RECONSOIL EVENT

FINE MATERIALS VALORISATION POTENTIAL FOR FERTILE SOILS CONSTRUCTION

5TH OF OCTOBER 2022 – 9:00 -16:00

LE HAVRE UNIVERSITY

Géosciences pour une Terre durable

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Morning agenda :

9:00-9:30 – Guests arrival at Le Havre University - Normandy

9:30-10:00 – Introduction: the ReCon'Soil project, objectives, first results and uses perspectives (S. Coussy, BRGM)

Session 1 (10:00- 11:00) – Regulatory aspects of fine materials valorisation in soil construction

10:00-10:15 – Regulatory aspects related to the recovery of sediments in soil construction (P. Bataillard, BRGM)

10:15-10:30 – VASC project feedbacks: How to approach regulation in an operational sediment recovery project in agriculture? (David Jullien, Chamber of Agriculture 17)

Spreading valorisation : MEERKATS 2 project feedbacks

10:30-11:00 – Discussions

Session 2 (11:00-12:30) – Treatment of polluted sediments with a view to valorisation in soil construction

11:00-11:15 – Feedbacks on existing sediment treatment techniques (Le Havre University)

11:15-11:30 – Sediment treatment by electrochemical migration (Le Havre University)

11:30-12:30 – Visit of the treatment pilot set up for the ReCon Soil project

12:30-14:00 – Lunch

Afternoon agenda :

Session 3 (14:00-16:00) – Operational aspects of setting up a soil construction project from fine materials

14:00 – 15:30 – **Table ronde** : **Round table**: Feedback on projects : ReCon Soil, MEERKATS 2, AGREGE and VASC

What are the criteria to optimise the use of fine materials in soil construction?

Which operational difficulties can be foreseen and how to anticipate them?

What is the economical outcome of fine materials valorisation in soil construction?

15:30-15:45 – Discussions

15:45-16:00 – Conclusion of the day

Introduction: the ReCon'Soil project, objectives, first results and uses perspectives (S. Coussy, BRGM)

Context

- Food safety, one of the main challenges of the 21st century

  ➡ Need to **preserver soils**, in particular organic matters stocks in soils.

- Disposal of earth from construction sites : 3,5 billion euros per year spent by companies in France (sources: CGDD, ADEME, BRGM, VALTEX)

  ➡ These materials, as well as other earthy materials generated by industry and dredging, could help improve the quality of agricultural soils, or even restore the most degraded of them.

- ReCon Soil project objective :
  - Demonstrate the **potential for the valorisation** of earthy materials and waste in the amendment, reconstitution or construction of fertile soils, in a safe manner for human health and the environment;
  - Evaluate the **"low carbon"** character of these new valorisation strategies.

PARTNERS

Recon'Soil is an INTERREG program

https://www.channelmanche.com/fr/projets/projets/

France :

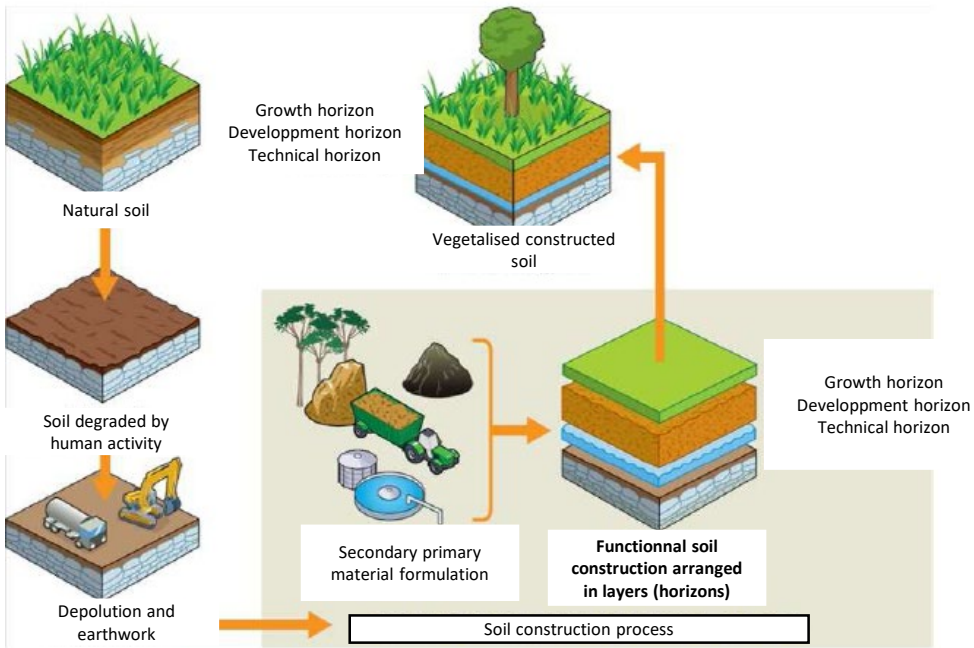
- **BRGM**
- **Station expérimentale du Caté**
- **Université du Havre**

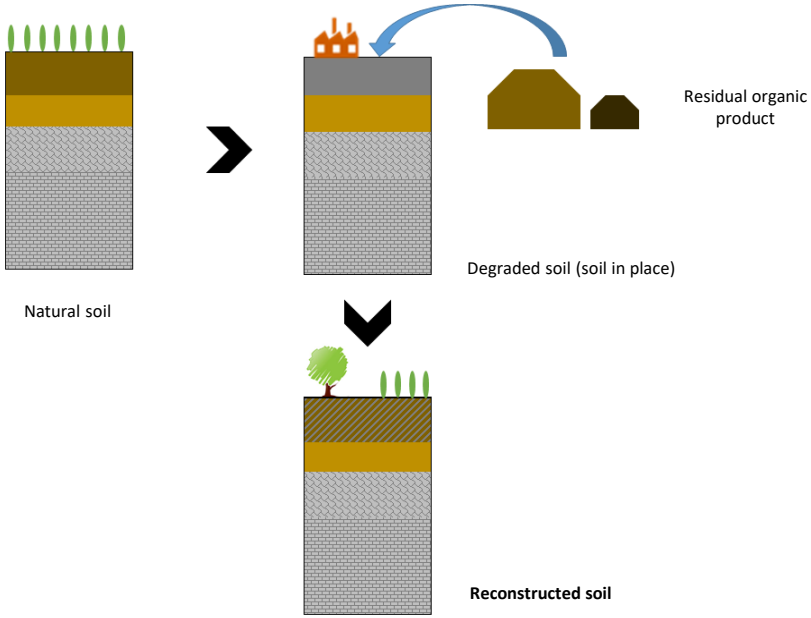
England :

- **University of Plymouth**
- **University of East Anglia**
- **CL:AIRE**
- **Cornwall College Eden Project Learning**

Soils construction

- Distinguish « construction » and « soil reconstitution »





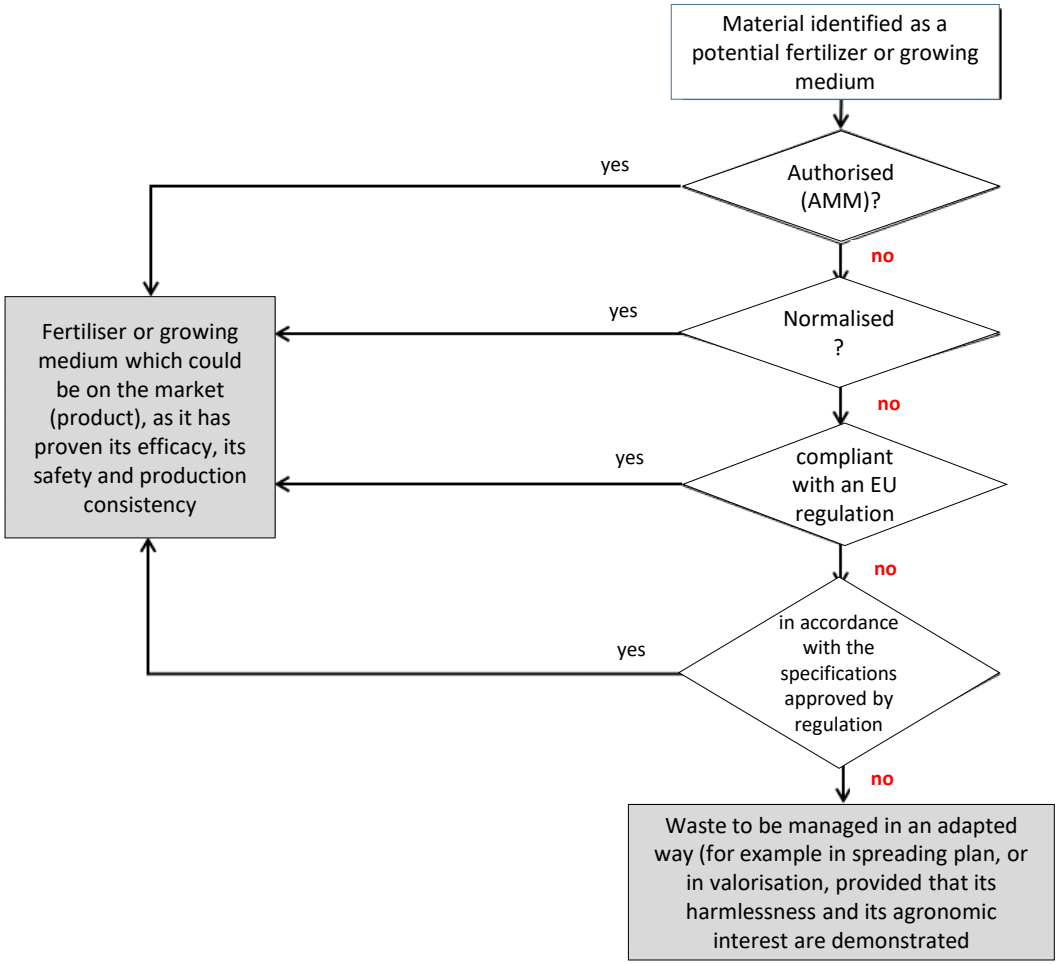
There is no specific regulation in France related to reconstruction of construction of soil.

Regulatory aspects

Code Rural (Rural Act)

- Fertilisers and growing media
  - Material marketing autorisation procedure (AMM)

- Threshold values of trace metallic elements on raw according to the "amendments" and "culture media" standards



Regulatory aspects

Code de l'environnement (Environment Act) (Waste regulation)

- Valorisation of waste in soil engineering
  - "Utility-innocuousness-responsibility" triptych
  - Traceability of waste
  - Specific regulatory provisions for sludge spreading
  - Good practice guides make it possible to validate the harmlessness of certain wastes for specific uses

→ No specific guides for soil engineering

- Exit from waste status
  - Possible but complex, given the expected variability of waste deposits

Experiments carried out in France

- Vegetable and horticultural station of Caté, in Brittany (St Pol de Léon)

- Setting up of soil construction pilots from sediments
  - Contaminated, treated or untreated sediments
  - Use of these sediments, mixed or not with an agricultural soil, as a support for zucchini cultivation

Résultats presented in session 2

- Implementation of demonstrators (lysimetric tanks) of soil construction from **clayey excavated soil and aggregate washing sludge**

Implementation of lysimetric tanks

- Objectives: improve the texture of loamy soil (therefore prone to beating) by adding clays
- 2 wastes tested: a **clayey excavated soil**, and a quarry **sludge from washing aggregates**
  - Mixing clay waste by liquid means in a concrete mixer
  - Different proportions tested to obtain a suitable texture
- Implementation in wet process: elaboration of a clay suspension incorporated in the original soil

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- Filling of lysimeters tanks

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- Installation of probes in each lysimeter: humidity and temperature monitoring at different depths
- Continuous monitoring and recording of data since February 2022
- CO_2 measurements at T_0 in February, T_{final} in September

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- 4 lysimeters containing elaborate recipes of reconstructed soils
- 2 lysimeters containing control soils (excavated soil from Caté)

Results

- Earth tanks condition just after planting (lettuces)

1 ExS :
34% of **clayey excavated earth** and 66% of agricultural earth

2 ExS :
11% of **clayey excavated earth** and 89% of agricultural earth

C :
Control (agricultural earth)

Result

- Plowing conducted after the first harvest
  - Example of the clayey excavated earth modality

Results

- Lettuces condition before the third harvest

1 ExS :

34% of **clayey excavated earth** and 66% of agricultural earth

2 ExS :

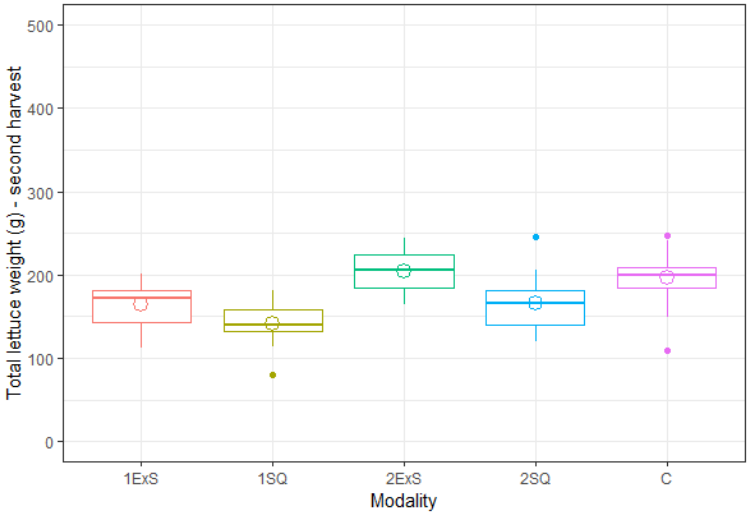
11% of **clayey excavated earth** and 89% of agricultural earth

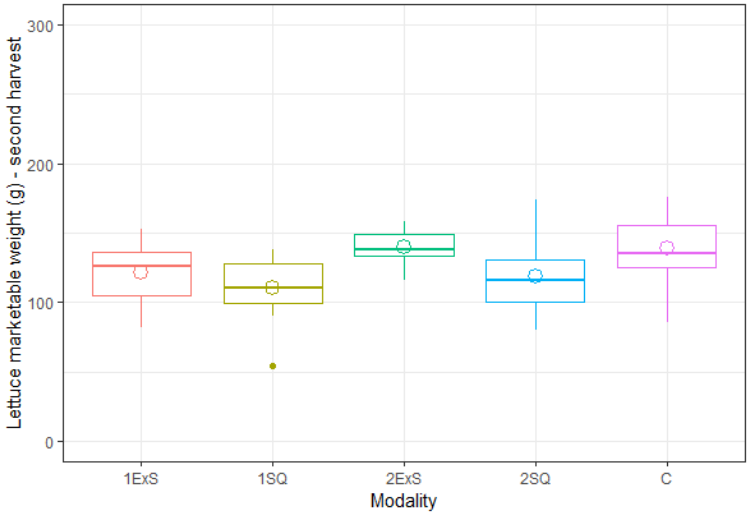
C :

Control (agricultural earth)

Results

- Produced lettuces mass comparaison by modality (second harvest)





1C & 2C:

2 agricultural earth tank (control)

1SQ/2SQ:

34% / 11% of **sludge from washing aggregates**

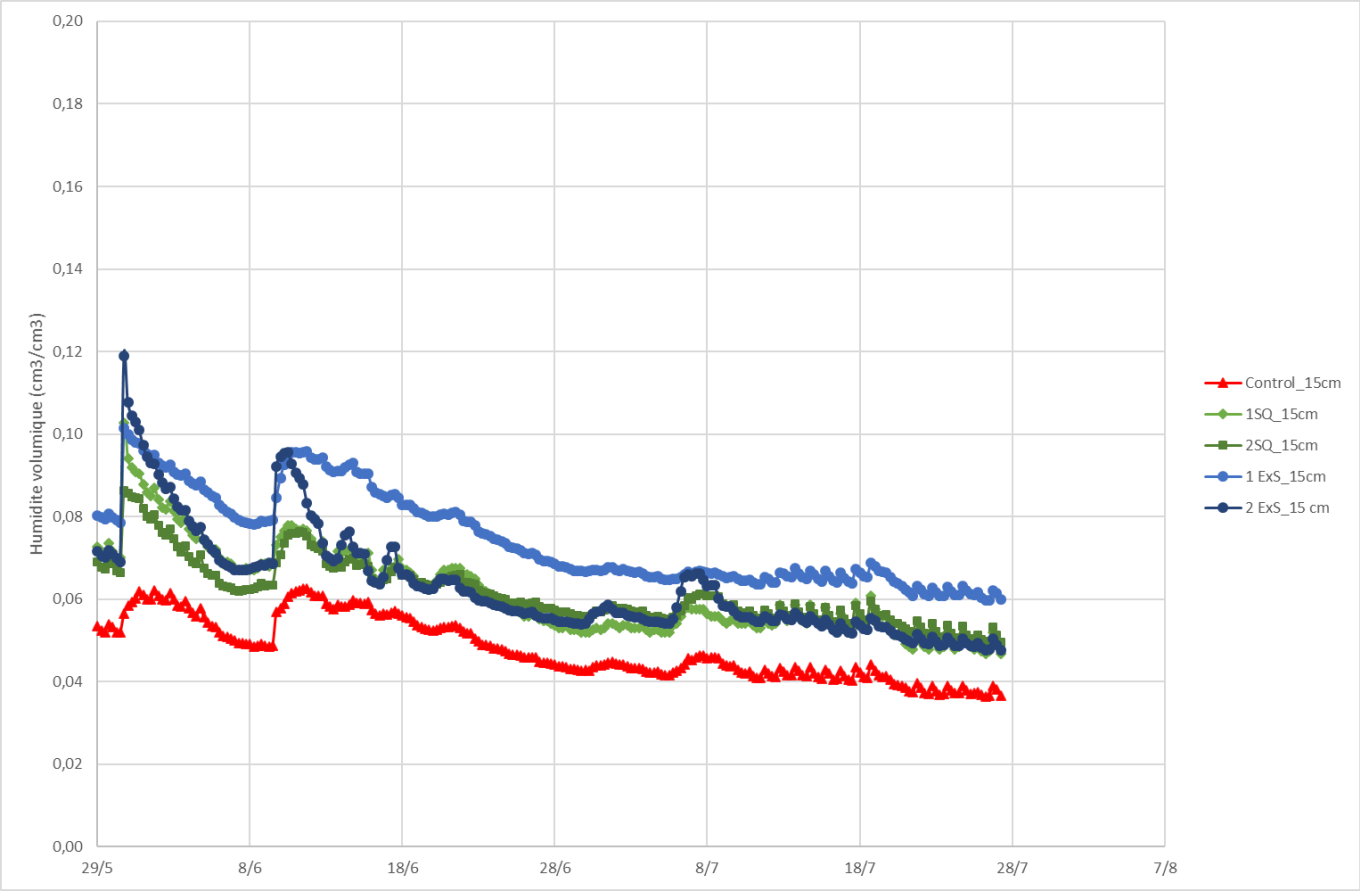
And 66% / 89% of agricultural earth

1ExS/2ExS:

34% / 11% of **clayey excavated earth** and 66% / 89% of agricultural earth

Results

- Soil moisture at the end of the second growing season (June-July)



Results

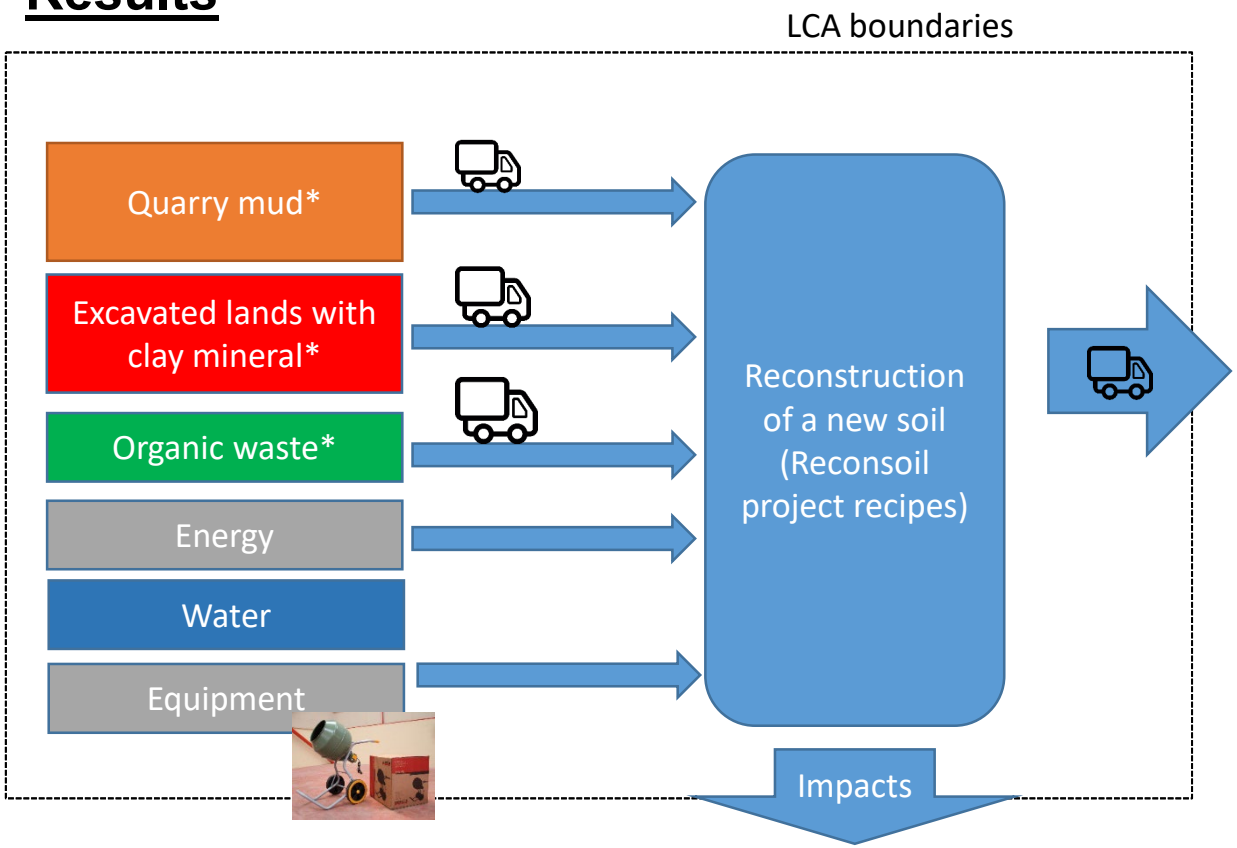
Life Cycle Assessment

- LCA : A method for assessing all environmental impacts during the life cycle of a product

- For RECONSOIL : assess the recycling process and the associated transport according to different scenarios
  - Soil recipe from excavated earth from the construction industry
  - Soil recipe from quarry waste such as "washing sludge"

- For simplicity and length of project observation (2 years): Choice to evaluate the first option. No assessment of long-term carbon sequestration by vegetation and soil or improvement of agricultural yield

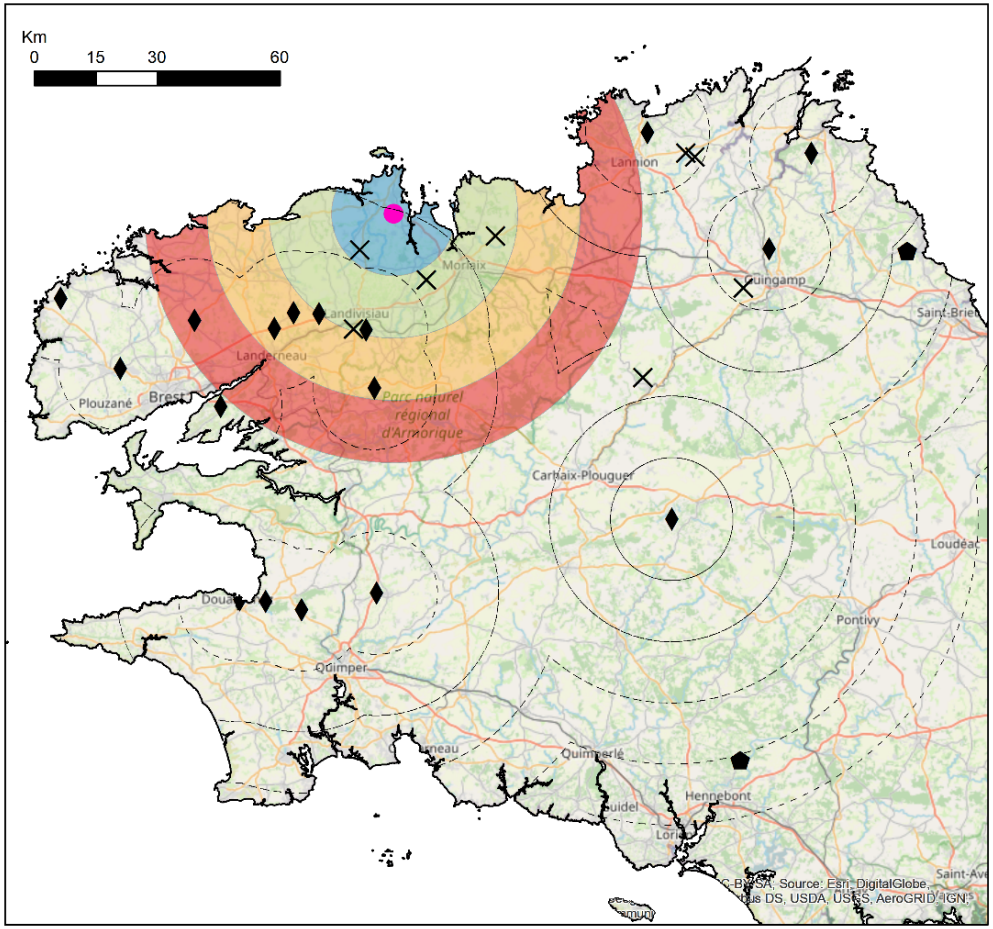
Results



Functional unit. Provide 1 ton of fertil sol and reusable for soil amendement in agriculture to the final client

Results

Everything is a matter of distances



Legend

Main facilities

- CATE
- Inert landfill
- Non-hazardous landfill
- Main quarries near CATE
- Inert landfill rings 10 km

CATE buffer areas

- 10 km
- 20 km
- 30 km
- 40 km

Results

In terms of CO_2 emission, an equilibrium between :

- **Avoided emissions**
  - Inert waste transportation
  - Disposal in ISDI landfill (61%) or in quarry backfill (39%)

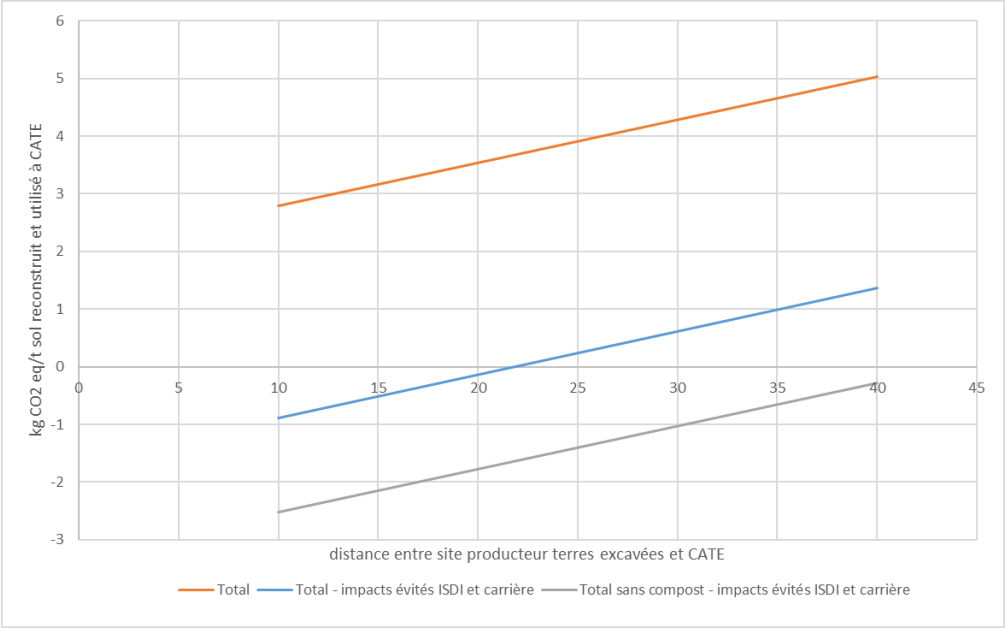
- **Soil construction related emissions**
  - Transport of earth and compost to CATE
  - Mixing and spreading energy

- **Organic matter degration in compost related emissions**
  - Penalising soil reconstruction but would have occurred with or without Reconsoil

Results

Carbon emission according to the excavated earth distance to site origine

- If we neglect the emissions from the organic matter degradation, the carbon balance is favorable **up to 42 km around the CATE site**



Conclusion

- Objective of soil construction or reconstitution: to **promote the circular economy** while **improving certain soil properties.**
  - Interest of **fine materials** in soil construction

- Regulatory aspects: how to take them into account in a soil construction project?

→ Subject of session 1

- Problem of polluted materials: is it possible to clean them up as well as possible to allow their valorisation?

→ Addressed in session 2

- Implementation of materials: which techniques are used, which economic balance?

→ Subject of session 3

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THANK YOU FOR YOUR PARTICIPATION