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HUMAN ROLE IN THE 6th. MASS EXTINCTION PROCESS

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ABSTRACT

Mass extinction is the large-scale extinction of living things. To date, it is widely believed that there have been 5 mass extinctions due to natural processes such as large volcanic eruptions, asteroid impacts or long-term climate change. Today, a sixth extinction is in the process of accelerating. But unlike the previous ones, this latest extinction is being driven by anthropogenic processes. Destruction of habitats of plants and animals, climate change due to fossil fuel consumption, consumption above the carrying capacity of nature, overpopulation, pollution; nuclear weapons, genetic interventions are among these. The fact that such practices are increasing rapidly and species are gradually decreasing in number and species indicates that mass extinction is continuing at the hands of human beings.

KEY WORDS: *Mass extinct, fossil, human, over population, capacity*

INTRODUCTION

The widespread and rapid decline in biodiversity and the sudden disappearance of large numbers of species over a short geological period, or even suddenly, is considered a mass extinction. This extinction process can sometimes occur as a sudden event, sometimes as a result of changing conditions and the inability of many species to adapt to new conditions or environments. According to all evidence, especially the fossil record (figure 1, 2), there have been five large-scale mass extinctions for which there is evidence in the last 4.6 billion years of geological chronology.



Figure 1. Tyrannosaurus Rex Fossilized Skull and Skeleton, American Museum of Natural History

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Figure 2. **They Were Living on the Earth Once: A Fossil Display of Several Well-Preserved Trilobites That Died in A Mass Extinction Event Around Morocco Several Million Years Ago**

The four mass extinctions in the Ordovician, Devonian, Permian and Triassic were caused by volcanic activity and massive carbon emissions associated with atmospheric degradation. In the Cretaceous, the asteroid impact that killed the dinosaurs was the cause of the other mass extinction. The thylacine, passenger pigeon, mammoth, great auk, dodo, Galapagos tortoise, stallers sea cow, aurochs, quagga, moa are species estimated to have become extinct during this period (figure 3).



Figure 3. Once Upon a Time: Mass Extinct Animals

Objectives

After 5 major mass extinctions, today we are facing a new extinction process. However, unlike its predecessors, this extinction is human-induced, as opposed to natural processes. In this context, is there a mass extinction process? If so, the study focuses on the answers to questions such as what are its origins and causes.

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The Main Causes of Mass Extinctions That Have Occurred

Apart from these five major extinctions, there are about 20 similar, albeit controversial, extinction stories. The main causes of these mass extinctions are the onset of glacial cycles and changes in sea level, changes in atmospheric and ocean chemistry, climate changes, and decreasing oxygen levels in the deep oceans.

Based on the principle that "the past is the key to the future", let us take a look at and analyze events and the environment:
The increase of dust and particulate aerosols, pollutants such as sulfur and sulfur-oxides in the atmosphere, sulfur-oxides that precipitate in acid rain and poison many organisms, further contribute to the collapse of food chains. Sudden changes in temperature and pressure also lead to biodegradation and a subsequent increase in methane. Methane is a much more potent greenhouse gas than carbon dioxide, so a methane explosion can cause rapid global warming, or become much more severe if the explosion itself is caused by global warming. A nearby nova, supernova or gamma-ray burst could destroy Earth's ozone layer and leave organisms vulnerable to ultraviolet radiation from the Sun. The Sun's eventual warming and expansion, combined with the eventual depletion of atmospheric carbon dioxide, could result in a globally sterilized world. Thus, once photosynthesizing or breathing organisms are gone, atmospheric oxygen can no longer be regenerated. Eventually, the loss of oxygen will cause the remaining simple aerobic life to suffocate to death.

Is There Mass Extinction Today?

Whatever the cause, living things today are under pressure and stress in the process of mass extinction. The cycle of photosynthesis and the breaking of food chains as a result of the disruption of the carbon cycle on Earth are the biggest drivers of mass extinctions (figure 4).

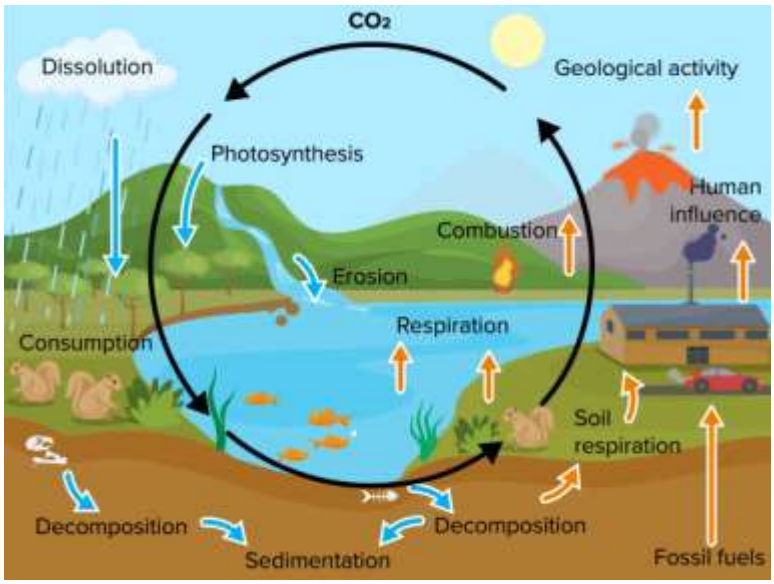


Figure 4. Carbon Cycle Diagram

Although the Earth is a habitable place thanks to the existence of systems. These systems do not exist in isolation, but are interconnected, interdependent and in great interaction with each other. Moreover, they form chain processes with each other. Negativities at any point in the process cause negative repercussions in other systems. Thus, a negative cycle emerges. In today's world, developments in human and environmental relations and the irreversible destruction of natural systems have reached great dimensions whose damages cannot be compensated in any way. By burning fossil fuels, humans inject billions of tons of carbon dioxide and other gases into the atmosphere every year, as in the case of major volcanic activity. This is nothing more than an accelerated artificial imitation of a slow natural phenomenon.

Although previous mass extinctions were fatal events, following the extinction of the non-avian dinosaurs, the numbers and habitat of mammals and birds continued to be the habitat of the planet. But in the current period, is there a total and complete extinction this time? This worries us all.

The extinction since 1900 is 1,000 times more than what has happened so far. It is claimed that 50% of the world's animal species have disappeared and this loss threatens the continuation of human existence.

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These findings indicate that the sixth mass extinction event or the process of biological destruction is ongoing. However, what is happening today, in terms of its size and nature, a possible sixth mass extinction is attributed to a very new reason, unlike the previous natural factors and processes.

Is Mankind a Factor in the Mass Extinction?

Clearly, that reason of the mass extinct is the last guest of the Earth, the human being. In the registration notes of the Roman Empire in 30 AD, it is stated that the world population was approximately 55 million. It is estimated that about 1 million people lived on the African continent at that time.

Based on the estimated population of around 60 million in China, it is estimated that there are less than 100 million people in other parts of Asia. America and Oceania did not have large populations. Approximately 2000 years ago, there were around 250 million people on Earth, most of whom lived in Southeast Asia. With the general acceptance of 300 million in 1000 and 500 million in 1650, it is seen that it took 1650 years for the world population to double. After this date, the world population has entered a rapid development process. 1 billion in 1802; 2 billion in 1927; 3 billion in 1961; 4 billion in 1971; 5 billion in 1987; 6 billion in 1999; 7 billion in 2011; and 8 billion in 2024.

Three major leap periods are remarkable in the increasing momentum of the human population, which is highlighted above. According to this:

The first leap was made when people discovered making tools. Humans struggled with wild animals with the tools they made, began to feed better by hunting them, and thus entered the process of faster reproduction.

The second leap was experienced with the transition of human beings to settled life. In this period, with the transition to the agricultural society, people managed to cultivate the soil, cultivate various crops and stock them in the winter periods, and eat well and comfortably. They also learned to tame animals to take advantage of their products, and they had alternatives sufficient to feed more people.

The third leap was accompanied by the industrial revolution. The highest population increase in the history of mankind has been experienced following this period. The first steam-powered engine in James Watt in Scotland in 1763 was recorded as the start of a new cycle.

In this period, the industry sector has improved, raw material resources have been transformed into new products, production has increased, nutritional and shelter assets have grown, and national economies have grown. With economic development and urbanization, people's purchasing power has increased. Due to the developments in medical technologies and other technological developments, life expectancy has increased and the population has increased rapidly with the increase of living standards and welfare. Thus, along with the industrial revolution, the demographic revolution was experienced in the west. Composing 18.3% of the world population in 1650, Europe increased this share to 22.7% in 1850.

The rapid population growth trend that started after the industrial revolution, has grown exponentially in a short time after 1950 and has been recorded in historical records as a population explosion. In this process, reasons such as development in agriculture, industrialization, and technological developments were improve living conditions, increase in birth rates due to developments in medical science and decrease in mortality rates are the first reasons that come to mind. Rapid population growth is still underdeveloped and continues in developing countries.

As seen, the population, which was around 1 billion at the beginning of the 1900s, has exceeded 8 billion today and moreover, it will exceed 10 million in the near future (figure 5).

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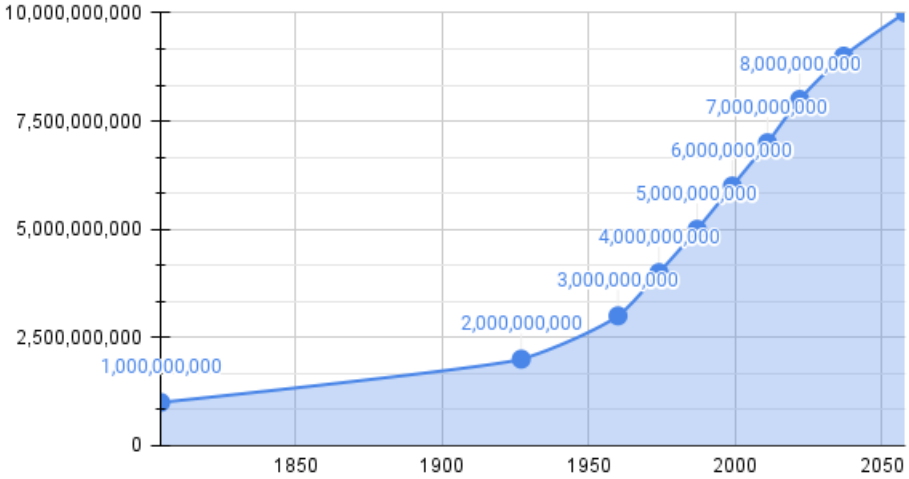


Figure 5. Population Growth Illustration

Prehistoric people were engaged in simple activities on earth for their basic needs. Over time, these activities became complex and multifaceted due to advances in science and technology. The active participation of human beings in earth systems and processes has started in the last ten thousand years and this participation has become an intervention today and has made progress towards becoming the most effective factor and process. Especially after the industrial revolution, human impact has increased rapidly. This impact has directly and indirectly created extremely unfavorable conditions and manifested itself as disasters.

In a 2010 Nobel Prize-winning paper published in the scientific journal Environmental Science & Technology, Dutch atmospheric scientist Paul Crutzen of the University of Mainz, Germany, geoscientists Jan Zalasiewicz and Mark Williams of the University of Leicester, and Will Steffen, head of the Climate Change Institute at the Australian National University, found that the beginning of this new era will also witness the sixth largest mass extinction on Earth. According to the researchers, in just two centuries, humans have undergone such a massive and unprecedented transformation that we may be experiencing the beginning of a new geological epoch that will change the face of our planet for millions of years. The four scientists have coined the name "New Human Era" for the new geological era they propose, in light of massive population growth, mushrooming megacities and the extraordinary increase in the use of fossil fuels. First proposed by Crutzen at the end of the last century, the name "Anthropocene" initially caused controversy in earth science circles.

However, the proliferation of signs of human destruction origin, such as global climate changes, mass extinctions in plant and animal species, has strengthened support for Crutzen's proposal. With the article "Anthropocene: An epoch of our making" written by James Syvitski in the magazine Global Change in 2012, the charts compiled by Steffen and his colleagues reveal a great human-induced change in the world within 250 years. Dr. Ekinci, in his book, "Anthropogenic Geomorphology", indisputably names our age as "Anthropocene" as a period separate from Holocene. This rapid acceleration is the result of "human footprints" and effects on the Earth. Both "the Global Human Impact Index" and "the Global Human Footprint Index" verify this situation.

Current Activities That Could Cause Rapidly Mass Extinction

Three main topics will be evaluated under this title. The first is nuclear technology, nuclear power plants, nuclear weapons, and wars. Second, Biological Warfare, and Terrorism, Man-made virus, bacteria, insect and Fungus outbreaks. Thirdly, Genetic technologies and related applications. Apart from these, there are many conspiracy theories or approaches that can cause mass extinction. But our study focused on probabilities in the light of science.

Nuclear Technology: Power Plants and Weapons

Nuclear technology can be named as processes that involve obtaining nuclear energy, developing nuclear weapons of mass destruction, or applying nuclear information in areas such as medicine. Radioactivity is the tendency of unstable atom nuclei to emit subatomic particles. Radioactivity is the degradation of unstable nuclei of heavy elements such as uranium, and thorium. As a result of this decay, radiation energy is released. The interest in this field has increased steadily in the recent century as the nuclear reaction releases more energy than other chemical reactions.

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The main purpose of nuclear reactors (nuclear power plants) is to generate energy. Nuclear power generation is achieved by using nuclear reactions that release nuclear energy in reactors. One way to obtain nuclear energy is the fission, another way is the fusion method.

The raw material element is taken from nature and used in reactors as a fiscal isotope is Uranium-235. The rate of Uranium 235 in natural uranium is 7 per thousand. The rest forms U-238. Today, 2,563 terawatt-hours (TWh), equivalent to 10% of the total energy produced in the world, are produced in electric nuclear reactors. As of March 2020, there are 443 Nuclear fission reactors with 395 gigawatts (GW) combined electrical capacity in the world. Besides, a total of 109 reactors, 56 of which are under construction and 53 in the planning phase, will involve in energy production. The biggest new building activity takes place in Asian countries such as South Korea, India, and China. Leaving aside any accident or mass destruction, nuclear power has the lowest mortality rates per unit of energy produced compared to other energy sources. Moreover, 64 gigaton CO2 equivalent greenhouse gas emissions, which may result in the burning of fossil fuels in the commercialization adventure of about 50 years, prevented the emission of 1.84 million possible fatalities that may occur due to air pollution.

In the civil nuclear power industry, 3 accidents occurred at level 5 or higher, the first of which was the Three Mile Island accident in 1979, a smaller-scale accident rated at IAEA 5. The other two are the Chernobyl and Fukushima accidents level 7(figure 6).

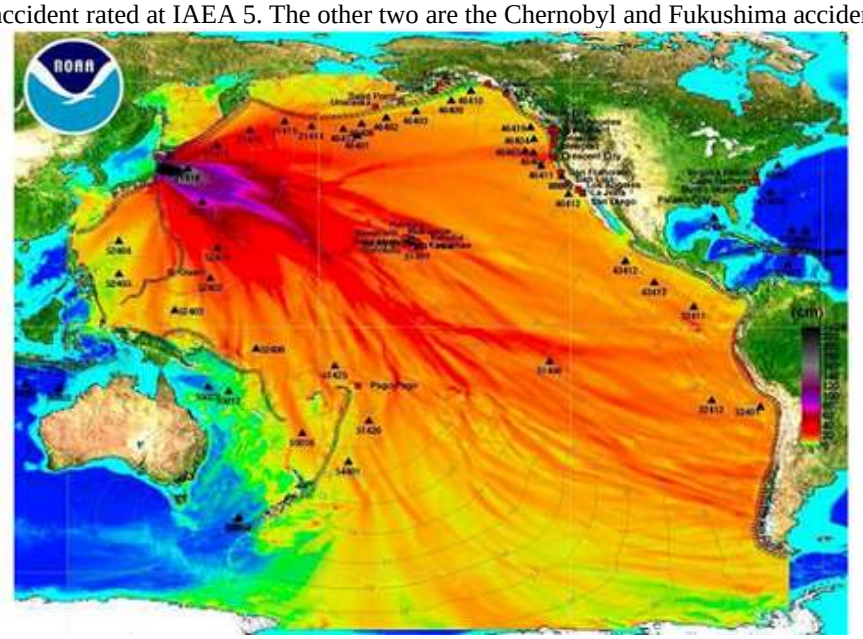


Figure 6. Radiation Spreading from Fukushima Across the Pacific Ocean

The Chernobyl disaster in the Soviet Union in 1986, the Fukushima Daiichi nuclear disaster in Japan in 2011, and the Three Mile Island accident, which took place more in the United States in 1979, provide some clues about mass destruction. Nuclear accidents cause great loss of life and destruction of natural environments. A nuclear accident can also cause social isolation, anxiety, depression, psychosomatic medical problems, reckless behavior, or even suicides. These clues are sufficient to demonstrate that nuclear power contains many irreversible threats to humans and the environment. Despite this, nuclear facilities continue to remain dangerous in many locations around the world (figure 7).

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Figure 7. World Map Nuclear Waste Radioactive Hazard Zone

Mass Destruction Weapons are chemical, biological, radiological and nuclear (KBRN) weapons or substances used to cause mass deaths. Atom, hydrogen, and neutron bombs are nuclear bombs. Nuclear Fission Weapons are also known as atomic bombs. High Uranium (235U) or Plutonium (239Pu) is used in atomic bombs based on fission-type nuclear reactions.

Fusion Weapons are known as hydrogen bombs. It is a destructive nuclear weapon that can provide uncontrolled thermonuclear energy.

The USA developed the first hydrogen bomb in 1952. The first hydrogen bomb was thrown into the Marshall Islands in the Great Ocean in 1954 and tested by the USA. The dropped bomb is about 1000 times more powerful than the atomic bombs dropped on Hiroshima and Nagasaki. The USSR, on October 30, 1961, conducted a 57 Megaton hydrogen bomb experiment, nicknamed Tsar Bomb, in Novaya Zemlya. This bomb is 3,800 times stronger than the atomic bomb dropped on Hiroshima. The flame ball he created could be observed from 1000 km away.

Neutron Bomb is a technically advanced tactical nuclear weapon. 14 million Volt energetic neutrons are emitted from the deuterium and tritium ions that interact during the fusion, which occurs as a result of the merger of the atomic nuclei in the millions of degrees of heat generated by the disintegration of the atom. These neutron beams do not harm the buildings and the environment, but they pose a definite lethal danger to human life.

Today, the United States, Russia, England, France, the People's Republic of China, India, Pakistan, North Korea, Israel (?) And Iran (?) have nuclear weapons (figure 8).

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Figure 8. Nuclear-Weapon States

It is a possible fact that people who have marked their marks on international terrorism will not be able to blow up the buildings in the coming years, and may attempt to threaten an entire city or even an entire country or whole World by using nuclear weapons of mass destruction.

Man-Made Virus, Bacteria, Insect and Fungus Outbreaks, and Biological Warfare and Terrorism

The use of biological toxins or infectious biological threat agents, such as bacteria, viruses, insects and fungi, or bioactive substances to kill or to neutralize people, animals or plants can be described as biological warfare. Animal, plant, bacterial, archaic and synthetic viruses attract attention in these attacks. Most of the pathogens of classical and modern biological weapons can be obtained from a naturally infected plant or animal and converted into a human-modified form.

The fact that a biological agent can cause mass extinction depends on high infectivity, high virulence, and effective delivery, spreading system, and vaccine deficiency. Such agents can kill infected people by 90%. Even the purpose of destroying it on a strategic scale can get out of control and affect the whole world. Some agents may not be fatal or deadly and can be targeted against a single person, a group of people, and even the entire world population. These can be developed, acquired, stocked or distributed by nation-states or different groups. The first is the bio-war, and the second is bio-terrorism. Common human diseases caused by viruses are colds, flu, chickenpox, and herpes. Viruses cause many serious illnesses such as rabies, Ebola virus disease, AIDS (HIV), avian flu, and SARS (figure 9).

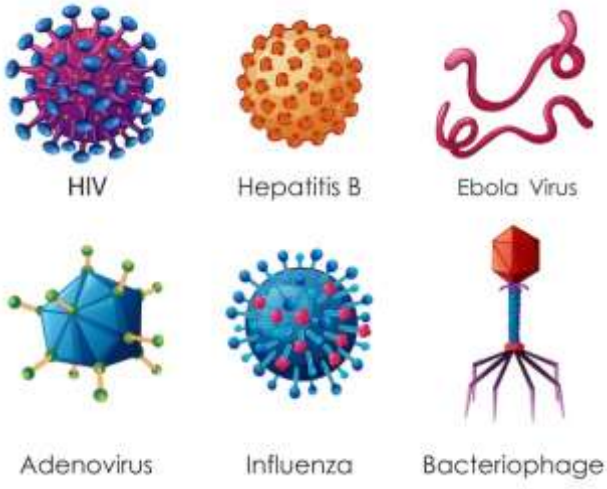


Figure 9. Diagram Showing the Shapes of Viruses: Bacteriophage, Ebolavirus, Hepatitis, Rotavirus, Adenovirus, Papillomavirus, AIDS, and Flu.

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Biowarfare or bioterrorism has the potential to kill more people than a nuclear war. So, biological agents can be classified in several categories in terms of risk. These:

Category A

These high priority agents pose a risk to national security, can easily be transmitted and spread, can lead to high mortality, have a potential impact on public health, cause public panic, or require special action to be prepared for public health.

- Tularemia or rabbit fever
- Anthrax
- Smallpox
- Botulinum toxin
- Bubonic plague
- Marburg virus, and Ebola virus viral hemorrhagic fever.

Category B

These are that become widespread and kills if the disease is not treated.

- Brucellosis (Brucella species)
- Salmonella (E Coli O157: H7, Shigella, Staphylococcus aureus)
- Glanders (Burkholderia mallei)
- Melioidosis (Burkholderia pseudomallei)
- Psittacosis (Chlamydia psittaci)
- Q fever (Coxiella burnetii)
- Ricin toxin from Ricinus communis (ritual bean)
- Abrin toxin from Abrus precatorius (Rosary peas)
- Staphylococcal enterotoxin B
- Typhoid (Rickettsia prowazekii)
- Viral encephalitis (for example, alphaviruses: Venezuelan horse encephalitis, eastern horse encephalitis, western horse encephalitis)
- Water supply threats (for example, Vibrio cholera, Cryptosporidium parvum)

Category C

Category C agents are pathogens that can be designed for mass spread due to their availability, ease of production and distribution, high mortality, or ability to cause a significant health effect.

- Nipah virus
- Hantavirus
- Coronavirus

Virus agents that are likely to die if an individual is infected are as follows:

- Marburg virus passing through infected monkeys
- Ebola virus passing through infected people or animals
- Rabies virus passing through infected dogs and other animals
- Human immunodeficiency virus (HIV) infecting a cell
- Smallpox virus
- Hantavirus pulmonary syndrome, which is caused by exposure to the feces of infected mice.
- H1N1 influenza virus called swine flu
- Dengue virus transmitted to humans with an infected mosquito bite
- Rotavirus causing serious diarrheal disease between infants and young children,
- Coronavirus (CoV1, CoV2, CoV19) virus that causes severe acute respiratory syndrome, or SARS that pass from bats to humans like CoV.
- MERS-CoV virus belonging to the same virus family as SARS-CoV and SARS-CoV-2

Entomological wars using insects for attack can also cause mass extinctions. Japan's use of fleas to spread plague in the Second World War is an example of this.

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Damages in the Gen and Reproductive System

In the female mammal, two types of gonadal hormones as estrogen, and progestin are secreted. Estrogens are substances that stimulate the beginning of cyclic heat, in which the women are sexually active and open to men. Hormonal balance is an important factor in female fertility, especially concerning the ovarian cycle. Lifestyle factors such as stress, excess body weight, coffee consumption, diet, and excessive exercise can affect a woman's hormonal balance and subsequent ovulation regimen. It is now clear that nutritional activities control hormonal control. There are indications that endocrine-disrupting chemicals such as PCBs and some pesticides can affect hormonal balance, thereby increasing the risk of subfertility.

Pesticides are used in agriculture and public health to control insects, weeds, animals, and disease vectors. The United Nations Food and Agriculture Organization (FAO), as a pesticide, 'human or animal disease vectors, undesirable plant species, or any mixture of substances to prevent, destroy or control any pest, including harmful animals.

Difficulty in breathing, headache, neurological or psychological effects, irritation of the skin and mucous membranes, skin disorders, effects on the immune system, cancer, and reproductive effects are the most known. Some pesticide agents can interfere with female hormonal function, which can lead to adverse effects on the reproductive system by disrupting the hormonal balance necessary for its proper functioning. In epidemiological studies, exposure to pesticides has been associated with menstrual cycle disorders, decreased fertility, long-term pregnancy, spontaneous abortion, stillbirths, and developmental disorders that may or may not be due to impaired female hormonal function.

Researches have revealed that foods, medicines, pesticides and other environmental factors destroy the following steps that are involved in the fertility process. These:

- Intervention in hormone synthesis Disruption of female hormonal function
- Interference with hormone storage and release
- Interference with hormone transport and clearance
- Interaction with hormone receptor recognition and binding
- Binding and activating the estrogen receptor
- Binding without activating the estrogen receptor
- Binding of other receptors
- Intervention with hormone post-receptor activation
- Intervention to thyroid function
- Intervention to the central nervous system

Approximately 25000 genes have been identified in the human genome. Undoubtedly, this information, which will provide great benefits in the diagnosis and treatment of diseases, has brought with it some ethical problems. The application of genetic technologies in the areas of stem cells, cloning, gene therapy, genetic manipulation, gene selection, gender selection and preimplantation has revealed great potential for the human race to affect and change human life on earth, as we know today (figure 10).

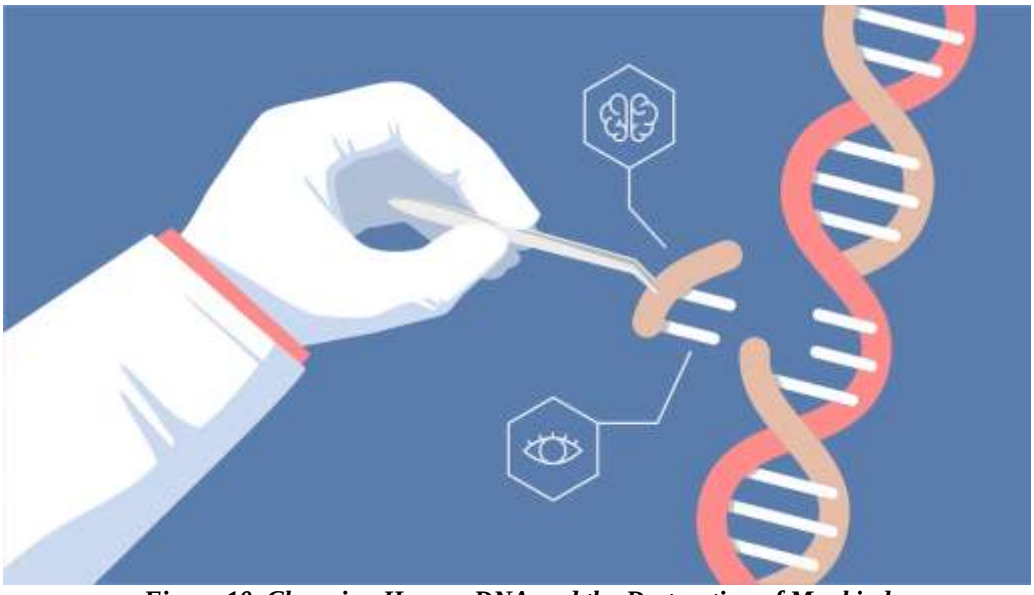


Figure 10. Changing Human DNA and the Destruction of Mankind

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As can be seen, these new genetic technologies have the potential to change human nature and society at the most basic level. Human cloning, genetic feature selection, genetic modification issues are of great concern. Human cloning refers to the creation of human embryos or human children genetically identical or dead parents. It is suggested that individuals with extra cognitive or behavioral features can be developed with this process, which will form a new version of the human species that cannot reproduce with normal people. therefore, the practice of germline development is seen as a potentially dangerous approach as it has the potential to change human species. It could potentially lead to inequality between a generation without their consent. Also, changing the nature of people, in the long run, can have unpredictable consequences now. Although it shows that many governments and organizations around the world have agreed to ban human reproduction cloning, hereditary genetic modification and social feature selection in front of the screen, it is clear that these are maintained in laboratories behind closed doors.

RESULT

The main triggering factor of the sixth mass extinction process that is happening today is humans. Increasing population as well as developments in technology pose a great risk for biodiversity. Living spaces are disappearing due to habitat destruction. Burning fossil fuels such as oil and coal and releasing excess carbon into the atmosphere causes global climate changes and many chain destructions. Again, people destroy sustainability by exceeding nature's carrying capacity in terms of numbers and consumption. Again, pollution and noise continue to destroy the ecosystem. Increased transportation and access it poses a great risk to isolated populations. Developments in the field of medicine and genetics, virus and bacterial epidemics, and nuclear technologies can be listed as problems that can quickly cause mass extinction.

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