



Review Article

Catastrophic Climate Change Requires New Society Model

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Abstract

This article addresses a topic of great interest for the future of humanity, which is that of global climate change with the proposal of solutions that can eliminate its catastrophic effects.

Keywords: Climate change; Global warming; Sustainable development

Introduction

Global warming is a climatic phenomenon to a large extent - an increase in the average temperature of the Earth's surface that has been going on for the past 150 years. The IPCC (Intergovernmental Panel on Climate Change), established by the UN (United Nations), says that much of the observed warming on the planet is due most probably to an increase in greenhouse and there is strong evidence that global warming is due to human activity. Many meteorologists and climatologists consider proven that human action is actually influencing the occurrence of the phenomenon. There is no doubt that human activity on Earth causes changes in the environment in which we live. Many of these environmental impacts result from the unsustainability of society's current development model.

The unsustainability of the current model of society's development stems from the fact that it is responsible for the rapid rise in global temperatures, the exhaustion of the planet's natural resources and of rise of sea levels on a larger scale in the 21st century than in the 10 thousand years since the last ice age. The facts of life are increasingly showing the need for the paradigm that has guided the

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development of human society since the 1st. Industrial Revolution has to be profoundly modified. That is why the model of sustainable development, among other measures, must replace the current model of society.

The method used in the study consisted mainly of analyzing the existing literature on the causes, consequences and future evolution of global climate changes and the sustainable development model to propose solutions to prevent catastrophic global climate change. Based on the study, the conclusion is reached that catastrophic climate change will be inevitable without the implementation of a new model of sustainable society globally. Future research should focus on finding sustainable society solutions specifically for developed and backward countries. This article consists of the following parts:

- The Paris Global Climate Agreement (COP 21) and its non-compliance
- The societal development model needed to prevent global catastrophic climate change in the 21st century
- Conclusions

The Paris Global Climate Agreement (COP 21) and its Non-Compliance

Alcoforado [1] states in its article Global Climate Change and its Solutions the following:

After several years of negotiations, impasses, timid advances and failures, 195 countries and the European Union produced at COP 21 in Paris a global agreement that defines how humanity will fight global warming in the coming decades. For the first time, every country in the world commits itself to reducing greenhouse gas emissions, strengthening resilience (ability to return to its natural state, especially after a critical and unusual situation) and to unite in a common cause to climate change. The agreement has no legal character for all goals, as the majority wanted.

The COP 21 agreement consists of a 31-page document. It contains a 12-page text, the Paris Accord, and a decision detailing how the agreement will be implemented. Together, the two documents form a sort of manual of reorientation of the world economy. They signal, albeit in a very preliminary way, that the bundle of emissions of greenhouse gases must end sometime in the 21st century. To the optimists, the deal represents the end of the era of fossil fuels.

The stated aim of the Paris Agreement is to contain the global average temperature rise by well below 2°C above pre-industrial levels and to make efforts to limit the temperature rise to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change. The reference to the target of 1.5°C came about thanks to the joint action of the island countries, which will be condemned to extinction in the long term by the rise in sea level resulting from a warming of 2°C.

As the targets for reducing greenhouse gas emissions presented are not able to maintain the temperature at the required level, it was decided that adjustments should be made every five years, starting in 2023. These adjustments would need to be considered in the text of the Paris Agreement report. The Paris Agreement also provides for rich countries to commit to disbursing at least US\$ 100 billion a year starting in 2020 for emission reduction projects in emerging countries and confirms that developing countries can expand the donor base in the future, even if voluntarily.

Two key aspects were not considered in the Paris Agreement: (1) The long-term goal of decarbonizing the economy by 2050 or cutting at least 70% of global greenhouse gas emissions by the mid-21st century; and 2) The temperature target is not accompanied by a road map telling how the world intends to reach less than 2°C or 1.5°C, which weakens the pursuit of that target. In other words, COP 21 has produced an agreement that is, in practice, a mere letter of intent.

It is therefore perceived that the Paris Agreement does not solve the fundamental issues, and the voluntary targets indicated by each of the nations are not enough to ensure that global warming is well below 2 degrees Celsius towards 1.5 degree Celsius by the year 2100. Moreover, the document is silent in not presenting proposals that contribute to the construction of a model of sustainable development on our planet in place of the unsustainable current model of existing capitalist development.

To change this situation and put an end to the constant climate change that threatens to destroy our planet and humanity, it is necessary to promote a deep transformation of the current society. The unsustainability of the current model of capitalist development is evident, since it has been extremely destructive of living conditions on the planet. Faced with this, it is imperative to replace the current dominant economic model throughout the world with another that takes into account man integrated with the environment, with nature, that is, the model of sustainable development. This was not considered at COP 21.

Another issue not addressed at COP 21 concerns wars, which is also largely responsible for the planet's environmental aggravation, which is proliferating throughout the world. Among the countless dire consequences of wars are the devastating effects on the environment. The bombing of military targets and civilian populations, the intense movement of military vehicles and troops, the great concentration of combat flights, the missiles thrown over cities and the destruction of military and industrial structures during all these conflicts also provoke the emission of metals and other substances that contaminate soil, water and air. In addition to environmental contamination, it is also necessary to consider the modification of natural landscapes and the loss of biodiversity in the long term, either by the presence of landmines or chemical agents dispersed in the environment. This was also not considered at COP 21.

Finally, it is important to emphasize that the Paris Agreement is also silent on the construction of a system of governance on the planet that is capable of ensuring the reorganization of the world economy that is leading the world to depression, of the planet's environment threatened by catastrophic climate change and of international relations that worsen every day fueling the proliferation of wars. Faced with these serious omissions of COP 21, it can be said that we will hardly succeed in trying to avoid catastrophic changes in the climate of planet Earth in the 21st century.

Katie Reilly [2] reports that IPCC of United Nations warned that sufficiently limiting man-made global warming will "require rapid, far-reaching and unprecedented changes in all aspects of society" in order to avoid dramatic global consequences, including rising sea levels, dying coral reefs and human casualties due to extreme heat. Reilly states that the special report - published by the United Nations' Intergovernmental Panel on Climate Change - assessed what it will take to limit global temperature increase to no more than 2.7°F (1.5°C) above preindustrial levels, in accordance with the 2015 Paris Agreement. Scientists consider that temperature to be a tipping point at which many severe effects of global warming will be realized.

The special IPCC UN report shows that "examples of actions include shifting to low- or zero-emission power generation, such as renewables; changing food systems, such as dietary changes away from land-intensive animal products; electrifying transport and developing 'green infrastructure', such as building green roofs, or improving energy efficiency by smart urban planning, which will change the layout of many cities. The report called climate change "an urgent and potentially irreversible threat to human societies and the planet," and warned that delayed action would make it impossible to limit warming to 2.7°F (1.5°C). "While the pace of change that would be required to limit warming to [2.7°F] can be found in the past, there is no historical precedent for the scale of the necessary transitions, particularly in a socially and economically sustainable way" the report stated. "Resolving such speed and scale issues would require people's support, public-sector interventions and private-sector cooperation".

Reilly [2] reports what the UN report presents as some changes that will need to be made in order to stop the current pace of global warming:

Reduce carbon emissions by 45%

By 2030, global carbon dioxide emissions should be 45% less than they were in 2010, the report found. In addition, carbon dioxide emissions must reach net zero around 2075 meaning the amount of carbon dioxide entering the atmosphere equals the amount being removed. By 2050, emissions from other heat-trapping greenhouse gasses, including methane and carbon black, should be reduced by 35%, relative to the 2010 rate. Emissions would need to decline rapidly across all of society's main sectors, including buildings, industry, transport, energy, and agriculture, forestry and other land use.

Remove carbon dioxide from the air

In addition to reducing carbon dioxide emissions, the reported carbon dioxide removal measures including planting new trees and carbon capture and storage, the process by which carbon dioxide is trapped and prevented from entering the atmosphere. Most current and potential [carbon dioxide removal] measures could have significant impacts on land, energy, water, or nutrients if deployed at large scale.

Use 85% renewable energy and stop using coal entirely

The report recommended far-reaching changes to land use, urban planning, infrastructure systems and energy use - changes that will be "unprecedented in terms of scale". Climate scientists said renewable energy sources would have to account for 70% to 85% of electricity production by 2050. The use of coal should decrease steeply and should account for close to 0% of global electricity, and gas just 8%.

While acknowledging the challenges, and differences between the options and national circumstances, political, economic, social and technical feasibility of solar energy, wind energy and electricity storage technologies have substantially improved over the past few years, the report stated. These improvements signal a potential system transition in electricity generation.

Plant new forests equal to the size of Canada

Scientists recommend that up to about 3 million square miles of pasture and up to 1.9 million square miles of non-pasture agricultural land are converted into up to 2.7 million square miles for energy crops, which can be used to make biofuels. That would amount to land a little less than the size of Australia. The report also recommends adding 3.9 million square miles of forests by 2050, relative to 2010 - which is roughly the size of Canada.

Such large transitions pose profound challenges for sustainable management of the various demands on land for human settlements, food, livestock feed, fiber, bioenergy, carbon storage, biodiversity and other ecosystem services”, the report stated. Mitigation options limiting the demand for land include sustainable intensification of land use practices, ecosystem restoration and changes towards less resource-intensive diets.

Jonathan Watts [3] reports that “the world’s leading climate scientists have been warned there is only two years of global warming to be kept to a maximum of 1.5°C, beyond which even half a degree will significantly worsen the risks of drought, floods, extreme heat and poverty for hundreds of millions of people. “ Watts claims that the authors of the landmark report by the UN Intergovernmental Panel on Climate Change (IPCC) say urgent and unprecedented changes are needed to reach the target, which they say is affordable and feasible although it lies at the most ambitious end of the Paris Agreement pledge to keep temperatures between 1.5°C and 2°C. The half-degree difference could also prevent corals from being completely eradicated and ease pressure on the Arctic, according to the 1.5°C study, which was launched after approval at the final plenary of all 195 countries in Incheon in South Korea that saw delegates hugging one another, with some in tears.

Watts [3] states that policymakers commissioned the report at the Paris climate talks in 2016, but since then the gap between science and politics has widened. Donald Trump has promised to withdraw the US - the world’s largest source of historical emissions - from the Paris Agreement. The Brazil’s presidential election put Jair Bolsonaro in a strong position to carry out his threat to withdraw Brazil from the Paris Agreement and also open the Amazon rainforest to agribusiness.

The IPCC UN report shows that the world is currently 1°C warmer than preindustrial levels. Following devastating hurricanes in the US, record droughts in Cape Town and forest fires in the Arctic, the IPCC makes clear that climate change is already happening, upgraded its risk warning from previous reports, and warned that every fraction of warming would worsen the impact. The report was presented to governments at the UN climate conference in Poland. At the current level of commitments, the world is on course for a disastrous 3°C of warming.

The UN report authors are refusing to accept defeat, believing the visible damage caused by climate change will shift their way. Climate change is occurring earlier and more rapidly than expected.

This report is really important. It has a scientific robustness that shows 1.5°C is not just a political concession. There is a growing recognition that 2°C is dangerous.

The Societal Development Model needed to Prevent Global Catastrophic Climate Change in the 21st Century

The risk that global warming contributes to the occurrence of catastrophic climate change requires that all mankind adopt the precautionary principle that has its application based on two assumptions: 1) The possibility that human conducts cause collective damages linked to catastrophic situations that can affect all living things; and, 2) Uncertainty about the existence of the dreaded damage. The fact that possible catastrophic events resulting from global warming did not have measurable risk would require the adoption of precautionary measures to prevent their occurrence. It should be noted that we are dealing with a non-measurable, potential, non-assessable risk.

The adoption of precautionary measures reinforces the duty of prudence. Prevention is better than cure. The precautionary principle goes further than the idea of preventing certain risk, since it seeks to preserve the environment considering an uncertain risk. Caution is taken when the risk is high - so high that full scientific certainty should not be required before corrective action is taken and should be applied in cases where any activity could result in lasting or irreversible damage to the environment. The precautionary principle differs from the principle of prevention that is directly related to a certain risk known to science. The precautionary principle is that it should preside over decisions related to addressing catastrophic climate change.

Once the world is facing a challenge not to allow average global temperature to be two Celsius degrees higher in the 21st Century, it is imperative that carbon dioxide (and equivalent) concentrations are stabilized at 450ppm (parts per million). In addition, it is necessary to reduce the amount of nitrous oxide (gas that reaches the ozone layer and increases global warming) released into the atmosphere that may more than double in the middle of the 21st century, as the United Nations (UN) warned in 2013 in a meeting held in Poland. According to UNEP, analyzes by scientists from 35 organizations revealed that NO₂ is currently the most important gas to deplete ozone and the third most powerful greenhouse gas emitted into the atmosphere. NO₂ exists naturally in the atmosphere, but in minimal amounts, released as part of the nitrogen exchange between land and air. If the current trend continues, NO₂ concentrations will increase by 83% by 2050, compared to 2005 levels. Without such attitude, the world will face catastrophic climate change at the end of this century, which can threaten the survival of humanity. To do so, global emissions will have to be reduced below their 1990 levels. Reducing emissions from 1990 levels is a gigantic challenge.

This is why it is imperative to implement the “sustainable development” model based on forms and processes that, when used; do not affect the integrity of the environment on which they depend. The new society to be built in the world would have to be sustainable from the economic, social and environmental point of view. The concept of sustainability has become a key element in finding viable solutions to solve the world’s greatest problems, relying on the thesis that a sustainable society is one that meets the needs of the present generation

without diminishing the possibilities of future generations to meet their needs.

How to build a sustainable society? How to build a sustainable society? It can be said that a Society is the group of people who share purposes, tastes, concerns and customs, and who interact with each other constituting a community. A society can also be considered a network of relationships between people who act in an interdependent way. A society reaches a high level of development when its members, in addition to acting interdependently, share common goals. In the world we live in, all men and women act interdependently without sharing, however, common goals in each country and on a global scale.

On a planetary scale, countries do not have common goals because each seeks to serve its own interests imposed by the holders of their respective political and economic powers. When these interests are contradicted by other countries, even war conflicts can result, as it is occurring in the present and has occurred in the past in various parts of the world. The fact that we live in societies governed by individual interest rather than collective interest makes it difficult to build common goals in each country and on a global scale.

In the era in which we live, humanity faces a major threat, of an environmental nature, represented by the depletion of the planet's natural resources, the disorderly growth of cities and the catastrophic global climate change that tends to produce serious repercussions on economic and social activities and the worsening of humanity's social problems with threats to the population's health and unemployment. Climate change is a major health concern of the 21st century. The rise in global temperature is already being felt in current heat waves, vector-borne diseases and food security for populations in all regions of the world. To monitor this issue, 27 academic institutions from all continents have just published the Lancet Countdown report. Small changes in temperature and rainfall can have a major impact on the transmission of vector-borne diseases and water. Cholera and malaria also registered increases associated with climate change. In 2017, 157 million more people than in 2000 were exposed to heat wave events, an increase of 18 million people compared to 2016.

80 million jobs could end by 2030 because of climate change. With climate change, increased heat stress in agriculture and other industrial sectors is expected to lead to a loss of productivity equivalent to 80 million jobs by 2030, warned the International Labor Organization (ILO) in 2019. The ILO considers that 2, 2% of the total hours worked in the world may be lost due to high temperatures, according to projections based on an increase in world temperature by 1.5°C, by the end of the century. In total, economic losses would represent about 2, 4 trillion dollars on a world scale, equivalent to the UK's GDP. The thermal stress that represents a heat higher than the body can tolerate without suffering psychological damage, usually occurs when temperatures exceed 35 °C with a strong humidity that will take dramatic consequences for employers, workers, local economies and even the global economy. Increased inequalities can be expected between high-income and low-income countries, deterioration of working conditions for the most vulnerable, as well as population displacement, according to the ILO. The two most exposed sectors are agriculture, which employs 940 million people worldwide and is expected to account for 60% of the hours of work lost in 2030 and construction, whose productivity would fall by 19%.

Everything described above tends to produce a true crisis of humanity that makes it imperative to build a new model of society or a new world order that acts in an interdependent and rational way with common goals in each country and in planetary scale without which the survival of human beings and life on the planet could be put in check.

To build a sustainable society, the following objectives must be pursued:

- Reduce global carbon emissions by promoting changes in the global energy matrix based on fossil fuels (coal and oil), on the other, based on renewable energy resources, hydroelectricity, biomass and solar and wind energy to prevent or minimize global warming and, consequently, the occurrence of catastrophic changes in the Earth's climate.
- Reduce the emission of nitrous oxide, whose levels have increased a lot in the last decades, mainly driven by nitrogen fertilizers produced industrially, by the pollution of road transport and by emissions from the chemical industry, because it is a powerful gas that causes the greenhouse effect, being more than 300 times more powerful than carbon dioxide (CO₂) by trapping solar heat whose molecule remains in the atmosphere for about 120 years until it degrades. According to UNEP, the nitrous oxide emission corresponds to about 8% of the "emissions gap", that is, the abyss of carbon dioxide emissions that needs to be reduced to meet the UN goal of limiting the Earth's warming at 2 °C, based on pre-industrial levels. Since agriculture accounts for two thirds of NO₂ emissions, there is a lot of potential to reduce them, through more efficient use of fertilizers or crop rotation, alternating with nitrogen fixing plants - those that have bacteria and others fixing organisms associated with its roots - with others that do not have this natural capacity. In addition, it is necessary to reduce the pollution of road transport and transport in general by replacing fossil fuels with biomass and the use of electric vehicles, as well as reducing nitrous oxide emissions by the chemical industry whose main emission sources are in the production of nitric acid (HNO₃) and adipic acid. Since more than 80% of all nitric acid produced in the world is destined for the production of ammonium nitrate and double salt of calcium and ammonium nitrate and 3/4 of the ammonium nitrate is destined for the production of fertilizers, it can be greatly reduced nitrous oxide emissions by the chemical industry decreasing the demand for nitrogen fertilizers in agriculture.
- Improve energy efficiency by developing actions to achieve energy savings in the city and in the countryside, in buildings, in agriculture, in industries and in transport in general, thus contributing to the reduction of global carbon emissions and consequently, the greenhouse effect.
- Make motor vehicles and equipment for domestic, agricultural and industrial uses more efficient, buildings designed for maximum lighting, cooling, and heating economy, agriculture and industry are modeled to require the least energy resources and raw materials, also contemplating the self-production of energy with the use of waste from its production processes based on reverse logistics and, finally, the use of new transport alternatives from the bicycle to those of high capacity based on railways, among other initiatives.

- Combat pollution from land, air and water, reducing waste by recycling the currently used and discarded materials. In this perspective, essential materials should only be used in production processes and in other applications only in the last case. When used in the various applications, they must first be reused many times; second, they must be recycled to form a new product; thirdly, they must be burned in order to extract all the energy they contain and, ultimately, they must be removed to a landfill.
- Restoring and stabilizing the biological base by making land use follow the basic principles of biological stability (nutrient retention, carbon balance, soil protection, water conservation and preservation of species diversity), rural areas have greater diversity than currently with balanced land management, where there is crop rotation and species cultivation, there are no wasted crops, tropical forests are conserved, there is no deforestation to obtain wood and other products, new trees are planted, there are efforts to stop desertification by transforming degraded areas into productive land, the extensive use of pastures is eliminated, as well as the food chain of affluent societies includes less meat and more grains and vegetables.
- Adjust population growth to the resources available on the planet, reducing their birth rates, especially in countries and regions with high rates of population growth.
- Reduce social inequalities, including the adoption of measures that contribute to meeting the basic needs of the world's population, such as food, clothing, housing, health services, employment and a better quality of life. For sustainable development, therefore, all human beings must meet their basic needs and be given opportunities to realize their aspirations for a better life.
- Ensure that the economic growth and wealth that results from it are shared by everybody, education services enable the population to increase the qualification levels for work and culture, health services are effective in combating child mortality and contribute to the increase in the life expectancy of the population, all men and women have decent housing, and there are public and private investments at the necessary level that contribute to the reduction of mass unemployment as a result of the general crisis of the world capitalist system which tends to worsen in the future.
- In order to avoid catastrophic climate change, it is therefore necessary to establish a society based on the model of sustainable development on a world scale that satisfies the needs of the present generation without diminishing the possibilities of future generations to meet their needs and, in this way, contribute to avoid the exhaustion of the Earth's natural resources and to prevent catastrophic climate change on a global scale.

Conclusions

Global climate change tends to produce a real crisis of humanity that makes it imperative to build a new society that acts in an interdependent and rational way with common objectives in each country and on a planetary scale without which it can be placed in check the survival of humans and life on planet Earth. The lack of convergence among countries around the world in tackling climate change is reflected in some countries failure to meet the targets set out in the Paris Agreement at COP 21.

It has been proven that, in order to avoid climate change, it is not enough to meet goals such as those established at COP 21. It is also necessary to build a new sustainable society from an economic, social and environmental point of view. The new sustainable society could be based on the vision of Capra ET Lenore [4] and Ernest Callenbach [5]. In their works, Capra, Lenore and Callenbach argue that the concept of sustainability has become a key element in the global movement, crucial to finding viable solutions to solve the world's greatest problems. Both rely on the definition of Lester Brown, founder of the Worldwatch Institute: A sustainable society is one that meets their needs without diminishing the chances of future generations to meet their needs. Capra, Lenore and Callenbach also point out that global sustainability requires that the world's population stabilize to a maximum of eight billion people, that sustainable economies are not driven by fossil fuels, but by solar energy and its many direct and indirect forms (heating and photovoltaic electricity, wind energy, hydric and so on), nuclear power is no longer used due to its long list of economic, social and environmental disadvantages and risks, energy production is more decentralized and, therefore, less vulnerable to cuts or blackouts and a much more efficient sustainable energy system to be used [6-13].

The authors mentioned above argue that transport in a sustainable society will be much less wasteful and polluting than today, people will live much closer to their workplaces and will move around in the vicinity by highly developed bus and rail transport systems, fewer cars and bicycles which will be an important vehicle in the sustainable transport system, recycling will be the main source of raw materials in sustainable industries, and product design will focus on durability and repeated use rather than the short and disposable life of products. They add that the desirable will be a mindset based on recycling ethics. Recycling companies will take the place of current urban cleaning and disposal companies, reducing the amount of waste by at least two-thirds.

The above authors defend the thesis that in a sustainable society there will be a need for a restored and stabilized biological base, land use will follow the basic principles of biological stability (nutrient retention, carbon balance, soil protection, conservation of water and preservation of species diversity), rural areas will have greater diversity than currently with balanced land management, where there will be crop rotation and species cultivation, there will be no wasted crops, tropical forests will be conserved, there will be no deforestation to obtain wood and other products, millions of hectares of new trees will be planted, efforts to halt desertification will transform degraded areas into productive land, the exhaustive use of pasture will be eliminated, as will food chain of affluent societies, to include less meat and more grains and vegetables.

Finally, Capra, Lenore and Callenbach consider that value systems that emphasize quantity, expansion, competition and domination will give rise to quality, conservation, cooperation and solidarity among human beings, the decisive characteristic of a sustainable economy will be the rejection of the blind quest for growth, gross domestic product will be recognized as a failed indicator, economic and social as well as technological changes will be measured by their contribution to sustainability, military budgets will be a small fraction of what they are today, governments will invest in a strengthened United Nations peacekeeping organization instead of keeping expensive and polluting defense institutions, nations will decentralize power and

decision making within their own borders and at the same time will establish a degree unprecedented level of cooperation and coordination at the international global problems.

It can be argued that the introduction of the concept of sustainable development will entail profound changes in the way society develops, so that economic growth is less intensive in the consumption of raw materials and energy and more equitable in the distribution of its results to the population. Above all, above all, a real political and cultural revolution must be carried out all over the world, so that the paradigm of current development is replaced by the paradigm of sustainable development.

We are, for the foregoing, facing a critical moment in the history of Earth and humanity, at a time when it must choose the course to be given to its future. As the world becomes increasingly interdependent and fragile, humanity faces at the same time great dangers and great promises in regard to its future. We must recognize that in the midst of a magnificent diversity of cultures and ways of life, we are a human family and a terrestrial community with a common destiny. We must join forces to create a sustainable global society based on respect for nature, universal human rights, economic justice and a culture of peace. To arrive at this purpose, it is imperative that all of us, the peoples of the Earth, declare our responsibility to one another, to the continuity of life on the planet and to future generations.

Author

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