

# The *Homines* Fossilization: Brief Review of Anthropocene

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## Abstract

This article is an insight into our lifetime and the enduring capacity of the planet—especially regarding water and space, in face of the *Homines* population growth. This is and will be recorded in the geological time: once preserved as human fossils, we will be part of a chapter in Earth's history. A brief taphonomic chronology is presented, from the emergence of humans to the domination of the environment and supremacy over other species, and also a concern on how much planet Earth can bear *Homines* neglects. The objective of this review is to show that the strata that contain human fossils change during the Anthropocene not only the human body but also its tools, resulting from its development. Four stages were identified as taphonomic phases: the first wave, when *organic Homines* fossils were preserved only with materials *in natura*, including natural artefacts. The second fossilization phase has occurred and still occurs with the *urban Homines*, a product of the proliferation of cities, including anthropogenic waste and diseases. The technology that we master today also belongs to our taphonomy: hydrocarbons, metals, plastic, radioactive elements—all fossilize together with the *industrial Homines*, representing the third fossilization phase, which is very close to the fourth fossilization phase, where our enlightened intelligence buries the *technological Homines* together with his world of digital waste and new viruses. How will we fossilize the future? This question makes us think about the behavior we assume today—who or what will go to the grave with us, which geological/environmental response will stop superpopulation, which extinction event will hold human proliferation? Which will be the mineral, human and waste components of our subsequent strata? How much water and space can we still use without causing a global environmental collapse?

## Keywords

*Homines*, Fossilization, Anthropocene

## 1. Emergence and Evolution: The First Wave

The emergence of a species can only take place via a mechanism, genomic mixture, involving sexuality or not. This is still the most effective success of similar species to generate a third [1]. Regarding *Homines*, we conveniently illustrate this evolution using Adam and Eve in Paradise (**Figure 1**): after all, to generate a new superior species, male and female are needed, as well as gestation and the individual's struggle to survive in the environment. How many trials have been in vain, how many succeeded—anthropological studies show that the footprints found in volcanic ashes near Laetoli in Tanzania (Africa) build a chapter of this first success towards *Homines*, as they are the first footprints of bipeds left on the Earth's surface of 3.7 million years of age (**Figure 2**). Other important records dated 1.5 million years were also found in Africa, in Caserta in Italy, and Happizburg in the United Kingdom, and were reviewed by Lockley [2]. Africa really seems to be the Cradle of Humankind, as DNA studies show that X and Y



**Figure 1.** Heinrich Jenny's Adam and Eve in Paradise and the forbidden fruit. The illustration shows the harmonized life with others species. (Undated). Jenny, H. Adam e Eve in Paradise of Heinrich Jenny Paint of genero. *Colour lithograph* ID da image: 384892/bridgemanimages.com.



**Figure 2.** Tanzanian hominids' footprints, illustration made from their footprints. Source: [https://darwinedeus.blogfolha.uol.com.br/files/2014/04/3.2.3-19\\_Homs\\_walking\\_footprints\\_KC\\_1.jpg](https://darwinedeus.blogfolha.uol.com.br/files/2014/04/3.2.3-19_Homs_walking_footprints_KC_1.jpg).

precursors of the modern humans emerged in Africa, where *Homo* diversified from them, generating: *Homo erectus*, *Homo ergaster*, *Homo rudolfensis*, *Homo habilis*, and even the *Australopithecus*, culminating in *Homo sapiens*. However, the lack of exploration and anthropologic collections can be solved with new findings and change this history, which is the most accepted among scientists. On the other hand, all are categorical in stating that probably the bipeds are the oldest ancestors [3] [4] [5]. We start to walk.

Who were Adam and Eve, or better yet, who were *Homo's* precursors? We must go back in time, before eight million years ago, back to primates that, with their enormous diversity and global distribution, already formed at that time the most advanced tribe on Earth among the existing animals. The high capacity of adaptation to the climate, aptitude to search for and find food, and locomotion were key tools for success. Fingers, the way of sporadically stand up and walk, the way to feed omnivorously, the way of relating to individuals and other species were aspects almost similar to those of the prehistoric humans [6]. Besides, there is no pre-history for *Homo*, we have a continuous history in which some chapters are missing and are necessary to complete the transition from primates to hominids.

The collection shows us that the transition to bipeds and the later dominance of the environment was a continuous path where different *Homines* helped the more *Sapientes* to develop, because necessity led to evolution. It fatally happened because the environment also changed, forcing this adaptation. The shape of rivers, seas and oceans changed, high lands became low lands due to erosion and sedimentation, food changed place or was botanically seasonal, climate and seasons forced the dislocation of species via large- or small-scale migrations. It would be usual for southern primates to move northwards or vice-versa in order to escape from the cold, or even accompany the flowering of fruit trees.

The encounter of tribes, no matter primates or hominids, was inevitable and maybe the key for the genetic exchange for the birth of new hominids. Lucy is the best example of this genetic mixture, because she was not a primate but an adult hominid living in Ethiopia, close to the Rift Valley and the Victoria Lake. Her 3.2 million years of age confirm biped patterns and nurturing and locomotion practices similar to those of the *Homo sapiens* [7]. Despite the idea of Africa being the *Homo's* cradle be irrefutable, doubts still remain: was there a single tribe of precursor primates, or a variety of tribes distributed around the planet? Which are the relationships of these different tribes with different human races? [8] [9] [10]. Either by genetic mixture producing different lineages or the extinction of a race and survival of another, allowing the eradication of a certain gene and perpetuation of another, the *Homo's* lineage leads us to infinite possibilities, as primates and *Homines* inhabited the continents at some synchronic moments.

If all started in Africa, this tribe must have been the most industrious to generate an immense number of *Homines* who were gradually being born and dis-

tributed around the planet—or alternatively countless primate tribes generating countless *Homo* lineages and some successful ones, leading to the African *Sapiens*. Whether it was a single *Sapiens*, as the genetic research shows, or several *Sapiens*, there is still a lot to be discovered. In Paleontology, rare are the species that form index fossils (*i.e.*, large spatial distribution in a short time interval)—so, how can we distribute our species throughout the planet if lifetime is short? This theory is more applicable to small-size, preferably marine, fossils. A question remains: if we are all Africans, were the passing of four million years enough to form *Hominines* tribes, and for these tribes to disseminate throughout the continents from Africa? If we take the Pleistocene fauna, we will see that the intercontinental species of this period had Cretaceous (120 Ma) correlates that developed separately.

It would be more plausible to consider genetic load for such discussion, but samples are lacking and the information we have may be unsound, once our DNA little varies when it is compared to that of the earthworm—no wonder when genetically comparing to primates, which would be almost identical. What we can learn about the different primate races, such as orangutans, chimpanzees, gorillas, tamarins, marmosets, and Howler monkeys spread around the world, is that they certainly have inhabited the planet for much longer than Hominids—how did this distribution happen, affecting us in perpetuation and extinction? Tishkoff & Verrelli [11] study genomic distributions show that mass movements can extinguish and displace tribes and individuals, or even isolate some species, proving that the planet's environmental dynamics can override the survival instinct of any tribe, even eradicating some DNAs. Glacial and interglacial events, sea level rise and fall, and desertification are other important barriers and certainly exterminated countless species in the last 10 million years, which experienced a variety of climatic cycles [12] as the present interglacial period.

Wherever we tell homonymous histories, a certainty remains, it was not easy. Imagine living in the same environment of mammoths, 3 m-sized saber-tooth tigers, and giant sloths in the Pleistocene (Figure 3). Maybe hominids were not at the top of the food chain, but survived and certainly their intellect made the difference to their evolution and domination that were to come.

As a successful mammal lineage, we were as privileged as the oogamic plant reproduction, food guaranteed until the first months of life—a strategy that worked for the mammals. Despite we lived in the dark and cold, we were bound to discover and dominate the most important, lethal and pollutant tool—FIRE. Either derived from lightning, volcanic lavas, natural forest fires [13] or even produced manually by our ancestors, the making and control of fire was discovered and the technique remained in our hands. We dominated the environment and changed from hunt to hunter, because with spears and fire we may have provoked the first great environmental impact, reducing the Pleistocene fauna [14]. We are the only species that controls fire, currently in food cooking, metal castings, burning fuels, fire weapons and other carbonifier uses, is fact the modern



**Figure 3.** Pleistocene, fauna and flora interacting with humans. Source: Google-Images.

wars depend of fire. Cause or effect, we do not know whether this unbalance is a result of the domination of the environment or of a growing population that was in great need of resources and food, maybe leading to the first extinction promoted by man, *i.e.* of mammoths.

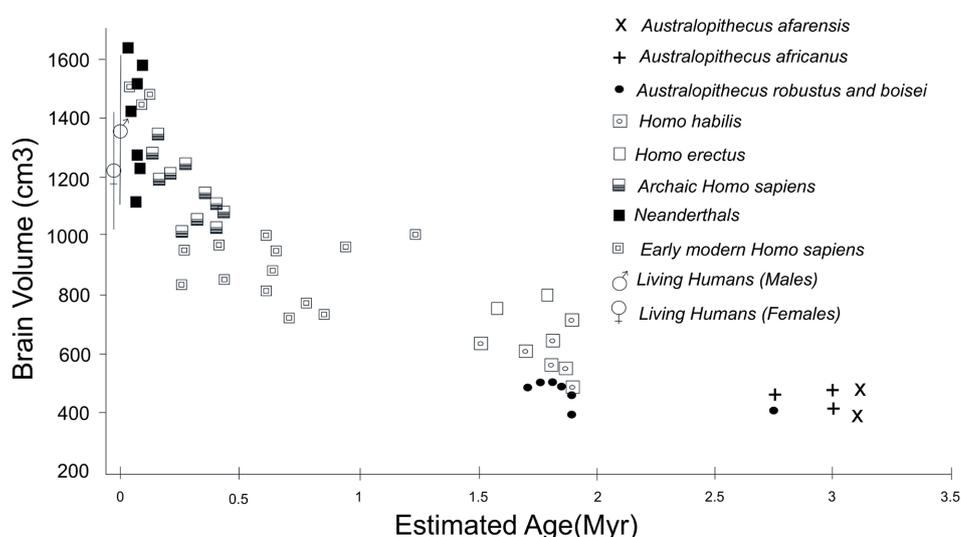
At this moment we can say that it was the beginning of the end. With the domination of the environment, growing population, abundant food, plenty of space, we reached the top of the food chain, certainly taking advantage of Earth, Sea and Air, because our lifetime was short—50 years lived in harmony with planet Earth. The taphonomy of this first wave or better first strata of humans deposit [15] is characterized by the use of natural raw materials and tools [16] for the fossilization of our ancestors. We interacted with leaves, soil, water, a variety of sediments, and even bitumen or other chemical substances, such as salt, but always *in natura* components. Sometimes calcined, sometimes calcified in shell mounds—the *sambaquis* [17], but in our ancestral tombs, all was organic and in small quantities, characterizing **organic Homines** fossils. Our first fossilization wave occupied small terrains and these ancient lands were sacred and clean. The respect for life and death were still humanized, but as time went by, our reproduction accelerated, new necessities appeared. Nevertheless, this is the first stratum that composes the *Homines* stratigraphic history.

## 2. Domination, Continental Proliferation and Technological Development: The Second and Third Waves

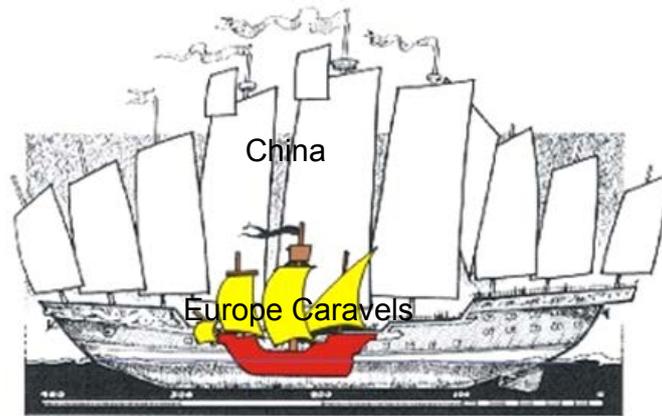
After the appropriation of food, shelter, fire, intelligence, capacity of locomotion and group work, birth success, growing population, more space and resources were needed. After dominating death, the lifetime of humans expanded, as well as the necessity of new information, new places, new food, because one of the

instincts of mankind is to want more and this vice is well used by capitalism and its philosophy. However, migrations were still taking place, in search of new frontiers, new tribes, new confrontations, new survival interests, new tools, new achievements. As the transition from collecting to farming *Sapiens* brought social stability and abundance of food [18], we settled down in the same place and therefore population growth took off. Now protected by tribes, then villages and microcities, humans started to stock water and food, environmental seasonality started to be understood and better used to plan agricultural production on the basis of annual climate cycles. We dominated, raised and cultivated: cattle, chicken, fish, corn, rice, potatoes—the menu is diversified, the still present hunting is sporadic and no longer a primary source. By stocking resources, humans dedicated themselves to the improvement of their most important tool that would change the future. The intellectual development not only takes place during gestation and subsequential development [19] (Figure 4), but also via training along the *Hominines* lineage, thus allowing a new diversity to take place among humans—the intellectual diversity.

Developing minds understand better, are more creative, have a higher capacity to face new environments—we could jump from the terrestrial environment to the desired unravelling of new frontiers. And so be it: let us dominate the oceans—remote vessels made of reed, bamboo or wood become part of the everyday scene; firstly propelled with oars, we navigated from tropical to glacial areas, maybe not too far in the beginning, a bay here and there, and thus we visited coastal regions at a global scale, as new continents were discovered. Vessels promoted the efficient distribution of humans around the planet. Further ahead, the Great Navigations with sails started in the East and widespread throughout the world (Figure 5). New frontiers, new tools—and for this to happen, we had to take another big step, which was not merely cook clay and separate crystals or even woodwork.



**Figure 4.** Brain size (in cm<sup>3</sup>) plotted against time (Myr) for specimens attributed to Hominidae. Source: [19].



**Figure 5.** Comparison between Chinese ships and European caravels. Source: <https://pt.slideshare.net/>.

We had to develop technology: tools made of iron, steel, bronze, for the construction of all the nautical apparatus, siderurgy unveiled in Antiquity. We had to cross the oceans, but how? A compass and a sextant were needed, but no problem, the oriental people solved it and the Great Navigations used the stars as guides. Enormous reed and bamboo vessels, with oars and sails, the Chinese were the vessel builders millennia before the Europeans.

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We first learned how to walk, then how to navigate short distances at first, seas, bays and lakes, evolving fast to great ocean crossings and unraveling new lands. At this moment global trade began. As today, riches navigated the oceans, making possible the gain of power and wealth by countless countries and families via piracy. Most of the present riches have come from piracy: “Look out there now, a ship is passing by loaded with gold, silver, food, spices, crockery. Whenever merchandise could generate wealth, there would be pillage”. Most of the European reserves were pillaged or exploited to scarcity, as still are nowadays, but during that nautical epic everything was violent. Not even humans were spared in this trade, maybe slavery was the first great fossilization act by humans in the oceans, as well as naval wars—all this waste and even bones from this era are buried in the sea. The marine environment is our second fossilization stage, which started on the land in an organic way under Pleistocene auspices; now we fossilize in marine carbonates, phosphorites, sandstones and shales. In this phase the ocean is still organic, but when it comes to Great Navigations, our organic particles share the deathbed with metals, copper, silver, gold, bronze—siderurgy provided us with tools, both for death and life and metals are the newest waste that accompanied our marine fossils.

Humans occupied all continents, excluding Antarctica, which was visited a little later. The terrestrial migrations and the Great Navigations were efficient in this distribution. We had compasses, sextants, ships, gunpowder, explosive weapons—it seems that nothing could affect us, besides ourselves. But it was not like that—together with our own, the microbial evolution invisibly took place: even with the total domination over land and sea, cities and villages, humans died from and saw the birth in this unstable urban environment of two of their main enemies: lack of hygiene and the proliferation of the bubonic plague, our first pandemic (Figure 6).

Urbanization and lack of basic sanitation, as well as basic notions of personal hygiene, led us to such situation—24 million people were exterminated from the planet. How it happened, what saved us—I would say information, study, water and chlorine, in spite of the chaos that forced a solution to be found. At that moment, a microscopic universe was unveiled, but it was already late, because a sick population was fossilized at a large scale and the plague bacillus followed the humans for the first time, so that we were not biologically alone in our tombs. Humans have suffered and suffer from countless microbial ailments, but the Black Death probably is the closest stage to a human index fossil, as it proves for the first time the environmental degradation of humans in the European continent.

Besides showing the human fragility in face of the unknown, the Black Death [20] was the most lethal illness of the planet and the event with the highest number of human casualties. It raised for the first time the need of a large-scale environmental safety in the cities. The *urban Homines* were buried in this fossilization stage, as a combination of waste and urban diseases.

Migrating by land or by sea, our ancestors were widespread throughout all continents and the survival technologies were no more secrets of a tribe, village or city. Sciences have had a fundamental role in life, because we had time and



**Figure 6.** Illustration of the Black Death, Europe 1347-1351. (Photo: Reproduction/Wiki-media Commons).

humans dedicated themselves totally to them. New frontiers were created, some by spontaneous expansion, others by domination of peoples and wars. The next step was yet to come and would be able to drastically change the humans' history.

After the domination of the environment and urban areas and the invention of the gunpowder, electricity, steam and combustion engines, humans were raised to a new level: the technological. Industrialization understood as mass or flow production was already occurring with the driving force of both water and wind. However, with engines we would not depend on wind or the impoundment of rivers by dikes, water could be pumped and mills would run for as many hours as necessary (**Figure 7**).

Land and sea migrations became frequent, either by train, steam or further ahead by planes. Humans spread more rapidly and their technologies accompanied them to all continents. Together with the dissemination of humans, a great quantity of residues, waste and other debris has been produced. What to do with such volumes of residues was until the last century a problem solved by burying them (**Figure 8**), totalizing 100 years of waste burial. Technology has created new facilities, but with it the technological waste was created for the first time in history, when we were leaving the organic world. The evolution that occurred in hundreds of years now occurs in tens of years, mostly resulting from the proliferation of education and science. However, it is not homogeneous and with the advancement of certain countries and the stagnation of others, we separate the First World from the Second and, because of the economic and social inequalities, a Third World [21].

We quickly moved from burning coal to burning oil and the first major environmental pollution began with carbon and hydrocarbons, persisting until today.



**Figure 7.** 3D replica of James Watt's steam engine (18<sup>th</sup> century). Source: <https://br.pinterest.com/>.

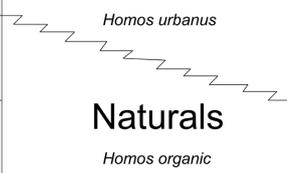


**Figure 8.** Waste collection systems over time: waste becomes an inseparable part of human life. (a) used animal force to transport wast, (b) wast are transport by trucks. Source: O Globo (Brazilian Journal).

Carbon, petroleum, gasoline, diesel, plastics, heavy metals, and radioactive elements circulate throughout the planet's surface and continental and marine waters. Sediments are loaded with H-C-O, phenols, alcohols, xylenes, iron, copper, lead, and everything else that the chemical industry is able to create. It was a moment of an almost childish and inconsequent discovery, we handled all types of chemical substances, without any concern for the environment. Humans and the periodic table were now fossilized together with pitches of oil and technological waste in sanitary landfills—this was the scavenger picture of humans and their products in the early modern era. Our taphonomy included metallization and even plasticization of our bodies; with a high preservation degree, we now fossilize the *industrial Homines*. The technology legacy was now printed on the pages of the newly-defined Quinary/Technogene Period (Ter-Stepamian, 1988, **Figure 9**). It was almost the total loss of the *organic Homines*, who still fossilizes locally. Inseparably the *urban Homines* and the *industrial Homines* form the past and present record of the second and third fossilization waves. In the strata coexist minerals, cement, bricks, iron, hydrocarbons, industrial oils, a variety of chemical and even radioactive components; we undoubtedly form a polymetallic layer that promotes countless chemical substitutions in the preservation of our bodies.

### 3. Superpopulation and Its Effects: The Fourth Wave

The Quinary is ours—yes, it totally belongs to humans, and the way things are going, will be exclusive to humans, as we have been mass extinguishing macro- and microbial populations. At present, we have nearly 7.7 billion consumers, under the point of view of the current capitalism. Extinction effects or events are ways to hold the control over superpopulation, such as pandemics, lack of food, space, competition, or drastically change in the reproduction of a species via reduction of births. All these factors occur with nowadays *Homo (sapiens?)*: the planet is inhabited by billions of people, food for these billions of people is genetically improved, as production must be accelerated—vitamins are added, farms occupy large areas: irrigated agriculture is one of the anthropic activities that consumes the largest quantities of water.

PERIOD	EPOCH	LANDSCAPE
QUINARY	Tectogene	Tecnogenic
QUATERNARY	Holocene 10.000y	
	Pleistocene 1.81Ma	

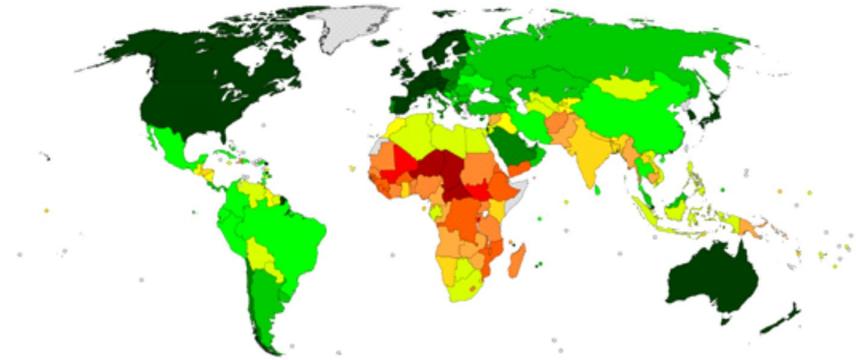
**Figure 9.** Geological time chart, indicating the transition from the Quaternary to the Quinary. Adapted from Ter-Stepanian (1988) [22], Nature [23] *apud* Salgado-Laboriau (1994) [24].

Herds in some countries (**Figure 10**) have the same number of individuals or more than the human population: in Brazil, which is a major producer of animal protein, has more cows and oxen than humans. Six billion chickens are produced in Brazil in 12 months. Pasture, food, animal feeds, water, vaccines for all these animals require a megastructure. Not only the preceding farming for human survival exists—we also have the developing industry: firstly in first-world countries and later the flagship of sub-developing, second- and third-world countries [21]. Everybody wants industrialization or better yet industrial centers, no matter of what. The policy aims at the capital advance to capital, profit generating more profit, and consequently employment or sub-employment, because at the beginning of industrialization it was a no-man’s land. Exploited to the maximum, the quasi-slave workforce had now social and labor rights, the organized society emerged, as the relationships between employer and employee—the socially organized *Homo*.

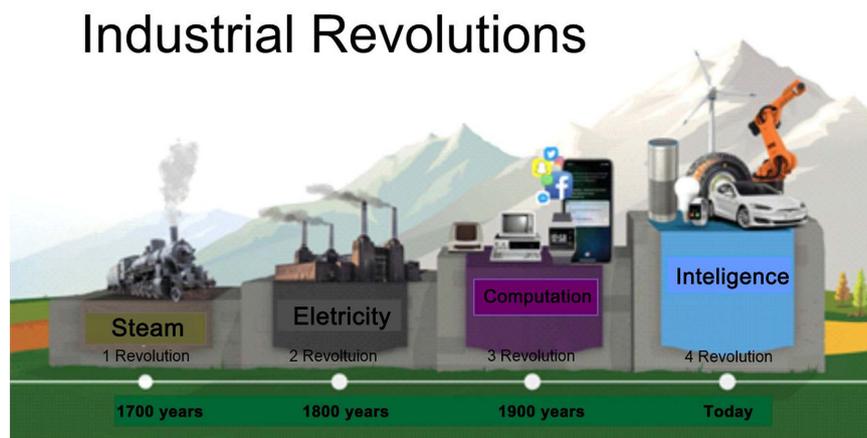
With capitalism dominating the philosophy of development, social classes emerged in a more evident way and even with all the farming and industrial development, the economic-social differences increased in all continents. Even in the “cradle of socialism” did we see and still see social division.

How can we create so much wealth and technology and not distribute then equally among humans? Not to save the species is a conflicting strategy for humans to carry out population control but it exposes greed. How can an individual have an income equal to the Gross Domestic Product? Something is wrong. What has the Fourth Industrial Revolution [26] (**Figure 11**) provided us, in addition to technological advances and facilities for the first world and monocratic wealth? Remember that there are people today who still live in the First Industrial Revolution. This small human niche does not even have access to electricity. Therefore, economic development has not solved social problems, even with riches of the order of billions of dollars.

When analyzing the effects of superpopulation, space is fundamental, as the Earth’s size does not change. Summing the continental areas available in all continents, we have 149,440,850 km<sup>2</sup> (**Figure 12**). However, Antarctica is practically



**Figure 10.** World map indicating the human development index (based on data from 2019, published in 2020) [25] above 0.900 0.850 - 0.899 0.800 - 0.849 0.750 - 0.799 0.700 - 0.749 0.650 - 0.699 0.600 - 0.649 0.550 - 0.599 0.500 - 0.549 0.450 - 0.499 0.400 - 0.449 below 0.399 Nodata. Source: <https://pt.wikipedia.org/>.



**Figure 11.** The four stages of the Industrial Revolution. Source: World Economic Forum.

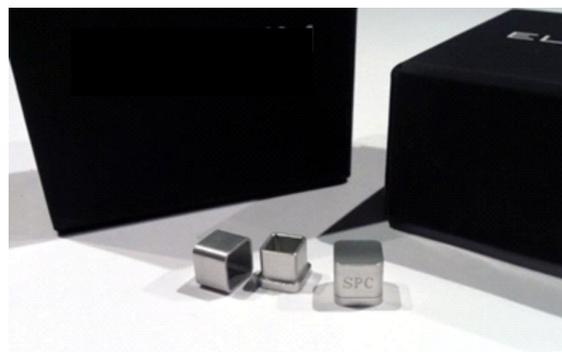
Continent	Area (km <sup>2</sup> )	Percent of total surface	Aproximate population 2008	Aproximate total population	Habitant density (km <sup>2</sup> )
Asia	43.810.000	29.5%	3.879.000.000	60%	86.70
America	42.330.000	28.5%	910.720.588	14%	41.8
Africa	30.370.000	20.4%	922.011.000	14%	29.30
Antartica	13.720.000	9.2%	1.000	0.00002%	0.00007
Europa	10.180.000	6.8%	731.000.000	11%	69.7
Oceania	9.008.500	5.9%	32.000.000	0.5%	3.6
Total area of continents :184.647.000 Km <sup>2</sup> or 29,1% of surface.					

**Figure 12.** Distribution of inhabitants/km<sup>2</sup> in habitable areas on the Earth's five continents. Source: United Nations (2008).

inhabitable—we have to subtract its 13,720,000 km<sup>2</sup> from the total, resulting in 135,720,850 km<sup>2</sup>. If we consider inhabitable deserts and mountains or of very low population density (e.g. Atacama, Gobi, Sahara, the Australian Desert; the Himalayas, Andes, Alps, Rocky Mountains), among other inhospitable areas, this value amounts to circa 30,000,000 km<sup>2</sup>, thus remaining 105,720,850 km<sup>2</sup> for living and surviving on the planet's surface. Dividing this area by the 7.7 billion inhabitants, the result is 72 inhabitants per km<sup>2</sup>—in other words, dividing all the land available for living on the planet, we would have today 72 people living on every 1000 m × 1000 m. Animals and plants, which today totalize 5% - 6%, besides water bodies (rivers, lakes etc.), are not being taken into account. Therefore, we cannot stay in our square kilometer, we have to share it with other 71 *Homines*.

Is 7.7 billion people a superpopulation? After all, everything has to be big, once we have to feed, promote health, housing, education, transportation, leisure and employment for all. Some simple calculations can help us check whether we have reached superpopulation. If superpopulation has been already reached, what will you with your 140 m<sup>2</sup>, which is the unit area for each *Homo* at present? The necessity of verticalization is obvious, with its beneficial and harmful effects [27], being this practice inevitable in urban zones. This milestone in construction is no other than silently pointing to the lack of space in the environment, massifying cities. The once plain areas dominated by houses are now occupied by agglomerates of even higher skyscrapers with larger capacity to store *Homines*.

In this phase of artificial intelligence and other technologies we fossilize *Homines* with digital sensors, implants that liberate hormones, bionic members, sonic ears—we have reached the maximum of possibilities to monitor and save lives with technology of the digital era—now we fossilize **technological Homines**. Some of these *Homines* of the technological era go beyond: they pay for their space fossilization, breaking all the taphonomic rules of Paleontology. They will not be buried, they will not be mineralized—it will be the mummification of human dust in vacuum, to make dinosaurs jealous, *space Homines'* fossils will emerge and our DNA will space wander (Figure 13).



**Figure 13.** Fossilization space capsules for space *Homines*. Source: <https://files.meiobit.com/wp-content/uploads/2015/08/20150818capsuladomal-634x400.jpg>.

In our reality, besides the space necessary to live, we must have water: life has come from it and we, as other species, depend on water. Have we driven the superpopulation effects to the water reserves of the planet? How much water do humans use per year? Which is the global mean? We have a number, but it varies according to availability, type of society, climate, industrialization degree, farming, riches, among other factors.

The world's drinkable water reserves, if grossly added, totalize 57,000,000 km<sup>3</sup>, according to 2018 *The World's Water* data (Volume 9). The mean value for each human being is variable: rich *Homines*: (including swimming pools, bathes, house cleaning, cars etc.) the mean value is estimated to be above 400 - 300 liters/day; middle-class *Homines*: 150 liters/day; needy *Homines* or close to the poverty line: 50 liters/day, and *Homines* below to the poverty line: less than 50 liters/day.

An average of 100 liters per *Homines*/day to live—believe me!—is a high number. Per year, each *Homines* uses 36,500 liters, a million people consume 36 billion liters of water/year, 10 million people use 1 km<sup>3</sup>/day. Calculating for 7.7 billion people/day, our water consumption reaches 770 km<sup>3</sup>/day. In 365 days: 770 km<sup>3</sup> × 365 = 281.050 km<sup>3</sup>/year. This represents 10% of the total anthropic use; computing all the anthropic activities, it totalizes 2,810,500 km<sup>3</sup>, which represents 5% of the global reserves. These 5% of the global reserves are used during the year, in 20 years the humans use 50% of volume of the global reserves of the entire water cycle of the usable volume (50% in 20 years). Remember that 50% or more of this volume will be polluted and already pollutes superficial reservoirs of 100 m to 200 m of depth, besides superficial waters (rivers, lakes), which undergo eutrophication. Would this use/volume cause global effects on the reserves? To recharge aquifers with polluted water will damage the health of the environment, as black waters will circulate freely, proving that we have learned nothing from the Black Death. Surely, we use too much water, we decontaminate less our water reserves. There is plenty of technology to the sustainable use of water, but how to take the sustainable use to the 7.7 billion users heterogeneously spread around the planet and in difficult social-economic situation? The commensurability of carbon [28] seemed to be a solution, but it has not taken off yet. In practice, First World countries would buy carbon royalties from Third World countries with the possibility of continuing to pollute.

The burial of oceans occurs in the same velocity that human population increases. The *urban Homines* throws 20 billion tons of debris/year into oceanic basins [29]. It is estimated that more than 20 billion tons of debris/year are launched by natural processes, totalizing 40 billion tons of debris/year, that is, humans and nature deposit the same volume of debris in oceanic basins. The Super Era is, then, unleashed: Superpopulation, Super-airplanes, Superships, Supercrops, Supercities, Superviruses, Superdebris. Superpopulation not only causes the autophagic extinction of *Homines*, but takes to the strata hundreds and thousands of terrestrial and marine species of our fauna and flora, besides

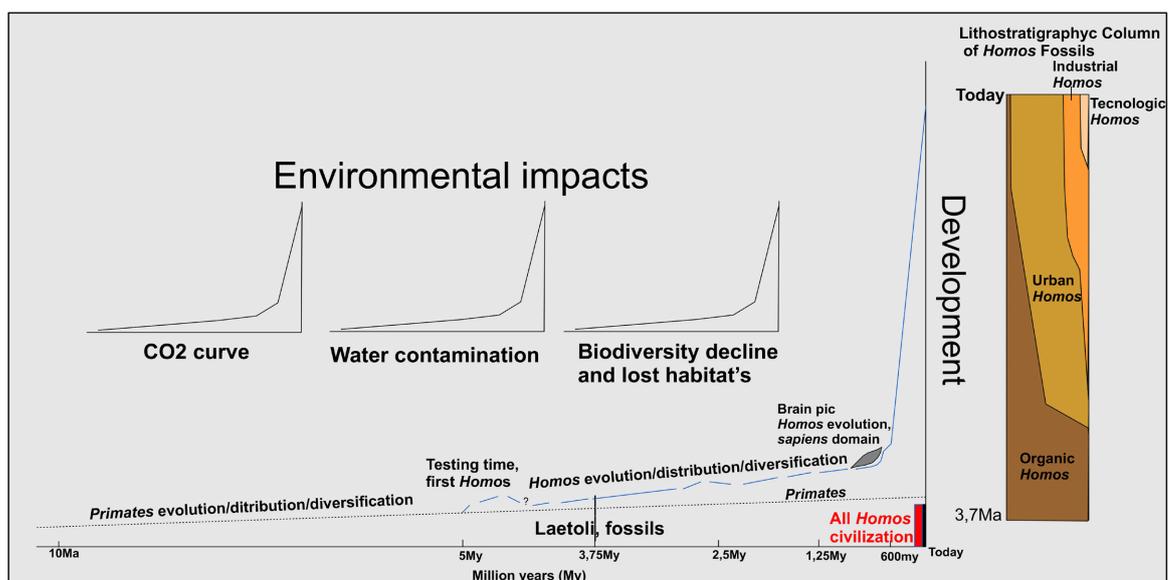
environmental degradation. The evolutionary curves for species and environmental impacts are identical and synchronous to the *Homines'* evolution (Figure 14). If we are on top of the chain, what will happen to it if we break these environment chains and to other species, as everything is intimately intertwined? We do not actually know.

#### 4. The Future: The Fifth Wave?

In this rhythm, the future will be for a few. Which will our final fossilization be, who and what will go to the tomb with us—a new virus? Covid is already a new pandemic: what will the new taphonomic processes look like? Regarding the pandemic, it is not as efficient as the first when it comes to human fossilization, but is surely more globalizing, maybe a prelude to an index fossil will be *Homines + Virus*, an efficient extinction process. We also fight against Cholera, Ebola, Sars, Mers, among other fatal viruses that currently coexist with *Homines*.

In the future we will have new energy sources, new metals in circulation, such as lithium, which are sold as solution to our energy problems. Initially as cadmium, zinc, and now lithium batteries [30], of attested high performance, these metals are mixed with global hydrogen tests, as new energy sources. In due proportion regarding energy production, lithium stands for each human, as uranium stands for each power plant. Will this metal be massified? It is as dangerous or more than lead.

Which is our near geological future? We are in an interglacial period until the next glaciation—will we be able to give shelter and heat to all, will we have the technology to face a modern era glaciation? Certainly we will, the question is how many will survive. But before the inevitable cooling, we have the present heating caused by anthropic actions—not to mention that the sun is getting



**Figure 14.** Evolutionary *Homines* curve, fossil lithostratigraphy and comparative curves between environmental impacts (Author).

colder. However, heating takes place due to the environmental anthropophagy and can change the level of the oceans in 10, 20, 30 m, mainly as a result of the loss of permanent ice [31]. If the sea level rises 50 m, practically 50% of the world population will be affected: imagine 3.75 billion people migrating to higher lands, there will not be enough space. An environmental collapse can happen, lack of water at a global scale, bad air quality at a global scale, lack of food at a global scale—reversing these global impacts is more difficult and certainly takes much longer than vaccination.

For the population itself, the numbers show a current growth in less developed countries (LDCs) in relation to more developed countries (MDCs). Population control can be the solution, less humans should be born to balance our quality of life. When will we pay attention and exercise the decrease of global population by means of less births; how many generations are needed for the decrease; will a drastic decrease of 50% of the global population be enough? The capitalists hate the idea of losing clients. We have already lost *Homines* to hunger, wars, diseases, or merely social-economic unbalance of a slowly withering population. Which will be the behavior of the future *Homines*—will it be exploratory, conservative, balanced? These are adjectives necessary to survival, such as countless others.

In Eastern Europe, the numbers of 2019 reveal that the population density is decreasing, no matter if caused by wars or environmental/population awareness [25]. With two children per couple the population density is more or less kept as it is; if the average is less than two, the tendency is a decrease in local population. We cannot consume in excess, as excesses kill or cause unbalances. Even power in excess becomes dictatorial, alcohol and drugs are harmful to health, excess food leads to obesity, consumption of basic movable or immovable properties lead to excess of residues/waste, many cars consume iron and fuel, lots of people need food and water, leading to the necessity of growth to supply the demands—but which is the limit to this growth? The size of the Earth does not increase and not even of its resources—on the other hand, we can create new sustainable processes. However, the technological advance leads to the production of new residues that participate in the pollution cycle.

And if limits will be imposed to us in the near future: how much water can be used, how much food can be stocked, how many houses, cars, children, waste can be produced, how much sewage must be treated, how many habitats can be destroyed, how many planes can burn fuel into the atmosphere, how many ships can circulate in the oceans, how much fish can we draw from the marine stocks, how much time we have left if we do not change? The Earth has a useful life and when it comes to an end, it will be recycled in other galaxies, maybe transformed together with the new reorganized matter. Then, *Homines* will be extinct and maybe his matter deposited in a new planet, with a new life and with a new and conscious *Homines*. While natural extinction does not arrive, our diversified taphonomy continues and in the most recent stratum we have a new companion called Covid, which inhabits our most recent fossils. Maybe it is a change of ha-

bit, maybe it is a habitat invasion, maybe it is superpopulation, but it is evident that Asia has given birth to respiratory diseases and I point out that this continent is inhabited by the two major populations of the planet. *Homines* are experiencing the Covid pandemic (2019-2020-2021), now with technological armament, and to what is shown being controlled; however, until when will we wait for a new virus to win the war, until when will we support the autophagic ailments, until when will we wait for a global environmental change to take place and face not only health collapse but something more severe, as the environmental collapse? What will our fifth fossilization wave look like?

## 5. Conclusion

Our evolutionary taphonomy reveals that in the Holocene strata, the first *Homines* were organically fossilized without chemical additives or anthropic industrial artefacts. This taphonomic stage represents the first wave, when **organic Homines** (*Homines* + Biomas) fossilized or proximal to extinction. The urban environment inhabited by the **urban Homines** (*Homines* + City) together with his waste becomes his main tomb in the second fossilization stage. Following this urbanization, technology and industrialization increased, fossilizing the **industrial Homines** (*Homines* + Factorys) in the third fossilization wave. With the technological advances the first **technological Homines** (*Homines* + High Tech Products) fossils emerge, and are still buried nowadays, representing the fourth wave. *Homines* still fossilize nowadays, but the proportionality among them has been changed, being rarer to find **organic Homines** and more common the **technological Homines**. Which will be the fossilization of the near future? Which will be the type of *Homines*' fossils? Everything points to a strong metallization and plasticization, leading to a **metallic, radioactive, space, plasticized or dehydrated Homines**—would one of these forms be the fifth wave? The *Homines*' history continues to build our fossil stratigraphy.

## Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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