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The advent of Speed Pedelecs

High speed e-bikes in the Netherlands - critical issues and lessons learned?

Despite innovations in mobility systems focussing on cars, the bicycle is gaining territory in the Dutch urban environment, triggered by the advent of electrically supported bicycles (KiM, 2016) which expand the scope of active modes offering more speed, ease of use and convenience to an already strongly embedded cycling culture and infrastructure. The remaining challenge is to extend cycling beyond short-term intra-city trips to intercity trips. This might be possible certainly now that the reach of bicycles has expanded with electric bikes and speed pedelecs. The latter is a bicycle which is able to attain 45 kilometers per hour with help of electrical support.

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Commuters riding a conventional bicycle to work on average bridge a distance of 7,5 kilometres (KiM, 2015). E-bikes, especially the speed pedelec is a valuable opportunity to create intercity movements as it enables the commuter to bridge longer distances at relative high speed. Up to now, intercity trips in the Netherlands, exceeding a distance of 7,5 kilometres, are primarily executed by car (KiM, 2016).

Reducing Pressure on Road Network

Struggling to find solutions for an ever growing pressure on the Dutch road network, the potential of the speed pedelec has been recognised by many governmental institutions. For example, the increase in investments in cycle highways is supported by the growing numbers of e-bikes and speed pedelecs on the road. Even though advantages of power assisted bikes have been recognised, not everyone welcomes the cycling trend with great joy. Remarks are made such as: 'Help! The bicycle is a success' (Immers & Weststrate, 11 December 2015). This exclamation seems to suggest that the phenomenon is growing out of proportion and is producing negative external effects. Immers and Weststrate (2015) point at the growing pressure on a cycling path's capacity, safety and comfort due to the growing number and variety in users. It is still unclear how the speed pedelec should fit in more properly in the urban transport system since its effects on mobility remain unsure (Rose, 2012). As the Knowledge Institute for Mobility (2015) states, there is more necessary than mere provisions of hardware related to bicycles to stimulate the use of bicycles and pedelecs. For conventional cycles and e-bikes many stimulating programs have been developed and evaluated (Tertoolen, de Vree, Ruijs & Stelling, 2016). For speed pedelecs only explorative studies have been carried out to define the target group and behaviour in relation to safety as in De Bruijne (2016). Another research consists of

interviews with speed pedelecs users to identify the influence of the physical environment on the cycling experience (Westerweele, 2016). Remarks such as 'help, the bicycle is a success', despite negative connotations, hold tons of opportunities to develop a sustainable urban environment. Such as an environment in which mobility is organized in a way that carbon dioxide is drastically reduced, lifestyles turn out to be healthier and the urban environment is organized more compactly (Rose, 2012).

The possible position of the speed pedelec in intercity traffic, and therefore the upscaling of speed pedelecs in the Dutch bicycle system, is subject to debates concerning classification of vehicles and road design. As this bicycle may reach 45 kilometres an hour, its distinction with mopeds has become unclear. Cycling lanes now have to deal with varying speeds: conventional cycles, childrens, cargo bikes, race cycles, e-bikes and speed pedelecs. As a response to this issue the ministry of Infrastructure and Environment in the Netherlands, has determined that the speed pedelec is to be regarded equally as a moped, per January 1st 2017 (ANWB, n.d.). The regulations are a response to safety and social issues, which have been evolving the past years in the Dutch cycling landscape, with the arrival of new types of bicycles. Yet, redirecting the speed pedelecer to car tracks causes new questions and problems. Not all participants in traffic are aware of the speed pedelec and its place on the road. On top of this, the speed pedelec has the appearance of a regular bicycle and is silent. Those challenges have not been present before in the Dutch urban landscape considering cycling. The discussion flamed up again after several accidents where speed pedelecs have been involved in the Arnhem-Nijmegen area (Barendregt, 2019): does the speed pedelec belong on a cycle lane or car track?

Within this premise, in this paper the Dutch debate around the speed pedelec is presented with empirical evidence that provides user insights on the potential of the speed pedelec in commuter traffic. The rest of the paper is organized as follows – the next section defines the features of a speed pedelec followed by the Dutch legal framework around. Then we present the user profiles and attitudes towards the legal mandates. Finally concluding remarks and a consideration of how to regard new vehicles are presented.

The speed pedelec

It is important to distinguish two types of electrically supported bicycles. First of all, there is a powered bicycle which is supporting the rider to a speed limit of 25 km/h. This is commonly known as the e-bike. Secondly, the speed pedelec, which may attain 45 km/h (De Bruijne, 2016; Rose, 2012). Due to the provision of power assistance to the rider, the speed pedelec has a great potential in expanding the role of the bicycle in urban transport (Rose, 2012). Such bicycles also respond to the perception of increase in physical activity and personal well-being (Jones, Harms and Heinen, 2016). The Dutch Knowledge Institute for Mobility reports that the partition of our travels by cycle remains about 25 % throughout the years (KiM, 2015). However, the growth in number of travelled kilometres by bicycle among the Dutch population is significant. This has risen with nine percent compared to 2004 (KiM, 2015). Related to this is the growth of ownership of the electric bicycles (Rose, 2012). Especially among elderly in the Netherlands the increase of pedelec ownership is significant. This particular group mainly uses such electrically supported bicycles for recreational trips. Yet, in 2016 the KIM reported that the number of e-bike users also increases among working people for commuting and shopping purposes (KiM, 2016). While the KIM reports that the e-bike is only 0,6 kilometre per hour faster than a common bicycle, the average distance travelled is two kilometres longer (KiM, 2015). In the subsequent research of 2016 it is calculated that the e-bike's operational distance is 1.5 larger than a conventional bicycle (KiM, 2016).

Legal framework in the Netherlands

Riding and owning a speed pedelec is confined through both the European and the Dutch law. In the European model various vehicle categories are distinguished based on number of wheels, motor capabilities, size and weight. A speed pedelec belongs to the L1e category as it is supported by an electrical motor. This includes all light motorised vehicles on two wheels (De Bruijne, 2016). According to European law it is allowed to build speed pedelecs with batteries that can deliver an output of 2000 watt. Yet, the speed pedelec will always only multiply the cyclists' efforts four times. This implies that the cyclist would have to put in 500-watt himself to exploit the batteries' capabilities. A threat to the rule of law is the relatively ease for a cyclist to tune his cycle to reach higher speeds. The limit of 45 km/h can be increased manually. Besides electronic tuning it also possible to change the limits mechanically (Ministry of I&E, 2014). It is difficult to maintain the current speed limit as tuned pedelecs will not be visibly recognizable.

In the Netherlands, the law on speed pedelecs has changed from the 1st of January 2017, hereby following the European law that was settled in 2013 on electrically supported bikes. This law implies that the speed pedelec is regarded to be equal to the moped. One of the consequences is that the speed pedelec users are now obliged to wear a helmet. Initially this would be the regular moped helmet. However, various parties have lobbied to design a new type of helmet. This norm has been published in august 2016, determined under the NTA (Dutch Technical Agreement) 8776 norm. The helmet has the appearance of a regular cyclist helmet but is designed for higher velocities. On top of this, it covers the temples and the back of the rider's head.

Its juridicial place on the road is now also equal to that of a moped. The following rules are forced upon the speed pedelec (Rijksoverheid, n.d.):

1. The maximum speed on a regular track is 45 km/h.

2. On a cycling/moped lane outside urban areas the designed speed is 40 km/h.

3. On a cycling/moped lane within the built environment the designed speed is 30 km/h.

In other words, the speed pedelec is redirected to the regular track and is forced to mix with car traffic in case of absence of a cycling/moped lane. This while their average speed is not comparable to that of a car (De Bruijne, 2016).

Research has pointed out that it is unfavourable to put speed pedelecs on car tracks as the average speed is 35 km/h, in contrary to the supposed 45 km/h speed limit (De Bruijne, 2016). This raises questions such as if using the speed pedelec remains attractive, will user numbers keep growing and how can people be still stimulated to use the speed pedelec.

The enforcement of this law has not been welcomed by every road authority in the Netherlands. Provincial road authorities have acknowledged the potential impact of speed pedelecs and employ this motivation to accelarate the construction of the cycle highway network. However, with the arrival of the new law, speed pedelecs are legally not allowed on cycle highways as these are almost always exclusively denoted for cycles, implying that mopeds are not allowed. This led to a research by the province of Gelderland, exploring on which provincial roads the speed pedelec rider would find himself in dangerous situations whenever he had to mix with car traffic (Maas, 2018). At sixteen trajects within the built environment, potential dangerous situations have been identified. In response to these findings the Province has amended the regulation for cycle highways. As per ~~january~~ 1st 2018, province of Gelderland enforced a measure of exception by implementing a new signpost informing the road users that speed pedelecs are also allowed on the cycle track on these trajects. After an evaluation study, province of Gelderland has maintained this measure as it appeared that speed pedelec riders preferred the cycle track over car tracks (Gelderland, 2018). Currently, they are working with municipalities to install this measure of exception on cycle highways as well. The longer term effects of this ammendment are yet to be seen.

The speed pedelec user

In an attempt to understand the value of the speed pedelec in commuter traffic and to identify possible motivational measures for potential speed pedelecers, we investigated the user profile, attitude and preferences through executing a survey among both current speed pedelecers and potential speed pedelecers, which are briefly summarized below (for further details please see Hendriks, 2017).

The speed pedelec sample consists of 222 speed pedelec users. In table 1, socio demographic data on the speed pedelec user has been summarised. The presented variables are age, gender, education, driving license, availability of a car and previous travel behaviour. It appears that the largest group (42,3%) is between 46 and 55 years old. The average age among the respondents is 48,52. Moreover, earlier research is confirmed when considering the share of men on speed pedelec is four times larger than women (De Bruijne, 2016). This is remarkable as research shows that women are inclined to commute more often by bike and men by car (Van Acker & Witlox, 2010). Riding a speed pedelec is primarily an activity for higher educated people. 69,8% of the respondents has completed university of applied sciences or university. A speed pedelec, with considerably high prices, might be more appealing to higher income groups which are presumably higher educated people (Van Acker & Witlox, 2010).

In table 2 the speed pedelec riders' general travel behaviour is demonstrated through illustrating their average speed, travel distance, multimodality, frequency of cycling to commute and previous mode of transport. As previous research has shown, not every speed pedelec user reaches the speed limit of 45 km/h (De Bruijne, 2016). This is confirmed through this data set. Almost halve of the respondents (48,6%) estimate their average speed to be between 31 and 35 km/h. What can be derived from the table below is that the share of speed pedelec users in commuter traffic grows as the distance augments.

Moreover, the full commuting distance is covered by 82,9 % of the speed pedelecers. This means that it fully substitutes other modes of transport. Considering the mode of transport that is replaced by the speed pedelec, table 1 shows that 58,4 % used to drive their car to work. On average the speed pedelec is used for 76,07 % of the working days. This limits the notion of car replacement. Apparently, approximately 25 % of the speed pedelec users still rely on other modalities. An argument that can be put forward is that those respondents have the opportunity to tele work or are expected to sometimes work from an office outside the range of their speed pedelec.

At the brink of the law enforcement, 75,7 % of the respondents stated that they realise the law on speed pedelecs has changed and understand what the implications are. This group of 168 respondents have reviewed the impacts of the new law on the following indicators (Items have been scored from one to five. One resembles strongly disagree and five equals strongly agree). The new helmet, despite not feeling very comfortable with the new design, is welcomed. Although a new helmet is designed, the speed pedelecers do not expect to feel safe among car traffic. With a score of 1,68 they strongly disagreed with this statement. In 2018, it was found that, as expected in 2017, most speed pedelecers prefer cycle tracks over car tracks (Keypoint, 2018). Moreover, similar to previous research, it was found that the average speed of a speed pedelecer was 33,3 km/h on a cycle track in contrary to

Observed variables	Description	Mean or proportion (%)
Age < = 35	Age up to or equal to 35 years	9,0%
Age 36 – 45	Age between 36 and 45 years	24,8%
Age 46 – 55	Age between 46 and 55 years	42,3%
Age 56 – 65	Age between 56 and 65 years	23,4%
Age 66 = >	Age equal to or above 66 years	0,5%
Male	Share of male respondents	81,1%
Female	Share of female respondents	18,9%
Primary school	Highest completed education is primary school	1,4%
Secondary school	Highest completed education is secondary school	10,8%
Vocational	Highest completed education is vocational school	18,0%
University of applied sciences	Highest completed education is university of applied sciences	43,7%
University	Highest completed education is university	26,1%
Driving license	Having a driving license	97,7%
Availability car	Having a car available to drive to work	95,0%
Car (driving alone)	Former primary transport mode in commuting: car	58,4%
Car (carpooling)	Former primary transport mode in commuting: carpooling	1,8%
Public transport	Former primary transport mode in commuting: PT	13,1%
Moped or light moped	Former primary transport mode in commuting: moped or light moped	3,6%
Bicycle	Former primary transport mode in commuting: bicycle	10,9%
Electrical bicycle	Former primary transport mode in commuting: e-bike	12,2%
Age	Mean age	48,52

Table 1: Characteristics speed pedelec riders

Observed variables	Description	Mean or proportion (%)
Speed		
< 25 km/h	Average speed under 25 km/h	2,3%
26 – 30 km/h	Average speed between 26 – 30 km/h	17,1%
31 – 35 km/h	Average speed between 31 – 35 km/h	48,6%
36 – 40 km/h	Average speed between 36 – 40 km/h	24,8%
41 – 45 km/h	Average speed between 41 – 45 km/h	7,2%
Distance travelled		
<= 10 km	Working distance home to work is under 10 kilometres	8,2%
11 – 15 km	Working distance home to work is 11 – 15 kilometres	17,7%
16 – 20 km	Working distance home to work is 16 – 20 kilometres	21,4%
21 – 25 km	Working distance home to work is 21 – 25 kilometres	20,5%
26 => km	Working distance home to work is 26 kilometres or more	32,3%
Multimodality		
Travelling also by car	The respondent combines speed pedelec and car when travelling to work.	12,6%
Travelling also by public transport	The respondent combines speed pedelec and public transport when travelling to work.	4,5%
Travelling solitary by speed pedelec	The respondent only uses the speed pedelec when travelling to work	82,9%
Other purposes	The share of respondents that use the speed pedelec for other purposes than commuter travelling	70,6%

Table 1: Characteristics speed pedelec riders

the maximum of 45 km/h. However, there are big differences in speed between speed pedelecers as the range is from 27 km/h to 40 km/h (Keypoint, 2018). From a speed pedelecer's perspective, it is preferable to be allowed on a cycle track. However, the possible conflicts with conventional cyclists need to be considered and minimalised wherever possible. From the Keypoint (2018) research it is shown that speed pedelecers do not limit their speed whenever they overtake a cyclist and there is enough space.

Conclusion

In the Netherlands, the speed pedelec is not one of a kind concerning the debate on its place on the road. After a tragic accident with a Stint, an electric supported cargo bike, the cargo bike has been the centre of debate in the Netherlands (Verlaan, 2019). A couple of years ago, the Stint entered the mobility landscape in the Netherlands as an alternative to small buses for bringing children from daycare to school. After the accident, its safety was questioned and removed from the road. The minister recently announced that with some adjustments to the vehicle it will be allowed again. Also, the

e-scooter is struggling to enter the Dutch urban landscape as regulations are too rigid to fit in new vehicles (Steinbuch, 2019; Venema, 2019). Uncertain about its place on the road, permits are not granted for companies to install a sharing system of e-scooters.

New vehicles require a new perspective on how public space should be designed to facilitate those vehicles properly in an urban landscape. It is relevant to critically consider a new approach as most of these vehicles meet the demand of travellers and facilitate alternatives to the car. In the Netherlands, the new design approach for urban public space, Urban Mobility, is preparing for the near future in which more innovative vehicles will be introduced (Immers, Egeter, Diepens and Weststrate; 2016). This new design approach is supported by the ANWB, the Dutch ADAC, recognising the pressure on our contemporary road network and opportunities that need to be seized. Following this design approach, our urban landscape will consist of domains where certain speed limits will be applied. Such a perspective enables the speed pedelec to flourish between cities where its maximum speed may be attained and is forced to adapt to the urban environment when entering the city. ■

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