Bio-integrated Economics Toward an economy inspired by life





Ex Naturae is a young NGO created in November 2019, whose goal is to conduct research, develop and promote **a bio-integrated or homeostatic economy**. Its second objective is to promote this macroeconomic model to the general public, scientists, government institutions and policy makers.

Transdisciplinarity is at the core of this project, so the profiles of the NGO's members come from various scientific disciplines (ecology, geology, physiology, economy, biophysics, etc...)





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General observation







The rate of biodiversity erosion is **100 to 1000 times higher than normal. Human activity is the main cause** of this massive extinction of life. Stocks of certain non-renewable resources are likely **to run out during this century**, if the global extraction and consumption rates remain at the current level. Purchasing power has a direct impact on the environmental footprint. Thus, the dilemma " end of the month vs the end of the world" is hardly solvable in the current economic framework. Global economic growth is correlated with the global material footprint. Despite technical progress, the absolute decoupling between these two curves has never been observed.

To address these concerns, **the bio-integrated economy** offers a **bio-inspired** economic alternative that responds to the challenges posed by systemic disorders caused by human development.



Feedback in living beings



Positive feedback **amplify deviations** from the steady state and makes it tend towards an explosion or blockage. They have a **destabilizing** effect and are very rare in living beings.

Negative feedback **stabilize systems back into a zone of equilibrium**. These are very common phenomena in living beings, especially for the maintenance of self-organization.



Links between feedback and economics



Since the 1970s, **global economic growth has been correlated with the global material footprint** (Wiedmann *et al.*, 2020).



The global GDP curve follows an exponential curve **similar to a positive feedback** (Maddison, 2008).



Feedback in economy and ecology



The same **exponential trend** is observed in various environmental and socio-economic parameters, with a clear acceleration since the 1950s (Steffen *et al.*, 2015).



Towards a bio-inspired economy

The current economic model of growth is similar to a positive feedback that feeds on itself and destabilizes its environment. This model is not sustainable in the long run, because it destroys the foundation that allows its own existence. The bio-integrated economics proposes to draw inspiration from living beings in order to integrate negative feedback into our societies. Similarly to complex biological systems, we delimit the area of sustainability by a lower bound (minimum vital) and higher bound (maximum toxic/lethal).



Economic growth requires **an increase in resources over time.** The process cannot be interrupted without major economic crises. Economic models based on positive feedback **destabilize the system and are therefore unsustainable in the long run.**

The bio-integrated economy creates a balance between the wealth level of an economic area and its consumption of resources. The system is self-regulating and doesn't follow an exponential trend. Models based on negative feedback are sustainable over the long run.



Homeostasis and bio-integrated economics



In living beings, the window of optimal functioning is called **"homeostasis**" (diagram above, left). Negative feedback are a major tool, correcting deviations to maintain the physiological parameters in a window of vital equilibrium. The bio-integrated economics is based on this principle to maintain the human activity in an area of social and ecological sustainability (above, right). It is therefore no longer a model with exponential growth (similar to positive feedback), but an economy with growth/decline variations in order to maintain the human activity in the sustainability area.



Linking resources and Life to economics



The central approach of the bio-integrated economy is to **link the environmental state and money creation** to run our economy. It is a **coupling** between what we call "the **exo-economy**" (biodiversity, resources) and "the **endo-economy**" (human economic activity).

The exo-economy is divided into three indicators that bring together all the resources we need to make our economy functional and the associated impacts non-renewable biodiversity. our ecological resources, and footprint. An average calculation using these three indicators gives us the **Dynamic Equilibrium Index** (DEI). This index makes it possible to establish the "conversion" of the environmental state into currency by means of a money creation mechanism known as ex naturae (from Nature)

Money creation *ex naturae*



The coupling between the created currency and the environmental state bases **wealth on preservation and no longer on degradation**. Indeed, the more the indicators deteriorate (decreasing biodiversity, increasing consumption of non-renewable resources, increasing ecological footprint) **the less the currency is created**. Conversely, the better the indicators, **the more the currency created increases**. Since this form of money creation cannot be achieve through credit, money is necessarily **given to the different actors in society** as a monthly dividend : a part is distributed to citizens, a part to the State, and a part to companies As a result, all actors in the system know the situation of the environment and can act together proactively. **When the dividend decreases or increases, it means a decrease or increase in our resource and living development**.



Money destruction: the melting of the currency



Since money destruction cannot be achieved through the repayment of credits, **it is achieved through melting**. A percentage of the currency available **on all bank accounts and on all transactions is destroyed at regular intervals.** The melting maintains a stable money supply according to exo-economic indicators and **reduce the gap in wealth between the poorest and the richest in society.** We were able to assess **the stabilizing property of money melting and the reduction of the wealth gaps**, with a computer simulation that we designed. The money melting behaves **like biological regulatory mechanisms which stabilize a system around balanced values**



Make the financial loss profitable : the CDEP



Under the current model, actions such as reducing production, leaving part of a territory to nature or cleaning up polluted areas, are considered as pure losses, because they are not profitable. The idea behind **Certified Dynamic Equilibrium Projects (CDEP)** is **to render profitable what is now considered a loss for investors**. It is an investment mechanism that has the virtue of redistributing part of our wealth to the living or limiting our anthropogenic impact.

CDEP can be proposed by citizens, States or companies. After evaluation and certification of the project by an independent organization, the implementation of the project leads to a reimbursement and a return on investment (calculated on the general melting rate). The CDEP are therefore a second mechanism of money creation that make profitable the loss.

EX NATURAE

An international legal framework

The Bio-Integrated Economy (BIE) requires a frequent measurement of exo-economic indicators. Thus, data mustn't be falsified to be consistent and functional. If a State was responsible for the management of its own indicators, they could modify them to follow political objectives, independent of the environment true situation, skewing exo-economic indicators. Alternatively, some States may have different methodologies for calculation based on their own interests.

This is problematic because, if the indicators do not measure the observable state of resource consumption and the state of biodiversity, then they have no reason to exist. That's why we, Ex Naturae, believe that such an economic system can only be set up through an independent, transparent and controlled international organization. This organization would be responsible for the following missions:

- establish the BIE in States that wish to subscribe to it
- organize data collection, calculation methods and verifications concerning exo-economic indicators
- create currency for States, companies and citizens of a country through a dedicated central bank
- destroy the currency in the same way in all countries that would enter a BIE
- dealing with certifications, verifications, refunds and money creation specific to CDEP
- have a mode of governance shared between all acceding countries without interfering with the political doctrines of Member States and non-members, but limit itself to the technical aspect of the BIE (calculation method, data taking, etc.)



The benefits of the Bio-integrated economy?



Wealth creation is no longer based upon exploitation, but on resources management and biodiversity preservation



Restores natural ecosystems and more generally tends to resolve issues related to environmental degradation



Provides a sustainable human society on the long run, strengthening its stability and resilience. Prevents economic crises and euphoria



Promotes collaboration and understanding among states. Pacification of international relations



Strongly reduces or eliminates taxes in the acceding countries.





Eradicates extreme poverty through the monthly dividend given to citizens



Change our relation to the commons through the emergence of co-responsibility for our impact on the environment



Global vision of the country's environmental situation through the dividend and for all actors



Motivational and non-punitive system



Short and long term vision

Share the theory with the general public and scientific communities Initiate research and development on the model (continuous improvement) Engage in discussions with institutional actors, policy makers in France and abroad Prepare transition plans for countries

Creation by States of an international organization for the establishment of the BIE

3 5 1 6 6 8 Increase internal Anticipate the Produce modeling Work to establish an capacity for NGO staff inherent problems in international legal tools, initiate framework for the and funding macroeconomic model experiments emergence of a BIE transitions

Creation of Ex Naturae



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