Analysis of Environmental Burden Shift for Using Recycled Concrete Aggregates in Low-Noise Asphalt Pavement

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INTRODUCTION

- The use of recycled materials changes the value chain of a product, leading to potential environmental burden shift.
- This study focuses on potential burden shift due to the use of recycled concrete aggregates (RCA) in the surface course of semi-dense asphalt (SDA) pavements.
- Fatigue testing was performed to determine the mechanical performance of asphalt mixtures.
- Life cycle assessment (LCA) was performed considering greenhouse gas emissions, non-renewable cumulative energy demand and ecological scarcity eco-points using three scenarios:
  - I. Reference Scenario: A reference SDA surface course without RCA;
  - II. Test Scenario 1: An SDA surface course using RCA as filler replacement;
  - III. Test Scenario 2: An SDA surface course using RCA as

ASPHALT MIXTURE

Information of SDA Mixtures

Scenario	Aggregates [%M]	RCA [%M]	Binder [%M]	Bulk Density [t/m^3]
Ref	93.9	0	6.1	2.14
Test 1	86.8	7.1	6.1	2.13
Test 2	77.8	15.7	6.5	2.10

SUPPORT AND COOPERATION

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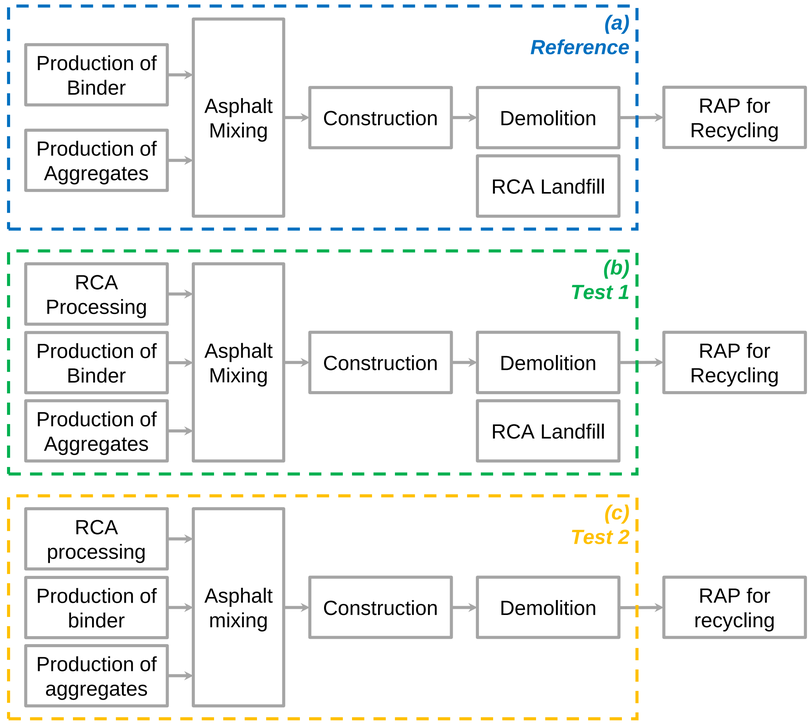
SYSTEM BOUNDARY



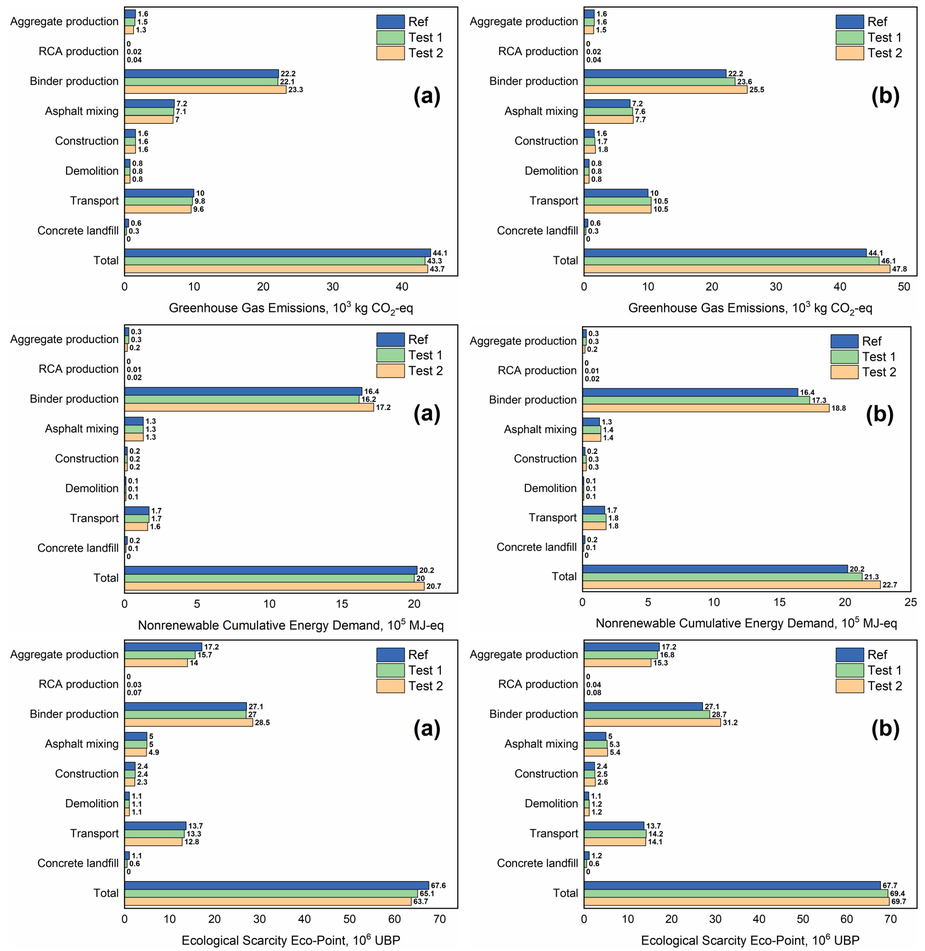
Data Sources:

1) Ecoinvent database v3.6 cut-off;
2) Swiss asphalt plants and road constructors;
3) Reports from the governments and authorities.

CONCLUSIONS

- Considering a 10% reduction in performance, the total greenhouse gas emissions, non-renewable cumulative energy demand and ecological scarcity eco-points are not improved by replacing natural aggregates with RCA for the SDA surface course;
- Environmental burden shift occurs from the aggregate production to the binder production in Test Scenario 2 when more binder is used.

RESULTS AND CONCLUSIONS



Notes:

a) General Assumption: The test SDA with RCA replacement has the same service life as the reference SDA;
b) Conservative Assumption: The service life of the test SDA is around 10% less compared to the reference SDA, according to the results of fatigue testing.