CHOOSING HIGH-ALBEDO ROAD COATINGS

HAZARD

HEAT

IMPLEMENTATION STEP

TERRITORY

AREA OF ACTION

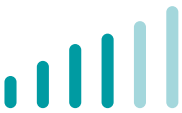
OUTDOORS

COST

€ € €

low **medium** high

LEVEL OF SKILL



medium

Faced with rising temperatures and the intensification and multiplication of heatwaves, the design of public and private outdoor spaces must respond to new challenges in terms of thermal comfort for users. It is widely accepted that changing the albedo on the ground has the capacity to cool down the local area and, in particular, reduce extreme heat (IPCC, 2018). The use of high-albedo (i.e. light-coloured and/or reflective) road surfaces is an effective way of combating overheating in outdoor spaces, similar to creating water features, greening areas and desealing soils.

IMPACTS

Unlike dark materials, which absorb solar energy, overheat, and then heat up the air, high-albedo coatings **reflect a large proportion of the sun's rays** and therefore remain "cool". Their use helps to slow down the formation of urban heat islands (where temperatures are higher in urban areas than in the surrounding rural areas) and generally **reduces users' outdoor thermal discomfort**.

INSTALLATION GUIDE

High-albedo coatings can be used on new and existing roads. For new roadways and major renovations, we recommend choosing light-coloured materials. For existing roadways, the albedo of mineralised surfaces can be improved by using **inverted paving** (high-albedo aggregate laid on a thin layer of bitumen), **coloured asphalt and concrete** (addition of reflective pigments to increase the reflectivity of the materials) and **adding a surface layer of concrete** on bitumen surfaces (concrete has a slightly higher albedo than bitumen).

Asphalt, concrete and granite should be avoided as they trap heat during the day and release it at night.

To maintain their reflective properties, light-coloured road coatings need to be **maintained regularly**, as they become dirty more quickly than dark surfaces.

Light-coloured and/or reflective coatings should be avoided in large, mineralised squares with no water points or vegetation, as the solar rays reflected by high-albedo road surfaces can increase users' thermal discomfort. Shading strategies may be more appropriate.

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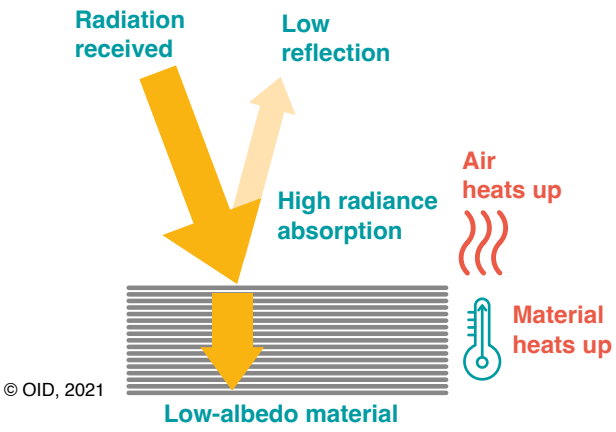
ILLUSTRATION OF THE REFLECTING PROPERTIES OF HIGH-ALBEDO ROAD COATINGS



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WEAK POINTS AND STRONG POINTS

⊕ High-albedo road surfaces can be combined with permeable coatings to improve thermal comfort and prevent flooding. While light-coloured or reflective surfaces have the advantage of **withstanding heavy vehicle traffic** and can therefore be used on roads, most permeable coatings are less resistant, making them more appropriate for pavements, cycle paths and parking spaces.

⊖ Because they reflect a large proportion of the sun's rays, high-albedo coatings can **dazzle people and cause discomfort**. Local biodiversity is also affected: young trees planted near a reflective surface are likely to get "sunburnt".

⊕ For the same reasons, this type of coating **increases the safety of road users** at night (because objects and people are more visible) and **reduces night-time lighting costs.**

⊕ High-albedo coatings can be used in the city or on buildings to improve thermal comfort for users.

MALADAPTATION

Maladaptation can result from the following:

Water pollution

Cooling down road surfaces can have negative environmental impacts, including water pollution. It's crucial to consider the materials and chemicals used throughout their life cycle, from manufacture to application and end of life. Some of these coatings contain chemicals designed to reduce heat absorption. When they are exposed to rain, the chemical agents can leach out and end up in drainage systems, watercourses and water bodies, which can be toxic for aquatic fauna and disrupt the ecological balance.

Bigger carbon footprint

Modifying road surfaces to increase their albedo can have a significant impact on the carbon footprint of projects, particularly due to the manufacture, transport and installation of new materials, and the management of waste associated with the removal of existing surfaces. Rather than demolishing and rebuilding, it's preferable to adapt the existing road infrastructure. As a result, you must carefully assess the balance between the need to adjust the albedo of roads and the intrinsic carbon impact of each project.

Increased light pollution

Light pollution results from the excessive diffusion of artificial light in the nocturnal atmosphere, particularly from public lighting, buildings, illuminated advertisements, etc. The massive deployment of high-albedo roads in urban areas could turn them into mirrors reflecting this light, thereby contributing to light pollution, which disrupts biodiversity and nocturnal ecosystems.

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MONITORING INDICATORS

MONITOR MY ACTIONS FOR CLIMATE CHANGE ADAPTATION

+/- : Quantitative indicator ★ : Qualitative indicator

INDICATORS OF MEANS	INTERPRETATION
+/- Percentage of road surface area with an albedo greater than 0.4 (%)	To be maximised

INDICATORS OF RESULTS	INTERPRETATION
+/- Comparison between the temperature of roads and that of a control situation* (°C)	Temperature of high-albedo roads < control area*

** The control situation is defined by the parameters established to isolate the influence of the adaption action (similar conditions: weather, time of measurement, space, etc.).*

REGULATION / CRITERIA

- A high **albedo** is **close to 1**. A coating is characterised as having a **low albedo** if it's between **0 and 0.4** (ADEME, 2021). An albedo greater than 0.4 is recommended.

TOOL

- An **albedometer** comprises two identical pyranometers facing each other: one pointing upwards (sky), the other downwards (earth). The upward pyranometer measures the incoming global solar radiation (direct + diffuse) on the ground, while the downward pyranometer measures the global solar radiation reflected by the ground (C2AI, 2020).

FIND OUT MORE

AdaptaVille (2021), *Limiter le bruit et la chaleur avec des nouveaux revêtements routiers en test à Paris*

ADEME (2012), *Guide de recommandation pour lutter contre l'effet d'îlot de chaleur urbain à destination des collectivités territoriales*

ADEME (2021), *Rafraîchir les villes : des solutions variées*

Institut national de Santé Publique Québec (2009), *Mesures de lutte aux îlots de chaleur urbains*

Ville de Paris (2023), *Mission d'information et d'évaluation du Conseil de Paris - Paris à 50°C*

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