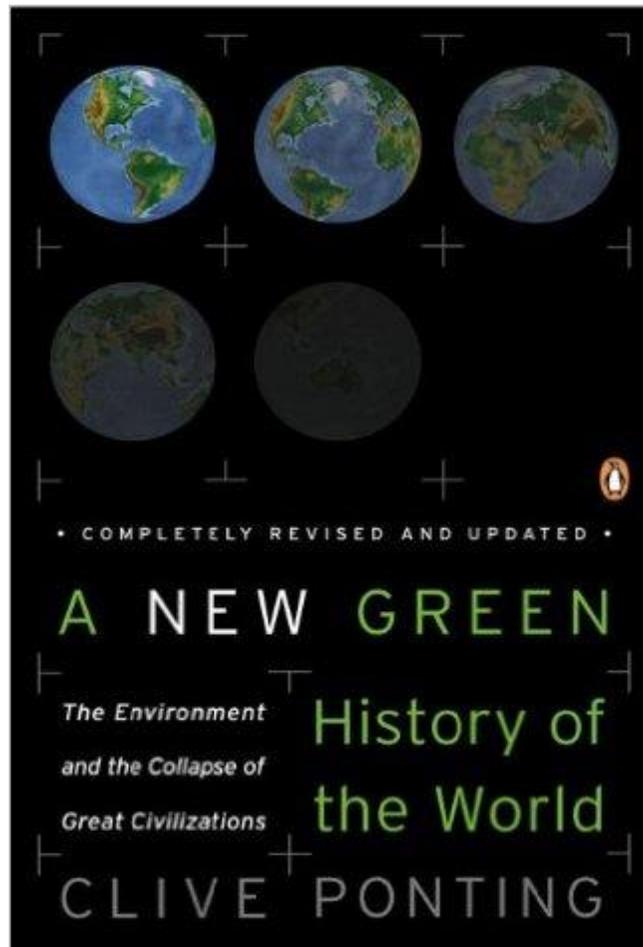


# Ethics, Public Policies, and Environmental Diplomacy



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Contents: A synopsis of the book "A New Green History of the World".

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To *rakas*,

# A **New** Green History of the World

## — An extrapolated synopsis—

Filipe Lisboa

*The first edition of Clive Ponting's "A Green History of the World" was published in 1991. After sixteen years, much of has changed in the World. The population grew by a billion people, tons of additional carbon dioxide have been added to our atmosphere and economy is still good provided it is steadily growing. This essay was done in the first half of the year 2016 where, for the first time in history, economic growth might have been decoupled from global warming. It is in the perspective of a changing World, with limited resources and increasing population that this text was written.*

*As in all recensions, some information was left to the book readers, and other was added. But this text in an attempt to merge a synopsis with a recension and a look to subjects that, though related to the book, fall out of the main storyline. That being said, when scientific information is not on Ponting's book, some external sources are included<sup>1</sup>. The book is four hundred and twenty-three pages, in a dense text with thoroughly revised information. When scientific evidence is still to be found, especially on anthropology aspects, there is little speculation. It is a brilliantly well-written text and pleasant to the expert and non-expert reader.*

*The story of this Green History of the World is a wonderful although worrying tale of the ventures of man in a limited resources environment. Indeed, it is a Green history of the World and not of the Earth. The Earth is 4.5 billion years old if we ought to merge that amount of time in a 24-hour clock, dinosaurs wandered the Earth at 22h56min. At about that "bedtime" (65million years ago) Europe was an amalgam of islands, only the Iberian Peninsula would be distinguishable, part of the Sahara Desert was under water and India was still an island. The book is not about that. "A New Green History of the World" is about a time where the continents look almost the same as nowadays, except for very specific locations. Those areas include, for example, the connection of Papua New-Guinea to Australia. During ice ages, water was concentrated in the polar regions up to latitudes around  $\pm 50$  degrees<sup>5</sup>. In the equator regions like North Australia, the oceans were much lower, and early humans could walk.*

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<sup>1</sup> Some information might come from the author of the recension with no citation needed, left for interpretation. That will be noted with the sign "\$".

### **The Lessons from Eastern Island**

The remote Pacific Easter Island is a grim warning to the World. Europeans first visited it in the early 18<sup>th</sup> century and found a three-thousand people society in a primitive state living in caves and almost perpetual warfare. Anthropological research, as well as scientific dating, is leading meaningful conclusions about the island's history. The isolation of the isle, with limited resources and poor management of such resources, resulted in its destruction. A society that was once dedicated to building giant moais ended in a catastrophic collapse. The chapter is coherent with the state of the art knowledge of the Rapa Nui society and their history. It revises the interesting processes of taking down palm trees for construction of the moais and extensive agriculture. Nevertheless, it should also be added that along with the first settlers of the island there were non-indigenous species like a big type of rat that are speculated to worsened the problem by eating all the seeds and impairing reforestation<sup>5</sup>.

It is a witty introductory chapter if we remember that "like Eastern Island, the Earth has only limited resources to support human society and all its demands." Can the advanced societies be any more successful in finding a way of life that does not fatally deplete the resources that are available and irreversibly damage the life support system?

### **The Foundations of History**

Human societies are dependent on complex, interrelated physical, chemical and biological processes. For example, the convection currents caused by the heat rising from the earth's iron core cause large tectonic plates to move across the surface of the globe. Furthermore, men have experienced climate variations in the weather. When *homo sapiens* originated, the Earth was in the middle of an ice age, according to Vostok ice cores, global temperatures two-hundred-thousand years ago were around four degrees Celsius lower than in the present [1].

Without being a book about the geophysical history of the Earth, this second chapter sets the ground on which the real history of the World depends upon the Earth system. Besides depending on a global geophysical system, we also rely on the different types of ecosystems. The basis for life on Earth, the photosynthesis, is the only way that energy is introduced into the system. Photosynthetic organisms are the bottom of the food chain and biologists romantically call it "primary production." Then, ecosystems have complex food chains. However, the iron rule is that the higher the animal is in the food chain, the rarer it will be. The different types of ecosystems depend on to a large extent on the temperature and level of rainfall. The soil of tropical forests is thin, acidic and of poor quality, with very little humus. Three-quarters of all the nutrients are held in the plants and the trees. Then, ecosystems develop naturally in a way that protects the soil on which they depend. For which the destruction of the primary producers will constitute an attack on the base of the food chain and it will have disastrous effects on all parts of the chain. In sum, ecosystems are part of a greater whole – the Earth and the Earth is a closed system. As so, all pollution affects natural processes and ecosystems.

### **Ninety-nine per cent of Human History**

This chapter is about the great migration of humans from the flourishing green Africa in the peak of the last glacial period. Let it be noted; scientific evidence let us come to the conclusion that we are now in the second interglacial period of modern humans' history. The other was around one-hundred and twenty thousand years ago. The book is rich in the broad picture of how the accepted migrations occurred. One must add thought that there were two periods of humans crossing the Red Sea, as well as two groups of humans reached Europe almost at the same time. Around forty thousand years ago, one group came from the Ural Mountains and another from the Middle East. The author avoids the discussion on the Neanderthal extinction that followed shortly after this "Europe's colonization" (pun intended, as to what is yet to come). As it is out of the scope of this great historical storyline, Ponting does not mention one of the great unfunded nutritional modern trends: that of the Paleo diet. It is a subject much related to what is discussed in this chapter. Based on what types of foods presumably eaten by early humans, some people choose consistently to eat significant amounts of meat, fish, some vegetables, and fruit and excluding dairy or cereal products and processed food. Not only, but meat eating habits is also one of the most impactful in climatic balance, the assumption is wrong. As it is broadly mentioned in the book, hunters and gathers were basically gathers for most of the time. Hunting was a male occupation that took one week of exhausting, seldom unsuccessful chase, followed by three weeks of rest. A catch would be so rarely accomplished that most of the so-called "paleo diet" would be dominated by the foodstuff gathering, hence vegetables and fruits. The scenario is supported by archeologists like Christina Warinner that have studied bone chemistry and ancient DNA. On the other side of the crusade, Loren Cordain is widely known for the vociferous fight against agriculture products, like potato. On the Paleo diet side, some also argue that it was the massive intake of meat that allowed for a surplus of energetic intake and ad somehow bigger brains. Nevertheless, one can only relate the origin of larger sized brains to the concomitant increase of salivary amylase, and the development of cooking in the Middle Pleistocene.

Still, on this exciting chapter, the reader might want to dig into another absorbing book from Christopher McDougall called "Born to Run." It discusses how human were the one-of-a-kind hunters. Not being the fastest or the agilest runners, pre-historical humans were able to run the longest in distance and in time. Thus, the catch was done via exhaustion of the prey. Together with this, some interesting habits are discussed like the barefoot running. Studies of the Kenya barefoot runners also indicate how the natural running patterns would be stepping on the front part of the foot. Almost every athlete wearing modern sneakers land square on the hills, which can cause so many of the patellofemoral pain.

## **The First Great Transition**

Twelve-thousand years ago at the early stages of agriculture population was about four million. This so-called Neolithic revolution was when there was the emergence of cities, development of craft specialization and powerful religious and political elites started to rule. The word “revolution” is misleading it was not an action undertaken to bring change but rather a thousand of years long set of changes of transformed and transforming human behavior. This step been taken, also meant the extra people it brought could not be fed back in a hunting and gathering scenario.

First, there is the domestication of animals and plants, about 12 000 years ago; then a second revolution took place with the beginning of the dairy products around 7500 years ago [2]. The first domesticated animal might have been the wolf between Papua New-Guinea and Australia and then spread across the globe when glaciers receded.

However, the staggering emergence of agriculture and how it happened throughout the world, sometimes independently, is very well characterized within the book. First, we are taken to the Foothills of the Zagros mountains of Iran, 10 000 years ago with the first agriculture practices and the domestication of cereals like Emmer. Riehl *et al.* [3] recent research narrows this date to 9800 calendar years ago.

## **Destruction and survival**

Agriculture evolves clearing natural ecosystem in order to create an artificial habitat where humans can grow plants and stock the animals they wanted. The natural balances and inherent stability of the original ecosystem are destroyed. The creation of artificial environments and the rise of communities meant that it was far more difficult for human societies to escape the consequences of their actions. In delicate ecosystems, the foundation of society could be so damaged as to cause its collapse. These early societies were dependent on the production of food surplus in order to feed and support the growing number of priests, rulers, bureaucrats, soldiers, and craftsmen. If food production became more difficult and crop yields fell, then the very basis of the society was undermined.

The given examples are plenty and detailed. First the rise and fall of Sumer in Mesopotamia.

“Crop yields fell by 40% between 2400 and 2100 BCE and by two-thirds by 1700 BCE. From 2000 there are contemporaneous reports that ‘the earth turned white’, a clear reference to the drastic impact of salinization.” (p.71)

Then, the Indus Valley, where salinization was a major problem.

“...Irrigation had the same effect as in Sumer – a rising water table and increasing water logging. This produced progressive salinization of the soil and eventually a layer of salt on the surface, which led to the gradual decline of crop production.” (p.72)

Both deforestation and salinization counteract in the long run the production of food surplus and therefore made the societies more vulnerable to external conquest. The Indus Valley forestry clearance was mainly for agriculture but worsened as people used mud bricks for building and dried them in wood ovens.

Curiously enough, deforestation crosses every ancient society mentioned by Ponting. It is a consistent slow progression of steady destruction of the woods and forests around these communities that powered their own development. Generally, people accepted the process as a natural mean of obtaining the resources they needed, and there is little evidence of any attempt at significant planting or replanting.

Thirdly, we are taken to China where trees were cleared for fields of millet. Although the soil was fertile, it was quickly eroded. Huge gullies and canyons developed as the soil was blown away by the wind or washed away by rain. At the same time, hillsides were cleared of trees for fuel and construction. By about two hundred years ago nearly all of the original forests of China had been cleared. The flooding of the Yellow River named that way because of the great amount of silt it carries, is also mentioned.

But one should not forget how forest are changed by men. Europe comes as a good example as where once were deciduous forests of oaks, beech, pines and cedars now thrive olive trees, vines, and low bushes. On top of that, in countries like Portugal, twentieth-century obsession with the planting of eucalyptus, mainly for paper production, led to harmful soil acidification. Much before, from the twelfth century onwards, deforestation in Portugal was a sign of demographic expansion. Later, between the fifteenth and sixteenth centuries, massive naval expansion led to the felling of approximately five million pines and oaks for building ships that would reach south America and India. On this subject a reading of the article by *Reboredo et al.* is highly recommended [4].

The cedars of Lebanon were famous throughout the Ancient Near East for their height and straightness. They were used as building materials and traded over a wide area. Now, there are only four small groves of cedars left in the region.

Around 650 BCE erosion of soils in ancient Greece is present in writers such as Herodotus, Xenophon, Aristotle, and Plato. The latter is cited through “*Critias*” where one can find a description of a green greek landscape that used to be and now has nothing but food for bees. By that time, a bounty was introduced for farmers to plant olive trees, the only species which the roots were strong enough to penetrate the hard limestone rock.

Until very recently, researchers believed that the Maya lived in shifting settlements scattered throughout the jungle, clearing it and waiting for it to be of use again. According to these

researchers, the inscriptions in the stelae revealed a peaceful society; that did not rely on a form of secular power supported by a secular elite and military force. Instead, they were wrong, new interpretations of the stelae revealed a society dominated in the same way as other early societies. Alongside, there was vast forest clearance, and some examples are present in Ponting's book as to how the ecological basis to support Maya's superstructure ceased to exist. They cleared jungles and made fields using extensive terracing to contain the inevitable soil erosion. The soils in tropical forests are easily eroded once the tree cover is removed.

Equally important was the construction of raised fields in swampy areas. Grids of drainage ditches were dug into swamps and the material from the ditches was used to form raised fields. In the fields crops such as maize and beans were grown for food together with cotton and cacao, for example. The cultivation system was too intensive, and the population continued to rise, and more people lived in cities and the construction of ceremonial centers took up vast amounts of labor. With the erosion of the soil, higher levels of silt silted the rivers leading to a decline in food production. In turn, these geophysical mechanics is accompanied by a societal one: violent conflicts and warfare set in, and/or cities are abandoned.

### **The long struggle**

Agriculture did not solve the problem of producing enough food to meet the needs of the world's population. Until about the last two centuries in every part of the world nearly everyone lived on the edge of starvation. Reliance on a small number of crops grown in a specialized environment increased vulnerability to crop failure. Due to the continuous cultivation of the same area soil fertility lowered. A primitive transportation system — anything more than the local distribution of food, except water, was difficult. Food supply and population were rarely in balance. It was almost impossible for a large part to obtain an adequate diet. Often increased population that put pressure on the limited agricultural system produced more poverty and malnutrition. Moreover, mass starvation and death prevailed until the population was more in balance with the output from farming. Before agriculture, the world's population was fairly distributed across the globe, but the rise of settled communities meant that the great empires of Near East, Mediterranean, India and China became the main centers of human society.

China developed the most sophisticated agriculture in the world, based on techniques such as crop rotation that were still not used in Europe, and produced high yields from intensively farmed land. However, even there, the balance between food supply and the population was never satisfactory, and the majority of the population lived on the verge of starvation.

Medieval European agriculture was of low productivity and kept a smaller number of people in the same condition. By that time, although the amount of land under cultivation increased, productivity remained the same.

Societies were, directly approached, a dynamic and simplistic relation between climate, food production and population. Inclement weather led to bad harvesting years and consequently disaster related to the lack of food. Worsened growing condition meant a significant reduction in food production and the widespread of famine and death. Ponting neatly gives examples, such as the events of 1315-17 in Medieval Europe when there were two bad harvests of half the average level causing a food shortage.

“The food that was available was often of very low quality – bread was mixed with pigeon and pig droppings, and animals that had died of disease were eaten, causing outbreaks of disease in the human population. Some of the people were even driven to cannibalism in an area stretching from England to Livonia on the Baltic coast bear witness. In Ireland 1318 bodies were dug up from graves to provide food and in Silesia executed criminals were eaten. “

Another example is the Potato blight that struck America and Ireland in 1845. By the time, Potatoes took up to 40% of the crop area. Peasants did not have money to buy wheat or maize, and a large part of grain was exported. Governments closed all relief works such as road construction and overall about one million people died of lack of food or outbreak of diseases.

Then we must also reflect upon the political and economical option of blind food distribution. Who is entitled to obtain food? In late twentieth-century, some of the countries experiencing famines were actually plenty of food, but they exported. For example, in the British-controlled Bengal in 1943 three million people starved to death.

Recalling gathering and hunting groups, they did not regard food as something to be traded but as something available to all members of a group, storage, and associated ownership would be a drawback to their need of mobility. With the ownership of land and food, we have faced the dependence of a limited amount of crops and associated increase in the risk of failure. The poorest members are systematically the victims, finding themselves unable to obtain food.

But the improvement in agriculture from 1200 to 1800 allowed the range of fodder crops to increase. The legumes, capable of fixating nitrogen from the air, were more widely used to improve fertility. And better breeding of animals and more cross-breeding enhanced output. Lastly, rotation of fields in Europe became more involved and manuring more widespread as more animals could be fed during winter months.

The spread of new crops meant that the subsistence base of many societies became wider, and it reduced the risk of disaster in crop failure and famine. The yields provided food with increase nutritional value. The significant changes in the distribution of plants and animals took place in two phases – in the Islamic world from the seventh to the tenth century and then the European contacts with the Americas after 1492.

## Ways of Thought

Are all the plants and animals in the world solely for the benefit of humans and do humans have the responsibility to guard and take care of the rest of nature?

In the last two hundred years, these religious and philosophical questions have been overtaken by issues of economics – how scarce resources should be used and distributed?

### The Classical thought

The firm conviction running through both Classical and Christian thought has been that human beings have been put in a position of dominance over the rest of a subordinate nature. Xenophon in *Memorabilia* stated: “Everything about humans has a purpose, and the gods have also provided everything for the benefit of a man.” Furthermore, Aristotle in *Politics*: “Now if Nature makes nothing incomplete, and nothing in vain, the inference must be that she has made all animals for the sake of man”. Thinkers like Socrates were also in line with this view. The idea that everything, including animals, is only produced and nourished for the sake of humans, makes frequent reappearances in the western thought until the nineteenth century. Then finally, developments in scientific theory, notably Darwin’s light on the origins of the species, natural selection, and adaptation, served to overthrow them.

### The Christian thought

In the view of Christian traditions, God has given humans the right to exploit plants animals and the whole world for their benefit. Nature is not seen as sacred and therefore it is open to the exploitation by humans without any moral qualms; humans have the right to use it in whatever way they think the best. God is typically portrayed as above and separate from the world and what matters is the relationship between the individual with God and not the natural world. Only very recently, even after the last edition of Ponting’s book, did Pope Francis slightly drift this institution view with two citations “Laudato Si” hereby included:

- “An inadequate presentation of Christian anthropology gave rise to a wrong understanding of the relationship between human beings and the world. Often, what was handed on was a Promethean vision of mastery over the world, which gave the impression that the protection of nature was something that only the faint-hearted cared about. Instead, our ‘dominion’ over the universe should be understood more properly in the sense of responsible stewardship.”
- “We are not God. ... Nowadays we must forcefully reject the notion that our being created in God’s image and given dominion over the earth justifies absolute domination over other creatures.”

These notes could bring us to the Saint Francis and his connection to the animal world, feeling at one with the “creation”<sup>§</sup>. No doubt, the historical relationship between Christian thought and

the natural world has plentiful intricacies worth exploring. The same goes to other thought traditions and schools.

### The rise of secular thought

But no doubt it was only with the increasingly rapid development of secular thinking in Europe from the sixteenth century onwards that these assumptions and beliefs gained little alteration. First by English naturalist John Ray at the end of the seventeenth century: *“The Wisdom of God Manifested in the Works of the Creation”* and Rene Descartes in *“Discourse on Method”*. Descartes saw the purpose of science and increasing human knowledge as being part of a wider experience so that “we can... employ them in all those uses to which they are adapted, and thus render ourselves the masters and possessors of nature”. Although slightly different in approach, the Promethean vision of this mastery is still present in these words. This Promethean project of modernity is, indeed and still, the cornerstone of twentieth-century policies.

### The idea of progress

History is seen as having no particular direction or as a decline until the end of the seventeenth century. The increase in scientific knowledge and advance in technology changed this view, and people started to believe in continual improvement.

### Other traditions

The world view of the Eastern religions, born centuries earlier to the emergency of Christianity, emphasize a less aggressive approach by humans to the natural world. To both Hinduism and Buddhism, for example, Humans are only a small part of a greater whole and not placed above or beyond the natural world. Furthermore, Chinese Taoist thought emphasized the idea of a balance of forces, within both the individual and the society. The aim of both should be to live in a harmonious way with the natural world.

“Among the gathering and hunting groups, there was a variety of beliefs about the interdependence of humans, plants, and animals. Their world is seen as being composed of them all linked together without distinct categories.” (p.128 citation)

The emergence of modern economic thought emerged in the eighteenth century when a relatively free market in land, labor and capital become predominant.

Marxist economics. Marx and Engels argued that the value of any product came from the amount of human labor put into producing it and therefore ignored the value of the resources involved in the production, citing Carl Marx: “Nature taken abstractedly, for itself, and fixedly isolated from man, is nothing for man”. (p.131)

The critique of economics. The resources of the earth are treated as capital, and their price is only the cost of extracting them and turning them into marketable commodities. However, the resources of the earth are not only scarce; they are finite. Prices also do not reflect real costs, for example, air is free for all, and firms do not have to pay a price for the smoke and gases they put

into the air. Further discussion of this matter can be found on the recension of the “Creating an Affluent Society,” chapter fourteen.

Modern liberal economics. Governments have become increasingly less powerful in economic terms. In the 1970’s they lost control over the exchange rate of their currencies and gradually gave up the attempt to manipulate and regulate economic activity. Privatization of nationalized industries and significant reductions in the power of trade unions followed and the one tool that could be used to influence the level of economic activity – the interest rates – was handed over to central banks to determine.

Institutions like the World Bank, International Monetary Fund, World Trade Organization converge power and ruling. Moreover, the rules of the World Trade Organization specifically exclude environmental protection as a reason for discrimination in trade. The inevitable result has been the tendency to reduce environmental standards to the minimum.

### **The Rape of the World**

This chapter takes us to another greater level of the worsening human exploitation of the World. The examples are many: the expansion of settlements, creation of fields and pastures for agriculture, the clearing of forests and the draining of marshes and wetlands have all reduced the habitats of almost every type of plant and animal. The deliberate hunting of animals for food, furs and other products and sport has reduced the number of species driven others to extinction. Although not stated in the book, this is a chapter mainly related to the rape of the ecosystems themselves and the abuse perpetrated by men on other species.

Outside their home continent, the Europeans had an even greater impact and in a much shorter period. Ponting addresses now, the discoveries done by the Europeans. The profusion of wildlife seemed to the early explorers and settlers as a convenient and readily available source of food which they proceeded to draw regardless of the consequences. This killing had a dramatic impact especially on islands where there were vulnerable flightless birds. The passenger pigeon in North America was driven to extinction in about fifty years after European arrival. In 1869 the Van Buren Company sent seven and a half million birds to the east for market selling.

Then non-endogenous species were added to the habitats of “New-World.” Europeans took with them domesticated plants and animals like pigs, cattle, sheep and horses. Many of the animals escaped and went wild and plants often replaced the native species.

For example, the island of Porto Santo, belonging to Madeira archipelago was reached and settled by the Portuguese in the 1420’s. The south-western Europeans brought rabbits that eventually escaped. In the absence of any natural predators their numbers rose rapidly and within a few years the land was devastated. Vast areas had lost all their plants, and the soil was eroding very quickly. In a striking similarity to the Easter Island, the settlers were forced to move to Madeira.

The problem of the commons is the next addressed issue underlined. The American ecologist William Ophuls addresses the problem of the commons: no one owned the animals and therefore no-one had the interest in controlling the rate of killing and ensuring that there was sustainable exploitation. The pattern of maximizing short-term gains at the expense of long-term considerations is a central feature on how people have hunted animals. Although the term is not present in the book, this is actually called the “Tragedy of the Commons,” a concept originated from William Forster Lloyd’s essay of 1833. Then other authors like Garrett Hardin took the idea further in 1968, and Elinor Ostrom won the Nobel price of economics in 2009 for having “challenged the conventional wisdom by demonstrating how local property can be successfully managed by local commons without any regulation by central authorities or privatization<sup>2</sup>.”

Then, fishing, fur trade, sealing, and whaling: the pattern is very much the same. First, the hunting was concentrated more in one area, once the animals were over-hunted and could not be found anymore, the hunting concentrated to the next area. Over-hunting can also go from one species to the next, adapting to different animals: seals, whales or fur animals until they were almost extinct or extinct everywhere. The killing was massive, for example, the Newfoundland sealing industry killed between 1800 and 1915 about forty million seals and the herds were reduced to about a fifth of their original size. The killing still continued, for example, Canada was still authorizing the killing of 330 000 seals a year in the early twenty-first century. Most observers also expect commercial whaling to resume in the next few years.

By the time this recension was written, in the first half of 2016, one breaking news serve as a useful example. The current polemics of whale hunting in Japan comes to mind. The country stopped whaling in March 2014 after an International Court of Justice ban. But Japan is planning to hunt minke whales in the Antarctic in 2016<sup>5</sup>, for “scientific research needs” and claiming the meat they get is a mere by-product. The governments of Australia and New Zealand have reacted against such ventures.

The world is now facing its sixth great extinction of animals and plants – the last one was 65 million years ago when the dinosaurs became extinct – and it is caused by human actions. In the last 400 years 83 mammals, 113 birds, 288 other animals and 650 plants have become extinct. Nearly all of these have occurred in the last century! Of the twenty-one marine species known to have become extinct since 1700, sixteen have taken place since 1972. The best estimates are that about half of the world’s existing species will be extinct by 2100.

This chapter serves as an opportunity to appoint another splendid work by Elizabeth Kolbert, “The Sixth Extinction: An Unnatural History.” As beautifully written as Ponting’s book, Kolbert book is a green history of the Earth, as it tells the history of the Earth since Photosynthesis appeared in Nature. The chronicles of the five great extinctions therein preceded a sixth one; wich is being given by human action. Winston Churchill once said “The farther backward you can

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<sup>2</sup> From the Official Site of the Nobel prize: [http://www.nobelprize.org/nobel\\_prizes/economic-sciences/laureates/2009/ostrom-facts.html](http://www.nobelprize.org/nobel_prizes/economic-sciences/laureates/2009/ostrom-facts.html)

look the farther forward you are likely to see” both books perfectly fit into this premonitory, though scientifically supported, spirit.

### **Foundations of Inequality**

The world economy that emerged over the four hundred years after 1500 was dominated by the states of western Europe. The tropical colonies in Africa, Asia and large parts of Latin America were forced into a subordinate position. Plantation agriculture and large-scale slavery happened together for the first time in the mid-fifteenth century when the Portuguese brought African slaves to work in the sugar plantations of Madeira. Between 1440's and the end of the fifteenth century the Portuguese took about 140 000 slaves from Africa to their Atlantic islands. The conquest and elimination of the native peoples, the growing of crops for export on the best land and the displacement of indigenous, subsistence agriculture to the poorest land also followed already.

### **Slavery**

The eighteenth century witnessed the slave trade at its height: 6 130 000 people, at a rate of about 80 000 a year, were transported in the last two decades from Africa to the Americas. In total, about 12 million people were brought by the Europeans to the Americas as slaves mainly working in the fields.

The plantations and the slaves who worked therein became the cornerstone to the growing wealth of the western Europe. By the middle of the eighteenth-century sugar and tobacco made up over half of Britain's overseas trade. Agriculture in the colonial era became more specialized, and a limited range of crops were grown for export.

After the end of slavery, the biggest problem was finding cheap labor force. A variety of measures was introduced to ensure that the Africans needed to work to earn money and did not remain as subsistence farmers. These measures consisted of taxes, forced labor schemes, import duties to raise the cost of goods to the Africans. Coincidentally and as an example, Kenyan population fell from four million in 1902 to two and a half million in 1921. Until the nineteenth century, the vast plantations were mostly concentrated to the Americas, where land was plentiful and climate suitable. Most of Africa was not under European control until the late nineteenth century because the weather was unsuitable for Europeans until medical advances were made. Plantations were European and American owned and increasingly run by commercial companies and large corporations. Rubber, coconut, oil palm, sisal, cacao and coffee needed substantial investment and risks were high because of supply and demand leading prices to fluctuate dramatically. Annual crops such as tobacco, sugar, cotton, and jute could adjust easier to changes in demand, but substantial investment was still required. These crops required intensive labor over a short period, unlike tea or rubber.

## Americas

Sugar was the key crop from the seventeenth-century, followed by tobacco and last cotton. All of these rapidly exhausted the soil which was a major problem for production. The last of great plantation crops was the banana. “The Banana Republics” plantations along the Pacific coasts and Central American republics relied on the export. The US-owned United Fruit Company came to dominate the politics of many of these countries. Very historical polemics related to the relation between US governments and chiefs of state of those countries could be added here, but we rather not too.

South-east Asia, the tea, rice, and rubber were the main products of the nineteenth century being cultivated. East India Company owned the monopoly of the tea plantations in Sri Lanka and southern India. The laborers had bad living conditions and pay was low. Because labor costs made up about two-thirds of the cost of production and the tea companies were determined to keep prices low as possible to ensure tea remained the most popular drink in Britain. Furthermore, clothing chains now found in any shopping center in Europe or the United States bring clothes from countries like Bangladesh, a very well-known brand of clothes is allegedly responsible for using labor work in buildings that are under a serious threat of collapsing.

In the late nineteenth century, Brazil dominated the world coffee market and the British were determined to establish their sources of coffee supply in East Africa – Malawi, Kenya, and Uganda. In a purely economic competition fashion, they used forced African labor on European controlled plantations of cocoa and in 1911 Ghana was the world’s largest producer.

The interconnection between cash crops and underdevelopment is well pointed out by Ponting. Colonial economies were restructured to specialize in a few commodities or a single crop. A diverse agriculture was increasingly replaced over broad areas by a monoculture which often exhausted the soil, reduced biodiversity and turned yields more vulnerable to pests and diseases. Environmental and social consequences followed such politics on land use. The political independence of the colonies did not change the situation, the industrialized countries and their corporations retained overwhelming financial and commercial control with the terms of trade set in their favor. Many of the countries then tried to increase export earnings by producing more of these cash crops — in the 1980’s coffee made up 93% of Burundi’s exports.

Even when the major corporations have been nationalized and their land distributed, the poorest countries remained dependent on the corporations for processing, manufacturing and marketing. Despite major problems of hunger and malnutrition, the developing world still continues to be the net exporters of food — 20% of industrialized world and only 12% back within.

Timber was one of the most valuable products sent to Europe, in particular, specialized timber trades like sandalwood. Timber was mostly obtained from the islands of the Pacific, but the trade lasted for less than a quarter of a century before all trees were cut down, in a much similar pattern to the hunting of many animals. European and American traders would

systematically exploit an island until there were no suitable trees left and then they would move on to another.

Minerals were the core of European investment in Africa; they accounted for two-thirds of all investment in the continent until the 1930's. Minerals still provide over 90% of the exports of both Zambia and Mauritania. The countries, however, rarely have smelters and processing plants due to transnational corporations' refuse in building them. For example, alumina is worth six times more than the raw bauxite. The final product, aluminum, is worth twenty-five times more than its ore. Besides destructing the environment, the mining companies also brought most of their labor from outside the country.

On the fertilizers issues, Ponting now addresses the catastrophic decline of Nauru's Republic, an island country in the mid-pacific ocean. The island's economy was almost wholly dependent on phosphate exploitation. The extensive activities led to an environmental catastrophe on the island as the majority of the nation's land was strip-mined. The island's phosphate deposits were virtually exhausted by the year 2000 although some small-scale mining is still in progress.

### **Disease and Death**

The creation of farming communities exposed humans to a whole range of diseases that originated with animals. Also, permanent settlements made it difficult to provide clean drinking water, and some conditions became endemic. Secondly, the development of cities brought human together in numbers sufficient to allow the major epidemic diseases to develop and eventually spread. Third, the gradual drawing together of human communities around the globe, first within Eurasia and then when the Europeans reached the Americas and Oceania, spread new diseases to people who had no natural resistance. Malnutrition was rare amongst gathers and hunters' and deficiency diseases unknown. Their primary conditions are likely to have a low level of intestinal parasites from poorly cooked food and unclean drinking water. The fact that numbers were small meant that the primary infectious diseases could not take hold. However, life expectancy was not high because of the high infant mortality.

This chapter is again full of detailed examples. Starting from the domestication of animals, humans now share sixty-five diseases with dogs, fifty with cattle, forty-six with sheep and goats, forty-two with pigs, thirty-five with horses and twenty-six with poultry. Furthermore, poor or non-existent sanitation now and in the past led to intestinal worms and the Typhoid fever. The development of irrigation in the first farming communities originated schistosomiasis, the reduced variety of food available through agriculture resulted in deficiency diseases. Then the settled societies alongside the growth of traveling and trading made it easier for the diseases to spread and not die out, they spread out while becoming resistant and incubate in populated areas. Additionally, measles and smallpox originated from animals but was a purely human disease needing large populations to thrive and spread.

The take-up rates of some paramount vaccines have declined like in the case of measles and smallpox which is now only in a frozen state. As seen as insurance that lost its value, although the disease is not observed, the release of the virus could be catastrophic.

Evidencing the opportunities of population concentrations for great diseases to spread, the first outbreak of the Black Death killed almost a third of the population of Europe in the mid-fourteenth century. While mentioning the Black Death Ponting missed the connection to the problem of the famine described above. Historical researchers now related the famine in northern Europe to the plague that came ashore meanwhile. The existence of the first may have weakened the population and set the stage for the devastation of the last. "The evidence indicates that the famine was a broader phenomenon, geographically and chronologically," as stated by Alexander More, a historian from Harvard University [5]. Additionally, other diseases like leprosy, tuberculosis and typhus took up the Eurasian-wide scale.

Then the lack of domesticated animals, especially cattle, among native Americans meant that Eurasian diseases, like smallpox and measles, were unknown to their antigens. The native Americans had developed no immunity, and the impact of such diseases was catastrophic. The population of Central Mexico in 1500 was around twenty million, within a century less than one million people in the area. Alongside, the population of the Caribbean was almost entirely exterminated. Other diseases like Yellow Fever and Dengue Fever were also taken to the Americas, but the drift was a two-way one as syphilis was brought from the Americas to Europe.

Malaria is one of the longest established human diseases. By the early twenty-first century, there was only one drug that could cope with all types of malaria and the World Health Organization warned that if it continued to be used on its own, then it would not take long for resistant strains to emerge. Rapid population growth, resistant strains of mosquitos and climate change mean that whereas 10% of the world's population was at risk of contracting the disease in 1960 that figure is now 40%.

Furthermore, the spread of illness through vectors can now be complemented with satellite imagery of dense population and vulnerability zones. In a striking connection to the second Copernican revolution described by Schellnhuber [6], we now have sensors all around Earth's orbits to study its many sicknesses. The Planet's diseases can affect either its geophysical balance (greenhouse gases, warmer temperatures, and erosion) or its biological wellbeing (like diseases through vectors or algae blooms).

Ponting continues on his list: influenza also originated with animals and its virus mutates easily and rapidly so that new strains constantly arise. Tuberculosis was not a major problem until the nineteenth century when the growth of cities climbed and the massive slums evolved, with overcrowded living conditions and poor diets. In the industrialized world, the smoke from industry produced a deficiency disease called rickets, and the Polluted drinking water caused cholera.

In the late nineteenth century improvements in public health and effective medical treatment became available; however, it has had a significant but limited impact because of the changing pattern of the disease. Of far greater importance than medical advances, such as vaccination and antibiotic drugs, was a better diet and environmental improvements. The proof is a huge disparity in the impact of disease and death between the rich and the poor countries.

Moreover, AIDS spread from chimpanzees to humans somewhere in the west and central Africa probably in the 1920's. – in some places, the death rates are as high as during the Black Death in Europe. It is a disease of poverty as in Swaziland and Botswana about 40% of the population have the disease. Ebola was first identified in 1976 in western Sudan and the Congo.

But the industrialized world is not immune, some of the explanations behind cancers lay on environmental degradation like the pollution from highly toxic artificial chemicals.

Ponting finalizes this chapter acknowledging that recent dietary changes have been harmful: like the reduction in fiber intake, rise in sugar consumption, higher levels of fat intake, and a higher portion of processed foods (e.g. white bread). Considerations on this subject given above still apply.

### **The Weight of Numbers**

The Population figures are overwhelming: there are now seven times as many people in the world as there were only two centuries ago. The expansion of agriculture resulted that by the end of the twentieth century about a third of the world's vegetated area was covered in domesticated plants and pasture. Improvements in transport, refrigeration and freezing increased in the amount of food traded. Strawberries from Spain are less expensive in Portugal than the ones growing there<sup>5</sup>.

High input farming made fertilizers ran off the soil into at least half the water courses. Their use also reduces the uptake of key trace minerals in the soil and can damage plant growth and lower nutritional levels. The increased productivity and mechanization meant a decline in labour force and growth in size of farms. The agricultural output in the industrialized world in the last sixty years has been raised artificially by the use of huge subsidies, for example; the European Union subsidises the sugar industry at a cost of 1.34 billion pounds a year through inflated price guarantees, export subsidies and high tariffs against imports. The process does not help the farmers in the poorest parts of the world.

Between the 1930s and the 1960s, the United States funded much of the research for The Green Revolution and the use of new high-yield varieties of wheat and rice. Although new varieties increased yields, they required a high amount of fertilizers, water, and pesticides. Farmers were also tied to the seed companies for new seeds because the new varieties were sterile and covered by patents. Small farmers could not benefit as largely and changes actually increased social and economic tensions in many places.

The warning is evident: first, half the world's food intake comes from rice, maize, wheat and potatoes. The world is very vulnerable to any disease that could affect one of these. Secondly, as the rise in agricultural productivity began to slow at the end of the twentieth century, now about a third of the world's population do not get enough food to live a healthy life. Adding to that number about forty million people a year die from hunger and related diseases. There is no absolute shortage of food; people are too poor to buy food at the highly inflated prices that prevail during a shortage. There is a maldistribution of food and the unequal access to food is made worse by the agricultural subsidies of the rich world.

### Deforestation

Before agriculture about 45% of the Earth's surface was covered by forests. Now, about a third of those forests have been destroyed in the last ten thousand years. From the 1970's much of the destruction was concentrated in Amazonia. One should note here that many of the deforestation in Amazonia is due to plant soy that is thereafter used to feed animals in European farms<sup>5</sup>. Again, another example of a second Copernican revolution: satellite pictures of the massive Amazonian deforestation depict an ever and daily growing progression. Tropical forest clearance involves the destruction of an entire ecosystem, and the forests contain about a half of all plant and animal species on the planet. The results are impactful on the climate, as the Brazilian scholar Antonio Donato Nobre points out the magic of the Amazon rainforest which sweats out to the atmosphere around twenty billion tons of water per day through a process called evapotranspiration [7].

### Soil erosion

Soil degradation now affects about a third of the world's land surface, and a third of the world's cropland is losing soil faster than it is created this, in turn, leads to flooding, dust storms, loss of fertility and abandonment of cultivation. According to Ponting, world's deserts are expanding by about 70 000 square kilometers a year. Meanwhile, over 15% of world's arable land is irrigated placing severe pressure on the world's water resources. In the drive to provide irrigation water, massive dams have been built, and many of these projects have been highly damaging both environmentally and socially.

### The second great transition

The last two centuries have been characterized by the use of fossil fuels (coal, oil, and natural gas) and by a vast increase in energy consumption. As men stopped relying on human power through forced labor and slavery, the primary constraint was the problem of growing enough food for animals. But cases are such that wheeled transport was replaced by camels in Near East because of its many advantages, as there was no need for roads.

Water and wind power. Until the nineteenth-century humans and animal remained the primary sources of energy. Water and wind power were no more than supplements and almost entirely confined to industry.

Wood. The world's leading source of fuel until the nineteenth century was wood. It was easy to collect, readily available, burned well when dried and it was often free. The easy option of felling was usually taken, and little attention for replanting seemed to have ever been paid. Once the industrial use of wood developed, consumption rose dramatically. Over the centuries the steady but relentless destruction of the forests slowly exhausted the resources of China, India, Near East and Western Europe, then Russia, and Northern Europe. Consequently, the demand for coal rose as wood and charcoal became scarce and more expensive.

Electricity. Due to the development of electricity in the late nineteenth century, finally a flexible, easily distributed form of energy capable of providing power, light and heating was available. Although a third of world's energy is used to produce electricity, at least two-thirds of it is wasted in generation and distribution. Although not mentioned in Ponting's book, the shift to electricity is part of the politics towards a greener Europe. As an example, the Covenant of Mayors and the Pact of the Islands, encourage local communities throughout Europe to reduce by 2020 at least 20% of carbon dioxide emissions of 2005. Across all of the individual proposals, the achievements are planned through a temperate, sometimes careful, decrease in the demand for energy accompanied by great plans for distribution grid efficiency and shifting to electrical power, for example in heating systems.

Oil as lubricants, such as whale and vegetable oils were inadequate for the demands of the new industrial machinery. Whale oil was in short supply, and the price was rising steadily. The enormous growth in the number of vehicles in the world transformed the oil industry.

Natural gas and nuclear power were then considered a promise for the future demand, but they too carry grave concerns. Although the countries of the industrialized world are now more energy-efficient, that has not stopped a massive increase in energy consumption. Moreover, the majority of world's people who live in the developing countries only use 10% of the world's energy.

### **The Rise of the City**

Until the early nineteenth century only a small minority, 3% of world's population, lived in cities. After that, with the setting in of industrialization about three-quarters of the people in Europe and North America started residing in the towns. Comparatively with pre-industrial times, large population centers only existed where the great imperial capitals were: Rome, Constantinople, Ch'ang-an or, on a smaller scale, centers of seaborne trading empires like Athens, Venice and Malacca. These cities depended on their empires for the import of food. By 1300 there were three to four thousand towns and cities in Europe, but only nine of them had a population greater

than twenty-five thousand, including Rome as was mentioned before. The first country to undergo incipient urbanization was China under the Sung in the eleventh and twelfth centuries. At this time the Chinese economy was similar to that of Europe seven centuries later, in the earliest stages of the industrial revolution.

As Britain was one of the first countries to be industrialized and densely settled, one more note should be added here. In Europe, the first city to ever reach one million inhabitants was Rome during the second century of the common era<sup>5</sup>. Then, the city went back to a village-like population during medieval times<sup>5</sup>. In 1801 the United Kingdom yielded the first census and London gained the status of the second European city ever to reach one million inhabitants<sup>5</sup>. By 1900 most of the Europe and North America had been transformed by urbanization. Two-thirds of the world's urban population lived in these continents. Then, in the first industrial cities, most of the people lived in overcrowded city centers and consequent suburban development was a common phenomenon. Mainly every town in the world depended on the construction of transport systems.

Later, the rise of the private car in the United States in cities like Los Angeles turned the skies yellow due to the pollution. The Apollo 10 mission saw a smudgy Los Angeles seen from space [8]. Along with many wonders of the new middle-class lifestyle, new shopping facilities were built dependent on the ability of people to travel by car. The twentieth century saw the urbanization of the developing world at a far faster rate than the industrial world in the nineteenth century. One of the main reasons is that the major facilities tend to be concentrated in urban areas.

In parallel, the cities in the developing world are very similar to those of pre-industrial and early industrial Europe. Rapid growth rates have placed immense strains on the infrastructure. Furthermore, the UN habitat report of 2006 accounts for a third of world's urban population living in slums. Cities are responsible for most of the energy consumption, and they are a focus for a range of environmental problems. The flood of people into cities also destroyed existing social bonds and institutions. In the 1990's alone over 800 000 hectares of land was built on – if this rate continued through the rest of the twenty-first century it would result in a doubling of the current urban area.

### **Creating the affluent society**

The borderline between hunters and gatherers and the agriculture men is the backbone of Ponting's "A New Green History of the World". Gathering and hunting groups kept possessions to a minimum since these were a hindrance to their mobile way of life. Most of their household goods were made from easily obtained materials that could be thrown away if necessary and quickly replaced by new when needed. The rise of agriculture and settled communities changed that. More goods were required to process and store food, and a sedentary way of life made it easier to acquire household and personal effects. The benefits that they gave were visible. In the pre-industrial societies, the low level of trade and the poor transport implied that most regions

had to be self-sufficient. In medieval and early modern Europe about 80% of the spending of the mass, population went on food, but their diet was still weak. About half of this expense went on buying bread which was often only baked every month or two (in the Tyrol only two to three times a year and it was cut using an ax). When food and clothing were provided, there was little money left for housing. The average peasant in Europe had a hut made out of wattle and daub, with an Earth floor, without windows or chimneys. The range of goods available to the wealthy was also very limited. Most of their money was spent on better housing, clothing and food. Most people lived in a state of destitution or on the edge of it. In early eighteenth century Cologne, there were twenty-thousand beggars out of a population of fifty thousand people. People could not often afford to keep their children and in the sixteenth and seventeenth centuries about 10% of all babies born in Italy were abandoned on city streets. There was no steady improvement in the human condition in pre-industrial societies, as the standard of living tended to fluctuate according to the balance between population and food supplies.

In the early stages of the industrialization, the conditions of life of the majority of population worsened. In the second half of the nineteenth-century conditions of life slowly improved but many still lived in permanent want and substandard housing. In 1800 boys recruited to Royal Navy from the slums were on average 20cm shorter than the upper-class kids. In 1940 working class children were still 10cm shorter than the ones who went to private schools.

The first phase of industrialization, until the last third of the 19th century, was based on the greater output of textiles through mechanization and factory production, steam engineering, iron production and construction of railways. In the early 20th century the rise of the vehicle industry continued the industrial expansion. Artificial fibers also started to replace natural fibers. From the 1930s the increasing use of plastics derived from oil was a major industrial area. Since 1750 the world industrial output has increased more than 100-fold, but most of that increase happened in the twentieth century and especially in the second half of the twentieth century.

Since 1700 a multitude of new uses for iron formed the basis of many key products of modern industrial society. (p. 323 figure) Production of other minerals (gold, copper, nickel, aluminum) has also increased dramatically. About 70% of the world's metal ore (95% in the US) is obtained by opencast mining, which is the most environmentally damaging of all methods. It involves the digging of vast pits, the removal of whole mountain tops, the destruction of topsoil and the creation of large amounts of waste.

The 20th century saw the development of large supermarkets retailing food which soon dominated the market; they relied on increasing car ownership and the development of the out-of-town shopping center. The 1920's started a consumer-durable boom: refrigerators, freezers, and washing machines became the standard in the US. Firms also began to design products with in-built obsolescence in the 20th century. Others call it the "programmed obsolescence," a term that has invited social media but yet didn't stop corporations like Apple from practicing it<sup>5</sup>. Car production now consumes more resources than any other industry; it uses about 20% of world steel production, 35% of the zinc, 50% of the lead, 60% of all natural rubber and 10% of aluminum

production. Over a third of the world's oil consumption is accounted for by vehicles. Cars have also brought road construction, petrol stations, car sales dealerships and service garages. As the number of cars in cities increased, the provision of public transport declined. In Australia, every city apart from Melbourne lost its trams and trolley buses between 1950 and 1970. The primary response of governments has been to spend more money on road construction, more than public transport. For example, railways are six times more energy efficient than highways. Tourism has been another new industry since the 20th century.

The unequal world. In the early 21st century the poorest 20% of the world's population receive about 1% of the world's income. The World Health Organization classifies them as living in extreme poverty.

Citing the author, "the quality of life for people (...) cannot be measured simply by dividing national income by the number of people". Taken this opportunity to complement the subject, there are three different types of metrics mostly studied to address human well-being. But the three have different approaches to wellness definition.

1. GDP per capita has permeated a traditional view of development, the opulence in which the satisfaction of individuals is done by ensuring goods and services. GDP and associated parameterisations have been widely questioned as a development indicator. As indicated by Joseph Stiglitz and Amartya Sen, GDP captures all final goods of the economy as they are consumed by households, companies or the government. The sum of goods produced by the economy divided by the population also does not tell us anything about the individual. Currently, there are some cases where the GDP increases, but this increase is not reflected in a general increase in individual incomes. Other problems are associated with GDP; there are goods and services for which a monetary value is difficult or impossible to assign. The very value of goods and services can be subjective, and its diminishing marginal utility provided they have less and less additional value. In many countries, particularly in developing countries, the increasing GDP occurs alongside with a decrease of natural resources. Therefore, the GDP tells us nothing about sustainability. One of the proposals of Stiglitz would be to subtract from GDP, the natural capital lost in achieving it. This newer version is called "Green GDP."
2. Secondly, we have the metric that underlies the statement of claims. It is a metric associated with subjective well-being and thus utilitarian. The main measurement parameter is necessarily subjective as it comes from asking individuals whether they feel more or less happy, based on their own judgment. What is revealed is extremely interesting: for rich countries an increase in the individual income is not proportionally impactful on the happiness levels. This happens for the case of the United States when compared to the northern countries of Europe or Fennoscandia. Higher incomes do not correspond to a proportional increase in happiness in the perspective of personal satisfaction.

3. The third, new metric is related to a concept in which the potentiation of the freedoms of individuals and development are in the same cycle, feeding on each other. Amartya Sen establishes a concept based on the question: "Should the development focus on increasing freedom of individuals?". According to Nobel economist Dhaka (now Bangladesh), yes. While traditionally development is measured by the increase in income, Sen argues that money alone is of little value in societies that still lack a health system or adequate education. An individual freedom covering various aspects of life is an important metric to increase economic development. In his book "Development as Freedom", Sen identifies five fundamental human freedoms: political, economic, social, transparency and security guarantees. That is, while the per capita income (economic freedom) is important this can not be considered the only factor to take into account to assess the development of a society. For example, consider a paid worker in a company, the context of the events in which he grew, had no access to a good education structure. It is expected that such individual does not profit his best potential, not being able to climb the career ladder or create his own business. The lack of access to education that may be materialised, for example, an inability to read or write which in turn means that that person is somehow deprived of his freedom. At the level of society, the effects of these freedoms are further enhancing of the individual freedom. All five strands reinforce each other. There is also an important implication of this approach: individuals are no longer seen as passive agents benefiting from the developed society but become agents of change, essential for the society to keep being more developed. These agents have a transformative role thanks to their potential and maximized freedom.

Unfortunately, throughout the world, only the first metric is used. The GDP that is referred by Ponting is the first one where not even the environmental degradation is considered. This fourteen chapter of "A New Green History of the World" proceeds with the end of the twentieth-century when half the world's industrial output took place in only three countries: the United States, Japan, and Russia. Most countries, especially those in Africa and Latin America, saw their share of world industrial output fall in the twentieth-century. As it became evident, the policies of providing monetary aid to promote economic development and narrow the gap between wealthy and poor has failed. In practice, the overwhelming majority of the assistance budget never leaves the country that gives it. This is mainly because it is tied to the purchase of equipment in that country or used to subsidise the prices of firms competing for contracts in the developing world. As an example given in the book, in the 1980s sixty-five million pounds of British aid went to India to buy helicopters from an ailing aircraft company. Furthermore, the multilateral lending agencies like the World Bank account for over a fifth of all world aid. Much of this money have been given for large-scale construction programmes which have provided work for the large corporations of the industrialized countries. Many projects, in particular building of large dams, have been extremely damaging environmentally. From the International Monetary Fund the so-called "adjustment policies" have consequently, and inexorably been catastrophic.

## **Polluting the world**

As noted by Ponting, gathering and hunting groups also accumulated large piles of rubbish like waste pieces of rock from tool making, animal bones and the tools thrown away when they became blunt. However, the amount of pollution produced by gathering and hunting groups was small – their numbers were low, and they had few possessions. Drifting from this anthropological knowledge present in the book, one can go to the current economic debates of sustainability where the scale of this problem gives rise to the terms "cowboy economy" and "spaceman economy" to describe two different situations. In the first, the population is much lower when compared with its natural resources. All men are like these hunters and gathers in a vast landscape, and there was no need to worry about the implications of human activities. To this end, men move along a vast unpopulated area, and to this extent, the harming effects are small, and nature will, in turn, absorb them. On the other hand, the "spaceman economy" describes the current situation of the World. With a population competing for the limited resources, the Earth is a spaceship where astronauts should optimize what is available to them. There should not be the notion of waste because there is nowhere to deposit it. Implications are tremendous: the human well-being should be considered as a state and not a flow or a continuous growth.

The fifteen chapter of "A New Green History of the World" goes on on pollution which was first localized, normally confined to a city, river, mine or waste dump. Throughout industrialization, the areas affected then widened to whole regions, continents and oceans.

The human settlement created a problem that has still not been solved across the world: the disposing of human excrement and urine whilst obtaining decent drinking water. For example in the sixteenth and seventeenth century in a village called Foxton in Cambridgeshire, a stream ran through the center of the settlement and acted as both a sewer and a source of drinking water. Although the use of the stream was regulated, the laws were not being obeyed.

Some of the first systems to bring water outside the city were constructed in Greece. Later, aqueducts were familiar across the Mediterranean. The first aqueduct was constructed in Rome in 312 BCE and within three hundred years Rome depended on nine aqueducts, which in total extended over four-hundred and twenty kilometers and supplied all the city's drinking water and a thousand public baths. As an additional note, the endeavour was first commissioned by censor Appius Claudius Caecus. The enormous amount of water that ancient Rome was provided with served as a populist propaganda making the city-dwellers increasingly satisfied. The same was true for a short period where the empire rulers gave a certain amount of free bread for the city's inhabitants. Nowadays, while other cities are currently implementing systems of public park watering with less water spending, Rome continues to be the city of fountains and continuous flowing water taps on the streets<sup>5</sup>. Would it be a coincidence or a two millennia tradition?

The rise of the cities in the north and west Europe from the 11th century led to exactly the same problems as those experienced in the Near East and Mediterranean thousands of years earlier.

By the early thirteenth-century the Thames was already polluted and in 1236 the first water was brought to London from Tyburn spring in lead pipes.

Although in the industrialized world large volumes of water are supplied to the urban population its purity is being called into question again. The biggest problem in the second half of the twentieth century was the contamination of industrial effluent and the run-off of fertilizers, pesticides and herbicides from agricultural land. Furthermore, not all these pollutants can be removed by modern treatment and filtration methods.

Until the development of water treatment facilities in the late nineteenth century, disposing of human waste posed great organisational problems, and frequently it was simply put into streams and rivers in hope that it would be carried away. Most houses had no lavatory facilities and even in the richest palaces and castles of medieval and early modern Europe the lavatory was no more than a hole in the floor that discharged into the street, the moat or simply outside the wall of the building. Around 1300 the Piazza del Campo in Siena was kept more or less clean by five pigs which ate the refuse. At this time there were 12 rubbish carts in London, and they all tipped their loads into the Thames. But even later, hygiene habits of upper classes can be considered poor when compared to middle-class styles in the industrialised countries. Portuguese literature Nobel, Jose Saramago, wrote a historical novel with interesting descriptions on the eighteenth-century Portuguese upper-classes lifestyles. The first three chapters of *"Baltasar and Blimunda"* bring us to what might have been the lifestyle of the court; the European kings and queens with hygiene habits that nowadays would have been considered to be very poor.

In the 1980's nearly all of Moscow's sewage was still dumped and untreated into the Moscow river. In Manila, where nine out of ten homes are not connected to a sewer system, untreated sewage makes up 70% of the volume of Pasig river. An overwhelming majority of the world's citizens still lack decent sanitation and still suffer from the disease and squalor this causes.

The book then goes from the solid and water pollution to the air quality degradation. The shift to coal-burning produced great problems related to smoke, especially for city-dwellers. In 1307 the burning of coal in London was banned, but that was ignored by people. In estimated calculations referred by Ponting, between 1840 and 1900, about one-million-four-hundred-thousand people died in Britan as a direct result of urban air pollution. Also in London, the terrible smog of December 1952 rendered the city with no daylight for almost a week and over four-thousand people died. The events finally motivated some action and the Clean Air Act of 1956 which introduced controls on the types of fuel that could be burned in city centers.

In sum, industrialization brought about a revolution in the scale, intensity and variety of pollutants released into the environment but for many decades there was not a single control mechanism for that. A major offender was the early chemical industry, which made large quantities of sodium carbonate for use in glass, soap and textile-making. An unwanted by-product was a huge amount of highly corrosive hydrogen chloride, which was released from chimneys without controls. Factories were often built along river banks to make waste disposal

easier, and the mix of chemicals produced by different industries was more than enough to kill off all life in the rivers.

Even in the mid-twentieth century, rivers still caught fire because of the load of chemicals they contained. The main factor associated with reduced industrial pollution is the decline of heavy industry. Consequently, from the 1960s' on, the air pollution in Western Europe, North America, and Japan fell into decline. The decreasing importance of such industry as a whole has impacted the economy via a gradual shift into the tertiary sectors. However, this was offset by increasing levels of pollution in eastern Europe, the Soviet Union, China, India and Latin America. Rivers are still getting on fire in 2016 as gases boil out of the water from Australian Condamine river near a fracking site. So much gas bubbles through that the river that can hold large flames<sup>5</sup>.

Ponting addresses next the acid rain. At a first localized phenomenon concentrated in the main industrialized cities, it spread to longer distances. However, in an attempt to reduce higher levels of pollution in the areas where emissions generated, a policy of building ever higher chimneys was adopted. The consequence was that the pollution levels dropped in the immediate area, but the acid rain increased over a wide area downwind of main industrial zones. Some of the greatest damage to rivers and lakes occurred in eastern Canada and the north-east of the United States, to the east of the main industrial areas, and in Sweden and Norway, which received most of their acid rain on the prevailing westerly winds coming from Britain. It was not until the 1980's that the first international action was taken to control the transnational pollution. The general principle that countries should stop transnational pollution was accepted at the UN Environment Conference held in Stockholm in 1972. It had taken time before any action was carried. The United States, which was responsible for half of the acid deposition in Canada, only took action in 1991 when an agreement between the two countries was finally reached. The problem with emissions other than carbon dioxide is now focused on China. The country is currently the largest emitter of Sulphur dioxide in the world.

Furthermore, The key change in the last half century has been the manufacture of a wide range of synthetic chemicals, many of which are highly toxic in even minute quantities and which cannot be broken down in the environment. Since 1950 about seventy-five thousand new chemicals have been produced and about two-thousand new ones are added every year.

The increasing use of detergents, which finish up in streams, rivers, lakes and oceans has substantially increased phosphate contamination of water supplies. Excess phosphate and nitrate levels produce a rapid growth of bacteria and blue-green algae blooms that, as we mentioned before are now detected from space in satellite like Sentinel-3 from the European Space Agency. As part of the Copernicus Programme, a family of satellites is being put into orbits, one of the main tasks is to study the warning signs of the Earth's life-supporting balance. The programme is funded by the European Commission with a budget of €3.786 billion for the period between 2014 and 2020.

The book takes us next to the implications of the use of DDT and the associated disasters. Then it refers Rachel Carson's "Silent Spring" and all the controversies it generated. Although it is a good example of public concern converted into efficient internal policies, the United States continued to use DDTs outside of the country.

Furthermore, in the last 30 years, there has been almost seven-hundred and fifty major oil spillage incidents across the world along with numerous accidents to synthetic chemical plants.

There is also the management of the toxic waste; many countries are running out of landfill sites and those that do operate have problems dealing with non-degradable items and the leaching of chemicals into the adjoining soil and water. Governments across the industrialized world began to introduce tighter controls on dumping: dumping at sea was banned, and controls on putting toxic waste in landfill sites raised the cost of disposal in the US from an average of fifteen dollars a tonne in 1980 to two-hundred and fifty dollars a tonne by the end of the decade. With incineration costing about a thousand dollars a tonne, the producers of toxic waste started to look elsewhere for disposal sites. Not surprisingly, developing countries became the main target. The poorer states could be bribed to take this waste. Basel Convention in 1989 was designed to limit the trade as it included a "notification and consent" process so that as long as the importing country knew the contents of the waste it was accepting, the trade could continue. The largest of all the toxic producers, the United States, refused to be bound by any restrictions on the trade and did not ratify the aforementioned convention.

The fastest growing trade is now electronic waste. The United States discard about a hundred million computers a year, and Lagos in Nigeria receives about five-hundred containers of used computers from the United States and Europe every month.

Nuclear pollution is also addressed. Although theoretical calculations show that the chances of a nuclear accident are highly remote, in practice, nuclear power generation has throughout its history suffered from serious accidents. The problems related to the depositing and management of nuclear waste are for sure a great example for studies on intergenerational ethics.

## **Conclusions**

We have merged the two last chapters of the book, finally assuming the critique of this "extrapolated summary." The chapter before the last is called "The Threat to Global Systems" which is a summary of the climate change science(s) of global warming complemented by demographic information, followed by summary entitled "The Shadow of the Past." The author does some global warming scenarios in these last chapters but not the intricate relation of representative concentration pathways. Better than that, the last paragraph is a clear invitation to be aware of what are our future perspectives, and what societies will we live in in the future.

"The problem facing modern societies stems from the way stems from the way they have evolved and, in particular, the momentous changes that have occurred in the last two

hundred years, The achievements of modern industrial, urban, high-consumption, high-energy-consumption societies have been remarkable. However, the other side of the coin is that the scale of the environmental problems that have created as a consequence of these achievements is unprecedented and of a complexity that almost defies solution. From a wider, historical perspective it is clearly far too soon to judge whether modern industrialised societies are environmental sustainable.”

With no great focus towards economic theories of sustainability on one side, and new green technologies on the other, Ponting’s work is a beautifully well-written recollection of historical facts. The most interesting of which are the ones under the ancient history category. Some historical facts might make part of readers minds, but the book broadens perspectives. “A New Green History of the World” changes the way history is told: from the epic fights and struggles of men on Earth to a man growing within a Planet, within ecosystems. At the scale of 4.5 billion years of Earth’s existence and 3.55 billion years since life exists on the Planet, the parable is unmissable: a very recent species that has still not reached puberty, rendering wisdom still far far away.

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