



## Cool Pavements

Number 23, 2017

Part of the [Tranzinfo Hot Topics](#) series, this issue offers a selection of material on cool pavements – a term that refers to pavements that have been modified to stay cooler in the sun than traditional pavements, thereby helping to mitigate the urban heat island effect. Examples include solar reflective pavements and permeable pavements.

## Glossary

**Albedo:** “Unabsorbed solar energy reflected back into the atmosphere by light-colored surfaces. Surfaces that appear translucent or white, such as ice and snow, have the highest levels of albedo, thereby reflecting the greatest amount of solar energy. Albedo is a ratio expressed on a scale from 0 to 1, where 0 represents total absorption and 1 represents complete reflectance of the solar energy.” [\(Minnesota Asphalt Pavement Association\)](#)

**Urban heat island (UHI):** An urban or metropolitan area that is significantly hotter than nearby areas with natural land cover due to factors such as human activity, waste heat generated by energy use, and surfaces in the built environment that absorb heat.

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## Research

### [Guide to urban cooling strategies](#)

Low Carbon Living CRC, University of NSW, Sydney, 2017

Practical guidance for built environment professionals and regulatory agencies seeking to implement development projects to mitigate urban heat island effects in major urban centres across a range of climates in Australia.

### [Life-cycle assessment and co-benefits of cool pavements](#)

Prepared for the California Air Resources Board and the California Environmental Protection Agency, California, April, 2017

The report develops a pavement life-cycle assessment for Californian cities and translates it into a dynamic decision support tool. Local officials can use this tool to evaluate the life-cycle environmental impacts of various pavements, both conventional (lower albedo) and cool (higher albedo).

### [Laboratory-simulated investigation on thermal behaviours of permeable concrete pavements](#)

Wu, H et al., Road Materials and Pavement Design, vol.18, no. sup3, 97-108, 2017.

Permeable pavements are considered an effective solution for mitigating the thermal discomforts of hot climates. In this study, the thermal behaviours and performances of permeable concrete pavement were investigated with a series of simulation experiments in the laboratory. For comparison purposes, traditional Portland cement concrete (PCC) and Portland cement porous concrete (PCPC), which are commonly used in municipal pavements, were considered for the study.

### [Energy and environmental consequences of a cool pavement campaign](#)

Gilbert, HE et al., Energy and Buildings, Volume 157, 15 December 2017, pp. 53-77.

Raising the albedo (solar reflectance) of streets can lower outside air temperature, reduce building energy use, and improve air quality in cities. However, the production and installation of pavement maintenance and rehabilitation treatments with enhanced albedo ("cool" pavements) may entail more or less energy consumption and carbon emission than that of less-reflective treatments.

### [A review on the development of cool pavements to mitigate urban heat island effect](#)

Yinghong Qin, Renewable and Sustainable Energy Reviews, Volume 52, December 2015, pp. 445-459.

The idea of using cool pavements to mitigate the urban heat island effect has gained momentum recently. This review synthesizes the existing definition, physical mechanism, and typical cooling techniques of cool pavements, presenting the influence of cool pavements on the urban thermal environment. Benefits, penalties, costs and policies for the applications of

cool pavements are presented with special emphasis on reflective pavements and evaporative pavements.

[Using cool pavements as a mitigation strategy to fight urban heat island: a review of the actual developments](#)

Santamouris, M, Renewable and Sustainable Energy Reviews, vol. 26, Oct 2013.

The use of cool pavements presenting substantially lower surface temperature and reduced sensible heat flux to the atmosphere appears to be one of the most important proposed mitigation solutions. The present paper investigates and describes the actual state of the art of the field of cool pavements. The main thermal and optical parameters defining the thermal performance of pavements are analyzed. Almost all of the developed technologies, where data and results are available, are considered while emphasis is given to the presentation of reflective and permeable/water retentive pavements.

[The use of reflective and permeable pavements as a potential practice for heat island mitigation and stormwater management](#)

Li, H et al., Environmental Research Letters, February 2013

To help address the built environment issues of both heat island and stormwater runoff, strategies that make pavements cooler and permeable were investigated through measurements and modeling of a set of pavement test sections. The investigation included the hydraulic and thermal performance of the pavements.

## **Case studies & trials**

[Using cool pavements to mitigate urban temperatures in a case study of Rome](#)

Battista, G & Pastore, EM, Energy Procedia, vol. 113, May 2017, pp. 98-103.

Solar reflectance of urban materials can lead to a reduction in built surface temperatures and mitigate the urban heat island intensity, with impacts and implications for energy efficiency, environment and human comfort and health. Measured temperatures were used to calibrate a model of a densely populated neighborhood in Rome using ENVI-met software.

[Cooling Cavenagh Street: innovative heat trial to cool our CBD](#)

Northern Territory Government Ministerial Media Statement, 15 November 2017, Australia.

The Northern Territory Government has announced a 12-month heat mitigation trial on Cavenagh Street in Darwin's CBD, with initiatives including the installation of a 50m green shade structure, and new technology pavement treatments.

### [Can reflective pavement cool off LA's streets?](#)

Curbed, 21 May 2017

A grey-coloured street seal is being trialled in parts of Los Angeles, California.

### [Lighter pavement used to combat heat increases](#)

IPWEA, 17 February 2016

In the inner western-Sydney municipality of Marrickville, a trial into the heat-combating effects of a lighter-coloured road surface is being carried out in collaboration with Monash University.

### [Sydney is changing the colour of roads to try to cool down the city](#)

Business Insider, July 2014

The Council is currently trialling lighter pavement in the inner-city suburb of Chippendale in a bid to reduce what's known as the 'urban heat island effect'.

### [First trial of 'cool roads' to combat warming](#)

ABC Radio, 29 May 2014, Australia

Audio download of an ABC Radio National interview with a sustainability advocate on the concept of 'cool roads', which seek to reduce temperatures in dense urban areas.

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