

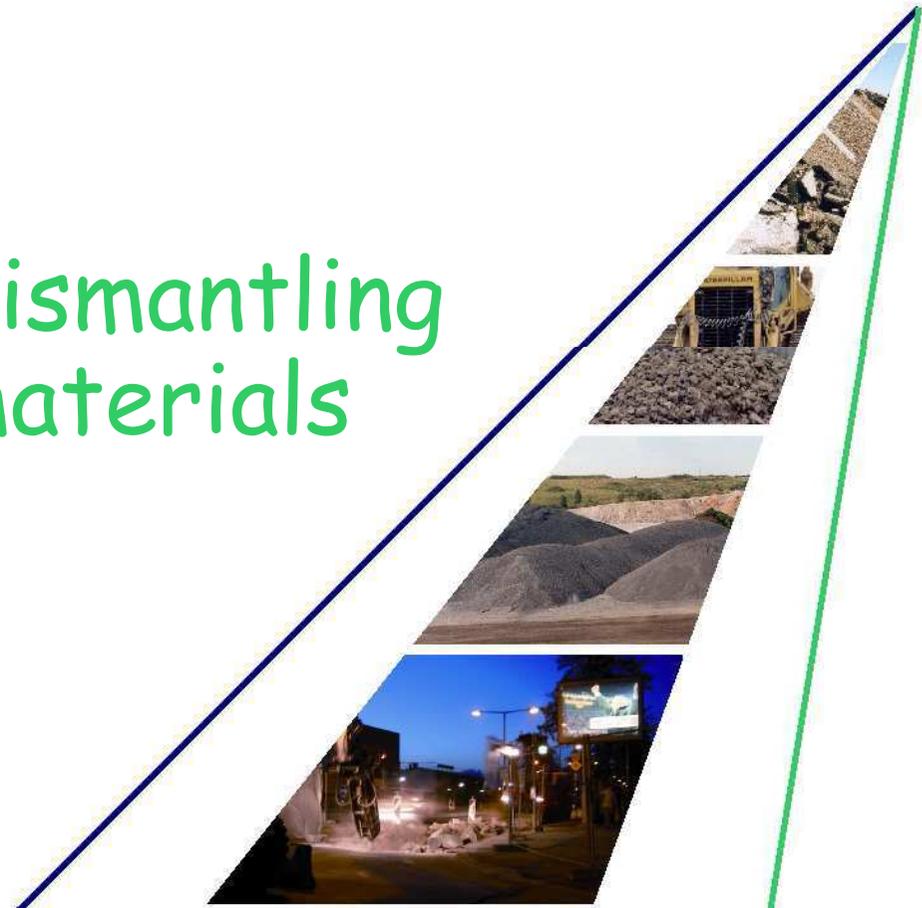


**DIRECT-MAT Final Workshop  
Brussels, 18 October 2011**

# Best Practices for dismantling and recycling road materials

## WP5 "Other materials"

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The project has received funding from the European Community's Seventh Framework Programme FP7/2007-2013) under grant agreement n°218656



# Focus of WP5

'Other materials not commonly recycled in roads' deals with:

- Materials that complicate the dismantling of road layers or structures: geotextiles, steel reinforcement materials, road markings,...
- Unwanted materials (with dangerous properties): tar, asbestos,...
- Secondary aggregates from industrial by-products / waste: slags, ashes, plastics, glass, foundry sand, ...
- Vehicle tyres (e.g. used as aggregate or as binder modifier)
- (Polluted) soil or sediment e.g. Excavated soil, sediment from ditches and rainwater basins, road cleaning waste
- Green waste from road shoulder maintenance (wood, grass)

# Materials that complicate the dismantling of road layers or structures



## Life cycle thinking / Design for disassembly

Think before you act: Is this material / construction recyclable? How to eliminate it at the end of its useful lifetime?

(S) checklist of types of materials present, to inform or alert the user.

## Road marking

(D) The producer must inform about the possibilities for recycling / elimination

Thick (thermoplastic) markings: selective removal before further demolition.

## Steel reinforcement bars for concrete

Block pavement → no big problems because limited steel content.

Continuously reinforced concrete pavements: → high steel content, long bars: difficult!

3-dimensional structures (mesh): attention at milling works !

## Geosynthetics

Attention at milling works! Not yet very much experiences available.

Laboratory tests show no problem for polyester geotextile in asphalt mix.

# Unwanted / dangerous materials

## 1) Tar

- European Waste Catalogue code \* 17 03 01 makes tar containing asphalt a dangerous waste > 0,1 % carcinogenic material.
- How do we detect tar?
  - (rather subjective method: specific smell of tar)
  - rapid identification and acceptance of the reclaimed asphalt:  
PAK-MARKER (a type of road paint with a specific solvent that reacts by discoloration to the presence of certain components that are also present in the tar), or the Belgian fast test with the toluene and/or DMSO solvent, are fast and simple tests.
  - quantitative results with GC-MS (gas chromatography + mass spectrometry).
- Cold recycling versus thermal destruction by incineration:  
CR is a better solution on short-term horizon (because of cheaper economics), but it gives no solution on long-term because the tar stays in the road construction. A thermal destruction by incineration is an expensive solution, but is better on the long-term horizon, because it takes the problem out of the road.
- Each solution (cold recycling, burning, ...) shall be optimized (technical + economical). This however depends on the local conditions (legislation) in every country.

# Unwanted / dangerous materials

## 2) Asbestos



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Limiting the creation of free asbestos fibres is crucial for the protection of health of workers.

Suppression of the release into the air of fibres from the milling or crushing of asphalt can be realised by the simultaneous spraying of water in the machine chamber.

The presence of asbestos in old asphalt pavement is very limited, only some countries have reported it.

The possible contamination with asbestos of recycled aggregates from building demolition waste is more common: as these recycled aggregates may also find their way into new road construction (sub-base or base-) layers, attention is needed for a problem that can be more widespread than its limited relevance from a pure road construction viewpoint could indicate.

Preventive measures taken from the start of the demolition work (with audit of the presence of asbestos in the old building) and careful selective demolition by skilled workers can guaranty the absence of asbestos in recycled aggregates.

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# Secondary aggregates

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Research is primarily done on possibilities of secondary aggregates for first (virgin) application in new road construction, as a (short term) solution for the industrial (mineral) waste materials, like ashes, slags, glass, ...

and does not take into account the future potential recycling possibilities, if relevant.

Little or no information on the second or further recycling cycle for road construction materials containing secondary aggregates.

Depending on the road construction application (be it in unbound, hydraulically or bituminous bound mixtures), the local geophysical conditions play an important role in this, e.g. the influence of acidity or pH changes on the related leaching of some pollutants like heavy metals.

Here more information is needed, in order to steer present research teams and future implications for new standardization committees on road materials.

# Tyre rubber

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Used tyres can be valorised as an alternative fuel (TDF = tyre derived fuel) for energy-intensive processes in facilities such as utility boilers, cement kilns, pulp/paper mills, benefiting from the excellent heating power of the tyre.

End of life tyres can be recycled in 3 ways:

- 1) cut to tyre shreds of different dimensions, and be recycled as lightweight material in embankments or filling in noise barriers, as frost insulating material in roads, as drainage in landfills, etc.
- 2) in the form of rubber granulate, used as a raw material for construction of rubber based "elastic" pavements for playgrounds and sports facilities, and
- 3) in the production of asphalt rubber (AR) mixtures for road paving:
  - used either in the modification of virgin bitumen to produce "bitumen rubber" binder ("wet process")
  - or it may be incorporated directly in the asphalt mixture, together with the aggregates ("dry process").

## Tyre rubber, cont.

Asphalt mixtures with bitumen modified with high rubber content (around 20 % rubber in the binder) have shown enhanced performance: resistance to cracking and able to mitigate crack propagation, and increased durability compared to conventional mixtures.

Table 5.2 - Types of rubber modified bitumen (wet process) used in some EU countries

Country	Identification	% crumb rubber in the modified binder
Portugal	BBB, Bitumen modified with low rubber content	< 8 %
	BBM, Bitumen modified with medium rubber content	8 - 18 %
	BBA, Bitumen modified with high rubber content	> 18 %
Spain	BC, Rubber improved bitumen	< 10 %
	BMC, Rubber modified bitumen	10 - 18 %
	BMVAC, High-viscosity rubber modified bitumen	18 - 22 %
Czech Republic		5 - 15 %
		15 - 25 %

# Soil and sediment

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Sediment from roadside ditches and rainwater basins, may contain pollutants from road run-off; dewatering may be necessary; preferably sediments reused within the treatment facility area; extracted soils be used primarily by road administrator; unpolluted soils can be used as backfill of trenches, or as fill material in road shoulders.

Road cleaning waste: split used as anti-skid material in winter is collected for further use: reuse as anti-skid material, recycling as fill material, recycling in asphalt production; or final disposal.

Excavated soil from ground works: a local balance between excavation and embankment works should be realised, so the transport of soil (and the possible pollution in it) to other locations is minimised.

If the technical quality of local soil is insufficient, a soil improvement technique is necessary. In general, soils with high clay or silt content can best be treated with lime, and sandy soils are better treated with cement as binder.

## Green waste

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### Cut grass:

Eco-friendly management of roadside green fields and their vegetation can enhance biodiversity in the direct neighbourhood of the road site. Haymaking is a common practice for the cut grass.

The green waste is seldom collected and recycled by means of composting or anaerobic digestion.

### Cut wood from trees or bushes:

Cut the wood to chippings and use the wood chips for energy recovery in heating plants, e.g. for heating a road maintenance building.

Use of wood chippings as biomass for further biogas production is not yet usual.

Or spread the chippings as mulch on the road shoulder, use it as an organic soil improver.

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THANK YOU FOR YOUR ATTENTION!!!

