Circular economy and sustainable development : conceptual clarification and insights for the biogas sector

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ART-Dev Acteurs, Ressources, Territoires dans le Développement

La Région Occitanie Pyrénées - Méditerranée

Université de Toulouse

Research question

- As part of the research projet *Biogazovert*
  - Identification of a circular economy normative criteria
  - Assessment of the circularity of the biogas-biomethane sector in Occitanie

- Research question of this paper

  - What are the normative criteria that can guide the implementation of practices grouped under the term « circular economy » ?

  - What insights can be drawn for the biogas sector ?

Structure of the presentation

1. Critical review of the literature

- Searching for a definition of Circular Economy
- Recent convergence towards the concept of sustainable development
- Is CE going round in circles ?

2. Weak vs. Strong circular economy

- Weak sustainability vs. Strong sustainability
- Operating principles of a *weakly* sustainable circular economy
- Operating principles of a *strongly* sustainable circular economy

3. Insights for the biogas sector in France

1.1. Searching for a definition of CE

- Lack of consensus on the definition of the circular economy
  - A concept that means different things to different people (Kirchherr et al. ; 2017)
  - A confusion between ends and means (Nobre & Tavares ; 2021)

- The (also many) criticisms of the circular economy
  - No underlying philosophical or economic theory(Velenturf & Purnell ; 2021)
  - Priority is given to recycling(Corvellec et al. ; 2021)
  - An ambiguous link with the growth regime (Bauwens, 2022 ; Kirchherr, 2022 ; Schultz & Piez ; 2024)

- « Good » and « bad » circular economies
  - Subverted vs. Ideal definitions (Kirchherr et al.; 2017)
  - Perma-circularity vs. circularity (Arnsperger et Bourg ; 2017)
  - « Reformist » vs. « transformative » (Reike et al.; 2018)
  - « Degrowth » vs. « circular economy » (Savini et al.; 2023)

1.2. Convergence towards SD

- How CE definitions has recently evolved ?
  - The link between CE and sustainable development is ambigous (Geissdoerfer et al., 2017 ; Reike et al.; 2018)
  - But the literature seems to be moving towards taking into account sustainable development as an organizational principle of CE (Kirchherr et al. ; 2023)

- Weak circularity, strong circularity : a theoretical consolidation ?

  → Some recent articles that link the concept of CE to strong and weak sustainability

  - Giampietro (2019) : European Commission's CE vs. Circular bioeconomy
  - Johansson & Henriksson (2020) : Eco-cycle of 1997 vs. Circular Economy Report of 2017
  - Aggeri et al. (2023) : EMA foundation's weak circularity vs. Strong circularity

    → Priority is given to criticism

    → No formalization of a weak/strong circular economy

1.3. Is CE going round in circles ?

- The role of the Ellen MacArthur Foundation in producing and disseminating the circular economy concept
  - Founded in 2009, the concept took off in 2012 with the publication of its first report
  - An accelerated dissemination of the concept in a specific context

- Industrial ecology, cradle-to-cradle, performance economics : CE as an umbrella terme
  - The 2012 report identifies Industrial Ecology and its extensions as CE's theoretical roots
  - CE has became an « umbrella » concept (Blomsma et Brenna; 2017), a « bricolage of ideas »(Belmonte Urena et al. ; 2021), an « essentially contested concept » (Korhonen et al. ; 2018)

- Circular economy in the economic theory
  - Boulding (1966; 1972), Pearce et Turner (1989)

→ **CE is a positive concept and its normative guide is sustainable development**

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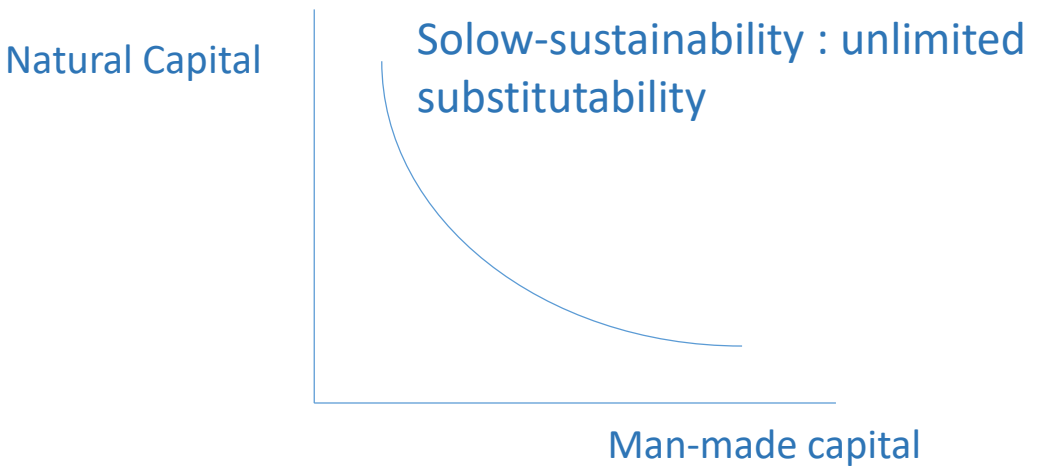
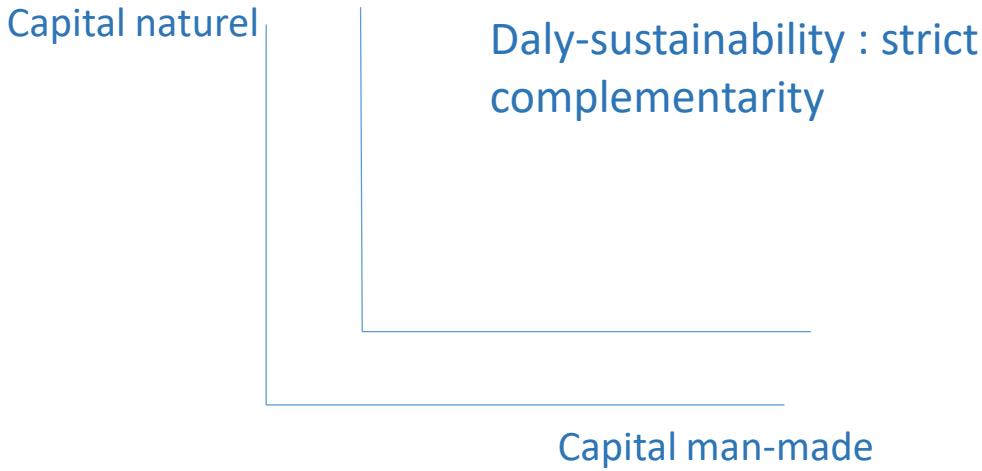
2.1. Weak sustainability vs. Strong sustainability

- A response to the « Limits to Growth » report : the special issue of the Review of Economics Studies (1974)
  - Dasgupta & Heal (1974), Stiglitz (1974) et Solow (1974)
  - → Limits can be overcome : substitutability and efficiency
- Two approaches to sustainability are developed : Neoclassic vs. Ecological economics



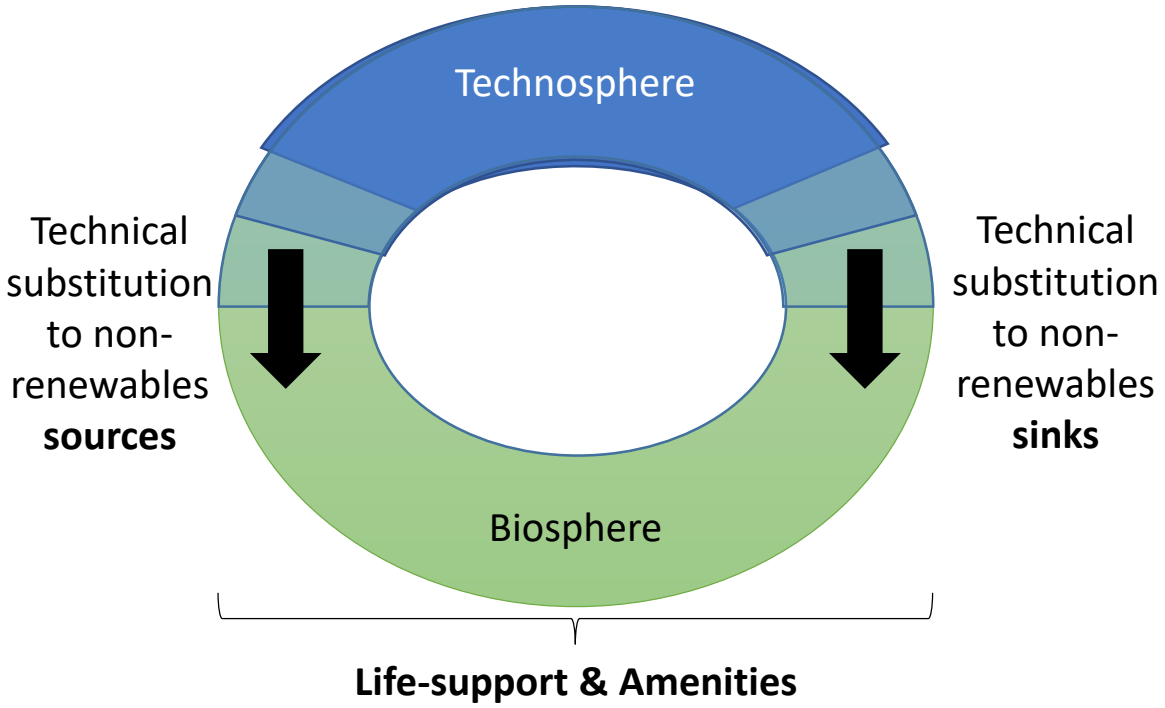


- Victor (1995), Common (1996), Van Den Bergh (2010)
  - → Substitutability is an empirical question, not a theoretical one

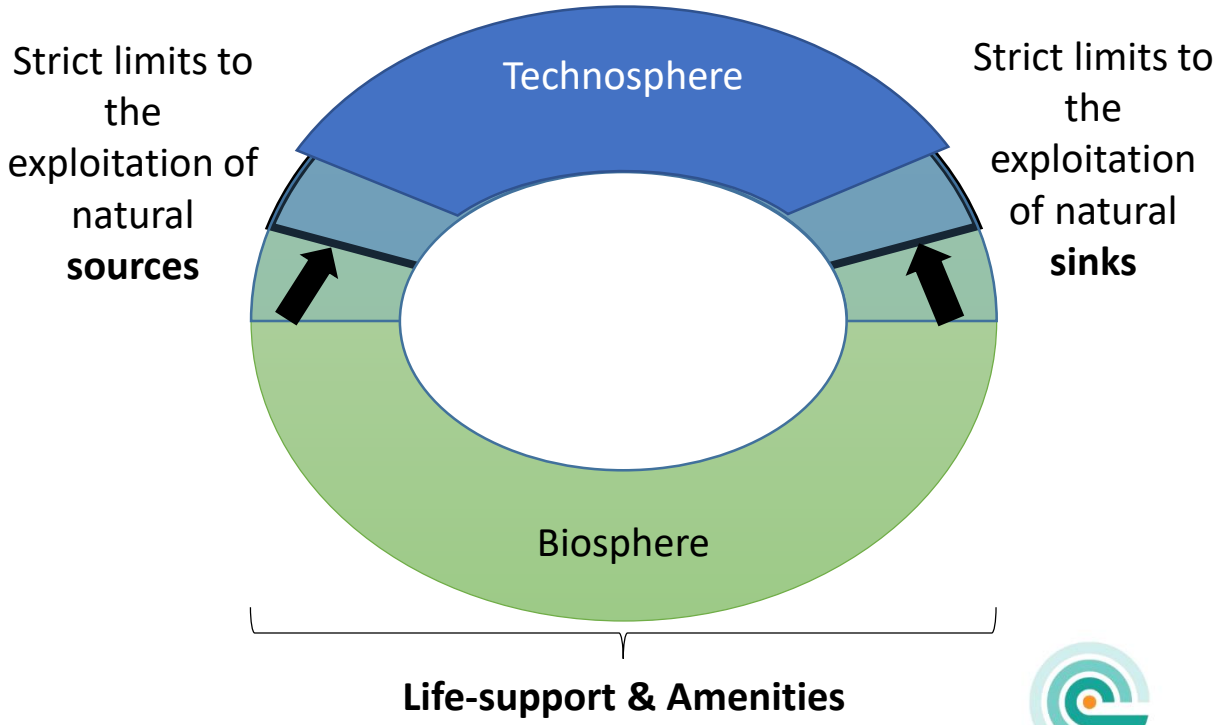
2.1. Implications for CE : substitution and limits

- The two sustainability paradigms lead to radically different perceptions of environmental limits and functions
  - (1) Resources, (2) Sinks, (3) Amenities, (4) Life-support

Weak circularity



Strong circularity



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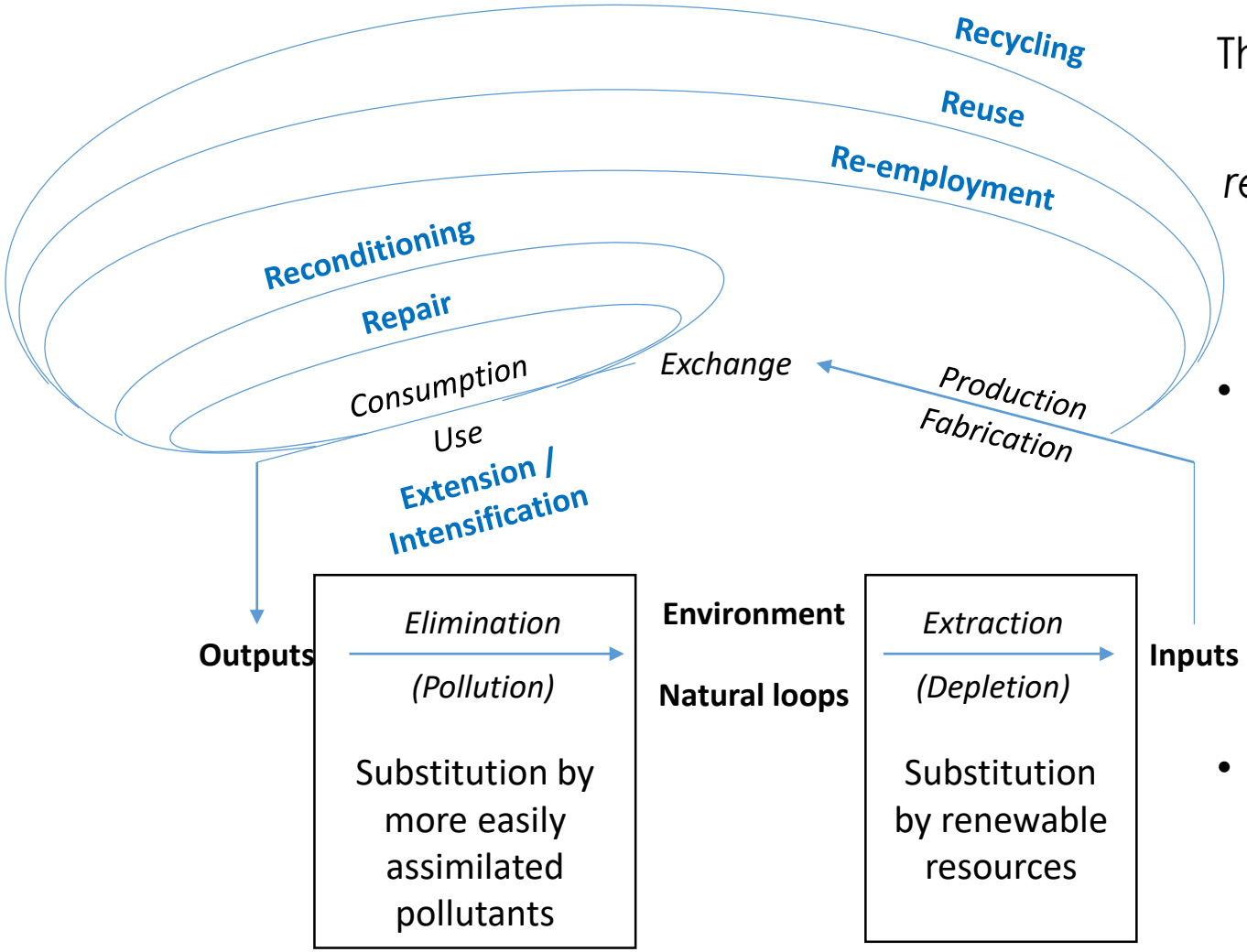
2.2. Circular economy based on weak sustainability



- How to guide public policy ?

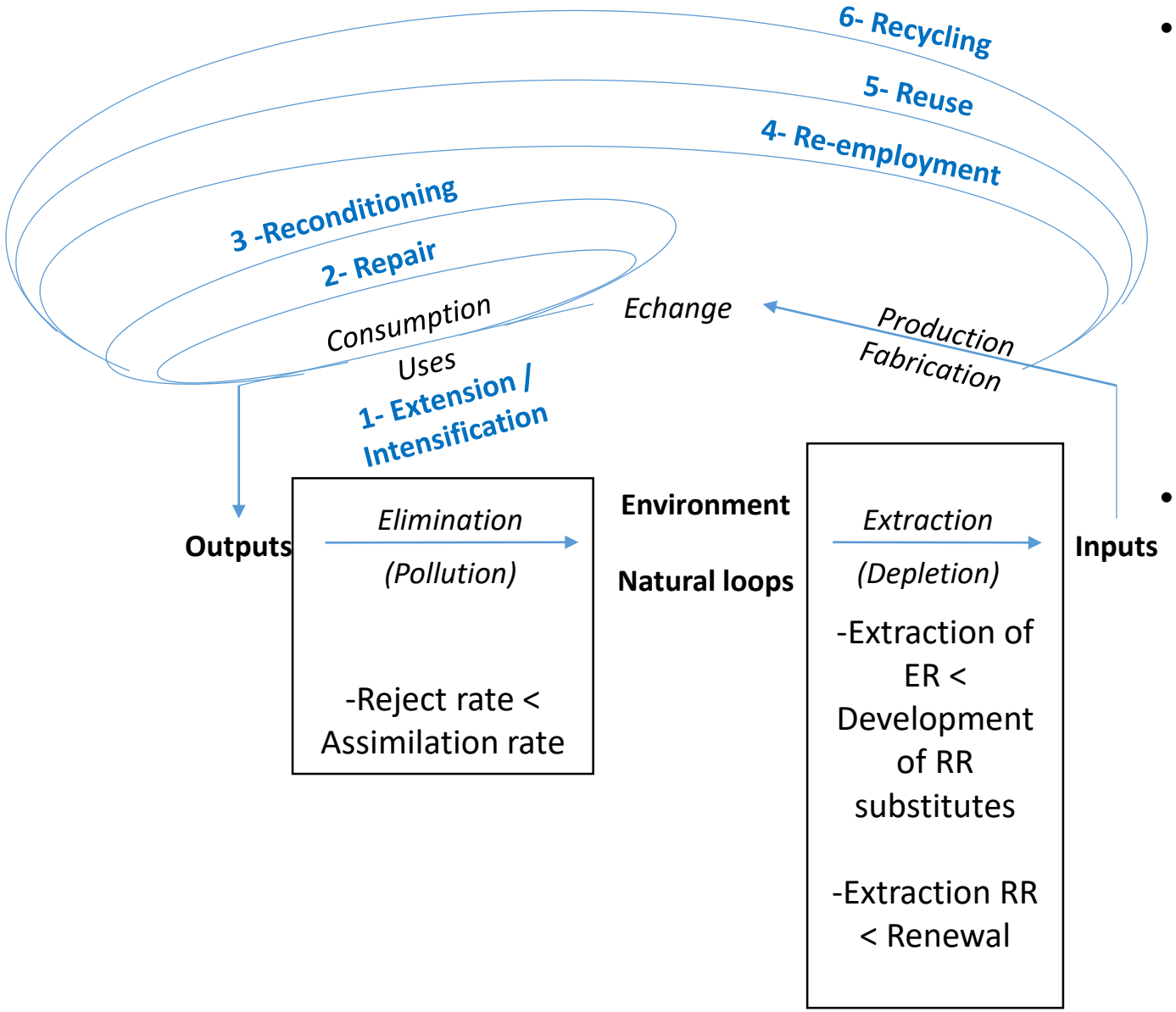
The Solow-Hartwick rule

« the investment of current exhaustible resource returns in reproducible capital implies per capita constant consumption »

- Market forces drive investment, subject to two conditions :
  - *Full internalization of environmental externalities*
  - *Markets are completes*

- Development of circular practices : prioritization is done *a posteriori* by the market
  - *Natural capital is preserved if considered to be profitable*

2.3. Circular economy based on strong sustainability



- Strong sustainability principles
  - Extraction ER < Development of RR substitutes
  - Extraction RR < Renewal
  - Pollution < Assimilation ; regeration favored if thresholds already exceeded

- The hierarchy is based on energy/material contents

  1- Reduce & Regenerate

  2 – Technical loops in ascending order

  They allow to mitigate the economic costs of limits

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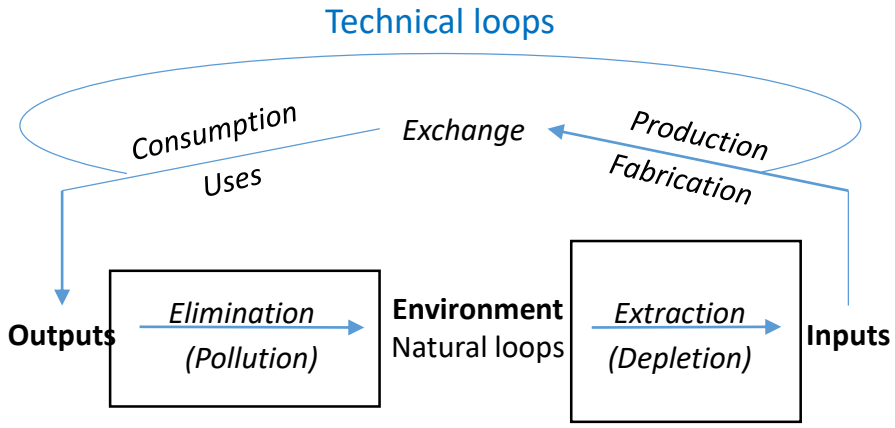
Insights for the biogas sector

Technical loops

- Digestate must be used locally
- Combined heat and power plants for local heat consumption
- Develop food and agri-food bio-wastes for inputs
- Small and decentralized methanization units reduce transport (environmental) cost

Regenerate

- Spreading plan for all kinds of digestate
- Best practices for digestate spreading (weather, fertilizer drills and boom drop spreaders)
- Increase tracability of inputs



Reduce

- Energy crops used for biomethane should be gradually phased out
- Ensure sustainable CIVE agriculture (crop duration and competition with main crops, irrigation needs, fertilization)
- Inputs must be sourced from sustainable agriculture

Thank you !

Time for discussion

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