

Science for Environment Policy

Waste materials are an underused resource in the construction of Europe's roads

Recycled waste material could play a major role in the construction of roads in Europe, bringing both environmental and economic benefits. A new study proposes a scenario where 50% of the asphalt for Europe's roads consists of recycled materials, leading to significant reductions in costs, energy use and greenhouse gas emissions.

According to the [European Waste Framework Directive](#), there is a need to promote reuse and [recycling](#), which are the preferred options to disposal or incineration of waste. However, there need to be clear pathways for that recycled waste to take. One such pathway is reuse in the construction and renovation of Europe's road network. Europe's road network is the key component in its transport infrastructure, and as such it requires constant maintenance; every year 4.7 million kilometres of new road are built.

Waste is already used in road construction. This study suggests that the input of recycled materials in road construction can be increased, with the potential for both economic and environmental benefits. The researchers assessed certain waste materials as substitutes for virgin raw materials that normally form the basis for new roads.

These waste materials, which include glass, asphalt, concrete, wood and plastics, were considered appropriate substitutes because they demonstrate comparable performance to traditional materials and are available in large quantities, with effective systems in place for their collection. In addition, there are no alternative applications with higher value for these waste materials, and they are too expensive to dispose of by traditional methods such as incineration. Part of the analysis also looks at potential sources for the materials, such as construction and demolition waste and end-of-life vehicles.

Following a literature review covering a range of potential materials and their sources, the study concludes that there are considerable economic and environmental advantages to using waste in roads and there is high potential for recycling in European road construction and repairs of potholes. Waste products analysed either match or improve upon currently used road materials in terms of performance. Examples of improvement include the enhanced drainage properties of scrap tyres, or the better stiffness and rutting resistance seen in ceramic mixtures. There is also potential for sizeable cost reductions; one US case demonstrated savings of 51–70% when using reclaimed asphalt pavement (RAP).

Current data suggest that around 17% of asphalt concrete in Europe's roads comes from RAP, but this is just one of many potential recycled materials. If an additional 33% of mixtures used for roads were to consist of waste materials, around 16% of the available European waste quantities would be recycled in roads, the study suggests. In a potential future scenario set out in the study, half of the asphalt concrete used in European road construction could come from recycled materials.

As part of the study, the researchers considered four hypothetical asphalt roads constructed using different combinations of the waste products discussed in the literature review. Each one demonstrated considerable decreases in cost, [greenhouse gas emissions](#) and energy use. One scenario saw material costs reduced by 31.4%, a saving of 76.1% in non-renewable energy used and an impressive 860% reduction in greenhouse gas emissions.

While these projections are promising, the researchers note that the use of waste is limited by national standards, with recycling rates and practices varying by country. The use of crumb rubber from scrap tyres in roads, for example, is allowed in Spain but not in Switzerland.

This study helps demonstrate the considerable value that can come from [incorporating recycled materials](#) into road construction. The scientific community has an important role to play in encouraging the widespread roll out of recycled materials in road construction, by bringing the required technical expertise to practicing professionals in road construction and recycling, it also suggests.



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