

## Poster Presentation: Modern Urban and Regional Development

### 23b: The Velomobile comes to Town – Infrastructure and a broader Definition of ‘the Cycle’

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#### Abstract

The purpose of this paper is to make clear to decision-makers that reducing human-powered vehicles to “the standard bicycle” impedes the future exploitation of the full potential of the cycle while truly progressive infrastructural planning has to embrace the broad variety of human powered vehicles with their different characteristics in terms of speed, shape, size, function and has to respond to the corresponding infrastructural needs.

Underpinning the points made above, the paper

1. Summarises key reasons that prevent greater use of cycling as a means of transportation and points out ways in which they can be reduced through technological development of the vehicles and improved infrastructure
2. Shows with an illustrated typology of different vehicles (cabin-cycles with full weather protection, freight-cycles, high-speed recumbents, foldable bikes, ...) that the two-wheeled standard bicycle is but one of many different human powered vehicles. Their significance for passenger and freight transport and safety and is reviewed and their individual strengths and weaknesses are discussed from the users’ perspective in context of the transportation system.
3. Argues that basing planning decisions on too narrow a definition of human-powered vehicles is obstructive to future technological development in the field and likely to fall short of exploiting the full potential of the cycle
4. Explores the infrastructural and institutional responses to these different vehicles and outlines an infrastructure planning that is technologically non-discriminatory by giving concrete examples.

## Introduction

In many industrialized countries cycling is considered as a sport only. We focus on the bicycle as a means of transport of people and goods. It has a tremendous potential for saving energy, and improving public health by reducing air pollution and noise levels (especially in urban areas) and counteracting life-style diseases if more people choose non-motorized vehicles for commuting, recreation and transport of light goods.

There are, however, a number of technical<sup>1</sup> aspects that limit a wider use of the cycle. Important aspects<sup>2</sup> are:

### 1. Travelling speed

To make cycling more competitive, it must be possible to cycle fast from A to B. In urban areas the bike already is the fastest transport mode for shorter distances. The development of fast bikes such as velomobiles (see Picture 5), low recumbents (see Picture 4) and racing bikes creates the potential to also cover longer distances by bike. Very often, however, the speed potential of these vehicles cannot be used because a suitable infrastructure does not exist. High speed tracks for bicycles - a kind of motorway for bikes - that do not require stopping at crossing roads (see Picture 12) could attract especially younger people, who may otherwise use a motorcycle or a car. In traditional urban planning, the road system is laid out to ease car traffic, and bicycle routes are usually longer, with various obstructions like high steps, gates, sharp corners, rumble strips and the like. This certainly doesn't promote cycling.

### 2. Personal safety

Personal safety is essential. Many people do not cycle because they consider it too dangerous. Safety can be increased both through better infrastructure such as a network of cycle tracks protected from motorised traffic, and through better cycles: three-wheeled trikes (see Picture 5) for example are much less likely to topple than bikes, especially in winter on slippery roads, and a three-wheeled load-carrying cycle (see Picture 3) offers more protection children passengers than a bike. But then again, the built infrastructure has to be able accommodate these safer vehicles in terms of lane width and parking space.

### 3. Comfort, in particular protection against wind, rain and cold

Comfort, in particular protection against wind, rain and cold, must be considerably improved for cyclists in order to encourage all-weather and all-year cycling. Modern velomobiles, now being offered by several European companies, already offer this comfort (see Picture 5). These velomobiles are very light human powered vehicles with full weather protection. Due to their significantly better aerodynamics they are in general faster than normal bikes (and also faster than racing bikes). At the same time they offer a considerably better protection of the cyclist in case of accidents. Most of these vehicles can be used on normal roads and bicycle lanes, but the existing infrastructure is far from optimal for this kind of vehicle. Its speed potential can only be utilized on high speed bicycle lanes.

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<sup>1</sup> The authors are aware, that there are also influential *factors in the cultural sphere* (e.g. vehicles as a coded expressions of status and identity within certain cultural grammars) influencing the choice of transport mode and that the influence of these factors cannot be overcome merely by infrastructural measures. These factors, however, cannot be addressed in this paper.

<sup>2</sup> Organized and save parking of ones human-powered vehicle, in particular at train stations, are another important aspect, though not in the focus of this paper. Chaotic parking conditions in many cities and towns, often with heaps of rusty, abandoned bikes seem to underline the low status of this means of transport and may damage its reputation, while organized and guarded cycle parking as e.g. in many cities in the Netherlands is more likely to increase the attraction of the bike.

#### **4. Limited physical power**

The use of power assist, in particular of a small electric motor, can help some people to become cyclists. A small additional power can encourage some people to get over a psychological threshold, and it may be a necessary feature for elderly and partly handicapped people. Here the existence of an appropriate maintenance infrastructure with knowledgeable staff and possibly a re-charging infrastructure is important.

#### **5. Transport capacity as a limiting factor for many families and for small enterprises.**

The transport capacity of the standard bike is limited, but today the bicycle industry offers many solutions to this problem (see for example Picture 3 and Picture 8) so that children and light goods in many cases can be transported with human-powered vehicles (hgv) instead of by car. An appropriate infrastructure that corresponds to the demands of the bigger width and length and weight of these cycles, would facilitate their use, that can be cumbersome with too narrow passages, too steep slopes or cycle racks that only fit standard bikes.

#### **6. Compatibility with public transport systems.**

Especially for daily commuting and journeys over longer distances the compatibility of cycle transport with public transport is crucial. Foldable bikes are designed to be taken along in trains, trams and busses, free of charge. These bikes have found an extended use in the last 10-15 years. If drivers of public transport, however, are not familiar with foldable bikes it can happen that e.g. bus drivers deny passenger arriving just in time access to their busses, stating that bikes are not permitted in the bus and not knowing that a foldable transforms into a small piece of luggage.

Some Metros and S-trains also make space for normal bikes against payment, but bikes like trikes, tandems, velomobiles are in general prohibited. Many international high-speed trains do not have any place for bikes, not even for usual ones. This should be changed.<sup>3</sup>

#### **7. Access to quick repair- and maintenance services in case of break down, small accidents or malfunctions that can also handle non-standard cycles**












could improve the reputation of cycling as a reliable means of transportations. In Denmark some big companies already offer their cycling employees free maintenance of their bikes at the workplace.

The following table gives an overview of different types of non-standard bikes that offer technical solutions to many of the shortcomings listed above:



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<sup>3</sup> In its recent opinion on the promotion of cross-border cycle transport the European Economic and Social Committee (the EU-institution in which civil-society articulates its opinions on EU policies as part of the EU-decision-making process as laid down in the EU-treaties) demands that *"In Europe every train, including high-speed international trains, should be obliged to make space available for transporting, among other things, bicycles."* OPINION of the European Economic and Social Committee (EESC) on the Promotion of cross-border cycle transport (Source: TEN/277 - CESE 616/2007 EN/o). The EESC also recommended *"that minimum quality standards (for example width of cycle paths, also for other non-standard bicycles (For example: tandems, delivery tricycles, aerodynamic reclining bicycles and three-wheeled covered bicycles.); signposting) be introduced for cycling infrastructure built with the aid of European subsidies, and that subsidy budgets be made available for the establishment of cycling infrastructure of the kind which has already proved effective in some European cities and countries."*

**Table 1: Overview of different types of non-standard bikes that offer technical solutions to many of the shortcomings listed above**

A cycle is ...						
... a bike,	... a foldable	... a tandem	... a load-carrying	... a recumbent	... a trike <sup>4</sup>	
Examples of non-standard-cycles		 <p>Picture 1: A foldable bike on the road (source: <a href="http://www.pedalkraft.dk/framesetb.htm">http://www.pedalkraft.dk/framesetb.htm</a>)</p>	 <p>Picture 2: A classical tandem with a bicycle trailer (source: <a href="http://www.tandemreise.de">http://www.tandemreise.de</a>)</p>	 <p>Picture 3: A three-wheeled load-carrying cycle (source: © Carlos Labraña A. <a href="http://www.nihola.de">www.nihola.de</a>)</p>	 <p>Picture 4: Low recumbents with very low air resistance permitting high speed at long distances (source: <a href="http://www.hpv.org">www.hpv.org</a>)</p>	 <p>Picture 5: A trike velomobile with an aerodynamic cabin and full weather protection (source: <a href="http://www.leitra.dk">www.leitra.dk</a>)</p>
	 <p>Picture 6: A foldable bike in the train (source: <a href="http://www.pedalkraft.dk/framesetb.htm">http://www.pedalkraft.dk/framesetb.htm</a>)</p>	 <p>Picture 7: a back-to-back recumbent tandem (source: built by Ostrad, picture from <a href="http://www.dantele.net/tobi/lt/janus.jpg">http://www.dantele.net/tobi/lt/janus.jpg</a>)</p>	 <p>Picture 8: a two-wheeled load carrying cycle (source: <a href="http://www.haasies-radschlag.de">http://www.haasies-radschlag.de</a>)</p>	 <p>Picture 9: - as Picture 4, front view (source: <a href="http://www.hpv.org">www.hpv.org</a>)</p>	 <p>Picture 10: an open trike with for aerodynamic front screen and rear (source: <a href="http://www.windcheetah.co.uk/gallery.htm">http://www.windcheetah.co.uk/gallery.htm</a>)</p>	

<sup>4</sup> While in the word 'bike' the prefix 'bi' refers to the vehicles two wheels, in 'trike' the prefix 'tri' refers to the vehicles three wheels.

<p style="writing-mode: vertical-rl; transform: rotate(180deg);"><b>Obstructions and inappropriate infrastructure</b></p>	<p>Foldable bikes are quite flexible and meet few obstacles. Nevertheless,</p> <ul style="list-style-type: none"> <li>• bus drivers are at times not used to foldable bikes and may reject to take them on board</li> <li>• Some cycle stands do not fit to small wheels</li> </ul>	<ul style="list-style-type: none"> <li>• Train transport can be difficult</li> <li>• Require more space for parking and storage</li> </ul>	<ul style="list-style-type: none"> <li>• road barriers can be too narrow</li> <li>• Unsuitable ramps:</li> </ul>  <ul style="list-style-type: none"> <li>• Picture 11: a bad example: steps for pedestrians and cyclists - This ramp is only useful for ordinary bikes. A complete ramp would be better for three-wheelers and bikes with trailers</li> </ul>	<ul style="list-style-type: none"> <li>• Many cycle lanes are not built for high speed (bad visibility due to narrow curves, bumpy surfaces, many traffic lights, ...</li> <li>• too steep turns</li> </ul>	<ul style="list-style-type: none"> <li>• Too narrow turns and barriers</li> <li>• Too narrow bike lanes</li> <li>• Not suitable long-distance trains</li> <li>• Unsuitable ramps</li> <li>• Steps and no ramp at all</li> </ul>
<p style="writing-mode: vertical-rl; transform: rotate(180deg);"><b>Infrastructural and organisational responses</b></p>	<ul style="list-style-type: none"> <li>• Public transport staff is knowledgeable and instructed with regard to passengers arriving with foldables.</li> <li>• Bicycle shops have staff trained to handle these non-standard bikes (This point applies equally to the other types of cycles presented in this table.)</li> </ul>	<ul style="list-style-type: none"> <li>• Sufficient space in trains</li> <li>• Sufficient space for parking and for storage at home and in the city</li> </ul>	<ul style="list-style-type: none"> <li>• Broad turns, barriers and lanes</li> <li>• Ramps without stairs</li> <li>• Suitable space in trains</li> <li>• Sufficient space for parking and for storage at home and in the city</li> </ul>	<ul style="list-style-type: none"> <li>• High-speed recumbents like this need-high-speed lanes.</li> </ul>  <p>Picture 12: an underpass for a long-distance-cycle lane allows safe cycling uninterrupted by crossing roads ( example from Denmark )</p>	<ul style="list-style-type: none"> <li>• Broad turns, barriers and lanes</li> <li>• Ramps without stairs</li> <li>• Suitable space in trains</li> </ul>



The listing in the table is certainly not be exhaustive - apart from the points listed in the table, there are also questions of

- insurance matters,
- of type-registration and type-certification and
- of ticketing in public transport

where a narrow understanding of 'the bike' often creates additional obstacles for non-standard bikes. Of course the many problems that all cyclists are confronted with also apply to non-standard bikes and measures that promote the use of standard-bikes are likely to also ease the life for users of non-standard cycles. We hope, however, that this paper spreads the awareness that a broad understanding of human-powered vehicles when planning and building infrastructure is necessary.