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CO_2 – Sustainability: between "fake news" and growth opportunities

Global economic development is gradually moving into a new paradigm both, on one hand, by the positive evolution of the stock markets in 2019, which for many stocks are based on the rise in multiples (Price-to-Earnings Ratio), whose levels will have to be supported by a recovery in corporate profit; and, on the other hand, by the positive impact that structural changes in production/consumption linked to our footprint on the environment in general will have on growth.

CO2, carbon dioxide, is mainly used by politicians to demonstrate the impacts of climate change. Human activity, however, combines many "unnatural" factors in the normal evolution of our climate.

I would like to start 2020 in an optimistic manner by using the following remarks as an attempt to broaden a debate that seems to me to focus the attention of the parties involved on a specific factor and not to consider the broader implications of a population explosion.

Confronting natural evolutions and the impacts of human activity

Does human activity have a specific impact on the evolution of the environment?

For some, humans are part of the development of our Earth system with a beginning and an end that is applicable, as are all the living species that have existed, subsist and that will develop in the future. For others, human activity was part of a specific evolutionary process that led to its extinction. There are also those for whom human society has an assertive stance and is going through a necessary transition phase arising from consideration of the ecosystem in which it evolves and the natural interactions that it must integrate into overall development in order to give itself a desirable future.

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Estimates made in terms of natural evolution put the age of the Earth at 4.54 billion years. The presence of humans, according to different sources, represents only 0.04% (Homo habilis – two million years) of this development span. The first industrial revolution, which can be considered one of the inflection points of "deviant" climate development, began at a point representing barely 0.025% of the time of human presence itself. If we reduce the Earth's age to 24 hours, the new industrial revolution began 0.004 seconds before midnight.

This tiny amount of time should not represent a significant empirical natural climate change of the planet. On one hand, those defending "human non-involvement" in what is currently taking place point to the activity of the sun, the inclination of the Earth's axis, the modification of the Earth's orbit in its evolution around the sun, and the change in the magnetic field, as the main arguments.

Those who believe there is a link with human activity highlight the increase in CO2 in the atmosphere. Consideration focused solely on this point may seem somewhat "simplistic" in explaining a set of modifications that interact to accelerate a natural process of climate development, since such an approach means evades several other elements of the said human activity that are more harmful than the CO2 increase alone.

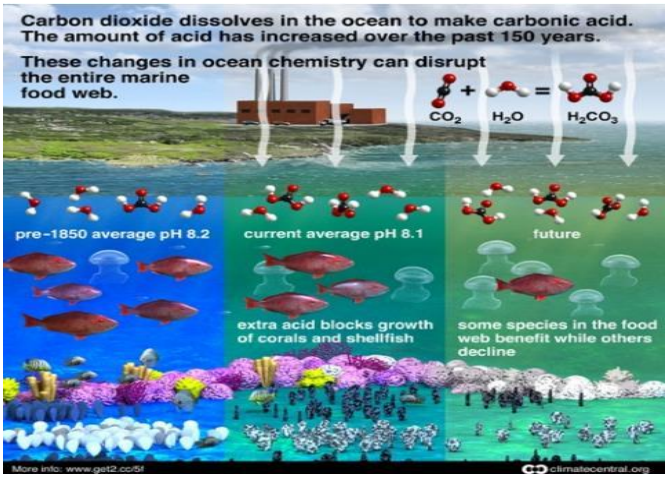
I would like to point out specifically that, from a purely financial perspective, humans act on a "ranking" and power-seeking basis in relation to their fellow human beings. This leads to systematic eradication of primary forests; the annihilation of soil fertility through exposure to chemical product "fertilizers"; as well as water pollution. The latter is generally due on the one hand to micro-plastics and the dumping of chemical products; and, on the other, to the acidification of the oceans resulting from an increase of CO2 in the atmosphere, as well as the annihilation of living species (the sixth extinction) with a related loss of biodiversity.

Ocean acidification

Excess CO2 changes the chemical composition of our oceans. As the pH decreases, the oceans become more acidic. The pH changes so rapidly that organisms, which normally benefit from the nutrient CO2, do not have time to adapt to the new conditions. Everything is connected in the ocean, as is the case in nature as a whole, and this specific acidification has a major effect on the food chain. The behaviour and development of interactions are no longer in line with an evolution over time of the formation of our ecosystem in general.

The exact consequences of these changes in pH are obviously still uncertain in their general scope, and a more acidic ocean does not mean that all marine life will disappear. However, the scientific consensus is that the increase in seawater acidity estimated at 30% is already affecting many marine organisms. If this acidification continues, some species will become scarcer, while some are already reaching the stage of extinction. Not to mention the "helping hand" of humans who are commercially overfishing all depth strata.

The image below visualizes the impact of the increase in CO2 in the atmosphere on marine fauna and vegetation, and the ensuing modification of the marine ecosystem.



Source: www.assets.climatecentral.org

Nature's time, human time, financial time

Time is a notion that allows human beings to quantify various criteria according to multiple parameters. The age of the Earth, economic growth, economic and financial performance, development of production, etc.: compared values are used to report on changes, or evolutions during the reference periods.

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The age of the Earth is part of a relative time of evolution that goes beyond the simple measurement of 24 hours a day. The whole of evolution is subject to this indefinite measure.

Human time depends on life expectancy defined at birth, which is 82 years on average for a European citizen. This has evolved by more than seven years since 1982. Nevertheless, it is structured around a 24-hour day and develops for each individual between

childhood, adolescence and active adulthood, which ends with the age of retirement from all professional activity. It is during this period that humans must structure the coverage of their own needs, both in terms of production and consumption and the coverage of their present and future needs. This period generally remained more or less in step with the evolution of a person's environment.

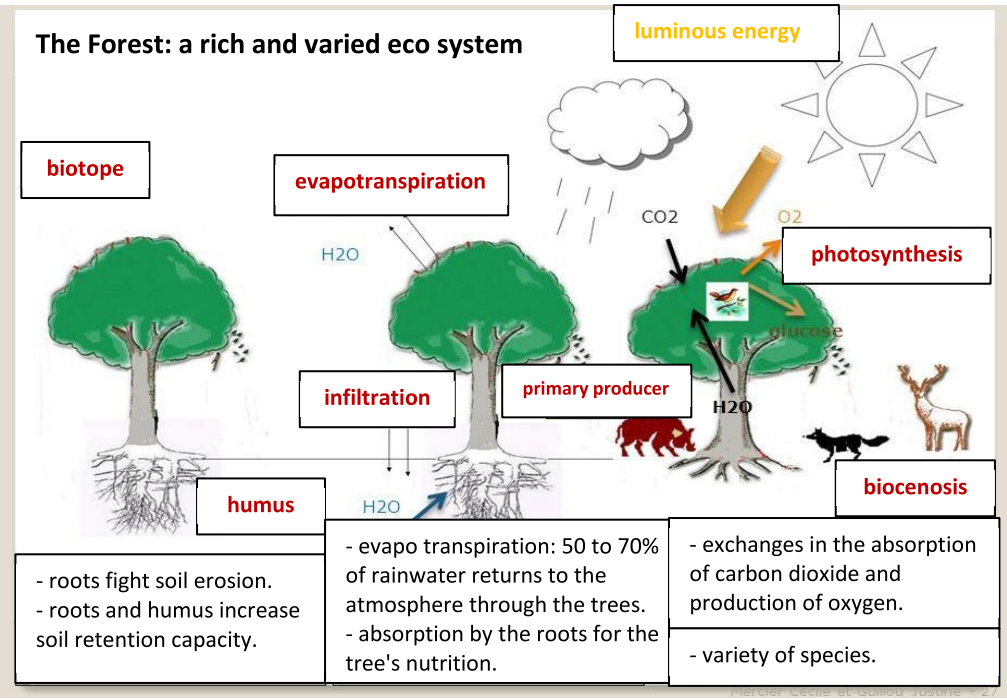
Financial time was initially in congruence with human time in order to allow people the means of building the production/consumption system required to cover their needs. Income surplus was directly allocated to savings, which were in turn made available to the real economy to invest, amortize and remunerate these savings and allow investment in all forms applicable to the life of human beings. However, the search for accelerated profits led finance to deviate from the concept of savings/investment to create high-frequency financial trading machines.

A stock market transaction can be carried out in less than 500 microseconds, allowing for up to 1,000 transactions per second. On the one hand, human beings evolve in an environment in which activities are accelerating climate change, making the framework conditions for living in our time more complex. On the other hand, this same human being shortens this development time through technologies that are no longer in line with Nature's time and diverts the savings that allow the real economy to continue its construction of a desirable universe.

How forest cycles influence the atmosphere

Forests are essential to balancing the planet's atmosphere. They represent carbon sinks that are essential for life on Earth, and at the same time enrich soils and protect biodiversity, as well as regulating humidity and rainfall.

The following diagram shows the biomass of the world's forests in tons per hectare:

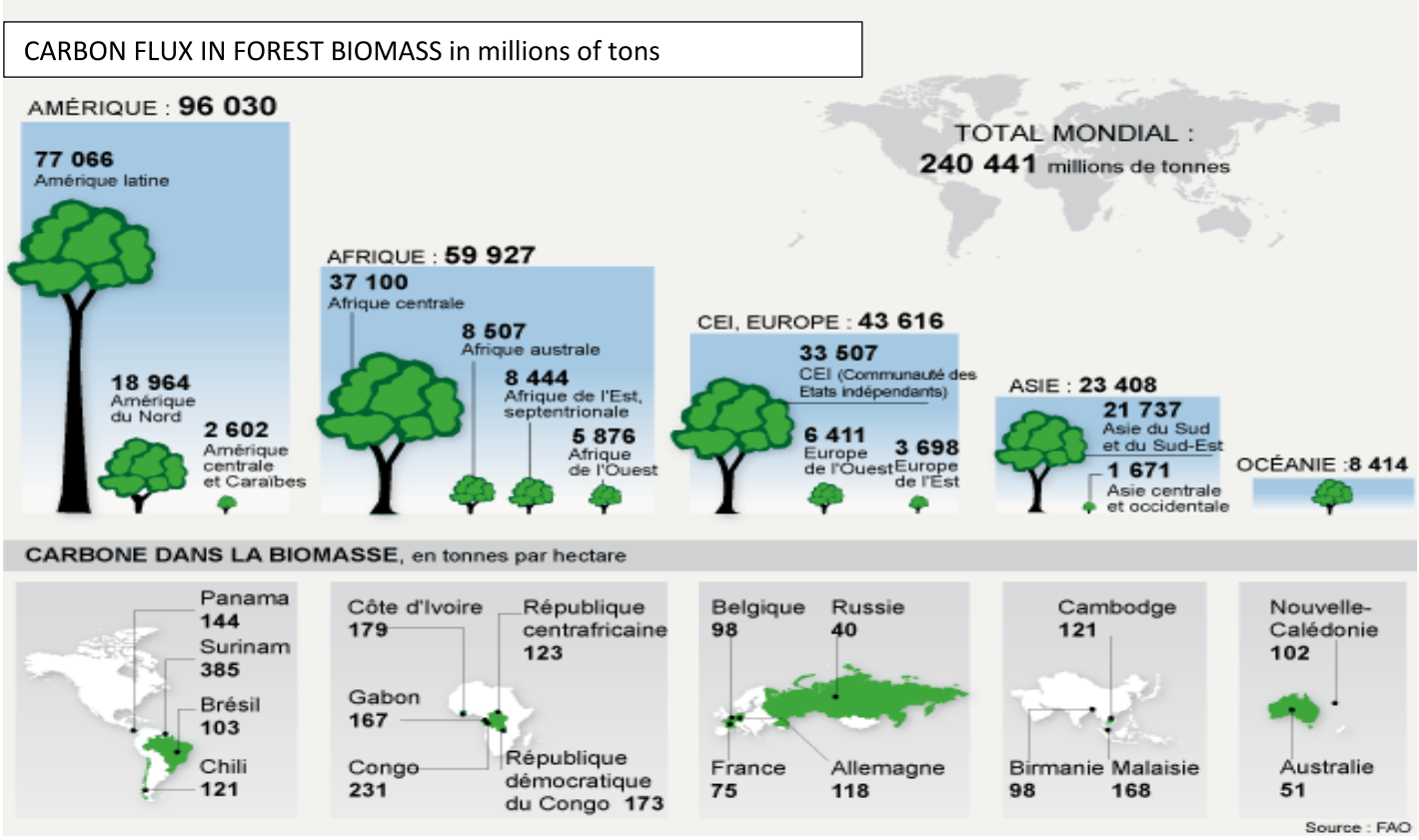


The diagram on the next page demonstrates the importance of a forest's ecosystem:

Eradicating forest areas leads on the one hand to a reduction in CO2 consumption; and on the other to a decrease in oxygen production, damage to biodiversity, impoverishment of the soil and a loss of natural protection in general. Above all, it reinforces a negative cycle of increasing global warming.

The impact of agriculture

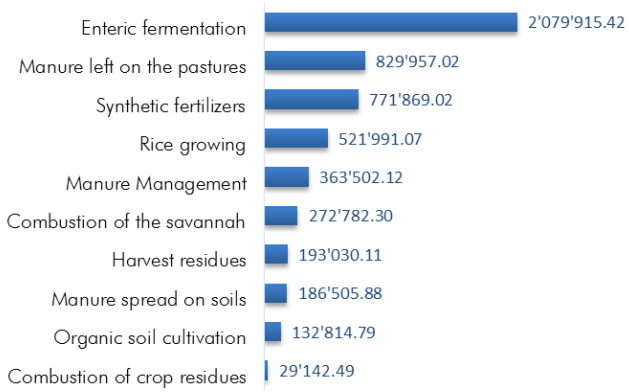
Agriculture emits two main greenhouse gases: methane (CH4) and nitrous oxide (N2O). Methane, 28 times more "warming" than carbon dioxide (CO2), comes from cattle flatulence ("enteric fermentation"), animal excrement and rice fields. Livestock farming is the largest source of agricultural emissions in the world: 39% in 2011. As for nitrous oxide, whose warming power is 310 times greater than that of CO2, it is released from the spreading of mineral and organic nitrogen fertilizers. On top of that, there is the CO2 emitted by tractors and other agricultural machinery.



The hunter-gatherer was fully integrated into Nature's time so as to satisfy his own needs. Today's humans have developed chemical production accelerators and are multiplying unfavourable elements in relation to the natural development with regard to covering their nutritional needs, as it is considered that these have gone beyond the simple need to feed oneself.

The graph below shows the different sources of greenhouse gas emissions in gigagrams per year:

Origins of global emissions in 2012 in Gigagrams of CO2 equivalent



Source : https://reporterre.net/Climat-l-agriculture-est-la-source

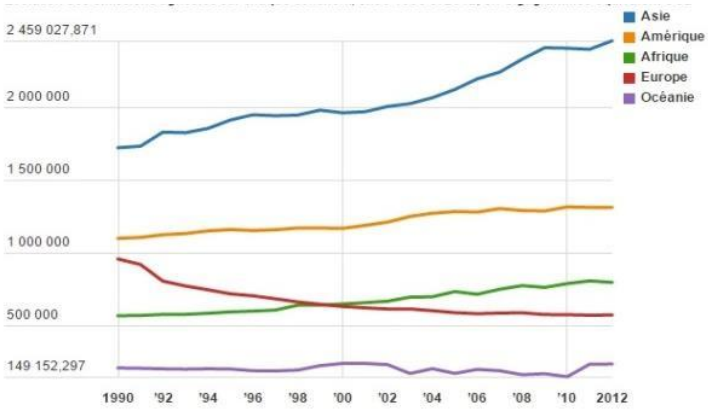
As can be seen in this graph, agriculture is complex in its interactions with the environment and cannot be excluded from the alternatives to be developed to make the latter less "harmful" to the environment.

India and China are the world's largest emitters of agricultural greenhouse gases (GHG) (source :FAO).

The evolution is directly proportional to the population of these two countries.

Evolution of agricultural emissions

Evolution of agricultural emissions on each continent, between 1990 and 2012, in gigagrams of CO2 equivalent



https://reporterre.net/Climat-l-agriculture-est-la-source

The annual increase of nearly 90 million people on the planet is not consistent with reducing nutritional needs and has significant collateral effects in terms of the need for agriculture to support this evolution.

It should be noted that it is difficult to accurately evaluate greenhouse gas emissions in agriculture. The biggest challenge is to define emission factors that are close to reality in order to better assess the adjustment measures to be considered.

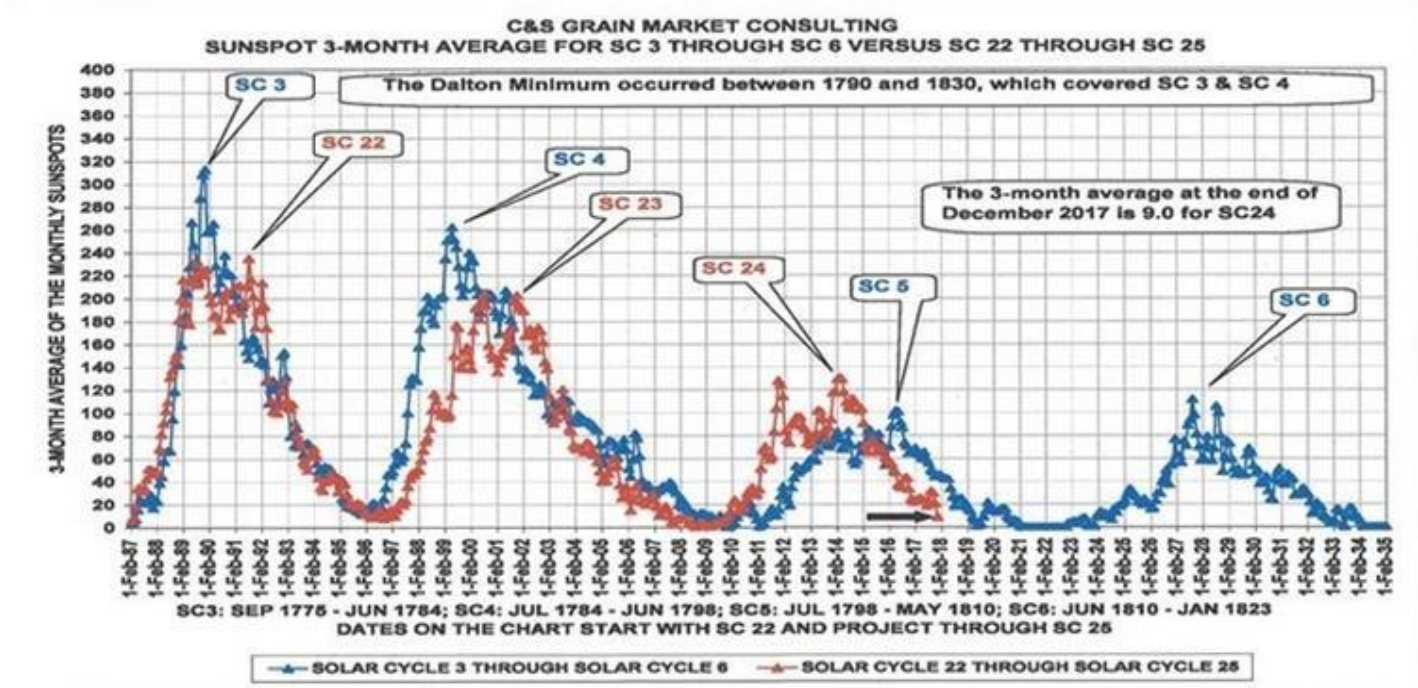
Solar cycles

Solar cycles last 22 years on average: 11 years that lead to a maximum and another 11 years that lead to a minimum, after which a new cycle starts. It is common, however, to refer to an average 11-year solar cycle, expressing the time it takes from the beginning of the cycle to its maximum. We are currently in the solar minimum, between Cycle 24 and Cycle 25. The first scientifically documented solar cycle began in March 1755. The conditions we are experiencing today mean that we are tending towards a cooling, rather than a warming cycle. This reality is therefore contradictory with the argument that the current solar cycle reinforces global warming. Solar cycles seem to be influenced by sunspots that appear and disappear from the surface of the sun. These sunspots are solar flares, whose temperature differences with the sun cause them to appear black from the Earth.

Solar flares project different waves into space that reach the Earth. Some can disrupt terrestrial radio transmissions and cause the aurora to appear by interacting with the Earth's magnetic field and the upper atmosphere. Below is a graph showing the contemporary period and a historical period that has recorded a long period of cooling which has impacted life on Earth. These data relate to the current cooling period.

Evolution of the Earth's orbit

As mentioned earlier, the relationship between the climate, the Earth, and the sun does not need proving and is indeed self-evident. Climatic cycles, which are primarily driven by variations in the eccentricity of the Earth's orbit, occur approximately every 100,000 years. This duration is unequivocal and goes far beyond the current period that has been running since the first



The previous graph shows a three-month moving average of sunspots since 1749. Sunspot cycles have ranged from 106 to 168 months and have lasted an average of 133 months. The size and magnitude of earthquakes and volcanic activity around the world and the low solar magnetic energy emitted by the Sun as SC24 and SC25 reach their minimums are likely to have a negative impact on global temperatures over the next 20 years. Note how each progressive series of solar cycle comparisons SC3-SC22, SC4-SC23 and SC5-SC24 has shown and continues to show declining sunspots. So far, the overall correlation of the three-month moving average of monthly sunspots for SC3-SC5 relative to SC22-SC14 has averaged 85.94%. Source: http://www.skyfall.fr/2018/02/22/previsions-pour-le-cycle-solaire-25/

industrial revolution. This period is far too short to directly affect the climate.

Change in the Earth's axis

Since the year 2000, the North Pole has taken a new direction and is no longer heading towards the Hudson Bay in Canada, but rather towards Greenwich in England, following the imaginary line that bears the same name.

Two factors related to global warming are given to explain the accelerated shift in the planet's rotational axis. With regard to the first factor, when an area is free of ice, the Earth rises, affecting the rotational axis. This is defined as a glacial rebound. In terms of the second, certain water tables have dried up and water reservoirs (artificial lakes) have been created.

These changes have affected the distribution of planetary weight, which has changed its rotational axis. (source: weather.com)

Although not directly pointed out, the fact of extracting more than six billion (6,000,000,000) tons of coal, 33 billion barrels (1) of oil and 100 billion cubic meters of gas(1) from the subsoil every year means that human activity weighs on the Earth's crust or, on the contrary, relieves it of a burden, depending on the relative positions of existing holes and those being exploited. These extractions modify constraints and can enable ruptures that lead to earthquakes. What are the impacts in relation to the distribution of the planetary weight and an accelerated change of the Earth's axis?

Modification of the magnetic field

Variations in the Earth's magnetic field are attributed to a single cause, which is the convection motion within the liquid metal core (iron and nickel) of the planet. To explain the variations over time, changes in the circulation within the core are invoked. This concept, which has been adopted by scientists, seems to be of little use in explaining the complete reversals of the Earth's magnetic field.

Another study links climate and the magnetic field.

["Climate is significantly influenced by the Earth's magnetic field, according to a survey done by two Danish geophysicists and published by the American journal Geology.

The two researchers, Mads Faurschou Knudsen of the Institute of Geology at the University of Aarhus and Peter Riisager of the Geological Survey of Denmark and Greenland (GEUS), compared a model of the Earth's prehistoric magnetic field with climate data from stalagmites and stalactites in China and Oman. The comparison, according to the authors, shows that the amount of precipitation in the tropics has been influenced by different changes in the Earth's magnetic field over the past 5,000 years. These results support the controversial theory launched ten years earlier by Danish astrophysicist Henrik Svensmark, that climate is influenced to a high degree by cosmic radiation from space that invades the Earth's atmosphere.

"There is a close relationship between the amount of rainfall in the tropics and the strength of the magnetic field, " co-author Faurschou Knudsen told the Danish scientific journal *Videnskab*. However, he pointed out: *"this study cannot be linked to the global warming observed over the past 150 years... "].* Source: Agence FRANCE PRESSE, January 12th, 2009

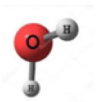
The eradication of primary forests leads to a change in rainfall, which influences the climate.

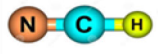
The units of a whole

In 1869, Russian chemist Dimitri Mendeleev developed a system for classifying chemical components according to their atomic mass: the "periodic table of chemical elements". At that time, it only contained 63 elements. Back then, this required a significant inventory effort, since only a few dozen simple chemical elements (mainly metals) were known to humankind 200 years earlier. Today, 118 essential chemical elements make up the table used by scientists around the world.

What does this have to do with the impacts of human activity on the planet?

Every isolated element has specific properties. When combined, they can represent:

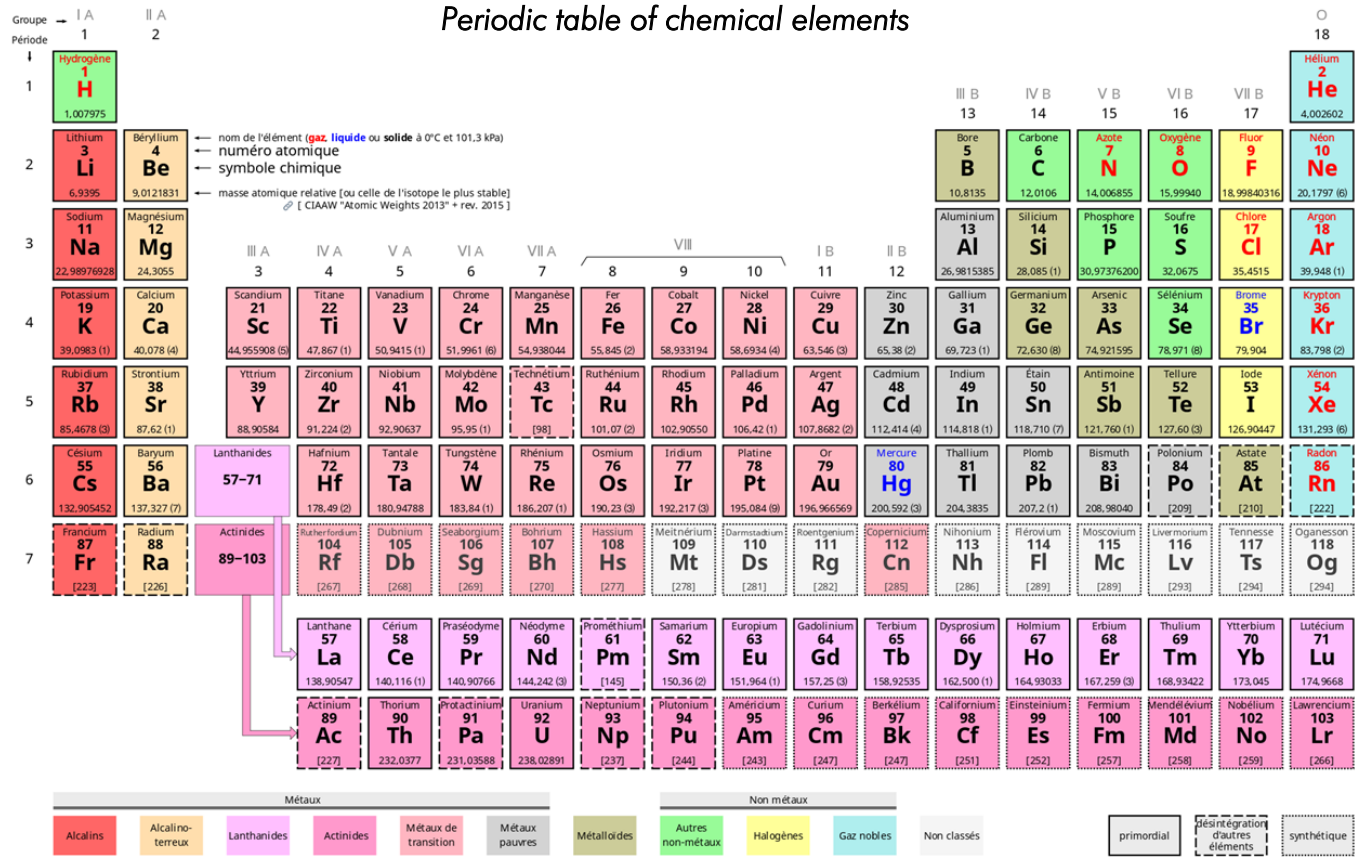
life: water 

or take away life: hydrogen cyanide 

As can be seen from these two compound elements, hydrogen can, depending on its entanglement, be either positive or negative.

For more than 150 years, humans have been extracting from the Earth and transforming elements that have taken up to several million years to materialize, such as oil, coal, etc.

Periodic table of chemical elements



These same elements are decomposed and assembled to form different biological constituents that interact with the natural environment and the development of life.

The accumulation in the environment of so many elements that are not integrated into the natural evolutionary cycle of the planet leads to dysfunctions which, when taken together, create dysfunctions in the natural cycle of the physical evolution of the planet.

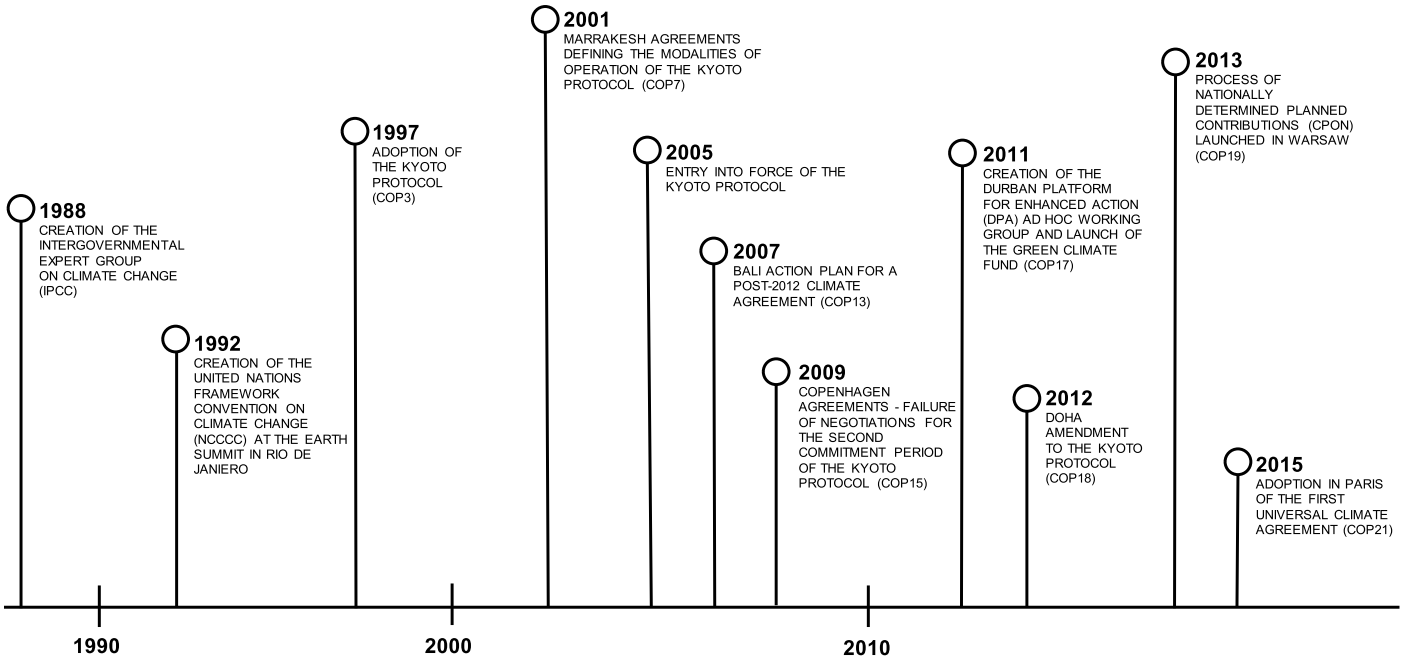
The reconstruction of natural cycles is a necessity in order to guarantee the construction of sustainable economic development.

Lengthy political negotiations

The United Nations Framework Convention on Climate Change, known as the "UNFCCC", was adopted during the Earth Summit in Rio de Janeiro in 1992. The Framework Convention is a universal convention of principle that recognises the existence of human-induced climate change and gives the primacy of responsibility for combating it to industrialised countries. The Conference of the Parties (COP), which is composed of all "stakeholder" States, is the supreme body of the Convention. It is held annually at global conferences where decisions are taken to reverse ongoing climate change.

States, in adapting to their ambitions and capacities, have committed themselves to action.

The COP brings together government representatives from all the countries which are signatories to the UNFCCC. Although the subject is technical, the issues at stake are also political and economic. International organizations can take part in the COP as observers, as can NGOs (non-governmental organizations) and representatives of civil society. They then participate in open meetings (plenary sessions and contact groups).



The above table shows a few key dates (1988-2015) of the negotiations.
Source ©Guide des négociations de la Cdp25-Climat, OIF/IFDD, 2019

The Kyoto Protocol (KP) was adopted in December 1997 at the end of the Third Conference of the Parties (COP3) and its operationalisation modalities were established within the Marrakech Agreements in 2001 (COP7). Its entry into force became effective on February 16th 2005.

It took 23 years of negotiations for 196 States to adopt a new "universal" regime and sign an agreement at COP21 in Paris. The Paris Accord is an international agreement that is binding on all States that have ratified it, by adapting to their climate ambitions and

capacities. Adopted at the end of COP21, it has the status of an additional protocol to the UNFCCC. With the main objective of containing the rise in the average temperature, compared to pre-industrial levels, well below 2°C, and limiting it as far as possible to 1.5°C, the Paris Agreement also aims to strengthen adaptation and resilience capacities in the face of the effects of climate change, as well as the implementation of financial flows adapted to these objectives.

In adapting to their ambitions and capacities, States have committed themselves to action. These terms demonstrate non-binding limits. To contain the rise of the average temperature relative to the pre-industrial level is ambitious and the notion of average leaves *a broad spectrum of action, without any obligation to achieve the intended objective.* ***Resilience to the effects of climate change*** implies taking concrete measures that can only be effective to the extent that the economy makes it a lever for development. To do so, the aim is to steadily increase nationally determined contributions in order to achieve a balance between anthropogenic emissions by sources and anthropogenic absorptions by greenhouse gas sinks during the second half of the century.

If we still needed convincing of the impact of human activity on the development of a hostile environment to its evolution, the following image is symptomatic of an evolution which shows increasing floods on one side and on the other a progressive desertification of areas that were still recently cultivable.

The following image is quite significant of the inevitable evolution of the environment in which humanity is likely to find itself:

Work of Isaac Cordal, street artist of Spanish origin

It's not just about CO2

CO2 is one of the elements highlighted in the "fight" for the survival of our environment. As we have seen, it is the nutrient of all vegetation, and its increase alone cannot explain what is happening in front of us. The latest forest fires in Australia (2020) have led to at least 27 deaths at the time of writing. This has been identified as a catastrophic consequence on humans. But what about the eradication of a billion animals? This is the paradox of our time. What are the values of our society? One of the causes of CO2 is the combustion of fossil fuels that have been building up in the environment over tens to hundreds of millions of years. In less than two centuries, we will have eradicated the "stocks".

But these same fossil fuels are used for a variety of other purposes. From agriculture to consumer goods, to utilities, to real estate (insulation), etc. At the end of a life cycle, these materials end up being discarded in nature or burned in their current state. It is estimated that each year, according to The Sea Cleaners, nearly eight million tons (8,000,000,000) of plastic waste is dumped into the oceans. These end up as micro-particles that are ingested by marine fauna. This plastic waste alone is said to cause the death of 100,000 marine mammals each year, and more than 1,400 marine species have already been impacted by this scourge.

According to the World Economic Forum and to the Ellen MacArthur Foundation, 32% of plastic packaging waste ended up in nature in the year 2016 (15% recycled, 25% incinerated, 40% landfilled and 20% uncontrolled in nature). Five Southeast Asian countries are responsible for 60% of the ocean's pollution, (Asia is responsible for 80% of ocean pollution), 20% of the oceans' pollution comes from rivers and the 20 main rivers account for 67% of this pollution. The most polluting are the Yangtze, Yellow, Xi Jiang, Hai He, Amur, Indus, Nile, Meghna, Niger, Mekong, and Pearl Rivers. Source : River Plastic Emission to the World's Ocean

In the Mediterranean alone, an estimate 280 million tonnes (280,000,000,000) of plastic micro-fragments that are floating in the Mediterranean according to the records of the "Mediterranean at Risk" expedition conducted off the coasts of France, Italy and Spain in July 2010. Ninety-seven percent of floating waste ends up sinking. Some of these polymers will take between a century and 1,000 years to degrade. Source: planetscope.com

This is only for the part related to the oceans. It is worth noting the amount of waste dumped on land, which increases endemic pollution. In terms of micropollutants, there are nearly 1.2 billion vehicles worldwide with a current annual increase of 90 million. Source: https://www.youtube.com/watch?v=fiTf-QGk-b4

For each vehicle, we have four tyres whose usage represents micropollutants which end up in our drinking water and in our wildlife. This is because even purification stations, for countries who have the luxury of having them, do not retain these particles. This adds up to the various sources of pollution that reduce the viability of the environment in which we live and that are not directly linked to CO2.

Opportunities for growth

This article is intended to point out that we have, within a short period of time, exhausted resources that took up to millions of years to build up. For each human being, these amounts are so colossal that they are almost impossible to grasp in terms of human scale perspective. Therein lies the difficulty of taking account of the fact that our way of acting is eradicating life on the only planet in the solar system offering such biodiversity, as least as far as we know. Even if we cannot exclude that there are potentially hundreds of millions of planets outside of our solar system that could have life forms, we know that we will not be able to transfer eight billion inhabitants to Mars or elsewhere.

We should bear in mind what Stephen William Hawking (British theoretical physicist and cosmologist who died in 2018), said in an essay published in *The Guardian*, explaining that in order to hope to survive the major challenges ahead – global warming, food production, overpopulation, etc. – it is necessary to adopt a clear vision of the future. – "We will need to adapt, rethink, refocus and change some of our fundamental assumptions about what we mean by wealth, by possessions, by mine and yours. Just like children, we are going to have to learn to share.

If we fail, then the forces that have contributed to Brexit, the envy and isolationism, not just in the United Kingdom but around the world that spring from not sharing, of cultures driven by a narrow definition of wealth and a failure to divide it more fairly, both within nations and across borders, will strengthen. If that were to happen, I would not be optimistic about the long-term outlook for our species. " Source: Victor Garcia (2016) "Stephen William Hawking: l'humanité ne "survivra pas 1000 ans de plus sur Terre" [archive], *L'Express*, November 17th 2016

I would complement this by noting that climate migration will destroy existing social security systems and create instability in host countries. This will be compounded by social dysfunctions, in the constitution, linked to the "papy boom" in developed countries. Taking into account our acquired knowledge and a better distribution of the goods that nature provides us with can enable us to fundamentally change our behaviour and allow us to build a new growth-oriented economy. Everything linked to the environment offers business potential for start-ups. To convince ourselves of this, we should consider that more than 150 years we have been building a world going against nature. Today, we must renovate and rebuild this world and continue building it differently.

In order to achieve this, we must also give a new value to finance. Under normal circumstances, savings, that is to say, the excess of unconsumed income, were made available to the real economy to build businesses and foster economic development. During the 1980s, thanks to the developed capacity of computers, these savings were increasingly transferred to financial products with no counterparts for the real economy, as mentioned above in the discussion on high-frequency trading machines. Derivatives have become a source of "distraction" from savings at the service of the economy, only to find themselves at the service of finance. The global derivatives market is complex, totally unregulated and frighteningly large. One of the world's leading experts on derivatives, Paul Wilmott, who holds a Ph.D. in applied mathematics from Oxford University, warned that the so-called notional value of the global derivatives market is more than $1.4 quadrillion. 11Source : https://www.zerohedge.com/news/2015-06-08/deutsche-bank-ceos-%E2%80%9Cshown-door%E2%80%9D-%E2%80%93-world%E2%80%99s-largest-holder-derivatives-trouble

Based on data from the Bank for International Settlements (BIS), derivatives were estimated to amount to $7.1 trillion in 2013. Source : https://www.bis.org/publ/otc_hy1405.htm

As these data show, we have a parallel world of an economy disconnected from human time that vilifies financial means for the benefit of the minorities, even though the means are available to move towards the construction of a desirable world. For nearly 18 months, a positive evolution has been felt in finance, moving towards more responsible and sustainable management. However, it must be admitted that all the derivative products built for finance that can now be labelled traditional are being rebuilt to present a captive and well-intentioned public with new environmentally and socially responsible products with better governance. This is indeed a new challenge facing the investors. Which investments have a real impact on the economy?