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## Guest Editorial Bioeconomics and its Derivations: Ecological Economics and Political Ecology

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Correctly understood Bioeconomics is (and entails) a critique of Political Economy. To-date, two quite different critiques of Political Economy are recognized: First, the well-known Marxist critique; second, the critique carried out by N. Georgescu-Roegen, the father of Bioeconomics. It is precisely this salient feature that lets us understand the two derivations of Bioeconomics, namely Ecological Economics, and Political Ecology.

A critique of Political Economy just means that the economy must be understood and judged vis-à-vis its responsibility toward society as a whole or toward each and every individual, and especially vis-à-vis its compromises with nature. Such responsibilities and compromises are, to be sure, political in the widest but strongest sense of the word. Briefly stated, every economic decision – whether commercial, financial, monetary or entrepreneurial, has strong direct social, environmental and political consequences. Such consequences cannot, by any means, be taken for granted.

Understood thusly, Bioeconomics does not have anything to do with (wrong) interpretations regarding the Cyclic Economy, Orange Economy, Blue Economy, Circular Economy, and definitely nothing to do with the 2015 Millennium Development Goals, the 2030 Sustainable Development Goals (SDG), and the like. Moreover, and more radically, Bioeconomics does not have any relation whatever with classical, neoclassical, Marxist, or neoliberal models or even to the scale economies since Bioeconomics

is a strong and direct critique of the production function (whereas the former economic frameworks and models leave the production function intact).

Broadly stated, the production function can be expressed by the following equation:

$$H = \frac{1}{N}$$

expressing that the human beings (H) are conceived as external, distinct and superior to nature (N), and, thereafter, nature is conceived as a means, i.e., a resource to satisfy human needs, wants, and desires. The equation truly condenses the entire history of Western civilization<sup>1</sup>.

Consequently, the Western world can be said to be born sick. Borrowing terminology from medicine, its disease can be identified as a mixture of a chronic, an acute, an orphan as well as a complex disease. The constitutive equation of the West does know everything about the human beings, in a generous sense, and yet, nothing about nature and the weave of life. To be sure, caring for the human being in general is important. Nonetheless, it is insufficient.

This systemic illness afflicting the Western world is called: anthropocentrism, anthropologism, anthropomorphism – three different labels that condense the idea that human beings are the center of the universe and everything else is taken up as a means or as a rod.

Thanks to E. Schrödinger, a new scientific framework was formulated for the first time, namely an inquiry about the nature and logic of life (Schrödinger, 2012). This radical new paradigm shift places life – and not just human beings – at the center of attention. Schrödinger's book is now seen as a foundational source for the understanding of Bioeconomics.

Meaningfully, the guiding thread that makes Bioeconomics possible consists in the interplay between Economics and Thermodynamics; more

1. The most commonly known production function equation is the Cobb-Douglas equation, which also admits different formula. The equation mentioned and introduced above aims to precisely identify the social, environmental and political dimensions of the production function.

specifically, it is about the relationship between Economics and the Second Law of Thermodynamics, entropy. Bioeconomics is an economy that considers life as well as nature, in the largest, deepest and strongest sense of the word. In other words, Bioeconomics can be safely interpreted as an economy for life, or also as an economy of life. Therefore, “bios” stands as a core concept and “economics” is just a suffix. In sharp contrast with classical economic frameworks and models, an economy for life has emerged that does not focus exclusively the several features that characterize normal economic frameworks such as markets, enterprises, consumption, production, growth, efficacy, efficiency, entrepreneurship, start-ups, competitiveness, and even government.

It is important to consider that thermodynamics is a single science that comprises two different kinds of systems or phenomena. On the one hand, it is concerned with closed or isolated systems i.e., systems that are defined in terms of equilibrium. On the other hand, thermodynamics also deals with open systems, i.e., phenomena that are far from equilibrium. Life, i.e., living beings, exist and develop far from equilibrium.

Closed systems tend inevitably towards equilibrium; in other words, death. This is exactly what entropy means. The Second Law of Thermodynamics states that all closed or isolated systems tend inevitably to entropy. In contrast, open systems reduce entropy and keep it low precisely by keeping themselves far from equilibrium. Economically speaking, the generation of value is possible under the proviso that entropy remains low. Plainly put, the generation of value is directly proportional to low entropy. Thus, what is truly at stake in the generation of value is the fact that biological existence is all that matters – not consumption, productivity, economic growth, revenues, and the like.

This said, Bioeconomics is articulated into two derivations, Ecological Economics and Ecological Politics. While the former focuses on the relationship between political, economic, and social factors, as well as environmental conflicts and changes, the latter concentrates on the management and valuation of sustainability. Whereas Ecological Economy can be viewed as a rather conservative and institutional approach, Ecological Politics is critical, considers alternatives to development and leads to a critique of the Political Economy, and the relationship between the State, the Government and the Economy.

In fact, Bioeconomics can be said to have developed along two parallel paths. The first follows Georgescu-Roegen’s study (Georgescu- Roegen, 2014) showing that human beings can use any low-entropy system or phenomenon

only once. Nature is the position of low entropy par excellence. In other words, nature is not a resource by any means or in any sense of the word. Social, cultural, economic, and political consequences follow thereafter. Most of the goods, services and products provided by the free-market system are not necessary – certainly not biologically necessary. It is perfectly possible to live with less.

At the same time, Passet's contribution to Bioeconomics lead to an understanding that the biosphere is the entire framework of the economy, and life in general is perfectly indistinguishable from evolution towards complexity, i.e. the way in which biology pervades complexity and the human and social sciences. Accordingly, it is impossible to be concerned with economics at large without explicitly knowing about evolution, ecology and biology in the largest and deepest sense of the word. Consequently, any economic process that goes against nature is doomed to fail, and result in disasters and suffering (Passet, 1996).

In contrast to the constitutive equation of Western civilization, a quite different relationship between humans and nature can be stated:

$$H \in N$$

where human beings are viewed as part of nature, as belonging to the biosphere, and definitely not distinct from it. Thus, Bioeconomics entails a radical new relationship and way of living concerned with how to live, and living-well, about which several historical and anthropological explanations can be found, for example: *eupraxein*, in Ancient Greece, *vivere beate*, in the Middle Ages, *suma qamaña* and *sumak kawsay*, in Quechua and Aymara languages and cultures, and *utz' kaslemal*, in quiché, the main language for the Mayans.

Economically speaking, knowing how to live and living-well consist in living according to low entropy. Two fundamental consequences follow regarding the carbon footprint, and particularly in the context of the information and knowledge society, the digital footprint. It is possible to empirically and practically measure, assess and radically modify both the carbon footprint and the digital footprint.

Living-well and knowing how to live consist, in short, in achieving a low or null carbon and digital footprint, something that is easily said but very hard to do. To succeed, we must distinguish between what we need and what we want, without being just consumers, workers or producers.

The two derivations of Bioeconomics extend into a manifold of domains, practices and modes of knowledge. Some of these pertain to food sovereignty and food safety, a clear-cut independence vis-à-vis the financial and bank systems, the importance and meaning of bartering, the emergence of self-regulatory, self-organized and self-managed groups and communities, all possible alternatives to development, the implications of zero tillage, the critique and rejection of hyper-consumerism, and the connected establishment of a close relationship with nature – namely, air, water, the seas, animals and plants – metafisically intended as with the universe.

Living-well and knowing how to live, the main outcomes of the derivations of Bioeconomics, certainly acknowledge the importance of education, information, science and technology, research, arts and philosophy – particularly in the context of the Information Society, the Knowledge Society and the Network Society. And yet, above all, Bioeconomics is an invitation to something that Western civilization ignores, namely wisdom. Indeed, information, science, technology and research are necessary, but insufficient to live-well and know how to live. A bit of wisdom is also needed. The trouble is that wisdom cannot be taught, but it can be learned. Against all odds, Bioeconomics brings forth the possibility to learn wisdom while learning how to live with nature or according to nature, in the largest and gentlest sense of the word.

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As noted above, the economy must be understood and judged vis-à-vis its responsibility toward society as a whole or toward each and every individual, as well as vis-à-vis its compromises with nature. It is exactly this epistemological perspective that fosters Bioeconomics' strong critique of the production function. Thus, this issue of the Journal gathers seven articles that reflect upon and debate theories, methodologies and practices aiming to drive harmonic relationships between economics and nature. The papers published here are grounded on cross-disciplinary approaches in which economic, environmental, and engineering methodologies converge to make evident socio-economic problems and conflicts, while proposing alternatives toward sustainable agriculture.

The seven thematically based research papers invite readers to look at floods, soil, the management of water and of waste. Five papers view these issues within the context of rural sustainable development, while one regarding urban development focuses on the circular entrepreneurial economy. The seventh paper describes migration from the countryside to the

city from an econometric perspective, identifying the structural challenges of the rural job market. A description of each paper follows:

The article on water management for biodiversity and food safety named **“Socioecological practices and community resilience strategies for sustainable agriculture in lower Sinú, Colombia”** was written by Rubén Darío Sepúlveda Vargas, María Alejandra Taborda Caro, Deivi David Fuentes Doria, Carlos Eduardo Maldonado Castañeda, and Ivan Darío Sepúlveda Calderin. It examines various socio-ecological rural practices aiming to identify strategies of common resilience and address ongoing socio-environmental conflicts caused by limited access to water, and the loss of biodiversity and ancestral knowledge. It is transdisciplinary, exploratory, non-experimental research carried out as a case-study. Three organized rural associations were selected for a sample of thirty interviewed people. The results show that models of self-management do promote the articulation of sociological systems, environmental sustainability and the equitable management, use, and access to eco-systemic services.

The paper **“Qualitative indicators for community water resilience in floodable areas: Agricultural pantry of La Mojana, Colombia”**, written by María Alejandra Taborda Caro, Rubén Darío Sepúlveda Vargas and Carmen Auxiliadora Ortega Otero, develops qualitative indicators that aim to systematize the hydric resilience in infringed communities due to floods in the sub-region of Mojana, Colombia. A sample of two hundred and thirty-one people of different ages and genders was considered. La Mojana is a geostrategic territory in the country that holds a huge reserve of fresh water, rich in biodiversity and productive wetlands that favor large-scale rice cultivation, which constitutes the basis of the region’s economy and supplies the majority of the internal production for the country. The indicators, which one can infer as addressing hydric resilience, are grounded on the following categories, namely wisdom exchange, applied ancestral wisdom and memory, socio-environmental conflicts, governance, and climatology.

Furthermore, the article **“Housing vulnerability, agricultural production, and goods lost estimated to floods in Rio Nuevo a rural community in Colombia”** by Gloria Esther Urrea-Ceferino, Camila Andrea Pinto Suarez, Dina Luz Jimeno Carrascal, Daniela Alejandra Yáñez Ventura, and Hernán José Tapia Contreras, studies the degree of determination of physical vulnerability and the economic loss in crops and estates due to floods in the community close to Río Nuevo, Valencia, Colombia. The outcomes reveal a high physical vulnerability with a value of 0.63 in a scale from 0 to 1, whereas the estimated economic loss of land and crops is estimated to be 169,555.56 US dollars.

Dealing with the management of the soil, the paper “**Application of Participatory Methods to Explore Changes in Land Use of a Tropical Dry Forest Basin**” by Yhonattan Méndez Nobles, Humberto Ávila Rangel, and Lina García Corrales explores the causes of the change of use of soil in a hydrographic basin of the dry tropical forest. Thus, the unit of analysis is the basin of the Canalete river, in Colombia. It is argued that the main causes for the change of the use of soil are associated with biophysical factors, whereas the shrubland-forests and the crops changed because of direct and underlying socio-economic factors. The prospective analysis grounded on participatory mapping shows a hoped-for scenario of land use for the year 2030, bearing a decrease of more than 16,2 ha of grass that is compensated for by an increase of nearly 2.4 mil ha of crops, and 13,8 ha forests and shrubs.

Regarding circular Bioeconomics, two papers reflect upon the management of agricultural and industrial waste with proposals aiming at profiting from residual biomass so that the principles of Bioeconomics can be fostered. The first article, “**Crop waste management proposal in rice systems at the department of Cordoba, Colombia**”, written by Gloria Urrea-Ceferino and Manuel Alejandro Grimaldos Mojica, focuses on the current market and its challenges with a proposal for the correct management of the waste from rice crops within the framework of circular Bioeconomics in the rice economic system of the state of Cordoba, Colombia. It is claimed that the farmers, researchers, rice federation, and public policies need to work at improving the nutrients of the soils, the quality of harvest, and the management of the waste that remains from the windmills and the places where rice is cultivated. Besides, it is argued, it is compulsory to increase the investment to obtain products that satisfy the current demands from the market regarding renewable materials and processes.

The second paper, “**Industrial perspective regarding circular economy activities in Atlántico – Colombia**” by María Bernarda Alvarado Bawab and Sandra Margarita Villa Marengo, diagnoses the entrepreneurial scope of forty-six small, middle and large enterprises in the state of Atlántico, in Colombia. This article presents the strengths and weaknesses faced by policies for a circular economy, particularly regarding the waste generated, the resources used, and the systems or methodologies of management implemented. The results show that minimizing the waste through recycling or re-using, re-planning and saving water are the main actions that help implement circular activities. In order to increase the positive impact of such actions, a holistic structure is needed that systematizes practices, focusing on each and every stage of innovation, and on barriers such as lack of experience and judicial and administrative procedural complexity.

Finally, from an econometric perspective, the dynamics of the market of rural jobs in the state of Córdoba, Colombia, is explained in the article “**Occupation Choice in the Rural Labor Market from the Córdoba Department in Colombia**”, by Alfredo Rafael Anaya Narváez, Jhon William Pinedo López, and Carlos Fernando Doria Sierra. This paper focuses on the structural hurdles that the rural work force encounters that leads them to seek alternative jobs in urban areas – via factors such as human capital, age, residence, gender, and others, that affect the choice of job. The econometric Logit multinomial model was used together with the information provided by the Great Integrated Household Survey (GEIH, in Spanish) carried out by the National Administrative Department of Statistics (DANE, in Spanish), during the third trimester of 2019.

All in all, this special issue presents alternative views to the academic and scientific community that look toward a sustainable management of the economy in the framework of rural development and its connection to the city. To be sure, the ideas of Georgescu-Roegen the father of Bioeconomics, is a guiding thread in the papers selected here, which all aim at a solid critique of the very grounds of political economy.

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