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ENVIRONMENTAL IMPACT OF BIO-BASED ASPHALT MIXTURES: LIFE CYCLE INVENTORY, LIFE CYCLE ASSESSMENT AND RECOMMENDATIONS

[a] *MANTALOVAS,* [g] *JIMÉNEZ DEL BARCO CARRIÓN,* [b] *BLANC,* [b] *CHAILLEUX,* [b] *HORNYCH,* [c] *PLANCH,* [d] *POROT,* [e] *POUGET,* [f] *WILLIAMS,* [a, g] *LO PRESTI*

[a]DEPARTMENT OF CIVIL ENGINEERING, UNIVERSITY OF PALERMO, VIALE DELLE SCIENZE ED.8, PALERMO 90128, ITALY
[b] LUNAM UNIVERSITÉ, IFSTTAR, ROUTE DE BOUAYE CS4, 44341 BOUGUENAIS CEDEX, FRANCE
[c] WESTERN RESEARCH INSTITUTE - 365 N 9TH ST, LARAMIE, WY 82072, USA
[d] KRATON - TRANSISTORSTRAAT 16, 1322 CE ALMERE, NETHERLANDS
[e] EIFFAGE INFRASTRUCTURES – DIRECTION R&D, 8 RUE DU DAUPHINÉ CS74005, 69964 CORBAS CEDEX, FRANCE
[f] IOWA STATE UNIVERSITY – DEPARTMENT OF CIVIL, CONSTRUCTION AND ENVIRONMENTAL ENGINEERING, IOWA STATE UNIVERSITY, USA TOWN ENGINEERING BUILDING, 394 TOWN ENGINEERING, AMES, IA 50011, USA
[a, g] NTEC - UNIVERSITY OF NOTTINGHAM FACULTY OF ENGINEERING, THE UNIVERSITY OF NOTTINGHAM, NG7 2RD

PROBLEM STATEMENT

Virgin Aggregates & Bitumen → Road Pavements

Raw materials Scarcity

Recycled Materials Alternative Binders → Green Road Pavements

Are they environmentally friendly ?

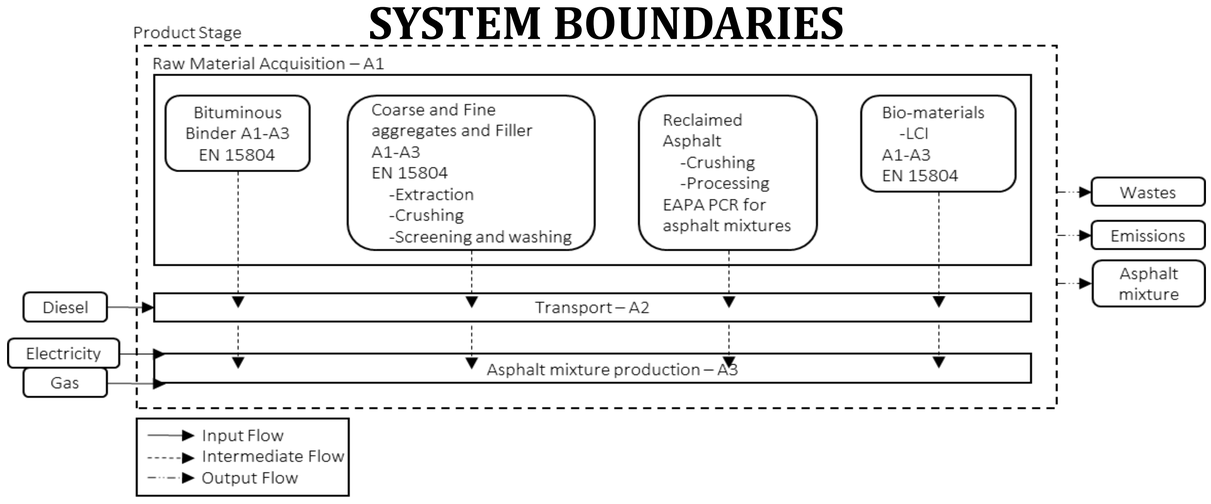
Life Cycle Assessment of Recycled Bio-Asphalt Mixtures

MATERIALS

50% Recycling +

Bio-Materials:
- BM1: Bio-Additive
- BM2: Bio-Binder *(0% virgin bitumen)*
- BM3: Bio-Additive

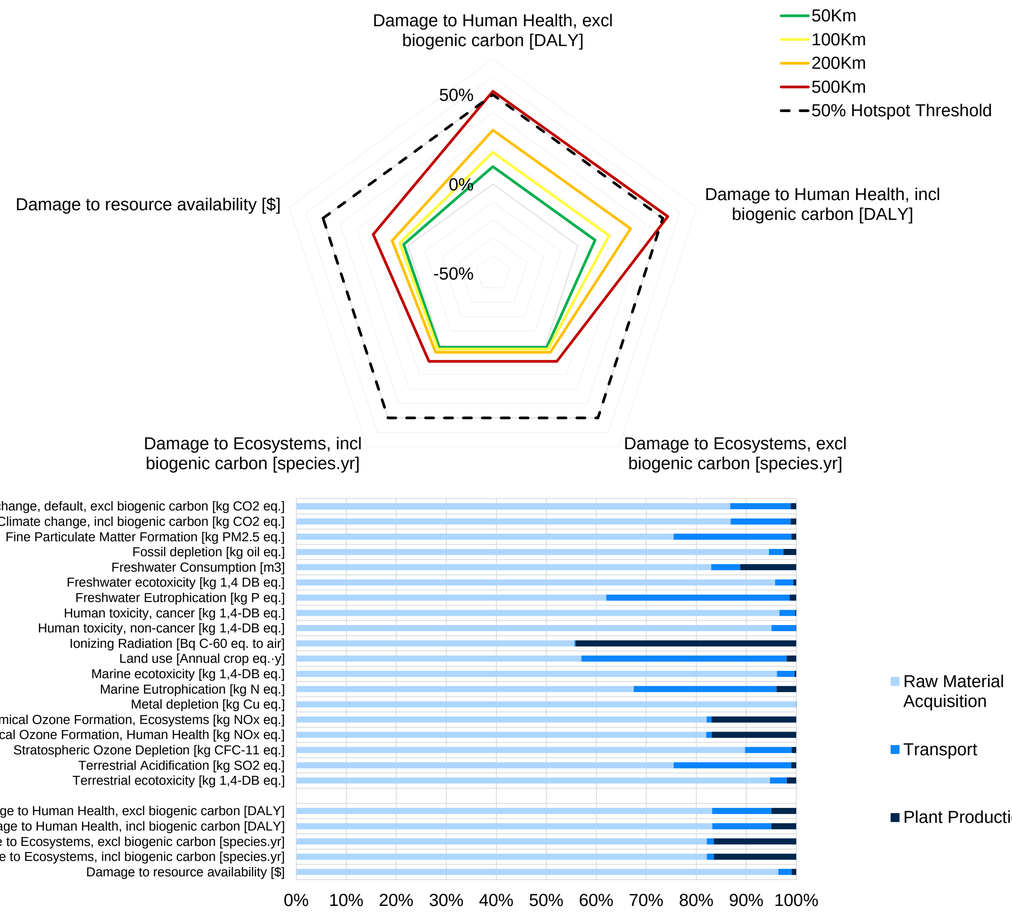
SYSTEM BOUNDARIES



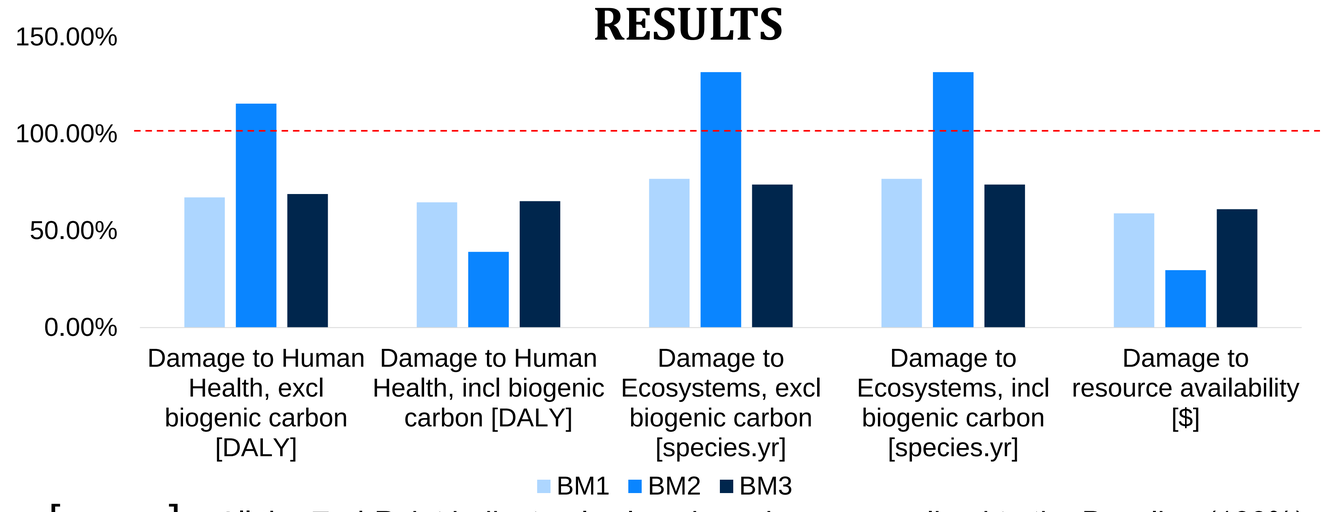
ALLOCATION AND CUT-OFFS

1] Upstream impacts associated with reclaimed/ materials previous lifecycles, are excluded from the system boundaries.
2] Impacts associated with the processes involved in the processing and screening of the reclaimed materials are included within the system boundaries.
3] No Cut-Off rules were applied. The LCI of the bio-materials was produced considering all the required processes for their production.

HOT-SPOT & SENSITIVITY ANALYSES



RESULTS



[----------] All the End-Point indicators' values have been normalised to the Baseline (100%)

CONCLUSIONS

1] Damage to resource availability and damage to human health including biogenic carbon are positively affected for all three studied technologies.
2] When biogenic carbon is included, the climate change indicator is positively affected for all the investigated technologies.
3] The acquisition of raw materials is shown as having the highest influence. Increasing recycling rates, seems the most effective and direct way to reduce the rates of raw material extraction and processing.
4] In order to avoid the transport stage becoming a hot-spot, the average transport distance of the raw materials to the mixing plant should be kept below 200Km.
5] When some components of the bio-materials are considered end-of-life products the values of all the endpoint impact category indicators are significantly reduced, making the use of bio-materials a significantly environmentally friendlier option compared to the baseline.
6] Even if the amount of bio-materials is less than 1%, cut-off rules should not be applied, since they have been found to be highly influential for the impact category indicators.

https://www.researchgate.net/profile/Konstantinos_Mantalovas
konstantinos.mantalovas@unipa.it
https://www.linkedin.com/in/konstantinos-mantalovas-123bb6117

UNIVERSITÀ DEGLI STUDI DI PALERMO
The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

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