



Best practice bicycle safety – improvement fact sheet

Poor driving conditions

Overview

Poor driving and road surface conditions are major risk factors for cycling safety. Uneven road surface conditions due to **potholes or damage from tree roots**, the presence of **sand and gravel** as well as **slippery road surfaces** caused by water and snow, can cause cyclists to **lose control or skid** and fall, often resulting in **serious injuries**. Poor riding conditions are typically observed on **unpaved roads**, but also on old, **not properly maintained** bicycle infrastructure whose paved surface has cracked and worn over time, or on bicycle infrastructure that is often affected by water and snow but is not subject to (winter) maintenance services. Studies indicate that a high share of especially single bicycle accidents can be attributed to poor driving conditions or road surface conditions.

What is the problem and where does it occur?

Good road surface and driving conditions are important factors for comfortable and safe bicycle infrastructure [9]. **Poor driving and road surface conditions** impose **major risks** for cyclists because they may **lose control** on uneven road surfaces, e.g., when riding over potholes or bumps, or **skid** on slippery road surfaces and **fall**, which can result in **serious injuries** [6, 10]. An **uneven road surface**, e.g., a pothole or damage from tree roots, a loose object on the road, or bumps or paving block types of surfaces that often become uneven over time, can lead to a loss of control of cyclists, resulting in **falling, swerving over the road and crashing with a kerb or object**, or **flying over the handlebars**, e.g., when a branch or piece of wood tangles into the front spokes [2, 7, 8, 10]. The presence of sand, gravel or leaves, but also slippery surfaces caused by water or ice, are problematic and can lead to cyclists **skidding** [8, 4]. Skidding depends on the **coefficient of friction between the tires and the road surface** and is also subject to the condition of the tires and the state of the road surface. With regard to the road surface condition, especially gravel, mud, water, wet leaves, ice and oil can **reduce friction** [10]. However, the latter is also apparent at **low friction surfaces like train & tram tracks, cobbles or drain covers** [8]. In these situations, mostly the **front wheel of the bicycle skids** resulting in the **bicyclist falling and getting injured** [10].

What causes the problem?

Bicycle infrastructure and roads are often **not well maintained** and **damaged due to potholes or tree roots** leading to **uneven road surface conditions**. In some cases, bicycle routes are covered with **sand and gravel** or affected by **water and snow** leading to **slippery road surfaces** [8]. This is typically apparent at bicycle route sections on **unpaved or gravel roads** or road sections with **cobblestone**. Furthermore, this happens at **old, not properly maintained** bicycle infrastructure, whose **paved surface has cracked and worn away over time**, or at bicycle

infrastructure that is often affected by water and snow but is **not subject to (winter) maintenance operations** [5]. These issues are **especially problematic at night or twilight** when visibility is low, in particular when **no light posts** are present [1, 11].

What is the size of the problem?

[8] analysed 349 single-bicycle crashes in Denmark and reported that **poor driving or surface conditions contributed to the majority of accidents**: curb stones were a contributory factor in 13% of the accidents, skidding due to sand, gravel and leaves was a **contributory factor** in 5% of the accidents, potholes (2%), uneven surface (2%), and low friction surface (including tracks and cobbles) was a contributory factor in 3% of the accidents. Furthermore, **slippery surfaces** were also a **major contributory factor**, with those caused by snow/ice being a contributory factor in nearly half (48%) of the accidents and those caused by water being a contributory factor in another 5%. For Sweden, [7] – based on a survey of 947 people who experienced a bicycle crash – showed that road surface problems (potholes, small stones, uneven surface) were the main contributory factor in 6% of bicycle crashes, curb stones were the **main contributory factor** in 7%, and 19% were related to skidding – on ice/snow (14%) and on gravel (5%). For the Netherlands, [10] conducted a study on cyclists taken to the emergency room after a bicycle crash and found that 12% of the single-bicycle crashes were related to **kerb impact collisions**. [3] used data from a self-reporting survey of cycling collisions in Ireland. Based on 295 single cyclist collisions, they report that **slippery roads** (water, ice, oil etc.) were the **most common factor** for single-cyclist collisions: they were a contributing factor in 31% of single cyclist collisions, and kerbs were a contributing factor in 21% of single-cyclist collisions. [4] analysed 638 single-vehicle crashes with e-bikes based on survey data in Switzerland and report that **slippery road surface** (51%) and **poor road**

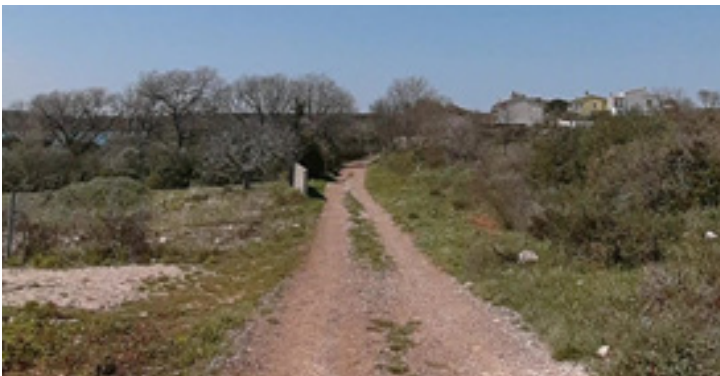
conditions (23%) were **among the most common factors** respondents believed to have had an (at least slight) **influence on the accident**.

In conclusion, studies indicate that a **high share of especially single-bicycle accidents** can be **attributed to poor driving conditions or road surface conditions**.

Examples



Potholes and damage due to tree roots at EuroVelo 8 in Croatia [12]



Presence of unpaved / gravel road at EuroVelo 8 in Croatia [13]

Related fact sheet

SOLUTIONS

- » Driving conditions

References and links

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12. SABRINA. Picture by FPZ
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