

Utopia: Utopian and Scientific¹

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The 21st century is characterized by global influences and tendencies, by cultural, economical, financial, sociological and scientific developments that are worldwide, by information and transactions that flow at velocities close to their physical limit. At every moment, decisions are being made under the pressure of answers that are urged just because the capability to craft swift answers has become the very measure of their quality. In nowadays world, urgency is not actually proportional to the risk humans and the environment are exposed to, and response to urgency is not measured in time units, but on the percentage of the profit that can be collected for a given financial effort. This prevailing trend shifts the presumed rationality of the measures and decisions to time scales that are not compatible with the well being of the majority and that might even threaten the very existence of the Humanity.

The examples are most often disturbing and surprising. Important scientific discoveries, like nuclear energy for peaceful purposes, the widespread use of Freon as the refrigerant fluid in the thermodynamic cycle of refrigerators and some commercial applications of the green revolution, just to mention a few that were well meant on their roots. They all gave rise to unforeseeable menacing implications for the whole Humankind. Moreover, we could also mention financial practices that led to systemic crises with no correspondence on the prices of essential goods in the material economy and that cause turmoil, unemployment and widespread suffering and injustice. Even education, a basic right of every human being, has shown to lead to unpredictable demographic shifts that can cause famine and population unbalances.

How can one counterbalance these current tendencies? In our opinion, by empowering actors and institutions to react on the basis of underlying cultural values that had time to mature and to reflect the common anthropological and sociological heritage of the human history. This means that, fortunately, for the sake of the common interest, it is not on every instance that agents do respond automatically to the “rationalities” of the moment. On the contrary, they may often behave according to the ambitions, aspirations and dreams that do not correspond to the prevailing Hegel’s “Zeitgeist”, the spirit of our time being without controversy, the pressure to make quick and substantial profit, irrespectively of the social cost. In fact, the notion of an “historic trail” is central in the thinking of many historians and philosophers from Giambattista Vico in the 17-18th century to Arnold Toynbee in the 20th century. In fact, Toynbee has shown in his “A Study of History”, after examining the rise and fall of 26 civilizations in the course of human history, that the thriving ones were those that successfully overcome the challenges thanks to a creative elite of visionary leaders that were not tuned to the urges of the moment.

Running the risk of oversimplifying the matters associated to the changes that took place during the last few centuries and that most directed influenced our time, we can say that the cultural background embodied by the city-states Athens, Jerusalem and Rome gave origin, from the 14th century till the early 17th century, to the Renaissance. The Renaissance, the European expansion and the Mercantilism gave rise in the 17th century to the Scientific Revolution in Europe. The Scientific Revolution, the French Revolution and the British Industrial Revolution did engender fundamental changes that lead to the contradictions of what some historians called the “long” 19th century, from 1789 to 1914. These contradictions, through massive industrialization that was made possible from knowledge of classical physics and chemistry and the abundance of raw materials arriving from colonies outside Europe, together with the political tensions among the capitalist world, fascism and soviet socialism were unresolved and led to two deadly World Wars. These destroyed Europe twice and sentenced the steady decline of its influence from 1945 onwards. The emerging world powers formed blocks around different economic and ideological conceptions, multinational capitalism versus soviet fascism, and a tense balance was maintained under the threat of a nuclear war. In the early 1990s, the collapse of Soviet Union and the widespread use of quantum physics based technology and the Internet reshaped the world for

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good. From 1960s onwards, the world has entered the Anthropocene due to the great acceleration of the changes on the crust of Earth driven predominantly by the human intervention. We live now in a world of global economy, intertwined by information, economical and financial transactions that involve the whole world. A fast moving world where the European Union experiment has been faltering, China has emerged as a major key global player and where the ensuing economic, social and political transformations will have implications on the life of millions.

In the next few decades, important decisions will have to be considered in order to halt the degradation of the environment and the steady destruction of ecosystems. It is foreseeable that without a decisive set of measures to control the use of the natural and human resources, developments in quantum computing, artificial intelligence and genomic edition will boost a new robotic driven industry and economy, leading to major ecological disasters, massive unemployment and generalized poverty. The world population is expected to reach 9 thousand million people in 2050, more and more concentrated around China, India and Nigeria. Thus, in order to feed the world a considerable injection of resources will be required which will involve an increase in the area of cultivated land and of human labour while diminishing the ensued impact on the environment.

In fact, looking back to the already mentioned contradictions generated in the 19th century, we can try to draw lessons from some of the generous ideas that have been then put forward. The first one was associated with the common ground perception that the developments of science were meant for the benefit of the whole Humankind. The second idea, which actually mobilized thinkers and a good fraction of the society, was the conviction that the capitalist order was incompatible with the broad principles of human dignity. In this context, a very popular book appeared in 1880, “Socialism: Utopian and Scientific”, written by Friedrich Engels, who is considered by many as a minor philosopher, and where two historical developments concerning socialism were opposed. The Utopian socialism, associated with the moral imperative of changing or, at least, mitigating the social injustices of the capitalist order and that involved three well-known 18-19th social reformers: Henry de Saint-Simon, Charles Fourier and Robert Owen. The Scientific socialism, arising from the historical materialism of Karl Marx, whose theoretical ground was discussed in his “Das Kapital” in 1867 and, according to which, history evolved by the opposition of economical interests between conflicting social classes that eventually give rise to a dialectical synthesis towards a new social order and so on till achieving the ultimate goal of history, the communist order.

We suggest, likewise Engels, that Utopia, as discussed by Thomas Moore in 1516 and many others after him, should be reconsidered in terms of the identifiable underlying economic mechanisms and the 21st century scientific knowledge that allow for creating a sustainable and humane new world order, the “Scientific Utopia”. In our view, this methodological change is only achievable if all components of the so-called Earth System (see below) and of the world economy are internalized into a global and all encompassing economical cycle. This new economic chain should also include all disruptive production processes and technologies that jeopardize the social cohesion so that the damage they cause are paid back to society. Actually, it should be remembered that the issue of development and economic performance involves a set of conditions such as political freedom, social opportunities, transparency guarantees, and protective security that can only be ensured by a collective ethical choice based on a principle of maximization of the common interest as defended by economists such as Amartya Sen [1].

But how can one achieve the internalization of intangible goods and services provided by all the ecosystems? Taxation and incorporation into the final price to consumers is an obvious solution for manufacturing and distribution of goods that harm the environment, cause unemployment and upset social harmony. Furthermore, one should follow the very steps of the idea of the rights of the authors that allowed for internalizing the immaterial cultural and social heritage of Humankind. But of course, these tenets can only work if set up on a global scale so that the “damage” cannot be exported. Clearly, these issues require not only profound political and social reorganization, but also demand deep changes in the very principles of manufacturing and delivery of goods and an urgent implementation and intensification of the principles of a circular economy.

Another important component of the Scientific Utopia concerns the use of the scientific evidence for the understanding of the Earth System [2] and for establishing the extent of the changes and damage that the human action has already inflicted upon it. Indeed, there is an emerging consensus about the notion of the Earth System, the planetary system that comprises the biosphere, including all living biota, and their interactions and feedbacks with the geosphere, the atmosphere, the hydrosphere, the cryosphere and the upper lithosphere. The state of the Earth System is the result of the interaction of many factors: rate of biosphere loss, land system change, global fresh water use, biogeochemical flows (global Nitrogen and Phosphorus cycles), ocean acidification, atmospheric aerosol loading, stratospheric ozone depletion, climate change, chemical pollution, and some others. Determining the optimal operational range for each of these parameters has led to the so-called Planetary Boundaries [3] and to the alarming awareness that the climate changes are not the only evidence available about the destabilizing nature of the human activities. In fact, through the quantification of the above mentioned parameters we are led to face the worrisome understanding that at least two of these parameters, the biosphere integrity and biogeochemical flows, have well overshoot the safety boundaries as shown in Figure 1. The land system use and the climate change parameters are also clearly under stress.

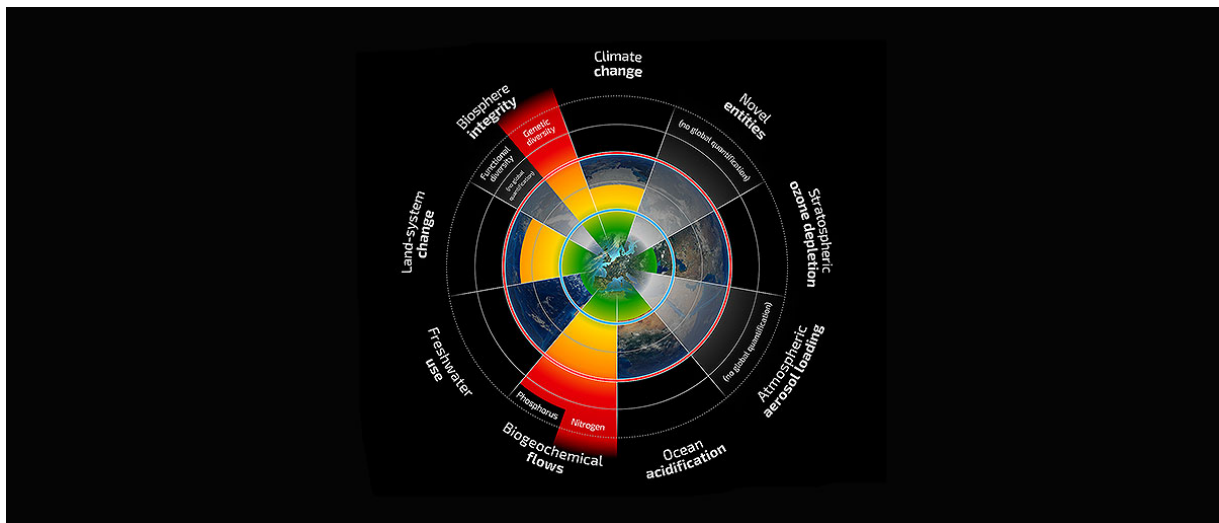


Figure 1. Planetary boundary depiction of the parameters that determine the state of the Earth System. The safety zone is shown in green. The yellow colour indicates overshooting beyond the safety zone. Red colour indicates an overshooting that can lead to irreversible disruption.

The transformations that lead the Earth System to different equilibrium states are driven, in general, by natural causes (astronomical, geological, internal dynamics) as depicted in Figure 2; however, after 1960s, the Earth System has been driven by human causes as depicted in Figure 3. In fact, the human intervention has been particularly destabilizing because the Earth System during the Holocene was in a state of great stability where the temperature has been constant for about 11800 years given the stability of natural causes.

In a recent work, it has been shown that the Earth System can be described thermodynamically by a physical framework in which the transitions between different equilibrium states take place between distinct phases according the Landau-Ginsburg theory of phase transitions [4] in terms of the free energy, F , of the system. It was found that natural causes lead to transitions as depicted in Figure 2, while the human intervention lead to a transition between the Holocene to the Anthropocene as shown in Figure 3. In Figures 2 and 3, $\psi = (T - T_H)/T_H$, where T_H is the average Holecene temperature.

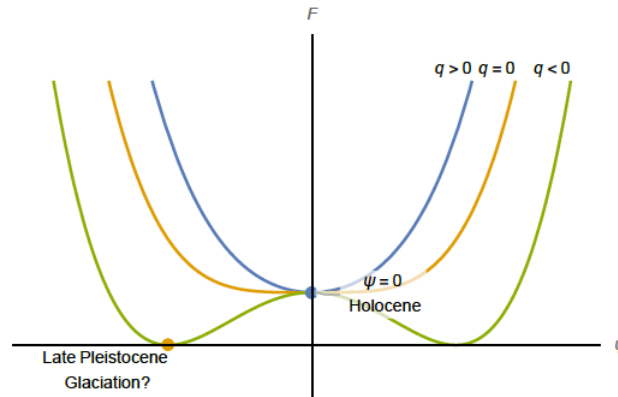


Figure 2: Minima associated to the Holocene and the Late Pleistocene and hotter era in a situation driven by natural causes, q (astronomical, geophysical and due to internal dynamics).

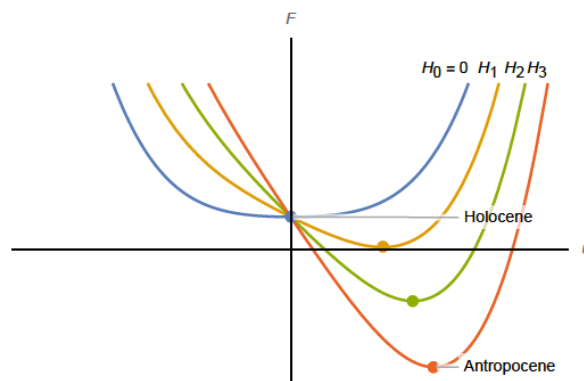


Figure 3: Transition between the Holocene and the Anthropocene due to human intervention, H .

Thus, the developed model allows, based on available data, to conclude beyond any reasonable doubt that the features of the transition from the Holocene to the Anthropocene can only be explained due to the human intervention [4].

Let us now discuss another generous idea that is in fact a remarkable example of a creative relationship between the awareness arising from the scientific knowledge and the prospect of creating a new legal framework, actually inspired on the concept of a condominium. Indeed, given that a condominium is a quite common and widespread practice of shared property, the idea is to scale up this set up of common interest and responsibility and create the legal framework of a global condominium [5]. In this worldwide condominium the sovereign countries will be able to share the responsibility of keeping the Earth System operating under established conditions and under the fundamental principle of internalizing all the benefits and fixing the harm that is inflicted upon it. In principle, this can be achieved via the voluntary membership of the sovereign states and through a system of quotas. This system can follow similar steps that lead to the Montreal Protocol signed up in 1987 to halt the destruction of the ozone layer and the Kyoto Protocol signed in 1997 for reducing the greenhouse-gas emissions (the latter was rectified in Paris in 2015) with the purpose of keeping the global temperature rise in this century below 2°C above pre-industrial levels. Following the same steps, the global condominium, the Common Home of Humanity [6] will allow for a harmonious evolution of a new world order in what concerns providing conditions for the operational sustainability of the Earth System.

To summarize, we can say that in this brief contribution we have presented an overall view of the transformations that have shaped our world and that are likely to lead to significant changes in the next few years. We stressed that a robust set of mobilizing ideas is required to encompass the mounting scientific knowledge about the Earth System and how to preserve its operational functionality, and a legal framework that internalizes the economical benefits of maintaining its optimal operational conditions. This means that a whole new legal framework is needed so to create economic gains when saving the operation conditions of the Earth System and effective

economic losses when degrading these conditions. Of course, this will involve a deep change in the prevailing practices of world's economy, but it is clear that without changing the basic tenets of the current economic paradigm, Utopia has little chances to go beyond the realm of the generous ideas and these will remain just Utopian. We believe that in a fast moving world prone to global and profound shifts, scientifically driven Utopia, based on the idea of a Common Home of Humanity, might provide the only realistic fix for the problems we face. For sure, the idea of Utopia has deep roots in the western culture and as such it must be an integral part of any educational programme as it has been acting as a pole of attraction for the most important social movements since the industrial revolution. The tension that the very idea of Utopia creates is an essential part of the critical thinking about our society [7]. Coupling this powerful idea with the scientific knowledge about the Earth System and the legal framework of a global condominium is a logical step.

It is remarkable that these ideas have sprung from discussions that were first carried out by a group of people gathered around the generous concept of the Common Home of Humanity, which has its focal point at Porto in Portugal.

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