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MONOGRAPH

"Irreversibility of the climate change"

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Gratitude

I would like to thanks first to my family, because they always support me in what I love, feeding my hungry for knowledge and for last all my teachers for pleased it with their expertise and patience over my lifetime, making the person that I´m right now.

Summary

On this paper would explorer different parts of the climate change, especially irreversibility changes on earth. Along text you experience a evolution of you matter of thinking about this topic, at first concepts would help you understand better the subject that it shows, the way you think it was the climate change it is not the correct or not the more accurate, so all your questions will be answer or affirmative. Later on you would see how it began if it was a human fault or maybe a natural depuration of the biosphere, making you reflect what the real answer of this problem.

With all the this explained now the lector can enter in some more difficult topics to understand about how the human provoke all the damage to earth, it shows the different affectations to environment, introducing you in topics more ambiguous and finishing with more specifics, like terrestrial damaging an later on you end in soil and animals that life in the terrestrial part of earth, and all of with aquatic environment and atmosphere. Noticing an evolution on the way you see and feel the global warming and human footprint to the biosphere, making you fell very guilty with some habits that affect in a really hard to the earth, and want to change this reality so sad to our society and our fellows' animals.

This internal emotion would make you question yourself about how is the best way to change this may be impossible present to fix, but here is where the text shows a better way to life in a sustainable way with all the resources that earth gift. Easy lifestyle changes would make a significant help to restore different part that now are degenerated by the human activity. And for last a big solution for this catastrophic future. With all that says the matter of living alongside the earth would make at least a little change in the lector.

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Introduction

Irreversibility of the climate change is very significant topic to talk now days because, is the future of the humanity that we are challenging, and people is starting to realize that we do not have a lot of time to make a real difference with this, if they do not act now they would have very horrible consequences, so they are gathering to propose real solution, and putting in practice all the thing that are in their hands to make a better future for human and their decedents.

The people need to know what is happening with the environment, how is affecting the human and animals, and what it is the truth behind the global warming with it is concepts, so in they can see the problem as a global duty no as something that happened far from their homes or cities. Knowing this affectations they would more compromise to help this cause, with a more ecological attitude like using less energy or recycling plastic something that is rarely seen in our Ecuadorian society.

A lot of scientist and people specialize in climate change is working on this topic making really huge effort to share his studies or works to the world to take them into account. The books I used were “Dire predictions”, “Atmosphere of hope” and “Huellas ecologica dentro del planeta tierra”. Some of them are working in the Antarctic (It is going to be mention later on paper) to recover data form the ice, CO2 levels of the ancient earth to compare with currents one and see if the human is prepare for the future. Other ones are creating solutions to high levels of carbon dioxide or methane in the air, trapping this product in different forms avoiding to be liberate to the atmosphere. Many people are into this, and they are compromise to change this reality.

This work is based on last 20 years of research about the damaging and solving actions of the climate change, mentioning actual problems, and it is made for the lector to see the whole view and make a difference to maintain the environment clean and healthy. Most of this text is based in 2 books (Dire predictions and Atmosphere of hope), both of them his last edition were published in the last decade, making this a recent work, with the most modern works, so it is not an obsolete text for its age of publication.

On text is going to be explained some important concepts like, climate change, and if it is a human or natural action. Later on it shows the consequences of our acts with the abuse of earth, and it is happening with the animals. More specific each environment that have planet earth, aquatic, terrestrial and atmosphere. At least solutions for this complication, at the begging of this chapter solutions to be practice at your life is going to show, and the last one is a geoengineering grand scale solution with a futuristic view because in the present is a little too complicated. But it not impossible so we need to make happen no matter what. (502)

Chapter I

What is climate change?

1.1 Definition

Before looking into the topic about climate change we need to know what it is, how and when did it start, because to make a real judgment, the person requires handling the concepts and building his own understanding of the idea.

Climate change involved the long-term changes in the weather patterns or increase in a global average temperature, in a certain region, warming persists over the years and could affect different ecosystems. There are many causes, one of the most accepted is the rising concentration of carbon dioxide, and this chemical element came, in the majority of cases, from fossils fuels that are burning all around the globe. Scientist have seen several patterns of changing since the 19th century, it´s called, from this year, climate change.

Another concept we need to manage is the greenhouses effect. Becerra and Mance (2009) affirm: “Greenhouse gases is a gas that can absorb infrared radiation from earth's surface, and reflect to the atmosphere and go back to earth and later return to the space, the energy warms the surface of the earth creating greenhouse effect” (p.45). The majority of chemical components intervening in this process are carbon dioxide, methane and water (ozone, nitrous oxides and fluorinated are others elements).

This have an effect on the temperatures of earth over the years, concentration of these gases is what drive us into the climate change in earth’s history. Something interesting about the intervention of the greenhouse gases over millions of years in earth is when our planet is warm through his lifetime the accumulation of those gases increases but when it is cold, it decreases.

Now we are facing a dangerous increase of the level of the greenhouse gases, we know all that because the earth was collecting these samples over millions of years through the ice, in Antarctic scientist drill out the cape of ice and observe molecules of carbon dioxide trapped in the ice, this is how we know the real proliferation of those gases. They have found "These ice cores reveal the unambiguous human effect on atmospheric composition, three gases carbon dioxide, methane and nitrous oxide have been rising at dramatic rates for the last two centuries" (Mann & Kump, 2016. p 31), this is something to be concerned.

1.2 How does it begin?

In all eras the earth has experience an increase and decrease in his temperature because of different factors environmental or external, but now the reason of this global warming is because the human been and his commercial activities such as industry, transportation or use of energy. Usually scientist regard part of the 19th century as the start of the activities that influence the climate. (Mann & Kump, 2016)

Experts agree that the Industrial Revolution was the turning point when greenhouse gas emissions that entered the atmosphere began to rise. The Industrial Revolution originated from smaller revolutions: agriculture, technology, demographics, transportation, finance, creating a new model of production and consumption.

From then on, population growth (in 1750, there were less than 800 million people on Earth, while we are now more than 7.5 billion), exploiting the use of resources, increasing demand and energy production, mainly from fossil fuels, everything saw the planet enter what the scientific community has called the Anthropogenic period, a new geological age characterized by human impact on Earth..

The main cause of this new stage was the increase in the global temperature of the planet, which has increased by 1.1C since this period, although it is estimated that, the thermometer could increase by 2.7C even if national commitments to reduce emissions are met.

1.2.1 A natural beginning?

Some people say that the global warming is because of the earth, and his various change across earth's history, some people came out with an inaccurate theory called the "Medieval Period", they think that settlements in southern Greenland during 10th century were established because of a warmer temperature than now, also point to the fact that wine grapes were grown in parts of England in medieval times. Refute all this with this affirmation, "Simulations indicate that the peak warmth during mediaeval times and the peak cold during later centuries were due to natural factors such as volcanic eruptions and changes in solar outputs. By contrast, the recent warming made by influence of human" (Mann & Kump, 2016. p 48).

The fast changing of the weather in the earth can´t be provoke by a natural factor, what we see is not a natural cause, IPCC says that the origin is in the human activity, and they have a 90% of exactitude in this data. So, we know certainly that global warming had not to be associate as a natural change of temperatures, well as an effect of the degradation of the planet earth made by the humans.

1.2.2 Which are the principal causes?

The principal causes of the emission of greenhouse gases are various. Mann and Kump (2016) say: "The largest contributor to current global greenhouse gas emissions is the global energy supply sector (…) Most emissions are in the form of CO2, stemming from fossil-fuel burning and deforestation" (p.75). With these data, we can notice that humans have a serious problem with how they produce energy, which produces most of it and we are not doing anything

about it to change our habits and production of energy use. Fossil-fuel energy plants are still working in his max capacity in countries industrialized to be able to satisfy the needs of its consumers, which has high demand for energy to keep their factories producing.

China is the best example, now their plants of carbon and diesel don´t satisfice their need, so they are building nuclear plants which could be very dangerous for the near habitants. We do not see a real reduction of carbon dioxide, with the incorporation of renewable energy sources. The renewable energy does not have the technology to create the same amount of energy than non-renewable energies founts.

The other great evil of our life style is agriculture, which not only sends greenhouse gases but also poisons the earth and water by the use of pesticides. A big space is use for the cultivation of plants, which limit the growth of cities and towns. After a long manipulation the ground start to decompose and erosion, losing it value, could not become nothing more than a dessert, were anything could be used for any kind of activity.

The Great Barrier Reef from Australia have experience big changes in his biosphere because of the over of the environment in that area.

> In the 1960s and 1970s mining the reef for fertilizer and drilling it for oil were proposed. These threats led to reef´s legal protection. Despite the ban on drilling, fossil fuels have been conductions a lethal stealth attack on the reef. The first intimations came in 1970s, when some areas turned white. (Flannery, 2015, p.44)

White corals are a sign that the reef is sick, the high temperatures turned in this colors, Caused by the climate change inside the ecosystem. Whit this data we can notice that the damage to our damage is irreversible, all the petroleum we extract is now something the earth has lost forever, and all the activities to extract the fuel has now affect the areas around them,

it´s difficult to ensure that some parts of the planet can be replace with something that could be the same, all the deforestation and contamination of the petroleum is now irrecoverable. So all our effort need to be focus on stopping the activities that can destroy the environment and life of the animals.

Face all those big troubles are huge problem, so the need of create new forms of reverse our future is now a necessity for our survivor in this planet. If those principal causes of producing greenhouse gases the earth would become uninhabitable. (1300)

Chapter II

How is affecting the environment?

2.1 Damage to environment

Before talking about all the topics about damage to earth, the first thing we need to do is defining what it is the damage to environment in a technical aspect, Mann & Kump (2016) say:

> For environmental damage to occur as a result of a human activity, there must be a pathway linking potential releases of possible contaminated waste and sensitive receptors in the environment. The pathway is usually a gravitational liquid flow, the harmful release being in the liquid phase and the receptor being an aquatic ecosystem.

All the industrial activity that extract and generate waste, can produce a damage to the environment because it has different chemical components that change the natural cycle of the decompose of the organic and inorganic materials. It can fell ill or kill an incompatible organism, all around the world they can be seen, as an ecological footprint made by the human been where ever he sits and live.

Now that everything is said, we can explore how the different parts of the earth, atmosphere, ground and aquifers are transform and murder by the man development. Every layer is damage in a different way, because our waste is released in different forms, a good example can be found in cars, CO2 produce by fossil fuel is liberated to the atmosphere causing all the troubles mention before, and oil that can be watered from the tank falling on the ground filtered to groundwaters, poising our potable water. So, every part needs to be described in separate parts.

2.1.1 Damage to terrestrial environment

The diversity of species on planet earth todays is the consequence of millions of years of evolution interaction between life and its surround. Human actions are recent, and powerful, which some liken to the forces that led to mass extinctions of life in the past, such as the asteroid impact, that happened 60 million of years ago. Human are leading the world to an imminent extinction. The real damage is told later on.

2.1.1.1 To the Soil.

The principal change in soil forming factors are biomass production of organic matter supplies, soil temperatures and soil hydrology, and this is made by shifts in rainfall zones, as well in evaporation of water in some areas. Soil changes because of the rise in sea levels resulting from the warm climate in Antarctic, making ice cap melting into the oceans.

The biggest single variation in soils as the a receiot of this postulated forcing change would be an improvement in fertility and physical conditions in humid and sub humid climates, making those zones the only area suitable for cultivation.

2.1.1.2 To living being.

Now days, the 38% of animal species are in danger, this is causing by different ways, the destructions of natural habitats and poaching are the main reasons, at present the climate change, doesn't look as a principal cause of the extinction of the animals, but it would grow in few years, but despite that is doing a lot of damage in the life of land animals.

AT the moment climate change has affect birdlife and animals, birds are laying eggs sooner than before, plants are blooming earlier, and mammals are waking up from their hibernation sooner. Distribution of species are affected too, animals are moving closer to the poles because of warmer temperatures, bird's migration and nesting is earlier year to year, and the

nesting grounds are closer of their habits so they don´t move enough for properly nesting, and theirs breeding don't have appropriate environment for growing and leaving the nest.

2.1.2 Damage to aquatic environment

2.1.2.1 To aquifers

The water cycle in earth depends on the temperatures of the environment, so it is not surprising that the planet rising fever is having a huge impact in the way that water move around the world, different scientist agree that this affect all the types of water. (Flannery T, 2016)

The temperatures rise and even more water evaporates from rivers, lakes and oceans and it held in the troposphere. Warm air hits these clouds and provoke heavy rainfall. More rain than snow or ice this leads to extreme flooding in coastal communities around the world.

2.1.2.1.1 Oceans.

Only 13% of the world oceans remains untouched by the damage of human, climate change is damaging artic wilderness areas protected by ice in 1970s had now been lost because of the high temperatures and the melting. Recent studies estimate that oceans increase 63 percent about the store heat in the climate system from 1970 to 2011.

In the oceans we have currents that change the climate or the stations, and it had been altered by the alarming warming of the sea, if the water is hotter it can alter not only his ecosystem, if not the entire earth, because all the animals and plants depend on seasons to change their skins, to reproduce and even eat.

2.1.2.1.2 Rivers and lakes.

As air temperature increase water do so, specific in shallow stretches of rivers and surface water of lakes. This aquifer may become unsuitable for cold water fish and support fishes from warmer waters and some of them are moving to higher latitudes.

When stream flow peaks earlier in the spring owing to warmer temperatures, low stream flow begins earlier in the summer and lasts longer in the fall. These changes stress aquatic plants and animals that have adapted to specific low-flow conditions. The survival rates of fish such as salmon and trout are known to diminish when water levels in rivers and streams are dangerously low, for example. That's partly because bears can snag spawning salmon more easily in very shallow water, as the salmon struggle upstream.

2.1.3 To atmosphere

The human has impacted the earth´s atmosphere in a very terrific way, keeping this topic in a major ecological issue politics, and present a huge problem that could be damaging the earth for centuries. Flannery (2016) affirms: “Even if humans quit polluting the, it still could take more than a century before the air clears. Atmosphere pollution affects the Earth for the long-term. Pollution will last well beyond the humans alive on the planet today”.

Looking at this affirmation the damage to the atmosphere is clear, and the problem is enormous. The air pollution is part of this, carbon dioxide release in the air creates ozone molecule at the ground, making the people develop different difficulties to breath, and can damage the lungs in a long term.

2.1.3.1 *Ozone depletion.*

It is an event that is study since 1970, a research about the four percent in the total amount of ozone in earth, and the much larger deflation around the poles. The main reason about it is the use of chemicals. In 1985 scientists from British Antarctic survey find out that something was

destroying the ozone molecules, creating a huge hole in the ozone cape. They make a research to find out what was doing that type of depletion, and discovered that chlorofluorocarbons were the main reason, so in 1987 countries from all over the world signed a protocol in Montreal to discontinue the use of CFCs. Until now we are using this type of materials on our packeting and normal use aerosol, but this agreement reduces significant the production, after 30 years we are looking at this progress. (1215)

Chapter III

Solutions

3.1 Simples Changes

If all this talk about energy sectors and the governmental buy-in leaves you feeling helpless in the face of global warming, don´t let it, our lifestyle choices can directly aid in the mitigation of greenhouse gas emission. Often, these are no regrets changes that have positive side benefits, improving our quality of life conserving natural resources and fascinating greater environmental sustainability.

The thing we can do is change our lifestyle in different ways. First we can more efficient in our use of energy. We can make home improvements that decrease the energy we use to heat and cool our houses and apartments. More efficient practices include better insulation, passive solar heating and using fans or opening windows for air conditioning. We can replace inefficient incandescent light bulbs. An important recent trend involves smart houses, where thermostats can be programmed and remotely controlled for maximum efficacy, where occupancy sensors can be used to minimize the unnecessary use of lightning, and smart power strips eliminate phantom energy by automatically sensing power use and reducing the power drainage by appliances in standby mode. There is also significant mitigation opportunity ¿ in simply being better about recycling.

There are other changes we can make that don't require that we remodel or even buy new appliance. Clotheslines make an excellent substitute for dryers, and unplugging appliances that are not in use helps reduce electricity leakage. We can make serious contributions to emission reduction efforts with our transportation choices (Becerra & Mance, 2009, p.145).

Many of us could commute to work by bike or on foot, for those of us who have difficulty finding time to maintain fitness regimes, this option allows for the best sort of multitasking, we exercise while our carbon footprints.

Other alternatives include public transportation and carpools. Hybrid and electric cars are another exciting new option. Given the high cost of gasoline in recent year, this option not only benefits the environment, but our pocketbooks as well. Employers, governments, and non-governmental organizations can play an important role, community focused organizations can provide relevant guidance and education to individuals.

Some governments already provide tax benefits and incentives for citizens who build green, add solar panels to their roof, or buy hybrid vehicles. Public outreach efforts can also include educational programs that teach energy conservation practices and campaigns aimed at encouraging individuals to make environmentally conscious decision. Of you want to know how well you are doing in terms of your own contribution to global greenhouse gas emission, turn to.

3.2 Geoengineering ¿A Grand scale solutions?

To begin with, we must understand what this word means that can lead us to a real change, and this says:

> Geoengineering is an alternative approach to mitigations that involves using technology to counteract climate change impacts either at the source level (something that increase greenhouse gas levels) or that impact level (offsetting climate change itself). Both approaches involve planetary scale environmental engineering that likes of which society has never before witnessed (Kump & Mann, 2016, p.106).

One source level geoengineering proposal, called iron fertilization involves adding iron to Upper Ocean. Iron is a scarce nutrient in the upper ocean. This scarcity of iron limits the activity of marine plants that live near the ocean surface.

Some scientists think that iron fertilization can increase the rate at which plants in upper ocean take up CO2, thus boosting the efficiency of deep ocean carbon sink, and offsetting the buildup of carbon dioxide in the atmosphere. However limited experiment suggest that iron fertilization would simply speed up cycling of carbon between the atmosphere and the upper ocean, with little or no burial of carbon in the deep ocean. And there could be negative side effects if humans interfere further with the complex and delicate ecology of the marine biosphere.

Other geoengineering approaches include attempts to increase the efficacy of terrestrial carbon sinks by planting more trees and greening regions that are currently desserts. Many consider this approach more environmentally friendly than other schemes, but it is unclear it could be accomplished on the scale required to significantly offset human carbon emissions.

Closely related to regional greening plans are carbon capture and sequestration approaches. In CCs approaches, carbon is extracted from fossil fuels as they are burned preventing its scape and buildup in the atmosphere.

The captured carbon is then buried and trapped beneath earth's surface or injected into the deep ocean, where it will likely reside for many centuries. One potentially effective CCs scheme would involve scrubbing CO2 from smokestacks and reacting it with ingenious rocks to form limestone. This mimic the way that nature itself removes CO2 from the atmosphere over geological timescale. Klaus Lachner of Columbia University argued for related

alternative, in which massive arrays of artificial trees take carbon directly out of the air and precipitate it in a form that can be sequestered.

A frequently proposed impact level geoenerring approach involves deliberately decreasing the amount of sunlight reaching earth's surface so that the reduction in incoming radiation offsets any greenhouse warming. One method involves deploying vast solar shields in space that reflect sunlight away from earth. Shooting sulphate aerosols into the stratosphere to mimic the cooling impact of volcanic eruptions is a less costly but potentially more dangerous alternative. This method could exacerbate the problem of ozone depletion by tampering with the chemical composition of the stratosphere.

"While calculations suggest that either of these impact level methods could offset greenhouse warming of the atmosphere, each has problem. First, they do nothing to avert the problem of ocean acidification associated with increasing atmospheric CO2 levels" (Kump & Mann, 2016, p.98). Furthermore, climate models indicate that reducing the incoming solar radiation, while potentially offsetting the warming of the globe, would not necessarily counteract the regionals impacts of greenhouse warming. Some regions might warm at even greater rates.

Each of the proposed geoengineering schemes has possible shortcoming and poses a potential danger. Some advocates maintain that if we are backed into a corner and graced with the prospect of irreversible and dangerous climate change, we may need to resort to these schemes at least as partial solutions. Either way, the debate over is likely to be an effective and prudent solution to climate change is bound to continue as scientists continue to propose new technology to address climate change problems. (1051)

Conclusion

With all this said you can conclude that many of the activities human made in the last two centuries are irreversible, which have already caused an irreparable damage, such as the extinction of specimens of both animals, insects and plants. The damage to the chemical composition of the earth and atmosphere not only affect this, but complicates the life of the living beings that inhabit them, causing diseases and even death. For what man provoked is something that affect us all, so humanity itself must commit to solve the problem and damage the environment.

In order to remedy this problem people must follow certain tips that several investigations have borne fruit, because sometimes common sense is not best to follow so you should research on how to make these positive changes for well-being environment. These changes in life can be a bit sacrificed, but the Fruits will be rewarding. Also the best way to follow this way of life is spread and train the people around you so that they also follow it, with that the magnitude of your help will be greater than what you used to do. Grand scale solution is a good path to follow, because in actual times, the climate change got bigger and bigger, geoengineering is one of them, and the humanity would need to put all her effort to make it possible or our future would be catastrophic.

The message of this work is to teach the public in the most didactic way about the different things that are handled when saying climate change, since the terms are often misused and can lead to misinformation. That is why I explain the different concepts of climate change clarifying the doubts of the general public, then I present how this term was created and also if it is an ecological or human cause. Further on, we see the true changes of climate change in ecosystems, and of what this is so irreversible, this tool is also used as awareness so that the

reader feels that he needs to do something about it. Then find the solutions to this big problem and realize that n is so difficult to do well. (360)

Recommendation

After everything read and reconsidered throughout the text, you can feel a degree of social responsibility with yourself and the surrounding environment, because the human being is not a lonely being in a broad universe, but an element of the society and that must support in the same, with the minimum actions. In order to find yourself in harmony with yourself, in addition to having a healthy environment for your development you will experience a better life, you will develop in a faster and more agile way. All this not only refers to life with others but with all the elements of life such as planet earth and its different tenants.

The changes are difficult and in several bad occasions, but they are not always irreversible, we cannot stand idly by the problems experienced by our environment, our other part of our life itself. We cannot let her die and she is sick because our life depends on herself, if she is well with us too. That is why we have to make a significant change in our lives because small things do not solve things but people who are rebellious before the system and fight for their principles and beliefs before anyone who wants to silence them. (209)

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