

## Summary

# Colored road surface for bicycles and public transport

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*The report summarizes experiences from Norway and other countries with colored surfaces for bicycle and public transport infrastructure. It is based on a review of scientific literature, a review of other countries' handbooks and guidelines, reports from experiences with colored surfaces in Norway and other countries, internet searches to find examples, and interviews with professionals. Whether colored surfaces for bicycles increase safety is uncertain, but it can, in combination with other measures, contribute to making cycling more attractive. The effects depend on how whether colored surface is used midblock or at conflict points and the type of material. For public transport facilities it is mostly used on midblock sections with the purpose of reducing illegal driving in bus lanes. In conflict areas, bus lanes are in some places highlighted with a box junction type of road markings.*

## Background

This report summarizes knowledge about experiences with the use of colored surfaces for bicycle facilities and public transport facilities. The purpose of the report is to answer questions about:

- Effects of colored surface on e.g. traffic safety, accessibility and safety
- Different types of colored surface (materials, colors)
- Differences in the effects between different types of bicycle and public transport facilities
- Consequences for costs, operation and maintenance, and the environment
- Discussion of colored surfaces in other countries' norms and guidelines.

The report is based on a review of scientific literature, a review of other countries' handbooks and guides, reports from experiences with colored cover in Norway and other countries, internet searches to find examples of the use of colored cover, and interviews with professionals.

## Effects on traffic safety for cyclists: Accidents, behavior, safety

Among studies of the effects of colored surface on accidents, one study found an accident reduction at intersections with a cycle path or lane on the section. The other accident studies found either unchanged or increased accident numbers at intersections. However, the results from these studies may be affected by a number of methodological weaknesses and cannot be easily generalized. We have not found studies that have examined the effect on accidents on sections (regardless of the type of facility).

Studies that have examined the effects on conflicts and behavior, mainly found fewer conflicts and improved behavior among motorists and cyclists, on sections and at intersections. Several studies also show that cyclists feel safer on colored cycle paths / lanes. However, some studies found more careless behavior among cyclists at intersections.

Studies that have examined how cyclists experience colored surfaces, indicate that colored surfaces can make bicycle infrastructure more attractive and visible, and that cyclists feel safer.

## Effect on accessibility for cyclists

Experience and empirical studies show that colored surfaces can affect cyclists, both in a positive and negative direction.

Results from empirical studies suggest that colored surfaces can improve accessibility for cyclists in situations where:

- Pedestrians often come into conflict with cyclists
- Bicycle paths / lanes are often blocked by parking cars
- Cars drive in bicycle lanes when there is a slow or stationary queue (such as in front of traffic lights)
- Cars do not comply with the duty to yield for cyclists at intersections or at exits.

Accessibility for cyclists may be poorer with colored surfaces if the surface has poorer quality than non-colored surfaces, such as:

- Holes or cracks
- Poor friction
- Greater rolling resistance than on non-colored cover.

## Effect on bicycle volume

Empirical studies that have examined how a given type of infrastructure affects the *total number* of cyclists are difficult to carry out and there are very few good examples of such studies. We have not found any such studies regarding colored surfaces on bicycle infrastructure.

A Norwegian study showed that road sections where red asphalt was installed had a 12% increase in cycling compared to other roads. The fact that red surfaces seem to attract cyclists does not necessarily mean that more people are cycling. However, it indicates that cyclists prefer red surfaces and that they may change the route to cycle on red rather than traditional black surfaces.

Our conclusion is that colored surfaces may serve as a kind of advertisement or information about the availability of cycling infrastructure, or also as a visualization of cycling as a "natural choice". But this effect will only occur where the quality of the infrastructure in general is in line with cyclists' expectations.

## **Effects of colored surfaces on public transport**

Public transport facilities on which colored surfacing may be used are mainly public bus lanes / high occupancy lanes, and bus streets. Most examples we have found of colored surface on bus lanes show colored surface on bus lanes. Colored surface may continue at intersections, but is not limited to intersection areas. One empirical study showed that colored surface on bus lanes reduces illegal driving in the bus lane. Effects at intersections have not been studied empirically to our knowledge.

At intersections and conflict points, road markings of “box junction” type are used in some places. For the bus expressway in Stavanger, blue surface is considered at intersections.

We have not found studies that have empirically investigated the effects of colored surface on public transport. Possible effects described in the following are based on theoretical assessments.

The effect on traffic safety may be positive in that colored surfaces reduce illegal driving in bus lanes. This is the most important intended effect of colored public transport, and we have found one empirical study that shows that illegal driving in public transport has been reduced from 14% to 3% with colored pavement (McKeown, 2006).

If the same color on bus lanes as for cycle paths / lanes, this is most likely not problematic as long as all colored bus lanes may be used by cyclists. Colored bus lanes that cannot be used by cyclists not have the same color as bicycle lanes, to avoid misunderstandings.

Colored surfaces can have positive effects on public transport by reducing illegal driving in bus lanes, but this is not empirically proven.

The report also discusses:

- The use of colored surfaces in different types of cycling infrastructure,
- Choice of color
- Choice of surface materials (asphalt, epoxy, concrete etc.)
- Costs with surface coloring
- Issues related to maintenance
- How colored surface is treated in guides and manuals from different countries.