Steinberg summarised it in 4 basic principles (Steinberg, 2017):

1. Distinct Entrances and exits are marked clearly by a sign: The sign clearly illustrates that priority is given to pedestrians. Because of that, the cars appear smaller in the sign's background, as the designers want to say that the cars are the exception in this street, while the residents are the primary users. Also, the sign could be accompanied by unique street furniture (trees, curb extensions).

The clear entrance could be achieved through trees, curb extensions, ramps up, sidewalk bumps or just the unmistakable sign of Woonerf (Collarte, 2014). Figure 5 shows sign examples.

Figure 5. *Woonerf entrance sign examples. Source: Collarte, 2014.*

The entrances and exits should also be clearly marked by changing the shape or height of their paving. Especially when the exit or entry is connected to a sidewalk from the outside (of Woonref), the place of connection with the sidewalk should be clearly visible. Figure 6, shows the entrance and exit of a Woonerf street.

Figure 6. *Photographs show the entrance and exit of a Woonerf street. They demonstrate the clarity of the entrance and exit. Source (URL-3)*

2. Shared and Paved Space: There is no difference between the surface of the vehicle's lane and the pedestrians` lanes. Remove all sidewalks, and make the street without any height difference. Furthermore, where the sidewalks are not removed, the start and end should be marked (plants, trees, benches). That is because the driver will have to slow down and be careful when there is no separation between pedestrians` areas and the roadway. The shared surface also encourages the sharing behaviour between road users, as the continuous surface gives the sense that the place must be shared (Karndacharuk, 2014). Figure 7 shows an example of Woonerf in Stuttgart.

Figure 7. *Woonerf Application at Stuttgart, Tübinger Straße,. Source (URL-4)*

The street should encourage walking and spending time (Biddulph, 2010). The critical factor to achieving this is reducing drivers' speed (Collarte, 2014). Countries use different rates (ranging between 10-20 mph (16-32km/h)).

3. Physical Barriers to reducing the speed of cars and cutting off the sightlines to force the drivers to drive carefully. The obstacles include speed bumps, narrow drive lanes, small corner radiations, trees, furniture, curves, parking rearrangement, chicanes, etc. (Collarte, 2014). Biddulph suggests (and according to Woonerf Design Standards published by the Dutch government) that they should be no more than 160 feet (49 m) apart, and that is for not creating long straight streets, which gives the feeling that the priority is for vehicles (Collarte, 2014). However, the distance should not form an obstacle for emergency vehicles because it is essential to leave space for large-size vehicles to enter the neighbourhood (Police cars, fire trucks, trash trucks, etc.) (Guttenberg, 1982).

4. Street Furniture (trees, seating places, playgrounds) to encourage people to stay and socialize and to make the street more attractive. They can also be used as speed barriers since the Dutch Motor Code for Woonerf (published by the Dutch government) states that playing is also allowed on the roadway (Guttenberg, 1982). Hence, drivers must be more cautious (The previously mentioned code estimated the allowed space at about 15-20 km/h). In figure 8 an example of Woonerf from Amestrdam.

Woonerven can be created by converting older streets or they can be "built from scratch." The cancelling of the distinction between sidewalk and roadway gives notice that this older Delft street is reclaimed for neighborhood life. Note the textured pavement and the centrally-placed lamp standards, saplings and benches.

Figure 8. *One example of Woonerf application in Amsterdam, Source (Guttenberg, 1982)*

Anyway, other principles are no less critical, and they are (Biddulph, 2001):
5. On-street parking should be provided (of course, this can mean designing low-rise buildings (as advised by Jacobs and others)). Physical elements or different pavement materials should indicate areas of parking. Moreover, the parking places should not be continuous, so the car would not be the dominant element in the zone (Appleyard et al., 2006).

6. Good public lighting provides visibility of all elements of the street during the dark and prevents conflicts (Collarte, 2014). Also, good lighting increases human activity in the space and the sense of safety, especially for disabled people (Clayden et al., 2006).

7. Social Space: places serving as areas for playing and seating. According to Biddulph, empty parking places could be used as social places, while social spaces cannot be used by cars (Biddulph, 2010). In addition, seating areas are essential, as they encourage people to stay and socialize (Collarte, 2014). Part of the social areas could be play areas for children.

8. Attractive street: Planters should make the street more attractive. Newly planted trees should suit already existing growers (Collarte, 2014).

9. Interface: To make sense of the community and increase safety, the buildings should be oriented to the street, as Jane Jacobs argued, because this will increase surveillance (Collarte, 2014).
So Woonerf's Concept mixes social activities and playgrounds with cars (Steinberg, 2017). It also uses as few signs as possible.

AN EXAMPLE OF WOONERF-LIKE APPLICATION IN ISTANBUL

YAKUT SOKAK IN BAKIRKOY

Bakirkoy is a diverse and vibrant neighborhood. It is located in the western south of Istanbul, on the shores of the Marmara Sea. Figure 9, shows the studied street location in Bakirkoy.

Figure 9. *The studied street location.*

In addition to residential buildings, it has many shops, restaurants, and services. It is very close to public transportation, making it easier for people to visit. The variety of places makes it a pleasant place for individuals and families. Figure 10 shows the variety in the studied street.

Figure 10. *The studied street at Bakirkoy*.

The street under consideration is long, with numerous clothing stores, restaurants, and cafes on both sides. As a result, cars and people are mixing here, and vehicles are moving slowly. In addition, cars use some spaces in the street as parking places (see figure 11). Furthermore, some roads cross at multiple points, allowing cars to pass from one side to the other.

It should be mentioned that the area around the street is very mixed and resembles Woonerf.
Cars do not seem to annoy wandering people. The priority is for pedestrians, and drivers are using their vehicles cautiously. The place creates a lively social public space.

Figure 11. *Parking places.*

The examined street resembles Woonerf from many points:
*It forces the cars to slow down despite having no physical barriers.
*It has some parking places. It also has a small open garage for parking (which may be contrary to Woonerf's idea of not making vehicles dominant in the street, especially since it is open).
*It has many places for human activity.
At the same time, the street is different from Woonerf in some points:
*It has barriers that discriminate between pedestrians and car lanes (people still use the road wide for walking).
*Parking places are not precise; any empty spot could be used for parking.
*Many vehicles are crossing the street, resulting in forming through traffic.
A questionnaire was conducted to examine visitors' satisfaction with the place.

PRACTICAL EXAMPLE

AKSEMSETTIN STREET EXAMPLE

Some streets in Istanbul need a Woonerf application to develop for the better. One example is Aksemsettin Street in the Fatih neighbourhood in Istanbul.

The street is residential and commercial; it contains a lot of shops, offices, restaurants, groceries, and residential apartments. It is a bustling place with too much traffic.

The street is narrow (about 10m) with two narrow sidewalks (about 1.7 m each), usually overtaken by the markets overlooking it. It is about 650 m long. It is a two-way street with two little parks and playgrounds at each end. They always have a lot of people and children spending time there (see Figure 12).

Figure 12. *The studied street (Aksemsettin Street/Fatih).*

The suggested space to implement Woonerf is as shown below:

Figure 13. *The suggested area of Woonerf.*

The segment is about 330 m long. It has a lot of commercial activities and, unfortunately, heavy traffic, which prevents feeling the place's enjoyment and causes a lot of noise, annoyance and the feeling of danger. The street also has many side entrances. Additionally, parking is allowed anywhere on the road, which causes a lot of traffic, noise, and inconvenience. It is vital to note that most parked cars belong not to the residents but instead to the users of the markets.

The suggested scheme (see Figure 13 and Figure 14):

The recommended steps are the following:

1. Use clear entrance and exit, with Woonerf signs, rump up of the surface or different colour or material, plants, and lamps.
2. Eliminate all sidewalks to make all users on the same level and use different surface colours to indicate travel lanes.
3. The road is narrow, so it is better to use parallel parking without making the cars the dominant element of the street (in the suggested scheme, 14 parking spaces are provided).
4. Close all the cross entrances to the street with unremovable bollards while leaving space for oversized vehicles to manoeuvre in the middle of the road (this entrance should be closed with removable bollards)—big vehicles such as emergency vehicles, trash vehicles, loading vehicles, etc. In addition, make it a one-way street.
5. Dedicate space to social activities (put benches, for example, or allow the adjacent restaurants and cafes to occupy an area in front of them), placing them mainly in front of closed entrances to the road, protected by plants.
6. Use plants as barriers to the drivers' sight and speed and make the travel lane curvy to force the drivers to slow down.
7. At the upper and bottom sides of the street, keep the separation between pedestrians and cars, provided that speed and parking limitations apply.

Figure 14. *The suggested scheme.*

It is crucial to involve the residents in the design process, informing them of the benefits they will achieve and how the new design works; this could be achieved through workshops and meetings.

CONCLUSION

Woonerf contributes to creating a street with social activities and an attractive environment that positively affects residents' lives. The Woonerf Concept is popular in Europe (under different names) and is applied in many countries in a wide range. In the U.S.A., shared places were mainly implemented in commercial areas, but in recent years, they have been adopted in new developments and existing streets. Still, it is rare in residential neighbourhoods (unlike in Europe) (Collarte, 2014). At the same time, it is still unrepresented in Turkey and many Middle Eastern cities. Although many of these cities, and cities of the global south, have a lot of neighbourhoods similar to Woonerf because most of them contain old and traditional areas. It is also because cities through centuries were built for people, with narrow streets, full of life, not suitable for cars (Gehl, 2010) or what we can call "Organic cities", which expand depending on the needs of humans, not vehicles` needs. So, although there is no Woonerf in these cities, the residents are already familiar with what Woonerf means without even knowing it, and that would help introduce the Concept for them to apply at needed and suitable places.

This spread of the Woonerf applications in all of Europe and America, and the tendency of countries towards adopting this application (with its all different names) to improve the cities' environment and make it more suitable for the population, in addition to the positive evaluations of neighborhoods similar to Woonerf in Istanbul, indicates the possibility of applying Woonerf in Turkey as well, and the chance to utilize it in new projects to seize the opportunity and improve cities and make them more human-centered, focusing on people's quality of life.

People may be reluctant to accept new changes and to get used to them. They are used to cars and fast-paced life but need time to change their habits (Jacobs, 1961) and be open to new ways of thinking about city planning and design. Eventually, all will benefit from the more attractive environment,

inviting people to socialize in the street. However, it is essential to remember that accepting the concept is related to behavior, culture, and understanding the idea.

Naturally, Istanbul has many places resembling Woonerf. However, because it is an ancient city, it already has many vibrant old streets where people easily mix with cars and markets and where there is no distinct differentiation between car lanes and pedestrians; these places need some improvements to become a clear Woonerf.

What must be studied is the ability to apply Woonerf from scratch in new redevelopment projects that have taken a prominent place in Istanbul over the last few years.

Initially, Woonerf was conducted in low-density places (Gameren et al., 2010), then it started to include more density under different names (Shared places, home zones). However, while the main aim of Woonerf is to develop an environment where humans and their activities and low-speed movement are more important than vehicles and their high speeds, in Istanbul, most redevelopment projects are car-centered; however, one could start applying Woonerf from places for people's activities within these new projects. However, these new redevelopment projects are a chance that must be grabbed to make a better place for people. As Todd Litman and Jane Jacobs suggested in their works, we must change how we think about cities and transportation to create human-centered neighborhoods.

However, it should be noted that there should be a pilot period before implementing the final plan. Observations should be made during this period, and appropriate modifications should be made to suit the place.

Maybe, to get the users to follow the recommended instructions and speeds, an effective monitoring system and fines should be used at first, at least. In addition to the contribution of the local municipalities in promoting the idea of Woonerf through special events and social media platforms, for example.

Finally, these solutions may seem extreme or significant change. Nevertheless, to improve our cities, make them more suitable for people and reduce the increasing dominance of cars, we must change how we think and experiment with all innovative solutions, especially those that have proven effective in other places, even if they seem difficult. People gradually get used to the new situation and learn only by experimenting. This change is happening now in almost all cities in the advanced world.

In many areas in Istanbul (almost everywhere except the highway), there is something similar to Woonerf: cars and people interact, and no one seems to be bothered by the other. Although this situation is ironic, it is a fact. So, it can be thought that Woonerf brings order to this situation. It organizes the speeds of the vehicles and the way and place of their movement and parking, bringing more feeling of safety to the users and preventing cars from dominating the street.

The automobile has become an inevitable element of shared spaces. As the saying goes, "If you cannot beat them, join them." it is also ironic, but it is true; Woonerf can be a tool to control/reduce/prevent negativities that the automobile phenomenon has/may cause in urban spaces.

CONFLICT OF INTEREST

I declare that there is no conflict of interest in this paper.

BIBLIOGRAPHY

Appleyard, B., & Cox, L. (2006). At Home in the Zone: Creating Livable Streets in the U.S. American Planning Association.

Ben-Joseph, E. (1995, Autumn). Changing The Residential Street Scene, Adapting the Shared Street (Woonerf) Concept to The Suburban Environment. Journal of The American Planning Association (A.P.A.), 61(4), pp. 504-515. Retrieved from https://www.tandfonline.com/doi/epdf/10.1080/01944369508975661?needAccess=true&role=button

Biddulph, M. (2001). Home Zones: A Planning and Design Handbook. The Policy Press.

Biddulph, M. (2010, March). Evaluating the English Home Zone Initiatives. Journal of American Planning Association, 76(2), pp. 199-2018.

Bruntlett, M., & Bruntlett, C. (2021). Curbing Traffic. Island Press.

Buchanan, C. (1963). Traffic in Towns. London: H.M. Stationery Office.

Clayden, A., Mckoy, K., & Wild, A. (2006). Improving Residential Liveability in the U.K.: Home Zones and Alternative Approaches. Journal of Urban Design, pp. 55-71.

Collarte, N. (2013). The Woonerf Concept: Rethinking a Residential Street in Somerville. A.P.A. Transportation Division Newsletter, 38(3), pp. 4-7.

Collarte, N. (2014). The American Woonerf, Creating Livable and Attractive Shared Streets. Thesis, TUFTS UNIVERSITY.

Gameren, D. V., & Mooij, H. (2010, June 1). The Heritage of The Woonerf. DASH(3).

Gehl, J. (2010). Cities For People. Island Press.

Guttenberg, A. Z. (1982, SPRING/SUMMER). How to Crowd and Still Be Nice, The Dutch Woonerf. Humboldt Journal of Social Relations, 9(2), pp. 100-119.

Jacobs, J. (1961). The Death and Life of Great American Cities. New York: Random House.

Karndacharuk, A. (2014). The Development of a Multi-Faceted Evaluation Framework of Shared Spaces. The University of Auckland.

Litman, T. (2016). Transportation Cost and Benefit Analysis Techniques, Estimates and Implications Second Edition. Victoria Transport Policy Institute.

Litman, T. (2021). New Mobilities, Smart Planning for Emerging Transportation Technologies. Island Press.

Nio, I. (2018). Communal Versus Private. The Unfinished Search for The Ideal Woonerf. Delft Architectural Studies on Housing(3), pp. 4-17. Retrieved from https://journals.open.tudelft.nl/dash/article/view/4579/4370

URL-1. What Is a Woonerf?. Planetizen. (n.d.). Retrieved September 01, 2023, from https://www.planetizen.com/definition/woonerf

URL-2. Bengtson, B. (2019, January 22). Help the District of North Vancouver Name a New Street. North Shore News. Retrieved September 02, 2023, from https://www.nsnews.com/in-the-community/help-the-district-of-north-vancouver-name-a-new-street-3092143

URL-3. Rich, S. (2010, July 10). Riding London`s Bicycle Superhighways. Fast Company. Retrieved September 15, 2023, from https://www.fastcompany.com/1661935/riding-londons-bicycle-superhighways

URL-4. Mussklprozz. (2013, June 03). Stuttgart Tuebinger Street.jpg. commons Wikimedia. Retrieeved September 05, 2023, from https://commons.wikimedia.org/wiki/File:StuttgartTuebingerStr_2013-06.jpg

Steinberg, L. (2017, 06 15). What Is a Woonerf? Creating Inclusive and Livable Streets, the Dutch Way. Retrieved from https://www.linkedin.com/pulse/what-woonerf-creating-inclusive-livable-streets-dutch-lior-steinberg/

Sunday, C. (2017, July). Woonerf: The Dutch Solution to City Planning. Retrieved from Nature's Path: https://www.naturespath.com/en-us/blog/woonerf-the-dutch-solution-to-city-planning/