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Article

Sustainable Complex Triangular Cells for the Evaluation of CO_2 Emissions by Individuals instead of Nations in a Scenario for 2030

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Abstract: The concept of sustainable complex triangular cells may be applied to an individual of any human society. This concept was introduced in two recent articles. A case study was proposed to show the applicability of this new concept to Indian populations without contact with civilization and with a low environmental impact. Here we propose to apply this concept to a recent study, which claims that the concept of "common but differentiated responsibilities" refers to the emissions of individuals instead of nations. The income distribution of a country was used to estimate how its fossil fuel CO_2 emissions are distributed among its citizens and, from that a global CO_2 distribution was constructed. We propose the extension of the concept of complex triangular cells where its area would be equivalent to the CO_2 emission per individual. In addition, a new three-dimensional geometric model for the regular hexagonal structure is offered in which the sharing of natural resources (human cooperation) is employed to reduce CO_2 emissions in two scenarios by 2030.

Keywords: Complex Cells; emissions; cooperation; sustainability

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1. Introduction

Global environmental problems have reached worrying heights. Greenhouse gas emissions (global warming) have resulted in drastic climate changes [1–17] with major impacts on biodiversity, human society and the planet's biogeochemical cycles [18–29]. Several important international environmental meetings have shown great concern over the high emissions of greenhouse gases, especially CO_2 which is a major contributor to global warming. One of the biggest economic challenges of the 21st century is how to decrease the use of fossil fuels. Thus, the search for a decarbonized economy is now a constant goal of many nations. As a possible mitigating solution, the IPCC report of 2007 [30,31] indicated the use of renewable energy on a large scale to replace fossil energy sources.

Models for mitigating CO_2 emissions have been proposed and adopted in international conventions. The most important among them is the Kyoto Agreement, which proposes a reduction of 5.2% in the annual rates of CO_2 emissions by 2012, based on the emissions of 1990. Countries that are required to meet these goals are listed in Annex 2. However, countries with the highest rates of annual CO_2 emissions, like the United States of America, have not signed the Agreement.

A more effective international policy dealing with the responsibilities of nations in reducing their CO_2 emissions is needed. In 2009, Chakravarty *et al.* [32] proposed a new concept to mitigate CO_2 emissions by a set of nations, which takes into account the differentiated emissions from nations and individuals and not to adopt equal emission rates for all nations, as the Kyoto Agreement proposed. This new proposal uses the concept of income distribution in a country to estimate how its CO_2 emissions from fossil fuels are allocated among its citizens, from which we can build a global distribution of CO_2. To seek a more fair principle, all individuals who are considered major emitters of CO_2 in the world are treated equally, regardless of where they live. The proposal presents a framework for the allocation of an overall reduction of carbon by all nations, using the concept of common but differentiated responsibilities for the emissions by the individual instead of by the nation. We propose a reduction in the projection of global emissions in 2030 by 13 Gt CO_2/year, to reach a total issuance amounting to 30 Gt CO_2/year. Extrapolating from current rates the estimate is that the total emission of nations in 2030 would be about 43 Gt CO_2/year. It is estimated that by 2030, there will be 1.13 billion individuals considered major emitters. In order to investigate these individuals further, the planet/ world was divided into four regions: the USA, the OECD minus the US, China and non-OECD minus China. The present paper also proposes a change in the methodology for defining a weight for individuals who are minor CO_2 emitters (individual annual emissions less than 1 t CO_2/year). It is estimated that by 2030 there will be 2.7 billion people living in poverty, who will make a small contribution in rates of global CO_2 emissions when compared to large individual issuers with higher personal incomes. The onus to reduce emissions would be directed to the individuals responsible for the greatest emissions (above 10.8 t CO_2/year).

This paper proposes that the concept of sustainable complex triangular cells be applied to any individual (citizen of the world). The area of these cells represents the overall carbon footprint of an individual. Approximately 50% of this footprint [33] refers to the individual energy consumption, which is primarily fossil fuel in the current world energy matrix. Therefore, there is proportionality between the area of the triangle that represents only the energy footprint, and the area of the triangle that represents the overall ecological footprint. Thus, it becomes possible to use the concept of

sustainable complex triangular cells considering only the area of the triangle that represents the energy footprint, without changing the geometry proposed by Sthel and Tostes in the first article on the concept of sustainable complex triangular cells [34,35]. With these considerations, the concept can be applied to the proposal of Chakravarty *et al*. [32], once their proposals are also applied to an individual, which is valued by his *per capita* income (economy), his CO_2 emission from fossil fuels (energy) and the possible reduction of CO_2 emissions by these individuals at the level of nations, making possible a proposal to reduce total CO_2 emissions by 2030.

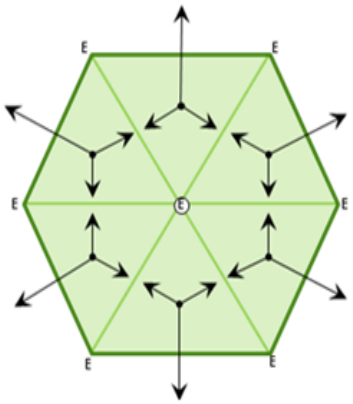
In today's society, the three issues of energy, environment and economics are interconnected and have no separate solutions, as the model of sustainable triangular cells demonstrates [35–38]. We propose in this paper an extension of the concept of the regular hexagonal community. In order to achieve this, we use a three-dimensional view of a Regular Pyramid Community (hexagonal base), with intense human collaboration, a new social paradigm, where we maximize the concept of collective intelligence, proposing a human strong cooperation as regards the use of natural resources [34,35]. This seems to be the safest way to achieve the goal proposed by Chakravarty *et al.* [32].

2. Sustainable Complex Triangular Cells: A Three-Dimensional View

The present study uses the concept of sustainable complex triangular cells [34], where a geometric representation indicates the inseparability of relationships between three the vertices: Energy, Economy and Environment ("The 3E triangle"). The area of the triangle is the individual ecological footprint, but only taking into account the contribution of energy consumption. The complex and individualistic structure of human society today is represented as a scalene triangle, indicating the asymmetry of the concepts of the 3E. Due to serious environmental problems faced by people today, new concepts and paradigms such as "sustainability" have been developed, seeking a more harmonic relationship among the 3E. A representation suggested in this model is an equilateral triangle, indicating symmetry among the three concepts (economy, energy, and environment). The model also suggests a possible coupling of a group of equilateral triangles, which can represent a community (a triangle for each individual), which, in turn, is represented by a group of six subjects forming a pattern (network) of a regular hexagon (Figure 1). The model assumes that the sum of the individual areas of equilateral triangles is larger than the total area of the regular hexagon, which indicates a decrease in the energy footprint when natural resources (energy) are shared. A situation that exemplifies this model is the use of public transport instead of using private transport (cars), with a significant reduction in the use of fossil fuels, thereby reducing CO_2 emissions.

In the regular hexagon model, as explained above, this is a pattern in which the relationships between the members of this ecological community are nonlinear, involving multiple feedback loops. A sustainable human community, which shares resources [39], requires that the various relationships between its members are interdependent. Strengthening the community means improving relationships between individuals (cooperation), thus maximizing the concept of collective intelligence [40–43], in order to allow other similar structures to engage among them. A sustainable social model is generated, so that: (i) it continues to exchange energy and matter with their environment, being structurally open, (ii) but has a closed growth pattern (network), being a self-organizing system [44].

Figure 1. Regular hexagonal structure: sharing natural resources (cooperation) [34].



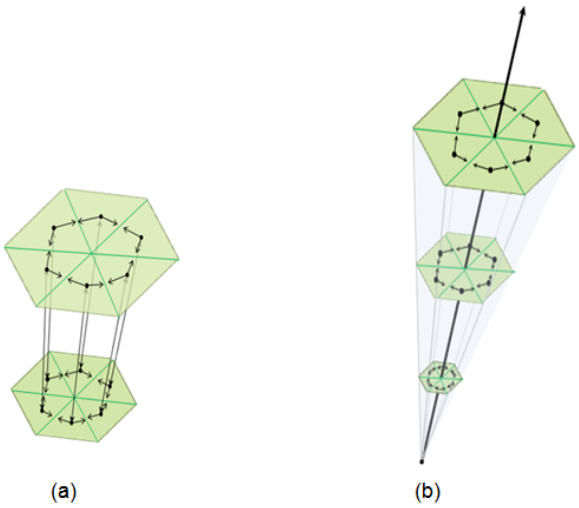
The pathway to sustainability, applying the cooperation model, involves governmental programs and organized society. Many actions are intrinsically associated to Energy, Economy and Environment, as environmental education, public policies aimed at economic and environmental sustainability, encouraging recycling practices, reduction in consumption of natural resources (water, soil and air), sustainable land use, pollution control, energy efficiency programs, stimulating transport collective use of renewable energy, among others.

From the chaotic structure of the current model of individualized asymmetric scalene triangles [34], order can be generated from a non-deterministic change in the cultural paradigm that leads to a human emergency [45] through an intense social cooperation. Thus, order can be obtained from regular hexagonal relationships that allow numerous engagements, forming a network structure, which share natural resources and environmental services sustainably. The use of renewable fuels on a large scale can be inserted into this proposal to arrive quickly and safely to the planned sustainable decarbonized economy.

The community of Indians of the Envira Amazon River, who had no contact with civilization, living in an economy of hunting and gathering, using a rudimentary agriculture for subsistence, was used as study of case for the sustainable model of complex triangular cells. Thus, the equilateral triangle that represents an individual of that community (Indian) tends to be "collapsed", [34] once its vertices would converge to the center of the triangle, due to the lack of definition of the concepts of economy, energy and environment for this individual. This collapse leads to a sudden reduction of the area of the triangle, indicating an almost zero carbon footprint for each individual. This situation can be appropriately applied to the regular hexagon model (Figure 1), since cooperation is a central feature of this collective community. If we apply the "collapse" concept in this Indians regular hexagon, we will notice the formation of a circle with a very small area, approaching the limit of a point, which demonstrates the minimal footprint of this community, which was possible through the sharing of natural resources [39]. In a highly sustainable relationship with the environment, the community practices a form of group intelligence, which improves their continued survival. Interestingly, this indigenous society represents the lower limit of the environmental cost of the regular hexagon model. Therefore, this is an ideal case for sustainability. The current model of civilization will never return to this lower limit, but that limit already existed at the beginning of the formation of human civilization and yet endures today, as in the case of the Indians of the Envira Amazon River.

If these sustainable hexagonal networks are coupled to generate sections of a pyramid (Figure 2a), after successive engagements, we will reach a basic regular hexagonal pyramid. The generatrix point of this pyramid represents societies with minimal ecological footprint, like primitive societies in Africa (Hazda) [46,47] or Amazon Indians. The increase in the ecological footprint starts from that original point, when other individuals are arranged to complete the stratification of the Regular Hexagonal Pyramid, and the maximum footprint will be the top face of the Figure 2b. In this way, it is possible to imagine a dynamic distribution of the entire human population in this large hexagonal pyramid. The present population is estimated around seven billion people, with great variation, since the death and birth rates vary rapidly in a short space of time. Therefore, we can place the entire human population in this pyramid, using as a criterion the individual's energy footprint. Individuals will be distributed from a minimal footprint (generatrix point) until completing the highest ecological footprint at the top of the pyramid (Figure 2b). The entire human population can be inserted in this model of three-dimensional sustainable complex cells, indicating that a network structure of a highly cooperative human society is possible, especially with the sharing of natural resources.

Figure 2. (**a**) Coupling of regular hexagons forming the pyramidal structure; (**b**) Regular hexagonal pyramid structure: sharing natural resources.



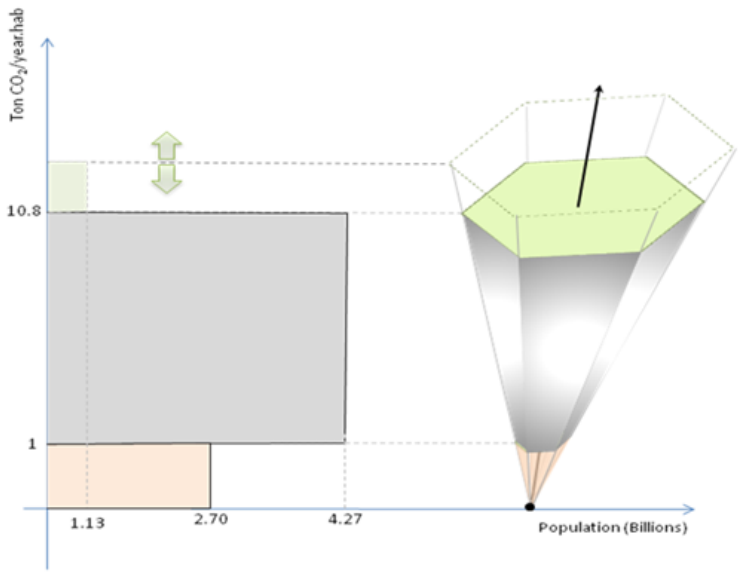
3. Three-Dimensional Model Applied to Chakavraty *et al.* Scenarios for CO_2 Emission until 2030

In a recent article, Chakravarty *et al.* [32] propose a new paradigm for globally reducing CO_2 gas emissions, based on the principle of common but differentiated responsibilities of the individuals. The study recommends that the amount of emissions of an individual is directly proportional to his income level. Using data from the World Bank, it was possible to estimate the CO_2 emissions of each country and calculate the mean amount that each individual is responsible for. By knowing the individual emitters, it becomes possible to calculate a global goal of reduction and divide the sum between individuals, regardless of where they reside (in the USA, India or Brazil. The proposed emission limit is 30 Gt CO_2/year by 2030, which will entail a 30% reduction in global emissions of CO_2. Emissions are predicted to be 43 Gt CO_2/year this year. The reduction rates would differ among countries, bearing in mind the individual emission limit of 10.8 t CO_2/year. In the U.S. there are 285 million

people above this limit; therefore, the country would have to cut CO_2 emissions by 60%. In Brazil 13 million people are above this limit, so the country would have to reduce emissions by only 4%. It is estimated that by 2030, 1.13 billion of individuals will emit more than 10.8 t CO_2/year, being considered as the major emitters. Another innovative proposal is to establish a lower limit to 1 t CO_2/year per individual. It is estimated that by 2030, 2.7 billion people will be below this limit, which will correspond to one third of the proposed population. These individuals would reside in poorer countries with very low *per capita* income. Thus, the article defends a "shield" of one third of the planet's individuals with low CO_2 emissions who would not be prevented from increasing their use of fossil fuels, such as diesel engines to access the basic needs, as lighting, pump water, cooking, *etc.*

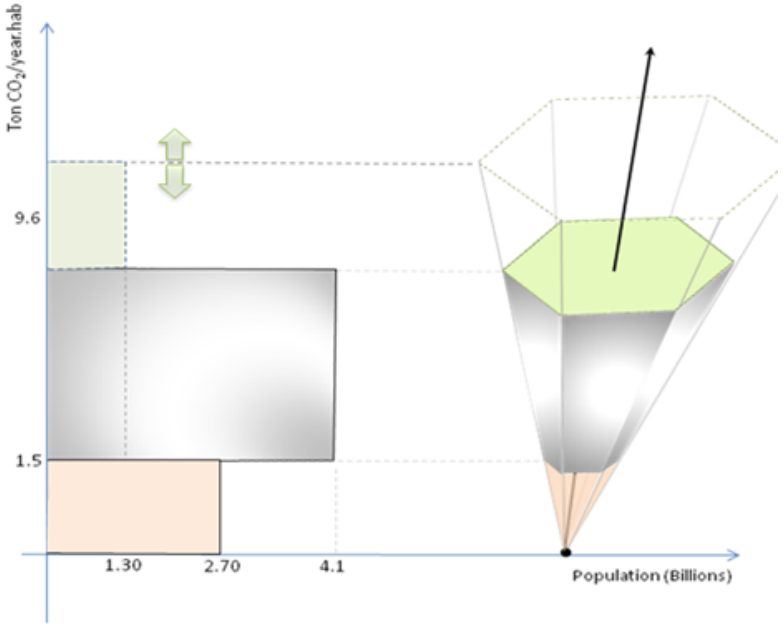
The new methodology involves the reduction of emissions from countries that emit more with differentiated reductions in rates by individuals: the countries would have to identify their individual emitters. Africa and India could increase their emissions within limits laid down by the new methodology, which would not limit human development in the poorest countries. Countries would have to reduce the emissions of individuals with the highest potential emissions (above 10.8 t CO_2/year) so that individuals with lower emissions (below 1 t CO_2/year) could possibly increase their emissions. Thus, using the economic and socio-environmental sustainability, the living conditions of a portion of the population would be improved, which is consistent with the B1 scenario of the IPCC report from 2007 [30,31]. Based on suggestions of Chakravarty *et al.* [32], we propose a distribution of individuals in the form of sustainable complex triangular cells in a three-dimensional arrangement, that is, a Regular Hexagonal Pyramid (Figure 3) in which the upper sector would consist of people who emit more than 10.8 t CO_2/year and the lower sector would consist of people who emit up to 1.0 t CO_2/year. According to estimates, there will be about 1.13 billion people occupying the top of the pyramid sector, 2.7 billion people occupying the bottom of the pyramid sector and about 4.27 billion people occupying an intermediate sector, *i.e.*, with emission between 1 and 10.8 t CO_2/year in 2030, for an estimate of a population of 8.1 billion people.

Figure 3. Regular hexagonal pyramid representing the distribution of population by ecological footprint of individuals with emission rates above 10.8 t CO_2/year and below 1 t CO_2/ year for an estimate of a population of 8.1 billion people in 2030.



Another proposal in the same article is to reduce the upper limit of the individual's emissions from 10.8 t to 9.6 t CO_2/year. Thus, 1.3 billion people would be included in the top section of the pyramid. In this new scenario, a larger number of individuals would participate in the effort to reduce emissions in their countries, which would allow the poorest individuals to emit a little more, up to a limit of 1.5 t CO_2/year (Figure 4). That would result in an improvement in the living of individuals in poorer countries, who could use more fossil fuels.

Figure 4. Regular hexagonal pyramid representing the distribution of population by ecological footprint of individuals with emissions rate above 9.6 t CO_2/year and below 1.5 t CO_2/ year for an estimate of a population of 8.1 billion people in 2030.



The targets for reducing CO_2 emissions proposed by the mentioned article for 2030 are based on certain principles, such as equity based on "common but differentiated responsibilities" of individuals instead of nations, as regards carbon emissions. Many of the poorest individuals will move to cities for the first time and, within an economy of CO_2-responsive, would be housed in buildings well-constructed, furnished apartments with energy efficient systems and served by efficient mass transportation. The 2007 IPCC also features original proposal for mitigating climate change by stating that: "the 'technological solutions' for the key mitigation problems and corresponding '*non-technological* practices', such as lifestyle changes [cultural paradigm] and consumption patterns that emphasize resource conservation can contribute to developing a low-carbon economy that is both equitable and sustainable." This is in accordance with one of the proposals of Chakravarty *et al*. [32], *i.e.*, equity (cultural paradigm), a solution that would be "non-technological" (IPCC). However, the IPCC proposal of using efficient mass transport, is clearly a "technological solution" because it implies the use of renewable fuels and "more fuel efficient vehicles; hybrid vehicles; cleaner diesel vehicles; biofuels; modal shifts from road transport to rail and public transport systems; non-motorized transport (cycling, walking)".

In a recent book entitled "The Third Industrial Revolution" [37], Jeremy Rifkin proposes the use of renewable energy and also proposes the use of energy in a power-sharing network which acts like the internet and converting the transport fleet to vehicles powered by electric cells, to reach a low carbon

economy. This proposal is analogous to the "technological solutions" of IPCC to achieve a low carbon economy. In the pyramid model proposed here, there would be a breakthrough in CO_2 emissions mitigation, if solutions based on collective intelligence (intense cooperation) are implemented by 2030. The non-technological solutions would depend on a cultural paradigm shift, that is, an intense sharing of natural resources, leading to a social organization represented by the regular hexagonal pyramid. Therefore, solutions based on the concept of collective intelligence (human cooperation) would facilitate emissions reduction making it possible to achieve the goal of CO_2 global emissions by 2030. We should like to reexamine a review of the social meaning of article Chakaravarty *et al.* [32], already addressed in our recent work [35]. The authors focused on global warming and global mechanisms to reduce greenhouse gas emissions. Even within the borders of the current economic system, that proposal proceeds to an agreement on the emissions of "greenhouse gases" via "social classes", that is, it proposes to divide in a "fair" way the responsibility of emission cuts, not via a fixed and universal reduction factor, but focusing on different factors in each country, depending on the polluting degree of the industrial energy matrix of each country and depending on the energy consumption of its respective social classes. In this case, the poorest countries should be allowed—for a time—to increase their emissions, which would allow them to develop.

4. Human Cooperation: Regular Hexagonal Pyramid

The influence of climate on the evolution of the genus *Homo* has been reported by several authors [48–55]. According to Susan Anton [54,55] there are strong morphological evidences showing that climate change shaped evolutionary changes in the genus *Homo*: the origin of the genus in Africa, geographical dispersal, body size and the effect of climate on sea level effecting the isolation of *Homo erectus*. A major evolutionary change occurred two million years ago. Africa's climate became extremely dry and, with the emergence of savannas, humans descended from the trees; it was an emergent property resulting from an abrupt climate change [55–63] and led to the emergence of *Homo erectus*. On the ground, there were threats from predators, particularly large felines. In order to survive this challenge, a new social organization based on the collective intelligence of the group (cooperation) was required. Our ancestors had to extend the social group and share resources in order to be able to survive. Cooperation was the mechanism that enabled the advancement of human society despite the challenges of living on the ground.

More recently, about 73,000 years ago, a gigantic eruption of the volcano Toba in Sumatra [64–69], almost led to the extinction of our species. The number of humans on the planet was suddenly reduced to a few thousand individuals. This eruption resulted in a harshly cold climate even in the tropics, with a concomitant drastic reduction in food availability. Humans were reduced to small groups. However, the ability to cooperate (collective intelligence) allowed the humans to survive to this sudden new natural climate change.

In the two situations described above, where the human species had to face sudden natural environmental changes, which directly influenced their evolution; they had to change their cultural paradigm to survive. This leads us to a crucial point about the collective survival, which anthropologists call "Cultural Damping Devices" [70–72]. This is a factor in group behavior—a technology in the form of social organization, cultural tradition—which improves their chances of

survival in the risky game of natural selection. Mary Stiner and Steven Kuhn [71] argue that early modern humans arose and settled in Africa with the use of these "damping devices". They developed the activities of hunting and gathering, which resulted in a more varied diet, thus increasing the chance of the species' survival. Eris Trinkhaus [70] goes further and suggests that "among all cultural damping devices, perhaps the most important is the existence of society itself." He explains this statement by conceptualizing the society "damping" in terms of systemic feedback: Large groups require more social interactions among their members [73–75] which leads to the evolution of greater brain activity during childhood and adolescence, which drives them toward greater complexity of language and indirectly increases the average life expectancy. This longevity, in turn, fosters the transfer of knowledge from one generation to another and creates, according to Chris Stringer [71], the "culture of innovation", the passage of survival skills and techniques of producing instruments from older to younger people. We conclude that this circuit stimulates the expansion of the group itself.

Homo erectus shared natural resources within the group, developing the first economy of hunting-and-gathering, where hunting animals were a significant part of the diet and resources were shared among group members. The role of food in human evolution is fundamentally important. We must remember that the demand for food, its consumption and, finally, how it is used in biological processes are all critical aspects of the ecology of an organism. The energy acquired with the proceeds of hunting leads to adaptive factors, critical to survival and reproduction [72]. These last two components of Darwinian fitness are reflected in the way we estimate the energy supply of an animal. The animal under consideration here is the man. We propose that in the society of *Homo erectus*, with a hunting and gathering economy, obtaining energy has next to no impact to the environment. Thus, it can be stated that there was a more harmonious relationship among men and the environment. If we look back, we see that we reached here because we shared natural resources (cooperation), thereby generating mutual protection against predators and also enabling us to face changes in the climate. We are currently facing an anthropogenic climate change caused by the large-scale use of fossil fuels. Chakravarty *et al.* [32]. proposed a scenario for reducing emissions of CO_2 for 2030, in order to lessen the risk of rapid climate change, which would result in major environmental impacts on human society and biodiversity. The proposal aims to reach a low-carbon society using the principle of common but differentiated responsibilities. Sthel *et al.* [35] propose that, to achieve a safer low carbon economy by 2030, we need to implement a change in the prevailing cultural paradigm of competition and individualism, leading to cooperation and sharing of natural resources, thus using the "cultural damping devices", already successfully employed in two situations when our species faced abrupt natural climate change. The difference with the past situations is that current climate change is anthropogenic, which has never yet been manifested abruptly. So, theoretically, we have some time to implement a cultural damping device. Cooperation is presented as a mechanism of collective intelligence to attain the cultural damping. This view can be represented by sustainable complex triangular cells in the three-dimensional vision, the Regular Hexagonal Pyramid.

Andrews and Davidson [76] recently published an article, where they mention an individualistic and competitive society, which was implemented by neoliberal policies in the mid-eighties. The article discusses our adaptive capacity to pursue a more sustainable future, suggesting that a bridge must be constructed between evolutionary biology and the social sciences, which should study sustainability. It is well known [77–87] demonstrate that not only humans, but also other species have a propensity to

belong to a group, which encourages many forms of cooperation and altruism. The main point is that our evolutionary history has given to humans an unparalleled ability to cooperate, and this ability has enabled our very successful adaptation in the last 250,000 years. The adaptation to current and future social and environmental conditions, therefore, requires the revitalization of our unique ability to cooperate for the benefit of group survival. The biologist Edward Wilson published recently a book [88–92], indicating that cooperation was fundamental to human evolution. He affirms that the evolutive process is much more successful in societies where individuals collaborate with each other to the common good. Then, group of people, corporations and countries that think in benefice of the collective (cooperation) frequently reach more success. A recent example of this was Japan earthquake in 2011, where people organized themselves and acted collectively facing a big catastrophe.

The biologist Martin Nowak [93–98] describes in his articles the cooperation as a mechanism of evolution. Cooperation is abundant in nature and appears to be involved in all construction stages of life on Earth. In certain social dilemmas, some cooperation can evolve even without any mechanism, but a mechanism would tend to increase the level of cooperation. There are five mechanisms that improve cooperation: direct reciprocity, indirect reciprocity, spatial selection, multi-level selection and kin selection. These mechanisms can work separately or together to promote the evolution of cooperation. These five mechanisms apply to all forms of organisms. Martin Nowak in a recent article [98] suggests that cooperation is fundamental to the evolution of life on earth, particularly to the body of humans, who achieved the civilization through deeper cooperation. Millions of years of evolution converted a slow and fragile creature (helpless) into the dominant species on the planet with a high degree of technological development, able to explore space and the oceans. In fact, humans are the species most cooperative or super-cooperative. He suggests that the main mechanism of human cooperation is the indirect reciprocity (reputation). This is because only humans totally dominate the language. Therefore, we are able to share information among everyone from relatives to strangers. The interaction of language and indirect reciprocity leads to a rapid cultural evolution, a condition that allowed our adaptability as a species.

With the growth of the human population, the levels of complexity of interactions between us and the environment increases, causing changes in the climate. We need to strengthen the adaptability and discover new ways of working together (intense cooperation) in order to save the life on the planet, leading to a more sustainable way of life. The Nowak's propose is in line with the present article in proposing the Regular Hexagonal Pyramid. He writes that in our current environmental history, the chances of saving human life seems to be small, as soon as we have to conserve natural resources, which are rapidly shrinking in a world with increasing consumer population. His argument is correct, since the current economic model prioritizes individualism and competition [76], instead of cooperation postulated by Nowak. That competition was represented by a scalene triangle [34], whose area is the individual ecological footprint, which is the vision of individualized human being present, as a true predator of natural resources, leading to an environmentally unsustainable way of life.

According to Nowak, evolutionary simulations indicate that cooperation is inherently unstable; periods of prosperity inevitably give rise to cooperative defection (competition). Thus, the spirit of selfless seems to rebuild the moral compass that guides us. Cycles of cooperation and defection are visible through the ups and downs of human history, in economic and political fluctuations. However, in the current environmental crisis, the feared climate changes seem to have no safe solutions if we do

not seek a strategy, as the cultural damping mechanism, already used by our ancestors in the two cases reported in this article.

Faced with the threat of the dreaded climate change, we need a new cycle of cooperation over the current competitive and individualistic model. Cooperation mechanisms already used in human society needs to be reinforced. Government policies with strong social integration should be immediately developed for achieving a low carbon economy and a real sustainable capacity to manage natural resources on the planet. Actions described above, such as the sharing of natural resources, energy efficiency programs and environmental education should be encouraged. Thus, it is possible to achieve the goals proposed by Chakravarty for reduction of CO_2 emissions by 2030.

The current anthropogenic climate change has roots, so they are still liable to be attenuated at least by us before uncontrollable effects of global environmental extremes possibly open to a systemic reality provided by J. Casti [99], where climate change and also various other effects of global environmental impact [21] can amplify each other. Authors such as Nowak [94], Casti [99] and Anderson and Davidson [76] are not optimistic about the scenario of a cycle of cooperative global human intervention before such extreme events occur. However, only the last of these references clearly explains the relationship between this "skepticism" with the current economic model, a relationship with which we agree.

5. Conclusions

In this paper we propose an application of the model of complex triangular cells, in a three-dimensional view for the two scenarios proposed by Chakravarty *et al.* [32] to reduce emissions by 13 Gt CO_2/year in 2030, based on the principle of common but differentiated responsibilities as regard each individual.

We follow the suggestion of the aforementioned article to assess CO_2 emissions individually, which identifies the individual major emitters. Thus, we establish upper and lower emission lids in order to reduce emissions from major emitters while allowing the lowest emitters to increase their emissions. We also proposed an intense human collaboration to achieve the safest way to be imposed on these differentiated targets for reducing emissions. The cooperation was an important evolutionary mechanism and a way to strengthen our adaptability to current climate change. However, applying this mechanism would be unlikely in the current economic model, which advocates individualism (Andrews and Davidson [76]). Finally, we present a possible form of social organization indicated by a Regular Hexagonal Pyramid which minimizes the ecological footprint of human society today, proposing the cooperation as a cultural buffer for tackling climate change.

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Conflict of Interest

The authors declare no conflict of interest.

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