



Social benefits and legislative challenges of speed pedelecs

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Bram Rotthier

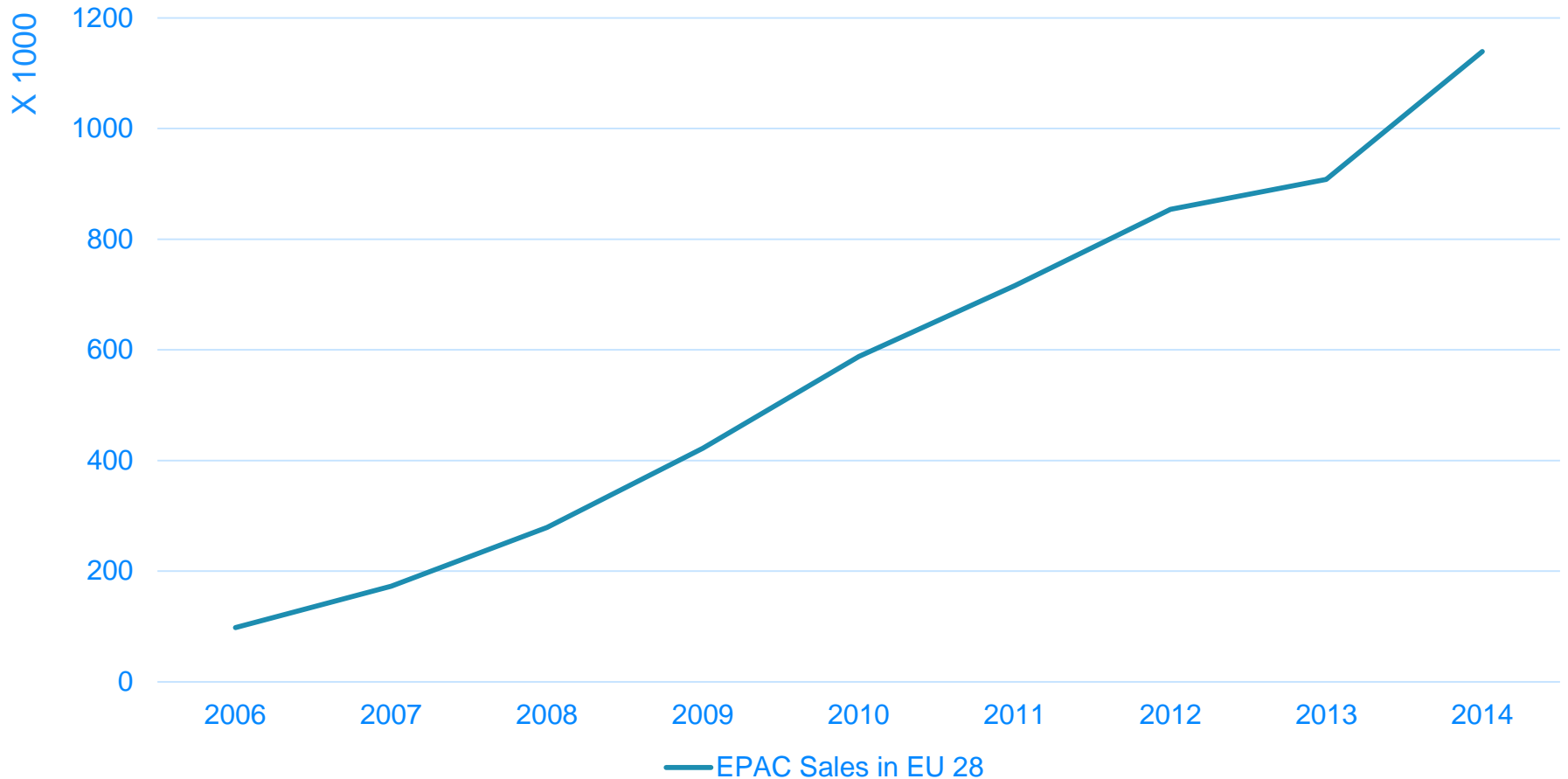
Classic pedelecs

European situation:

- Assistance up to 25 km/h
 - Maximum continuous rated power of 250 W
 - Exempt from type approval
 - In most EU countries equated to bicycles
-
- Great rise in popularity since 2006
 - Mostly sold to elderly, recreational cyclists

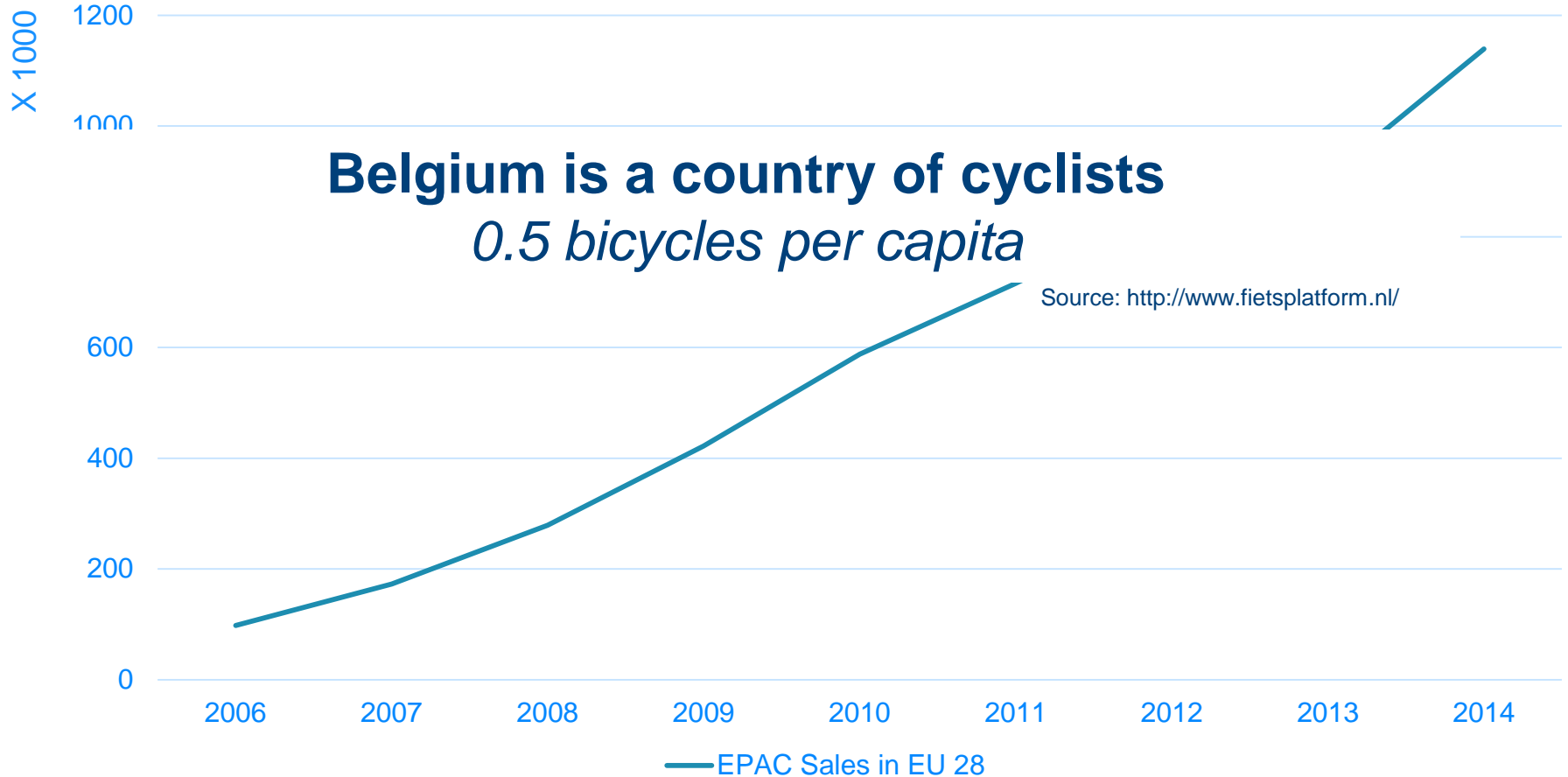


EPAC Sales in EU countries



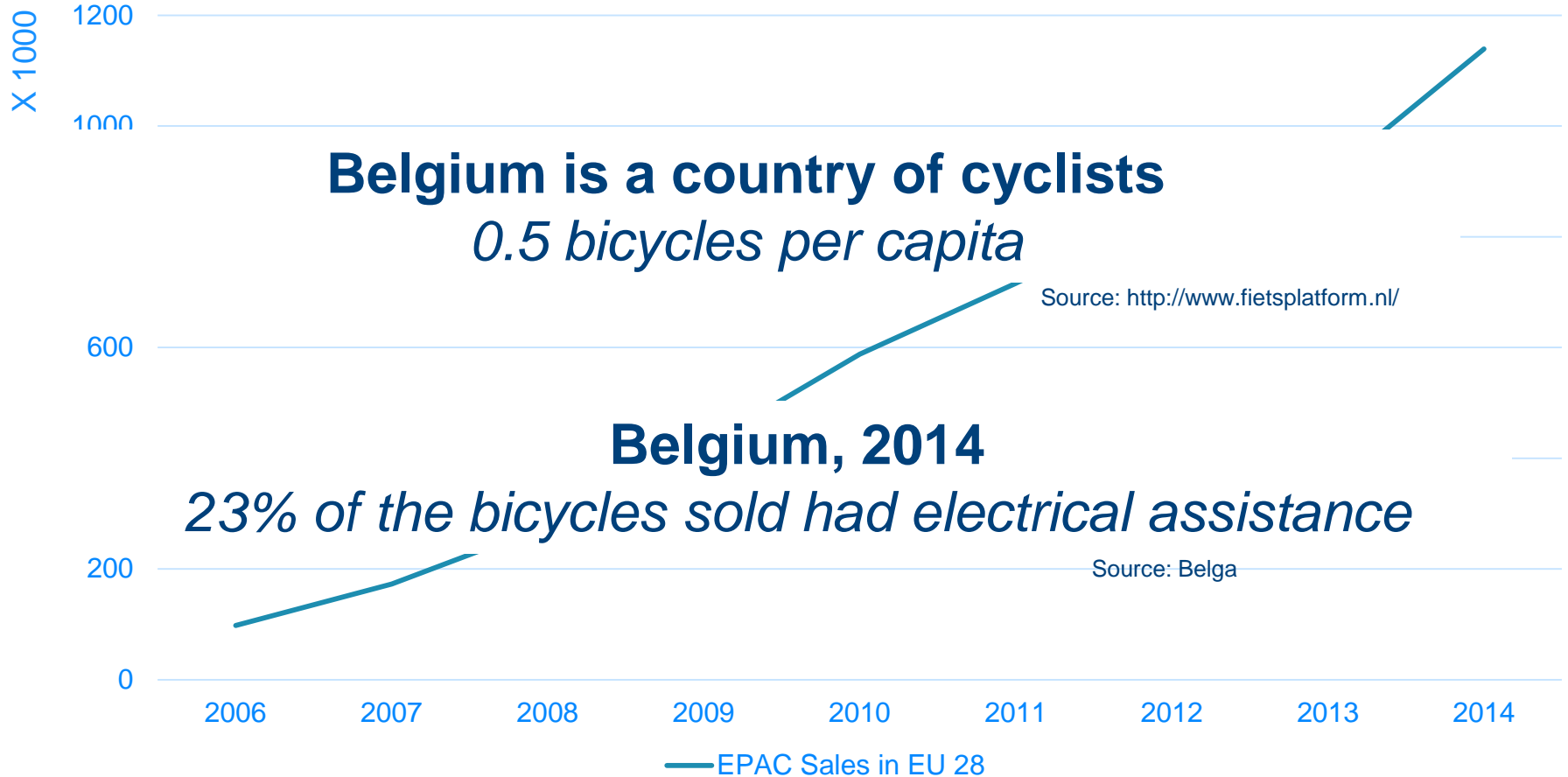
Source: Conebi

EPAC Sales in EU countries



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EPAC Sales in EU countries



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Speed pedelecs

What is a typical speed pedelec?

- Electrical assisted bicycle
- Max. assistance speed: 45 km/h
- Max. cont. rated power: 250 W – 500 W
- Also known as *s-pedelec* or *high speed bicycle*

Speed pedelecs

Why are people interested in speed pedelecs?

- Punctual (*no traffic jams*)

Belgium was the most congested country in Europe in 2014 with drivers wasting, on average, 51 hours in traffic

Source: <http://inrix.com/>

Speed pedelecs

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- Silent
- Fun
- ...

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➔ A decent alternative for the car!

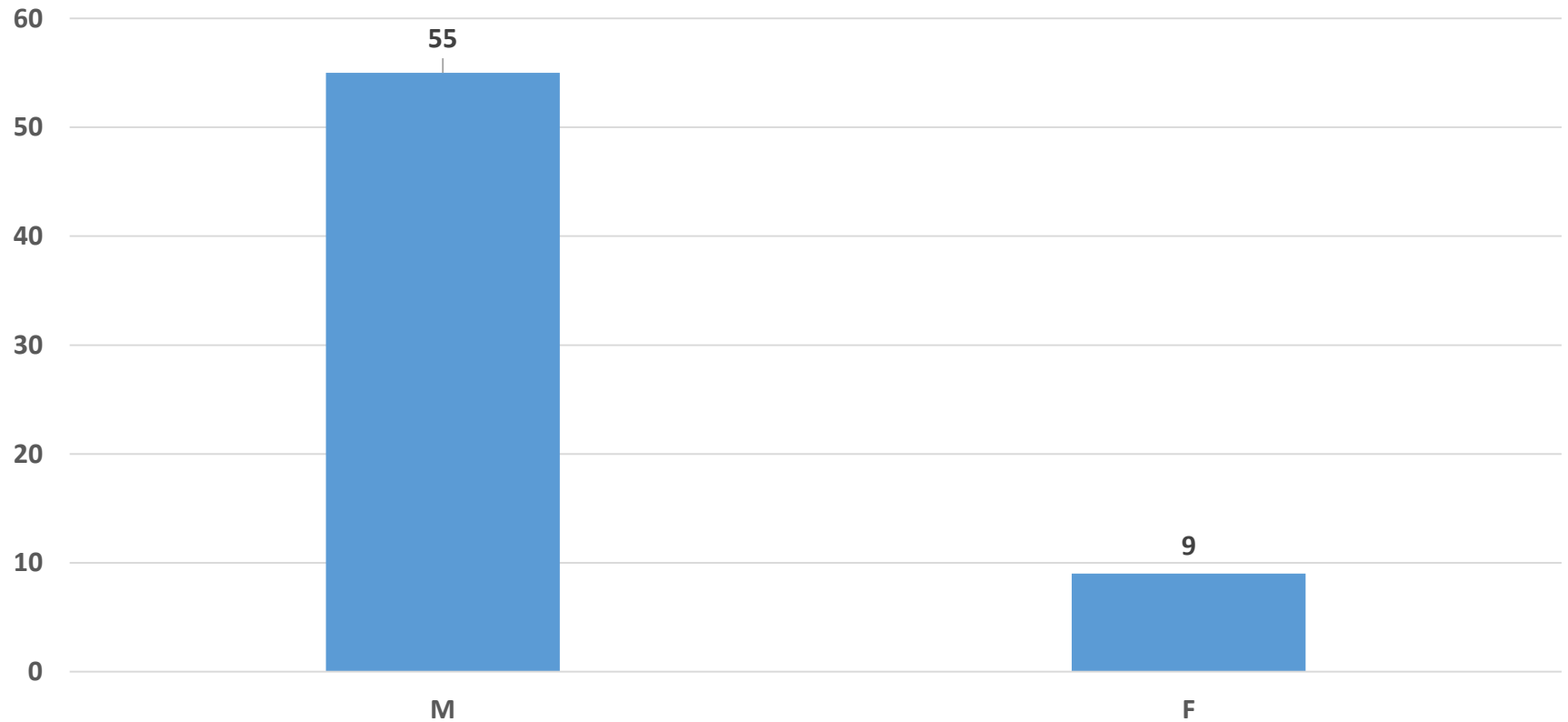
Speed pedelecs

Who are the current speed pedelec users?

(Results of a limited survey amongst Belgian speed pedelec users in June 2015)

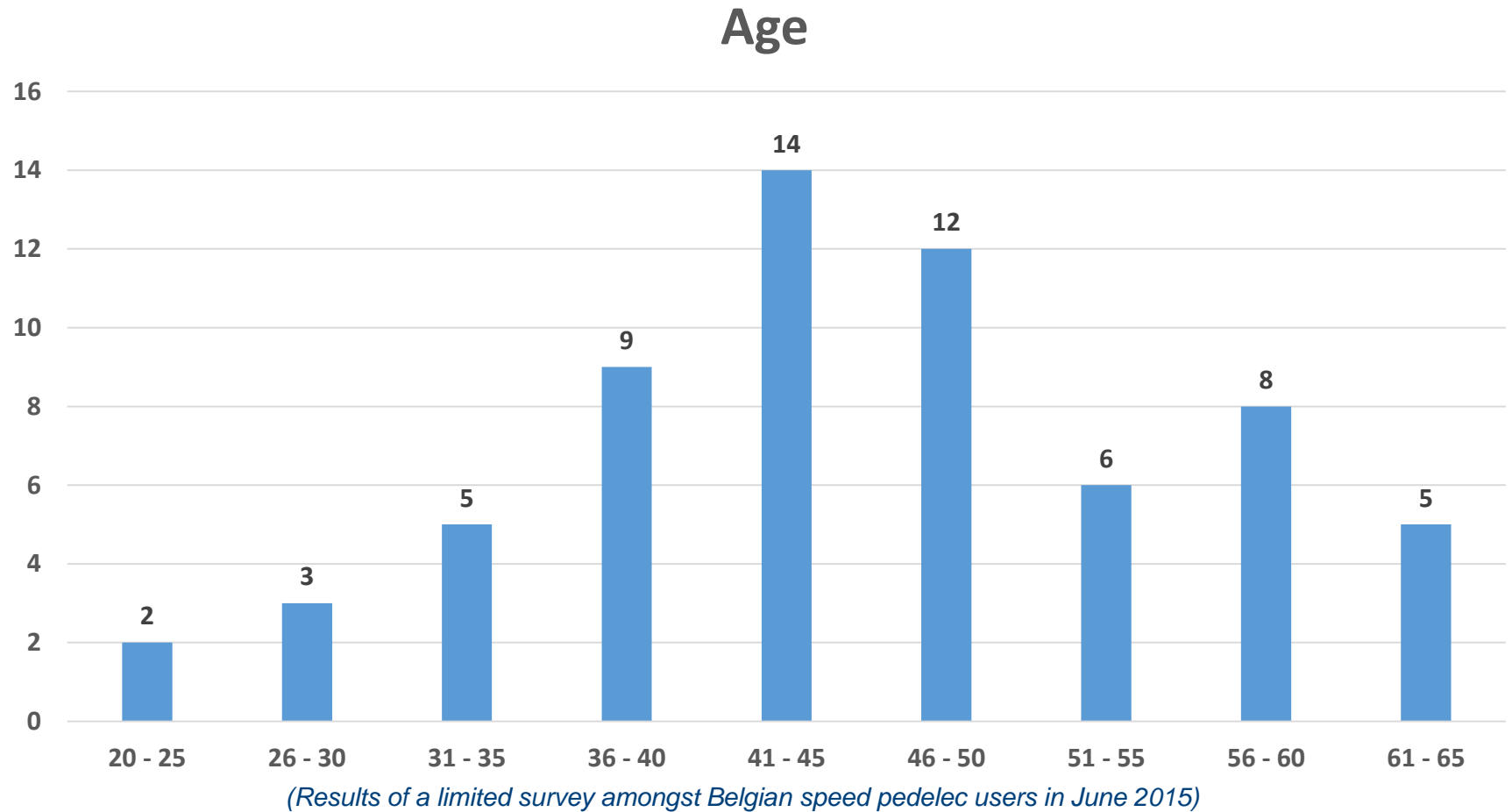
Speed pedelec users

Gender



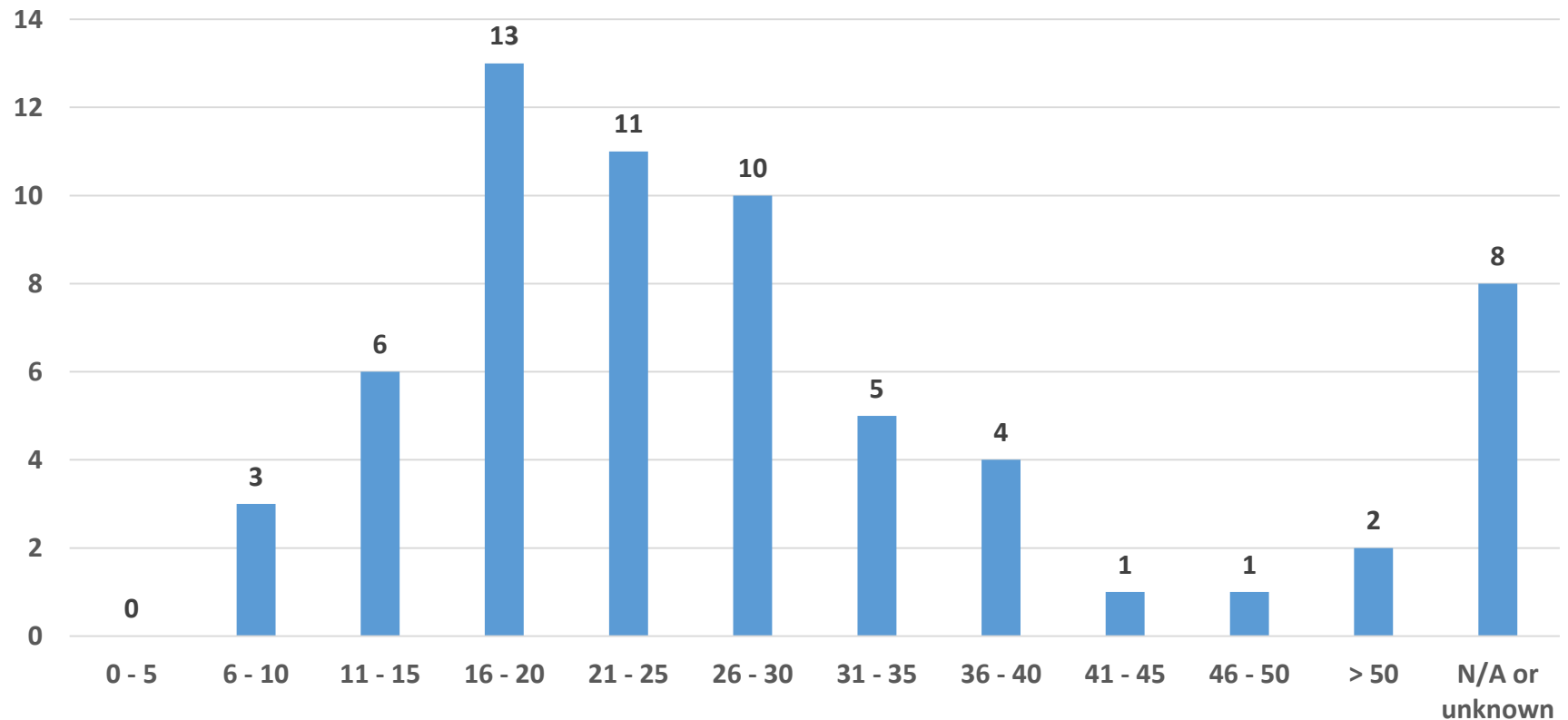
(Results of a limited survey amongst Belgian speed pedelec users in June 2015)

Speed pedelec users



Speed pedelec users

Commuting distance



(Results of a limited survey amongst Belgian speed pedelec users in June 2015)

Speed pedelecs

- Attracting a different public than normal EPACs
- A great alternative for the car

Speed pedelecs

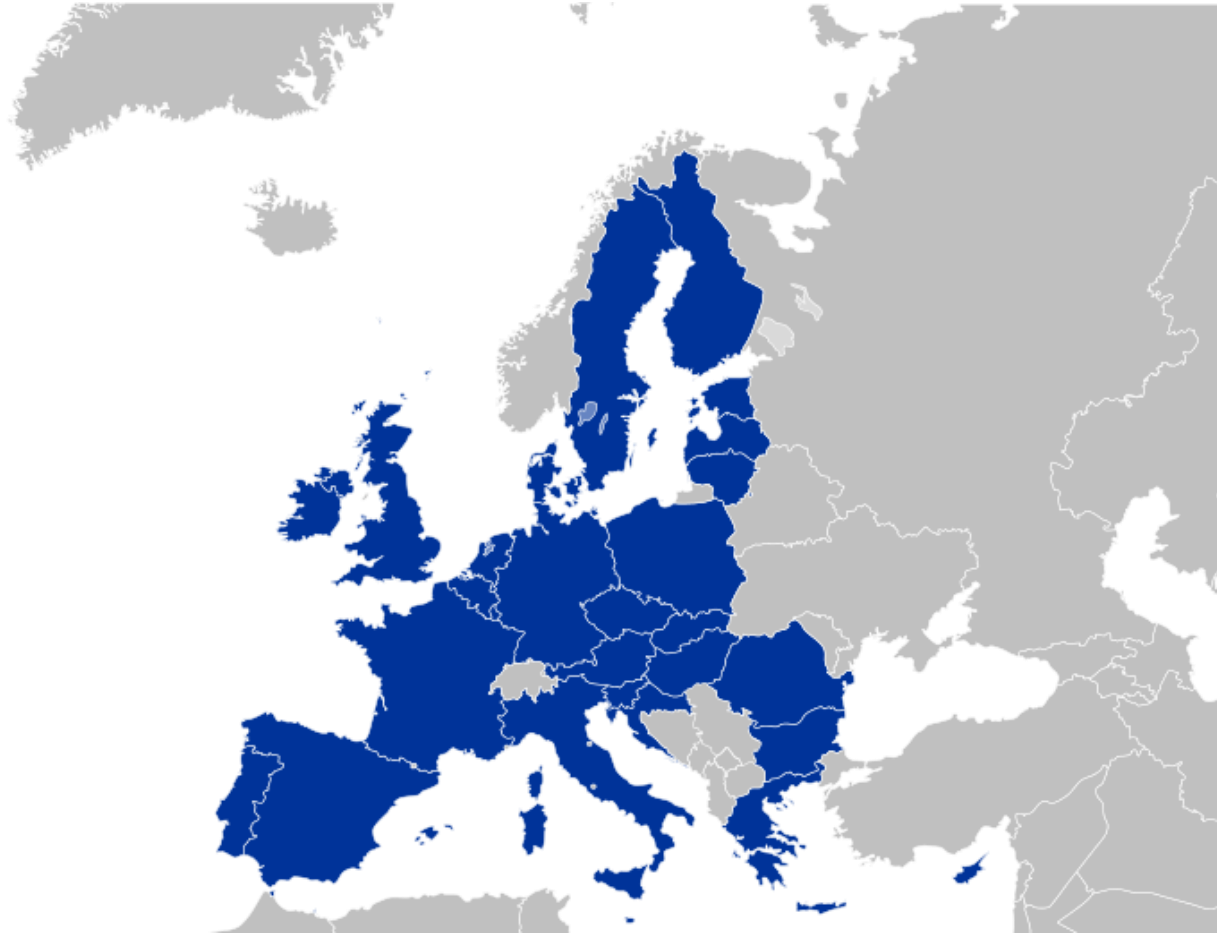
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 - A great alternative for the car
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- ➔ Vehicle with a great potential for green, active commuting
 - ➔ Can foster the modal shift to light electric mobility

Speed pedelecs

- Attracting a different public than normal EPACs
 - A great alternative for the car
- ➔ Vehicle with a great potential for green, active commuting
- ➔ Can foster the modal shift to light electric mobility

But: vehicle with higher assistance power and speed is challenging both local and EU authorities

EU Legislation



EU Classification of light two-wheel powered vehicles

- Exempt from type approval
 - max: 25 km/h, 250 W*
 - Vehicles primarily intended for off-road use and designed to travel on unpaved surfaces;*
 - Vehicles equipped with any seating position of the driver or rider having an R-point height ≤ 540 mm*
 - ...
- L1e: Light two-wheel powered vehicles
 - L1e-A: Powered cycles
 - pedal assistance & max: 25 km/h, 1000 W*
 - L1e-B: Two-wheel moped
 - max: 45 km/h, 4000 W*
 - *Cycles designed to pedal*
 - ≤ 35 kg, adjustable rider positioning, maximum assistance factor of 4...*

Source: EU REGULATION 168/2013 and COMMISSION DELEGATED REGULATION (EU) No 3/2014

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← Speed pedelec

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← **Speed pedelec**

Point of dispute

Test procedure maximum assistance factor

Operation points to test the maximum assistance factor

Point of operation	Simulated rider input power (+/- 10 %) in (W)	Target vehicle speed ⁽ⁱ⁾ (+/- 10 %) in (km/h)	Desired pedalling cadence ⁽ⁱⁱ⁾ in (rpm)
A	80	20	60
B	120	35	70
C	160	40	80

⁽ⁱ⁾ If the target vehicle speed cannot be reached, the measurement shall be performed at the maximum vehicle speed reached

⁽ⁱⁱ⁾ select gear closest to required rpm rate for the point of operation

The maximum assistance factor shall be calculated according to the following formula:

Equation Ap4-1:

$$\text{Assistance factor} = \frac{\text{mechanical motor power of test vehicle}}{\text{simulated rider input power}}$$

where:

The mechanical motor power of the test vehicle shall be calculated from the sum of the mechanical brake motor power minus the mechanical input power of the test bench crank motor (in W).

Source: COMMISSION DELEGATED REGULATION (EU) No 134/2014

Comments on maximum assistance factor

- A maximum assistance factor is not technology neutral (*propulsion, sensors..*)
- There is no scientifically established link between assistance factor and safety
- Maximum assistance factor of four causes fickle vehicles
- Control strategy is not taken into account
- This vehicle classification complicates (unharmonised) conditions for using the vehicles.

Comments on maximum assistance factor

- “*L1e-B cycles*”, designed to pedal with an assistance factor > 4 are available on the market. There exists haziness on their classification.
- Legal bottlenecks hamper market development

Possible alternative for maximum assistance factor:

Limitation of maximum continuous rated power

Consequences of the current regulations

Designed to pedal

500 W

30 kg

45 km/h

Assistance factor < 4



Not designed to pedal

500 W

30 kg

45 km/h



Designed to pedal

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L1e-B

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500 W

30 kg

45 km/h

Assistance factor > 4



**L3e-A1?
L1e-B?**

Local legislation



Local legislation

Popular points of dispute:

- *Driving on bike lanes*
- *Driving on towpaths*
- *Requirement to wear a (moped) helmet*
- *License plate*
- *Driver's education*
- *Compulsory insurance*
- ...

Local legislation

Why could there be a legal difference between mopeds and speed pedelecs?

Local legislation

Why could there be a legal difference between mopeds and speed pedelecs?

- Great resemblance with traditional bicycle
 - Occupies same space on the road
 - Little difference in performance with trained cyclist
 - Maximum speed \neq cruising speed
- An effort is needed
 - Sweating \Leftrightarrow moped helmets
 - Active population
- Limited weight (max 35 kg) → lower kinetic energy
- Energy efficient
- Silent

Thank you for your
attention!



Contact: bram.rotthier@kuleuven.be

KU LEUVEN