

# WHY EMPIRICAL EVIDENCE CALLED A DOMINANT DESIGN OF BIOECONOMY INTO QUESTION? THE CASE OF A REGIONAL STUDY

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## 1. ~~Context: an appropriation of the buzzword “bioeconomy” by the European institutions~~

The “bioeconomy” is considered in Europe as the solution to give new impetus to employment, growth and investment while improving and developing a sustainable use of resources (European Commission, 2012, 2018). Various authors or institutions use recently the buzzword “bioeconomy” (Bugge *et al.*, 2016) to improve economic activities based on both innovation in production and the industrialization of biologic process with renewable resources (OCDE, 2009; EC, 2012; OCDE, 2017; EC, 2018). It provides sustainable production and transformation of biomass in products intended for food and feed, chemistry, materials and energy production (Colonna *et al.*, 2015, p.280). It raises therefore many hope and promise in terms of substitution of fossil resources to go beyond a thermo-industrial society (Mitchell, 2011; Valceschini *et al.*, 2018).

## 2. ~~From a diversity of the conception of the bioeconomy...~~

~~We point out three issues presented as follows.~~ The scientific literature shows that a diversity of the conception of the bioeconomy exists ([Bugge et al., 2016](#)). Vivien *et al.* showed in Budapest for ESEE 2017 and demonstrate in a forthcoming paper published in *Ecological Economics* (2018) that three types of bioeconomy ~~exist=exist:~~

~~shortly presented as follows:~~

~~The type I bioeconomy - An “ecological economics” from in the spirit of Georgescu-Roegen’s analysis frameworks words (1975): its an equilibrium between ecological pressures and~~

~~human activities. As he said, “it is neither only biological nor only economic. It is “bioeconomic” (Georgescu-Roegen Georgescu-Roegen In Missemer, 2015, p.87);~~

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- The type II bioeconomy - A “life-science engineering”: it is a bioeconomy of biotechnologies. These biotechnologies are ~~founded~~ based on the development of the living things for human activities, by way of industrialization of biology (Proux and Milanovic, 2017), through the knowledge in genetic engineering (this is an industrial revolution for pharmacy, medicine, chemistry).
- ~~The~~ type III ~~The~~ bioeconomy - A “bio-based carbon materials”: this third ~~use of the word~~ consider the bioeconomy as bioeconomy ~~see~~ the living diversity as a biomass for energy and chemistry. The best example ~~of this third form~~ type III bioeconomy are the biorefineries (Cherubini, 2010; Laurent *et al.*, 2011; Levidow, 2013; Ragauskas *et al.*, 2014).

### 3. ~~... to a diversity of technological trajectories~~

We show two opposing paths causing the absence of a « dominant design » ~~for an ecological transition,~~ ~~but a diversity of technological paths instead. These oppositions are~~ They are based on an opposition between a replication of the existing, like a path dependency, and a “radical” innovative point of view. Nieddu *et al.* (2010, 2014a, 2014b, 2015) ~~point~~ point out indeed that the defence of chemicals traditions exist, rather than the triggering of transitions based on new paradigms. We define them as a “*dominant way of resolution of productive problems by using a fundamental of shared knowledges which make predictable the technologic evolutions*” (Proux and Milanovic, 2017).

These “predictable technologic evolutions” as a paradigm in the bioeconomy are perceptible in the model of biorefineries. As demonstrated by Nieddu *et al.* (2014a), biorefineries were chosen to be the “best way” to trigger a transition toward a biocarbon society. We know indeed how to use it (technologically) and what to do with ~~it~~ carbon (biofuels, bioproducts, etc.). However, ~~two strategies exists:~~

~~the biorefineries are exposed in front of two strategies:~~

- **An “identically substitution” where we trend to continue and do the same work, the same activities, the same products than the chemistry based on fossil fuels. This is the “drop-in strategy”;**
- A “innovative substitution” where we want to go further with the biomass and its functionalities. The objective is the production of new products instead of the “identically substitution”. This is the “new functionalities strategy”.

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These two opposing paths (identically *versus* innovative) cause a paradox. On one hand (i), we observe we've got the industrials and the politicians who are looking for producing the same activities, the same products than the carbon chemistry. On the other hand (ii), we observe some alternatives to the carbon chemistry with different technologies, different various process and different uses, functions and functions of the biomass (for example photochemistry, catalysis, non-thermal technologies, sound chemistry). (example)? Paradoxically, we show that the current strategies are replicating the former carbon chemistry: nothing radically is changing.

That is why, the aim of the paper is to show why the biorefinery model is still only based on the first strategy with “identically substitution”. We to point out the barriers inside the bioeconomy's world by testing a diversity of technological trajectories: with their own dynamics. Instead of the focus on the biorefineries as a dominant design, there is a variety of trajectories. These different paths are different but compatible, them got their own dynamics.

this paradox is why the biorefinery model (and through it the bioeconomy) looks like stuck in the first strategy (the “identically substitution”).? It looks like a copy and paste of the carbon chemistry while we try to go out this model and while there are different paths, technologies, process, functionalities etc.

The aim of the paper and the objective is to point out the barriers inside the bioeconomy's world. Instead of the focus on the biorefineries as a dominant design, there is a variety of trajectories. These different paths are different but compatible, them got their own dynamics.

#### 4. Our methodology

Our approach is based on transdisciplinary studies on a specific empirical ground, which is one of the most important territory and innovation center in European Union for the bioeconomy (around Pomacle-Bazancourt -15km north of Reims-) considered as example by the European Union in opposition with the Rotterdam port.-

The methodology is to confront theory and practice by analyzing the particularities of these this diversity of trajectories. The theoretical approach will explore the literature about the dominant design model and the alternatives. We strengthen this literature with a practical approach through some conferences, direct interviews and analyses of different technologies with specialists, industrials and chemists. It enables us to have a landscape of the current different techniques and technologies with their different barriers identified.

Our paper will be divided as follows. Firstly, we will objective is to explain the diversity of the conception of the bioeconomy through its three forms (I). Secondly, we

~~show that no dominant design in bioeconomy exist regarding existing We prove that there are some identified barriers (lock-in, institutions, market, evaluations), similarities and ; differences (II). Thirdly, we will discuss the relevancy of technological attempts for an ecological transition (III).~~

~~and so we can't have a dominant design (II) but different technological attempts in economical sustainability transformations (III).~~