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Centre d'étude et d'expertise sur les risques, l'environnement, la mobilité et l'aménagement

Interreg North-West Europe SeRaMCo

TECHNISCHE UNIVERSITÄT KAISERSLAUTERN

Environmental analysis of end-of-life concrete

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- Part. I: Reducing the environmental impacts of Recycled Aggregates Concrete (RAC)
- Part. II: Recycling end-of-life concrete: an attempt towards circular economy in the residential sector
- Conclusions and perspectives
- What's next ? Perspectives & Deliverables

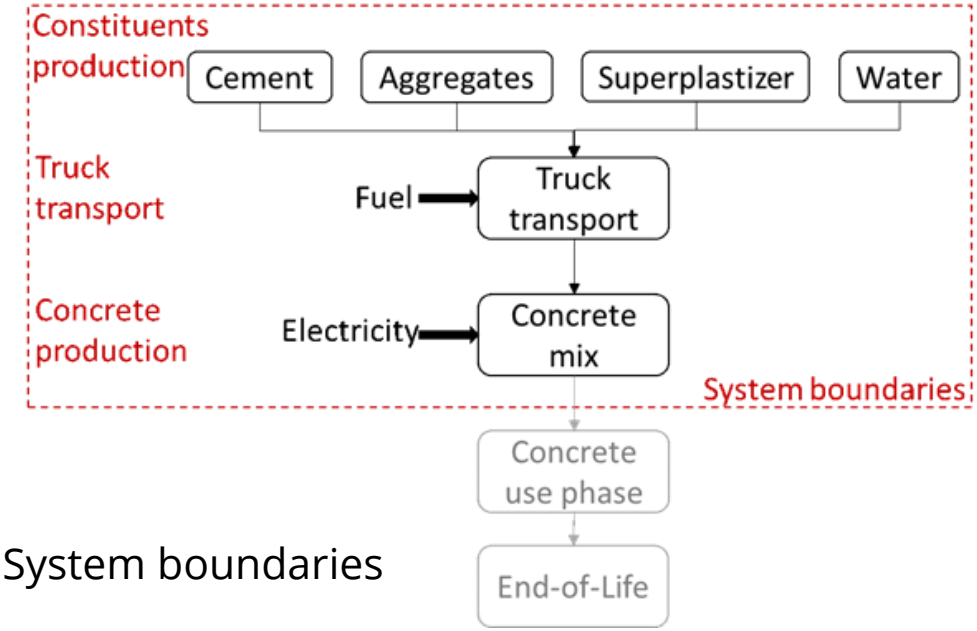
Reducing the Env. impacts of RAC

- Compare the Env. impacts of RAC to conventional one

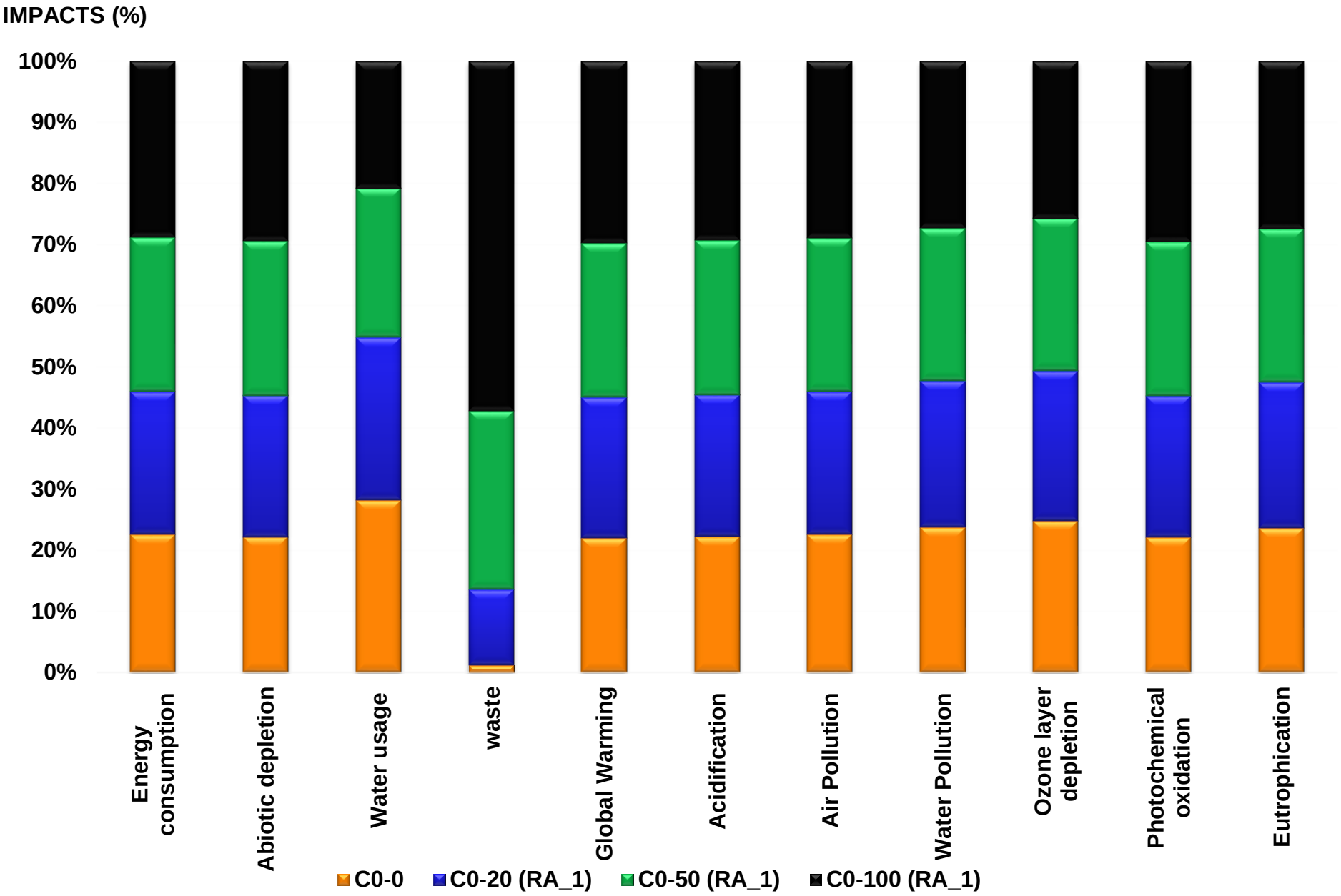
- How to reduce these Env. impacts:
  - Optimization of the recycling process
  - Consider the CO_2 uptake of RA
  - Consider the ecological profitability distance

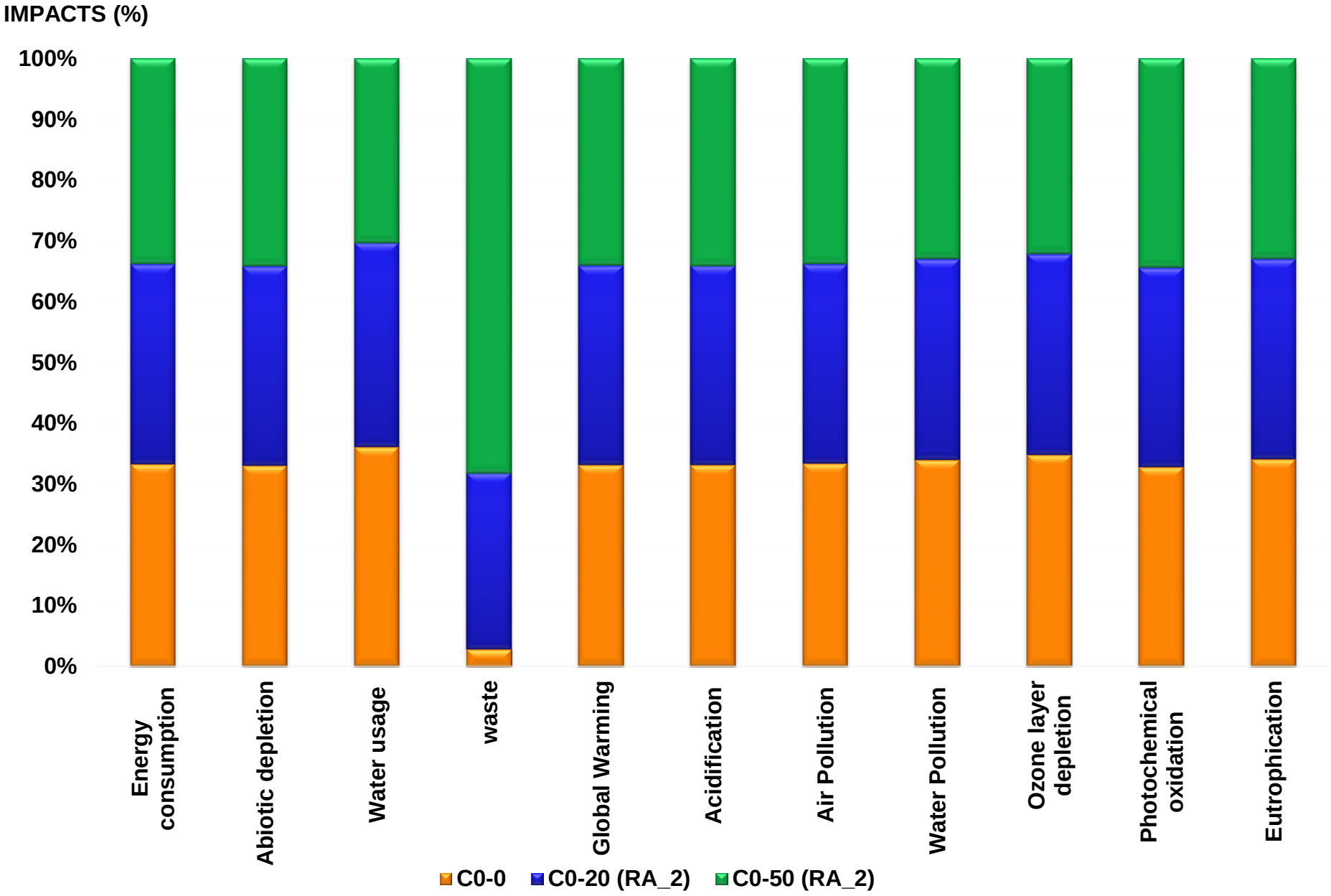
Part. I: Env. impacts of RAC

- Life cycle assessment of RAC
  - FU: manufacture 1 m3 of concrete C30/37
  - ➢ Change the quality of recycled aggregates (**RA_1** & **RA_2**)
  - ➢ Change the substitution rate of RA: 0/20/50/100



System boundaries


IMPACTS (%)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Energy consumption
Abiotic depletion
Water usage
waste
Global Warming
Acidification
Air Pollution
Water Pollution
Ozone layer depletion
Photochemical oxidation
Eutrophication
C0-0
C0-20 (RA_1)
C0-50 (RA_1)
C0-100 (RA_1)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Ozone layer depletion
Photochemical oxidation
Eutrophication
C0-0
C0-20 (RA_2)
C0-50 (RA_2)

Part. I: Reducing Env. impacts of RAC

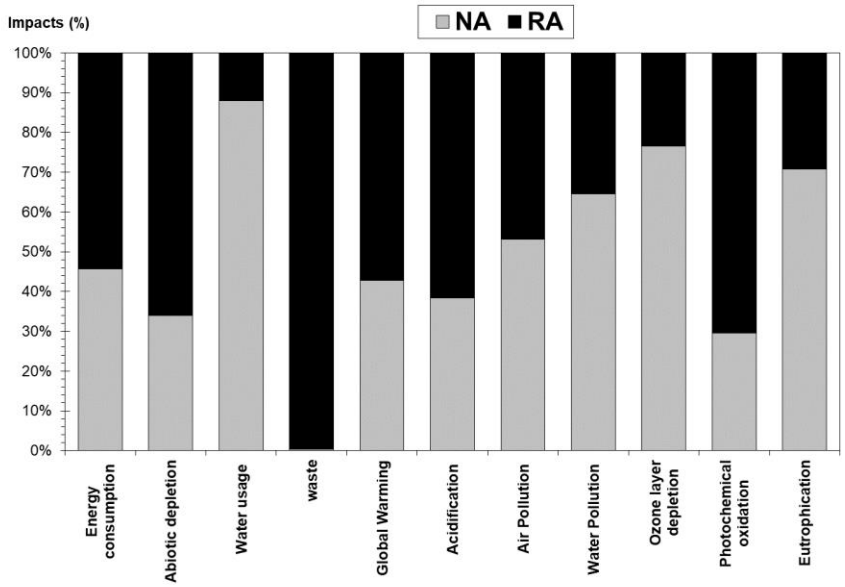
- How to reduce these Env. impacts:
  - Optimization of the recycling process
  - Consider the CO_2 uptake of RA
  - Consider the ecological profitability distance

Part. I: Reducing Env. impacts of RAC

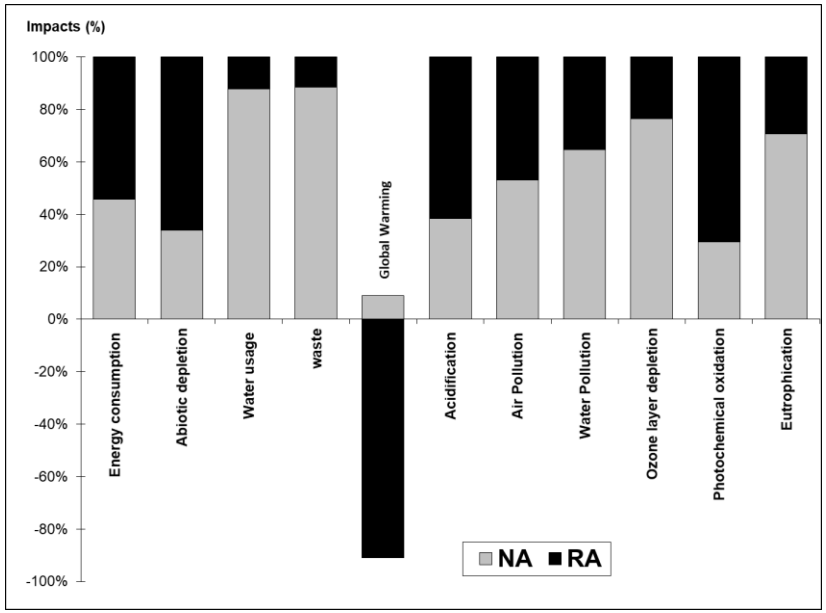
- Optimize the recycling process of RA production
  - Reduce water consumption
  - Reach energy efficiency
  - Reduce waste generation and landfill

Part. I: Reducing Env. impacts of RAC

- Consider CO_2 uptake of RA
  - CO_2 uptake of cement based material could reach 0,05 ton CO_2/ton
  - Optimize GWP and waste indicators



Without CO_2 uptake



With CO_2 uptake + Waste recovering

Part. I: Reducing Env. impacts of RAC

Circular Economy

- From research to application ?
  - Stock deposit ?
  - Economic feasibility ?
  - Legal feasibility ?

- Part. II: Case study of concrete from the French residential sector

Part. II: Recycling end-of-life concrete

ELSEVIER

Journal of Cleaner Production

Volume 281, 25 January 2021, 124489

Towards achieving circularity in residential building materials: Potential stock, locks and opportunities

Nacef Tazi ✉, Rachida Idir ✉, Amor Ben Fraj ✉

https://doi.org/10.1016/j.jclepro.2020.124489

What's next ?

- Towards circular economy in the construction sector (locks and opportunities)
- Durability and mechanical properties of SeRaMCo RAC

Deliverables

10/2019

1. Abstract for the LCE2020 (27th CIRP Conference on Life Cycle Engineering).

11/2019

2. SeRaMCo Pre-report on Environmental evaluation of concretes and concrete elements composed of recycled fines / aggregates.

12/2019

3. “Toward implementing circular economy in French dwelling materials: potential stocks, barriers and opportunities”. Online ! (JCP).

03/2020

4. 2 papers on the SeRaMCo final conference.

> 03/2020

5. Final SeRaMCo deliverable on the environmental impacts of concrete and concrete elements.
6. Article “Mechanical and durability properties of recycled concrete“.

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