



Ministry of Infrastructure  
and Water Management

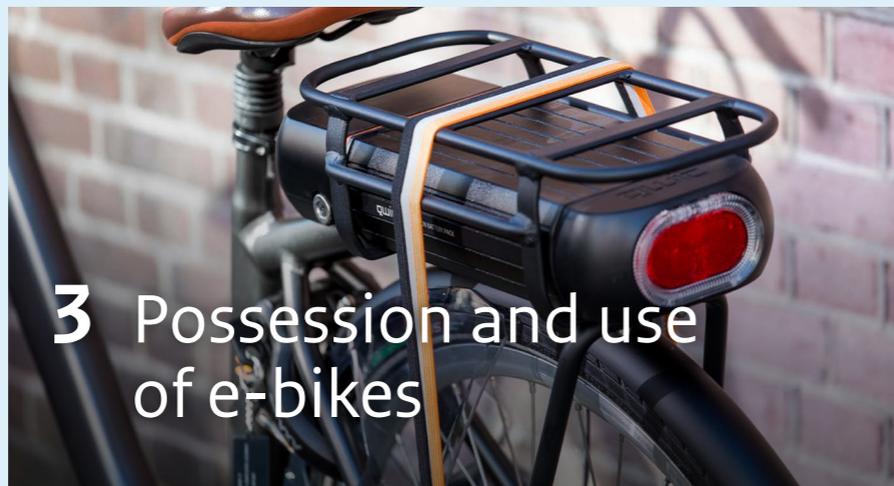
# Cycling Facts

Netherlands Institute for Transport Policy Analysis | KiM

Lucas Harms & Maarten Kansan



# Contents



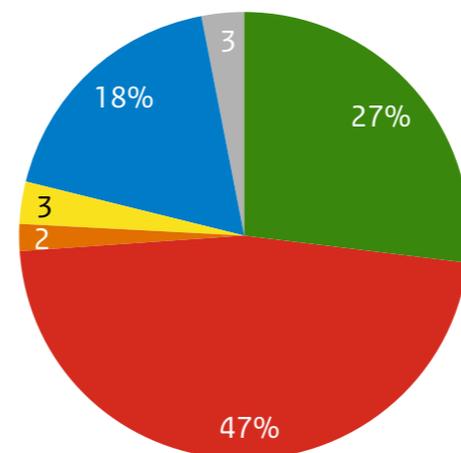


# 1 Facts and figures on bicycle use

## Bicycles account for 25% of daily mobility<sup>1</sup>

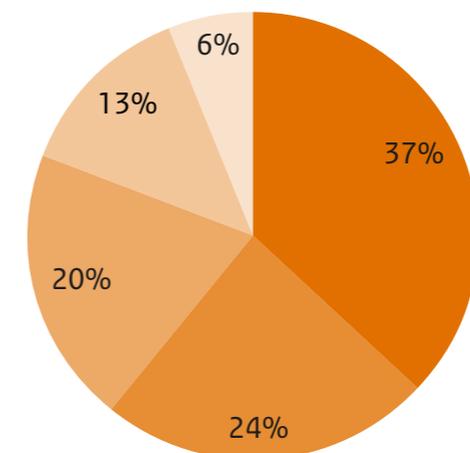
- More than one-quarter of all trips made by Dutch residents are travelled by bicycle.
- 2016 saw a total of 4.5 billion bicycle trips, spanning a distance of 15.5 billion bicycle kilometres.
- More than one-third of all bicycle kilometres are travelled for leisure purposes; one-quarter involve work-related trips.

Distribution of trips by mode of travel, 2016



■ Bicycle    ■ Bus, tram, subway  
■ Car    ■ Walking  
■ Train    ■ Other

Distribution of bicycle kilometres by purpose, 2016



■ Leisure    ■ Shopping  
■ Work    ■ Other  
■ Education

<sup>1</sup> Statistics Netherlands (CBS) (Netherlands Travel Survey (OVIN) 2016 – data adapted by KIM).

### In the Netherlands, bicycles outnumber residents<sup>2</sup>

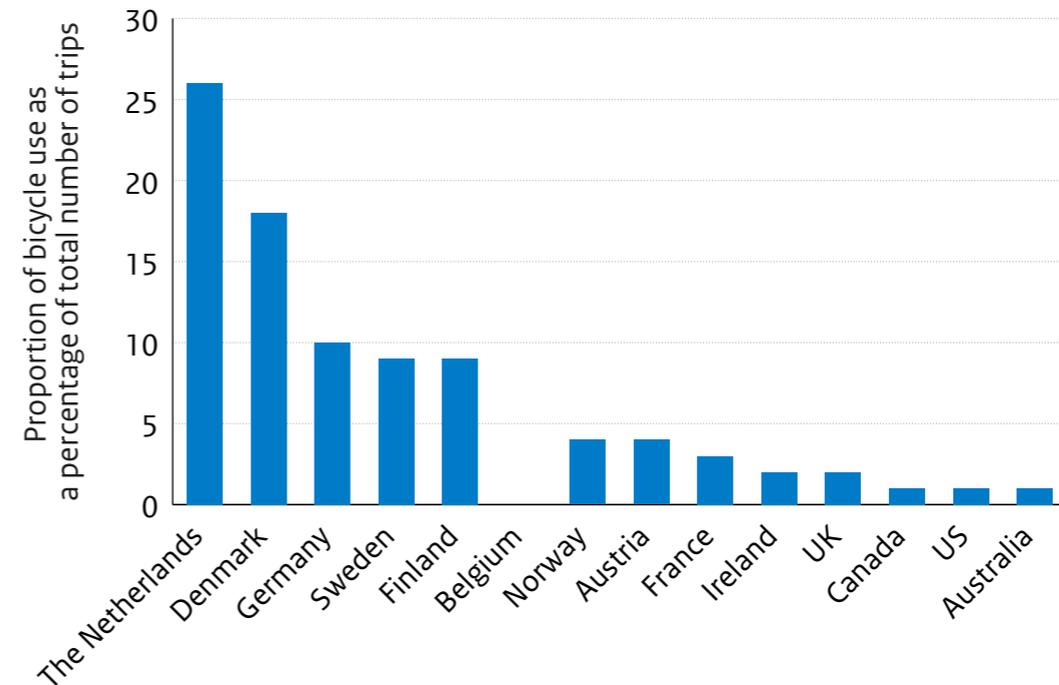
- The Netherlands accommodates 17 million inhabitants and 23 million bicycles.
- Increasingly more Dutch residents own an e-bike; of the 23 million bicycles, 2 million are e-bikes.

### Half of all passenger car trips are shorter than 7.5 km<sup>3</sup>

- Half of all passenger car trips are shorter than 7.5 kilometres (=3.6 billion car trips), one-third are shorter than 5 kilometres (=2.5 billion car trips).
- Of all trips involving a distance up to 7.5 kilometres, one-third are made by car and one-third are made by bicycle.
- Of all trips involving a distance ranging from 7.5 to 15 kilometres, 70 per cent are made by car and 15 per cent are made by bicycle.

### The Netherlands is the unrivalled number one bicycling nation<sup>4</sup>

Figure: Proportion of bicycle use as a percentage of total number of trips in several countries.



<sup>2</sup> Bovag (2018), *Fietsverkopen na jaren weer in de lift* [After many years, bicycle sales on the rise again].

<sup>3</sup> Statistics Netherlands (CBS) (Netherlands Travel Survey (OVIN) 2016 – data adapted by KIM).

<sup>4</sup> Buehler and Pucher, 2012.



## 2 Trends in bicycle use

### Growth in bicycle use since 2005: more people, more frequently on the road, travelling greater distances<sup>5</sup>

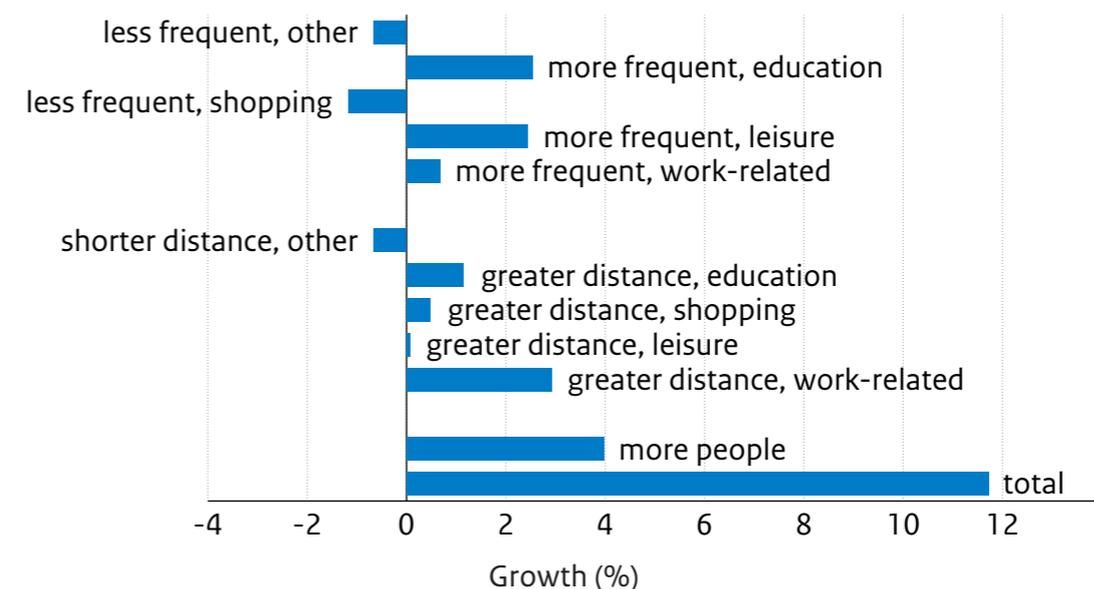
- Measured by kilometres travelled, bicycle use has increased by some 12 per cent since 2005.
- Both the growth in the number of cyclists and the increased mobility per capita (more frequent trips over greater distances) contribute to the increase in bicycle kilometres.

### Particular increase in use of bicycles for education, work, and leisure<sup>5</sup>

- Growing bicycle use is mainly related to education, work, and leisure (bicycle use for shopping purposes has not increased).
- The growth in the use of bicycles for trips to and from work can mainly be attributed to greater cycling distances, particularly among cyclists in their forties and fifties. The increase in the use of e-bikes may be a contributing factor in this respect.

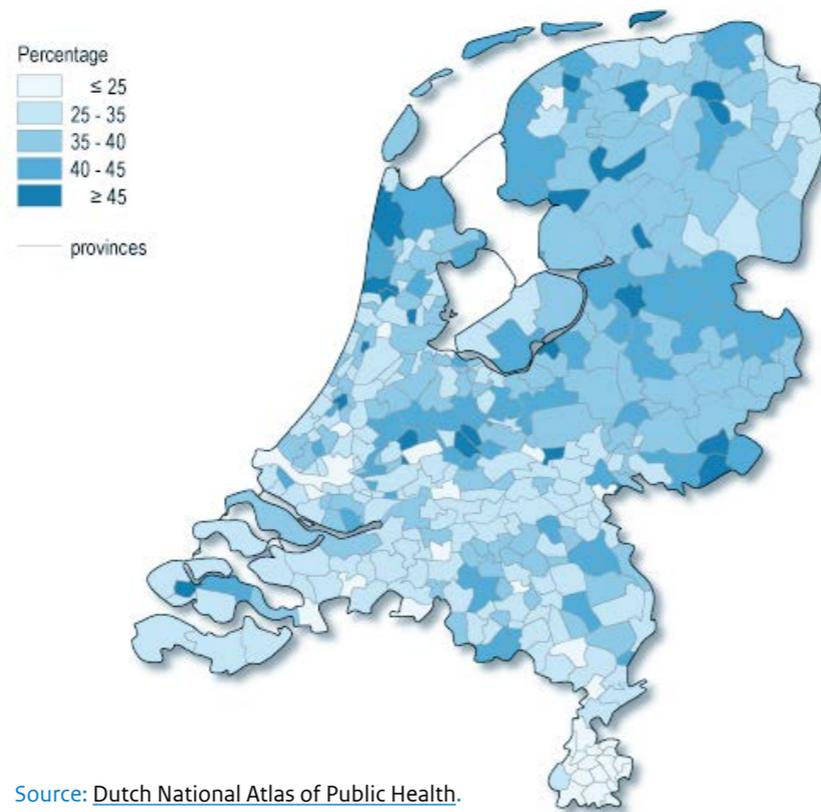
<sup>5</sup> KiM (2017), *Mobiliteitsbeeld 2017* [Mobility Report 2017]. The Hague, Netherlands: Institute for Transport Policy Analysis.

**Figure:** Contribution of more frequent trips, trips over greater distances, and larger numbers of cyclists to the growth in the total number of bicycle kilometres between 2005-2016, in percentage points. Source: RWS/CBS, MON/OViN; data adapted by KiM.



### Large spatial differences in trends in bicycle use

Figure: Bicycle use 2010-2013 by municipality, for distances < 7.5 km



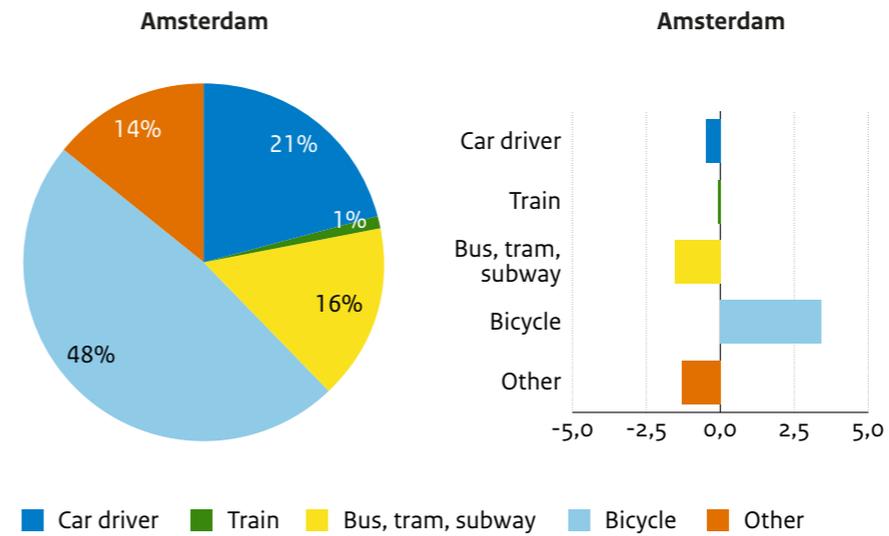
Source: Dutch National Atlas of Public Health.

### Bicycle use is increasing in urban areas...<sup>6</sup>

See, for example, modal split and modal shifts in home-to-work trips in Amsterdam (percentage in 2016 and shift in percentage points since 2005).

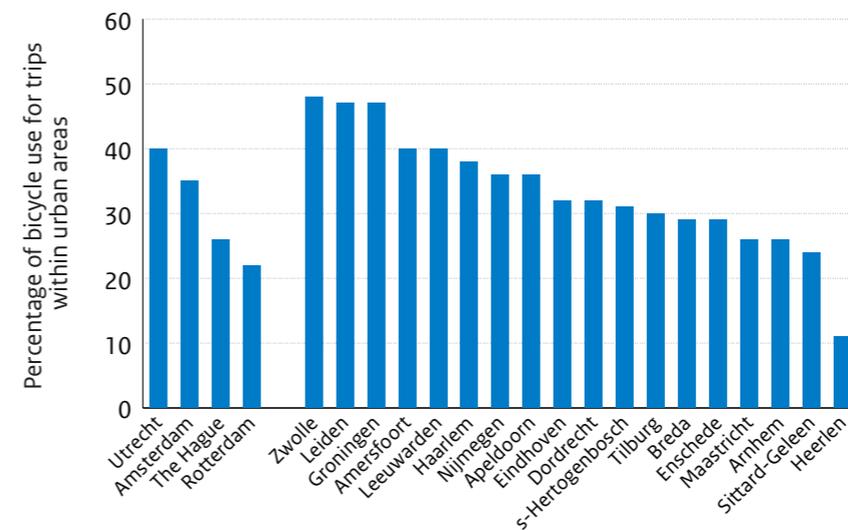
<sup>6</sup> KiM (2017), *Mobiliteitsbeeld 2017* [Mobility Report 2017]. The Hague, Netherlands Institute for Transport Policy Analysis.

Figure: Modal split of home-to-work trips in Amsterdam in 2016 (left) and modal shifts since 2005 (in percentage points, right).



### ... but not every city is seeing a rise in bicycle use...<sup>7</sup>

Figure: Proportion of bicycle use in trips within urban areas, 2010/2016.



<sup>7</sup> Statistics Netherlands (CBS) (Netherlands Travel Survey (OVIN) 2010-2016 – data adapted by KiM).

## Large social differences in trends in bicycle use

### Particular rise in bicycle use among adolescents and young adults up to 30 years of age...<sup>8</sup>

- The growing use of bicycles for trips to and from educational facilities can mainly be attributed to the age group of under-30s. It is related to the increased participation in education by this age group.
- Among young adults (ages 18 to 30), the use of bicycles for recreational purposes has also risen vis-à-vis 2005. Presumably, this is largely related to the fact that this group, more so than in former days, is domiciled in (highly) urbanised areas.

### ... and growing bicycle use by over-60s<sup>8</sup>

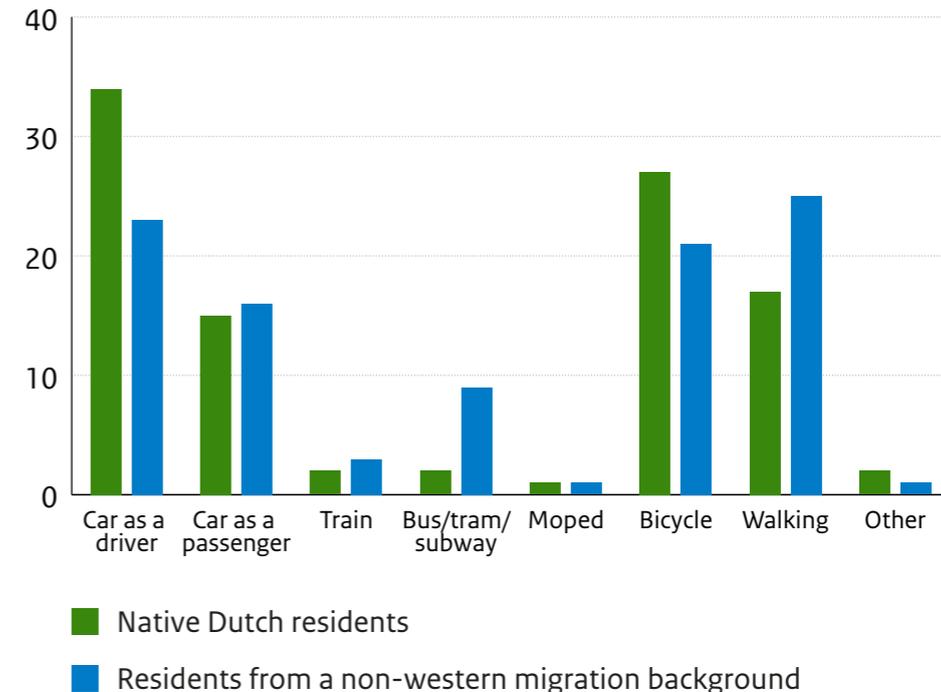
The over-60s account for by and large half of the growth in bicycle use for recreational purposes. On the one hand, because the overall health situation of this age group has improved, and on the other, because the introduction of electric bicycles has fostered the use of bicycles among seniors.

### Bicycle use is less widespread among persons from a non-western migration background<sup>8</sup>

- Residents from a non-western migration background tend to cycle less frequently compared to native Dutch residents (bicycles account for a share of 21 versus 27 per cent, respectively, in the total number of trips).
- In comparative terms, residents from a non-western migration background tend to walk more and make less use of cars (as a driver). Their use of buses, trams, and subways is four times as high compared to that of native Dutch residents.

<sup>8</sup> KiM (2017), *Mobiliteitsbeeld 2017* [Mobility Report 2017]. The Hague, Netherlands: Institute for Transport Policy Analysis.

**Figure:** Modal split of trips among native Dutch residents and residents from a non-western migration background, 2010/2016. Source: Rijkswaterstaat/CBS OViN; data adapted by KiM.



### Increase in bicycle use from and to train stations<sup>8,9</sup>

- Between 2005 and 2015, the use of bicycles in first-mile transport to the main Dutch train stations (top 16 of embarking and disembarking passengers) has increased from 36 per cent to 44 per cent.
- Bicycle use for last-mile transport also shows some (slight) growth: from 10 per cent in 2005 to 14 per cent in 2015. This upward trend has been boosted by the introduction of rental bicycles for season-ticket holders: in 2008, such rental bicycles were used for 0.5 million rides, versus 1.9 million in 2015 and an impressive 3.2 million in 2017.

<sup>9</sup> Jonkeren et al. (2018), *Waar zouden we zijn zonder de fiets en de trein* [Where would we be without the bicycle and the train]. The Hague, Netherlands: Institute for Transport Policy Analysis (to be published).

A close-up photograph of an e-bike's rear section. The focus is on a black battery pack mounted on the frame, with a red rear light integrated into its design. The battery pack has 'QWIN' and 'ON BATTERY PACK' printed on it. The background is a blurred brick wall.

# 3 Possession and use of e-bikes

## Use of e-bikes: rejuvenation and increasing home-to-work traffic<sup>10</sup>

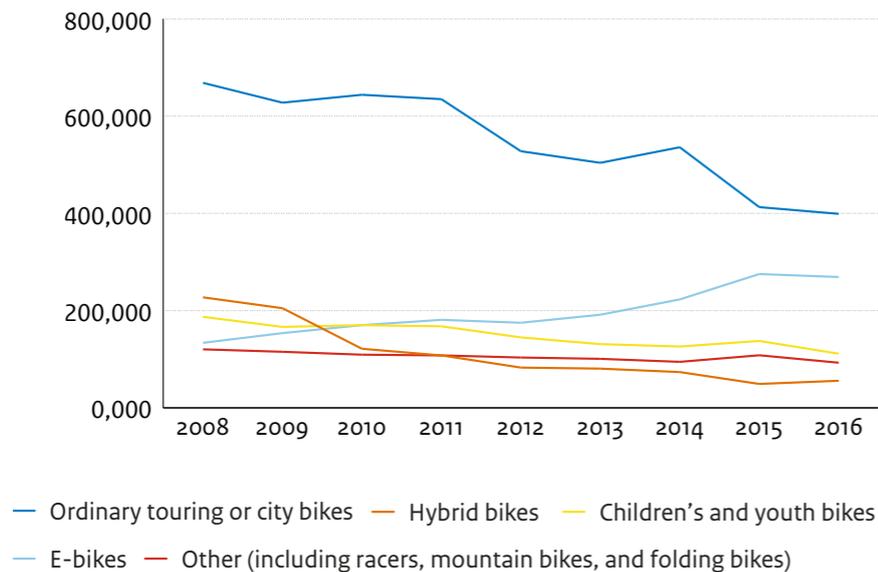
- In 2016, the number of e-bike trips among Dutch residents totalled more than 400 million (out of 18.6 billion trips overall), covering a total distance of nearly 2 billion kilometres (out of the 187.3 billion kilometres overall).
- The 65+ age group accounts for nearly half of the e-bike kilometres. However, adults under 65 account for an increasing share of the e-bike kilometres.
- More than half of all e-bike kilometres are travelled for leisure purposes, such as recreational touring. However, between 2013 and 2016, a particular rise can be observed in the share of work-related kilometres.

<sup>10</sup> [KiM \(2017\), Mobiliteitsbeeld 2017 \[Mobility Report 2017\]. The Hague, Netherlands. Institute for Transport Policy Analysis.](#)

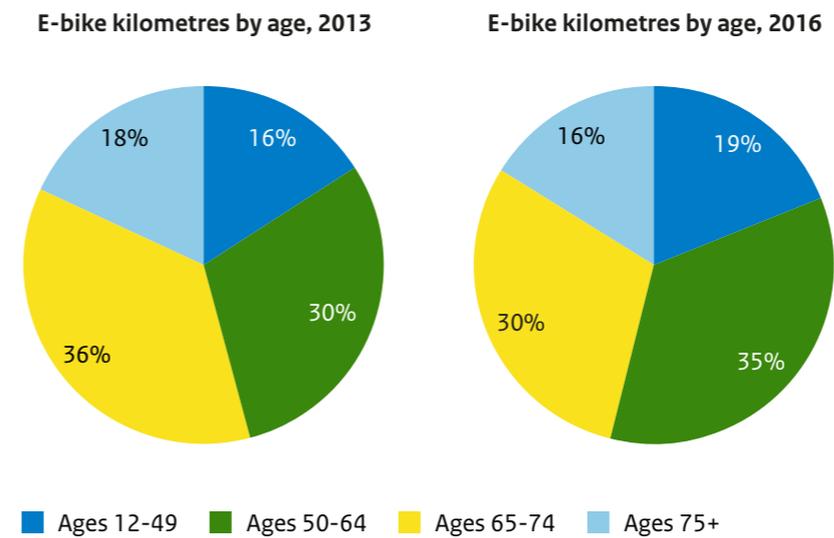
### Bicycle sales: e-bikes on the rise<sup>11,12</sup>

In 2016, e-bike sales totalled some 270,000, which is slightly less compared to 2015, but more than in the years before 2015. Currently, 3 out of every 10 bicycles sold are e-bikes. Sales figures of bicycles without electrical pedal assistance have declined over recent years. In 2016, a total of 930,000 new bicycles were sold.

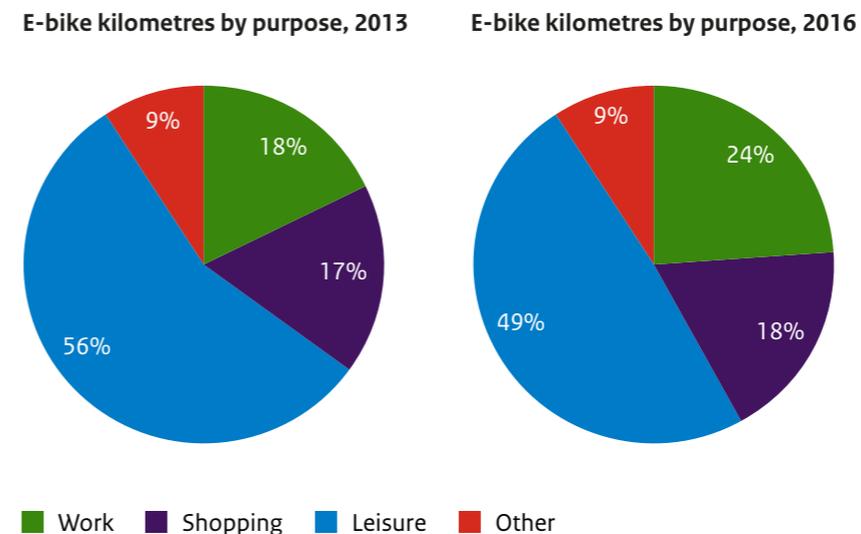
Figure: Bicycle sales by type, 2008-2016. Source: BOVAG-RAI (2017); data adapted by KiM.



### Majority of e-bikes used by over-65s<sup>13</sup>



### E-bikes mainly used for recreational purposes<sup>13</sup>

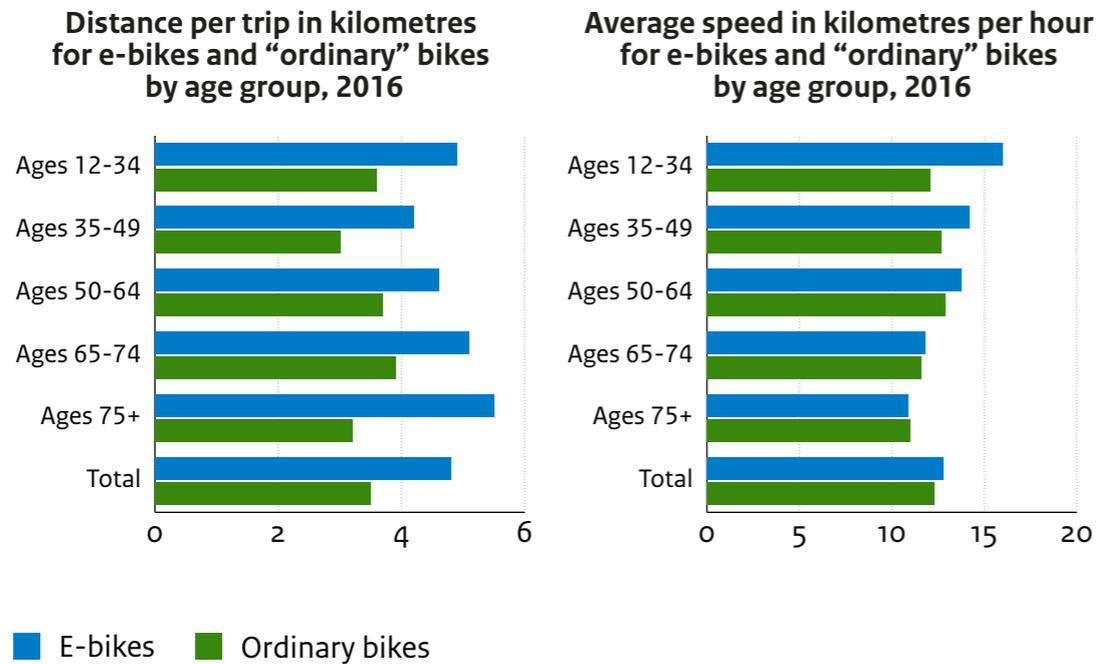


<sup>11</sup> RAI-Bovag (2017), *Mobiliteit in cijfers – tweewielers* [Mobility figures – bicycles].  
<sup>12</sup> KiM (2017), *Mobiliteitsbeeld 2017* [Mobility Report 2017]. The Hague, Netherlands Institute for Transport Policy Analysis.

<sup>13</sup> Statistics Netherlands (CBS) (Netherlands Travel Survey (OVIn 2013-2016 – data adapted by KiM) in KiM (2017), *Mobiliteitsbeeld 2017* [Mobility Report 2017]. The Hague, Netherlands Institute for Transport Policy Analysis.

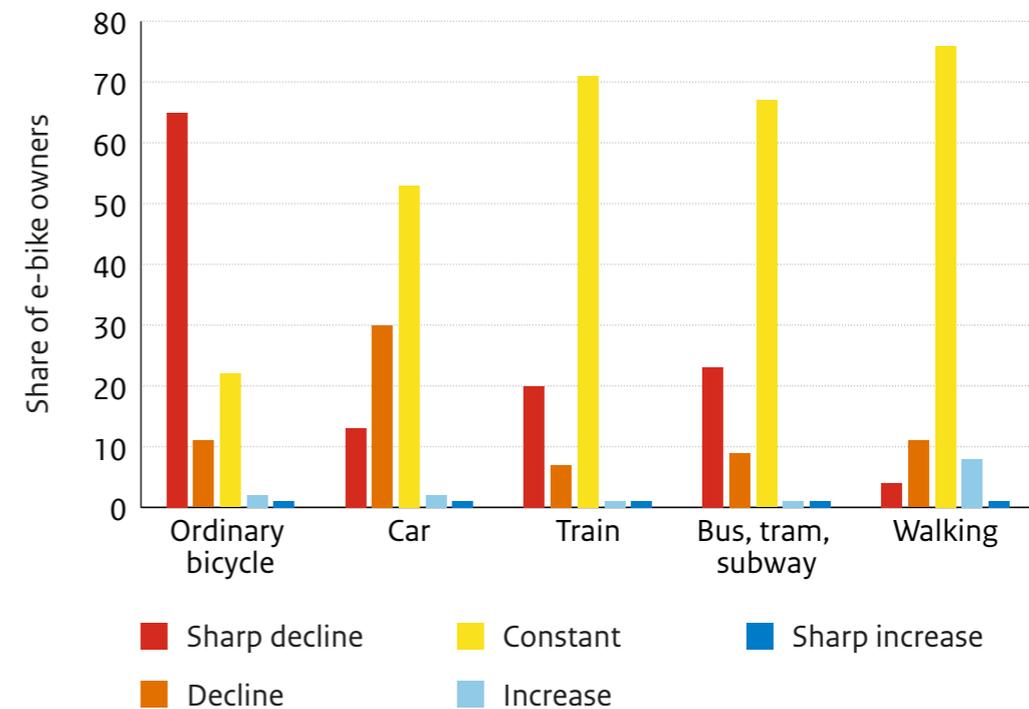
### Greater range but limited difference in speed<sup>14</sup>

Figure: Distance per trip in kilometres (left) and average speed in kilometres per hour (right) for e-bikes and “ordinary” bikes by age group, 2016.



### Decrease in use of cars and “ordinary” bikes among owners of e-bikes<sup>15</sup>

Figure: Effect of e-bike ownership on the use of other modes of transport (expressed in shares of e-bike owners indicating a decline or increase in their use of other modes of transport), 2016.



<sup>14</sup> Statistics Netherlands (CBS) (Netherlands Travel Survey (OVIN 2013-2016 – data adapted by KiM) in KiM (2017), *Mobiliteitsbeeld 2017* [Mobility Report 2017]. The Hague, Netherlands Institute for Transport Policy Analysis.

<sup>15</sup> Harms et al. (2017), *Stabiele beelden verdiept; trends in beleving en beeldvorming van mobiliteit*. [In-depth look at stable images; trends in perception of mobility]. The Hague, Netherlands Institute for Transport Policy Analysis.



## 4 Effects of bicycle use

The estimation of the effects of bicycle use is inspired by a TNO review conducted in 2010, which maps out the benefits of cycling (“Cycling is green, healthy, and economical”).<sup>16</sup> The results and summarising chapter titles from the TNO study have been used as points of departure, supplemented by recent insights from (scientific) literature. Furthermore, other emphases have been placed wherever necessary and meaningful, and perspectives have been added to the earlier findings (such as the impact on road safety).

<sup>16</sup> Hendriksen, I. and R. van Gijlswijk (2010), *Fietsen is groen, gezond en voordelig* [Cycling is green, healthy, and economical]. Leiden: TNO Quality of Life group.

### Cycling leads to a longer and healthier life

- Cycling helps to reduce the risk of various illnesses, such as diabetes, some forms of cancer, cardiovascular diseases, and depression:<sup>17,18,19,20</sup>
  - Riding a bicycle to work every day reduces the risk of premature death by 41 per cent (risk of dying from heart disease: -52 per cent; risk of dying from cancer: -40 per cent).
  - The above figures pertain to population averages and differ strongly per age and socio-economic background. The largest benefits can be expected among people who currently get little exercise.

<sup>17</sup> De Hartog, Jeroen Johan, et al. (2010), “Do the health benefits of cycling outweigh the risks?” *Environmental health perspectives* 118.8 (2010): 1109.

<sup>18</sup> Hans Nijland (2017): *Fietsen leidt tot langer en gezond leven* [Cycling leads to a longer and healthier life]. The Hague, Netherlands Environmental Assessment Agency.

<sup>19</sup> Celis-Morales, Carlos A., et al. (2017), “Association between active commuting and incident cardiovascular disease, cancer, and mortality: prospective cohort study.” *bmj* 357: j1456.

<sup>20</sup> INHERIT (2017), Exploring triple-win solutions for living, moving and consuming that encourage behavioural change, protect the environment, promote health and health equity.

- The health benefits of cycling daily rather than taking a car for short trips outweigh the risks entailed in the inhalation of air pollutants (based on the assumption that 12 per cent of short car trips are replaced by cycling):<sup>17,18</sup>
  - Daily exercise prolongs life expectancy by 3 to 14 months;
  - Inhalation of polluted air: reduces life expectancy by 1 to 40 days;
  - Increased risk of traffic accidents: reduces life expectancy by 5 to 9 days;
- Regular cycling boosts physical fitness and compares to 1 to 2 weekly gym sessions.<sup>21</sup>
- Cycling is an efficient way to prevent obesity (thus reducing the incidence of diabetes, cardiovascular diseases, and depression).<sup>21</sup>

### Cycling evokes positive feelings

- Two-thirds of Dutch residents aged 18 and over associate cycling with joy.<sup>22</sup>
- People who walk or cycle to work tend to be more satisfied, less stressed, more relaxed, and experience greater freedom compared to people who drive their car to work.<sup>23,24</sup>
- Bicycle use not only improves physical health, but also has a positive impact on mental health and subjective well-being.<sup>24,25</sup>

<sup>21</sup> Hendriksen, I. and R. van Gijlswijk (2010), *Fietsen is groen, gezond en voordelig* [Cycling is green, healthy, and economical]. Leiden: TNO Quality of Life group.

<sup>22</sup> Harms et al. (2017), *Stabiele beelden verdiept; trends in beleving en beeldvorming van mobiliteit*. [In-depth look at stable images; trends in perception of mobility]. The Hague, Netherlands Institute for Transport Policy Analysis.

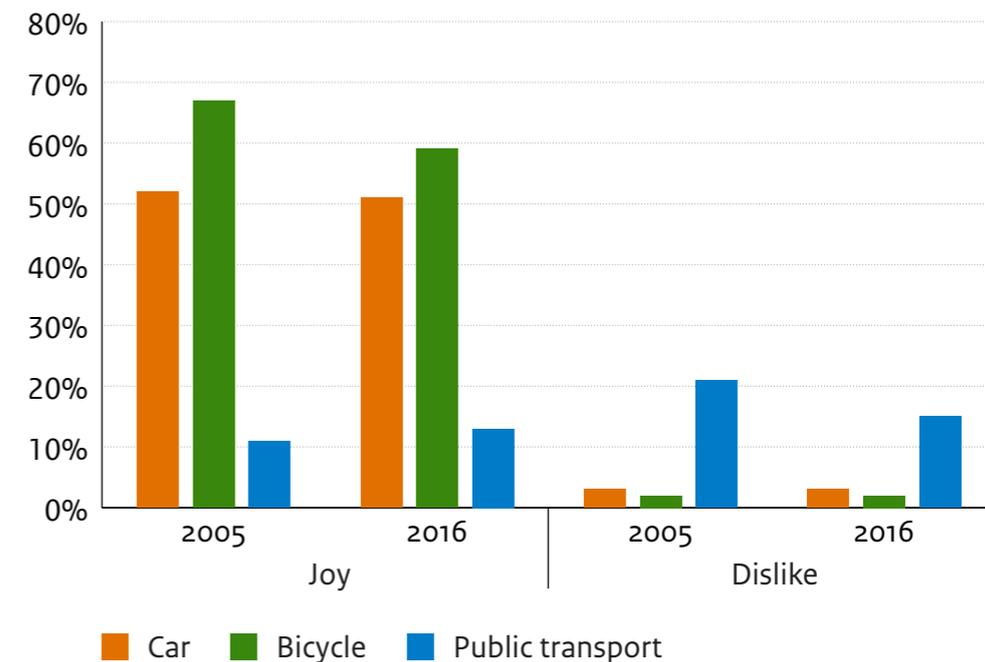
<sup>23</sup> Willis, D. et al. (2013), "Uniquely Satisfied: Exploring Cyclist Trip Satisfaction". Washington DC, Transportation Research Board 92nd Annual Meeting, No. 13-0943, 2013.

<sup>24</sup> Singleton, P. (2018), "Walking (and cycling) to well-being: Modal and other determinants of subjective well-being during the commute." *Travel Behaviour and Society*.

<sup>25</sup> Anable, J. & B. Gatersleben (2005), "All work and no play? The role of instrumental and affective factors in work and leisure journeys by different travel modes." *Transportation Research Part A: Policy and Practice* 39.2-3: 163-181.

- Cycling encourages social interaction: "Cyclists continuously, (un)consciously negotiate with others and with their surroundings to prevent collisions or mediate traffic flows. In doing so, they interact with a large number of other road users and objects in physical space. Cyclists also have a high degree of freedom to traverse and interact with their surrounding environment, given the infrastructure, traffic laws and cultural acceptance."<sup>26</sup>

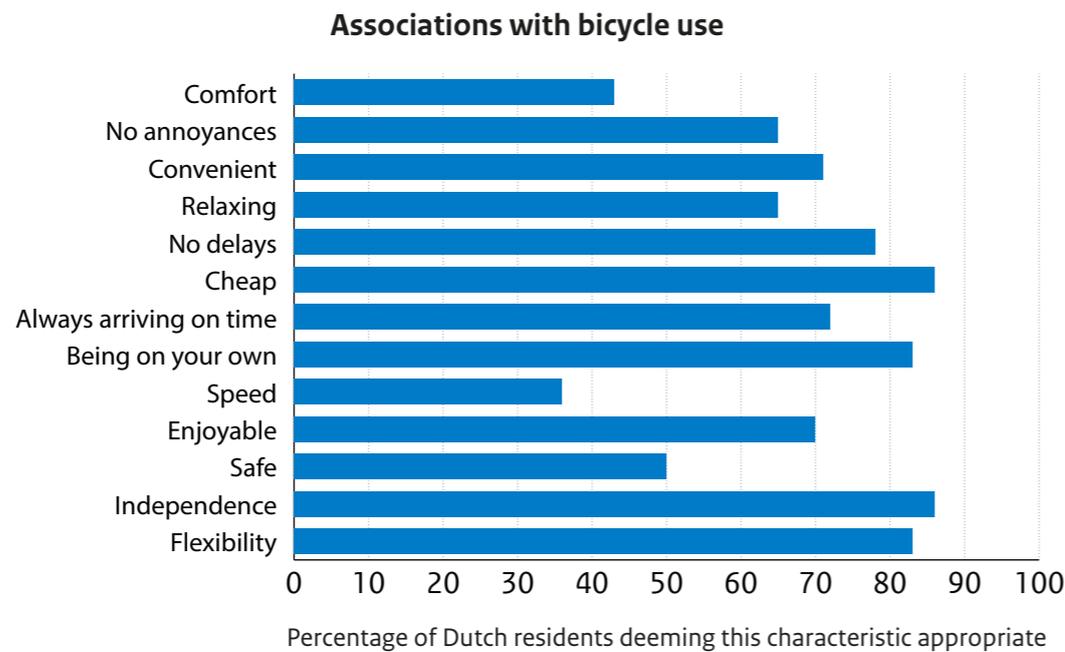
**Figure:** Proportion of Dutch residents associating joy and dislike (strongly + very strongly) with cars, bicycles, and public transport.<sup>22</sup>



<sup>26</sup> Te Brömmelstroet, M. et al. (2017), "Travelling together alone and alone together: mobility and potential exposure to diversity." *Applied Mobilities* 2.1: 1-15.

### Cycling is easy

- Many people own a bicycle and virtually every Dutch resident knows how to ride a bicycle.<sup>27</sup>
- Cycling takes you from door to door; cycling offers individuality (little need to have consideration for others), flexibility, and freedom (ample opportunity for adapting travel times, speed, and routes).<sup>27,28</sup>
- With the advent of e-bikes, cycling has become even easier, in particular for older people.<sup>28</sup>
- In the perception of Dutch residents, bicycle use scores particularly positively with respect to costs (cycling is cheap), the guarantee of “arriving on time”, “being on your own”, and the peace and quiet it offers. Furthermore, cycling is increasingly associated with convenience and comfort.<sup>28</sup>



<sup>27</sup> Hendriksen, I. and R. van Gijlswijk (2010), *Fietsen is groen, gezond en voordelig* [Cycling is green, healthy, and economical]. Leiden: TNO Quality of Life group.

<sup>28</sup> Harms et al. (2017), *Stabiele beelden verdiept; trends in beleving en beeldvorming van mobiliteit*. [In-depth look at stable images; trends in perception of mobility]. The Hague, Netherlands Institute for Transport Policy Analysis.

### Increased bicycle use means lower greenhouse gas emissions

- Switching from a car to a bicycle saves 150 g of CO<sub>2</sub> per kilometre.<sup>29</sup>
- Each 7 km by bicycle rather than by car will save an emission of 1 kilogram of CO<sub>2</sub>.<sup>29</sup>
- Cars are used for 3.6 billion short trips (< 7.5 km) annually.<sup>30</sup>
- Replacing all these short car trips by cycling would save roughly 2.0 megatons of CO<sub>2</sub> per annum.<sup>29</sup>

### Increased bicycle use means cleaner air

- Switching from a car to a bicycle saves 0.2 g of NO<sub>x</sub> per kilometre and 0.01 g of particulate matter per kilometre.<sup>29</sup>
- Each 7 km by bicycle rather than by car will save an emission of 1.5 g of nitrogen oxides and 7 mg of particulate matter.<sup>29</sup>
- Cars are used for 3.6 billion short trips (< 7.5 km) annually.<sup>30</sup>
- Replacing all these short car trips by cycling would save roughly 2.6 kilotons of NO<sub>x</sub> and 0.13 kilotons of particulate matter per annum.<sup>29</sup>

<sup>29</sup> Estimated by KiM based on indicators published in CE report *STREAM Personenvervoer 2014* [Passenger transport 2014] (CE 2015). In accordance with the calculations of the TNO report entitled *Fietsen is groen, gezond en voordelig* [Cycling is green, healthy, and economical] (Hendriksen and Van Gijlswijk, 2010) the estimates are based on a city, rural road, and motorway ratio of 70%, 25%, and 5% respectively, factoring in the CE emission indicators for 2011 and the expected indicators for 2020.

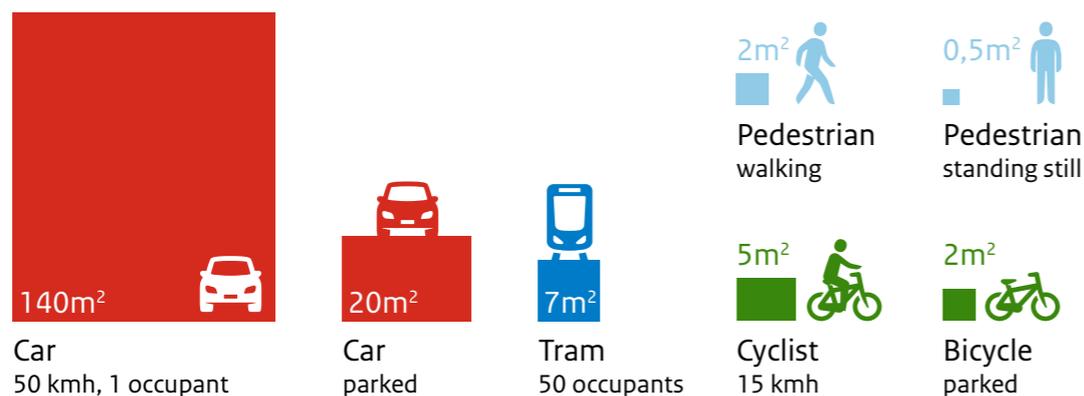
<sup>30</sup> Data derived from Netherlands Travel Survey (OViN) pertaining to the years 2013-2016 (CBS 2017), adapted by KiM.

### Cycling is quiet

- Traffic noise is a serious nuisance to roughly 30 per cent of the population.<sup>32</sup>
- An increase in the number of bicycles will reduce such nuisance, but the effects will be limited. For example: depending on the type of road, traffic composition, and construction density, a halving of the number of motor vehicles will locally result in a 3 dB noise abatement, a difference which is discernible to the human ear.<sup>32</sup>

### Cycling improves accessibility

- A moving car takes up 28 times more space than a moving bicycle. A parked car takes up 10 times more space than a parked bicycle.<sup>31</sup>



- In metropolitan and urban areas, parking a bicycle in the vicinity of one's destination is far easier than parking a car.<sup>32</sup>
- In metropolitan and urban areas, a time of arrival can be estimated more accurately and more reliably when travelling by bicycle rather than travelling by car (or public transport).<sup>32</sup>

<sup>31</sup> Fietscommunity [Cycling community] (2017), *Van wie is de stad?* [Who owns the city?]. The Hague: Platform 31.

<sup>32</sup> Hendriksen, I. and R. van Gijlswijk (2010), *Fietsen is groen, gezond en voordelig* [Cycling is green, healthy, and economical]. Leiden: TNO Quality of Life group.

### Cycling is economical

- Cycling is a cheap mode of transport. The annual costs of cycling range from 175 to 300 euros. By comparison: the costs involved in driving a car range from 2500 to 8500 euros a year, based on an average annual mileage.<sup>33</sup>
- Cycling also scores well in terms of the social impact of a kilometre of urban travel by bicycle compared to such costs involved in a kilometre of travel by car or by bus: each kilometre of bicycle use yields a social benefit of 0.68 euros, whereas cars and buses cost society 0.37 euros and 0.29 euros per kilometre, respectively.<sup>34,35</sup>
- The annual infrastructure costs per traveller kilometre are 0.03 euros for bicycles, 0.10 euros for cars, 0.14 euros for buses, and 0.18 euros for trains.<sup>36</sup>

### Bicycle safety remains a point for attention

- In 2016, road accidents caused 629 deaths, among which 189 cyclists and e-cyclists (30%).<sup>37</sup>
- The traffic mortality rate among cyclists and e-cyclists has remained fairly stable for three years. The long-term decline (2005–2016) among cyclists is lagging behind the decline among car occupants.<sup>37,38,39</sup>

<sup>33</sup> Hendriksen, I. and R. van Gijlswijk (2010), *Fietsen is groen, gezond en voordelig* [Cycling is green, healthy, and economical]. Leiden: TNO Quality of Life group.

<sup>34</sup> Decisio (2016), *Waarde en Investeringsagenda Fietsen Verantwoordingsrapportage* [Justification report on the social value of and investment agenda for cycling]. Amsterdam: Decisio.

<sup>35</sup> Decisio (2017), *Waarderingskengetallen MKBA Fiets: state-of-the-art* [Rating indicators of cycling SCBA: state-of-the-art]. Amsterdam: Decisio.

<sup>36</sup> Ministry of Infrastructure and Water Management (2018): *Factsheet Fietsinfrastructuur* [Bicycle infrastructure fact sheet].

<sup>37</sup> KiM (2017), *Mobiliteitsbeeld 2017* [Mobility Report 2017]. The Hague, Netherlands Institute for Transport Policy Analysis.

<sup>38</sup> SWOV (2017), *Factsheet Fietsers* [Cyclists fact sheets]. The Hague: Institute for Road Safety Research.

<sup>39</sup> SWOV (2017), *Monitor Verkeersveiligheid 2017* [Road safety monitor 2017]. The Hague: Institute for Road Safety Research.

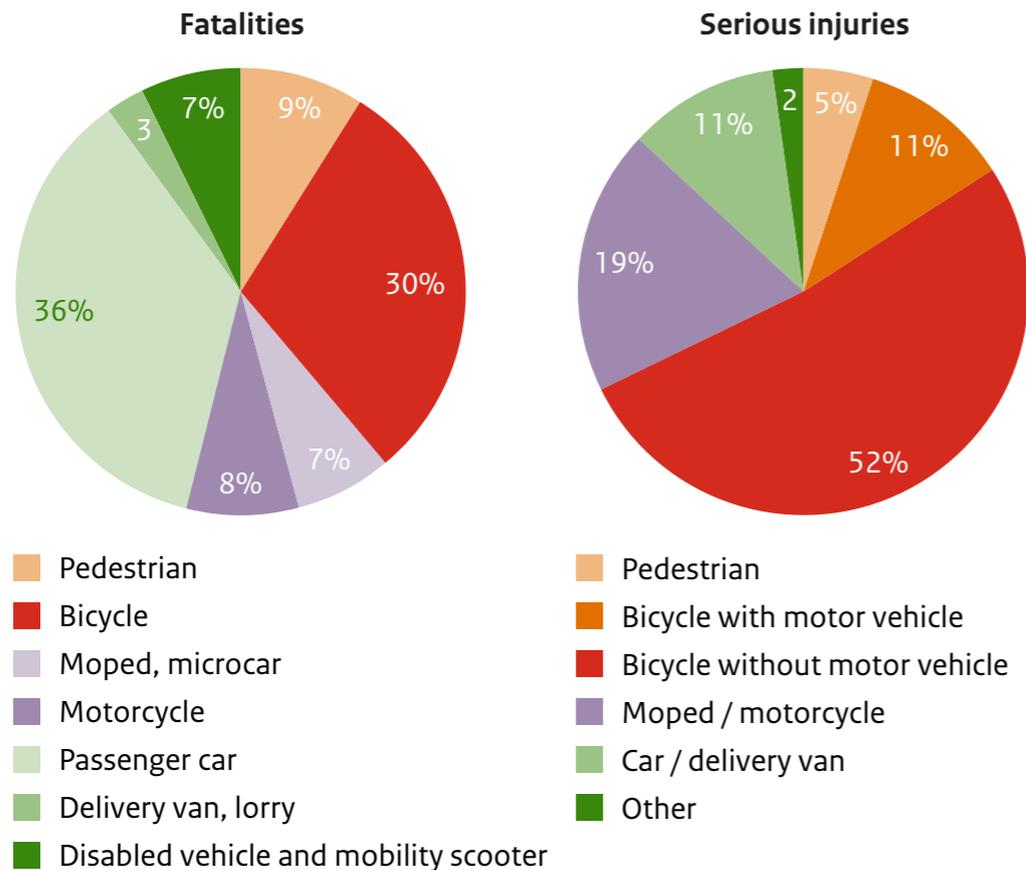
- The traffic mortality rate among cyclists resulting from accidents not involving motor vehicles has risen sharply over the past ten years, whereas the proportion of fatal cycling accidents involving motor vehicles has declined. Currently, some 40 per cent of the fatal accidents among cyclists do not involve any other motor vehicles.<sup>40</sup>
- Although there is no exact data on serious injuries among cyclists, numbers appear to be rising. Cyclists were estimated to account for 63 per cent of the total number of serious traffic injuries in 2015 (which comes down to more than 13,000). The majority concerned accidents not involving any other motor vehicles.<sup>39,40</sup>

- A recent study has shown that an electric bicycle in itself is no more dangerous than ordinary bicycles. The increase in the number of road casualties among e-cyclists can mainly be attributed to the increase in the number of older cyclists: a group with a relatively high risk of traffic accidents and relatively vulnerable in the event of an accident.<sup>41</sup>

Summary

- Cycling leads to a longer and healthier life:
  - it helps counteract various illnesses, such as diabetes, some forms of cancer, cardiovascular diseases, and depression;
  - it is an efficient way to prevent obesity.
- Cycling is relaxing, convenient, and economical:
  - cycling takes you from door to door and offers individuality, flexibility, and freedom;
  - it is a cheap mode of transport and yields substantial social benefit.
- Cycling improves accessibility and, compared to cars, involves lower greenhouse gas emissions and less air pollution:
  - switching from a car to a bicycle saves an average of 150 g of CO<sub>2</sub> per kilometre and 0.2 g of NO<sub>x</sub> per kilometre.
- Bicycle traffic safety remains an important point for attention:
  - the traffic mortality rate among cyclists is not declining and the number of serious injuries is increasing.

Figure: Proportion of fatal and serious injuries by mode of travel, 2016<sup>39</sup> (Road Safety Monitor).



<sup>40</sup> Schepers, P. et al. (2017), "Bicycle fatalities: trends in crashes with and without motor vehicles in The Netherlands." Transportation research part F: traffic psychology and behaviour 46: 491-499.

<sup>41</sup> Valkenberg, H. et al. (2017), *Fietsongevallen in Nederland; SEH-behandelingen 2016* [Cycling accidents in the Netherlands; ER treatments in 2016]. Amsterdam: VeiligheidNL, report no. 679.

# Colophon

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