

Winter cyclists' perceptions of environmentally friendly winter maintenance strategies on bicycle paths in Germany

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Even though the number of cyclists has been increasing over the past few years, the share of those cycling in winter months is distinctly lower compared to summer. While 17 to 19% of the German population cycle on an average day in summer, this number drops to 10% in winter time. Winter maintenance on cycling infrastructure is an essential prerequisite for winter bicycle use, as cyclists' decision to cycle then is – apart from adverse weather – especially influenced by problems with winter maintenance and low perceived safety. In slippery conditions caused by compact snow, ice and slush where plowing is not sufficient, stone grits are sometimes used on cycle paths, but show only limited effectiveness and can even be dangerous for cyclists due to their rolling behavior after thawing. Road salt or sodium chloride, while being effective, is legally only allowed in some German municipalities due to its harmful impact on the environment. The present project is aimed at testing alternative, more ecofriendly thawing materials and analyzing cyclists' perceptions with regards to factors such as environmental compatibility, traffic safety and grip. It is financed by the German Federal Ministry of Transport and Digital Infrastructure (BMVI) with funds from the National Cycling Plan 2020, and carried out in cooperation with Stadtreinigung Hamburg. Surveys were carried out on two test tracks in Hamburg in the winter of 2020/2021. Temperatures ranged between -6.5 and +2 degrees Celsius on the days of examination. On their way to or from work, cyclists could complete the experiment by cycling through a test track area where four different thawing materials (sodium chloride as the control and sodium formate, calcium magnesium acetate [CMA] and potassium acetate as the experimental materials) had been spread. In previous analyses, the materials had been tested for their thawing power and environmental compatibility, with sodium formate, CMA and potassium acetate showing similar thawing power and being more ecofriendly than sodium chloride. After they had completed the test track, the cyclists were asked to take part in structured interviews on site. Out of 54 persons (52 males, mean age 42.5 years) who took part in the study, half had noticed differences between the thawing materials. Sodium chloride, sodium formate and, to a lesser extent, potassium acetate were evaluated as having good brake, grip, safety and visibility characteristics, meaning it was easily recognizable that thawing materials had been used on the test tracks, while CMA was rated less favorably on all these properties. No differences in perceived safety were found regarding the participants' age. When asked what they found to be important in a thawing material, cyclists named factors such as safety, grip, environmental compatibility and noncorrosiveness for bikes. Limitations such as the non-visibility of the materials on some of the examination days due to early thawing are discussed. The results show that especially sodium formate, but also potassium acetate could serve as thawing materials that are being as positively evaluated by cyclists as sodium chloride and thus might be a suitable and environmental-friendly proxy. In conclusion, by testing different thawing materials and analyzing cyclists' assessments, this study provided first insights into an under-researched field in Germany and serves as a step towards a safer and eco-friendlier winter maintenance for cyclists. It remains to be seen, however, whether these positive effects will be reflected in an increase in the number of cyclists in winter time.