Cycle Highway: Concept and Benchmarking

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Abstract

Only 8% of the European Union residents use bicycle to commute, being the Netherlands the country with the biggest representativeness in bicycle use for everyday activities. Even if there is no expressive use of bicycles in most European countries, the benefits of this mode of transportation are well known. Starting from the health benefits, as bicycling is considered a physical activity, what lower people's body fat and decreases the risk of diabetes, hypertension and some kinds of cancers, to the environmental benefits of the bicycle, which are related to the reduction of CO_2 emissions to the atmosphere. The advent of e-bikes brought more people to use bicycles, especially elderly or people with reduced mobility. This technology also allowed people to travel longer distances, what is a key factor to the implementation of the concept of Cycle Highways. Cycle Highways (CH) were thought to be the bicycle connection between cities when people need to commute to work or study. These infrastructures are longer than 5 km and allow bicyclists to perform higher speeds than the ones practiced in cities. The CH can be placed alongside highways or in totally different sites, but the basis is that bicycles have their own space away from cars and pedestrians to make inter-cities displacements. Besides explaining the concept of Highways, this work also shows where they are present in Europe and how they benefit society through the exercise of Benchmarking.

***Keywords**: Bicycle, Cycle Highway, Cycling.*

1. Introduction

The car has been the main mode of transport around the world since the 20th century, and the problems with its utilization can be felt in the present days. Major and medium-sized cities suffer from long queues of traffic congestion everyday not only on peak hours, the problem with air pollution has been affecting people's health and demanding more funding from governments to treat them. Stress has also been a huge problem in modern society because of the problems caused when driving long hours and being stuck in long traffic lines of congestion.

Therefore, this work shows how bicycles have been used in a different form around Europe to promote a healthy and sustainable manner of commuting. The new concept of Cycle Highways created in the Netherlands lead people to go through different cities by bicycle within a distance from 5 km in a comfortable and fast way. Proper infrastructure is provided to cyclists once they do not need to interact with cars and pedestrians in these fast routes. The

trails are planned to give total wright of way to bicyclists with intersections in different levels from car roads and pedestrian paths.
Along with the concept and benefits of the use of bicycle in cities and between cities – the case of the Cycle Highways, there will be made a benchmarking of current infrastructures being used in Europe and the ones planned to be built in the next years. Emphasis will be given to the Netherlands, Denmark, United Kingdom and Germany, once these are the countries with more length in CH infrastructure.

2. Concept of Cycle Highways

Cycle Highways are high-quality cycle paths that offer a direct connection between home and work. They allow users to cycle at a constant speed with relatively low energy expenditure because the routes are free of intersections (under and over passes), consist of linear stretches and large-radius curves, have a good surface and are wide enough to allow overtaking and side-by-side cycling. The conceptual comparison with highways is intentional: Cycle Highways are cycle paths separated from the rest of the traffic and on which cyclists generally have the right of way away from main roads, so as to allow them to reach higher speeds with relatively low energy expenditure (Ministerie van Verkeer en Waterstaat & Netherlands, 2012).
According to European Cyclists' Federation (2014), the Cycle Highways have to be at least 5 km long, be ≥3.0 m wide if one-directional, and ≥4.0 m if bi-directional, be separated from motorized traffic and pedestrians, avoid steep climbs and prioritize mild gradients, avoid frequent stops (e.g., by giving priority at crossings) to enable an average speed of ≥20 Km/h, provide regular maintenance, winter service, public lighting, service stations, etc.

3. Benchmarking

3.1 The Netherlands

The Netherlands started building Cycle Highways in 2006 to combat traffic jams. The first city stretches were situated alongside busy motorways to offer frustrated motorists visible alternative (van der Zee, 2016). The pioneer 7 km route was created to connect Breda and Etten-Leur, and nowadays authorities and cyclists association aim at creating 675 km of Cycle Highways around the country's cities by 2025 (European Cyclists' Federation, 2014). Data from the (European Cyclists' Federation (2014) shows that there are eighteen existing routes in the Netherlands, and seven under construction with a total estimated cost of 700 million euros (approximately 1 million euros per kilometre), benefiting major metropolitan areas like Amsterdam, Rotterdam and Hague.

3.2 Denmark

According to Office for Super CycleHighways (2018), 23 municipalities and the Capital Region of Denmark have joined forces to create the Cycle Highways, and by the year of 2018 eight CH have been built, seven more are on the way, as a total of 45 routes is foresighted to the Capital Region of Denmark. Office for Super CycleHighways (2018) says that these 45 routes will have a total length of 746 km of Cycle Highways. In general, these routes make

use of existing infrastructure and are upgraded to live up to the CH criteria and standards. The requalification process counts with an investment of 295 million euros by 2045. Projections of the Super Cykelstier Office (2017) show that the implementation of the 45 routes of the Cycle Highways has the potential to reduce the number of days of sickness by 40,000 days a year, ensuring a year reduction in CO_2 emissions of 1,500 tons (equivalent to almost 200 times Dane's annual emissions) and reducing the number of car trips by one million. These routes can also lead to a socioeconomic return of 11% relative to the investment.

3.3 United Kingdom

London had been working on a system of 12 Cycle Highways running into the city centre, as the city claimed to increase the bicycle share by a factor of 5 until 2006. These routes are built to be clearly recognizable by the blue surface of the asphalt (Ministerie van Verkeer en Waterstaat & Netherlands, 2012).
Projections from the Transport for London (2017) show that by 2022, the transportation network in the city will include more than 90 km of CH and 250 km of Quietways. Different parts of the city are already connected, as CS1 connects the city to Tottenham, CS2 connects Stratford to Aldgate, CS3 connects Barking to Tower Gateway, CS5 connects Oval to Pimlico, CS7 connects Merton to the City, and CS8 connects Wandsworth to Westminster.
For every Cycle Highway in London, the Transport for London (TfL) commission makes a consultation with the users and general population to include in the project special needs from the citizens.

3.4 Germany

According to Regionalverband Ruhr (n.d.-b), the Cycle Highway called RS1 is going to be built from Duisburg to Hamm with a length of 101 km, and the main goals are to provide quality of life to the population and improve mobility in the Ruhr Metropolis, which is the most populated region of Germany and hosts the biggest industrial park of the country.
RS1, as a CH, will connect ten cities and four universities in its total extension. The bikeways are completely separated from the vehicle lanes, with a 4 m width, tunnels, lights and snow cleaning because safety and accessibility issues are two of the biggest obstacles to biking (McCartney, 2016)
The RS1 is intended to serve the almost 2 million people that live within 2 km of the route for daily commuting (Rayaprolu, 2017). In such a densely populated polycentric region, the Cycle Highways are anticipated to impose a significant relief on road and rail congestion (0'Sullivan, 2016). The regional association predicts that the 101 km CH could take 52,000 cars off the roads every day, reducing daily car kilometres by around 400,000 km and annual CO_2 emissions by 16,600 tons (Regionalverband Ruhr, n.d.-a).
Other regions of Germany are also planning Cycle Highways to connect cities. Frankfurt is planning a 30 km path south to Darmstadt, Cologne and Hamburg are also in the planning phase, Nuremberg and Berlin are conducting feasibility studies, and Munich is finalizing a 15 km pilot route into its northern suburbs (Rayaprolu, 2017).

4. Conclusion

The urge for better and greener ways of displacement made possible the Cycle Highways implementation in Europe, as this kind of infrastructure enables people to travel between cities to go to work or study without having to use cars and pollute the environment.
The structure needed has a higher standard than the regular cycle paths built in cities. They give right of way to bicyclists in intersections and prioritize the bicycle over the car, excluding any interaction between bicycles, cars, and pedestrians. This is one of the reasons that CH have been more and more used for experienced cyclists and for people who shift from cars to bike because they can commute without getting traffic congestion and having contact with nature.
Fortunately, some regions of Europe are already investing in this kind of infrastructure to solve traffic problems, as the United Kingdom, Denmark, the Netherlands and Germany, which have already built some extensive kilometres of CH and had received a good and positive feedback from users and from environment data on pollution.
It would be interesting that other countries in Europe look at Cycle Highway as a means to help relieve the impact of massive car use in cities. To enable citizens to shift from cars to bicycles in a comfortable and safe way to commute every day.

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