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Procedia Economics and Finance 8 (2014) 83 – 90

Procedia Economics and Finance

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1st International Conference 'Economic Scientific Research - Theoretical, Empirical and Practical Approaches', ESPERA 2013

New holistic approach of bioeconomics and ecoeconomics theories, practical bridging from the green economy to blue economy, trough new integrated and innovative paradigm about "bio-eco-geo-economy"

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Abstract

The authors present a new practical approach through the bridges between green economy and blue economy, with practical examples about the *rural eco-bio-economy*, for *the agrifood green power, innovative eco-biotechnologies, the management of complex systems etc*. Within the globalized context of the *agrifood and climatic crisis*, with a major social impact, the authors exemplify the numerical dynamics of the multiple disparities regarding poverty and famine all over the world, including the *"hidden hunger"* through the food insecurity caused by pollution. Finally, the authors of this paper, based on their professional activity in wide trans-disciplinary and biodiversity comparative collectives in ecosanogenesis, suggest a series of projects necessary for the social welfare and viable solutions for a good guvernance, based on a innovative bio-eco-geo-economy through *complexity sciences* and *the integration of the complex socio-ecological systems*, including the knowledge of the *chaordic systems* principles for a smart shaping of the globalized green world and innovative reshaping for a blue bioeconomy, that will

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Selection and peer-review under responsibility of the Organizing Committee of ESPERA 2013
doi:10.1016/S2212-5671(14)00066-5

save the food safety of the planet Earth.

*Keywords:*bioeconomics, ecoeconomics**,** eco-biotechnologies,, bio-eco-geo-economy, blue economy;

1. Introduction

Here introduce the paper, and put a nomenclature if necessary, in a box with the same font size as the rest of the paper. The paragraphs continue from here and are only separated by headings, subheadings, images and formulae. The section headings are arranged by numbers, bold and 10 pt. Here follows further instructions for authors.

In the last years, within Romanian Academy, at the National Institute for Economic Researches "Costin C. Kiritescu", through the studied topics by the scientific researchers from the Center for Studies and Researches of Agroforestry Biodiversity "Acad. David Davidescu", new visions of bioeconomy and ecoeconomy are addressed in a national and international context on the basis of new searches that target viable solutions for durable development of our country and all humankind against the great challenges of XXI century. They're researches have been developed between 2011-2013 through the activities of 105 scientific postdoctoral researchers in a project funded through Romania's post-accession European Union funds (POSDRU project "Postdoctoral School for Zootechnical Biodiversity and Agri-Food Biotechnologies, based on Eco-Economy and Bio-Economy for Eco-Sanogenesis", ID No. 63258, with the next thematic areas: plant and livestock biodiversity, food safety and security, zootechny and vegetable biotechnologies, genomic banks and genetic engineering, rural ecoeconomy, integrated bioeconomy, biochemistry cycles, ecosanogenesis.

1.1. New holistic approach of bioeconomics theories

In the international speciality literature is already established the fact that the first who used the term "bioeconomy" and even "bioeconomical science" is the Romanian Academymember, scientist GrigoreAntipa, through the communicaton made in 1931 in Paris at the International Congress for Aquaculture and Fish Culture, and on the basis of another conference presented at the Oceanographic Institute from Paris, issues published in French, in the year of 1933, in the Scientific Section Bulletin of the Romanian Academy, with the title "La Biosociologie et la Bioeconomie de laMer Noire". In over 12 pages, RomanianAcademy member GrigoreAntipa proves scientifically the need of approaching the biological and ecological mechanisms with social and economical impact on the relationships between man and nature for the biotopes and biocenosis from the ecological areas that are specific for the Danube and the Black Sea.

Also, it is very well known, at international level, the pioneering activity of the american scientist with romanian origins, the Romanian Academy member Nicholas Georgescu-Roegen, proposed many times for the Nobel Prize, scientist that is considered the parent of world bioeconomy, both by economists and biologists, and also, by other specialists, such as sociologists, doctors, philosophers, lawyers, etc. In this respect, a numerous speciality literature that acknowledges the ideas and bioeconomical conceptions of this important and visionary economistexists. Within National Institute of Economic Researches "Costin C. Kiritescu", there are, by many decades, constant concerns for the study and capitalization of scientific original contributions of Nicholas GeorgescuRoegen scientist; thus, 15 volumes that contain the high prestige scientific opera of Academy member Nicholas GeorgescuRoegenhave been already published, through the care of Romanian Academy member AurelIancu and the professor Ion Valeriu Franc.

1.2. New holistic approach of ecoeconomics theories

In the last 30 years, and especially over the last 12 years, in the world speciality literature, through the complexity, depth and originality of innovative approaches of relationships between ecology and economy, another american scientist imposed – Lester R. Brown, founder of the well-known Worldwatch Institute and Earth Policy

Institute, being also chosen member of the Romanian Academy. Through his book, entitled "Eco-Economy: Building an Economy for the Earth", published in 2001 and translated in over 25 languages, spoken on every meridian of the world, the Romanian Academy member Lester R. Brown is unanimously recognized as the father of the new concept/paradigm of ecoeconomy. Recently, he published the book "Full Planet, Empty Plates: The New Geopolitics of Food Scarcity", in which considers, with scientifical, geostrategical and social-economical arguments that the humankind already entered a new era, that of chronic shortage of food, thus considering that "the agricultural land (the soils) represents the new gold and the food is the new oil". In this context, the author senses corectly the contradiction between the limited natural resources of the Earth and using the agricultural land for production of biofuels, being very well documented on new challenges and opportunities of the agro-food globalized crises.

2.Bridging between green economy and blue economy

In the current conditions, of unpermitted growth of numerous and varied major pollutant factors in all anthropic ecosystems, from those local to those regional and globalized, scientists and an important part of the responsible civil society fights vigorously and with plausible arguments for a sustainable development of the humankind through green economy and performant, but clean technologies. This green economy is based on green energy, green technologies, green business and green industries, that in agriculture led to the success application of the "green revolution" principle elaborated by Norman Borlaug. Today, the green economy is expanding in the European Union and at global level through clean technologies, with green energy produced, for example, through wind turbines and biofuels.

In agriculture industry, the green economy uses different plant types and animal breeds, with high genetic performances in bioconversion of solar energy in vegetal biomass and then, through the food chain from agroecosystems, based on agrobiodiversity, agrifood green power increases through bioconversion of plant biomass in animal origin proteins biomass, including green products obtained in bioreactors.

Blue economy is a new concept released by Gunter Pauli, concept that is based on applying nature's mechanisms and principles for humankind development. A few principles of this concept, selected by R.S. Serea, are presented below:

Nature responds to basic needs and then evolves from sufficiency to abundance, while the present economic model relies on scarcity as a basis for production and consumption; Nature only works with what is locally available, because sustainable business evolves with respect not only for local resources, but also for culture and tradition; Nature evolved from few species to a rich biodiversity, wealth meaning diversity, while industrial standardization is the contrary; Natural systems cascade nutrients, matter and energy – waste does not exist and any by-product is the source for a new product; in Nature one process generates multiple benefits, because Nature is efficient, so sustainable business maximizes use of available material and energy, which reduces the unit price for the consumer.

It's obvious the fact that, from these principles, that are correct and real, a part of them are common with the principles of bio-economy established by Nicholas Georgescu-Roegen, and another part, with those of eco-economy, established by Lester R. Brown; also, there are marked differences between the approaching ways from the green economy and blue economy, especially under the aspect of excessive nonrenewable raw materials consumption, thus our group will carry on with this kind of comparative approaches for the benefit of human society development, in conditions of social inclusion and employment positive trend.

2. New integrated and innovative paradigm about "bio-eco-geo-economy"

The scientific researchers collective, including those recently nominee as associated scientific researchers at the Center for Study and Research of Agroforestry Biodiversity within National Institute of Economical Research of Romanian Academy, after many years and many scientifical papers regarding the original concept/paradigm about eco-bio-economy (in essence an economy based on environmental factors and especially on limited natural resources that are needed for a durable life of actual generations and especially those in the future). In the central square of figure no. 1posted below, we synthesize the elements of Bio-Eco-Geo-Economy, with explications also in figure no. 2.

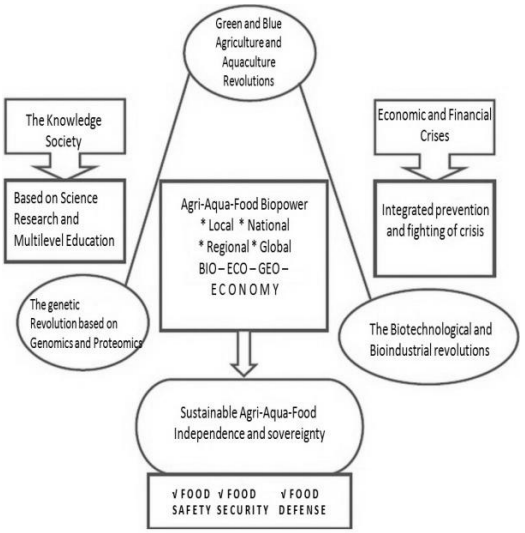

Fig. 1 Innovative use of Complexity Sciences and Innovative Applications for Globalized Interrelations between Green and Blue Agriculture and Aquaculture Revolutions, in the context of Knowledge Society and Genetic, Genomics and Proteomics Revolutions, with Integrated Prevention and fighting of Economic and Financial Crisis for Biotechnological and Bioindustrial Revolutions, based on Reshaping the Sustainable Agri-Aqua-Food Independence and Sovereignty, through smart Bio-Eco-Geo-Economics, that will achieve Food Safety, Security and Defense (orig. A.T. Bogdan, DorinaBogdan, Denis L. Diaconescu, S. Chelmu and AmaliaStrateanu, 2009; modified by A.T. Bogdan, N. Istudor, N. Bulz, I. Gaf-Deac, S. Chelmu, I. Prica, C. Sonea, R.S. Serea and Carmen Pasalau, 2013).

These new innovative approaches of our group start from the fact that thebiogeochemical cycles are based on bio-eco-geo-entropy for life survival and sustenability in anthropic ecosystems (fig. 4). This image explains Georgescu-Roegen's ideas about thermodynamic laws in generally, and especially about entalpy and entropy, respectively the scientific foundation of his bioeconomical theory. Looking at this image, with a butterfly on a flower from the globalized ecosystem's biota, the coresponding author of this article, in collaboration with the young biologist Radu-SorinSerea from the Ecological Society "Aquaterra" have discussed about the well-known expression refering to the fact that "something as small as the flutter of a butterfly's wing can ultimately cause a typhoon halfway around the world" (this is today's reality of the globally interconnected world, with unpredictible actions of *chaordic systems* principles).

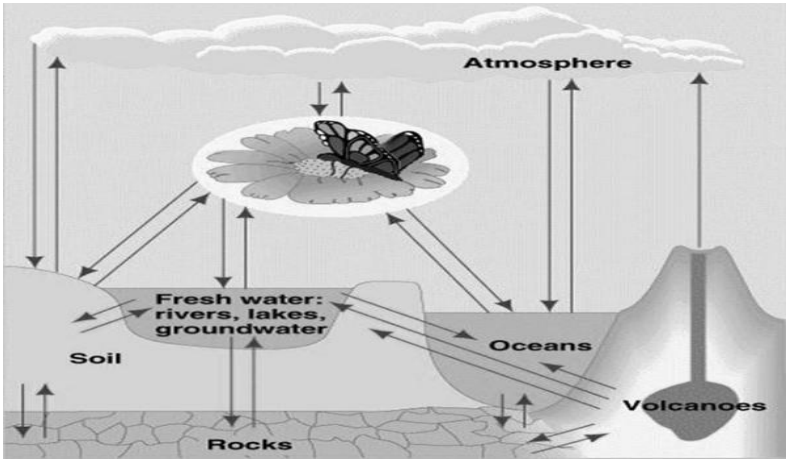

Fig. 2Generalization of biogeochemical cycles (after course: "Introduction to Biogeochemical cycles, Chapter 4", University of Colorado, U.S.A.). *Note:* It's observed that these biogeochemical cycles are based on bio-eco-geo-entropy for life survival and sustenability in anthropic ecosystems.

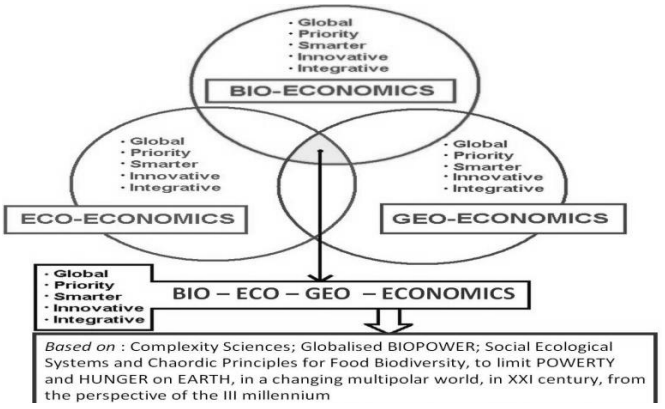

Fig. 3 Global, Prioritary, Smarter, Innovative and Integrative - principal characteristics of BIO – ECO – GEO – E C O N O M I C Striade,

to limit POVERTY and HUNGER on EARTH in a changing multipolar world, in the XXI century from the perspective of the III Millennium, for practical bridging from the green economy to blue economy, in the context of reshaping the world's economy (orig. A.T. Bogdan, DorinaBogdan and AmaliaStrateanu, 2013; modified by A.T. Bogdan, N. Istudor, C. Sonea,R.S. Serea and Carmen Pasalau, 2013).

3.1. Scientifical basis of bio – eco – geo - economics

In a synoptic way, in the figure 4 and 5, the complex role of science and technology in the modern, globalized society is presented, highlighting some particularities that resulted from the activity of our group of specialists and associated scientifical researchers from N.I.E.R. / C.S.R.A.B., during activities progress from our annual thematic plans 2007-2013, refering to new theoretical and practical approaches on the impact of bioeconomy and ecoeconomy in the actual context of multiple and simlultaneous crisis.

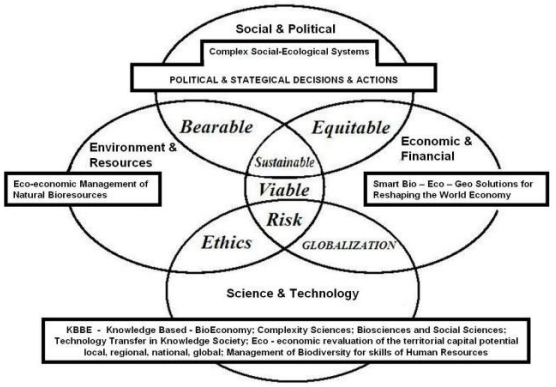

Fig. 4 Modifications and completions of the initial scheme used by Lester R. Brown, based on a triade of determining factors in the practical realisation of the benefits from eco-economy, in the actual and perspective context of holistic bio-eco-geo-economic approaches, underlining the role of life sciences and that of social - ecological system complex (after A. T. Bogdan, N. Istudor, N. Bulz, DorinaBogdan, G. F. Toba, Denis L. Diaconescu, I. Prica, AmaliaStrateanu, R. S. Serea, C. Sonea, Carmen Pasalau, 2013).

The special importance of scientific research in knowing and applying innovative strategies in bioeconomy at local, regional, national and global level is highlighted through the fact that, in the FP7 program and further, in FP8 program, an more and more important focus is on the new paradigms of ecoeconomy, bioeconomy and eco-bio-economy (fig. 5).

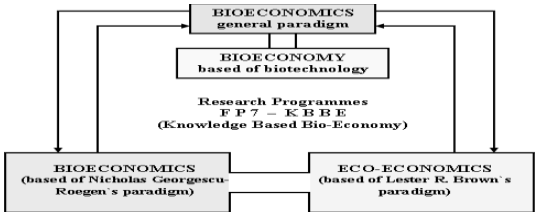

Fig.5 Schematic presentation of the links between research programme FP7, referring to KBBE = Knowledge-Based Bio-Economy, including the relationships between bioecoeconomy and biotechnology (orig. A.T. Bogdan et al., 2009).

These scientifical approaches, combined under the name KBBE continue also for the period 2014-2020, such that already exist in progress more project proposals for scientifical research, competitively funded by the European

Union, proposals that our group from N.I.E.R. / C.S.R.A.B. is structuring into the next 3 national and prioritary megaprojects:

- bioeconomical capitalization of natural resources potential from the national, territorial Carpathian-Danubian and Pontic capital, in collaboration with prestige specialists from the Danube riveran countries, inclusively from the eco-area of European Carpathians and coastal areas of the Black Sea;
- implementation of pertinent proposal from the text of "National Strategic Framework for Sustainable Development of Agro-food Sector and Rural Space in the period 2014-2020-2030", elaborated by a Presidential Committee (in which are part several members of the Romanian Academy, in collaboration with university teachers, representatives of professional associations from agriculture and performance farmers) in the context of global food crisis and constant growth of food needs of humankind;
- integrated bio-eco-geo- approach of interdependence between main ecological factors in their dynamics, modified through pollution actions and biodiversity decrease, consecutive to unfavorable anthropic actions, respectively the elaboration and implementation of some integrated projects, with concrete measures of techno-prophylaxis, especially for prevention and fighting anthropogenic pollution.

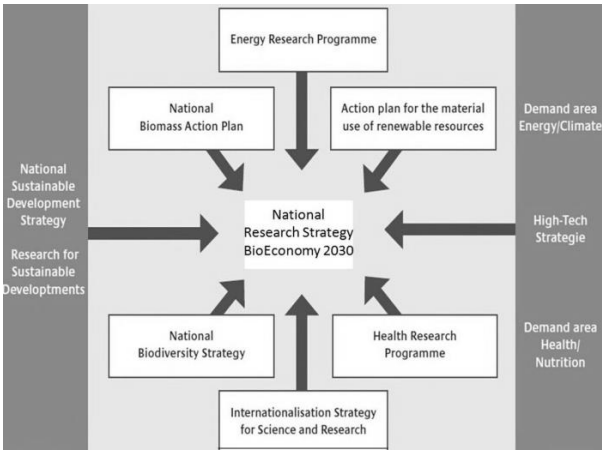

Fig. 6 Schematic presentation of national bioeconomical research strategy until the year 2030, elaborated, discussed and completed by Education and Research Minister from Germany, for the period 2014-2020 and for the perspective of 2030, similar with the strategies already approved in more european countries and at OECD level. *Note*: This new time horizon that already prefigured the advance with at least another decade, respectively 2030, the fierce competition at world level, under the aspect of excelence scientific researches, road openers, through the originality of approaches, data gathering and, especially, elaboration of new studies and prognosis, based on the progress of life sciences, but also on some unfavorable consequences, due to distructive actions on long and very long term, actions conducted, unfortunately, by people with a low ecological and civic education.

3.2. Practical aplications of bioeconomy in the specific biomass for agri-aqua-food.

In the 2 principal papers for projection of bioeconomy development strategies in the European Union and in OECD countries until the year 2030, there are numerous and varied examples of vegetal biomass conversion (respectively the feed) into animal biomass (respectively milk, meat and eggs). In this respect, in figure 8 the global dynamic for milk production, forecasted for the year 2040 is presented and we can observe a permanent increase of this index. This is why, we also have to have in our country real prognoses regarding bioeconomic dynamic of milk production. Thus, we consider that the potential production of milk biomass is, for Romania, of at least 125.000 hectoliters, respectively a potential production of cow milk for internal consumption of at least 65.000 hectoliters and the difference of 60.000 hectoliters represents the real disponibilities for export.

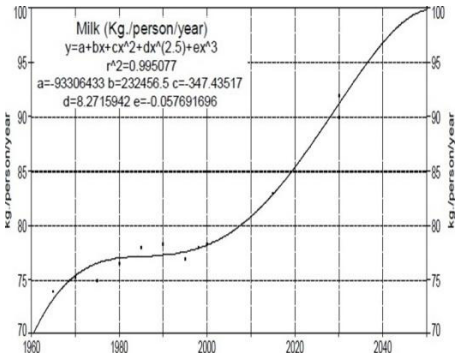

Fig. 7 Milk dynamic production in the period 1960-2040; calculations made by A.T. Bogdan, R. Burlacu and I. Surdu, on the basis of figures published by specialised organisms of ONU and FAO.

This milk biomass, consecutive to bioeconomic approach of milk cow growth is obtainedfrom cattle effectivesof which potential is at least 7 millions heads; if Romania would have as indicator the degree of quantitative intensification of milk cows effectives from Switzerland, from Netherland and from Denmark then,the source effective of pregnant cows and calved cows from Romania, has to be over 3.5 million heads. Unfortunately, the dramatic decrease, both under quantitative and qualitative aspects of cattle effectives from Romania, to only a quarter from the potential number mentioned, proves indubitable the fact that bioeconomy is a real opportunity for sustainable development of agrofood sector, like the green power, respectively a biopower, especially in the perspective of a substantial increase of the demand for dairy products and their derivates.

Through the versatility of speciality professional training of the author's of this scientific article, our group from National Institute of Economical Researches / Center for Study and Researches of Agroforestry Biodiversity, within the topics of scientific research has statistically processed calculations regarding also other animal species from romanian zootechny, as from other agricultural production areas, vegetal and animal, as for example: from aquaculture, fish culture, aquaponics, permaculture, vegetable culture in green houses and solarium; these data are available by forwarding a request through e-mail at the e-mail address mentioned in the abstract page.

It is obvious, both from international and national speciality literature, and also from our group researches, that the agrifood bioeconomy, especially in her integrating form of agro-aqua-food (or agro-sea-food), represents today a major concern in what is named "The Reshaping of the World:Consequences for Society, Politics and Business", the title in which the World Economic Forum will be held in Davos, Switzerland, in January 2014.

This is why, our extended group, with prestige specialists from the romanian academical environment propose further another national, strategical and prioritary megaproject, that will target the 2020 horizon, the real ensuring of agro-sea-food independence and sovereignty for Romania's population and some disponibilities for export. These proposals are made on the basis of our participation at Global Agriculture Forum, that is organized annually, in January, at Berlin, with massive world representation, the participation at World Economic Forum, also organized annually in January, at Davos (Switzerland), as exchanges of "good practices" developed within the 2 POSDRU projects (doctoral and postdoctoral researches), competitively funded by European Union and won through National Institute of Economic Researches / Center for Researches and Study of Agroforestry Biodiversity, with scientifical research thematic in bioeconomy and ecoeconomy of food and feed safety and security. These projects have been conducted in good conditions, with the permanent professional support of National Institute of Economic Researches.

At the end of this subchapter are presented forward a synoptic sketch regarding the holistic decalogue of bio-eco-geo-paradigms proposed by A.T. Bogdan et al., for research and study in the period 2014-2016.

Aknowledgements

In the first place, the first author and coordinator of this article and of bio-eco-economic scientific research thematics of Center for Researches and Study of Agroforestry Biodiversity within National Institute of Economic Researches of Romanian Academy, wishes to thank to the management board of "Alexander van Humboldt" Foundation since 40 years ago, that have granted me, in the year 1971, through an international contest with a strict selection of candidates a 2 years scholarship for scientifical research in citohistophysiology and endocrinology of reproduction biotechnologies at Veterinary Medicine University from Hanovra, a scholarship from which I've benefited only 3 months in 1971 and I've then continued it for 1 and a half years in 1991, at Munchen University, Veterinary Medicine Faculty, in picotechnical researches (precision 10 la – 12), through computerized bioluminescence investigations on oocytes and zygotes of farm animals, used in artificial insemination and embryo transfer biotechnology. In these research cycles with the scientifical world elite and with

ultrasophisticatedequipment, have germinated in my mind the ideas of the great german scientist Alexander von Humboldt, a true precursor of evolutionary biology and of ecology based on economical geography, namely the germs of conceptions about ecosystems, their protection and economic ecology have brought forth.

Conclusions

1.The cellular and metabolic homeostasis is projected in ecosystems through the state of climax specifically for complex food chains and for a richness of vegetal and animal biodiversity, thus the eternal nature, through her self regulation and perpetuation mechanisms it offers the most efficient and durable examples of energetic conversion at low entropy, namely through intelligent bio-eco-geo-economical strategies, we can still balance and re-ecologize the anthropic ecosystems, until it becomes an irreversible global process, thus integrating the principles of bio-eco-geo-economy in the dynamic of food chains, with dystrophic modifications specific for ecopatology, from cell apoptosis to economical apoptosis remaining one single step!...

2.We have to realise very fast and definitive, at global level, the reconciliation of humans with nature, the rational construction of a durable and fair partnership between humans and nature, thus the green economy and, especially the green agrifoodbiopower to develop, this thing leading at rethinking of production and distribution systems of food, uniformly at world level, in a mechanism with profound implications in managing our planet's resources, including through intelligent use of blue economy, thus avoiding the increase of ecological debt of actual generations from the "accounts" of natural resources necessary for the sustainable survival of future generations, because "living on debt" led to the globalised economical and financial crisis from the last years and major social and ecological conflicts.

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