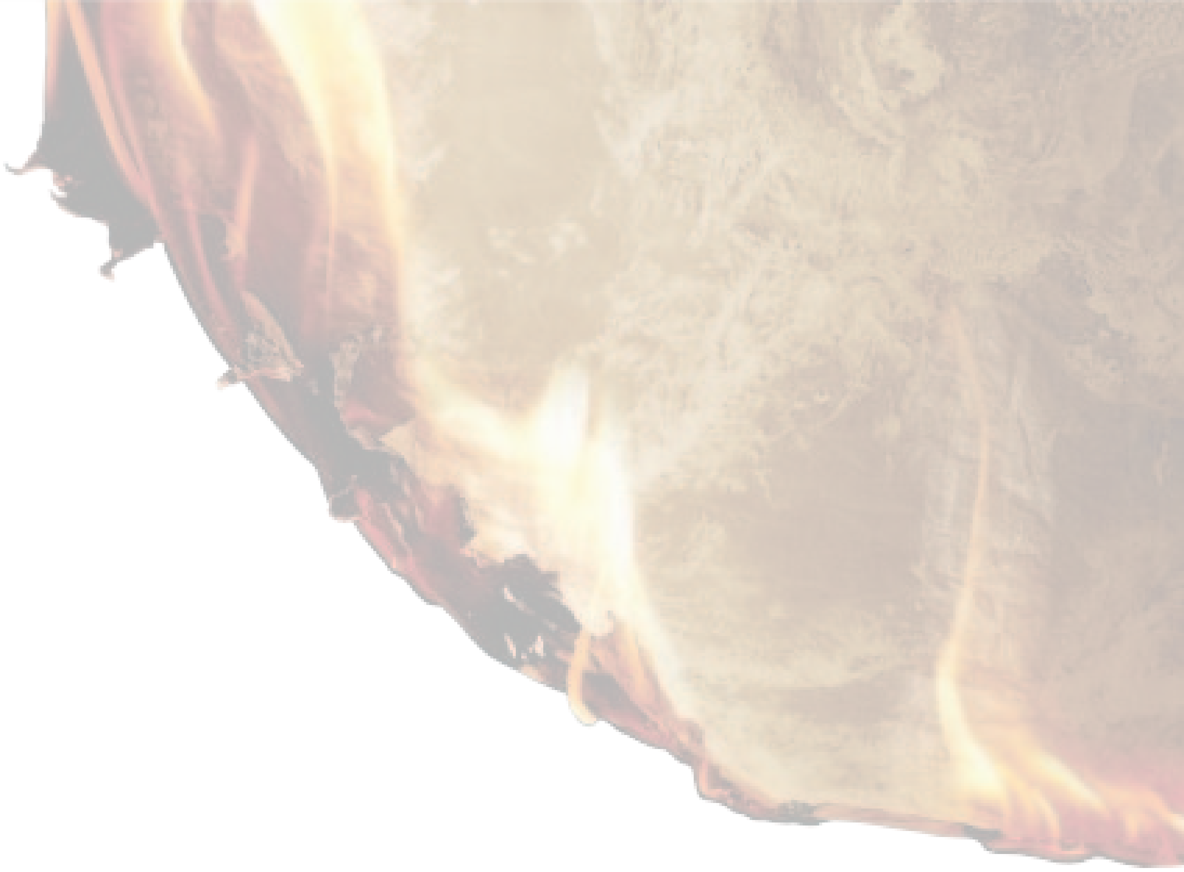

CIVILIZATION MANIFESTO

FOR INTELLECTUALS OF THE PLANET

A NEW CIVILIZATION DEPENDS ON THE TRANSFORMATION OF
HOMO CONSÚMENS **INTO** ***HOMO COSMICUS*****,**
WHILE THE PLANET'S SALVATION DEPENDS ON THE CREATION OF A DIGITAL ENVIRONMENTAL ECONOMY

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2023

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Dr. **Alexander Potemkin,** an ethnic German, a German citizen since the late 1970s, an investor in scientific and commercial projects, a writer (his contemporary intellectual prose is recognized as a Russian classic of the 20th century, and his novel *The Russian Patient* was named one of the masterpieces of Russian literature and included in an educational publication put out by Lomonosov Moscow State University titled “Sixteen Masterpieces of Russian Literature” edited by Valentin Nedzvetsky, a Russian literary scholar, Doctor of Philological Sciences, and Professor). He is an ecologist engaged in the research of the imminent existential risks and catastrophes facing planet Earth. He is the author of the first global world infrastructure project EuRICAA—an intercontinental mega-highway designed to span the entire planet, a Model for the World’s Peaceful Future, and a New Eco Sapiens Code of Civilization Standards.

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A. POTEMKIN

CIVILIZATION MANIFESTO FOR INTELLECTUALS OF THE PLANET

A NEW CIVILIZATION DEPENDS ON THE TRANSFORMATION OF

Homo Consúmens INTO Homo Cosmicus, WHILE THE PLANET’S SALVATION DEPENDS ON THE CREATION OF A DIGITAL ENVIRONMENTAL ECONOMY -

Tbilisi, 2023, 340 pages.

This scientific-research work is the first to publish a new global environmental and evolutionary concept for upgrading *Homo Sapiens*. It presents an alternative worldview to the rapid development of today’s consumer civilization, draws attention to the resource potential of the planet and the availability of all its vital reserves (water, gas, oil, basic mineral resources, fertile soils, etc.) and proposes ways in which *Homo Sapiens* can adjust its lifestyle to the new conditions.

This book is intended as a guide for a wide range of readers and will be of interest to all scientists, ecologists, biologists, chemists, politicians, sociologists, students, graduate students, teachers and all those interested in saving the planet.

ISBN ?????

I would like to thank Giorgi Kvesitadze, my colleague and co-author of other scientific works, professor, Doctor of Biological Sciences and President of the National Academy of Sciences of Georgia (2013 - 2023), as well as other world-renowned fellow scientists for the many years they have spent researching and compiling a catalog of all the toxicants existing on planet Earth and developing innovative ways to transform them. I would also like to thank these outstanding people for clearly articulating the major challenges facing scientific intellectual humanity. It is science, and not the opinions of public figures, that gives humanity confidence in its future and, hence, in its ability to upgrade and transform itself.

Alexander Potemkin

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INTRODUCTION

HEDONISM

According to popular understanding, we humans are rational animals. But this is not entirely true.

The actions of so-called rational humans have brought the environment, along with its enormous potential, to the brink of extreme instability caused by overpopulation of the planet, overconsumption of all types of resources, depletion of non-renewable energy reserves, acute shortages of drinking water, soil degradation and desertification, forest fires, greenhouse gas emissions, melting glaciers and global warming, accumulation of garbage, damage to the world ocean ecosystem, contamination of agricultural land with pesticides and mineral fertilizers, food overproduction (despite global starvation), a rampant increase in all kinds of transportation means, overconsumption of hydrocarbons and an increase in toxic compounds in every environmental system.

Humanity is heading slowly but surely toward extinction due to its wasteful use of the planet's resources, environmental degradation and mass urbanization. *Homo Sapiens* is focused on consumption rather than on enriching its mind to enhance its evolution. It is indifferent about the future and has no idea what this future will look like, not to mention if it actually exists, which has an influence on an ongoing annual increase in the planet's population of 80-100 million people. The current generation is growing up with the sole desire to consume and ensure its personal comfort, while paying no heed to the impending global environmental disaster. Civilization today needs people who, with the help of science and under the guidance of the *Microbiome*, could transform themselves into a new species, *Homo Cosmicus*, capable of living expediently both on Earth and throughout the Universe.

The *Microbiome* is a part of the world or planetary biome or *Cosmicus Quanticus Cerebrum* (the universal quantum mind) — a community of microorganisms that forms ecosystems, from the simplest single-cell to physiologically and morphologically complex animals, united on the principle of co-existence in a world they have created themselves. *Cosmicus Quanticus Cerebrum* unites all taxonomic groups of microorganisms, such as viruses, archaea, lower and higher eukaryotes, their genomes (including genes) and cell organelles, which have created all living things throughout the universe and on our planet, including humans, in a single integrated habitat. *Homo Sapiens*, the most physiologically complex organism created and endowed with the ability to reason, is a product of the *Microbiome*. There may be many microbiomes in the Universe comprising the global *Worldbiome*, otherwise known as the Creator, or *Cosmicus Quanticus Cerebrum*—the Universal Quantum Mind. Non-living matter does not exist; it is merely matter with a reduced capacity to change its physical properties, which goes unnoticed during a human lifetime. This concept has no true scientific substantiation; it is used to simplify the perception of reality and misrepresents the world of *Cosmicus Quanticus Cerebrum*.

SCIENTIFIC BACKGROUND

Scientists today are becoming increasingly aware that we live in a very complex world, ranging from the microcosm to the vast expanses of outer space abounding in elementary particles of matter, atoms, molecules, cells, organic and inorganic components, planets, stars and much, much more, which we call the Universe. Evolution is evident all around us, propelled by certain laws and all kinds of similarities in complex processes of interaction of matter at all levels—atomic, molecular and cosmic—and not by established political and ideological national and religious doctrines or economic programs. The actual ideology of life and the principles, methodological approaches and understanding generated by it for thousands of years have largely changed our ideas about the world we see, the world in which the real evolution of matter and all living things occurs. The universe and its complex systems and phenomena in the surrounding space are based, as before, on abstract, mathematically described models, where rational numbers and representations have been replaced by irrational ones. At the same time, the existence of the universe, the behaviour of particles, atoms, and molecules, various electromagnetic emissions and fields with a probabilistic description of the processes resembles a complex mathematical game. But we are material and real. This changes the ideology of the contemporary world generated by the self-consciousness of *Homo Sapiens*. Today, science does not yet have precise and clear answers to what matter is and how it evolves. Nor can it fathom the origin of life or provide a holistic natural scientific picture of the world. The contradictions and multitude of interpretations and opinions on these issues are hindering the development of science and humanity as a whole, since they have a direct bearing on the worldview not only of scientists, but also of ordinary people, the methodology of science itself and the formation of a holistic natural scientific representation of the material world.

We need to radically rethink the integration and symbiosis of members of *Homo Sapiens* with high and low intelligence in order to bring about the successful birth of a new species, *Homo Cosmicus*. This is because those with a high level of intelligence will be confused and perturbed by overconsumption, while those with a lower intelligence level will not want to rack their brains about higher matters or the incomprehensible scientific world of *Homo Cosmicus*. Communal living will impede the successful research efforts of the first and the mental comfort of the second due to their inability to participate in the programme aimed at creating a new civilization. Future international expert consultations on this subject will need to find

MATTER IS STUFF, ENERGY, AND INFORMATION

ways to finance the activities of scientists who have dedicated themselves to research on the creation of the new species, *Homo Cosmicus*.

The goal is to find a solution to the current worldview and methodological crisis caused by a lack of understanding about the evolution of the *Microbiome*, as well as create an integral natural scientific view of the material world and the evolution of extremely versatile and multifarious living matter and provide the relevant information.

According to many natural scientists, the purpose of the human mind is to move the biosphere into the noosphere. The noosphere is the realm of reason. Reason is a developed mind. A developed mind is a commensurate mind. Commensurate means the ability to correlate the heart of the matter with what is needed, thus endowing the goal with meaning and moving towards its achievement. Humans are destined to raise the co-evolution of all kinds of matter to a new level, to ensure the immortality of life on Earth and take personal life out into the expanses of the universe.

Matter is stuff, energy, and information. Stuff and energy are immortal; they merely morph into a new form. Only personal information is mortal, but it is information that changes matter.

Information in this case is regarded as the dynamic, systemic totality of forms and structures of the evolution of matter, an attribute determining its state at different hierarchical levels. Changes in forms and structures lead to changes in information. Consequently, the physical state of the environment, as well as the logical sequence of the unfolding biological processes and human consciousness, changes.

The established formulations will give these concepts a clearer physical meaning and primarily help humanity to determine how the integrity of the material world will develop on an integrated material energy-information basis. Without clear scientific concepts, the evolution of *Homo Sapiens* is impossible, and this species will die out in the next 50 years.

THERE IS NO OTHER POSITIVE WAY FOR HOMO CONSÚMENS TO LIVE

Due to its irrational and ruthless consumption, which is destroying the planet's environment, contemporary civilization is expected to come to an end soon. Ninety-nine percent of *Homo Consúmens* do not know and, what is more, do not want to know that our planet has a limited amount of all kinds of resources. Business is bearing ever forceful pressure on it to fill out its bank accounts, and all the countries of the world are applauding replenishment of their budgets, while consumers are making pigs of themselves and gloating over their new clothes. What kind of future can our brainless species expect if the planet's resources are being squandered at such a catastrophic rate?

In 20-30 years, humankind will start to perish. There will be no drinking water from the available natural sources left on the planet. The salt water of the seas and oceans, even if it is desalinated using contemporary technology, cannot satisfy even the minimum needs of the entire planet. Limited full-fledged recycling of wastewater will require more money and energy. The customary change in seasons could disappear, which will lead to a catastrophic situation in the agricultural sector and cause devastating food shortages. The rise in temperature on the planet's surface, as well as at its core will cause billions of tons of ice at the North and South Poles to melt, significantly reducing the land surface. Forced relocation of peoples will lead to overwhelming global chaos. It appears that today's consumer society is well on its way to mass extinction and self-destruction.

It is my belief, prompted by *Cosmicus Quanticus Cerebrum* and concurring with it, that *Homo Cosmicus* is the ultimate goal for the evolution of *Homo Sapiens*. If this goal is not achieved soon, humanity will perish. We can clearly see the signs of this apocalypse in the threatening events that are descending with increasing intensity on our lives.

Nature is indifferent to the social order that governs a country, region, or continent; its only demand of us humans on the planet is for the environment to govern the economy. What *Cosmicus Quanticus Cerebrum* has been creating over billions of years is actively replacing *Homo Sapiens*, which is losing the right to be called intelligent. Only a green digital economy (see, The *Homo Consúmens* Digital Economy) can create a healthier planet, not the consumer mentality characteristic of *Homo Consúmens* aimed at satisfying its exorbitant desires, or an increase in human prosperity, or the burgeoning of government budgets.

By 2030, there will be 8.5 billion of us on the planet; and our food and energy consumption will increase proportionately. Where will humanity get everything it needs? How will we deal with the resulting overpopulation of the planet, with at least a few billion “extra” people? The complete depletion of energy-critical hydrocarbons will lead to a harsh, aggressive political and military confrontation in the world.

TWO DANGERS OF GLOBAL DEMISE WILL ARISE:

During the last few decades, humanity has been swept up in an overpowering unscientific, political, consumerist, and religious tsunami of fake media. This fake information pandemic is zombifying and stupefying humans, destroying and stifling their thirst for scientific knowledge. Humans are not being guided by their reason, but by media consumption patterns. Political scientists, sociologists and economists do the greatest damage to public consciousness. It appears that it is not only people with a low or reduced level of social responsibility who sell themselves for money.

Today’s world is more interdependent than ever before. Whereas 100 years ago people were afraid of what they might encounter in their immediate environment, today we are afraid of what may be thousands of miles away. There is nowhere to hide from mortal danger. The only question is, when? The era of consumer terrorism is increasing the speed with which destruction will strike.

At the very beginning of the 21st century, NASA scientists began studying cosmic solar energy relating to our planet. Cosmic energy can serve humankind. It is hoped that by the 2030s the first tests of energy transfer from outer space to planet Earth will be carried out. Much will depend on how accessible and usable these technologies are.

The main incentive for reincarnation into *Homo Cosmicus* is that non-biological intelligence regularly doubles or even triples its potential at a high rate, while our natural intelligence, due to slow biological evolution, does not change its insignificant resource and cannot compete with artificial intelligence.

The global artificial intelligence (AI) market is divided into technology type (virtual assistants, unmanned cars, digital cars, robotics and humanoid robots) and user categories. The volume of the global software market using artificial intelligence algorithms reached $62 billion in 2022. The volume of the global market for robots with artificial intelligence is currently $8.18 billion and is expected to reach $52.6 billion by 2030; robot androids bring in $3.9 billion at present, and this figure is expected to grow 10-fold by 2030. For more than seven years, the development rate of the AI market has outpaced Moore's Law, meaning that processor speed doubles every 18 months. This indicates that developers can expect software performance to double within that time span at the same hardware cost.

To survive on the planet, humanity must force itself to renounce rampant consumption and subordinate its mind to one overpowering idea—its own epigenetic upgrade to an all-planetary dweller. The transition to *Homo Cosmicus* must be made not by implementing society's political and economic concepts, but by each individual member of *Homo Sapiens* undertaking their own self-organisation (see "The Fundamentals of Self-Organisation of *Homo Cosmicus*"). The development programme for *Homo Cosmicus* implies that the people of the new species will settle in designated territories of pristine landscapes—mountain caves and plateaus all over the planet—and select a partner for social communication in accord with their level of intelligence. That is, it implies the possibility of replacing humans with a robot android possessing a high level of organisation and artificial intelligence, or a clone with the mind of a specific person. Self-organisation, by relocating at least a small part, 0.1-0.3%, of the *Homo Sapiens* population (we are sure that this small number of people will agree to move) to "caves", is intended to isolate them from the world of overconsumption and communication with *Homo Consúmens*, as well as to fully immerse them from the very outset in the self-aware programme aimed at creating the new species *Homo Cosmicus*.

A forum of the world's intellectual minds must be created to make practical decisions regarding the transfer to self-organisation of the new species.

There is absolutely no other way for *Homo Sapiens* to survive in the future.

The constitutions of many nations of the world compel us to obey the letter and spirit of the existing laws, purposefully frustrating our rampant passions and sensual fantasies. This submission is produced by our own minds, which is subject to our will. Admittedly, everyone in today's consumer civilization has already been born into environmental sin, which has been insufferably exaggerated by perverted industry and media advertising. This constantly provoked environmental sin can be overcome with new civilizational postulates, reason and willpower.

If a person is unable or emphatically unwilling to live without overconsumption, separate zones of residence must be allocated for them, where they will all be referred to as *Homo Consúmens*, regardless of their nationality, race and religious affiliation, and not as Chinese, Japanese, American, Italian, etc., who will witness the demise of their own habitat.

We admit that since the idea of consumption has become ingrained in the human consciousness over centuries and millennia, it will be extremely difficult to instil in *Homo Consúmens* entirely new economic standards and introduce the digital economy into everyday life in 20-30 years. The established worldview has already become part of the hereditary mentality.

Never has the question been as urgent, radical, ruthless and grim as it is today. To live or not to live? But if we choose to live, it must be in a new way, which applies not only to one person, or to hundreds, thousands, or millions, but to the entire species of *Homo Sapiens*. This categorical demand has been made not by a tyrant, not by idiotic laws, not by terrorists, but by the most powerful force on the planet—NATURE!

We cannot comprehend what goes on in Nature's mind. But we scientists, who have long been studying its mysteries, declare that humanity has only one future—the creation of a new civilization, *Homo Cosmicus*, new environmental consumption standards, a digital economy and scientific research aimed at reformatting humans from *Homo Consúmens* into *Homo Cosmicus*. Do not rely on the existing political and religious pseudoscientific claims, accepted norms and established stereotypes such as, "my freedom above all else!" That is all in the past. Today we need to study new digital economic standards and start living by completely new rules.

We must forget all the former fleeting joys and pleasures of sensual consumption and no longer set selfish goals for ourselves. This, admittedly, is a difficult task, since these feelings have been instilled in us and shaped our individuality for millennia. Information constitutes the main difference between the human body and other material bodies. Each person eternally owns only what they have realised or created during their lifetime. So, information is individual to each member of *Homo Sapiens*. The contemporary world, with its innovative technologies and virtual social networks, has brought the human world closer to monotony and impersonality. No more than a dozen of the hundreds of mentalities known in the past now remain.

Everything subjective must be erased from the consciousness. Do not make yourself or your loved ones the top priority in everything you do, instead focus on the whole of humanity, striving for an all-planetary way of life. Numerous facts testify to the ways in which gifted people have sacrificed themselves for the world. These *Homo Intellectivus* should be brought forward as examples. Everyone should be made aware of the heroic deeds these people have carried out in their lives. The new civilization must embrace the whole of humankind.

The specifics of the digital civilization are that electronic devices, gadgets, must be the channel of communication between the digital economy and humans. The multifunctionality of these gadgets has made it possible to replace several electronic household devices in human life—the telephone, personal communication device, compact disc player, still-shot camera, video camera, navigator, etc.

The modern gadget performs the function of a wallet, a mailbox, a writing desk, house keys, car keys, home and bank safe keys, personal stationary, personal medical consultant, heart rate meter, calorie consumption controller, navigator showing a shortcut, contactor with law enforcement agencies, fire fighters, medical services, commercial facilities, acquaintances and relatives, your own office and employees. It is also a booking office for all types of travel tickets, an archive of personal and business correspondence, a photo and video album, a facial and object recognition assistant, a consultant on healthy and environmentally friendly nutrition, a cinema, a library, a personal psychologist, a hobby and interest club, a cookbook of recipes from different nations, a textbook on any subject, a hairdresser and seamstress, dance and singing classes, a platform for performances and debates, a real estate agency, project office, museum and carrier of other information. All in all, it is a transmitter of the digital information that will shape the new world.

The digital age saves people a lot of time. It makes deliveries, shopping, dealing with the bureaucracy, making payments, organising and manufacturing food supplies, acquiring an education, making public statements about oneself and one's achievements, participating in any global project, enjoying virtual travel anywhere in the world, instant social communication and organising international business much easier and faster. People have become closer to each other. Digital distance is measured not in kilometres, but by the speed at which information signals travel. People can control every aspect of their own lives just by reaching for their gadget.

Homo Consúmens is also changing who it communicates with. Most Europeans, Asians and North Americans no longer socialise with their friends, spouses, or partners, but are befriending, socialising and eating with their pets. And the telephone number 112 is the only companion, saviour and protector on Earth.

HOMO CONSÚMENS IS ALSO CHANGING WHO IT COMMUNICATES WITH

The market for humanoid robots (androids) is growing at a cosmic rate. Interpersonal relationships are being replaced in all spheres of *Homo Consúmens*' life. Look at the sexual interests of our contemporaries. Erotic international fairs in the world's largest metropolitan cities offer a wide variety of artificial male and female body parts with intimate details—sizes, volumes, depths, moans and verbal compliments. The sex industry market has a billion-dollar turnover. Today, approximately 0.5%-1% of our contemporaries are interested in sex dolls and their parts for private use. And that is 40-80 million *Homo Consúmens*. A glimpse at these products convinces you that the consumer civilization is returning its members to the bisexual era from which our ancient ancestors emerged, while our master, the *Microbiome*, has transformed most of us into a monosexual product. It has long been known that each of us retains genital traces of the other sex. But the hypertrophied attraction to androids is a provocation of the consumer civilization. Today, this type of product amounts to 0.5%-1% of the population, in five years it will have reached 3%-5%, in 10 years ... and so on. People today have less and less need for another human being; they are beginning to prefer a humanoid robot, or even its parts, to satisfy their personal needs. If *Homo Consúmens* today can be seduced by a doll or its parts, its days are numbered. Who will artists be portraying on their canvases in 20 years' time? Who will young people fall in love with? Robot Sophia? The Gregory Peck Muppet? What kind of love stories will writers offer their readers?

The difference between real life and virtual life will be entirely erased by 2040. The sense of intimacy among all *Homo Consúmens* will gradually become virtual, while *Homo Cosmicus* will have new meaning and life impulses. By 2060, there will be a complete immersion into the virtual world. All the delights of physical intimacy will ultimately disappear from the consciousness of *Homo Cosmicus*. **This will hasten the liberation of *Homo Cosmicus* from its own flesh, the main cause of consumer perversion.** This will result environmentally and evolutionally in a significant reduction in the nutritional biological resource, as well as in the acquisition by humans of their new species.

The knowledge and skills that were important a few years ago will become morally obsolete as the new world model emerges. Humankind, regardless of age, must constantly learn new skills and ways of thinking in order to keep up with the times.

The new capacity of the world's connection of everyone to everyone guarantees absolute transparency of every event on the planet. In this renewed environment, everyone becomes a policeman, media centre, lawyer, prosecutor or judge, which means that politicians will also become more accessible. Their honesty and responsibility will grow, their accountability will increase, and the world will become a clearer, more understandable and peaceful place.

Global communication makes an enormous contribution to the transparency of the planet. The people of today's civilization will not be able to live in a new transparent world. Global openness will make them uncomfortable; they will feel like a participant in a global cyber war. And the obsessive thought: "I have become a stranger in this world. War has taken on new forms..." will be devastating for them. People will not immediately be able to understand that the confrontation between the old and new civilizations has already begun online and is becoming all-encompassing. These circumstances will ensure the victory of the *Homo Cosmicus* civilization.

The fierce struggle for drinking water, which will become critical as early as 2030 between the representatives of *Homo Consúmens* and the new civilizational generation, will be witnessed by one generation. It will be a struggle between the current environmental cultural dysfunction performed by the plunderers of our planet's resources and the environmentally wise inhabitants of the Earth. It will be a dramatic and merciless struggle between vanity and militant propagandists, whose faces are already being scanned by surveillance cameras around the world, and environmental laws.

***Cosmicus Quanticus Cerebrum* will protect *Homo Cosmicus*. But what lies in store for the world of *Homo Consúmens*? An increasing number of pandemics, shrinking numbers of reckless consumers and depletion of the planet's resources.** Their worldview is tainted by arrogance, self-love, pretentiousness and domestic excess. The truths of the earth's environmental existence have been completely erased, swept under the carpet by temptation and extravagance, and taken on the appearance of insane perversion. **Nature itself will eradicate *Homo Consúmens*. "Let noble pandemics that reduce the numbers of environmental barbarians appear more often and follow one after another with newer and newer viruses!" The size of the population of *Homo Consúmens* on the planet will be reduced to the necessary two billion people. And it will shrink even more when artificial intelligence butts heads with the former consumer consciousness. Having various virtual forms, AI will be developed and supplied by *Homo Cosmicus*.**

NATURE ITSELF WILL ERADICATE *HOMO CONSÚMENS*

The Universal Quantum Mind will once again prove that humanity is its creation, its product, and that it controls everything, including the size of our population.

An overwhelming crisis of religious messianic ideas is already evident. People today are convinced that religions are nothing more than clumsily invented ridiculous legends for the minds of literate people. It all sounded fine—mercy for the fallen, the humiliated and the insulted, compassion, humaneness and unselfishness. And over the millennia, these entreaties have become ingrained in the minds of *Homo Consúmens*. Today we can only feel sorry for our ancestors who believed in and sought the kingdom of God. Religious dogma is nothing but a call for honesty and order.

Over the entire history of the planet (there are different estimates of its age, from 5 to 25 billion years), more than 90% of all the biological species that existed on Earth have died out at different times and for different reasons. Our creator, *Cosmicus Quanticus Cerebrum*, also played a part in this. So why should it do otherwise regarding humans? After all, we are destroying the earthly world it created; humans have not understood the purpose of their creation. Many are already heeding the shout, **"Hey, humans! It's time for you to leave!"** If our consumer standards are not changed, more than two billion *Homo Consúmens* will disappear by 2035-2040. ***The Universal Quantum Mind*** itself will ensure the reduction of our population. Here it is appropriate to recall and continue the thoughts of Confucius: "...if the product knows its creator, it will begin fulfilling its creative fantasies without strict orders; if the product does not know its creator, it will not carry out its orders and commands". Ninety-nine percent of the planet's population does not know that our creator is *Cosmicus Quanticus Cerebrum*. Therefore, the process of reformatting *Homo Consúmens* into a better product has not been set in motion. Obviously, so-called randomness is a complex preconceived signal transmitted by *Cosmicus Quanticus Cerebrum* during the natural selection of its own living and non-living products. It fulfils its main function—to either destroy the product or to improve it. This largely explains all the evolutionary processes occurring on the planet, a small part of which scientists can observe in the universe as well, while the rest are not yet accessible to us. And to see a certain divine creative force in this remarkable process of ascension or extinction of various products is to admit that our minds are still incomplete, that they are in the process of formation (or already dying away).

You are *Homo Consúmens*! Planet Earth no longer has any need for you. How can you welcome a product that has entered your home with the intention of destroying it? A new product, *Homo Cosmicus*, capable of constant self-formatting, is already knocking at the planet's door. It is capable of steady intellectual development and improvement, of changing its earthly biological body into a universal, miraculous, ever-changing substance through proven algorithms, depending on the atmosphere of all the newly discovered planets of the Milky Way.

Ask yourself in what way *Homo Consúmens* can improve itself in the near future? It is tirelessly pursuing one mental road that is leading to its utter degradation and destruction.

The main fundamental scientific discoveries were made before the second half of the twentieth century. The intelligence of today's species *Homo Consúmens* has been steadily decreasing in recent years. Today, no more than 1.0% of the entire population of *Homo Sapiens* is employed in the global intellectual sphere. That is only 80 million people out of 8 billion. Don't these numbers scare you? **What future can *Homo Consúmens* have with such miserable, depressing demographic statistics, considering that we have only one planet, which is not the largest in the Universe, with a resource potential that can be calculated by our own reasoning, without resorting to complicated mathematical models and calculations? Another terrifying fact is that the number of representatives of *Homo Sapiens* is increasing at a rate of 80 to 100 million annually, as is the population of domestic animals. How can the Earth's resources sustain this number?** Today's world community is so preoccupied with wealth, consumption, territory and wars, and *Homo Consúmens* is so drunk on power, that it does not think, ponder, or debate about the future of our planet at all. **The Green Party in all countries of the world is basically a useless and illiterate community.** It holds no public debates about the state of the planet's resources. The author of this work does not dream of power, nor does he wish to remove the representatives of these parties from their lucrative seats. But no one is sounding the alarm in the social networks on the expanses of the Internet. Get involved in the project to create a new species, *Homo Cosmicus*. *Homo Consúmens* has no prospects! Absolutely none! If we do not pay close attention to the problem of overpopulation on the planet and the depletion of its resources, if we do not begin to actively debate and seek ways out of this tragic situation, our creator, *Cosmicus Quanticus Cerebrum*, will independently join this process, provoking and instilling in the minds of politicians the idea of the need for a nuclear war to reduce the population of *Homo Sapiens*. It has already sent the first signals—pandemics, and ignorant "scientists" are conveying the idea to the masses that the viruses are supposedly being created in certain laboratories. This is utter nonsense. There are trillions of viruses in humans' own bodies.

We are absolutely convinced that our new civilization manifesto is sound—the future must be based on digital modelling of a programme to develop *Homo Cosmicus*, which will destroy the mentality of *Homo Consúmens* and remove it from the generic species *Homo Sapiens* by means of the abovementioned system of new standards. Together with the creator, *Cosmicus Quanticus Cerebrum*, we will gradually create a completely new worldview biological product, *Homo Cosmicus*, because when the mind is consistently stimulated by one main idea, it will undoubtedly yield the desired result.

Can we be sure that reformatting humans is the only correct solution? Yes, if we set our sights on the evolutionary perfection of the species *Homo Sapiens*. It stands to reason that we will not go along with other contemporaries of our time if they continue to profess a consumerist worldview, that is, the degradation of the planet Earth and the destruction of humanity. The new proposed civilizational environmental consumption standards promote the development of the mind and change the flesh, thus leading to a complete reformatting of humankind.

Naive consumers do not want to concern themselves with the suffering of nature and its destiny, and its power and majesty are not infinite. Pretty soon people with change their optimistic tune and will be filled with an indomitable desire to destroy their enemy *Homo Consúmens*. We want to awaken in each of you the desire for your own perfection, so that your mind is filled with one wish—to become a unique all-planetary product. Could Voltaire's words, "We shall leave this world as foolish and as wicked as we found it", indeed be prophetic?

So, in order to preserve planet Earth and create a *Homo Cosmicus* civilization, we must ensure that *Homo Consúmens* transfers to new consumption standards. Until this transition is complete, *Homo Cosmicus* will continue to use some of the services and technology of *Homo Consúmens*, living and improving itself by means of a symbiosis provided by the universe.

I am appealing to you, scientists of the world! Please study the information and programme for the improvement of Homo Sapiens presented here and become involved in its discussion and implementation.

This work is devoted to a common problem faced by all humankind, people of all faiths, nationalities and political beliefs. The solution to this problem will lead to the well-being of our common home, planet Earth, and its resources. It is based on the geodiversity of the planet, which differs significantly with respect to the climatic conditions and chemical composition of the soil of individual regions, as well as habitat conditions. Nature, throughout its long evolution, has created an extraordinary biodiversity of completely different, sometimes surprising forms of life. A characteristic feature of nature is that it constantly strives toward improvement of its organisms. Thanks to the endless movement caused by the energy of chemical compounds existing in nature and natural physical and spontaneous chemical processes, ever newer forms of life, from the simplest to the most complex, are constantly emerging.

Analyzing the history of many millions of years of life, one involuntarily comes to the conclusion that only natural factors, such as climate change, volcanic emissions of large, high-temperature underground masses and natural processes of putrefaction and biological oxidation influencing the climate and enriching the environment with a wide range of chemical compounds, have had the main influence on the evolutionary formation of organisms living in the past. Over millions of years, nature, our creator Cosmicus Quanticus Cerebrum, has created a living world based on chemical and biological potential acceptable for the coexistence of a great variety of life forms.

This is where the natural evolution of organisms ends, and it is related to the emergence of thinking and active humans, that is, all of us humans, who, while gradually vanquishing nature, have ruthlessly, in our own interests, changed many of the natural processes and even biorhythms of evolution and, in so doing, have already significantly reduced the diversity of life forms inhabiting the planet.

Over time, based on the knowledge and experience we have accumulated in natural and applied fields, we can change the existing canons of nature, imposing processes that are not inherent of it for our well-being.

THE MAIN OBJECTIVES PRESENTED IN THIS MANIFESTO ARE AS FOLLOWS:

1

An analysis of innovative, nature-friendly global, environmental biotechnology based on the ability of microorganisms and plants to symbiotically remove toxic compounds from all ecological niches. Nature-friendly biological technologies based on natural transformations are far more efficient and far-reaching than all known contemporary classical technolog

2

The transformation of *Homo Sapiens* into a new kind of human being, *Homo Cosmicus*, with the ability to explore new planets and, at the same time, keep a close eye on the planet's environmental problems, while making as frugal use as possible of all natural resources.

By intuitively refusing to choose a path that is truly friendly and in complete harmony with nature and its values, we, all of humanity, have chosen self-assertion and dominance over the natural world. We now stand on the brink of an environmental disaster, and I wonder why no one has tried to change our logic and philosophy of life before now, directing us toward softer forms of natural resource management. It appears we like to repeat the expression that has become a universal motto: "Everything for the human race!"

The author of this manifesto suggests holding the first expert consultations on the creation of a *Homo Cosmicus* civilization according to the following schedule:

Hamburg, Germany – September-October 2024

Tokyo, Japan – April 2025

Chicago, USA – October 2025

Tbilisi, Georgia – March 2026

The experts of this new concept may agree to change these dates as necessary.

Everyone interested is welcome to contact the author in German, English, Russian, Spanish or Turkish at the following address:

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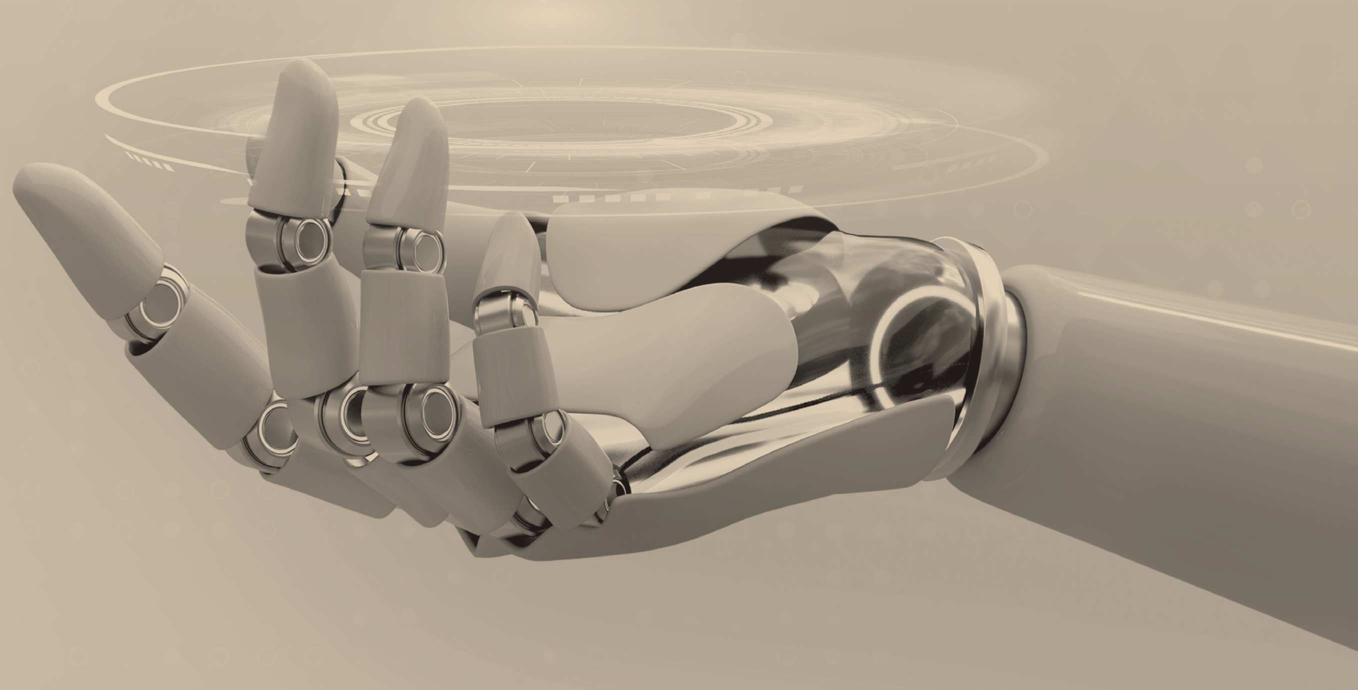
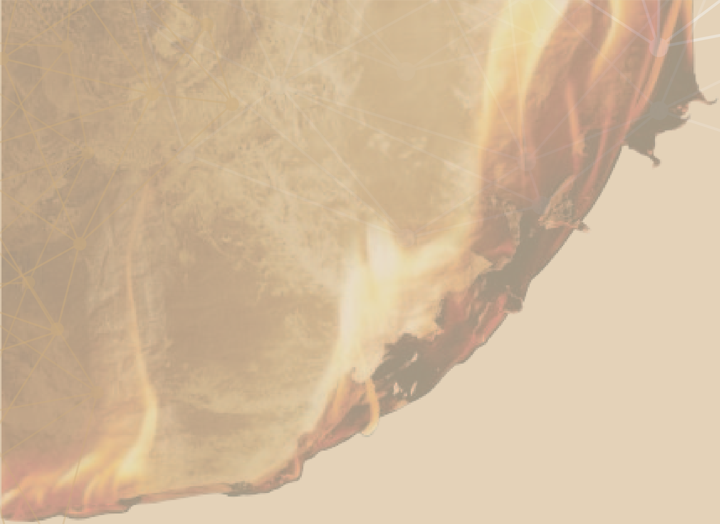
INNOVATIONS AND PROPOSALS OF THE CIVILIZATION MANIFESTO FOR *HOMO SAPIENS*



1	*Worldbiome/Planetarybiome*
2	*Cosmicus Quanticus Cerebrum – Universal Quantum Mind*
3	*Homo Consúmens – consuming man*
4	*Homo Cosmicus – reformatted Homo Consúmens for the new civilization*
5	*Homo Intellectivus – intellectual man*
6	*HIC (higher intelligence consciousness) – higher intelligence consciousness index*
7	*Wanton consumerism*
8	*Shoppinglust*
9	Introducing soil remediation (decontamination)
10	Introducing ectroplasma water purification technologies
11	Calling for a total rejection of religion
12	Eradicating overconsumption
13	Eradicating the current seawater desalination system
14	Banning pesticides, herbicides and man-made chemical toxicants
15	Eradicating toxic explosives
16	Closing down hazardous industries
17	Reducing the population of cats and dogs by banning breeding and imposing mandatory sterilization
18	Eradicating stray pets from the planet
19	Proposing the use of animal-like android robots
20	Collecting faeces and urine separately from other wastes
21	Separating water into technical and drinking water, introducing control over water consumption
22	Introducing a total ban on the industrial bottling of carbonated drinks, kvass, energy drinks and the production of all types of alcoholic beverages
23	Introducing technology for collecting drinking water from large trees
24	Using washing machines without water
25	Introducing the widespread use of edible tableware, dishes and utensils
26	Closing down all zoos
27	Reducing food production
28	Banning transportation with internal combustion engines

29	Reducing products manufactured by the textile industry
30	Reducing the production of mineral fertilizers
31	Calling for the proper recognition of green energy (solar, wind and hydro)
32	Reducing use of the internet for communication
33	Reducing the use of television
34	Eliminating the IQ test as a method of defining intelligence
35	Instigating a total overhaul of space exploration (eliminating existing combustion technologies)
36	Opposing the use of plastic
37	Using hydrogen as a fuel
38	Introducing new air purification technologies (catalytic, plasma-chemical)
39	Introducing new soil purification technologies (electrochemical, electrokinetic, thermal)
40	Introducing technologies based on the action of microorganisms and plants
41	Minimising the extraction and use of exhaustible natural resources
42	Introducing a new type of agrarian technology (vertical farms)
43	Carrying out soil enrichment and creating tropical environmental conditions along the entire length of the Nile River
44	Disbanding all national armies
45	Imposing a total ban on all warfare
46	Calling for total world disarmament (destruction of all types of armaments)
47	Calling for population reduction (legal birth control)
48	Introducing the use of new methods of male contraception
49	Removing all pharmacologic contaminants from water
50	Opposing IVF
51	Reducing tobacco and alcohol consumption
52	Calling for a total ban on new tobacco substitutes (e-cigarettes, vapes)
53	Curbing the popularisation of LGBT
54	Introducing new education standards (secondary education - primary, higher education - secondary, PhD and doctoral degrees - higher)
55	Organising "cave" settlements

56	Organising planetary settlement
57	Replacing sex partners with android robots
58	Dividing the world into two parts: the world of consumers and the world of participants in scientific experiments
59	Digitalising all world finances
60	Creating a global data base
61	Eliminating all cash
62	Introducing a new financial system
63	Opposing a unified administrative structure
64	Intensifying criminal punishment for environmental crimes
65	Integrating artificial intelligence (neuron brain implants)
66	Replacing presidents with artificial intelligence
67	Replacing judges, prosecutors and tax inspectors with artificial intelligence
68	Introducing the concept of a personal consumption passport
69	Introducing global control over the speed of transport vehicles via GPS
70	Reducing traffic noise
71	Eliminating the use of haemodialysis (searching for new ways to cleanse blood without the use of water)
72	Making the cultivation of kidneys and other organs from stem cells more accessible and cheaper, using the organs of other biological species
73	Introducing ECOGOODLINE: a new global logistics system for freight transport
74	Introducing a Humanity Improvement Day
75	Introducing a new school subject called “The Planet’s Resources: Ways to Maintain the Life of Future Generations”
76	Classifying people according to level of intelligence rather than ethnicity
77	Introducing new neologisms, such as “With the help of *Cosmicus Quanticus Cerebrum*”, “With the help of my *Microbiome*”
78	Introducing a day of bereavement called “Human Imperfection and Stupidity Day”
79	Introducing a celebration called “Human Transformation Day”
80	Brainstorming on radical measures to be taken against enemies of the planet



THE ENVIRONMENTAL DIVERSITY OF THE PLANET ON THE BRINK OF ITS PHYSICAL LIMITS

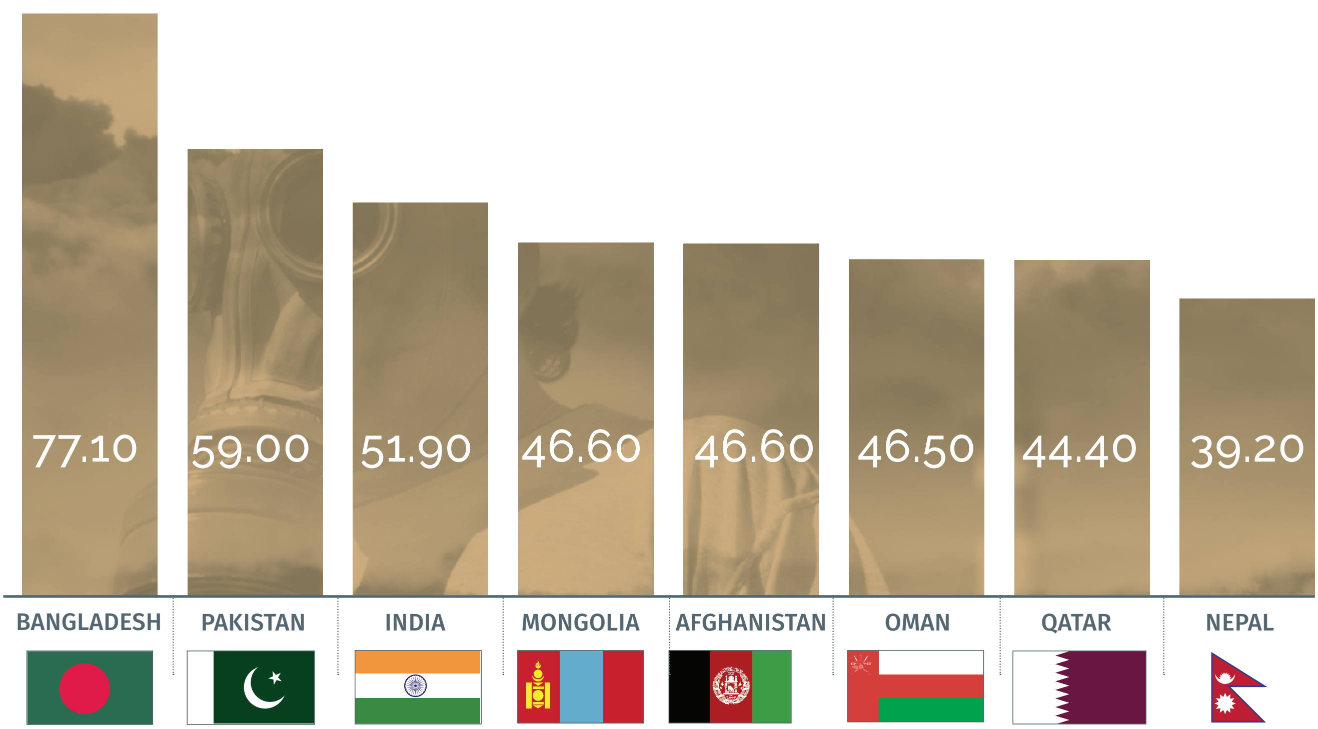
1.1 THE PLANET'S ENVIRONMENTAL CHALLENGES

Uncontrolled, unpredictable population growth is changing the reality of the planet. Natural ecosystems are being replaced by megacities and transportation, agricultural, energy and other industrial facilities, which are leading to environmental pollution, loss of biological diversity and a decrease in agricultural plantations.

Environmental pollution causes great damage to the global environment and has an extremely negative impact on the health of its inhabitants. The energy industry, agriculture, other industries, transportation and the building of megacities cause enormous harm.

More than **1.8 million people** annually die as a result of non-communicable lung diseases; **9** out of **10** inhabitants of the planet breathe polluted air. More than **70% of deaths** from strokes and the wide dissemination of lung cancer and respiratory diseases are caused by high levels of air pollution [2].

Today, the most polluted countries in the world in terms of PM2.5 *(particulate matter)* content are as follows:



It should be noted that there are different reasons for the environmental problems in all these countries [3].

The environmental problems of **Pakistan** are related to the depletion of natural resources and prolonged hostilities. **Qatar** is a country rich in such natural resources as gas and oil. However, the country's processing plants emit a critically large amount of toxic compounds into the atmosphere.

The environmental issue in **Afghanistan** is due to the long-lasting hostilities that have been going on for several decades. **Bangladesh** is mainly affected by natural disasters such as floods and landslides. Deforestation and forest fires significantly worsen the environment in **Mongolia**. This list goes on, but it should be noted that not only oil and gas production, but also other factors, can be the cause of environmental pollution.

On 25 September 2015, the UN adopted a set of sustainable development goals (SDGs) consisting of 17 goals and 196 targets to ensure the balanced development of all continents. Three out of these 17 goals are related to environmental issues:

GOAL 13. **Take urgent action to combat climate change and its impacts.**

GOAL 14. **Conserve and sustainably use the oceans, seas and marine resources for sustainable development.**

GOAL 15. **Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.**

It cannot be said that all these recommendations are being strictly implemented, but there is no doubt that they have already had an effect in practice.

As early as the beginning of the 21st century, humanity has been faced with unprecedented environmental problems: climate change, an unpredictable growing global population, the melting of large ice masses, a colossal increase in industry and transport, the formation of numerous megacities, etc. Because of intensive farming, soils are becoming increasingly degraded and depleted in their content of organic carbon and nitrogen as a result of the technogenic compounds emitted by toxic technologies. In this rapidly changing world, achieving a sustainable environmental balance and providing food resources for the world's population has become a task of paramount importance. It is impossible to describe the entire range of global environmental problems within the framework of this monograph. Therefore, the main factors causing the environmental imbalance common to all continents will be discussed.

Soil is one of the most important components of the ecosystem, being diverse in structure, chemical composition and the presence of toxic contaminants. As a non-renewable natural resource, soil underpins the production of agricultural produce, animal fodder, fibres and fuel. It purifies tens of thousands of cubic kilometres of drinking water per year, which is so important for all of humanity. It serves as the main reservoir for the storage and use of fixed carbon, significantly reducing emissions of carbon dioxide and other greenhouse gases into the atmosphere. Soil provides more than 95% of food and is the foundation for eradicating poverty and providing food for all of humanity.

The characteristics required to ensure the normal level of all soils are as follows:

1) A minimum level of erosion caused by water and wind deficiency.

2) The soil should not undergo degradation and should provide a stable physical environment for the movement of air, water and heat, as well as the growth of the roots of herbaceous, shrubby and large trees.

3) A surface cover (formed, for example, by growing herbaceous plants) is needed to protect the soil.

4) The soil requires a stable supply of organic matter, corresponding to the optimal level of the local environment.

5) The soil must ensure that sufficient nutrients are available to sustain all plant species.

6) The soil should have a minimum level of salinity and alkalization.

7) The soil should contain the required amount of water in the form of precipitation, additional sources of water and artificial irrigation.

8) The soil should have a very low level of toxic pollutants in the natural environment.

9) The soil should provide the existing biodiversity with a full range of chemical compounds, including *reversible* redox processes thanks to reactive forms of oxygen, as well as biologically active and physical-chemical functions and properties of organo-oxometallic complexes $[Qr^{+\delta}...O_2^{-\delta}...Ag^{+}]$.

10) To achieve the abovementioned goals, it is necessary to provide optimal modern soil management systems. There is a clear relation among the global environmental problems, the population explosion and the synchronous acceleration in the development of environmental science and technology. In recent years, humans have removed an increasing area of land from the natural environment to build megacities, factories, facilities, communications, landfills, etc.

The main current environmental problems must be identified, among which we can single out, first and foremost, the consequences of human activities impacting on the environment, which are primarily manifested in the following:

- air pollution and reduced oxygen concentration
- depletion of drinking water resources
- pollution of the soil cover with toxic, mainly technogenic, substances and waste products of production and consumption
- violation of the logically acceptable territorial relationship between non-agricultural industrial, agrarian and free environmental territories - forests, meadows, pastures, lakes and rivers - which determine the environmental balance of large regions.

The current environmental problems are related to global problems of sustainable development and the existence of the world community. Constant and comprehensive attention to environmental issues has already become a worldwide concern. Judging by the existing environmental situation, the further development of society may become futile if specific measures are not taken. In particular, all developed technologies should be evaluated through the environmental prism. Urgent environmental remediation measures, which also include legislative, organizational, technical and innovative, as well as eco-friendly technological developments in environmental protection, are needed.

Careful attention must be paid to the purification of contaminated soils. To this end, state organizations have been created in a number of developed countries, such as the United States, Canada, the countries of Western Europe, Russia, Japan, South Korea, China, etc., to carry out in-depth studies of the condition of the soil.

Despite the numerous environmental pollutants, the problems of processing and using oil and petroleum products, which are among the most important extractable resources on the planet, are the subject of a special discussion. On the planet's surface, oil and waste from its processing are particularly widespread and highly toxic, and such components as toxic hydrocarbons have an exceptionally high migration capacity. For millennia, anaerobic conditions based on the reduction reactions of organic compounds have been the environment in which organic mass, the

CAREFUL ATTENTION MUST BE PAID TO THE PURIFICATION OF CONTAMINATED SOILS

precursor of petroleum products, has formed. This is where the transformations characteristic of geochemical processes in an oxygen-free environment have been occurring very slowly over the span of millennia. Let us remember that during the extraction and transportation of oil, the characteristics of crude oil itself, as well as petroleum products, change due to their intensive contact with oxygen.

The shortage of fresh water is another overarching problem for the planet. Being an absolutely necessary component in providing the ecological and life-giving conditions required for all organisms inhabiting the planet, fresh water has already become acutely scarce in at least 40 countries of the world. These countries occupy at least 60% of the planet. According to reliable data, humanity uses at least 10 million tons of drinking water per day and, with the rise in the world's population, this figure is constantly increasing.

The planet's entire population annually uses approximately 4 trillion m^3 of water. On a global scale, the greatest danger for the atmosphere, water and soil is posed by various anthropogenic pollutants that spread relatively quickly over large areas, polluting all ecological niches. This leads to both local and global acceleration of undesirable oxidative processes in the soil, a decrease in the pure oxygen necessary for the normal existence and activity of all living organisms, water pollution, and largely contributes to the depletion of the ozone layer [4].

It stands to reason that unpredictable population growth, megacities, urban agglomerations and metropolitan areas with their corresponding infrastructure are some of the main causes of environmental pollution. The environmental situation has become so complicated that the European Union, where carbon dioxide emitted by cars comprises 12% of the total amount of human-made exhaust gases, imposes strict requirements on car manufacturers. The purpose of these requirements is to ensure that the intensity of exhaust gases containing carcinogenic benzo[a]anthracene, benzo[a]pyrene and carbon monoxide becomes as low and as close to zero as possible, while carbon dioxide is completely converted into organic compounds by photosynthesis.

A major environmental document is the report presented by the United Nations Environment Program, UNEP, 2009, as a response to the 2008 global food, fuel and financial crisis. The paper discusses a range of political actions to stimulate the economy and at the same time improve the stability of the global economy. The Global Green New Deal (GGND) invites governments to allocate special funding to the green sector in three areas:

1) economic recovery (improvement);

2) eradication of poverty;

3) reduction of carbon emissions and ecosystem degradation; as well as implementation of the framework programme to stimulate green programmes and thus support local and international environmental policies [5].

The European Green Deal, approved in 2020, is a set of policy initiatives by the European Commission aimed at making the European Union (EU) climate neutral by 2050. Climate change and environmental degradation is an existential threat both to Europe and the world. The implementation of the European Green Deal will transform the European Union into a modern, resource-efficient and competitive economy ensuring:

- the elimination of greenhouse gas emissions by 2050 and
- the achievement of non-resource-driven economic growth by maximizing the replacement of harmful emission processes with GGND processes.

1.2 NEGATIVE ENVIRONMENTAL FACTORS

Natural phenomena and economic, material, physical, biological, social and political factors that negatively affect the environment play an important role in the complex solution of global and regional environmental problems. An analysis of long-term observations allows us to conclude that, under the current conditions of global economic development, these factors are subject to change, often leading to their negative or extremely negative environmental impact.

It is obvious that environmental pollutants should be divided into three main groups (Fig. 1).

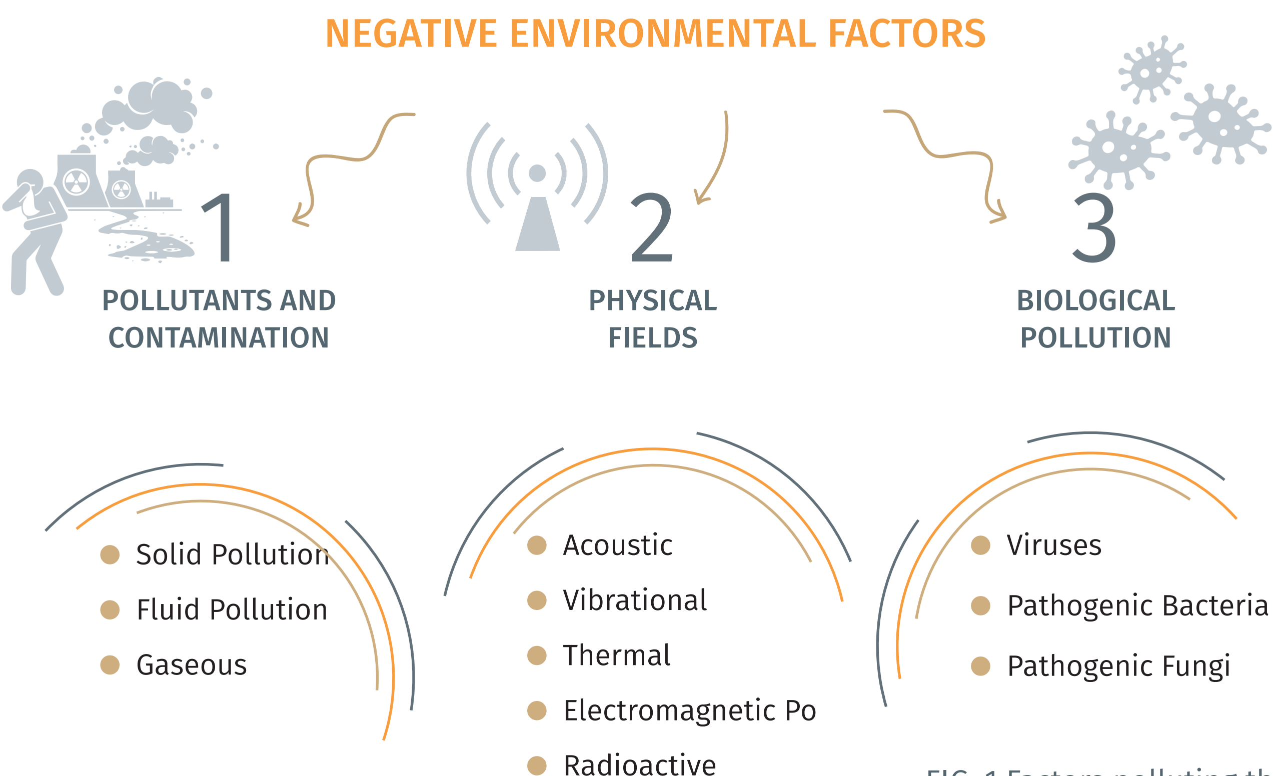


FIG. 1 Factors polluting the environment

The first group includes mechanical pollutants, which, depending on their physical state, can be solid, liquid or gaseous. In addition to the well-known and well-described pollutants – gaseous and liquid aggressive mixtures – the decomposition of a colossal amount of plastic materials obtained by chemical synthesis has recently sparked great interest. The problem is that, as they decompose under the influence of solar radiation, these materials emit traces of methane and ethylene, which are typical greenhouse gases. This property is especially inherent in polycarbonate, acrylic, polypropylene and high and low density polyethylene. The polyethylene used to make plastic bags is considered to be the most active source of methane and ethylene emissions. As a greenhouse gas, methane has been found to be 30 times more potent than carbon dioxide. According to reasonable belief, anthropogenic methane emissions are a major contributor to the global warming effect.

The second group includes physical fields, which, depending on their physical nature, can manifest themselves in the form of:

- an acoustic field resulting from the impact of various sources of sound waves;
- a vibrational field or exposure to various sources of elastic mechanical vibrations;
- a thermal field resulting from a temperature increase in the environment, primarily in the atmosphere;
- an electromagnetic field, which is a consequence of various sources of electromagnetic waves;
- a radiation field, influenced by sources of ionizing radiation.

The third group includes biological pollution and various forms of pathogens and microorganisms, such as viruses, bacteria and filamentous fungi. Being sources of biological decay of natural compounds and infectious diseases negatively affecting the physiology and metabolic processes of humans, animals and plants, they cause environmental degradation of the ecosystems.

These factors not only negatively affect the human body, but also worsen the environmental situation at the regional level, contributing to the manifestation of various infectious diseases in humans and causing extremely serious damage to large cities (as places of their most likely distribution), urban agglomerations and metropolitan areas.

Pollutants: natural and anthropogenic. Any natural or synthesized compound found in the environment in quantities exceeding the maximum allowable concentration (MAC) or those habitual to the region responsible for pollution can be a pollutant. Any pollutant is a chemical compound with the corresponding structures, physical, chemical, biological and environmental characteristics.

Pollutants are classified according to various criteria. The first and main feature is the physical state of the polluting factor: gaseous, liquid, or solid. Pollutants can also be classified in terms of their natural or anthropogenic properties. Basically, correspondence to established factors significantly determines biodegradability and, consequently, the stability of a wide range of toxic chemical compounds.

...ANY NATURAL OR SYNTHESIZED COMPOUND FOUND IN THE ENVIRONMENT CAN BE A POLLUTANT...

In environmental terms, natural pollutants are the waste products of organisms, volcanic eruptions, forest fires, sandstorms and other natural phenomena, including the external influences of outer space, which result in an imbalance of material substances and physical factors in the environment. However, all these phenomena are the output of the planet or its biosphere.

Abundant and widespread anthropogenic pollutants pose a more serious environmental hazard. These pollutants are characterized by uneven distribution in the air, oceans, seas and other water bodies, as well as by different chemical composition and structure, different susceptibility to biodegradability and other parameters.

It is generally accepted that the main natural environmental pollutants are: methane, as a product produced by microorganisms; toxic gases and solid particles released during volcanic eruptions, naturally occurring forest fires and sandstorms; oil seeping into the soil, rivers and seas during its extraction and transportation; heavy metals during the washout of ores during floods and landslides; and other products of technogenic industries.

Anthropogenic factors that negatively affect the environment, equally polluting all ecological niches, represent the greatest environmental hazard due to their large number and wide distribution. As the main form of environmental pollution, they radically affect and change the micro-environment and, in some cases, the macro-environment of their location. Since they are stable in their surrounding biotic and abiotic conditions, they negatively affect all types and forms of organisms, either per se or in composite supramolecular complexes with other environmental components.

The existing environmental imbalance of the planet is caused by the ongoing human desire to improve diverse living conditions and to strive, as multinational companies, to gain as much profit as possible. However, over the past 100-120 years, the unpredictable growth of the planet's population has increased the technogenic load on ecosystems so much that it has already exceeded the *bio-regeneration* potential of the planet. The problems associated with the constantly accelerating, intense pollution of nature—air, soil and water—must be resolved.

The etymology of the concepts "demography" and "pandemic" makes it possible to characterise them as words that derive from the same root: "demos" – "the people" and, in the second case, "pandemic" – "all the people", which covers the greatest number of people and so is the most dangerous. It is obvious that the demographic "footprint" of the pandemic, as a special form of environmental and economic crises, is primarily manifested in the high mortality rates. And once again, supplying the victims with pure "activated oxygen" is an urgent issue, since this form of oxygen helps to reduce destruction of the lungs by transferring an electron to the haemoglobin without increasing the content of other forms of active oxygen.

...OVER THE PAST 100-120 YEARS, THE UNPREDICTABLE GROWTH OF THE PLANET'S POPULATION HAS INCREASED THE TECHNOGENIC LOAD ON ECOSYSTEMS SO MUCH THAT IT HAS ALREADY EXCEEDED THE BIO-REGENERATION POTENTIAL OF THE PLANET.

1.3 AIR

It goes without saying that atmospheric air is one of the most important components of the biosphere. Throughout the history of humanity, despite the often chaotic, geological, climatic and evolutionary processes taking place on the planet, the amount of nitrogen, oxygen, carbon dioxide and argon in the air—its main components—has remained unchanged. This is undoubtedly the result of nature's phenomenal capacity for self-renewal and environmental self-regulation of the entire planet.

It stands to reason that even minor changes in the composition of the air can cause unusual physiological and biochemical changes that will harm a broad range of terrestrial organisms that have adapted to the existing conditions.

Therefore, it is important to identify the phenomena that have an influence on the atmospheric air. The chemical composition of the atmosphere is affected by any non-natural gaseous formation that, apart from mechanical mixing, chemically reacts with the air's components. The gases existing in the air are capable of dispelling radiation of different wavelengths, which reduces their overall impact on all life forms on the planet.

More than 3,000 substances that do not compose atmospheric air but penetrate it are also air pollutants. Firstly, these compounds pollute the air. Secondly, when they react with the air's components, their concentration is reduced, forming new unusual components of the air. What is more, certain substances normally present in other atmospheric layers are also pollutants, such as ozone from the stratosphere once it enters the troposphere.

Natural and non-specific anthropogenic gases come from a number of main sources. They include gases occurring in all industrial processes, those contained in the exhaust of vehicles running on gasoline and diesel, those released by pathogenic microorganisms that have volcanic origin, those that come from outer space and are not indigenous to the planet's atmosphere, as well as those gases formed in nature as a result of biological processes of decay, biological oxidation and other microbiological processes carried out by pathogenic microorganisms.

The unprecedented speed and scale of industrial development is responsible for the release of a wide variety of new technogenic compounds – more than two thousand – into the atmosphere that are alien to the environment, e.g., chlorine, which is widely used in the chemical industry. Despite its low concentrations in the air and soil, this halogen is naturally hazardous, forming organochlorine compounds that enter the food chain and have an extremely negative effect on human and animal health.

A group of technogenic compounds called dioxins is particularly toxic and has a lasting effect. This particular group of organochlorine compounds is distinguished by its unusual natural stability and a solid toxic structure that has remained unchanged for decades.

Against the backdrop of the negative impact on the atmospheric air of a huge number of natural and anthropogenic factors, their effect on living organisms and the changes they cause on the surface of the planet and in the water, air and soil are especially important.

One of these factors is the so-called greenhouse effect, caused by an increased amount of technogenic gases, which is a “response” of the near-earth atmosphere to an underlying increase in unnatural gases. This effect was in existence by the 20th century and is now normal for big cities.

The most common anthropogenic compounds for different layers of atmospheric air are the following [6]:

- **gaseous atmospheric substances** (sulphur dioxide, carbon and nitrogen oxides), particulate pollutants (dust, soot and heavy metal compounds), organic compounds, including those forming photochemical smog and destroying the ozone layer of the atmosphere, as well as petroleum vapor;
- **soluble and insoluble gaseous substances** (chlorine compounds, hydrogen sulphide, ozone and hydrogen), suspended solids and soluble salts of heavy metals and liquid pollutants (petroleum products, fats and oils, acids, alkalis and surfactants) in the hydrosphere;
- **gaseous substances** (ammonia, chlorine and nitrogen compounds), a wide variety of toxic compounds, suspended solids, soluble salts of heavy metals and liquid pollutants (petroleum products, oils, acids, alkalis and pesticides) in the lithosphere (especially in soil as its upper fertile layer). It is anthropogenic pollution and primarily air and soil pollution by gaseous, liquid and solid substances (fine dust), which are a threat to human health, that remain the most acute environmental problem of the highest social and economic priority.

The most common pollutants in the gaseous state include the following:

Sulphur dioxide (sulphurous anhydride) SO_2 is a colourless gas with a pungent odour. Its molecular weight is 64.066. The density of pure sulphur dioxide at a temperature of 0°C and a pressure of 760 mm Hg is 2.9267 kg/m^3, its heat capacity is 39.8 J/(mol·K), its melting point is -72°C, boiling point -10.06°C, critical temperature 157.5°C and critical pressure 7.88 MPa. Pure sulphur dioxide condenses into a liquid at a temperature of 10.8°C and at a vapor pressure of SO_2 above the liquid phase of 760 mmHg. At a temperature of +50.0°C and a pressure of 0.84 MPa, SO_2 becomes liquid. The average specific heat capacity of liquid SO_2 ranging from -20.6°C to +9.8°C is 20.8 J/(mol·K). At a temperature of -75.5°C, SO_2 becomes solid.

After entering the air, sulphur dioxide remains there for a relatively short time: from several hours (in humid air with impurities such as ammonia) to three weeks (in dry and clean air). When SO_2 mixes with moisture droplets in the air, chemical, photochemical, physical and other reactions occur, resulting in the formation of a secondary pollutant – sulphuric acid (H_2SO_4) – which greatly increases the environmental hazard of sulphur dioxide. In addition, when interacting with suspended particles, sulphur dioxide forms sulphates, which can settle in human lungs and cause serious diseases, right up to the destruction of tissue. Inhalation of relatively low concentrations of sulphur dioxide in humans inflames their upper respiratory tract. In this case, lung damage occurs 1–2 days after SO_2 enters the respiratory tract [7].

In the working area air of industrial premises, the Ambient Air Standard (AAS) for sulphur dioxide is 10 mg/m^3, in the atmospheric air of the city the maximum one-time AAS for the maximum permissible dose is 0.5 mg/m^3, while the average daily AAS for mean daily concentration is 0.05 mg/m^3.

Nitrogen monoxide (NO) is a colourless gas formed by the direct combination of nitrogen with oxygen. Its molecular weight is 30.008. The density of pure nitrogen monoxide at a temperature of 0°C and a pressure of 760 mm Hg is 1.3402 kg/m^3, its heat capacity is 29.86 J/(mol·K), its melting point is -163.6°C, boiling point -151.7°C, critical temperature 93°C and critical pressure 6.48 MPa.

As a component of air, NO is a highly toxic substance, and it mainly damages the central nervous system, has a destructive effect on the lungs, and in severe cases it causes pulmonary oedema and lowers the blood pressure.

In the working area air of industrial premises, AAS for nitrogen monoxide is 5 mg/m^3, in the atmospheric air of the city the maximum one-time AAS for the maximum permissible dose is 0.4 mg/m^3, and the average daily AAS for the mean daily concentration is 0.06 mg/m^3.

Nitrogen dioxide (NO_2) is a reddish-brown gas with a characteristic pungent odour. Its molecular weight is 46.008. The density of NO_2 at a temperature of 0°C and a pressure of 760 mm Hg is 1,490 kg/m^3, its heat capacity is 36.7 J/(mol·K), its melting point is -11.2°C, boiling point 21°C, critical temperature 158°C and critical pressure 10.1 MPa.

Short-term exposure of the human body to nitrogen dioxide causes an imbalance in the lungs, affects the mucous membranes of the eyes and nasopharynx, damages lung tissue and reduces the body's resistance to infectious diseases. In the working area air of industrial premises, AAS for nitrogen dioxide is 2 mg/m^3, in the atmospheric air of the city the maximum one-time AAS for the maximum permissible dose is 0.085 mg/m^3 and the average daily AAS for the mean daily concentration is 0.04 mg/m^3.

Carbon monoxide (carbon monoxide – CO) is a colourless, odourless gas. Its molecular weight is 28.01. The density of CO at a temperature of 0°C and a pressure of 760 mm Hg is 1.25 kg/m^3, its heat capacity is 29.14 J/(mol·K), its melting point is -205.02°C, boiling point -191.50°C, critical temperature 140.2°C and critical pressure 3.48 MPa.

Carbon monoxide is highly poisonous. As a product of incomplete combustion of petroleum hydrocarbons, it replaces oxygen molecules in the blood, when the human body is exposed to it, which leads to vasospasm, headaches, decreased immunological activity, loss of consciousness and sometimes even death.

In the working area air of industrial premises, AAS for carbon monoxide is 20 mg/m^3, in the atmospheric air of the city the maximum one-time AAS for the maximum permissible dose is 5 mg/m^3 and the average daily AAS for the mean daily concentration is 3 mg/m^3.

Carbon dioxide (CO_2) is a colourless, non-flammable gas with a slightly sour smell and taste. Its molecular weight is 44.010. The density of CO_2 at a temperature of 0°C and a pressure of 760 mm Hg is 1.97 kg/m3, its heat capacity is 819 J/(mol·K), its melting point is -56.6°C, boiling point -78.47°C, critical temperature 31.05°C and critical pressure 7.38 MPa.

The toxicity of carbon dioxide depends on its concentration and is a result of combustion processes, while at sufficiently high concentrations it can displace oxygen from the air. A high concentration of carbon dioxide in the air causes suffocation. Carbon dioxide easily penetrates sunlight in the ultraviolet and visible parts of the spectrum and absorbs infrared rays emitted by the Earth's surface. Carbon dioxide is classified as a greenhouse gas [8].

The most common type of polluting component in solid state is fine dust, which is divided into organic and inorganic (mineral):

1

organic dust includes vegetable dust (for example, wood dust), as well as the dust of some synthetic substances: dust from various plastics, rubber products, finishing fabrics, cotton wool and polyester resins.

2

inorganic dust includes metal and mineral dust, for example, iron dust, dust from lead and other heavy metals, iron oxide, dust from sand, crushed stone, gypsum, cement and ceramic dust.

The properties of dust vary greatly and depend on the specific conditions of the formation of the dust particles, as well as a number of other parameters. The main characteristics of dust are: dispersion – the size and shape of dust particles, structure, specific surface, adsorption capacity and chemical composition; density – true, apparent and bulk, electrical resistance, stickiness, abrasiveness, wettability, equilibrium moisture content and other properties that determine the nature of its effect.

Dust particles sized PM2.5 and PM10 are the most dangerous for humans. The negative impact of dust on the human body is manifested in its penetration through the respiratory system into the gastrointestinal tract, skin and mucous membranes. According to the nature of the effect on the human body, dust can be divided into irritating and toxic. Depending on the chemical composition of the dust, its AAS values in the working area air range from 1 to 10 mg/m^3, while AAS for the maximum permissible dose and AAS for the mean daily concentration of dust are on average 0.5 mg/m^3 and 0.15 mg/m^3, respectively.

Petroleum products – complex mixtures of hydrocarbons containing organic compounds of other classes – seriously add to air pollution. The main elements in the composition of petroleum are carbon (83-87%) and hydrogen (12-14%). Sulphur, nitrogen and oxygen can also be found in detectable quantities in the composition of petroleum products. The composition of petroleum also includes alkanes in the form of paraffins, cycloalkanes in the form of naphthenes, aromatic hydrocarbons, asphaltenes, resins and olefins. Moreover, petroleum normally contains insignificant amounts of trace minerals. More than 1,000 individual compounds have been identified in the composition of petroleum.

Petroleum products comprise various hydrocarbon fractions obtained from petroleum. However, in its wider connotation, “petroleum products” are usually represented as a commodity raw material derived from primary processed oil. The products of refining petroleum are used in various types of economic activity: aviation and automotive gasoline, kerosene fuels (jet fuel, tractor fuel and lighting oil), diesel and boiler fuels, fuel oils, solvents, lubricating oils, tars, bitumen, paraffin, petroleum coke, petroleum acids, etc.

Petroleum usually contains light fractions of paraffin and sulphur. Light fractions are highly toxic to living organisms; their low-temperature volatility promotes rapid self-purification. So, for example, paraffin vapours in the air do not have a strong toxic effect on living organisms, but due to its high pour point, paraffin significantly affects the physical properties of the soil. Sulphur increases the risk of hydrogen sulphide contamination of the soil.

It is advisable to single out hydrocarbons that have no colour but a characteristic smell into a specific group. Their molecular weight varies from 16.04 to 44.09. The density of these hydrocarbons at a temperature of 0°C and a pressure of 760 mm Hg ranges from 0.7168 to 2.019 kg/m^3, their boiling point ranges from -162 to -42°C, critical temperature from -82 to 96.8°C and critical pressure from 4.12 to 4.49 MPa.

The most dangerous hydrocarbons are polycyclic aromatic hydrocarbons (PAHs), known for their carcinogenic, mutagenic and teratogenic properties – benzo[a]anthracene and chrysene, benzo[b]fluoranthene, benzo[j]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, benzo[ghi]pyrylene, coronene, dibenz[a,h]anthracene, indeno[1,2,3-cd]pyrene and ovalene.

When the human body is exposed to hydrocarbons the central nervous system, endocrine system and cardiovascular system are affected, while haemoglobin and erythrocytes in the blood are reduced. In the working area air of industrial premises, AAS for hydrocarbons is 300 mg/m^3, in the atmospheric air of the city the maximum one-time AAS for the maximum permissible dose is 900 mg/m^3, and the average daily AAS for the mean daily concentration is 300 mg/m^3.

The next classification feature of pollutants is the level of their negative impact on the environment. This is reflected in the toxicity category rating, which comprises four categories. It is this classification that primarily considers the chemical properties of pollutants, as well as the values of the average lethal dose of a substance when it enters the human body through the respiratory tract (inhalation), skin (percutaneous) or gastrointestinal tract (orally) [9].

When assigning a pollutant to one or another class of toxicity, the method of its penetration into the human body is taken into account, which makes pollutants the most toxic substances. According to their degree of toxicity, air pollutants with pronounced chemical properties (toxicants) are divided into [10]:

EXTREMELY HAZARDOUS (CLASS I)	HIGHLY HAZARDOUS (CLASS II)	MODERATELY HAZARDOUS (CLASS III)	SLIGHTLY HAZARDOUS (CLASS IV)

The degree of toxicity of a substance that enters the body from the air depends on the amount (dose) of the substance that has settled in the body, the method of its intake, its distribution in and excretion from the body, the physical properties and duration of intake, its interaction with cellular structures, the gender and age of the person and their individual sensitivity to the toxicant.

To eliminate the pathological effect of a large number of toxic compounds on terrestrial organisms, nature itself has a set of natural technologies, including the detoxification potential of microorganisms and plants, climatic and temperature factors affecting the structure of the toxicants (precipitation, temperature changes, winter and summer) and oxidative processes under exposure to atmospheric oxygen. Photosynthesis, which utilizes a colossal amount of carbon dioxide, can also be attributed to this list of specific environmental processes. Photosynthesis, the combination of a plant + solar energy → organic compound + oxygen, is one of the most important natural processes that determines the existence of life on our planet and is quite unique. Photosynthesis is the process used by plants and some other chlorophyll-containing organisms to convert light energy into chemical energy. Through photosynthesis, green plants, algae, diatoms and certain forms of bacteria synthesise carbohydrates from carbon dioxide and water with the help of chlorophyll, using the energy captured by chlorophyll from sunlight and releasing excess oxygen as a by-product. See Figure 2.

Due to the quantum energy of light incident on chlorophyll, ATP – a form of energy used by the cell – is generated, and photodecomposition of water (the light phase) occurs. The resulting hydrogen is used to reduce NADP-H (nicotinamide - β - adenine dinucleotide phosphate), with the help of which carbon dioxide is reduced to glucose in the dark phase. ATP is the source of energy in these synthesis reactions. Oxygen formed during the photodecomposition of water is released into the environment.

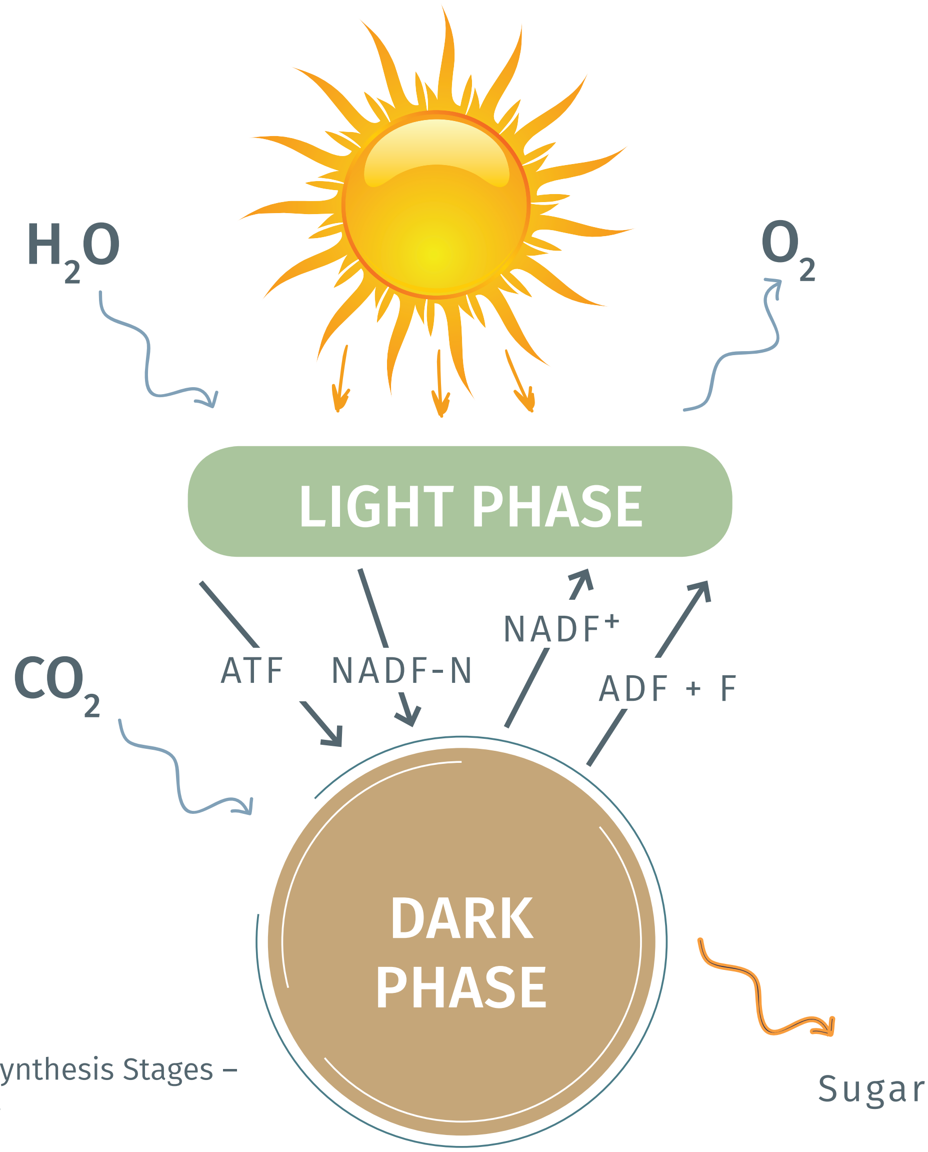


FIG. 2 Photosynthesis Stages – Daniel Mayer

Figure 2 shows the implementation of the stages of photosynthesis on a planetary scale.

By assimilating carbon dioxide and processing it into organic compounds, plants largely determine the environmental balance of the planet. Essentially, they create the necessary basic conditions for the existence of living organisms. The quantity of the main substrate of photosynthesis, carbon dioxide (CO_2), is much higher than that of carbon monoxide (CO) and, as an inorganic pollutant, poses a significantly lower environmental hazard. According to the available data, as a result of intensive industrialization, the amount of carbon dioxide in the environment is constantly increasing and has reached such proportions that the problems associated with its photosynthetic conversion potential are looming.

If we look at how active photosynthesis processes are distributed throughout the regions of the world, we can conclude that the planet is not using its photosynthesis enhancement potential to the fullest extent [11].

The numerous other toxic environmental pollutants include the following. Trichloroethane – TCE – is one of the widespread chlorinated hydrocarbons in the atmospheric air that have a toxic effect on the liver. This solvent is mainly used for degreasing metal surfaces to decompose a number of substances, including those of natural origin. In moderate quantities, TCE is applied in organic synthesis. It is estimated that about 90% of all TCE produced ends up in the air, while the rest is contained in solid waste and wastewater. TCE is extremely stable under aerobic conditions. In sea water, its half-life is about 90 weeks, while it can exist in fresh water from 2.5 to 6 years. Under the action of anaerobic bacteria, the half-life of TCE is reduced to 40 days. At the same time, TCE partially breaks down into CO_2.

The toxic effect of TCE on animals is due to its metabolic transformation, usually catalysed by monooxygenases. Firstly, TCE is converted into an epoxy compound, which further converts into trichloroacetaldehyde (see Figure 3).

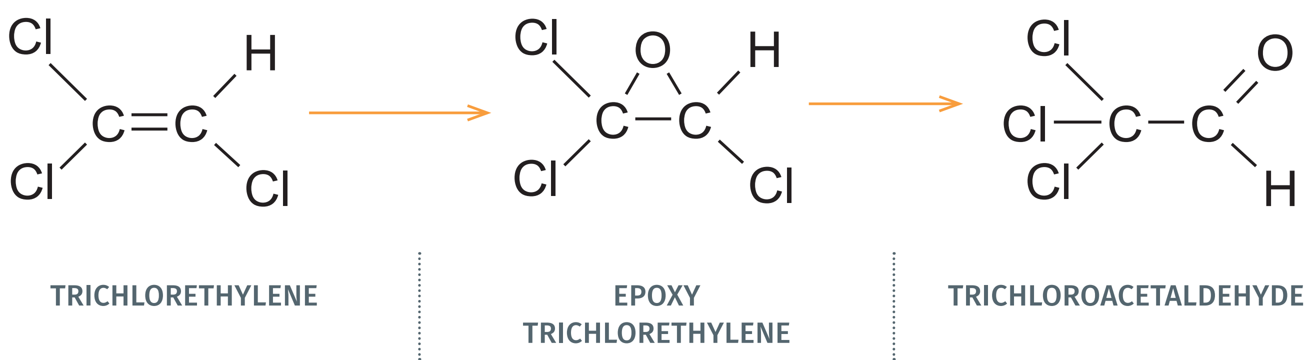


FIG. 3 Enzymatic transformations of trichlorethylene in animals

In addition to aldehyde, trichloroacetic acid, trichloroethanol and chloral hydrate can be formed in the body. Trichloraldehyde is a mutagenic substance: when it actively reacts with DNA, it causes structural changes in the DNA.

Of course, the above list of atmospheric air pollutants is not exhaustive, and it should be emphasised that the pollutants common in different regions of the planet vary greatly in their structure, function and degree of toxicity. Like all other components of the ecosystem, atmospheric air is a rather sensitive component that requires special attention.

1.4 SOIL

Soil is humanity's invaluable natural wealth or, to be more exact, it is the foundation of the existence and participation of living organisms in various processes. Soil is a favourable microbiome environment for the habitat and reproduction of soil organisms: bacteria, fungi, algae, animals and plants. As a result of their metabolism, organisms inhabiting the soil ensure its fertility. For example, bacteria, fungi and actinobacteria decompose organic substances into inorganic ones, which dissolve in water and are absorbed by plant roots as a soil solution.

Soil and plants are in constant mutual metabolic conversion, and without this symbiosis the life of these organisms is impossible. Soil is the most important living environment, the foundation of life for plants and humans. Living organisms receive water from the soil, as well as nitrogen compounds and all the important trace elements necessary for their existence.

Let's focus on plants. Nutrition from the soil plays an important role in the life of plants. In fact, we can say it is vital. Air provides the plant with oxygen and carbon dioxide, but the soil provides plants with the minerals they need. A plant can only grow properly if provided with the correct proportions of nutrients.

The biological relationship between the soil and plants, which is extremely beneficial and is based on the soil being enriched with exudates released from plants, is of particular importance. These compounds contribute to the activation of processes by the soil's microflora. **The soil, in turn, prepares organic and inorganic forms of nutrients enriched with oxygen, transforming them into water-soluble compounds to be fully absorbed by plants.**

Plants are able to use inorganic soil nitrogen compounds to synthesise a wide variety of compounds, including carbon-bound nitrogen, which is essential for plant growth and fertility. The diverse activity of plant cells is shown by the multiple synthesis of such important and unique components as low-molecular compounds – secondary metabolites (phenolic compounds, essential oils, carbohydrates, etc.) – usual for plants. Secondary metabolites, also called specialized metabolites, toxins or secondary products, are organic compounds produced by bacteria, fungi or plants that are not directly involved in the normal growth, development or reproduction of an organism. Plants, in comparison with other organisms, form a wide variety of secondary metabolites for their own secondary physiological needs. It is interesting to note that the vast majority of secondary metabolites in plants are characterised by polyfunctional activity. Over the past several decades, these well-known important characteristics of plants have been supplemented with new ones, which include assessing the composition of plants and soil microorganisms, as environmental agents capable of removing toxic compounds from the soil due to the high intracellular activity of redox and hydrolytic enzyme reactions. This method of degradation and, accordingly, removal from the soil of a wide variety of toxic substances based on their metabolic transformations is the most promising because, since it is entirely natural, it does not require the use of special conditions or environmentally hazardous chemical compounds [12].

The most important ability of some legumes to enrich the soil is their symbiosis with *Rhizobium* soil bacteria, which are able to assimilate molecular nitrogen from the air.

Although 78.03% of the planet's atmosphere is made up of nitrogen, this inert gas – N_2 – can only be captured and assimilated by nitrogen-fixing free-living and symbiotic bacteria. Bacteria in symbiosis with leguminous plants usually assimilate 100–300 kg of molecular nitrogen per hectare of cultivated land, while free-living nitrogen-fixing bacteria in the same area assimilate only 1–3 kg of nitrogen of the same form.

The unusually abundant plant world – Plantae and Vegetabilia – living in the soil belongs to the domain of eukaryotes. Among prokaryotes, there are a number of autotrophic organisms capable of using solar energy. Purple and blue-green *Rhodospirillum* or algae, also called cyanobacteria, belong to this type. In the case of algae, photosynthesis proceeds, as in plants, with the release of oxygen, while in purple bacteria, no oxygen is released during photosynthesis.

It stands to reason that the soil and its fertility, after humans began cultivating the land even in the most primitive way without destroying it, is one of humanity's invaluable natural resources. The plant kingdom, which contains biologically active compounds (BAC) and microorganisms that inhabit the soil and carry out its transformation, forms the foundation that sustains the life of all organisms on the planet. It has been proven that the biochemical processes occurring in the soil are closely related to the ecology of the entire planet and the microflora in the soil, where, combining with plant BAC, they symbiotically decontaminate harmful compounds, including toxic ones [13].

The layer of soil beneficial for agricultural, decorative, sports and other purposes in different regions of the planet should be between 20-25 and 150 cm thick. Most of the planet is covered with a soil layer within these limits. Together with solar energy and the necessary amount of precipitation, it is the main foundation for sustaining all life. A healthy generation of people can only be sustained when the soil is in the proper condition. The soil, with a constant diffusion of the products of soil metabolism among its layers, is a complex natural system. It must at least have the mineral and organic compounds, water, air and microorganisms necessary for ensuring the polyfunctional activity of the soil. The biological, chemical, photochemical and stoichiometric processes that occur continuously in the soil ensure its self-renewal, the degradation of alien inorganic and organic compounds and the synthesis of new ones characteristic of the existing soil and climatic conditions. Thus, the soil retains its fertility. Depending on the soil and climatic conditions it takes a long time, presumably at least 8-10 years, for full-fledged soil to form. Under the conditions of the active natural processes usual for soil, it is relatively rare for beneficial soil microflora to contain pathogenic soil organisms (bacteria, viruses and fungi). One of the remarkable properties of the soil is its ability to self-purify, thanks to which it evolves, adapting to environmental conditions. At least 28 types of soils are identified, including: sandy, loamy, limestone, peaty, podzolic, sod-podzolic, permafrost-taiga, grey forest, chernozems, chestnut, brown soils, tundra, gley soils, etc.

It is vital that healthy soil, as one of the main components of the environment and an important biological system, together with others, affects the microclimate of regions. This ability is due to different types of plants, soil microflora and other soil organisms, water resources and climatic conditions, which ensure high stability of the "immune system" of the soil and prevent the spread of pathogenic microflora – bacteria, viruses and fungi.

It will be absolutely fair to say that healthy and normally functioning soil is an important component of the "immune system" of nature as a whole and, at the same time, it is especially significant for the ecology. According to the UN Food and Agricultural Organization for 2019, the soil annually provides us with more than 760 million tons of wheat, 510 million tons of rice, 1,100 million tons of corn, 350 million tons of potatoes, 175 million tons of sugar, 335 million tons of meat, 852 million tons of milk and plenty of other agricultural products.

It has been acknowledged that the ecological condition of the soil has deteriorated over the past 100 years. These data are expressed in figures as follows: at the moment, approximately a little more than 40% of the planet's dry land is covered with vegetation; in fact, almost 2 billion hectares are subject to erosion, and 4.5 billion hectares to desertification. Twenty-four billion tons of fertile soil is lost every year due to erosion (https://www.fao.org/in-action).

IT HAS BEEN ACKNOWLEDGED THAT THE ECOLOGICAL CONDITION OF THE SOIL HAS DETERIORATED OVER THE PAST 100 YEARS

The forest area is annually decreasing by an average of 10 million hectares. In present-day conditions, there is a little more than 0.4 hectares of soil per capita globally, and this figure is constantly decreasing. Recently, the vast majority of land has been actively exploited, and there is almost no fertile soil suitable for farming on the planet.

According to the forecasts, in three decades, the availability of land for agricultural purposes – the cultivation of grains, fruit plantations, etc. – will decrease to 0.1 hectares per capita, which will be a critical level and signify the beginning of an environmental and nutritional disaster.

The soil is actually an extremely complex, variable and living environment that absolutely necessary for life on the planet. It contains 25% of the world's biodiversity, twice as much carbon as the atmosphere, while about 95% of food is directly or indirectly related to the soil.

The deterioration in the condition of soil as the most important ecological niche is caused by numerous external factors, including the constantly increasing technogenic toxic compounds of different degrees of stability and structure in the soil. There can be no doubt that industry and the environment are inherently mutually exclusive. Therefore, special attention should be paid to the creation of new environmentally friendly green technologies. To maintain an acceptable regional environmental balance, a number of developed countries are transferring the production of environmentally harmful industries to developing countries (Figure 4).

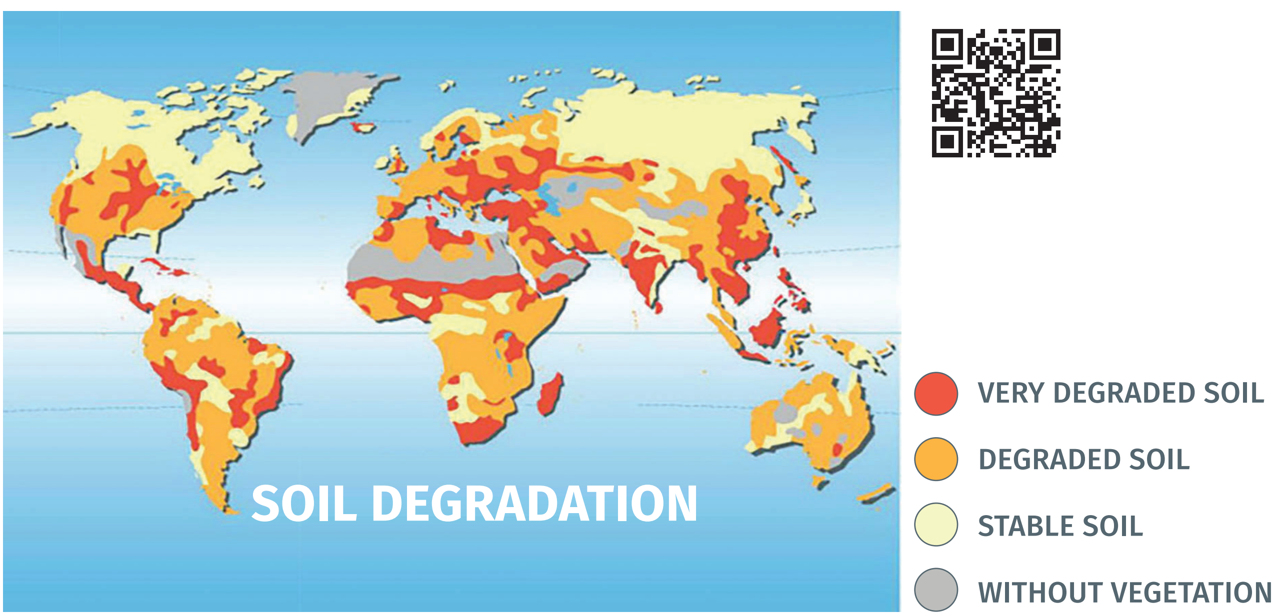


FIG. 4 Status of the world's soil resources (Map developed by the United Nations Environment Programme, GRID Arendal https://www.grida.no/resources/5507).

Taking into account the high emission of toxic compounds into the environment and their high stability in abiotic conditions, as well as the likelihood of their long-term presence in the soil, degradation of the upper layer and the accompanying processes of soil erosion – salinization, desertification and waterlogging – are inevitable. This is caused by toxic emissions, waste from energy, chemical and metallurgical industries and oil refineries, toxic emissions from motor vehicles and other means of transport and intensive farming. Based on the scale of industrial production development in developing countries, the large number of new industrial enterprises and implemented technologies, technogenic pollution, both local and global, is significantly increasing and has already reached threatening proportions.

The regions where the level of soil pollution by some toxic compounds significantly exceeds the maximum allowable concentration have long been identified. These are: Accra (Ghana), Raniped and Sukinda (India), Kabwe (Zambia), Dhaka (Bangladesh), Karabash and Dzerzhinsk (Russia), etc. According to the international classification system, countries in a compromised environmental situation include Saudi Arabia, Kuwait, Bahrain, Qatar, the United Arab Emirates, Oman and Libya. All of these countries are oil producers, and most of them also produce natural gas.

The permanent wars in various countries of the world are causing significant territorial damage to the environment and especially to the soil. The enormous environmental damage wrought on the environment by the 20th-century wars alone has still not been assessed. In addition to the visible casualties and destruction typical of war, all aspects of the environment, including the soil, as well as other ecosystems, are polluted with carcinogenic explosives, aggressive solutions and other compounds alien to the soil, including components of chemical and biological weapons. A classic representative of toxic carcinogenic explosives is trinitrotoluene, also known as TNT. Military units of all countries of the world are armed with it. This stable compound, obtained by chemical synthesis, contains three nitro groups and exhibits high stability to biotic and abiotic influences. When released into the soil, TNT retains its extremely toxic, unnatural structure for years, causing great damage to the soil. Ordinary soil microflora, annual and perennial plants, as well as the soil itself, cannot quickly and fully neutralise TNT, because restoration of nitro groups is required at the initial stage of degradation. It should also be considered that the intermediate products of partial TNT conversion are highly toxic too.

In this context, we cannot fail to mention chemical weapons obtained by chemical synthesis and consisting of active chemical poisons and other biologically aggressive components, which significantly complicate their biological neutralisation by the enzyme systems of microorganisms in natural conditions.

All components of the environment and ecosystems of a belligerent or post-war country, including soil and water resources such as lakes, ponds and groundwater, require serious environmental control and the implementation of remedial measures due to the presence in the soil of a large amount of toxic compounds in the form of explosives, as well as the toxic products of their partial biotransformation.

In this regard, the remediation of soils containing TNT can serve as an example. A soil decontamination technology was developed with the participation of the authors of this manifesto and consists of a combined approach to phytoremediation of TNT-contaminated soil. The essence of this innovative biotechnology is a three-stage process of biological soil treatment and remediation in the following sequence (Figure 5):

AT THE FIRST STAGE, specially selected rhizospheric microorganisms are introduced for these purposes. They carry out the initial transformation of explosives in the root system, turning them into relatively less toxic, more hydrophilic compounds that are more easily absorbed by plants;

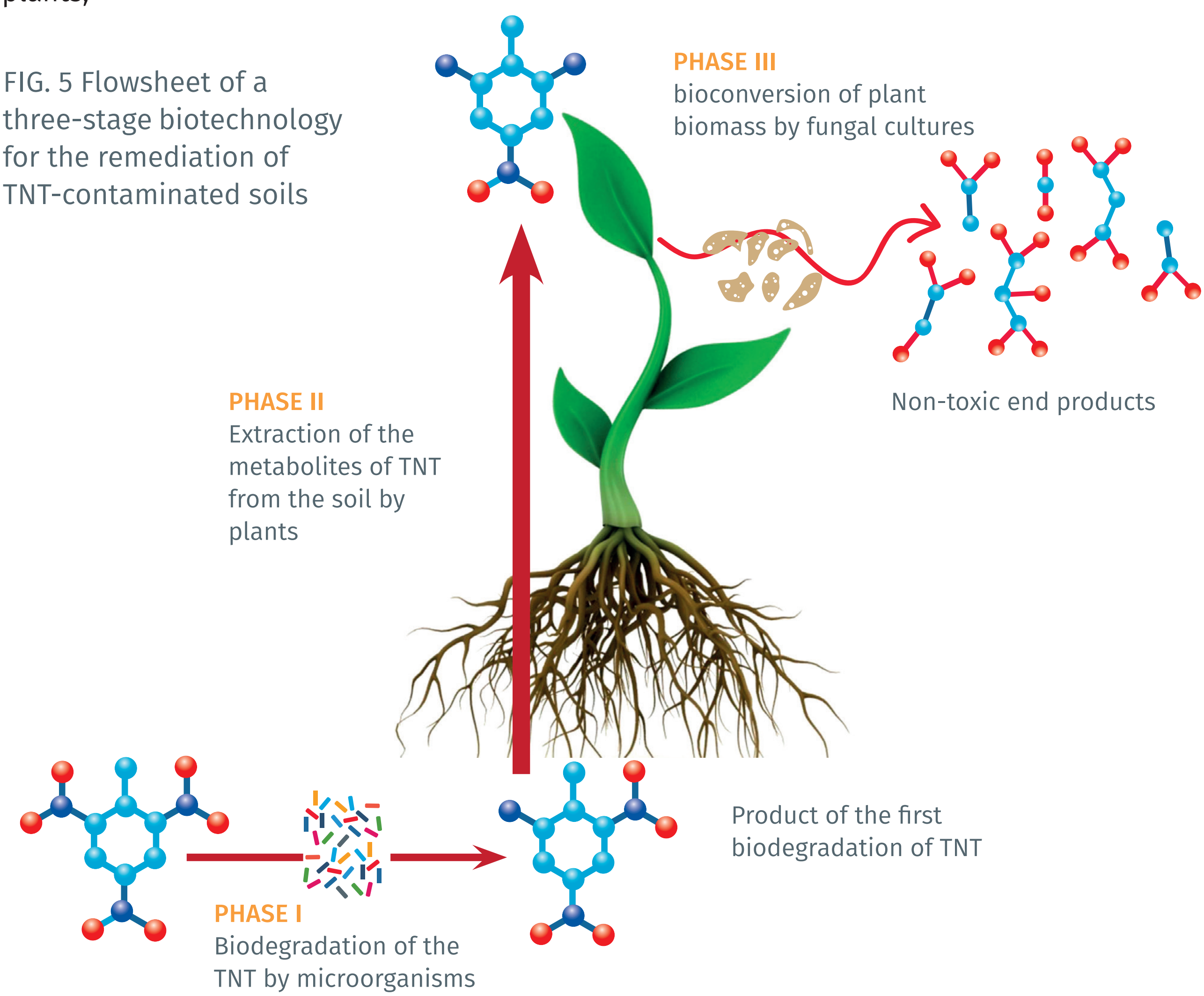


FIG. 5 Flowsheet of a three-stage biotechnology for the remediation of TNT-contaminated soils

AT THE SECOND STAGE – "extraction" – plants specially selected for this purpose, with a high phytoremediation potential, effectively remove the products of the partial transformation of the explosives from the soil and ultimately accumulate them in the above-ground parts of the plants;

AT THE THIRD STAGE – "bioconversion" – plant residues used in phytoremediation are treated with a fungal culture of basidiomycetes, which completely destroy the carbon skeleton of the toxic explosive residues in the plant biomass, leading to the maximum degree of TNT neutralisation and the products of its partial degradation by transforming them into non-toxic metabolites.

According to their purpose, highly toxic soil pollutants are divided into the following groups: pesticides in agriculture; petroleum products in the chemical and petrochemical industry, the chemical industry and the construction and engineering industry; polymeric materials in solvents and dyes; detergents in car service and consumer services systems; and explosives in the military-industrial complex, mining and pyrotechnics.

Pesticides are a general name for chemical plant protection products used to control weeds, harmful insects, phytopathogenic fungi and plant diseases. Most of them have a structure that is responsible for the toxic nature of the compounds.

Pesticides include more than 1,000 representatives of different chemical compound classes. Globally, the production and use of pesticides is measured in hundreds of millions of tons per year, reaching a billion. According to their type of action, pesticides are usually divided into the following groups [14]:

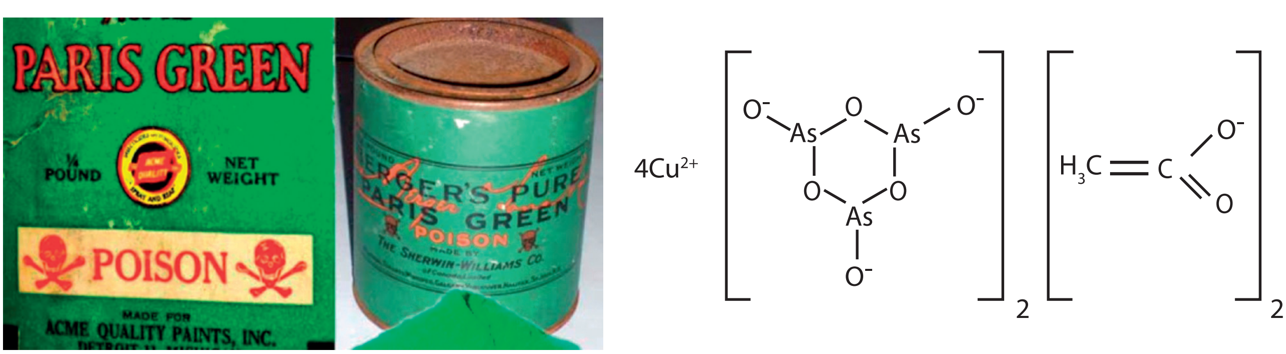
- **algicides** used in the fight against algae
- **acaricides** used against acaridae
- **attractants** used to lure parasites, insects and rodents
- **bactericides, biocides, disinfectants and sanitizers** used to destroy microorganisms and, in particular, protect against bacterial diseases
- **herbicides** used for destroying weeds and poisonous vegetation
- **desiccants** used to dry out the roots of unwanted plants
- **defoliants** designed to accelerate leaf fall, usually used to facilitate harvesting
- **insecticides** used to get rid of insects
- **molluscicides** used to protect underwater surfaces from snails
- **nematocides** used to protect against harmful nematodes and roundworms

- **ovicides** used to destroy the eggs of insects and worms
- **repellents** used to repel pests, including insects (such as mosquitoes) and birds
- **rodenticides** used to combat rodents
- **plant growth regulators** used to change the rate of growth, flowering and reproduction of plants
- **pheromones** used to combat insect reproduction
- **fumigants** used to destroy pests in buildings and/or soil
- **fungicides** used to protect against fungal diseases and mould.

Pesticides are categorised as inorganic and organic compounds. The vast majority of them are toxic compounds. To avoid undesirable long-term effects on the soil, they should be used for a limited duration, after which they should be degraded into environmentally-friendly molecular components and then take part in regular soil processes. Basically, since they are structures obtained by chemical synthesis, their biodegradation by hydrolytic and oxidative enzymes of soil microorganisms and the plant root system is not always feasible. Recently, biopesticides obtained by microbiological synthesis, biodegradable compounds that are much faster decomposed by soil microflora have gained momentum.

Among inorganic pesticides, the most common are: copper compounds – copper sulphate and the basic sulphates of copper used in Bordeaux Mixture; fluorine compounds – sodium fluoride, sodium, potassium, ammonium, zinc, magnesium silicofluorides; arsenic compounds – arsenites and arsenates of sodium and calcium, acetate-arsenite copper (II) - so-called "Paris green" (copper acetoarsenite) (Figure 6), lead hydroarsenate, etc.; and barium and mercury compounds in the form of chlorides, etc. Moreover, one of the most important inorganic pesticides is sulphur and its various compounds. For example, elemental sulphur in its finely divided form, so-called colloidal sulphur, is effectively used against herbivorous mites and powdery mildew fungi.

FIG. 6 «Paris Green» - copper (II) acetate-arsenite



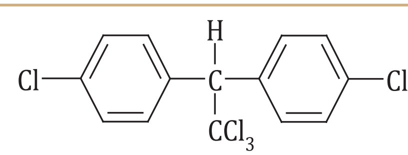
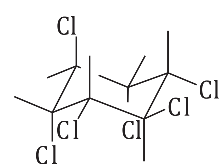
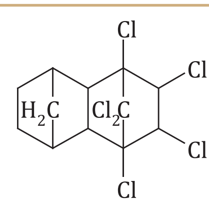
With regard to their action, pesticides can be contact or systemic. Contact pesticides cover the surface of plants and thus protect plants from pests. In most cases, contact pesticides are unable to penetrate into the intracellular system of plants. In contrast, systemic pesticides intensively penetrate into the intracellular system and are distributed through the plants, thus having a lethal effect on phytopathogenic insects and microorganisms.

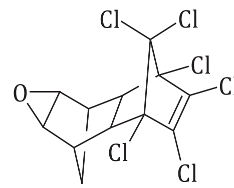
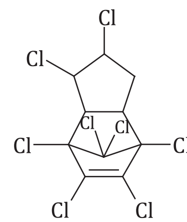
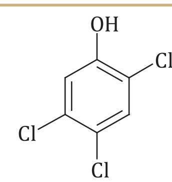
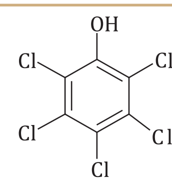
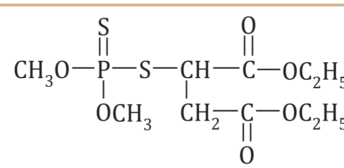
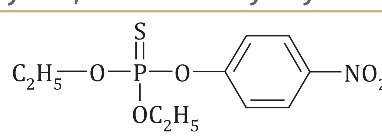
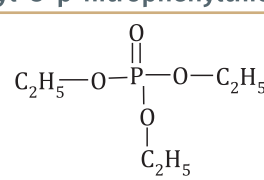
Organic pesticides obtained by chemical synthesis are mainly organochlorine, organophosphorus, and organometallic. In some cases, they are classified according to the compound they are derived from: urea, phenoxy acids, dipyridyls, alkaloids – derivatives of pyrethrin – and others. The following table provides data for the most widely used pesticides.

The names, structural formulas and purpose of some of the most common pesticides are provided in the table below:

Names, structural formulas and purposes of some of the most common pesticides

TABLE 1

NAME	PURPOSE	STRUCTURAL FORMULA AND CHEMICAL NAME
1	2	3
	ORGANOCHLORINE COMPOUNDS	
Dichloro-diphenyl-trichloroethane	Insecticide against mosquitoes, lice, bedbugs and various other harmful insects	 **1,1,1-trichloro-2 2-bis (p-chlorophenyl)ethane**
Lindane	Insecticide against pests of cotton, rice and wood-destroying insects	 **1,2,3,4,5,6 hexachlorocyclohexane (γ-isomer)**
Aldrin	Insecticide against ants, beetles and worms	 **1,1,2,3,4,10,10-hexachloro-1,4,4,α5,8,8α-hexahydro-1,4:5,8-dimethanonaphthalene**

Dieldrin	Broad-spectrum insecticide	 **(1aR,2R,2aS,3S,6R,6aR,7S,7aS)-3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro- 2,7:3, 6-dimethanonaphtho[2,3-b]oxirene**
Chlordan	Broad-spectrum insecticide	 **Octachlor-4,7-methanohydroindane**
2,4,5-T	Defoliant	 **2,4,5-trichlorophenol**
PVC	Broad-spectrum insecticide	 **2,3,4,5,6-pentachlorophenol**
	ORGANOPHOSPOHROUS COMPOUNDS	
Dithiophosphate (Malathion)	Insecticide for the destruction of pests of fruit trees, vegetables, ornamental plants and mosquitoes	 **O,O-dimethyl-S-1,2-dicarbethoxyethyl dithiophosphate**
Thiophos (Parathion)	Broad-spectrum insecticide	 **O,O-diethyl-O-p-nitrophenylthiophosphate**
Triethylphosphate	Broad-spectrum insecticide	 **Triethylphosphate**

Anthropogenic pollution by uncharacteristic gaseous, liquid and solid substances remains an acute environmental problem of social priority and economic importance.

Petroleum products are complex mixtures of gaseous, liquid and solid hydrocarbons and organic compounds of other classes. As one of the main soil pollutants, petroleum products are widely used in various industries and are mainly represented by various hydrocarbon fractions obtained from crude oil. Oil refining products used in various economic activities have a fairly wide range. These are gasoline, aviation, automotive, kerosene, jet, tractor, lighting, diesel and boiler fuels; fuel oil; solvents; lubricating oils; tars; bitumen; paraffin; petroleum coke; etc.

Soil microorganisms such as bacteria and filamentous fungi in aqueous solutions decompose oil into simple hydrocarbons. Heavy oil fractions are highly resistant to the effects of soil microflora and therefore settle in the soil almost unchanged. The predominance of the transformation, migration and accumulation of petroleum products is largely determined by natural and climatic conditions and the biochemical, physicochemical properties and structure of the soil itself. When petroleum enters the soil, it causes profound changes in the chemical, morphological, physical and microbiological properties of the soil, which leads to a significant decrease in fertility and sometimes to the elimination of contaminated areas from agricultural use.

Plants in the process of crop formation are rarely able to fully carry out the oxidative degradation of hydrocarbons, and, what is extremely undesirable, these hydrocarbons may end up in food. Hydrocarbons affect the human body in the form of damage to the central nervous system, as well as the endocrine and cardiovascular systems, and lead to a decrease of haemoglobin and erythrocytes in the blood.

The widespread use of pesticides causes pollution of soils, groundwater, rivers, lakes, reservoirs, etc. Pesticides and the intermediate products of their transformation can find their way into food, causing various diseases and pathologies in living organisms.

Pesticides differ significantly in the nature of their action, both within structural analogues and interclass representatives. These differences are manifested at the level of various properties – stability, water solubility, transition to a gaseous state – and in the mechanism of their biological and chemical effects. Typically, pesticides are sprayed onto crops or applied to the soil. There, pesticides mainly undergo anaerobic transformations, which result in the replacement of chlorine atoms by hydroxyl groups, although this leads to a significant decrease in their biological toxicological activity.

Organochlorine pesticides, such as DDT, lindane, chlordane, dieldrin, etc., are especially potent toxicants. They can easily enter the human body, penetrating through the skin or digestive tract and resulting in damage to the nervous system. DDT is one of the extremely active chemicals with insecticidal action. This compound was first synthesised in 1874, and since 1930, after its insecticidal properties were identified, DDT has been intensively used against the causative agent of malaria, the Anopheles mosquito.

2,3,4,5,6-pentachlorophenol has strong fungicidal, bactericidal and insecticidal properties. Therefore, it is widely used for indoor treatment.

Carbamates are derivatives of carbamic acid. They have a general formula and belong to the category of pesticides, which include insecticides, fungicides and molluscicides.

Organo-phosphate pesticides, such as esters of phosphoric and thiophosphoric acids, for example, insecticides – alkyl phosphates, parathion, etc., as well as carbamates – herbicides – barban and betanal; and fungicides – maneb, etc. – act on the nervous system, blocking enzymes that regulate the activity of the neurotransmitter acetylcholine. They are strong inhibitors of acetylcholin esterase. This affects signal transmission to nerve endings with a acetylcholine receptor. A decrease in enzyme activity leads to the accumulation of acetylcholine, which in turn, depending on the metabolite dose, causes symptoms such as salivation, pulmonary oedema, colic, diarrhoea, nausea, blurred vision, increased blood pressure, muscle spasms and convulsions, impaired speech and respiratory paralysis.

Even on external contact with the skin, dipyridyls such as the herbicide paraquat cause blistering and ulceration. When ingested, dipyridyl damages the kidneys and liver, and then causes lethal fibrotic lungs changes. Due to their high toxicity, dipyridyls require extremely careful handling.

Pyrethroid pesticides, which are synthetic analogues of the widespread insecticide pyrethrin, a compound extracted from chrysanthemums, are also toxic.

Petroleum contains hundreds of different chemical components, more than **75%** of which are hydrocarbons. The rest are derivatives of hydrocarbons containing sulphur, nitrogen and oxygen. Petroleum hydrocarbons are paraffins **(10-30%),** cycloparaffins or naphthenes **(30-60%),** as well as aromatic and naphtheno-aromatic hydrocarbons **(up to 5%).**

Hydrocarbons are constantly subjected to predominantly oxidative degradation as a result of the action of soil microorganisms, as well as a result of photo- and chemical oxidation. However, it should be noted that no taxonomic species of microorganisms, a representative of which would have the ability to assimilate all petroleum components, has yet been found. Microorganisms assimilate alkanes easier and faster, while cycloparaffins and aromatic hydrocarbons are much more slowly assimilated.

Complete degradation of petroleum components is possible only with the participation of individual active representatives of microorganisms of various taxonomic groups – bacteria, fungi and actinobacteria – which is nigh impossible in the broad range of soils in natural conditions. It should be noted that the microbiological transformation of petroleum hydrocarbons leads to the formation of intermediate compounds, most often those with polar functional groups – alcohols, aldehydes, etc. These products of hydrocarbon transformation dissolve in sea water more easily than petroleum hydrocarbons themselves, and therefore pose a danger to marine organisms that assimilate these compounds. Important factors influencing the microbiological decomposition of petroleum are temperature, nutrient content (mainly organic) and partial pressure of oxygen in water.

Assessing the condition of the soil globally, it should be noted that approximately 40-45% of the world's population lives and works on highly degraded agricultural land. Restoring soil functionality by increasing organic carbon, removing toxic contaminants and balancing nutrients will greatly facilitate food security and climate regulation, improve the quality and increase the amount of low-salt water and ensure the biological diversity of the soil cover [15-17].

According to some data, the remediation of air, water and soil by plants is determined by a number of factors: the presence and intensity of light, the temperature and the content of soil microorganisms and natural pigments that have the ability to interact with heavy metals, converting them into soluble compounds used by plants for growth and participation in photosynthesis.

The joint action of microorganisms and plants can be represented as a double-barrelled environmental weapon that detoxifies ecological niches by means of various mechanisms.

Biodiversity is a direct indicator of the environmental state of a large region, as well as the entire planet.

1.4.1 The role of organooxometallic compounds in the transfer of metals from soil to plants

In 1968, Japanese scientists first discovered the biological activity of germanium compounds [22]. Professor Kazuhiko Asai founded the Asai Germanium Research Institute and synthesised a drug (carboethylgerm-sesquioxane) that has a wide range of biological effects—it ensures the transfer of oxygen in the body tissues and increases the immune status, including antitumor activity. According to the WHO (1998), micro doses of germanium were recognized as essential (vital) for the normal functioning of the immune system of living organisms. Ge deficiency in baby foods is associated with the development of intractable childhood diseases, such as Kashin-Beck disease. However, there was no lack of water-soluble forms of Ge convenient for practical use. Several groups of scientists were engaged in the synthesis *of water-soluble Ge complexes with carboxylic acids* [29, 30]. For this purpose, such complexes as *carboxylates of 1-hydroxy germatran* based on carboxylic acids of the Krebs cycle (citric, malic, fumaric, succinic and malic) were synthesised. An important assumption about the antihypoxant activity of Ge complexes and Ge oxo complexes was confirmed by inversion polarography. Clinical trials have made it possible to establish the therapeutic effects: in particular, organogermanium complexes increase the activity of mitochondrial enzymes, *improve cell energy supply and increase the supply of oxygen to cells.* The use of physicochemical methods, including radiation-chemical modelling of redox processes in liquid media, made it possible to elucidate the mechanism of reactions responsible for the antihypoxant and radioprotective activity of germanium oxo complexes with Qr [$nQr^{\delta+}$ ...Ge^{n+} $mO_2^{\delta-}$] [21].

GE DEFICIENCY IN BABY FOODS IS ASSOCIATED WITH THE DEVELOPMENT OF INTRACTABLE CHILDHOOD DISEASES

To explain the mechanism of the protective activity of Ge-organic complexes in *living systems*, it became necessary to evaluate the possibility forming nanostructured germanium particles in reverse micelles, which are the closest models of cells and bio membranes in living organisms.

FIG. 7 A) Reverse micelle scheme

r_m - micelle radius,
r_w - water pool radius,
RH - *isooctane* C_8H_{18}; AOT-surfactant: bis(2-ethylhexylsulfosuccinate Na,
$\omega = [H_2O]/[AOT]$, $r_{w.p.} \sim k \times \omega$, k=1.5 [23,24].
ω – solubilization coefficient

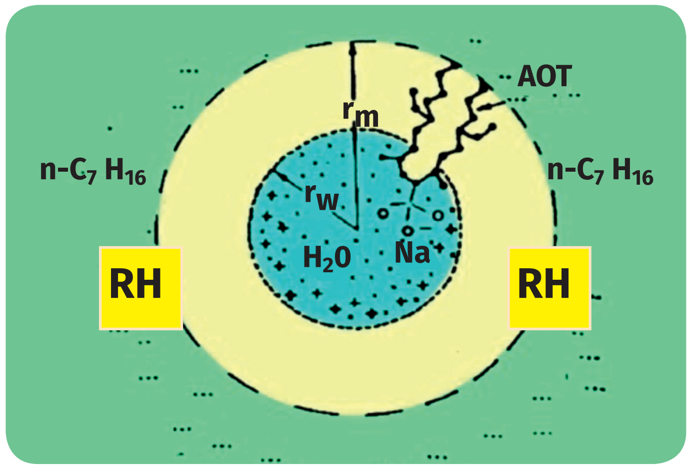
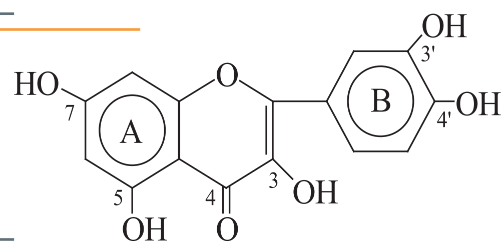


FIG. 7 B) Pentahydroxyflavone, Qr quercetin, flavonoid.



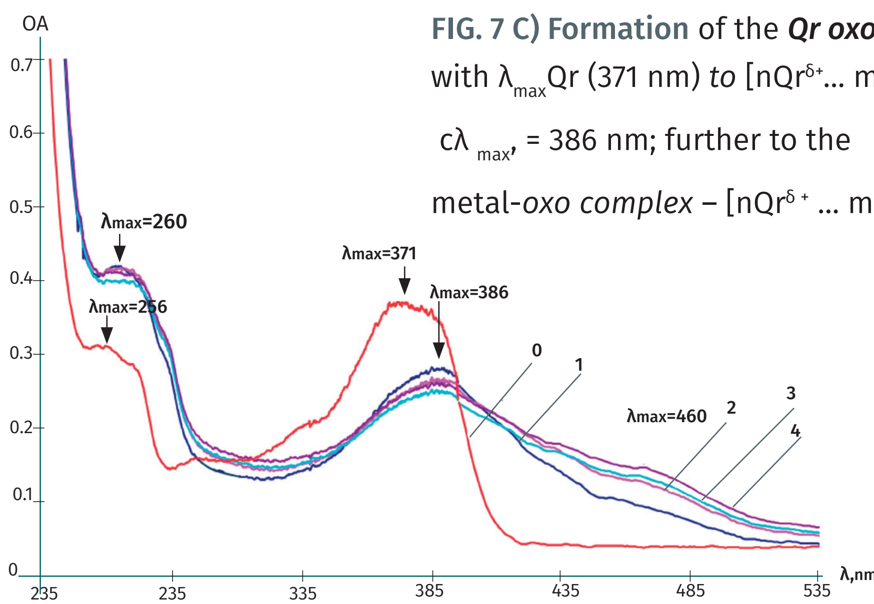
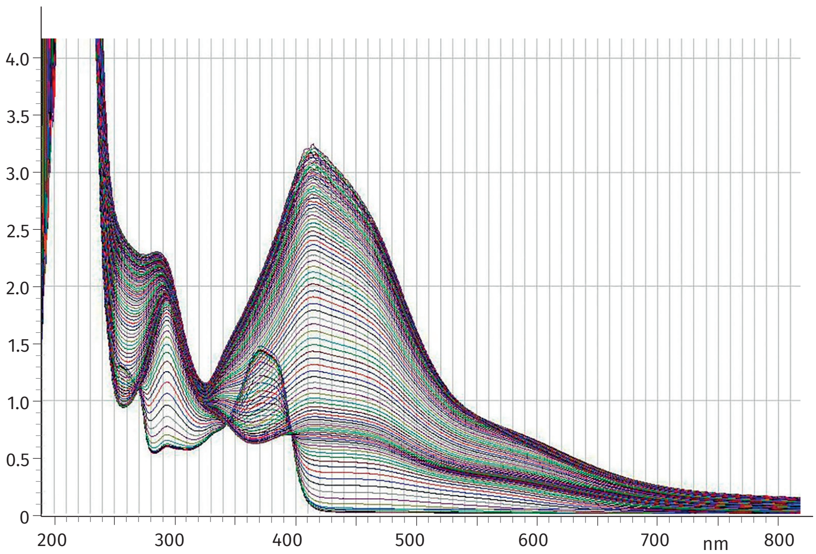


FIG. 7 C) Formation of the ***Qr oxo complex*** with λ_{max}Qr (371 nm) *to* $[nQr^{\delta+}... mO_2^{\delta-}]$, $c\lambda_{max}$, = 386 nm; further to the metal-*oxo complex* – $[nQr^{\delta+} ... mO_2^{\delta-} ... pGe^{+n}]$, λ_{max} ~460 nm

Fig. 8 a) below shows the kinetics of the formation of Ag nanoparticles in Reverse Micellar Solution (RMS) via the formation of an *oxo complex* (at λ_{max} ~383 nm), then a metal oxo complex (at λ_{max} ~450 nm) and then a simultaneous increase in the absorption band of Ag nanoparticles with λ_{max} ~ 410-420 nm.



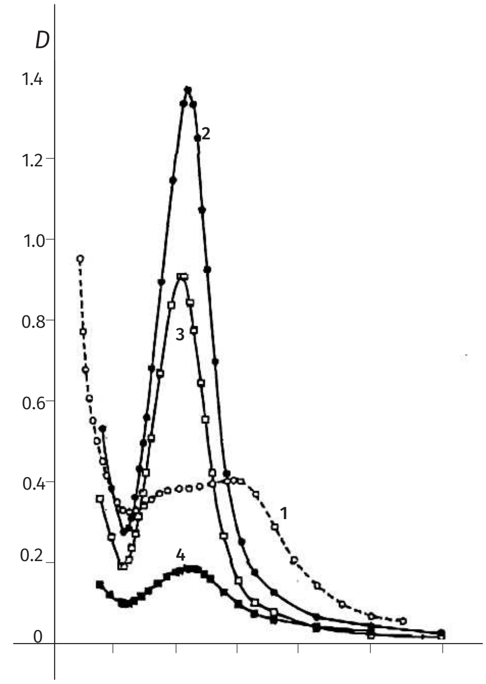


РИС. 8А)
Kinetics of the formation of AgChem nanoparticles

Δt=5 min, $T_{ambient*}$

*A.A. Revina. RF patent # 2312741..2007. (Chem) [24]

FIG. 8 B) OD SPECTRA
of Ag RadChem NPs

1 - immediately after irradiation,

2 - Δt= 40 min,

3 - Δt= 1 day,

4 - 4 months.

Fig. 8 b) shows a change in the optical absorption spectra of the AG RadChem particles in RMS containing silver salts, but with no QR and O_2, depending on the time after exposure to ionizing radiation. One can pay attention to the intense narrow spectra of Ag nanoparticles both in chemical synthesis and in RadChem. In both syntheses, λ_{max} Ag NPs = ~ 415 nm.

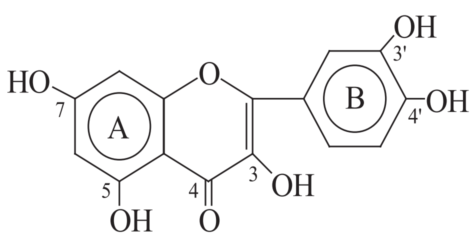
In both cases of syntheses, RMS had the same compositions – 0.15 M AOT/isooctane, ω=5.0 [H_2O]/[AOT]. [Ag+]=0.3M.

The spectra of Ag nanoparticles obtained by different methods of silver ions reduction are shown to compare the changes in the spectra of Ag NPs with different methods of formation and the possibility of registering participation in Chem-synthesis without the participation of external irradiation with ionizing radiation, but with quercetin (λ_{max}Qr =371 nm) and oxo-complex ($Qr^{\delta +}...mO_2^{\delta -}$) with$\Delta\lambda$ ~ 10-15nm and *metal oxo complex* [$nQr^{\delta+}... mO_2^{\delta -}... pGe^{+n}$] with λ_{max} ~ 450 nm. It should be noted that the metal complex exists under these conditions for a long time, depending on the content of the metal salt.

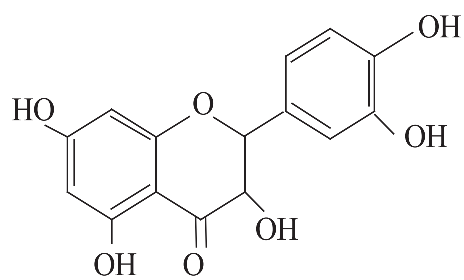
The following results are presented to demonstrate how sensitive the chemical methods for forming Ge NPs are to the flavonoid structure due to *self-organisation*, the formation of intermediate complexes in which charge transfer occurs, as well as the reduction of metal ions and their further aggregation during the formation of nanostructured particles.

The chemical method of Ge NP formation, GeChem NPs:

Synthesis of Ge Chem NPs was carried out in the presence of Qr flavonoids and DHQr dihydroquercetin:



Quercetin, 3,5,7,3',4'–pentahydroxyflavo [23]



dihydroquercetin 3,5,7, 4', 5'–dihydropentahydroxyflavone, DHQr.

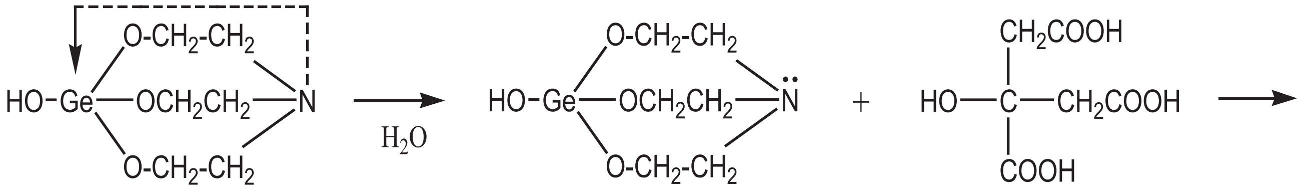
Despite the slight difference in the structural formulas of Qr and DHQr, the latter molecule has two hydrogens in the central ring instead of a double bond in positions 2 and 3. However, as will be shown, the intermediate processes involving electron transfer in these compounds are different, which affects the physicochemical properties formed by the Ge nanoparticles.

Spectrophotometrically, complexes are determined by the bathochromic shift of the Qr optical absorption band in the presence of Ge ions and by changing the reduction potential of the oxygen molecule in these solutions: [$nQr^{d+}... mO_2^{d -}$] [$nQr^{d+}... mO_2^{d -}... pMe^{m+}$]

Dl= 10-15 нм; **Dl**~ 20-45 нм (для Ge^{n+})

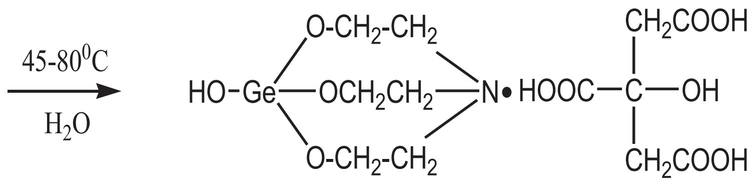
[$Qr^{d+}... O_2^{d -}$] [$Qr^{d+}... O_2^{d -}... Ge^{m+}$] → Ge^{m-1} → ... $НЧGe_n^{m+}$.

Spectrophotometric studies of the formation of *Ge-organic complexes* based on eniogerm, a water-soluble compound



I (IN HARD FORM)

II



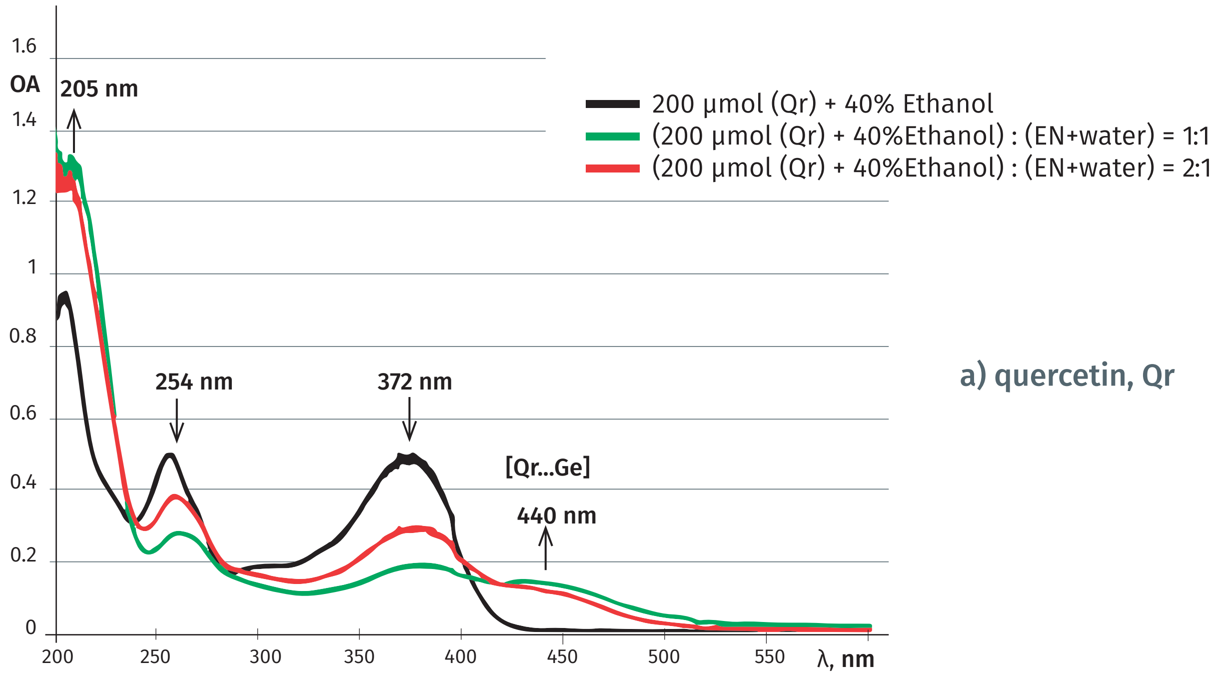
III (YIELD > 90%)

Formula: $C_6H_{13}GeNO_4 \cdot C_6H_8O_7$
1-hydroxygermatran citrate, **eniogerm**

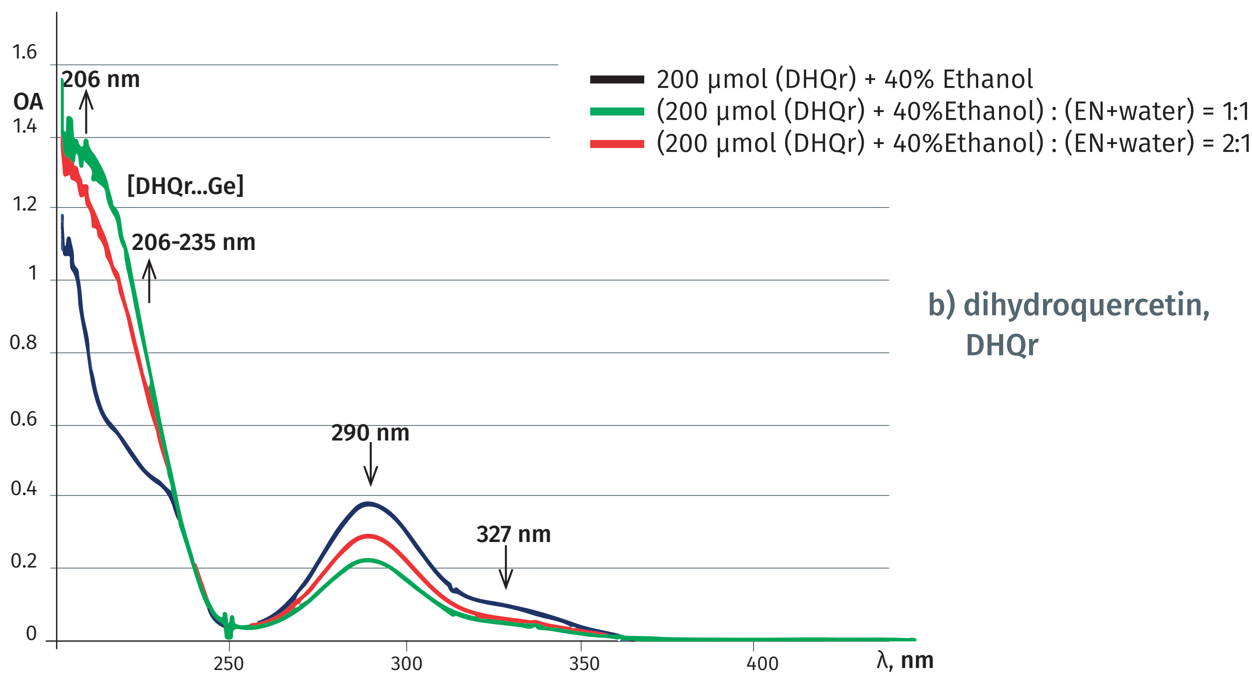
Fig. 9 shows changes in the optical absorption spectra in 40% ethanol solutions of 200 μM Qr – (a) and 200 μM DHQr, while (b) shows the solutions, depending on the ratio of the added aqueous solutions to eniogerm. As can be seen, during the formation of flavonoid metal oxo complexes, the intensity of the characteristic Qr absorption bands (λ~254 nm) and (λ~372 nm) decreases, but a new band appears at (λ~450 nm). In the absorption spectra of DHQr, the intensity of the base band (290 nm) decreases. It should be noted that the intensity of the gamma bands in the UV spectral band of flavonoids in the composition of Ge oxo complexes, especially in DHQr, increases significantly.

200 μM Qr – **(a)** and 200 μM DHQr – **(b)** 5 h after mixing the solutions, which makes it possible to answer the question about the effect of the flavonoid *structure* as catalysts on the formation of Ge Chem NPs. Firstly, the intensity and structure of the bands in the UV (190–240 nm) of Ge Chem NPs in OMR AOT/isooctane ([En]=0.136 mM) with Qr and DHQr differ. Secondly, the intensity of the Qr and [Qr…O_2] absorption band at λ~390nm decreased due to the formation and retention of the [Qr…Ge…O_2] ternary complex (λ~450nm), and a less intense absorption of Ge NPs in the UV region compared with the DHQr sample was found.

FIG. 9 Optical absorption spectra of flavonoid solutions (A): 200 μM Qr (a) and 200 μM (DHQr) in 40% ethanol, depending on the concentration of the introduced aqueous solution of 200 μM eniogerm (B) at the following ratio (A:B): 1: 0 – 1); 1 : 1- 2); 2 : 1-3).



a) quercetin, Qr



b) dihydroquercetin, DHQr

It can be noted that when Ge ions come in contact with molecules of different similarly structured flavonoids, a difference was found in the transformation of complexes with charge transfer. However, the formation of Ge NPs was registered both by UV-VIS spectrophotometry and by the results of AFM (atomic force microscopy).

Fig. 10 shows the optical absorption spectra of Ge NPs in RMS in the presence of (**a**) 200 μM Qr and 200 μM DHQr **(b**).

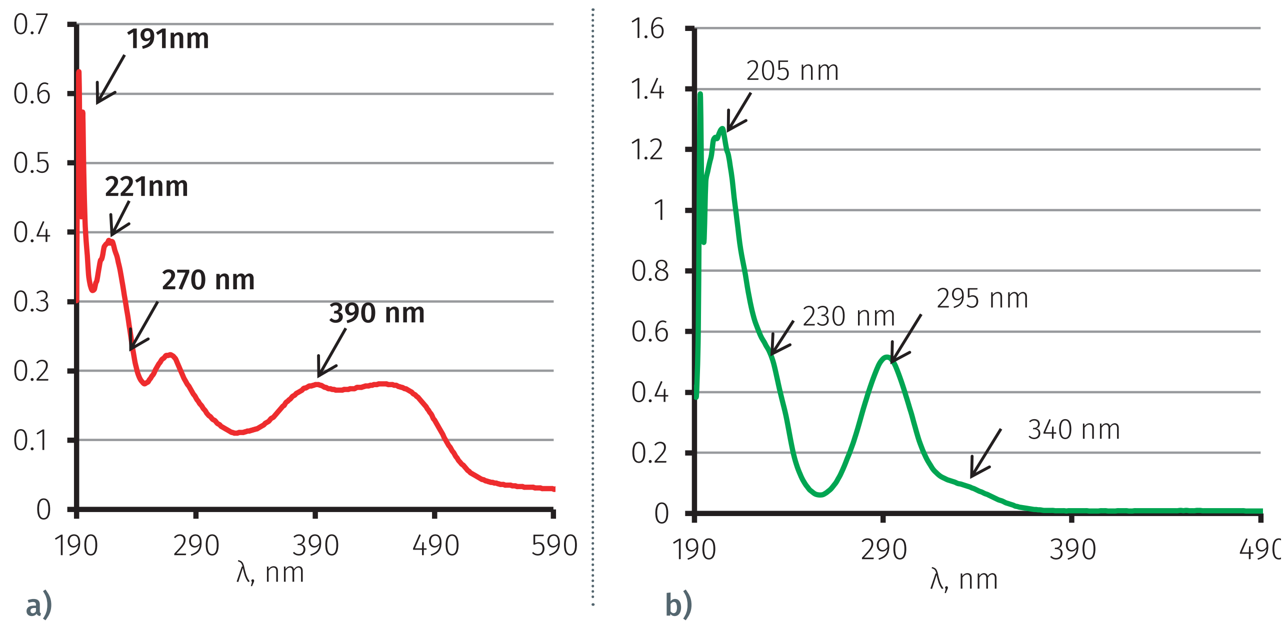


FIG. 10. OA spectra of Ge Chem NPs in RMS AOT/isooctane ([En]=0.136 mM) in the presence of 200 μM Qr – (a) and 200 μM DHQr – (b) 5 h after mixing the reagents.

Fig. 10a) shows the OA spectra of solutions of 200 μM Qr in 0.15 M AOT/isooctane after introducing an aqueous solution of eniogerm under aerobic conditions. Note the OA decrease in the oxo complex [Qr...O_2] (λ_{max}~382nm); there are also changes in the band (λ_{max}~450nm) of the [Qr...Ge..O_2] metal oxo complex with a simultaneous increase in the band intensity in the UV spectrum (λ_{max}~200nm). The results of AFM measurements showed the presence of stable Ge NPs of very small sizes (d ~ 2–6 nm) in the RMS. Theoretical calculations by J. Alan Creighton [25] confirmed that many metals in the "colloidal" state have weakly resolved bands in the ultraviolet spectral band (λ~200 nm). This can be related to the lack of precise data on identification in the UV spectral band absorption of Ge NPs.

Fig. 11 shows AFM images and histograms of the GeChem/Qr NPs topographic size distribution. GeChem NP sizes are (3÷5) and (8÷10) nm. Large particles have an almost regular spherical shape.

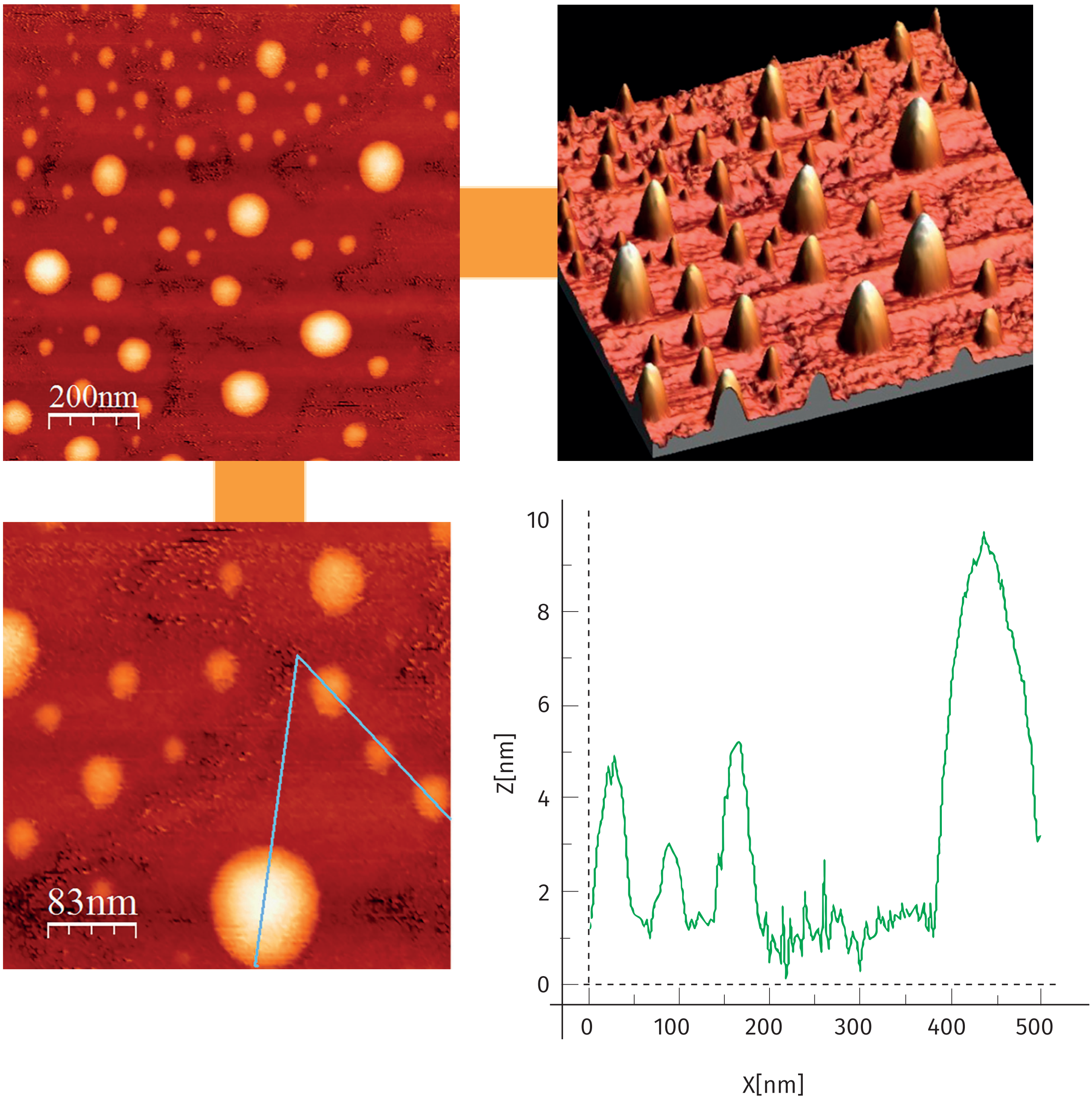


Fig. 11 AFM images and histograms of the GeChem/Qr NPs topographic size distribution (ω_{RMS} = 5.0). GeChem NP sizes are (3÷5) and (8÷10) nm.

Fig. 12 shows AFM images and histograms of Ge NPs (ω_{RMS}=5.0) Chem /(DHQr) topographic size distribution.

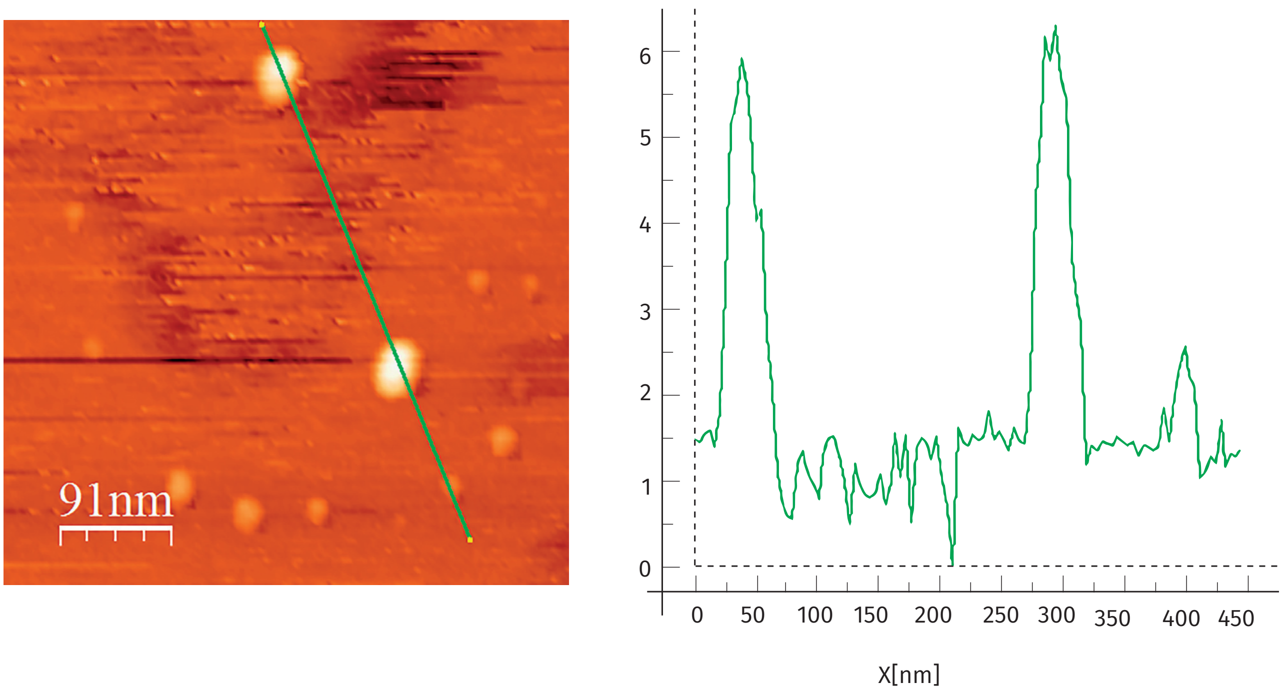


Fig. 12 AFM images and histograms of the Ge NPs (ω_{RMS} = 5.0) Chem /(DHQr) topographic size distribution. Chem/DHQr. NP sizes are 2÷2.5 nm and ~6 nm.

It can be seen that a slight difference in the structure of the Qr and DHQr flavonoid molecules affects the nature of the rearrangement of the corresponding metal complexes in RMSs and the GE NPs spectral characteristics, which have absorption bands only in the UV spectral band. The superposition of the Qr initial spectra and its complexes makes it challenging to trace the kinetics of different stages. However, comparing the results of the spectra of GeChem NPs and GeRadChem NPs and the data from AFM measurements, we can confirm the formation of GeChem nanoparticles. This synthesis is of great importance, as it relates to the production of nanoscale metal structures by chemically activating the process with the participation of biologically active compounds that our plants are rich in, while the soil helps them to deliver metal compounds.

And, what is vitally important, all of this happens in *aerobic conditions*. Just as the processes of *self-organisation* of Ge nanostructured particles in MRSs presented in [25-28] are very important, so are the environmental technologies in the complex processes of living nature.

1.5 WATER

The technical and technological progress of the 20th century has caused a number of environmental problems, primarily in relation to drinking water, contaminating it with unusual and harmful components. Practically all substances dissolved in water, unless they are drugs or mixtures for technical or agricultural use, are pollutants. Water is a unique substance with incomparable physical, chemical and biological properties. The peculiarity of drinking water is that, before being used, it goes through a number of natural processes, undergoing not only purification, but also becoming enriched with organic matter and metal ions. The full value of water and the difference in the chemical composition of drinking water in different geographical and soil-climatic conditions is ensured by this multi-stage natural treatment. Water is a mobile and easily infected system with a pronounced set of abnormal properties, depending on the type of environmental influence on it. In nature, there is no chemically pure water; it is produced for medical and scientific research needs by means of special treatment.

The word “exceptionally” can be endlessly applied to water. It is an exceptional solvent; the vast majority of substances in any aggregate state – liquid, solid or gaseous – dissolve in it. As for harmful and radioactive substances, their quantity is constantly increasing on the planet, which, unfortunately, is also shown in the quality of our water.

Living organisms cannot exist without water. Water is a structural component of all cells and tissues. Sixty percent of human body weight consists of water. Water is present in the cytoplasm of cells and tissue fluid. Tissue fluid serves as an intermediary between the cellular elements of the body and the blood, providing the cells with all the nutrients it needs and receiving their metabolic products.

Water is a mandatory component of many metabolic reactions: hydrolysis, oxidation, synthesis, chemical regrouping, hydration, etc. It is involved in the implementation of anabolic and catabolic processes, in particular the splitting of macromolecules and some other food components, regular body synthesis and high-molecular-weight and secondary metabolites using inorganic components. Water is directly involved in many chemical reactions and transformations associated with the functional activity of all components of the cell. Water solubility determines the normal course of cellular metabolism that is so important for all physiological processes. Water transports metabolic products formed in the cells and released from the body. Water is directly involved in the regulation of the body’s thermal balance via the preservation, distribution and release of heat.

Water is an absolutely necessary and indispensable component of technological processes in almost all sectors of modern industry.

In the 21st century, one of the most important tasks facing humanity is the replenishment of drinking water reserves and their rational use. Despite this, more than one third of the world’s population is already experiencing a lack, or acute lack, of water. There are reasons for this: first of all, water shortage is caused by unpredicted population growth which leads to a systematic increase in water consumption. Over the past century, the number of countries experiencing a water shortage has risen to over 80, and the data analysis regarding the daily use of the existing volume of drinking water confirms this trend.

Right now, the use of water in certain regions of the world has reached the brink of disaster. A large number of reservoirs and large and small rivers on all continents contain water that is not sufficiently clean and sometimes simply unsuitable for drinking.

There is still a fairly large supply of water on the planet, exceeding 1,400 million km^3. However, the specific volume of fresh water is approximately 35 million km^3, that is, 2.5% of the total supply. In the current global situation, desalination of sea water is of particular importance. Based on an annual 100-million-person increase, by 2035 the world's population will be about 9 billion, and this is not the limit. If the current annual consumption of water per capita in the world as a whole is 490 m^3, a significant replenishment of fresh water will become necessary due to the anticipated population growth.

Nowadays, about 70% of non-communicable diseases are caused by water that does not meet the required purity standards. Long-term observations have shown that low-quality water is the main cause of almost 80% of diseases.

Four million children and 18 million adults die from gastroenteritis every year. The diseases contracted by 2 billion people – that is, more than 25% of the world's population – are essentially caused by poor-quality water.

Data on the spread of water-borne diseases are as follows:

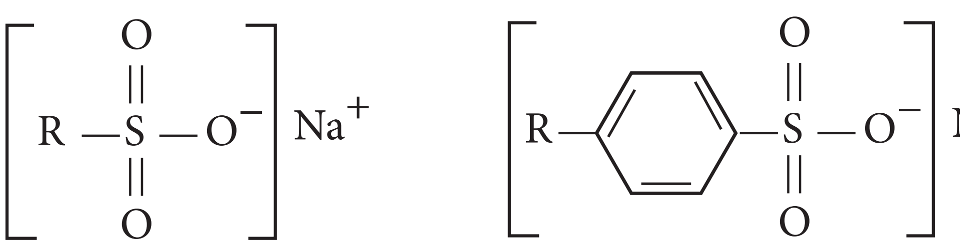
malaria – 800 million patients,
trachoma – 500 million,
schistosomiasis – 200 million and
gastroenteritis – 400 million.

When determining the quality of drinking water, attention should be paid to the required presence of a certain percentage of organic matter and chemical elements, which is not always the case. Particular attention should be paid to the content of calcium and magnesium salts in drinking water, which determine its hardness, although their maximum allowable doses are legally specified. Full-fledged water should have a calcium content of 25-130 mg/l and a magnesium content of 5-65 mg/l. Prolonged consumption of highly mineralized waters leads to urolithiasis, pathologies caused by an imbalance of various types of salts, cardiovascular diseases, hypertension, premature birth, frequent miscarriages, etc. Drinking water with a low level of mineralization leads to diseases caused by a deficiency of potassium and magnesium, which primarily has a negative effect on the cardiovascular system. In addition, the quality of water in any region of the world must meet specific requirements that have a positive effect on human health and comply with organoleptic, chemical and microbiological standards. The chemical composition of water is diverse. Water may contain a small concentration of iron, iodine, zinc, etc. In addition, water may contain undesirable compounds that are of anthropogenic origin.

Process water used in industry must also meet specific requirements regarding possible impurities. Wastewater from domestic and industrial sewage that contains detergents and disinfectants and other uncharacteristic components is the main cause of anthropogenic pollution of water bodies and groundwater. Water used for agricultural purposes often contains traces of pesticides, fertilizers and insecticides.

Detergents include a large group of organic compounds with high surface-active properties and are substances that pollute water bodies. Surfactants – or tenside surfactant detergents – are substances that belong to different chemical classes, which are characterized by the presence of hydrophilic and hydrophobic sites.

Detergents are divided into three main groups: anionic, cationic and neutral surfactants. For example, anionic surfactants include alkyl sulfonic acids, which have a hydrophilic group in the form of a sulphuric acid residue (Fig. 13).



Alkyl sulfonic acid

Alkylene sulfonic acid

FIG. 13 Alkyl sulfonic acids

Cationic surfactants include alkylammonium compounds that have a quaternary ammonium group as a hydrophilic site (Fig. 14).

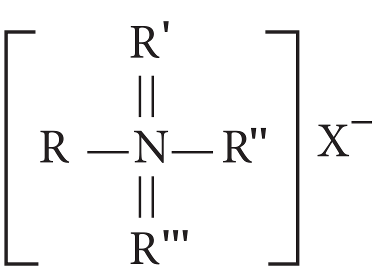


FIG. 14 Alkylammonium surfactants. R, R' and R'' are alkyl radicals, R''' is a phenyl group, X is an anion of a halogen or an acid residue.

The increased demand for surfactants in industrial enterprises, as well as their intensive use in everyday life, primarily in laundry, has led to accumulations of foam in groundwater, riverbeds and reservoirs. Foam impedes navigation, and the high toxicity of surfactants leads to mass fish mortality. The negative experience with the use of chemically-obtained surfactants has forced the use of surfactants that are destroyed by biological biodegradable factors. Relatively easily degradable surfactants include straight-chain surfactants, such as non-ionic detergents and alkylbenzene sulfonates, which, in addition, have a low level of toxicity for humans and fish. The biotic chain breakage in molecules results from β-oxidation, i.e. the elimination of acetic acid residues.

An insignificant concentration of surfactants in river water – 0.05–0.1 mg/l – is sufficient to activate toxic substances adsorbed in benthic sediments. Water seeping into the soil and wastewater condensation containing tensides also leads to the activation of toxic compounds.

According to European Union data, the current environmental situation has brought more than 100 thousand species of sea inhabitants to the verge of extinction. All industries – energy, manufacturing, medicine, pharmacology, agriculture, food industry, etc. – consume large amounts of water. The quality and purity of water in agriculture is also of great importance. A universal requirement for irrigating crops – fruits, vegetables, cereals – is to use low-salt water and, if possible, water with natural characteristics.

At the same time, about 360 million km^2 of the planet's total area of 510 million km^2 are covered with water. The land area is almost two-and-a-half times less than the water surface and, despite this, approximately 11% of the planet is covered with deserts and eroded lands formed due to the lack of water resources.

Dozens of technologies have now been developed for obtaining clean low-salt water, among which only a few have any practical use and, even then, only on a small scale. In this regard, membrane technologies for pure water production are of interest. Unfortunately, however, their large-scale application cannot yet be introduced due to the technical difficulties of the production process. In addition, mechanical and biological filters have been created to purify water for various needs. Purification technologies based on electrolysis and other processes are used on a non-industrial scale. Their efficiency is quite high, but it does not fully ensure the desalination of sea water.

Despite many attempts, it has not yet been possible to develop a cheap and large-scale technology for desalinating salt water, which would solve the problems of extensive desertification, agriculture, health care and providing the population with food while, at the same time, significantly improving the global environmental situation.

The drying up of the Aral Sea, the area of which was 58 000 km^2 30 years ago, is evidence of dehydration and the disruption of the ecological equilibrium. Today, the total area of all the individual residual lakes of this sea is approximately 7 000 km^2, or 8% of the entire Aral Sea area. The bottom of the dried sea is a mixture of dry salts, pesticides and other chemicals. In conditions of high temperatures of up to 50ºC, this mixture is transported by dry hurricanes over long distances of 400-500 km, which poses a serious environmental threat to the countries of Central Asia. The Aral Sea is not the only example of complete desertification and the transformation of large land resources into useless territory due to the lack of water.

Based on the acute water shortage, it should be emphasized that one of the most important global problems is the lack of industrial large-scale seawater desalination technology. Several technologies have already been developed and put into practice for obtaining fresh water: distillation, electrodialysis, ion exchange, freezing and reverse osmosis. Summarizing the above, we can confidently conclude that the shortage of fresh water is already a global challenge, and this problem will worsen in the near future.

There are new approaches to water purification that have not yet received wide recognition, among which electroplasma technologies should be noted, which have significant advantages over the existing traditional methods. These are physical methods using electric and magnetic fields. As a result of both individual factors and synergistic effects on water flows, disinfected low-salt water is obtained at the output of the technological complex. The main advantages of the electroplasma method over others are: versatility, a high degree of purification from microflora and organic pollutants in comparison with other methods and a high degree of water flow desalination.

It should be noted that all existing water desalination technologies have a specific scope. However, these technologies do not solve the main problem of obtaining the volume of low-salt *drinking* water required on the global scale. Considering the growing need for drinking water under the conditions of today's unpredictable population increase, it is obvious that the potential of existing water treatment technologies is still insufficient. It is also necessary to keep in mind the *structure* of the resulting water.

Drinking water is controlled according to a number of factors. However, even after water purification, in some cases the range of possible impurities remains quite diverse. The history of the use of drinking water is replete with cases of mass infection of people with fatal outcomes. Therefore, the technologies used are very important in the water treatment system. Their purpose is to remove chemical and biological factors contaminating water: water disinfection by chemical technologies and the removal of pathogenic bacteria, spores of filamentous fungi and viruses from water, etc. For these purposes, chlorine and ozone are most often used, which, in addition to their main purpose – water disinfection – enter into physical and chemical interactions with the residues of humic acids, petroleum products, detergents, pesticides and any other chemical compounds dissolved in water, forming uncharacteristic substances such as chlorine-phosphorus-nitrogen organics and even a number of dioxin-like compounds. These substances, contained in drinking water in homeopathic concentrations, are mutagenic and carcinogenic. There are more than 2,000 such compounds. At the moment, there is no reliable method for removing all chemical and biological water pollutants from drinking water. The World Health Organization (WHO) has begun to pay greater attention to the problem of mutagenicity and carcinogenicity of drinking water due to the increase in oncological and hereditary diseases. Recent studies have shown that even a slight manifestation of mutagenicity in drinking water (and even more so strong mutagenicity) is the main cause of such severe and fatal diseases as cancer, atherosclerosis, sclerosis of cerebral vessels and others, as well as irreversible damage to the gene pool. There is an assumption that it is not enough just to clean water of impurities, because water has a homeopathic memory effect; that is, it has the ability to retain a trace of influences on its molecular structure. This assumption further challenges the issues associated with obtaining high-quality water.

This is why many scientists and companies involved in water science are now struggling with the problem of developing an industrial, economically acceptable technology for treating sea water aimed at turning it into drinking water that is as close as possible to natural high-quality water. This issue required an in-depth study of numerous scientific sources and an analysis of contemporary water physical, chemical and biological concepts. The contemporary theory of drinking water had to be reconsidered and numerous designs and pilot developments analysed. Unfortunately, despite a certain amount of success, it has not been possible to develop technologies that will ensure the large-scale production of drinking water in sufficient amounts to meet the needs of the world's growing population.

We will sum up this chapter by emphasizing the following: pollution of certain regions of the planet with heavy metals and organic toxicants is occurring unevenly. There are environmentally-friendly countries, such as Canada, Sweden, Finland, Switzerland, Scotland, Norway, Iceland, etc., while the environmental state of other countries can be assessed as slightly, moderately or heavily polluted.

Even in Arctic conditions, the presence of toxic compounds of an anthropogenic nature has been established in the soil, fish, birds, seals and other animals, which once again indicates the general spread of global toxicity.

We should understand that the planet's ecology has already been compromised, since it is aggravated by unnatural negative factors. Global warming is just one indication of this, which has already caused a rise in the ocean levels, a number of infectious diseases, etc. Complication of the environmental situation is indicated by frequent mudflows, abnormally high temperatures in different regions and droughts. The current situation requires special attention at all stages of human activity, and this, in turn, necessitates a search for new approaches to solving vital problems. It stands to reason that high-quality new large-scale technologies must be developed for desalinating sea water, ensuring the rational use of water resources and creating new, environmentally-friendly and efficient technologies for cleaning polluted soil and water.

1.6 RESOURCE POTENTIAL OF THE EARTH

Most of humanity knows very little about the planet's natural environment and its resource supplies. Only a very small number of *Homo Sapiens* is privy to this knowledge. The global human resource is unable to comprehend the world in all its diversity, since no more than 1.5 percent of the total population possesses HIC (the highest expression of consciousness). Most humans evaluate and perceive the planet from a short-sighted perspective and exclusively as consumers. All important, fundamental, and intellectual issues remain beyond their level of consciousness.

Very little is being done today to maintain a homeostatic balance in the natural environment, prevent the inevitable depletion of its resources and ensure global environmental security as a whole. It is particularly alarming that these problems are still not the focus of widespread social concern. Of course, not everyone is destined to understand the complex self-developing system of the natural world in all its diversity. However, the indifference with which consumers regard environmental degradation and the destruction of the biological foundations of life—the womb of their existence—is truly amazing! The dehumanising potential of AI can only be countered by ensuring scientific monitoring of the global environmental balance and maintaining an acceptable level of its self-reproduction. This also requires carrying out painstaking educational work with the mass consciousness aimed at eradicating the consumer inducements of post-industrial society and forming a responsible attitude towards one's own consumer behaviour. There is an urgent need today for consumer self-restraint controlled by reason and conscience. This book, which is addressed to all sentient human beings, is devoted to fulfilling this need.

The data presented here provide food for thought about humanity's existential choice: over-consumption or saving the natural foundations of our existence? At the current consumption level typical of the "golden billion" countries, our grandchildren will be compelled to fight for a glass of drinking water. Like astronauts, they will drink filtered bio waste, fight for food and clothing, struggle for warmth or coolness and compete for a breath of clean air... If we do not do everything we can to curb our consumer appetites, in a few decades this kind of "war of all against all" (Thomas Hobbes) will become our daily routine.

There is an urgent need today for everyone to study the map of the Earth's natural resources and decide where the planet's inhabitants should focus their efforts.

Alas, religion, which has long consoled people in all their trials and tribulations, is unable to provide humanity with the necessary environmental harmony. As an authoritative religion, Protestantism sanctifies an enthusiastically pragmatic attitude towards the changes in the natural environment for the sake of industrial growth.

For many centuries, Christianity, Islam, Buddhism, and other lesser world religions have held sway over the minds and conscience of some intellectuals and ordinary people (although, admittedly, to a much lesser extent now). Their doctrines are based on fiction, legends and fakes deprived of scientific substantiation. In the first half of the 19th century, famous philosopher Ludwig Feuerbach wrote in his book *The Essence of Christianity*: “Religion is a fashionable superstition, while superstition is an unfashionable religion”.

Study of religious doctrines always convinces you that in the social environment, people have no free will.

The purpose of the myths about the afterlife, eternal life, paradise and the fiery cauldrons of hell is to keep believers in a state of psychological dependence and fear and, through the rite of contrition and repentance, either absolve them of their sins or condemn them.

Humans are individuals; humans are products of the *Microbiome*, part of the *Worldbiome/Planetarybiome* or *Cosmicus Quanticus Cerebrum* (the Universal Quantum Mind). Death means the end of an individual’s life, but not of his or her internal microorganisms, which transform into other biological products.

People bury the deceased in graves, i.e. in the earth. But what is earth? It is an aspect of the *Microbiome* that surrounds the deceased during the transition from one biological product to another and the continuation of eternal life at other structural levels of life and in various different capacities: as grass, a tree, animal, or another person... That is why the stories about the afterlife are a religious myth, a myth that demeans the mind.

Cosmicus Quanticus Cerebrum is able to upgrade us, and we must engage with it to successfully undergo this evolutionary process. The original intention of *Cosmicus Quanticus Cerebrum* was for *Homo Sapiens* to have low HIC but with innate potential. The creator provided this mechanism so that when communicating with it, humans could receive tips on how to upgrade their species. That is why humanity’s primary task is to establish a communication channel with this mechanism to facilitate its transformation from *Homo Consúmens* to *Homo Cosmicus*. However, contemporary science does not finance projects that appear “mystical”. It generously rewards research that produces effective economic results. The result is obvious: *Homo Sapiens* is on the verge of extinction.

The fate of both the planet and humanity can change for the better. This can be done by initiating scientific research aimed at optimising the population to save and make rational use of the resources of our planet. Visual images and specific details will help to give the reader a clear understanding of what rational use of the Earth’s natural resources means.

In developed countries, a family of three usually lives in a three-room apartment 75 m^2 in area. Their home consists of an entranceway, kitchen, living room, two bedrooms, corridor, bathroom, two toilets and a balcony.

A standard set of household appliances consumes at least 250-300 kW per person per month. This amounts to between 600 kW and 1000 kW for the entire family, depending on **the material wealth and consumption habits of its members.** Water consumption for household needs per person—drinking, cooking, personal hygiene, cleaning, pet care, watering plants, laundry, and negligent use—amounts to 9.9 m^3 per month, while for a family of three people and one pet it reaches 12-15 m^3 per month.

Let us also assume the family has a 600 m^2 plot of land. After deducting the area required for recreation purposes, garden paths and utility facilities (80 m^2), about 400-500 kg of vegetables, fruits, berries and gourds can be grown per person annually on the remaining 520 m^2.

What would happen if another 50 people suddenly showed up at this apartment and land plot, including 10 children and pets: 5 dogs, 7 cats, 2 parrots, 2 fish tanks and a terrarium of snakes. The available space cannot accommodate such a large number of people: there will be a queue to use the bathroom, kitchen and electric sockets… Let's also consider the additional use of electricity and water, the increase in garbage and household waste, the deterioration in sanitary conditions, food shortages, conflicts of interest among the residents and their neighbours, and the burden and financial cost of providing access to the Internet and TV. Furthermore, there will not be adequate sleeping and eating conditions, or educational opportunities and medical treatment for everything, which will lead to personal degradation.

How long will people be able to exist peacefully and safely in such conditions? And this is precisely the situation that we face globally today on our planet. Humanity needs to search for urgent new solutions to everyday life.

Every concerned human must clearly understand that the time in which *Homo Consúmens*, the direct heir of *Homo Sapiens,* has left to live in the style to which it is accustomed is running out. Furthermore, we must understand that this across-the-board overconsumption has led to the depletion of the Earth's natural resources, as shown in the data in Tables 2 and 3 below.

THE AVAILABILITY OF BASIC MINERAL RESERVES AND FOREST RESOURCES, TAKING INTO ACCOUNT THE INCREASE IN THE GLOBAL POPULATION AND GROSS DOMESTIC PRODUCT (GDP)

TABLE 2

RESOURCE NAME	World resources		Current consumption* (2021)	Natural resource availability, period, in years	
	Measurement unit	Amount*		at current consumption levels	at forecast consumption levels (Table 3)
1	2	3	4	5	6
Petroleum	bln tons	225	4.80	47	30 - 33
Coal	bln tons	1030	7.43	138	48 - 50
Natural gas	trln m^3	188.1	4.20	45	33 - 36
Iron	mln tons	84	2.10	40	21 - 23
Manganese	thousand tons	1300	19.4	67	33 - 35
Gold	thousand tons	53	3.20	17	12 - 14
Silver	thousand tons	530	26.02	20	12 - 14
Copper	mln tons	2100	24.99	84	45 - 47
Nickel	mln tons	94	2.57	36.5	18 - 20
Lead	mln tons	95	4.70	20	15 - 17
Zinc	mln tons	250	12.8	19.5	15 - 17
Wood	bln m^3	365	5.60	65	36 - 38
Tungsten	mln tons	3.4	0.0915	37	21 - 23
Molybdenum	mln tons	18	0.3	60	36 - 38
Antimony	mln tons	1,5	0.153	10	6 - 8
Bismuth	thousand tons	680	19	36	21 - 23
Tin	mln tons	15.4	0.31	50	33 - 35
Cobalt	mln tons	7	0.140	50	18 - 20
Uranium	thousand tons	8 070.4	74.019	109	48 - 50

* USGS Minerals and Consumption Data

https://pubs.usgs.gov/periodicals/mcs2021/mcs2021.pdf

FORECAST OF THE CONSUMPTION OF MINERAL AND FOREST RESOURCES, TAKING INTO ACCOUNT THE INCREASE IN THE GLOBAL POPULATION AND GROSS DOMESTIC PRODUCT (GDP)

TABLE 3

RESOURCE NAME	INDICATORS	PERIOD					
		2022-2024	2025-2027	2028-2030	2031-2033	2034-2036	2037-2039
Petroleum	Consumption, bln tons	14.99	15.91	16.89	17.92	19.02	20.18
	% increase*		6.14%	6.16%	6.10%	6.12%	6.10%
	Remaining natural reserves, bln tons	210.01	194.1	177.21	159.29	140.27	120.09
Coal	Consumption, bln tons	22.75	23.98	25.81	27.07	28.87	30.16
	% increase		5.41%	7.63%	4.88%	6.65%	4.47%
	Remaining natural reserves, bln tons	1007.25	983.27	957.46	930.39	901.52	871.36
Natural gas	Consumption, trln m^3	12.93	13.54	14.14	14.76	15.41	16.08
	% increase		4.72%	4.43%	4.38%	4.40%	4.35%
	Remaining natural reserves, trln m^3	175.17	161.63	147.49	132.73	117.32	101.24
Iron	Consumption, bln tons	6.96	8.1	9.93	11.61	13.47	15.64
	% increase		16.38%	22.59%	16.91%	16.02%	16.11%
	Remaining natural reserves, bln tons	77.04	68.94	59.01	47.40	33.93	18.29
Manganese	Consumption, mln tons	62.50	69.49	77.26	85.91	95.52	106.21
	% increase		11.18%	11.18%	11.19%	11.18%	11.19%
	Remaining natural reserves, mln tons	1237.5	1168.01	1090.75	1004.84	909.32	803.11
Gold	Consumption, thousand tons	10.20	11.10	12.20	13.30	6.20	
	% increase		8.8%	9.9%	9%		
	Remaining natural reserves, thousand tons	42.8	31.7	19.5	6.2	0	
Silver	Consumption, thousand tons	87.6	104.14	123.68	146.89	67.69	
	% increase		18.88%	18.76%	18.77%		
	Remaining natural reserves, thousand tons	442.4	338.26	214.58	67.69	0	

Copper	Consumption, mln tons	78.78	84.91	91.31	98.04	105.58	113.70
	% increase		7.78%	7.54%	7.37%	7.69%	7.69%
	Remaining natural reserves, mln tons	2021.22	1936.31	1845	1746.96	1641.38	1527.68
Nickel	Consumption, mln tons	9.34	11.25	12.97	14.38	15.80	17.36
	% increase		20.45%	15.28%	10.87%	9.87%	9.87
	Remaining natural reserves, mln tons	84.66	73.41	60.44	46.06	30.26	12.9
Lead	Consumption, mln tons	14.82	15.99	17.22	18.54	19.96	8.47
	% increase		7.89%	7.69%	7.66%	7.65%	
	Remaining natural reserves, mln tons	80.18	64.19	46.97	28.43	8.47	0
Zinc	Размер потребления, Consumption, mln tons	39.96	42.50	44.99	47.76	50.68	24.11
	% increase		6.35%	5.85%	6.15%	6.11%	
	Remaining natural reserves, mln tons	210.04	167.54	122.55	74.79	24.11	0
Wood	Consumption, bln m^3	18.01	19.31	20.70	22.19	23.79	25.51
	% increase		7.21%	7.19%	7.19%	7.21%	7.22%
	Remaining natural reserves, bln m^3	346.99	327.68	306.98	284.79	261	235.49
Tungsten	Consumption, mln tons	0.30	0.35	0.40	0.46	0.53	0.61
	% increase		16.67%	14.29%	15.00%	15.22%	15.09%
	Remaining natural reserves, mln tons	3.10	2.75	2.35	1.89	1.36	0.75
Molybdenum	Consumption, mln tons	0.94	1.00	1.07	1.14	1 22	1.30
	% increase		6.38%	7.00%	6.54%	7.02%	6.56%
	Remaining natural reserves, mln tons	17.06	16.06	14.99	13.85	12.63	11.33
Antimony	Consumption, mln tons	0.49	0.51	0.49			
	% increase		4.08%				
	Remaining natural reserves, mln tons	1.01	0.493	0			

*** THE PERCENTAGE GROWTH IS CALCULATED BASED ON THE PREVIOUS PERIOD**

RESOURCE NAME	INDICATORS	PERIOD					
		2022-2024	2025-2027	2028-2030	2031-2033	2034-2036	2037-2039
Bismuth	Consumption, thousand tons	61.20	68.05	75.67	84.14	93.56	104.03
	% increase		11.19%	11.20%	11.19%	11.20%	11.19%
	Remaining natural reserves, thousand tons	618.8	550.75	475.08	390.94	297.38	193.35
Tin	Consumption, mln tons	0.97	1.03	1.09	1.16	1.23	1.30
	% increase		6.19%	5.83%	6.42%	6.03%	5.69%
	Remaining natural reserves, mln tons	14.43	13.40	12.31	11.15	9.92	8.62
Cobalt	Consumption, mln tons	0.49	0.61	0.76	0.94	1.17	1.46
	% increase		24.49%	24.59%	23.68%	24.47%	24.79%
	Remaining natural reserves, mln tons	6.51	5.9	5.14	4.2	3.03	1.57
Uranium	Consumption, thousand tons	234.22	253.64	274.66	297.42	322.07	348.77
	% increase		8.29%	8.29%	8.29%	8.29%	8.29%
	Remaining natural reserves, mln tons	7836.18	7582.54	7307.88	7010.46	6688.39	6339.62
		PERIOD					
		2040-2042	2043-2045	2046-2048	2049-2051	2052-2054	2055-2057
Petroleum	Consumption, bln tons	21.42	22.73	24.12	25.60	26.22	
	% increase	6.14%	6.12%	6.11%	6.15%		
	Remaining natural reserves, bln tons	98.67	75.94	51.82	26.22	0	
Coal	Consumption, bln tons	31.93	33.26	34.99	36.35	38.05	80.63
	% increase	5.87%	4.17%	5.20%	3.89%	4.68%	111.91%
	Remaining natural reserves, bln tons	839.43	806.17	771.18	734.83	696.78	616.12
Natural gas	Consumption, trln m^3	16.80	17.53	18.31	19.11	19.96	9.53
	% increase	4.48%	4.35%	4.45%	4.37%	4.45%	
	Remaining natural reserves, trln m^3	84.44	66.91	48.6	29.49	9.53	0

RESOURCE NAME	INDICATORS	PERIOD					
		2040-2042	2043-2045	2046-2048	2049-2051	2052-2054	2055-2057
Iron	Consumption, bln tons	18.16	0.13				
	% increase	16.11%					
	Remaining natural reserves, bln tons	0.13	0				
Manganese	Consumption, mln tons	118.09	131.31	145.99	162.34	180.51	64.87
	% increase	11.18%	11.19%	11.17%	11.19%	11.19%	
	Remaining natural reserves, mln tons	685.02	553.71	407.72	245.38	64.87	0
Gold	Consumption, thousand tons						
	% increase						
	Remaining natural reserves, thousand tons						
Silver	Consumption, thousand tons						
	% increase						
	Remaining natural reserves, thousand tons						
Copper	Consumption, mln tons	122.44	131.86	141.99	152.91	164.67	177.32
	% increase	7.68%	7.69%	7.68%	7.69%	7.69%	7.68%
	Remaining natural reserves, mln tons	1405.24	1273.38	1131.39	978.48	813.81	636.49
Nickel	Consumption, mln tons	12.9					
	% increase						
	Remaining natural reserves, mln tons	0					
Lead	Consumption, mln tons						
	% increase						
	Remaining natural reserves, mln tons						
Zinc	Consumption, mln tons						
	% increase						
	Remaining natural reserves, mln tons						

RESOURCE NAME	INDICATORS	PERIOD					
		2040-2042	2043-2045	2046-2048	2049-2051	2052-2054	2055-2057
Wood	Consumption, bln m^3	27.35	29.32	31.43	33.64	36.03	38.62
	% increase	7.21%	7.20%	7.19%	7.03%	7.10%	7.18%
		208.14	178.82	147.39	113.75	77.72	39.10
Tungsten	Consumption, mln tons	0.70	0.05				
	% increase	14.75%					
	Remaining natural reserves, mln tons	0.05	0				
Molybdenum	Consumption, mln tons	1.39	1.48	1.59	1.69	1.81	1.93
	% increase	6.92%	6.47%	7.43%	6.29%	7.10%	6.63%
	Remaining natural reserves, mln tons	9.94	8.46	6.87	5.18	3.37	1.44
Antimony	Consumption, mln tons						
	% increase						
	Remaining natural reserves, mln tons						
Bismuth	Consumption, thousand tons	115.67	77.67				
	% increase	11.19%					
	Remaining natural reserves, thousand tons	77.68	0				
Tin	Consumption, mln tons	1.38	1.47	1.56	1.65	1.75	0.81
	% increase	6.15%	6.52%	6.12%	5.77%	6.06%	
	Remaining natural reserves, mln tons	7.24	5.77	4.21	2.56	0.81	0
Cobalt	Consumption, mln tons	1.57					
	% increase						
	Remaining natural reserves, mln tons	0					
Uranium	Consumption, thousand tons	377.68	408.99	442.89	479.60	519.35	562.40
	% increase	8.29%	8.29%	8.29%	8.29%	8.29%	8.29%
	Remaining natural reserves, mln tons	5961.94	5552.95	5110.06	4630.46	4111.11	3548.71

RESOURCE NAME	INDICATORS	PERIOD					
		2058-2060	2061-2063	2064-2066	2067-2069	2070-2072	2073-2075
Petroleum	Consumption, bln tons						
	% increase						
	Remaining natural reserves, bln tons						
Coal	Consumption, bln tons	113.78	119.14	124.95	130.79	127.46	
	% increase	41.11%	4.71%	4.87%	4.67%		
	Remaining natural reserves, bln tons	502.34	382.20	258.25	127.46	0	
Natural gas	Consumption, bln tons						
	% increase						
	Remaining natural reserves, bln tons						
Iron	Consumption, bln tons						
	% increase						
	Remaining natural reserves, bln tons						
Manganese	Consumption, mln tons						
	% increase						
	Remaining natural reserves, mln tons						
Gold	Consumption, thousand tons						
	% increase						
	Remaining natural reserves, thousand tons						
Silver	Consumption, thousand tons						
	% increase						
	Remaining natural reserves, thousand tons						
Copper	Consumption, mln tons	190.95	205.63	221.44	18.47		
	% increase	7.68%	7.68%	7.68%			
	Remaining natural reserves, mln tons	445.54	239.91	18.47	0		

RESOURCE NAME	INDICATORS	PERIOD					
		2058-2060	2061-2063	2064-2066	2067-2069	2070-2072	2073-2075
Nickel	Consumption, mln tons						
	% increase						
	Remaining natural reserves, mln tons						
Lead	Consumption, mln tons						
	% increase						
	Remaining natural reserves, mln tons						
Zinc	Consumption, mln tons						
	% increase						
	Remaining natural reserves, mln tons						
Wood	Consumption, bln m^3	39.10					
	% increase						
	Remaining natural reserves, bln m^3	0					
Tungsten	Consumption, mln tons						
	% increase						
	Remaining natural reserves, mln tons						
Molybdenum	Consumption, mln tons	1.44					
	% increase						
	Remaining natural reserves, mln tons	0					
Antimony	Consumption, mln tons						
	% increase						
	Remaining natural reserves, mln tons						

*** THE PERCENTAGE GROWTH IS CALCULATED BASED ON THE PREVIOUS PERIOD**

RESOURCE NAME	INDICATORS	PERIOD					
		2058-2060	2061-2063	2064-2066	2067-2069	2070-2072	2073-2075
Bismuth	Consumption, thousand tons						
	% increase						
	Remaining natural reserves, thousand tons						
Tin	Consumption, mln tons						
	% increase						
	Remaining natural reserves, mln tons						
Cobalt	Consumption, mln tons						
	% increase						
	Remaining natural reserves, mln tons						
Uranium	Consumption, thousand tons	609.02	659.50	714.16	773.35	792.68	
	% increase	8.29%	8.29%	8.29%	8.29%		
	Remaining natural reserves, mln tons	2939.69	2280.19	1566.03	792.68	0	

Source data for % growth forecast:

- Organization of the Petroleum Exporting Countries (OPEC) (https://www.opec.org/opec_web/en/998.htm#:~:text=By%202025%2C%20the%20share%20of,at%20about%2028%20per%20cent);
- International Energy Agency (https://www.iea.org/data-and-statistics/charts/changes-in-global-coal-consumption-by-region-2018-2025);
- Analytical and consulting organizations: Coherent Market Insights (https://www.coherentmarketinsights.com/), Market Insight Reports (https://www.marketinsightsreports.com/).

WHAT PROSPECTS DOES HOMO SAPIENS HAVE IN THE EVENT OF MINERAL RESOURCE DEPLETION?

Today, the share of hydrocarbons in the structure of world energy demand remains predominant. They provide 87% of all primary energy consumption. And at present, there is no alternative to hydrocarbons.

Thus, all resources can be divided into two groups: hydrocarbons, which provide humanity with fuel and electricity, and other exhaustible resources, which provide raw materials for industrial production (ferrous and non-ferrous metal ores, wood, rare earth metals, inert materials, etc.).

Hydrocarbons are the main source of energy. So if there are no hydrocarbons, there will be no energy for the production and processing of other exhaustible natural resources; and it will no longer be so important which resources are available and which are exhausted. It will be impossible to process wood or extract and process almost all other natural resources, since electricity is needed for all of this.

It is obvious that the absence of development prospects of the consumer economy, leading to the inevitable collapse of society, must be discussed globally and with a critical eye.

HYDROCARBONS:

Petroleum

At present, petroleum provides about 33% of the world's energy needs.

Crude oil refinement products, such as gasoline and diesel fuel, are used in virtually every means of transport around the world.

In fact, all agricultural machinery runs on oil products, as well as aircraft, trains, cars, and sea vessels. Due to the depletion of oil reserves and the reorganisation of world logistics, humanity will encounter a colossal food shortage. Countries that use petroleum to generate electricity will face a commodity crisis.

Crude oil and the derivatives from its processing have a significant impact on all industries.

They form the basis for the production of a wide range of different things: gasoline, diesel, liquefied gas, jet fuel, liquid boiler fuel, kerosene, aviation fuel, fuel oil, naphtha, propylene glycol, plastic containers, casing for household appliances, furniture parts, toys, CDs and DVDs, baby soothers, diapers, artificial fur, stuffing materials for pillows and upholstered furniture, polyurethane, plastic containers, polyethylene, cling film, plastic bottles, fabrics, polyester, nylon, polyamide, cosmetics, shampoos, perfumes, aspirin, antiseptics, antibiotics, anti-tuberculosis drugs, medicines for gastrointestinal diseases, synthetic rubbers, rubber shock absorbers, mats, gaskets, bitumen, polypropylene, solvents, paints and varnishes, lubricating oil, electrical insulating oil, motor oil, hydraulic and electrical insulating oils, coolants, fertilizers, wax, tar, coke, sulphur, petroleum jelly, paraffin, detergents, chewing gums, solar panels, synthetic fertilizers and pesticides. What is more, pesticides, food flavouring, food thickeners, emulsifiers, food colouring, and food itself are also produced from petroleum. And, of course, condoms.

Imagine what will happen to our species in about four decades when oil runs out. Will we be alive?

Coal

At present, coal provides about 30% of the world's energy needs.

Coal is mainly consumed in power generation and metallurgy. Accordingly, the world will most likely face a 30% shortage of electricity, which cannot be replaced, given that gas and oil will run out faster than coal. Without coal, steel production, which means the construction industry, aviation and mechanical engineering, instrument manufacturing and daily routine activities, is impossible. We should also consider that coal mines are backbone enterprises. When the mines close, hundreds of thousands of people will become unemployed.

Full depletion of coal reserves is expected in about 50 years.

Natural gas

At present, natural gas provides about 24% of the world's energy needs.

Natural gas is an energy source for heating, cooking and electricity generation. It is used as a fuel for vehicles (still on a small scale) and as a chemical raw material in the production of plastics and other commercially important organic chemicals.

Consequently, when natural gas disappears, the chemical and transportation industry will suffer significantly, although definitely not to the same extent as when oil disappears, and people will no longer be able to enjoy the comfortable life they are accustomed to, especially in countries with a seasonal climate.

Full depletion of natural gas will occur in less than 40 years.

THE AVAILABILITY OF NATURAL GAS FOR DOMESTIC CONSUMPTION BY CONTINENT

TABLE 4

№	COUNTRY	Resources, trln m^3	Annual consumption, trln m^3	Number of years before resource depletion	Country's population, mln people
NORTH AMERICA					
	Resource-holding countries				
1	Canada	2.067	0.124	17	38.5
2	USA	13.167	0.858	15	338.3
	Total population of the region	15.234	1.093	14	606.2
SOUTH AMERICA					
	Resource-holding countries				
1	Argentina	0.396	0.049	8	45.5
2	Brazil	0.368	0.041	9	215.3
3	Bolivia	0.311	0.003	103	12.2
4	Venezuela	5.663	0.014	395	28.3
5	Peru	0.311	0.008	38	34
	Total population of the region	7.049	0.135	52	439.7
AFRICA					
	Resource-holding countries				
1	Nigeria	5.748	0.022	261	218.5
2	Egypt	1.784	0.060	30	110.9
3	Algeria	4.502	0.047	96	44.9
4	Mozambique	2.832	0.001	2128	32.7
5	Libya	1.501	0.007	227	6.8
	Total population of the region	16.367	0.218	75	1 386.8

AUSTRALIA AND OCEANIA					
	Resource-holding countries				
1	Australia	3.228	0.043	76	26.2
2	Papua New Guinea	0.184	0.0002	1102	10.1
	Total population of the region	3.412	0.047	72	41.57
EUROPE					
	Resource-holding countries				
1	Norway	1.557	0.005	325	5.4
2	Ukraine	1.104	0.026	42	39.7
	Total population of the region	2.661	0.598	4.5	694.74
CENTRAL ASIA					
	Resource-holding countries				
1	Turkmenistan	11.327	0.044	260	6.4
2	Kazakhstan	2.407	0.016	152	19.4
3	Azerbaijan	1.699	0.012	136	10.4
4	Uzbekistan	1.841	0.042	44	34.6
	Total population of the region	17.274	0.118	146	131.63
SOUTH AND SOUTH-EAST ASIA					
	Resource-holding countries				
1	China	6.654	0.363	18	1425.9
2	Brunei	0.261	0.004	63	0.5
3	Indonesia	1.416	0.035	40	275.5
4	India	1.388	0.066	21	1417.2
5	Malaysia	1.189	0.036	33	33.9
6	Vietnam	0.708	0.007	101	98.2
7	Pakistan	0.595	0.042	14	235.8
	Total population of the region	12.211	0.832	14	4 193.39

Therefore, according to Table 4, if the existing natural gas reserves are used only for each country's own needs without any additional imports, the countries of the European Union, including Turkey and Georgia, will be the first to face a shortage of natural gas in the next five years, while the countries of North America, South and South East Asia will face shortages in 14 years. Importing this natural resource from Australia and Africa will make the price of natural gas for domestic and industrial needs equal to the price of a bottle of champagne.

NONRENEWABLE RESOURCES

Iron (iron ore)

The percentage of global scrap iron used as a source of raw materials is reaching 40%. This is due to the depletion of iron ore deposits. In the short term, the decrease in reserves and complete disappearance of iron deposits (their depletion) can actually be completely compensated for by the metallurgical use of scrap iron.

Full depletion of iron ore will occur in a little more than 20 years.

Manganese

Almost 90% of all this metal is consumed in ferrous metallurgy. It is used in the manufacture of a high resistant alloy of manganese, copper and nickel. This alloy is in demand in electrical engineering. Manganese is used in printing and paint production, as well as in the glass and ceramic industry. In agriculture, it is used for mineral fertilizers and in treating seeds.

The depletion of manganese will lead to problems in the steel industry, even though this industry may use scrap iron.

This resource will be exhausted in less than 40 years.

Gold

The depletion of gold will lead to the complete disappearance of the jewellery market. It will affect the chemical industry, electronics and measuring instruments, as well as the aviation and space industries. But in this case, the effect on industry will not be as critical as the direct economic consequences. It should be noted that gold can be 99 % recycled.

The world's gold resources are expected to last no more than 15 years.

Silver

In addition to being used in the jewellery industry, silver is used in food, medicine, the chemical and electrical industries, as well as in the production of batteries and solar panels. Given the imminent exhaustion of hydrocarbons, new sources will be needed to generate electricity, and silver is indispensable. It is worth noting that up to 80% of silver can be safely recycled.

The world's silver resources are expected to last up to 15 years.

Copper

Copper is mainly used in the production of wires, cables, network conductors and power lines. The main property of copper is considered its high electrical conductivity, which determines its predominant use. Copper also has a very high thermal conductivity. Electric wires, in turn, are used in all industries, mechanical engineering, the aviation industry, etc. The depletion of copper calls into question the entire green economy. Copper is also needed in the production of electric vehicles—the alternative to internal combustion engines. If there is no energy for recycling, there will be no electric cars, the batteries of which also need to be charged with electricity.

Copper resources will run out in 50 years.

Nickel

Nickel is mainly used in metallurgy. The absence of nickel will lead to a crisis in the metallurgical industry.

Nickel reserves will be exhausted in no more than 20 years.

Lead

Up to 45% of lead is used to make lead-acid battery plates, which are used in all motor vehicles. Lead shortages will lead to a crisis in the automotive industry.

Lead screens serve to protect against radioactive and X-ray radiation. Thus, medicine and, consequently, all of humanity, will suffer.

Bricks and containers for storage and protection against radioactive substances are made from lead and its alloys. Considering that nuclear energy will remain one of the main sources of electricity, there will be more waste, and without its proper disposal and storage as a result of lead shortages, there is a global risk of radioactive contamination.

Lead resources are expected to last for up to 20 years.

Zinc

Zinc is mainly used in metallurgy. A shortage of this metal, along with manganese and nickel, will lead to crises and risks in the metallurgical industry. Ten percent of zinc is used in the medical industry. Zinc deficiency will affect the abovementioned industries.

Zinc resources are expected to last for up to 20 years.

Wood

The depletion of the lignocellulosic wood supply will lead to serious environmental problems: soil erosion and a decrease in the water level of rivers, thereby leading to a shortage of clean drinking water. The annual fixation of molecular carbon dioxide amounts to at least 160 billion tons of renewable biomass. The reduction of trees, as well as shrubs and annuals, will certainly increase the formation of the greenhouse effect and generally have a negative effect on the immune system of the natural environment as a whole. At last count, there were 3.04 trillion trees on the planet. On average, there are 380 trees per person in the world.

Considering the forecast consumption level,
timber stock is expected to last up to 40 years.

Tungsten

It is mainly used in metallurgy and mechanical engineering. Given the metal's hardness, tungsten alloys are used to make medical appliances, tool alloys, and tools that require high strength (drills). If tungsten supplies run out, all industries using its alloys will be deprived of their main component, which will lead to a significant increase in the cost of products or make them impossible to manufacture.

Tungsten resources are expected to last up to 25 years.

Molybdenum

This metal is mainly used in metallurgy, the aerospace industry and the building of nuclear engineering facilities. Molybdenum is used to manufacture the casing and frame elements of supersonic aircraft and rockets, heat exchangers, the sheaths of rockets and reentry capsules, and heat shields. The depletion of molybdenum resources will lead to problems in the steel industry and production risks in the aerospace industry.

Molybdenum resources are expected to last up to 40 years.

Antimony

This metal is part of almost 200 alloys, so its disappearance with cause problems in the metallurgical industry. The majority of antimony produced is used for the manufacture of solid lead for battery plates and batteries (as with lead, its depletion will lead to production risks in the automotive industry).

Antimony is contained in the alloys produced to manufacture high-quality semiconductors. Considering that nowadays it is difficult to imagine human life without electronic devices, a shortage of antimony will seriously affect the industry of analogue and digital electronics. The chemical industry, especially the production of heat-resistant paints used to paint ships, including their underwater parts, will also suffer.

Antimony resources are expected to last up to 10 years.

Bismuth

Metallurgy is the main consumer of bismuth. It is in great demand in the production of aluminium, which affects the entire aviation industry. Bismuth is used for coolants in nuclear reactors. Given that nuclear energy will remain the only source of electricity in the near future, since solar batteries, wind turbines, and hydroelectric power stations will be unable to provide the necessary volumes of electricity, the depletion of bismuth reserves will have an overall affect on human needs.

Bismuth supplies will last for another 25 years.

Tin

Most of the tin smelted is used in metallurgy. Alloys are used to make foil for packaging and food tinplate—the main source of food storage containers (canned food). Tin is also used in the manufacture of batteries.

Tin supplies will last for another 35 years.

Cobalt

It is mainly used in metallurgy. It is a component of mineral fertilizers and fodder additives for livestock, animals and bees in agriculture, veterinary medicine and pharmaceuticals. Furthermore, it is used in the production of some human medicines.

Cobalt supplies will run out in 20 years.

Uranium

Metallic uranium and its compounds are mainly used as nuclear fuel in nuclear reactors.

There are 439 nuclear power plants operating worldwide and 62 new plants are currently under construction. Over the next two decades, China, India, Russia, Europe, the Middle East and South East Asia will dramatically increase the use of nuclear energy, sparking fierce competition in uranium mining. According to the World Nuclear Association, 139 new plants are under construction and 326 new plants are at the planning stage. By 2030, China will build 50 new reactors (a 500% increase) and India will build 35 reactors (a 150% increase). China and Russia have already begun actively buying up huge stakes in uranium mining operations around the world in order to stockpile uranium to meet their growing domestic demand.

Uranium supplies will last for another 50 years.

Before too long, irresponsible human consumption could return humanity to the Stone Age, when there was no electricity. The available scientific and environmental information and data on exhaustible natural resources should be publicised on all platforms possible. Obviously, there are inexhaustible sources of energy, such as solar and wind energy, river energy, etc. And there are alternative energy sources—wind power plants, solar panels, and hydroelectric power plants, the role of which is constantly increasing. However, the potential of these sources is not enough, since their coefficient of performance (COP) is quite low. Taking into account climate change, the shallowing of rivers and the changes in wind and ocean currents, further prospects for their use are compromised. Moreover, the introduction of alternative sources can take decades, and there is no guarantee they will produce the electricity output required. Thermonuclear fusion is the only method that might make up for the unavoidable shortage of uranium due to the depletion of hydrocarbons. Hydrogen, an inexhaustible natural resource, is the main fuel for this process. But the slightest human error in its use threatens a very serious disaster. According to British Petroleum (Statistical Review of World Energy 2022), at the end of 2021, global electricity production amounted to 28,466.3 terawatts (TW), which equals an average of 3.6 megawatts (MW) per person per year or 9.9 kilowatts (kW) per day.

The ever-increasing shortage of drinking water is of particular concern. In recent decades, shortages of fresh waters have been occurring in regions where they did not exist before, and have been increasing everywhere, for example in China and Egypt

https://www.bloomberg.com/opinion/articles/2021-12-29/china-s-water-shortage-is-scary-for-india-thailand-vietnam,

https://ecfr.eu/article/commentary_the_end_is_nile_international_cooperation_on_egypts_water_crisis/.

The obvious reason for this is the increase in water consumption due to population growth and the burgeoning economy. However, if that were the only reason, only the relative indicators of water supply would worsen: the volume of water resources per capita and per unit of product. **But fresh water of the required quality is becoming scarce not only in relative, but also in absolute terms.** This trend, however, is not arousing concern.

In Europe, the growing water shortage is due to climate change
https://www.ft.com/content/887170b2-99ed-4c78-96a0-f40273cadc10

Fresh water (at least from available surface and underground sources) is traditionally considered a **reproducible or renewable** resource. It is assumed that the exploitation of water bodies does not do them significant harm, particularly if rational management methods are used. Such methods will prevent any damage from reaching the critical level, beyond which the water body as a source of fresh water will begin to deteriorate and its replenishment (even not in full) become problematic. Water resources are compared with mineral resources such as oil, the argument being that the reserves of the latter can run out, but fresh water supplies are inexhaustible. **Specialists in this field have understood this fallacy for many years, but**

society doesn't recognize the problem. This is explained by the physical law of substance conservation, according to which water naturally undergoes continuous circulation and replenishment.

Climate change and anthropogenic activities, increased toxicity in all environmental niches, growth of the global human population and its level of consumption, uncontrolled urbanisation and irrational land use are causing a reduction in world supplies of clean fresh water at a catastrophic rate, as well as leading to the destruction of freshwater ecosystems.

The main supplies of water come from river runoff and groundwater. It takes a long time to restore them, which puts them in the category of non-renewable sources. Underground sources are fed by precipitation and replenish rivers in the form of springs. In some regions, for example in Hungary, there is an overlap (surplus) between surface and groundwater. In other regions, e.g. Egypt, Israel, Kazakhstan and Turkmenistan, there is a shortage.

UN Data Base for Water Supplies AQUASTAT,
http://www.fao.org/nr/water/aquastat/data/query/index.html?lang=en

If water withdrawal from underground sources exceeds natural replenishment, the water supply becomes depleted.

The shortage of fresh water is caused by the cheap availability of its low volume – 0.01%. It is a tool for manipulating interpersonal and intergovernmental relations.

In human society, water does not unite states and peoples, it separates them. There is no joint global consensus regarding the rational use of water resources, nor is there likely to be in the future.

Although global water bodies will not dry up, the water in them will become so dirty that will be unsuitable for consumption, and we will have to spend as much money on purification and water treatment as we do on the desalination of sea water, or even more. This purification process contributes to global warming due to the use of a high-carbon energy source, and the toxic waste produced is problematic in terms of disposal. As a result, clean water will become the most expensive product of future civilization.

In Tables 5 and 6 below, the author presents data on the world's drinking water reserves, collected over many years.

DEPLETION TIME OF THE WORLD'S AVAILABLE SUPPLIES OF CLEAN DRINKING WATER AT THE CURRENT RATE OF POLLUTION AS OF 2022 BY REGION

TABLE 5

Continent	Rate of fresh water pollution, bln m^3/year	Total available fresh water supply, bln m^3/year	Depletion time of clean drinking water, years
North America	93.7	7117.8	76
South America	130.3	17974.7	137.9
Europe	91.1	7787.8	85.5
Caribbean Basin	16.4	98.4	6
Sub-Saharan Africa	74.1	5477.2	73.9
Asia	1454.5	14183.4	9.7
Oceania	5.7	1648.6	290
Middle East and North Africa	190.7	411.1	2.2

DEPLETION TIME OF THE WORLD'S AVAILABLE SUPPLIES OF CLEAN DRINKING WATER AT THE CURRENT RATE OF POLLUTION BY COUNTRY

TABLE 6

ESTIMATED DEPLETION TIME OF AVAILABLE FRESH WATER BY COUNTRY							
Country	Total available water resources. bln m^3	Consumption of fresh water, bln m3/year			Volume of purification of consumed fresh water. %	Volume of contaminated fresh water. bln m^3 /year	Volume of contaminated fresh water. bln m3 /year
		Water reclamation	Direct source	Total			
1	2	3	4	5	6	7	8
Kuwait	0	0.8	0	0.8	84.7	0.12	0
Libya	0.7	0.15	5.5	5.7	16.6	4.75	0.1
Saudi Arabia	2.4	12.7	8.5	21.2	80	4.24	0.6
Barbados	0.08	0.03	0.07	0.1	2.8	0.097	0.8
Yemen	2.1	0.1	3.5	3.6	34.4	2.36	0.9
Turkmenistan	24.8	1.6	26.3	27.9	14.8	23.77	1.0
Uzbekistan	48.9	4.5	54.4	58.9	32.3	39.88	1.2
Pakistan	246.8	12	188	200	1	198.00	1.2
UAE	0.15	0.5	2.1	2.6	95.9	0.11	1.4
Sudan	37.8	1.1	25.8	26.9	3.4	25.99	1.5
Egypt	58	13.4	50.8	64.2	45.5	34.99	1.7
Iran	137	9.3	83.7	93	22.1	72.45	1.9
Palestine	0.812	0.19	0.21	0.4	6.33	0.37	2.2
Syria	16.8	2.2	11.8	14	45.2	7.67	2.2
Tunisia	4.6	1.1	3.7	4.8	59.7	1.93	2.4
Tajikistan	21.9	0.9	9.5	10.4	13.3	9.02	2.4
Saint Kitts and Nevis	0.024	0.001	0.009	0.01	25.9	0.007	3.2
Dominican Republic	23.5	1.5	7.6	9.1	20.4	7.24	3.2
Afghanistan	65.3	0.4	19.9	20.3	5.7	19.14	3.4
Iraq	89.9	2.7	35.8	38.5	37.1	24.22	3.7
Kyrgyzstan	23.6	0.6	7.1	7.7	18.9	6.24	3.8
India	1911	62.2	585.3	647.5	26.6	475.27	4.0

Sri Lanka	52.8	1.6	11.3	12.9	1.3	12.73	4.1
Morocco	29	1.4	9.2	10.6	36.1	6.77	4.3
Armenia	7.8	0.8	2.1	2.9	40.1	1.74	4.5
Lebanon	4.5	1.1	0.7	1.8	45.7	0.98	4.6
Somalia	14.7	0.1	3.2	3.3	10.5	2.95	5.0
Eswatini	4.5	0.1	1	1.1	17.9	0.90	5.0
Algeria	11.7	3.6	6.2	9.8	76.2	2.33	5.0
Maldives	0.03	0.009	0.001	0.01	41.7	0.006	5.1
Jordan	0.9	0.5	0.4	0.9	82	0.16	5.6
Azerbaijan	34.7	3.5	9.3	12.8	57.4	5.45	6.4
Cuba	38.12	2.5	4.5	7	18.9	5.68	6.7
South Africa	51.4	8	11.4	19.4	61.3	7.51	6.8
North Macedonia	6.4	0.6	0.4	1	9.1	0.91	7.0
Kazakhstan	108.4	8.6	13.9	22.5	35.7	14.47	7.5
Mauritius	2.8	0.3	0.3	0.6	38	0.37	7.5
Timor-Leste	8.215	0.1	1.1	1.2	12.7	1.05	7.8
Zimbabwe	20	0.6	2.7	3.3	23	2.54	7.9
Kenya	30.7	0.8	3.2	4	9.4	3.62	8.5
Jamaica	10.82	1.3	0.1	1.4	13.7	1.21	9.0
Philippines	479	25	67.8	92.8	42.9	52.99	9.0
North Korea	77.2	2.1	6.6	8.7	7.2	8.07	9.6
Turkey	211.6	9.1	50.9	60	63.3	22.02	9.6
Saint Lucia	0.3	0.01	0.03	0.04	24.1	0.03	9.9
Mauritania	11.4	0.1	1.2	1.3	12.3	1.14	10.0
Thailand	438.6	5.7	51.6	57.3	24.4	43.32	10.1
Haiti	14	0.2	1.3	1.5	10.7	1.34	10.5
Bahrein	0.1	0.17	0.03	0.2	95.6	0.009	11.4
Puerto Rico	7.1	0.87	0.03	0.9	32.5	0.61	11.7
Indonesia	2019	32.9	189.7	222.6	24.6	167.84	12.0
Cyprus	0.79	0.1	0.1	0.2	67.2	0.07	12.0
Dominica	0.2	0.019	0.001	0.02	18.2	0.016	12.2
Saint Vincent and the Grenadines	0.1	0.009	0.001	0.01	21.5	0.008	12.7
El Salvador	26.3	0.7	1.4	2.1	2	2.06	12.8
Ethiopia	122	0.9	9.6	10.5	10	9.45	12.9
Eritrea	7.3	0.1	0.5	0.6	6.3	0.56	13.0
Mexico	461.9	21.1	66.7	87.8	59.6	35.47	13.0
Malawi	17.3	0.2	1.2	1.4	6.5	1.31	13.2

Vietnam	884.1	4.3	77.6	81.9	18.5	66.75	13.2
China	2840	210.7	381.1	591.8	64.8	208.31	13.6
Cabo Verde	0.3	0.002	0.028	0.03	31	0.02	14.5
Djibouti	0.3	0.017	0.003	0.02	10.9	0.018	16.8
Burkina Faso	13.5	0.4	0.4	0.8	2.3	0.78	17.3
Bulgaria	21.3	4.9	0.8	5.7	79.2	1.19	18.0
Tanzania	96.3	0.6	4.6	5.2	5.3	4.92	19.6
Senegal	39	0.2	2	2.2	14.2	1.89	20.7
Niger	34.1	0.2	1.5	1.7	4	1.63	20.9
Trinidad and Tobago	3.84	0.299	0.001	0.3	38.8	0.18	20.9
Israel	1.8	0.5	0.7	1.2	93.1	0.08	21.7
Mali	120	0.1	5.1	5.2	3.4	5.02	23.9
Belgium	18.3	3.995	0.005	4	81.3	0.75	24.5
Grenada	0.2	0.009	0.001	0.01	19.7	0.008	24.9
Moldova	12.3	0.76	0.04	0.8	38.5	0.49	25.0
Spain	111.5	10.9	20.3	31.2	86	4.37	25.5
Madagascar	337	0.6	13	13.6	9.3	12.34	27.3
Albania	30.2	0.4	0.8	1.2	13.4	1.04	29.1
Ukraine	175.3	5.6	3	8.6	34.3	5.65	31.0
Portugal	77.4	2	7.1	9.1	73.6	2.40	32.2
Antigua and Barbuda	0.1	0.003	0.001	0.004	24.3	0.003	33.0
Poland	60.5	9.1	1	10.1	81.9	1.83	33.1
Nepal	210.2	0.2	9.3	9.5	37.2	5.97	35.2
Argentina	876.2	9.8	27.9	37.7	36.5	23.94	36.6
Qatar	0.056	0.2	0.1	0.3	99.5	0.0015	37.3
Myanmar	1168	3.8	29.4	33.2	10	29.88	39.1
Bangladesh	1227	4.4	31.5	35.9	16	30.16	40.7
Serbia	162.2	4.7	0.7	5.4	27.1	3.94	41.2
Burundi	12.5	0.1	0.2	0.3	4	0.29	43.4
Nigeria	286.2	7	5.5	12.5	48.3	6.46	44.3
Ghana	56.2	0.4	1	1.4	12.1	1.23	45.7
Costa Rica	113	0.9	2.3	3.2	23.3	2.45	46.0
Laos	333.5	0.3	7	7.3	10.1	6.56	50.8
Chad	45.7	0.2	0.7	0.9	2.3	0.88	52.0
Guatemala	127.9	1.4	1.9	3.3	27.2	2.40	53.2
Venezuela	1325	5.9	16.7	22.6	13.90%	22.57	58.7
Romania	212	5.3	1.5	6.8	48.3	3.52	60.3

Botswana	12.2	0.13	0.07	0.2	2.3	0.20	62.4
Ecuador	442.4	1.9	8	9.9	31.1	6.82	64.9
Georgia	63.3	0.8	1	1.8	46	0.97	65.1
Rwanda	13.3	0.1	0.1	0.2	2.6	0.19	68.3
South Sudan	49.5	0.45	0.25	0.7	2.5	0.68	72.5
São Tomé and Príncipe	2.18	0.02	0.02	0.04	25	0.03	72.7
Zambia	104.8	0.4	1.2	1.6	14.2	1.37	76.3
Lesotho	3	0.037	0.003	0.04	2.3	0.04	76.8
Uruguay	172.2	0.5	3.2	3.7	39.4	2.24	76.8
USA	3069	268.2	176.2	444.4	91.1	39.55	77.6
Mongolia	34.8	0.23	0.27	0.5	10.4	0.45	77.7
Estonia	12.71	1.79	0.01	1.8	91.1	0.16	79.3
Russian Federation	4525	45.8	18.6	64.4	12.9	56.09	80.7
Ivory Coast	84.1	0.6	0.6	1.2	14.2	1.03	81.7
Czech Republic	13.15	1.5	0.1	1.6	90	0.16	82.2
Honduras	92.2	0.4	1.2	1.6	30.2	1.12	82.6
Greece	68.4	2.2	9	11.2	92.7	0.82	83.7
Togo	14.7	0.13	0.07	0.2	15	0.17	86.5
Gambia	8	0.06	0.04	0.1	11.1	0.09	90.0
Belarus	57.9	1	0.4	1.4	56.5	0.61	95.1
Uganda	60.1	0.35	0.25	0.6	2.4	0.59	102.6
Italy	191.3	17.1	16.9	34	94.7	1.80	106.2
France	211	23.3	3.1	26.4	92.5	1.98	106.6
Brunei	8.5	0.094	0.006	0.1	21.2	0.08	107.9
Slovenia	31.9	0.896	0.004	0.9	67.2	0.30	108.1
Comoros	1.2	0.005	0.005	0.01	5.6	0.01	127.1
Australia	492	5.8	10.1	15.9	76.2	3.78	130.0
Panama	139.3	0.8	0.4	1.2	21.5	0.94	147.9
Mozambique	217.1	0.4	1.1	1.5	6.7	1.40	155.1
Nicaragua	164.5	0.3	1.2	1.5	31.8	1.02	160.8
Peru	1880	3	13.1	16.1	28.3	11.54	162.9
Bosnia and Herzegovina	37.5	0.2	0.2	0.4	46.8	0.21	176.2
Namibia	39.9	0.09	0.21	0.3	26.3	0.22	180.5
Paraguay	387.8	0.5	1.9	2.4	16	2.02	192.4
Brazil	8664	26.3	39.4	65.7	33	44.02	196.8
Guinea Bissau	31.4	0.05	0.15	0.2	21.4	0.16	199.7
Denmark	6	0.4	0.3	0.7	95.9	0.03	209.1

Finland	110	6.4	0.2	6.6	92.3	0.51	216.5
Suriname	99	0.18	0.42	0.6	23.8	0.46	216.5
Colombia	2360	7.2	6.4	13.6	21.3	10.70	220.5
New Zealand	327	3.8	6.1	9.9	85.1	1.48	221.7
Hungary	104	4	0.5	4.5	89.6	0.47	222.2
Guyana	271	0.1	1.3	1.4	18.5	1.14	237.5
Japan	430	26.9	54.3	81.2	97.8	1.79	240.7
Belize	21.7	0.03	0.07	0.1	17.2	0.08	262.1
Chile	923.1	6	29.4	35.4	90.5	3.36	274.5
Benin	26.4	0.075	0.025	0.1	4.3	0.10	275.9
Cameroon	283.1	0.4	0.7	1.1	8.3	1.01	280.7
Angola	148.4	0.55	0.15	0.7	29.2	0.50	299.4
Cambodia	476.1	0.1	2.1	2.2	30.6	1.53	311.8
Canada	2902	33.1	2.6	35.7	75.9	8.60	337.3
Croatia	105.5	0.63	0.07	0.7	60.3	0.28	379.6
Bolivia	574	0.2	1.9	2.1	29.3	1.48	386.6
Ireland	52	0.63	0.17	0.8	83.4	0.13	391.6
Slovakia	50.1	0.57	0.03	0.6	79.8	0.12	413.4
Fiji	28.55	0.04	0.06	0.1	31	0.07	413.8
Oman	1.4	0.4	1.2	1.6	99.8	0.003	437.5
Bhutan	78	0.02	0.28	0.3	41	0.18	440.7
South Korea	69.7	12	17.2	29.2	99.5	0.15	477.4
Guinea	226	0.3	0.3	0.6	21.4	0.47	479.2
Norway	393	1.85	0.85	2.7	75.7	0.66	599.0
Malaysia	580	3.6	3.1	6.7	87.8	0.82	709.6
Sierra Leone	160	0.16	0.04	0.2	8.4	0.18	873.4
Germany	154	24.1	0.3	24.4	99.3	0.17	901.6
Lithuania	24.5	0.23	0.07	0.3	93.4	0.02	1237.4
Central African Republic	141	0.099	0.001	0.1	0.6	0.10	1418.5
United Kingdom	147	7.2	1.2	8.4	98.8	0.10	1458.3
Sweden	174	2.33	0.07	2.4	95.2	0.12	1510.4
Austria	77.7	3.43	0.07	3.5	98.6	0.05	1585.7
Equatorial Guinea	26	0.019	0.001	0.02	22.3	0.02	1673.1
Luxembourg	3.5	0.04999	0.0001	0.05	96.3	0.002	1891.9
Democratic Republic of Congo	1283	0.63	0.07	0.7	12.3	0.61	2089.9
Iceland	170	0.2999	0.0001	0.3	73.5	0.08	2138.4

TABLE 6 CONTINUED

Gabon	166	0.07	0.03	0.1	22.5	0.08	2141.9
Papua New Guinea	801	0.399	0.001	0.4	10.8	0.36	2245.0
Latvia	34.9	0.13	0.07	0.2	93.1	0.01	2529.0
Liberia	232	0.092	0.008	0.1	14.3	0.09	2707.1
Switzerland	53.5	1.55	0.15	1.7	99.2	0.01	3933.8
Netherlands	91	7.97	0.03	8	99.8	0.02	5687.5
Singapore	0.6	0.48	0.02	0.5	99.99	0.0001	12000.0
Malta	0.051	0.022	0.018	0.04	99.99	0.000004	12750.0
Republic of Congo	832	0.05	0.002	0.05	7.2	0.05	17931.0
World	**54699**	**1127.16**	**2754.3**	**3881.5**	**47**	**2056.5**	**26.6**

NOTE TO TABLE 6:

clarification of terms used according to the guide on the UN-Water Integrated Monitoring Initiative for SDG 6

https://www.unwater.org/app/uploads/2020/07/Global-Acceleration-Framework.pdf

Water reclamation is treatment of water coming from a natural source of water intake, to bring its quality in line with the requirements of technological consumers, requiring additional purification and preparation before use.

Direct water source is water that comes directly from natural sources of water intake to consumers.

Total available water resources is the sum of internal renewable water resources (average long-term river flow and the country's groundwater recharge formed by internal precipitation) and external renewable resources (the flow of rivers entering the country), i.e. the reserves of fresh water resources of water bodies: rivers, lakes, swamps, reservoirs, groundwater, as well as the water of canals and ponds.

Fresh water consumption or total water withdrawal is the volume of fresh water withdrawn from a source (river, lake, aquifer) for cities (providing for the household needs of the population), for the needs of agriculture, industry (including cooling of thermal power plants) and energy. Freshwater withdrawals include primary water (water withdrawn for the first time), secondary water (water that has already been withdrawn and returned to rivers and groundwater after sewage and agricultural drainage water treatment), desalinated water and groundwater. The following sources – direct use of treated wastewater, agricultural drainage water – are not taken into account.

According to Table 6, the estimated actual supply of the world's fresh water, based on the global hydrological cycle, **is about 55 trillion tons.**

If the current rate of fresh water pollution and continuous consumption remains unchanged, clean drinking water will run out in 27 years, by 2047 (see Table 6). This forecast is optimistic, since the figure for fresh water consumption or total water withdrawal was calculated according to the official data of the World Bank at the 2017 level

(https://data.worldbank.org/indicator/ER.H2O.FWTL.K3).

As of 2022, according to statistics, the increase in total fresh water consumption, taking into account population growth, is between 5 and 10%.

Homo Sapiens as a species has a very acute need for the same figures of water quality, which give both geographical and temporal generalisations, making it possible to consider the variability of pollution of water masses in time and space. Calculation of such characteristics as the general level of a water body's pollution, the duration and volume of clean and polluted runoff, the permissible load of a water body with one pollutant or another, the size of emerging pollution zones in rivers, lakes, and reservoirs, the accumulation of harmful substances in water bodies and their removal at different values of water exchange requires an integrated approach and unified methods. ***Homo Consúmens* is not paying the necessary attention to this problem.**

Given the current level of human water pollution, from 55% to 80% of untreated wastewater is discharged into the environment (https://sdg6data.org/indicator/6.3.1), which significantly exceeds the permissible level necessary for the self-purification of natural water bodies.

Keeping in mind the external and internal factors of pollution and self-purification of water bodies, there are no calculations of precisely when water resources will run out. Moreover, some large water sources are no longer subject to purification as a result of human intervention. Humans do not want to understand that the problem will not be resolved, despite the existing purification of potable water. And this is because long-outdated methods of water purification are still considered feasible. There is no country in the world where wastewater can be purified by even 70-80%, never mind 100%. This water is unsuitable for direct human consumption and can only be used in industry and partly in agriculture. Formal calculations regarding the total amount of drinking water in a particular region often do not reflect the true state of affairs. The actual volumes of safe drinking water are often up to 40% lower than those recorded based on the assessment of river flows and total surface water reserves.

OVER THE PAST 90 YEARS, HUMAN IMPACT ON THE PLANET'S WATER CYCLE HAS REACHED GLOBAL DIMENSIONS

Eighty percent of the world's wastewater, whether it is toxic salt water that forms during desalination or other types of waste, ends up in seas, rivers, lakes and wetlands. According to the UN, 2.4 billion people around the world do not have regular access to basic sanitation, including toilets or pit latrines. The absence of centralised sewage disposal contributes to the spread of deadly diseases that kill millions of people every year, and the lack of normal water filtration systems forces about two billion people around the world to drink water polluted with defecation waste every day. At the same time, about five billion people all over the world use the Internet. According to the WHO, two million people annually die due to diseases caused by the consumption of poor-quality drinking water.

Over the past 90 years, human impact on the planet's water cycle has reached global dimensions. Data on the volume of waste water formed by surface runoff differ greatly in various sources, as do the standards for diluting polluted water. It is even more difficult to estimate the volume of anthropogenically polluted water in natural facilities themselves. Comparison of various data leads to the conclusion that from 2,000 to 3,100 km3 of surface waters are annually polluted around the world

(https://sdg6data.org/indicator/6.3.1). Pollution of water bodies is the main reason today for the shortage of water and the instability of water use.

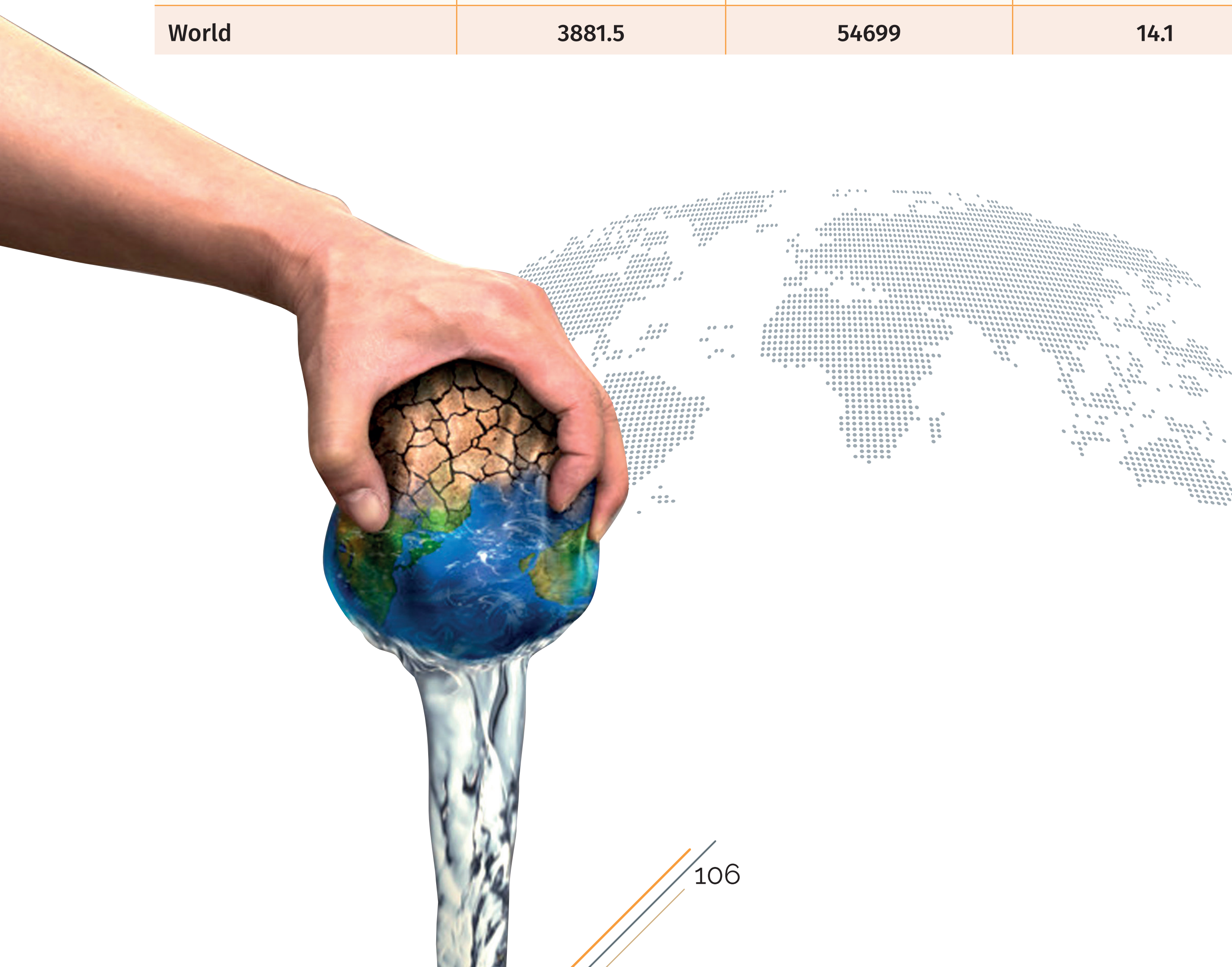
The unacceptably high water withdrawal from many rivers, as well as underground sources, causes a regime change in the water bodies, which is also facilitated by the suppression and transformation of natural ecosystems in watersheds and the construction of various hydraulic structures. By 1950, 5,000 dams over 15 m high had been built in the world. Nowadays, there are more than 45,000 such dams. In the last five decades, an average of two dams per day has been built.

Humans do not yet consider it necessary to invest in sewer systems, water treatment systems, and wastewater treatment. Tables 7 and 8 estimate the approximate amount of time available drinking resources will last, considering the current level of consumption and no treatment.

AMOUNT OF TIME THE WORLD'S AVAILABLE RESERVES OF CLEAN DRINKING WATER WILL LAST BASED ON CURRENT HUMAN ACTIVITIES AND WITHOUT TREATMENT BY REGION

TABLE 7

Region	Rate of fresh water pollution, bln m^3/year	Total available fresh water supply, bln m^3/year	Amount of time clean drinking water will last, years
1	2	3	4
North America	581.1	7117.8	12.2
South America	211.5	17974.7	85
Europe	292.1	7787.8	26.7
Caribbean Basin	20.2	98.4	4.9
Sub-Saharan Africa	98.6	5477.2	55.5
Asia	2348.4	14183.4	6
Oceania	26.3	1648.6	62.7
Middle East and North Africa	303.3	411.1	1.4
World	**3881.5**	**54699**	**14.1**



AMOUNT OF TIME THE WORLD'S AVAILABLE RESERVES OF CLEAN DRINKING WATER WILL LAST BASED ON CURRENT HUMAN ACTIVITIES AND WITHOUT TREATMENT BY COUNTRY

TABLE 8

Country	Total available water resources, bln m^3	Fresh water consumption, billion m^3/year	Amount of time clean fresh water will last (gr.2/gr.3), years
1	2	3	4
Kuwait	0	0.8	0
Libya	0.7	5.7	0.1
Saudi Arabia	2.4	21.2	0.5
Yemen	2.1	3.6	0.7
Pakistan	246.8	200.0	1.2
Syria	16.8	14.0	1.3
Turkmenistan	24.8	27.9	1.4
Uzbekistan	48.9	58.9	1.4
Egypt	58	64.2	1.4
Algeria	11.7	9.8	1.5
Sudan	37.8	26.9	1.5
Jordan	0.9	0.9	1.8
Qatar	0.056	0.3	1.8
Iran	137	93.0	2.3
Tajikistan	21.9	10.4	2.4
Iraq	89.9	38.5	2.4
Lebanon	4.5	1.8	2.7
South Africa	51.4	19.4	2.9
Dominican Republic	23.5	9.1	3.2
Afghanistan	65.3	20.3	3.4
Kyrgyzstan	23.6	7.7	3.5
Armenia	7.8	2.9	3.5
Sri Lanka	52.8	12.9	4.6
India	1911	647.5	4.7

Somalia	14.7	3.3	4.7
Eswatini	4.5	1.1	5.1
Azerbaijan	34.7	12.8	5.2
Palestine	0.812	0.4	5.2
Philippines	479	92.8	5.7
Malta	0.051	0.04	5.8
UAE	0.15	2.6	5.9
Saint Kitts and Nevis	0.024	0.01	6.7
Cuba	38.12	7.0	6.8
Morocco	29	10.6	6.9
Kazakhstan	108.4	22.5	6.9
Zimbabwe	20	3.3	7.0
Saint Lucia	0.3	0.04	7.1
Oman	1.4	1.6	7.1
Barbados	0.08	0.1	7.1
Mauritius	2.8	0.6	7.3
Timor-Leste	8.215	1.2	7.9
Bulgaria	21.3	5.7	8.8
Cyprus	0.79	0.2	9.1
Indonesia	2019	222.6	9.2
Mauritania	11.4	1.3	9.2
North Macedonia	6.4	1.0	9.4
North Korea	77.2	8.7	9.6
Kenya	30.7	4.0	10.3
Maldives	0.03	0.01	10.5
Haiti	14	1.5	10.6
Mexico	461.9	87.8	11.0
Jamaica	10.82	1.4	11.3
Thailand	438.6	57.3	11.4
Vietnam	884.1	81.9	12.4
El Salvador	26.3	2.1	12.7

China	2840	591.8	12.8
Ethiopia	122	10.5	12.9
Eritrea	7.3	0.6	13.3
Turkey	211.6	60.0	13.6
Malawi	17.3	1.4	13.9
Grenada	0.2	0.01	14.4
Cabo Verde	0.3	0.03	15.0
Trinidad and Tobago	3.84	0.3	15.9
Italy	191.3	34.0	16.1
Spain	111.5	31.2	17.9
Burkina Faso	13.5	0.8	17.9
Senegal	39	2.2	19.5
Dominica	0.2	0.02	19.6
Niger	34.1	1.7	21.2
Djibouti	0.3	0.02	21.9
Moldova	12.3	0.8	23.2
Nepal	210.2	9.5	23.3
Ukraine	175.3	8.6	23.9
Saint Vincent and the Grenadines	0.1	0.01	24.5
Mali	120	5.2	25.7
Tanzania	96.3	5.2	26.5
Puerto Rico	7.1	0.9	27.0
Madagascar	337	13.6	27.0
Antigua and Barbuda	0.1	0.004	27.2
Albania	30.2	1.2	28.6
USA	3069	444.4	28.8
Argentina	876.2	37.7	29.1
Nigeria	286.2	12.5	31.0
South Korea	69.7	29.2	31.8
Serbia	162.2	5.4	32.1
Costa Rica	113	3.2	36.9

Bangladesh	1227	35.9	41.2
Myanmar	1168	33.2	41.8
France	211	26.4	42.0
Ghana	56.2	1.4	42.2
Guatemala	127.9	3.3	43.2
Czech Republic	13.15	1.6	47.5
Tunisia	4.6	4.8	48.2
Ecuador	442.4	9.9	49.6
Israel	1.8	1.2	50.1
Laos	333.5	7.3	53.6
Chad	45.7	0.9	56.4
Romania	212	6.8	56.9
Georgia	63.3	1.8	56.9
São Tomé and Príncipe	2.18	0.04	59.1
Honduras	92.2	1.6	59.3
Estonia	12.71	1.8	59.4
Portugal	77.4	9.1	60.4
Burundi	12.5	0.3	62.0
Bahrein	0.1	0.2	64.5
Japan	430	81.2	66.2
Botswana	12.2	0.2	72.2
Zambia	104.8	1.6	74.9
Togo	14.7	0.2	77.6
South Sudan	49.5	0.7	78.4
Rwanda	13.3	0.2	78.6
Lesotho	3	0.04	80.2
Russian Federation	4525	64.4	80.8
Ivory Coast	84.1	1.2	83.2
Gambia	8	0.1	86.2
Venezuela	1325	22.6	87.4
Uganda	60.1	0.6	104.8

Germany	154	24.4	105.0
Uruguay	172.2	3.7	114.8
Hungary	104	4.5	115.6
Greece	68.4	11.2	121.7
Singapore	0.6	0.5	122.0
Belarus	57.9	1.4	125.6
Peru	1880	16.1	149.6
Poland	60.5	10.1	150.0
Mozambique	217.1	1.5	151.9
Comoros	1.2	0.01	164.4
Malaysia	580	6.7	169.6
Bosnia and Herzegovina	37.5	0.4	176.4
Paraguay	387.8	2.4	180.6
Nicaragua	164.5	1.5	183.8
Mongolia	34.8	0.5	188.3
Brazil	8664	65.7	188.4
Guyana	271	1.4	203.9
Benin	26.4	0.1	209.4
Namibia	39.9	0.3	228.2
Belgium	18.3	4.0	229.1
Angola	148.4	0.7	231.0
Colombia	2360	13.6	231.3
Cambodia	476.1	2.2	239.6
Belize	21.7	0.1	241.4
Panama	139.3	1.2	268.8
Guinea Bissau	31.4	0.2	299.0
Bhutan	78	0.3	329.7
New Zealand	327	9.9	331.1
Bolivia	574	2.1	376.6
Croatia	105.5	0.7	391.9
Suriname	99	0.6	401.8

Cameroon	283.1	1.1	406.6
Guinea	226	0.6	428.0
Australia	492	15.9	440.8
Lithuania	24.5	0.3	450.5
Sweden	174	2.4	563.6
Denmark	6	0.7	809.7
Sierra Leone	160	0.2	811.5
Slovakia	50.1	0.6	901.1
Brunei	8.5	0.1	923.9
Fiji	28.55	0.1	959.7
Netherlands	91	8.0	1139.2
Slovenia	31.9	0.9	1142.1
Ireland	52	0.8	1144.9
Gabon	166	0.1	1357.1
Equatorial Guinea	26	0.02	1428.6
Finland	110	6.6	1676.3
Liberia	232	0.1	1690.5
United Kingdom	147	8.4	1746.1
Democratic Republic of Congo	1283	0.7	1894.7
Central African Republic	141	0.1	1951.0
Iceland	170	0.3	2171.1
Austria	77.7	3.5	2226.4
Papua New Guinea	801	0.4	2554.2
Chile	923.1	35.4	2610.0
Switzerland	53.5	1.7	3085.4
Luxembourg	3.5	0.05	7608.7
Canada	2902	35.7	8122.0
Norway	393	2.7	14604.2
Latvia	34.9	0.2	19281.8
Republic of Congo	832	0.05	90434.8
World	**54699**	**3881.5**	**14.1**

Thus, according to Table 8, clean water supplies will only last for 14 years.

Let us determine how long available clean fresh water supplies will last in the coming decade with a provisional current increase in the planet's population of 250,000 people per day and a proportional increase in consumption in relation to the current level according to the formula below:

$$L = \frac{T}{W + R \times C \times 10}$$

Where L is the amount of time clean drinking water will last, years

T is the total available water resources, bln m^3

W is fresh water consumption, billion m^3/year

R is annual population growth, people per year

C is water consumption per capita – W / 7.92 billion people, m^3

Calculation of water consumption for a decade, based on current population growth:

1 person – 490 m^3 per year; total consumption by 2032 in a decade will be (3,881.5 billion m^3 + 441 million m^3 (900 million people*490 m^3) = 4,322.5 billion m^3; 54,699 billion m^3: 4,322.5 billion m^3 = 12.6 years.

By 2032, based on the rate of population growth, there will only be enough clean water to last for 1.5 years (14.1-12.6).

According to some forecasts, world population growth will increase for at least another 20-25 years. This increase will be supported by the desire of the world population, and, above all, that of the developing countries, to improve their quality of life, which is impossible without solving water management problems.

For information purposes, I will present the growth in the size of the *Homo Sapiens* population compared with that of *Homo Consúmens*:

Year 0, the beginning of the new era - **300 million people;**

10th century, 1,000 years later - **400 million people** (normal, steady growth);

15th century, 1,500 years later - **600 million people** (steady growth based on past years);

20th century, 2,000 years later - **6 billion people** (rapid, uncontrolled growth);

and 22 years after that - **8 billion people** (catastrophic, uncontrolled, insane growth);

by 2050, the world's population is forecast to reach **10 billion people**, whereby, the demise of humanity is inevitable due to the absence of resources.

As an exploited resource, fresh water can only be replenished and inexhaustible if water protection rules and hydrological and environmental consumption standards are observed. Furthermore, there are no substitutes for it, since the natural environment and the *Microbiome* place limits on anything that might replace it by virtue of the fact that it is a fundamental element of all life on earth. As biological organisms, people require a specific amount of water, regardless of the level of their economic and social development. If a person loses 15-25% of their total body weight due to an insufficient intake of water, irreversible processes begin that lead to their death. Therefore, the consumption of drinking water is of paramount importance.

Many countries that have large natural reserves of fresh water do not use them due to economic inexpediency or because of the labour-intensive production processes. Therefore, they use alternative sources such as desalination, import, rectification, and use of sea water in daily life.

Countries experiencing a severe shortage of fresh water, whereby water consumption is higher than natural water replenishment, use desalinated water. The extraction of water from wells is not considered the main method of water supply for the population, since, due to the intensive pumping of groundwater, gradual salinity of these water sources occurs.

The increase in desalinated water consumption in these regions is due to population growth and urbanisation, as well as water use for economic purposes, as well as a decrease in its volume due to high temperatures and lack of precipitation.

In total, 16,000 desalination plants operate in 177 countries (https://idadesal.org/wp-content/uploads/2019/04/The-state-of-desalination-019.pdf) with a fresh water production capacity of 95 million m^3 per day, as well as a salt brine capacity of 142.5 million m^3. It takes 2.5 litres of sea water to produce 1 litre of desalinated water. The average salinity of sea water in the world ocean is 35 g/l. Thus, the salinity of brine is approximately 87.5 g/l.

As a result, 12.5 million tons of waste and contaminated salt are dumped into the ocean or accumulate on dry land every day. This produces 4.6 billion tons of salt per year. This catastrophically worsens the environment of the region and destroys the ecosystem of the World Ocean. At shallow depths and in the absence of fresh water runoff, water salinity triples in places where brine is discharged, which makes the desalination process more expensive as time goes on.

The modern technologies used for seawater desalination are not capable of replacing drinking water in terms of quality, since they do not exclude the penetration of heavy isotopes of hydrogen (deuterium) and oxygen-18 into desalinated water

(http://samlib.ru/e/etkin_w/eshepazokachestvevody.shtml).

The main reason that desalinated water is harmful to human health is the absence of World Health Organization standards for desalinated drinking water containing deuterium and oxygen-18.

The International Atomic Energy Agency notes that sea water more contains harmful heavy isotopes than fresh water, which are not removed from the water after desalination.

Scientists have concluded that the heavy isotope of deuterium in desalinated water damages human genes, causes various diseases (e.g., cancer) and accelerates aging. If desalinated heavy water for is used for drinking, humanity faces extinction. We need to move to deuterium-free drinking water. Today, technologists do not give any scientific advice. While the body is young (under the age of 20, according to geneticists), heavy isotopes of ordinary tap fresh water have little effect on the health. However, aging, stress and adverse external influences weaken the body's defences; DNA molecules become saturated with deuterium; water exchange worsens, immunity decreases, and the rate of chemical reactions in cells changes [19]. This is the reason for the increase in the number of genetic defects in cell division and malfunctions in the work of finely-tuned body systems, since biologically this type of hydrogen replacement is far from equivalent. All this leads to congenital malformations in foetuses and oncological diseases in adults, as well as male and female infertility.

What is more, desalinated seawater is also deficient in four essential minerals vital to human health: calcium, magnesium, fluorine and iodine. These minerals are removed during the desalination process along with the salts (https://www.sciencedirect.com/science/article/abs/pii/S001393511830358X).

Low iodine intake potentially leads to diseases such as thyroid dysfunction, which, especially in young children, can lead to intellectual and cognitive deterioration. During pregnancy, a lack of this mineral can cause serious foetal developmental disorders such as mental retardation, thyrotoxicosis (enlargement of the thyroid gland) and physical deformities. Twenty percent of a person's daily magnesium intake should come from water.

In 2018, scientists established a link between the consumption of desalinated water in Israel and an increased risk of cardiovascular disease and death from heart attack, as well as an increase in cancer: https://www.sciencedirect.com/science/article/abs/pii/S001393511830358X.

The main disadvantage of the desalination technology for the environment is that a second flow of water forms alongside the flow of fresh water, the salt concentration of which kills living organisms on the coast if it is discharged into the ocean. This water also destroys flora and fauna if it is continuously discharged into the soil or if brine is pumped into wells.

According to the UN (https://www.unep.org/news-and-stories/story/five-things-know-about-desalination), in most desalination processes, for every litre of potable water produced, about 1.5 litres of liquid polluted with chlorine and copper are created. This wastewater ("concentrate") is twice as saline as ocean water.

The desalination process is very energy-intensive; it contributes to global warming and the deterioration of human health.

Nor is there any sense in using desalinated water in agriculture. Plants grown using such water are deficient in the basic elements necessary for growth and development. Thus, the consumption of these agricultural products is of no benefit to human health.

Despite many attempts, it has not yet been possible to develop a cheap and large-scale technology for desalinating salt water, which would solve the problems encountered in global desertification, agriculture and health care, provide the population with food and, at the same time, significantly improve the global ecology. In March 2019, the UN Environment Assembly adopted a resolution on protecting the marine environment from land-based activities, specifically desalination plants. This is due to the damage inflicted on the global ecology [20].

Consequently, unless the problems relating to salt utilisation are resolved, modern desalination technologies are detrimental both to the health of *Homo Sapiens* and to the planet's marine ecosystems.

Much of the information presented is nothing new. But does humanity know about it? Do politicians and the Green Party? No, they do not. Or they pretend they do not know. When German Minister for Economic Affairs and Climate Action Robert Habeck recommended that the citizens of his country follow his example and reduce the time they spent in the shower to 5 minutes to save water resources, it caused a scandal. Everyone began making fun of the politician. People, you are unable to step out of your comfort zone to save the planet and conserve the resources provided by *Cosmicus Quanticus Cerebrum*. If *Homo Sapiens* cannot restrict its

ANOTHER OF HUMANITY'S GLOBAL PROBLEMS IS LAND DEGRADATION...

water consumption today, when the water crisis has still not reached its limits, what will happen in the next few years? *Homo Sapiens* has very limited supplies of clean water today, and in the near future they will run out entirely. Possible ways to save fresh water resources in global consumption, based on the total volume of water available in its recirculation cycle, are presented in the chapter titled "The *Homo Consúmens* Digital Economy ".

Another of humanity's global problems is land degradation, which is associated with intensive agricultural use, deforestation and climate change. It is a process in which the quality of the biophysical environment is influenced by a combination of human-induced processes that have an impact on the earth's soil cover. While natural disasters are rarely cited as a cause of human-induced degradation, they can cause floods and forest fires.

THE MAIN APPROACHES TO LAND DEGRADATION AND ITS IMPACT ON THE ENVIRONMENT ARE AS FOLLOWS:

1) A temporary or permanent decrease in land productivity. This can be judged by the loss of biomass and actual or potential productivity, changes in vegetation cover and nutrients in the soil.

2) Farming activity with respect to the soil's ability to provide resources for human sustenance.

3) Loss of biodiversity: a decrease in species variety or ecosystem complexity due to environmental degradation and the impossibility of sustaining the existence of key species which ensure a stable balance of the biosystems.

4) Increasing environmental risk: the vulnerability of the environment and humans to disruption or stressors.

In addition to the types of land degradation that have been known for centuries (water, wind and mechanical erosion, physical, chemical and biological degradation), four other types have emerged over the past five decades:

1) chemical pollution as a result of agriculture, industry, mining and any commercial activity;

2) loss of arable land due to urban and road construction, land conversion for urban and social infrastructure, degradation of agricultural land and the incorporation of new land formerly occupied by forests, cutting down forest shelterbelts;

3) radioactive contamination caused by neglect of safety standards in the disposal of radioactive waste;

4) land use restrictions due to armed conflicts.

A total of more than 36 types of land degradation can be singled out. All of them are caused or exacerbated by human activities, such as soil erosion, soil pollution, soil acidification, siltation, salinisation, urbanisation, etc.

Causes of land degradation:

- deforestation, use of agricultural land for urban and social needs;
- depletion of nutrients in the soil due to the intensive use of chemicals in agriculture;
- animal husbandry, including overgrazing and constant growth of livestock;
- improper irrigation;
- urban sprawl and commercial infrastructure development;
- vehicle movement off-road;
- mining of stone, sand, ore and minerals;
- increasing the size of fields, reducing natural shelters for wild animals;
- absence of soil protection technology, soil destruction after harvesting with heavy machinery
- use of monocultures that destabilise the local ecosystem;
- dumping of non-biodegradable waste such as plastics;
- climate change;
- loss of soil carbon.
- The percentage of soil degradation throughout the world is presented in Table 9:

AREA OF DEGRADED LAND IN THE TOTAL LAND AREA BY COUNTRY

TABLE 9

№	Country	Share of degraded lands in the total area of the country, %	Share of degraded and desertified lands, km²	Total area of the country, km²
1	2	3	4	5
1	Tajikistan	6.6	9 332.4	141 400
2	Kazakhstan	21.3	580 425	2 725 000
3	Portugal	6.1	5 624.93	92 212
4	Moldova	5.4	1 827.68	33 846
5	Uzbekistan	26.1	116 771.4	447 400
6	Ukraine	30.4	183 524.8	603 700
7	Kirgizia	9.6	19 190.4	199 900
8	Turkmenistan	17.7	86 393.52	488 099
9	Spain	11.1	56 164.89	505 990
10	Greece	5.8	7 653.51	131 957
11	Italy	12.5	37 653.75	301 230
12	Hungary	14.4	13 395.6	93 025
13	Latvia	8.7	5 691.24	64 589
14	France	10.7	58 201.58	543 940
15	Turkey	13.4	104 997.31	783 562
16	Albania	20	5 749.6	28 748
17	Serbia	4.2	3 716.96	88 499
18	Montenegro	6.7	925.4	13 812
19	Czech Republic	9.9	7 808.23	78 871
20	Russia	12	2 052 000	17 100 000
21	Georgia	6.6	4 600.2	69 700
22	Poland	0.2	645.15	322 575
23	Slovenia	26.7	5 412.89	20 273
24	Bosnia and Herzegovina	6.8	3 482.21	51 209
25	Slovakia	11.5	5 639.025	49 035
26	Lithuania	14.3	9 337.9	65 300
27	Armenia	19.4	5 770.14	29 743

28	Romania	11.4	27 177.26	238 397
29	Finland	0.4	1 353.76	338 440
30	Belarus	19.27	40 000	207 600
31	Kuwait	72	12 828.96	17 818
32	Bhutan	8.59	3300	38 394
33	Laos	84	198 912	236 800
34	Cambodia	24.58	44 500	181 035
35	Myanmar	17	115 018.26	676 578
36	Malaysia	68.3	225 300	329 847
37	Mongolia	7.8	121 992	1 564 000
38	Vietnam	3.94	13 048	331 210
39	Bangladesh	43	63 837.8	148 460
40	Nepal	21.47	31 600	147 181
41	Thailand	34.87	178 944	513 120
42	Philippines	44.09	132 275	300 000
43	Japan	3.5	13 260	377 975
44	Azerbaijan	12.8	11 084.8	86 600
45	DPRK	17.5	21 094.5	120 540
46	Sri Lanka	33	21 651.3	65 610
47	Iraq	5.13	22 500	438 317
48	China	5.33	512 000	9 597 000
49	Afghanistan	80	522 288	652 860
50	Iran	72.81	1 200 000	1 648 000
51	India	29.76	978 500	3 287 000
52	Pakistan	16.93	134 810	796 095
53	Syria	31	57 405.8	185 180
54	Oman	0.72	2 215	309 501
55	Indonesia	25.3	482 000	1 905 000
56	Jordan	41	36 630.22	89 342
57	Yemen	10.79	56 970	527 968
58	Saudi Arabia	18.6	400 000	2 150 000
59	Maldives	50	148.9	297.8
60	Turkey	13.4	104 997	783 562
61	Tunisia	64.78	106 000	163 610

62	Algeria	5.87	140 000	2 382 000
63	Iceland	22.3	22 969	103 000
64	Croatia	14.3	8 093	56 594
65	Estonia	7.5	3 392.1	45 228
66	Austria	11.3	9 477.42	83 871
67	The Netherlands	13.3	5 525	41 543
68	Bulgaria	7.5	8 324.55	110 994
69	Northern Macedonia	2	514.26	25 713
70	Great Britain	22.4	58 953.62	243 610
71	Denmark	15.5	6 657	42 951
72	New Zealand	5.27	14 125	268 021
73	CAR	11.24	70 000	623 000
74	Madagascar	30	176 112	587 040
75	Canada	11.7	1 168 245	9 985 000
76	Fiji	70.56	12 894	18 274
77	Australia	36.66	2 818 200	7 688 000
78	Belize	20.85	4 788	22 966
79	Costa Rica	19.54	10 000	51 179
80	USA	7.68	755 313	9 834 000
81	Honduras	16.67	18 750	112 492
82	Jamaica	18.2	2000	10 991
83	Mexico	44.5	874 000	1 964 000
84	Cuba	35	38 801	110 860
85	Trinidad and Tobago	58.3	2 989.62	5 128
86	The Dominican Republic	68.95	33 401	48 442
87	Grenada	41.36	142.29	344
88	Nicaragua	30	39 111.9	130 373
89	Guatemala	45.3	49 326	108 889
90	Haiti	50	13 875	27 750
91	St. Kitts and Nevis	20.3	53	261
92	Guyana	0.003	64.49	214 969
93	Peru	54	693 900	1 285 000
94	Paraguay	50.4	205 000	406 752

95	Chili	80	605 560	756 950
96	Bolivia	12.03	132 255	1 099 000
97	Venezuela	14.12	129 394.30	916 445
98	Brazil	16.44	1 400 000	8 516 000
99	Ecuador	49	138 994.4	283 560
100	Argentina	70	1 946 000	2 780 000
101	Zambia	7.32	55 100	752 614
102	Botswana	69	401 393.7	581 730
103	Sudan	34.39	640 000	1 861 000
104	South Sudan	4.19	27 019	644 329
105	Angola	31.17	388 721	1 247 000
106	Eswatini	23.78	4 128.65	17 364
107	Gambia	50	5 650	11 300
108	Burkina Faso	32.8	90 000	274 400
109	Côte d'Ivoire	38.88	125 373.23	322 462
110	Chad	88	1 129 920	1 284 000
111	Senegal	29.97	58 947.75	196 722
112	Benin	19.17	22 000	114 763
113	Eritrea	8	9 408	117 600
114	Ghana	35	83 486.55	238 533
115	Togo	3.83	2 174.5	56 785
116	Tanzania	61	576 503.07	945 087
117	Lesotho	8.25	2 504.29	30 355
118	Comoros	11.83	264.40	2 235
119	Nigeria	62.88	580 841	923 768
120	Niger	75	950 250	1 267 000
121	Zimbabwe	2.77	10 838.25	390 757
122	Uganda	20	48 207.6	241 038
123	Ethiopia	85	945 200	1 112 000
124	Rwanda	32.9	8 666	26 338
125	Somali	23.16	147 704	637 655
126	Malawi	41	48 576.8	118 480
127	South African Republic	60	732 000	1 220 000
128	Egypt	90	901 800	1 002 000

129	Kenya	61.4	357 744.64	582 646
130	East Timor	4.66	700	15 006
131	Lebanon	39	4 076.28	10 452
132	Israel	54.19	12 000	22 145
133	Palestine	80	4 816	6020
134	Sweden	21.5	113 616	528 447
135	Germany	31.4	112 282.63	357 588
136	Malta	19.31	61.01	316
137	Papua New Guinea	31.4	145 339.62	462 840
138	Sierra Leone	0.49	352.8	71 740
139	Namibia	12.67	104 427.3	824 292
140	DR Congo	5.71	134 000	2 345 000
141	Cameroon	25.24	120 000	475 442
142	Belgium	31.7	9 728.1	30 688
143	Cyprus	13.1	1 211.88	9 251
144	Liechtenstein	11.4	18.24	160
145	Ireland	8.8	6 184.02	70 273
146	San Marino	6.7	4.1	61.2
147	Andorra	4.3	20.12	468
	WORLD	**23.91**	**30 021 325.67**	**125 580 221**

Table 9 source data:
UN Sustainable Development Goals database,
https://w3.unece.org/SDG/en/Indicator?id=66

15 LIFE ON LAND

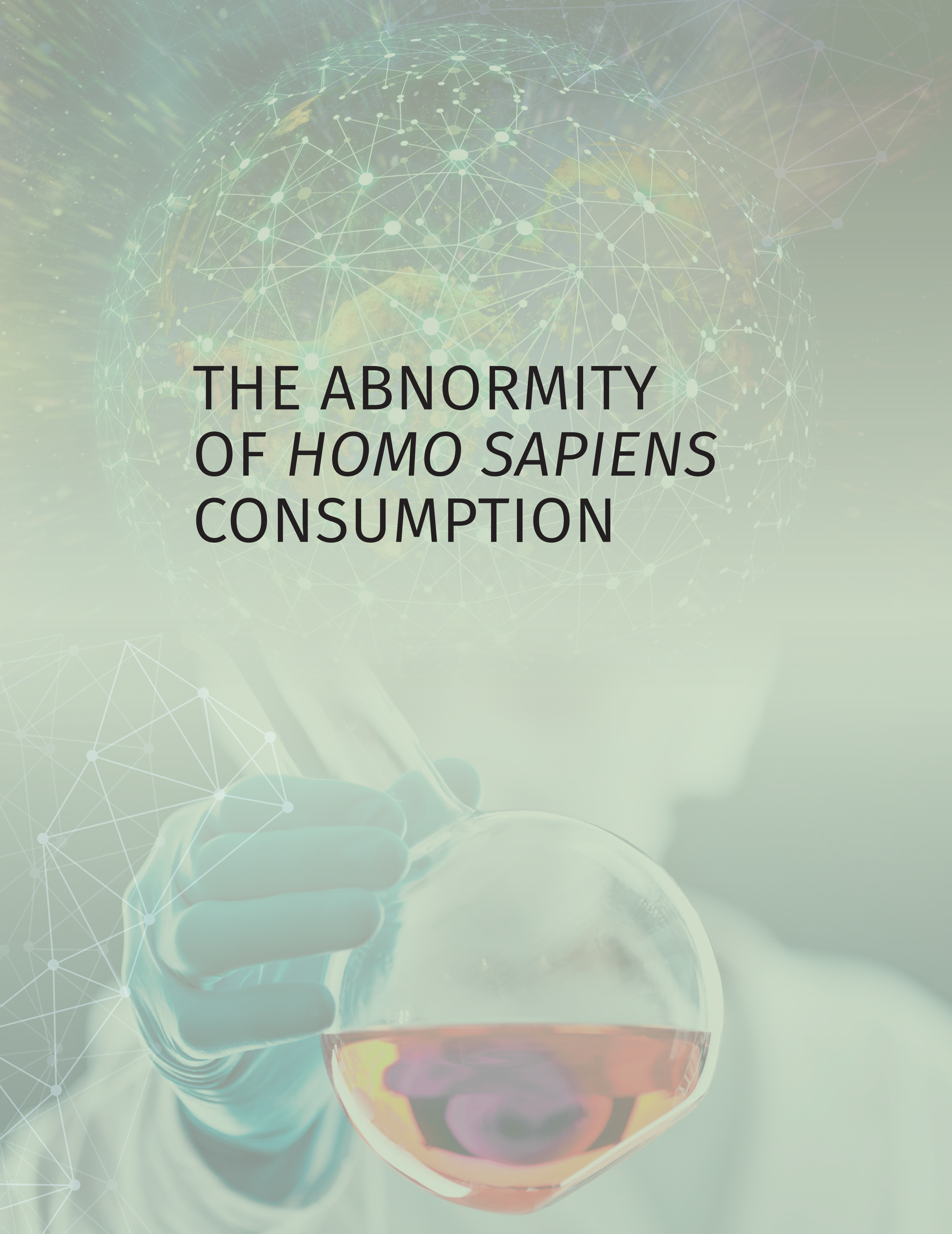
Based on the data in the UN SDG charts and other open sources, the area of global degraded land amounts to 3 billion hectares, or 23.91% of the total land area. It will take several decades free from the impact of human anthropogenic activities to naturally restore this land. This process can only be accelerated with the aid of significant financial, labour, material and energy resources, as well as effective innovative technologies. Otherwise, this land will add to the amount of barren lands, increasing their share in the total land balance from 17.2% to 41.11%. Nevertheless, the uncontrolled growth of the world's population will intensify the anthropogenic impact, which will lead to previously unaffected territories being added to this share and further complete degradation of the soil. The constant reduction in and shortage of fertile soil for such a large world population (8-10 billion people) will inevitably lead to the extinction of humanity.

According to *The Daily Star* of November 2022, the World One supercomputer, which predicts civilizational patterns, has determined that humanity will become extinct before 2050. The World One calculations are based on complex algorithms and on many factors, including birth rates and environmental pollution rates. Several of the supercomputer's predictions have already come true. This applies in particular to the reduction in the availability of natural resources and vital minerals. According to the supercomputer's latest calculations, civilization will collapse by 2050. Global pollution will be the main reason for human deaths. Between 2040 and 2050, civilized life as we know it will come to an end. According to the calculations, even strict birth control and a complete transition to environmentally friendly cars will not change the situation.

The author of this *Civilization Manifesto* addressed this topic in his philosophical novel *Humankind Undone*, as well as in other works and scientific papers, before it was highlighted by the artificial intelligence of the supercomputer. After carrying out an in-depth study and analysis of all the negative anthropogenic factors and assessing the planet's resources, he made some forecasts and proposed his own solution on how to save *Homo Sapiens* by reformatting humans into *Homo Cosmicus*.

INTELLECTUALS OF THE WORLD, UNITE!

THE ABNORMITY OF *HOMO SAPIENS* CONSUMPTION



2.1 TOXIC CHEMICAL COMPOUNDS PRODUCED BY *HOMO CONSÚMENS* AND THEIR CIRCULATION IN NATURE

Intellectuals of the world, unite!

Natural ecological niches are characterised by the ability to accumulate a variety of toxic chemical compounds, the dynamics of which clearly show a constant increase in their concentration. Most of the molecules and atoms of these toxicants used to be constituents of natural compounds before they were converted into toxic compounds. *Cosmicus Quanticus Cerebrum* maintains constant control over the cycle of alien carbon and nitrogen compounds, including toxic ones, in the environment, so most of the toxic structures are converted into natural forms acceptable for the *Microbiome*. In natural processes, nature itself creates several unnatural toxic compounds. However, to a much greater extent, industrial processes, the energy industry, transportation and other forms of human activity result in the formation of toxicants. The incremental increase in technogenic, unnatural toxicity, which is dubious in origin and incompatible with *Cosmicus Quanticus Cerebrum,* negatively affects human health, biodiversity and the ecology of the planet.

...HOWEVER, TO A MUCH GREATER EXTENT, INDUSTRIAL PROCESSES, THE ENERGY INDUSTRY, TRANSPORTATION AND OTHER FORMS OF HUMAN ACTIVITY RESULT IN THE FORMATION OF TOXICANTS...

Thus, the sources of environmental chemical pollution are divided into natural and anthropogenic.

Local environmental degradation can result from such natural disasters as biological oxidation of natural compounds and the release of toxic gases from closed air spaces and swamps formed by the activity of aerobic and anaerobic consortiums of microorganisms, as well as from toxic gases released during volcanic eruptions, earthquakes and other processes.

The harm caused to the environment by anthropogenic activities has significantly surpassed natural processes. As a result of urbanisation, unpredictable growth in industry, transport and agriculture, ongoing hostilities and uncontrolled overconsumption, *Homo Sapiens* has created a powerful weapon of toxic contaminants aimed at its own destruction.

Contemporary science cannot solve the set tasks of creating global technologies aimed at improving the global ecology. We do not have sufficient natural intelligence or the necessary investments. The temptations created by the civilization of *Homo Consúmens* (consuming humans) distracts and diverts scientists away from the task at hand and deprives them of opportunities to fully realise their scientific potential.

TOXIC SUBSTANCES OF BIOLOGICAL ORIGIN

The toxic substances created by Cosmicus Quanticus Cerebrum not only include atmospheric air substances, but also comprise a special intracellular segment of natural toxic compounds; they are found in plants, microorganisms and animal organisms, posing a danger only to humans.

For example, poisons of biological origin occur as high-molecular protein substances, although low-molecular toxins such as tetradotoxin, animal poisons, etc. are also known [31]. Toxins produced by microorganisms, plants and animals are distributed around the world. Their effect on the human body inhibits physiological processes, represses the activity of enzymes and disrupts metabolic processes. In most cases, the effects of biological poisons are fatal. In terms of their effect, toxins can be divided into the following groups (Table 10).

CLASSIFICATION OF TOXINS ACCORDING TO THEIR EFFECT ON THE HUMAN BODY

TABLE 10

Item number	Name of toxin	Mode of toxic action
1	2	3
1	Heamotoxins	Affect the blood
2	Neurotoxins	Affect the nervous system
3	Myotoxins	Affect the muscles
4	Haemorrhaginstoxins	Affect blood vessels
5	Haemolysinstoxins	Affect red blood cells
7	Nephrotoxins	Disturb nephric activity
8	Cardiotoxins	Disturb cardiac activity
9	Necrotoxins	Cause necrosis

The strongest natural poison is botulinum neurotoxin type D (the lethal dose is $0.32x10^{-6}$ mg/kg), which is millions of times more toxic than potassium cyanide. It is followed by botulinum toxin type A, dioxin, tetradotoxin (puffer fish), sea snake venom, cobra venom, hydrogen cyanide and potassium cyanide. Batrachotoxin, derived from the skin of the Colombian golden poison frog, is the strongest non-protein poison.

Neurotoxins are natural poisons produced and used by various organisms for self-defence. Potulinum toxin, poneratoxin, tetradotoxin, batrachotoxin and the poisons of bees, snakes and scorpions belong to the above-mentioned category (Table 11).

IN MOST CASES, THE EFFECTS OF BIOLOGICAL POISONS ARE FATAL

THE CHARACTERISTICS OF NATURAL TOXINS

TABLE 11

Name	Source	Molecular weight, D	LD_{50}	
			mg/kg	mmol/kg
1	2	3	4	5
Botulinum toxin type A	Clostridium botulinum	150000	$2.6 \cdot 11^{-8}$	$1.7 \cdot 10^{-13}$
Botulinum toxin type B	Clostridium botulinum	167000	$1.0 \cdot 11^{-8}$	$0.6 \cdot 10^{-13}$
Tetanus toxin	Clostridium tetani	140000	$2.8 \cdot 11^{-8}$	$2.0 \cdot 10^{-13}$
Ricin	Castor-oil plant seeds	65000	$2.8 \cdot 10^{-3}$	$4.3 \cdot 10^{-8}$
Taipoxin	Venom of the Inland Taipan	42000	$2.0 \cdot 10^{-3}$	$4.8 \cdot 10^{-8}$
β-Bungarotoxin	Krayt dragon venom	28500	$2.5 \cdot 10^{-2}$	$8.8 \cdot 10^{-7}$
Cobrotoxin	Cobra venom	6782	$5.0 \cdot 10^{-2}$	$7.4 \cdot 10^{-6}$
Toxin II	Scorpion venom	7249	$0.9 \cdot 10^{-2}$	$1.2 \cdot 10^{-6}$

Toxins of biological origin differ significantly in terms of their effect. As extremely highly toxic compounds, the neurotoxins created by *Cosmicus Quanticus Cerebrum,* serve to protect the host organisms that synthesize them (from microorganisms to vertebrates). Other such compounds are neurotoxins that enter the body from the external environment. They are exotoxins and include gases (CO), metals (mercury), liquids (ethanol) and several solids.

Hemotoxins formed by animals, plants and microorganisms damage the membranes of red blood cells and destroy them, i.e., cause their haemolysis [33]. *The Microbiome* has created hemotoxins of various origins, formed by opportunistic and pathogenic streptococci, staphylococci and other microorganisms; plants (crocin, saponins, etc.); animal organisms such as parasitic worms, spiders (arachnolysins) and snakes (poisons). The action of these and several other chemical compounds, including drugs, results in nephrotoxicity**,** which damages the liver. More often, nephrotoxicity occurs in individuals who have had signs of decreased liver function before taking any medication.

The list of existing natural toxicants, as well as their structures and functions with respect to *Homo Sapiens,* has not been fully understood and is of great scientific and practical interest for medicine and contemporary toxicology/environmental science.

UNNATURAL TOXIC SUBSTANCES

This category of pollutants has an unnatural structure; they are not subject to biodegradation or slowly degrade over time, that is, they are highly stable in environmental conditions and exhibit toxic properties. They include chemical compounds formed during the incomplete combustion of organic substances, pesticides, some types of fertilizers, varnishes and paints, organic solvents, emulsifiers, preservative agents, oil products, household chemical products and chemicals used in the production of polymers (polymers, monomers, pigments, plasticizers, stabilizers, etc.), pharmaceutical industry products, surfactants, freons, explosives, packaging materials, etc.

A special group of pollutants includes radionuclides, which are a source of ionizing radiation and have an extremely negative effect on all organisms and life processes. Radionuclides form a special group of environmentally hazardous substances and pollutants, for the neutralisation of which special remediation measures have been developed, including environmental technologies that ensure their maximum reduction or complete removal from the ecosystem [34].

Heavy metals, which are components of various toxic emissions into the atmosphere and constituent components of natural ecological niches, form a widely distributed separate group of toxic compounds.

Heavy metals are chemical elements with a certain density, which is at least 5 times higher than the density of water. In small quantities, these elements are necessary for living organisms, but an increased content of any of them causes acute or chronic poisoning. The toxicity of heavy metals in an increased amount suppresses the growth and development of microorganisms and plants, causing serious damage to human and animal health. Heavy metals cause dysfunction of the central nervous system, changes in blood composition, adversely affect the functions of the lungs, kidneys, liver and other organs and cause the development of cancer, allergies, dystrophy, physical and neurological degenerative processes. Twenty-three of the 35 metals have found widespread use in *Homo Consúmens* activities and are produced on an industrial scale. According to the toxicity characteristic of these elements, arsenic, lead, mercury and cadmium rank first, second, third and seventh, respectively.

2.2 HEAVY METALS

ARSENIC

Semimetal arsenic is one of the most toxic elements and is actively used in various spheres. All arsenic compounds are extremely toxic. When heated, they decompose, which causes the spread of poisonous arsenic fumes. Sources of environmental arsenic pollution are emissions from the extraction and processing of arsenic ores; production of arsenic and its compounds; melting copper, lead and zinc; burning coal, etc. Such arsenic compounds as oxides, arsenites and arsenates are used mainly for wood processing. Statistics show that 88% of the total amount of arsenic is used for these purposes. Its compounds are used in insecticides, herbicides and desiccants; they are also used in the manufacture of various types of glass, anti-corrosion alloys, ammunition and acid batteries. High-purity arsenic is used in semiconductors, solar cells, LEDs, lasers and integrated circuits.

Arsenic compounds released into the atmosphere with emissions settle on the surface of the soil and water bodies, are absorbed by plants and then enter the food chain.

Arsenic and its compounds are carcinogenic. They cause tumours in the skin, liver, intestines, bladder and lungs.

Some tropical algae are arsenic-resistant. They are able to absorb arsenic in the form of arsenate, reduce it to arsenite and bind it to phospholipids. The conjugates formed are stored in fat droplets or cell membranes. In the event of a high phosphate content in water, the same algae lose their ability to neutralise the toxic effects of arsenate ions and die. In this case, arsenic covalently binds to the sulfhydryl groups of enzymes, causing significant inhibition of their activity.

Some types of filamentous fungi and bacteria can also absorb and convert arsenic compounds. For example, under aerobic conditions, methanogenic bacteria are able to convert inorganic arsenic into methylated compounds, which are enzymatically reduced to volatile alkyl arsines.

LEAD

Lead is a heavy metal widely used in industry. Metallic lead and its compounds — oxides, halides, carbonates, chromates, sulphates, etc. — are used in mechanical engineering, for the manufacture of batteries, piezoelectric elements, rubber, glass, glaze, enamels, drying oils and putties, in printing, for the manufacture of paints, in particular, lead pigments and ceruse white, serve as an additive to varnishes and paints to increase the stability of coatings, are used as anti-knock additives to petrol, for protection against γ-radiation, etc.

Several million tons of lead are produced annually throughout the world. The most important technogenic sources of lead emission include emissions and wastewater generated during high-temperature technological processes of metallurgical, metal-working, machine-building, chemical, pharmaceutical, petrochemical and other industries; exhaust gases of internal combustion engines; mining, transportation and processing of metal; erasing parts containing lead, etc. A high degree of lead pollution has also been established in soils at the sites of military operations and ranges [36].

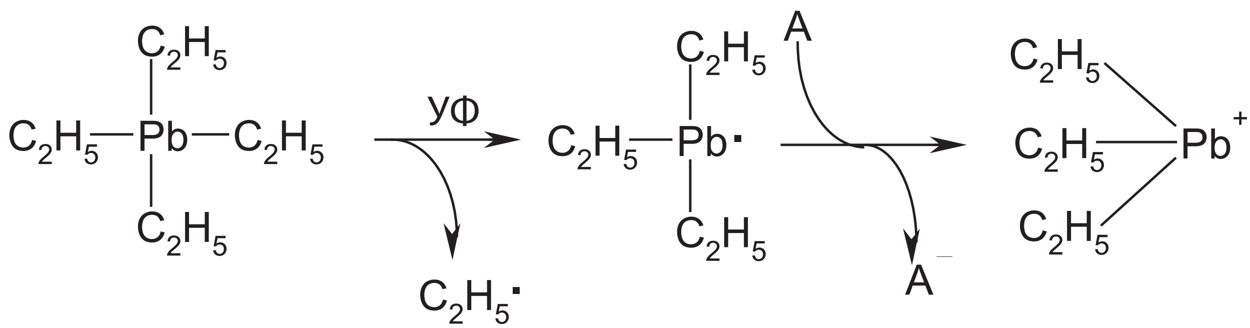
Exhaust gases emit lead compounds (oxides, chlorides, fluorides, nitrates, sulphates, etc.) in the form of solid particles, about 20% of which settle in the immediate vicinity of the road. Therefore, agricultural plants, particularly fast-growing vegetable crops, should not be planted near highways.

The excess lead content in the soil leads to a decrease of the main representatives of the soil's microbiocenosis. The degree of lead toxicity for microflora depends on the type of soil: in chernozems, toxins are neutralised faster than in other soils. Some representatives of eukaryotes — microscopic fungi and prokaryotes — are the most resistant to lead compounds. Actinomycetes and nitrogen-fixing bacteria are much more sensitive to lead. Obviously, the presence of these organisms can be used as bioindicators of lead contamination.

In soil, lead levels that reduce yield or plant height by 5–10% are considered toxic. When the lead content in the soil is above 50 mg/kg, its concentration in horticultural crops exceeds the permissible limit. It should be noted that lead enters the human body mainly through food chains (about 90%), 60–70% of which is found in plant products [37].

Lead causes chronic poisoning called "saturnism" (lead poisoning) with a variety of clinical manifestations: it affects the central and peripheral nervous systems, bone marrow, blood and blood vessels, inhibits protein synthesis, acts on the genetic apparatus of the cell, has a gonadotoxic and embryotoxic effect and activates oncological processes [38].

The difference in toxicity of all lead compounds is explained by the unequal solubility of these compounds in the body's gastric juice, intestines, blood and cytoplasmic fluid. Sparingly soluble lead compounds also undergo transformations in the intestine, and, as a result, their solubility and absorption increase significantly. Ceruse, sulphate and oxide of divalent lead are more toxic than other compounds. Lead compounds containing a toxic anion, such as orthoarsenates, chromates and azides, are particularly toxic. Some organic lead compounds, in particular, lead tetraethyl, which is used to increase the octane number of petrol, are distinguished by biocidal properties. Volatile lead tetraethyl rapidly spreads in the air and, as a result of UV rays, is split into radicals (Fig. 15). The lead triethyl radical reacts with various substances (A) with acceptor properties [35].



lead tetraethyl lead triethyl radical lead triethyl ion

FIG. 15. Formation of the lead triethyl radical and ion from tetraethyllead (A — acceptor)

Due to the ionic charge, the resulting triethyllead ion Pb(C2H5)3+ exhibits hydrophilic properties, and the presence of ethyl groups makes the ion lipophilic, due to which the triethyllead ion easily penetrates through cell membranes and binds to sulphur atoms, proteins and peptides, causing changes in their structure. It should be noted that, due to its high toxicity, the use of leaded petrol in many countries is prohibited or restricted.

MERCURY

80
Hg

This heavy metal exists in the earth's crust as cinnabar (HgS), a relatively harmless substance. In addition to natural processes, *Homo Consúmens'* irrational consumer activity has led to the accumulation of more than 50 million tons of this heavy metal in the world's oceans, in the form of toxic compounds. Anthropogenic sources of mercury distribution include the electrochemical manufacture of chlorine, mercury-containing devices, paints for synthesis, etc. [39]. Its natural sources are the weathering of rocks and volcanic activity.

Under natural conditions, mercury compounds are mainly adsorbed in stream sediments. Mercury is slowly released from them and dissolves in water, which leads to the formation of a chronic source of pollution. Initially, mercury enters water in the form of Hg^{2+} ion. Then, under the effect of anaerobic microorganisms, it quickly interacts with organic substances and forms extremely toxic compounds of dimethylmercury (CH_3_Hg_CH_3) and methylmercury ion (CH_3_Hg)$^+$ [40]. Due to its high solubility, methylmercury quickly penetrates into hydrobionts (algae, molluscs, fish, etc.) and subsequently enters the blood's food chain and brain tissue, destroying the cerebellum and cerebral cortex. Numbness, loss of orientation and blurred vision are among the clinical symptoms of this involvement. Mercury poisoning can be fatal.

Mercury compounds cause inactivation of some key enzymes of cellular metabolism, in particular, cytochrome oxidase, which is involved in respiration. Moreover, mercury can combine with sulfhydryl and phosphate groups, inactivate enzymes containing sulfhydryl groups and damage cell membranes.

CADMIUM

48
Cd

Cadmium is a heavy metal characterized by high toxicity, very high mobility and permeability. Cadmium metal and its compounds are mainly used for the production of pigments, as a stabilizer for plastics (especially polyvinyl chloride), for the manufacture of batteries, nuclear reactor rods, electric cables, car radiators, solders, alloys, phosphate fertilizers, etc.

Cadmium sulphide (CdS) and selenide (CdSe) are heat-resistant yellow and red dyes, respectively, and are used in printing, in the manufacture of varnishes, paints and rubber products, as well as in leather dyeing. Cadmium oxide (CdO) and cadmium carbonate ($CdCO_3$) are used for colouring glasses, preparing enamels, applying glazes on ceramics, etc. [41].

The manufacture of steel and other metals, the combustion of fossil fuels and garbage, tobacco smoke, the use of fertilizers, as well as wastewater from industrial enterprises, and the leaching of cadmium from agricultural plantations are the main anthropogenic sources of cadmium emissions into the atmosphere [41].

Cadmium mainly attaches to dust particles that can enter the body through breathing. During the precipitation of cadmium from the atmosphere (dry and wet), plants actively contact with cadmium, and some of the cadmium can penetrate the leaves through the cuticles. If a high concentration of cadmium is formed in plants, it most often leads to the disruption of normal growth. For example, the yield of legumes and carrots is reduced by 50%. Unlike plants, many types of fungi accumulate cadmium in large quantities.

Food is the main source of cadmium ingestion in animal organisms. Cadmium reduces the activity of such important digestive tract enzymes as trypsin and pepsin. In addition, cadmium is a calcium antagonist meaning that in the event of calcium deficiency, cadmium is accumulated in body in an increased amount. Since the need for calcium in young organisms is higher than in adults, they are more susceptible to the accumulation of cadmium. Increased accumulation of cadmium causes itai-itai disease, which is characterised by a decrease in the calcium content in the bones, thus leading to their softening. In the kidneys, liver and gallbladder, cadmium binds to proteins and peptides that are involved in the exchange of cadmium between various tissues and organs. Cadmium has the most perceptible effect on the kidneys. Excess cadmium competes with zinc and inhibits the action of zinc-containing enzymes, which disrupts the normal functioning of the kidneys [42]. It leads to proteinuria. In the liver, cadmium blocks enzyme systems containing sulfhydryl groups.

Earthworms are able to rapidly accumulate cadmium from the soil, which is why they are often used to test the soil's cadmium content.

2.3 AROMATIC HYDROCARBONS

BENZENE

The petrochemical industry accounts for more than 90% of the benzene produced, the rest comes from coke production and natural gas. As the largest exporter, the UK annually produces about a million tons benzene.

The aromatic benzene ring is used as a basis for measuring the toxicity of many organic compounds. Benzene itself and its homologues are extremely toxic.

To a large extent, benzene and its homologues, in the form of various mixtures (so-called BTEX — benzene-toluene-ethylbenzene-xylene), are used in many types of fuel to increase its octane number, while replacing lead tetraethyl as a very toxic petrol additive. In addition, benzene is used as a raw material in the production of styrene, cyclohexane, ethylbenzene, cumene, nitrobenzene, aniline, etc., as well as a solvent or additive in the manufacture of paints, inks, rubber, glue and stain-removing mixtures and the production of furniture, detergents, medicines and pesticides. Cigarette smoke also contains some benzene.

The main anthropogenic sources of benzene distribution and its homologues in the environment are the following:

- release of crude oil and oil products during the refining and processing of crude oil;
- emissions from enterprises producing and processing tar and coal;
- production wastes, in the technological schemes of which, benzene is the final product or the initial component of the synthesis;
- emissions from the combustion of fuel and fossil fuels;
- leakage from underground reservoirs (tanks) for storing combustible products.

Benzene is primarily discharged into the atmosphere during production or use, and then enters other ecosystems. Benzene is found in different quantities in the oceans, seas, lakes, water storage reservoirs and rivers, in groundwater, even in drinking water, soil, precipitation, etc.

Benzene and its homologues have long been known as carcinogens that cause leukaemia. After it penetrates the liver or lungs as a nonpolar and relatively stable compound, benzene undergoes primary oxidation by cytochrome P450-containing monooxygenase, resulting in the formation of benzene-oxepin and benzene oxide [43]. These compounds have higher water solubility and are more reactive than benzene itself.

Further, the products of primary benzene oxidation are transferred from the liver by the blood to other organs, including the bone marrow. In these tissues, benzene oxepin and benzene oxide undergo the following enzymatic transformations: first, they are reduced to phenol, which is then oxidised to catechol or hydroquinone. These diphenols are in turn oxidised to benzoquinones. The transformation of diphenols is mainly catalysed by enzymes of bone marrow cells. The resulting benzoquinones are extremely reactive. Due to the oxo groups, each of them can bind two molecules of protein or nucleic acids, which leads to the disruption of their normal biological function [43].

POLYCYCLIC AROMATIC HYDROCARBONS (PAHS)

Polycyclic aromatic hydrocarbons, which are highly toxic compounds, are almost insoluble in water, have a high boiling point and do not easily undergo biological degradation [35]. These compounds are quite widespread in the environment: 3, 4 – benzopyrene; 1,2-5,6-dibenzoanthracene; 7,12-dimethylbenz[a]anthracene; 3-methylcholanthren; and 3,4-benzofluoranthrene.

PAHs are not produced on an industrial scale; compounds of this class are formed during combustion and are contained in many natural materials. PAHs can also be found in resins, bitumen, soot, humic components of the soil, exhaust gases from internal combustion engines, smoked products, tobacco, etc. PAHs are found in the air, water and soil. These compounds are extremely stable in any environment, which creates a real danger of their highly concentrated accumulation in living organisms.

PAHs are generally characterized by carcinogenic properties. When ingested, PAHs form epoxy compounds, under the action of enzymes, that react with guanine. This prevents DNA synthesis, causes disruption of transcription processes, often leads to mutations and contributes to the development of cancer.

Only a small number of microorganisms and plants can neutralise PAHs by degrading them to common cellular metabolites [44].

2.4 Pesticides

Chemicals widely used as modern plant protection products and synthesised by *Homo Consúmens* are grouped under the general name of 'pesticides'. Considering their area of distribution, they are currently the main compounds that pollute the environment, primarily the soil. According to the latest data from the Environmental Protection Agency (EPA) and the World Health Organization (WHO), more than 1,000 compounds representing various chemical classes are defined as pesticides. Among them are the following: amides, dipyridyls, diphenylethers, thiocarbamates, carbamates, carbamides, coumarins, nitrophenols, pyrazoles, pyrethroids, triazines, phenoxyacetates and urea derivatives. This class of compounds also includes organoelement compounds containing chlorine, bromine, fluorine, phosphorus, arsenic, tin, mercury, copper and others. The manufacture of pesticides is growing annually and is estimated at least one billion tons per year, which is due to their increasing use in agriculture [45-47]. Pesticides are classified according to several properties and chemical composition.

Widely used organophosphate pesticides are esters of phosphoric and thiophosphoric acids (for example, such insecticides as alkyl phosphates and parathion), as well as carbamates (for example, herbicides: barban, betanal, and fungicides: maneb and others). They are chemical agents that are detrimental to the nervous system. They block the active site of acetylcholinesterase. This enzyme removes the neurotransmitter acetylcholine from the nerve synapse. As a result of inhibition of acetylcholinesterase, excess acetylcholine accumulates at the synapse, which disrupts signal transmission by the acetylcholine receptor.

Highly active compounds include organochlorine insecticides (chlordane, lindane, dieldrin and dichlorodiphenyltrichloroethane (DDT). Used as a solution, these pesticides easily penetrate the human body, both through the digestive organs and through the skin. Due to their high lipophilicity, they accumulate in adipose tissues and affect and damage cell membranes. Organochlorine insecticides have a particularly harmful effect on the membranes of nerve cells and disrupt their normal cycle. Almost all organochlorine insecticides have pronounced carcinogenic properties. When ingested in large quantities, phosphates, carbamates, alkyl phosphates (triethyl phosphates) and others give rise to such diseases as salivation, pulmonary oedema, colic, diarrhoea, nausea, blurred vision, increased blood pressure, muscle spasms and convulsions, speech impairment, paralysis respiratory tract, etc. Organochlorine compounds change the excitability of nerve cells. First, they damage nerve pathways, and then, at higher concentrations, they damage sensory neurons. It should be noted that among other pathologies usual for these pesticides, chlordane and dieldrin are compounds that have a pronounced carcinogenic effect.

The unrestricted use of DDT has led to its ubiquity, primarily due to its good fat solubility. This factor determined the introduction of this insecticide into the food chain, whereby the insecticide becomes concentrated at the end of this chain to a degree that is almost a million times higher than its concentration in natural conditions. An example of such an unusually large

... MORE THAN 1,000 COMPOUNDS REPRESENTING VARIOUS CHEMICAL CLASSES ARE DEFINED AS PESTICIDES...

accumulation is the food chain that runs from rainwater through ruminants to breast milk.

DDT is well absorbed in clays and also accumulates in humus with pine needles, where this insecticide dissolves in the waxy substance of pine needles, thus having an extremely negative effect the ecosystem and destroying many organisms that inhabit pines.

DDT is a typical contact poison that quickly penetrates the skin. It disrupts the normal cycle in the nerve cells membranes, since it reduces the sensitivity of the Na^+ pump, therefore, after excitation of nerve signals, the normal resting potential is not restored. Ingestion of a large amount of DDT causes paralysis of the limbs. It is assumed that through breast milk, this insecticide can seriously harm the health of a child or, if it penetrates into the sex glands (gonads), can disrupt reproductivity.

Under normal conditions, DDT decomposes slowly and incompletely. Under aerobic conditions, the degradation products are dichlorethylene derivatives, which are less toxic than DDT itself. Under anaerobic conditions, dichloroethane derivatives are formed, which are easily transformed into acetic acid derivatives [35].

The physiological effect of herbicides on the human body differs from their effect on plants. Thus, 2,4-D and 2,4,5-T have fewer herbicidal properties than 2,3,7,8-tetrachlorodibenzodioxin (TCDD), which is present as an impurity and characterised by extremely high toxicity. This substance is 500,000 times more toxic than the herbicide itself, and if its content in the herbicide is even as low as 0.005 mg/kg, this concentration cannot be considered harmless. TCDD is exceptionally stable in all natural environments.

Here is a salient historical fact [48]: in the small American town of Times Beach, Missouri, about 10 m^3 of technical oil was sprayed onto the ground of the hippodrome so that dust would not rise during the races. A few days later, the hippodrome was littered with dead birds, a day after that a rider and three horses fell ill, and then 29 horses, 11 cats and four dogs died in a month. Three months later, several more adults and children fell ill, after which the authorities were forced to conduct a special investigation to establish the true cause of what was happening. It transpired that toxins and furans were to blame, since their concentration in the hippodrome's soil reached 30–53 mg/kg. The technical oil was a waste product from the manufacture of 2,4,5-trichlorophenol, an intermediate product in the production of 2,4,5-T. This defoliant substance known as "Orange Reagent" caused the disaster in Times Beach.

Even on external contact with the skin, such dipyridyls as the herbicide paraquat cause blistering and ulceration. When ingested, it damages the kidneys and liver and then causes lethal fibrotic changes in the lungs. Pyrethroid pesticides, which are synthetic analogues of the widespread insecticide pyrethrin, are compounds extracted from chrysanthemums.

The *Microbiome* provides an opportunity for animals, birds, soil organisms and plants to actively participate to varying degrees in the circulation and degradation of toxicants in the soil. The highest decontamination activity is shown by microorganisms of different taxonomic groups (bacteria, fungi, actinobacteria). Plants, in the same way as microorganisms, are able to assimilate toxic compounds of anthropogenic origin and, due to hydrolytic and redox-enzymatic reactions, degrade, that is, neutralize them, by reducing the structures of toxic compounds to ordinary cellular metabolites or carbon dioxide. Being entirely natural, this way of exhaustive detoxification of many toxicants based on their metabolic transformation in plants to carbon dioxide and water is the friendliest for the biological environment created by the *Microbiome*. At the same time, the products of intracellular degradation of toxicants, including carbon atoms, are used by plant and microbial cells in the constructive synthesis of compounds required by the cell.

2.5 ORGANOCHLORINE TOXICANTS

In addition to chlorine-containing pesticides, organochlorine toxicants also include dioxins, polychlorinated biphenyls, chlorinated derivatives of methane, ethane, ethylene, etc. Chlorine atoms, which are part of these compounds, significantly increase their resistance to the action of oxidases (oxidative enzyme systems) involved in both abiotic oxidation and detoxification of organochlorine toxicants. Furthermore, most chlorine-containing compounds are highly lipophilic, due to which they easily penetrate cell membrane barriers and accumulate almost freely in various organs, including the nucleus, causing irreversible changes [49–53].

DIOXINS

A group of compounds comprised of both polychlorinated dibenzodioxins and dibenzofurans.

Dioxins are highly toxic substances with teratogenic, mutagenic and highly carcinogenic effects [54-56]. Dioxins are always present in the environment as a complex mixture of congeners and isomers. Dioxins are formed as a result of the technological processes carried out by chemical enterprises producing chlorine, organochlorine pesticides, polychlorobenzenes, chlorinated alkanes and alkenes. During the electrochemical production of chlorine, dioxin, which is present as an impurity in the gas formed and undergoes chlorination, is produced when carbon anode, chlorine and atmospheric oxygen interact ,.

Pulp and paper production heavily pollute the environment with dioxins, since the wood is treated with chlorinated reagents to remove lignin and the rest of the phenolic part. As a result, a large number of dioxins are produced. The same happens in papermaking when chlorine or chlorine compounds are used as bleaching agents. High-temperature chemical processes involving organic and inorganic chlorine-containing compounds are another source of dioxin emission into the atmosphere [57].

These include the incineration of municipal solid waste and the emissions of road transport, since 1,2-dichloroethane is added to fuel to prevent lead compounds from becoming deposited on the internal parts of engines running on leaded petrol.

Dioxins, like other polychlorinated compounds, are highly resistant to biotic and abiotic transformation conditions in the environment. Possessing a carcinogenic effect and being toxic to living organisms, dioxins pose a real threat to the environment and human health.

Upon contact with the skin, they cause chloracne, a disease characterised by particularly severe skin lesions, resulting in long-term non-healing ulcers. Dioxins also cause diseases that damage the endocrine system, disrupt the function of the glands involved in sexual development and have a detrimental effect on development of the embryo. Under the influence of dioxins, an immunodeficiency develops in the human body that results in increased vulnerability to infectious diseases.

Due to the exceptional stability of their structures, dioxins are hard to biodegrade. Their full mineralisation is only possible thanks to the combined action of anaerobic and aerobic microorganisms. It has been established that there is a bacterium capable of destroying these toxicants. This is an *Dehaloccocus* sp. anaerobic bacterium, which removes chlorine atoms from the dioxin molecule by reductive dehalogenation. In this case, *p*-dioxin is formed, which is converted by the action of dioxygenase and hydrolase enzymes, as a result of which the aromatic nucleus is split and standard cellular metabolites are formed. In eukaryotic organisms, the same effect was found in some strains of basidiomycetes, representatives of the *Phanerochaete chrysosporium* genus.

Some representatives of soil filamentous fungi and actinobacteria are extremely sensitive to dioxins. The absence of these microorganisms in the soil can indicate dioxin pollution.

POLYCHLORINATED BIPHENYLS

Polychlorinated biphenyls are a group of chemical compounds with particularly strong toxicity [57]. Polychlorinated biphenyls (PCBs) include more than 20 particularly toxic compounds. All polychlorinated biphenyls have exceptionally high thermal stability; they do not burn, so they are used in electrical engineering, printing and the manufacture of paper, inks and paints. As flame retardant additives, they are used in transformers and industrial oils, various heat transfer fluids, plastics and packaging materials as pesticide constituents. Polychlorinated biphenyls are practically insoluble in water and have a high boiling point [58]. Despite this, PCBs are abundant in the environment. Because of the exceptionally high stability of their structures in natural conditions, these toxicants remain unchanged for a long time, and, due to their high lipophilicity, they are easily concentrated in plant and animal tissues, from where they enter the food chain and pose a great danger to human health.

The chemical stability of polychlorinated biphenyls is largely determined by halogen atoms. If the amount of chlorine molecules is less than 30% of the total mass, biphenyls are less stable, more biodegradable and are excreted from the body more easily than biphenyls, in the molecules of which chlorine does not comprise less than 60% of the total mass.

CHLORINATED ALKANES AND ALKENES

Of the toxic derivatives of hydrocarbons, the following chlorine-substituted alkanes and alkenes should be noted: tetrachloromethane CCl_4, dichloromethane CH_2Cl_2, chloroform $CHCl_3$, dichloroethane $CH_2Cl–CH_2Cl$, vinyl chloride $CH_2=CHCl$, trichlorethylene $CCl_2=CHCl$, tetrachlorethylene $CCl_2=CCl_2$ and others. These compounds are widely used in organic synthesis both as solvents and reagents. Chloroalkanes and chloroalkenes are highly volatile compounds; their water solubility and volatility are much higher than in corresponding hydrocarbons.

Trichlorethylene remains unchanged in the soil for several months. It has been established that poplar, aspen, willow, clover, alfalfa, rye, sorghum and some other plants actively absorb trichlorethylene and other chlorinated aliphatic hydrocarbons, which leads to partial mineralisation of the toxicant [53].

In terms of its toxic effects on the human body, trichlorethylene is similar to carbon tetrachloride. As a result of transformation, the trichloroacetaldehyde formed is characterised by mutagenic properties. This compound causes unnatural structural changes in DNA molecules.

The polyvinyl chloride monomer, vinyl chloride, is known to have cariogenic properties [53]. This polymer is particularly widely used in industry. Linoleum, washable wallpapers, artificial leather, plastic bottles and many other polymer products are manufactured from it.

The vast majority of toxic compounds of the anthropogenic spectrum are able to actively migrate in all natural ecosystems.

2.6 THE MIGRATION OF TOXICANTS

Once in the biosphere, toxic compounds migrate into the environment. This is due to the characteristic tendency of chemical substances to spread in ecosystems for physical, chemical and biological reasons, caused in particular by the following:

- physicochemical properties of toxicants: molecular weight, solubility in water, hydrophobicity (distribution coefficient of a substance between non-polar and polar solvents – n-octanol and water, denoted by KOW) and vapor pressure, which determines the volatility of substances, the presence of chemically active functional groups, etc.;
- physical processes of mass transfer and emission of substances, such as adsorption, desorption, diffusion, convection, dispersion, dry and wet deposition, etc.;
- chemical processes, in particular, oxidation, hydrolysis, synthesis, photolysis, conjugation of toxicants or their derivatives with natural materials, etc.;
- geographical processes of circulation of substances, for example, atmospheric transfer (precipitation, winds, hurricanes, floods), oceanic circulations, transfer by river waters, etc.;
- biological processes involved in the global natural cycles. These include bioconcentration, biomultiplication, bioaccumulation, biotransformation, biodegradation, biotic transfer of substances, etc.

The first stage in the spread of toxic compounds is their migration from the area of their specific use. The speed of this process primarily depends on the specific method / technology of their use or the location of the toxicant (for example, in the case of a pesticide, it is of great importance how it was sprayed – on the ground or from an aircraft). Geographical factors that determine the tendency of the toxicant to spread, as well as its fugacity, i.e., the tendency of a substance to escape from its initial location, are of great importance.

Escape of toxic substances from the area of their use is followed by further heterogeneous distribution in adjacent ecosystems. The most important stage in the distribution of toxicants is the abiotic and biotic transfer of substances between natural media such as soil, water and air, which is also determined by a number of geographical, physical, chemical and biological factors. Among the wide variety of locally applied environmental technologies designed to eliminate the effect of toxicants, the degradative metabolic potential, primarily of microorganisms, as well as plants, is especially important, since it prevents their spread beyond the ecosystem of their location. Due to their genetically determined ability to use the carbon atoms formed as a result of degradation in the constructive synthesis of ordinary extracellular metabolites, these organisms are distinguished by their ability to utilise toxicants according to the principle of low-waste technology.

Toxic compounds are characterised by different specifics of migration in particular ecological niches.

Adsorption processes play an important role in soil contamination with toxic compounds and their possible long-term effect. Due to the different adsorption capacity of the constituent components, toxicants that have entered the soil are distributed unevenly. Basically, they are sorbed on the lipophilic organic material of the soil, absorbed by the mineral (clay) layer and also covalently bound to the humic components. During desorption, salt solutions do not completely remove the products of the reaction of toxicants with the humic fraction from the soil. Nor can they completely remove the molecules of toxicants embedded in the layered structure of clay minerals or humic macromolecules present in the air. Adsorption significantly slows down the mass transfer of dissolved chemicals, which is the main driving force behind the migration of toxicants in the soil. High soil porosity, large molecular sizes, low concentration gradient, etc. are factors that slow down diffusion. Local soil pollution remains intact for a long time. This is due both to the high adsorption capacity of the soil and the physicochemical properties of the toxicants, in some cases, their extremely high stability in the environment.

The migration of toxic compounds from soil to water, which largely determines the purity of groundwater often used for drinking, is an important issue. Toxicants are subject to partial or complete transformation in the soil by its microflora and exudate enzymes of the plant's root system, as well as under the influence of sunlight, air oxygen and water itself. Mineral substances in the soil (for example, oxides of such metals as iron, aluminium, etc.) often serve as catalysts for this transformation.

Binding with humus occurs mainly due to the polar functional groups of toxicants (hydroxyl, amine, carbonyl, carboxyl, etc.). On the one hand, these groups increase the polarity of toxicant molecules and thereby promote the formation of hydrogen bonds and van der Waals forces that attract toxicant and soil organic material particles and, on the other, promote the covalent binding of toxicants with humus components, such as humic and fulvic acids.

Another reason for long-term soil pollution is due to the chemical stability of the toxicants themselves. The stability of toxic substances is largely determined by their chemical structure. The reasons for the stability of aliphatic hydrocarbons in soil have been established: aromatic hydrocarbons are more resistant to transformation and, with an increase in the number of substituted groups in the aromatic nucleus, the stability of the compounds increases. Halogen-substituted aromatic hydrocarbons have the highest stability, especially when the substituents are chlorine or fluorine atoms.

Complete removal of toxic compounds from the environment occurs only when they are mineralised, when organic substances decompose and form CO_2, H_2O, HCl, NH_3 and other inorganic substances. Such degradation of toxicants in the soil can be carried out both abiotically and biotically. Abiotic transformations combine self-performing photochemical and chemical redox reactions, as well as hydrolytic disintegration of toxicants. They involve the soil's organic matter, metal oxides and minerals. Biological mineralisation, carried out by the soil's microflora and plants, ensures full decomposition of toxic organic compounds.

The stability, that is, persistence of toxic compounds, is estimated based on the time it takes for 95% of the toxicant to decompose. For example, it takes 14-15 years for dioxins to undergo 95% decay, 10-12 years for polychlorinated biphenyls (PCBs), 4 years for DDT, 3.5 years for heptachlor, 3 years for lindane, etc. Widespread sim-triazine pesticides (simazine, triazine, promethrin) persist in the soil for about two years; carbamates can remain there from several months to one year, while organophosphorus insecticides (chlorophos, metaphos, etc.) and derivatives of phenoxyacetic acid — 2,4-dichlorophenoxyacetic acid (2,4-D), 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) and others — are subject to degradation within a few months.

Among the minerals, clays are strong adsorbents, and they absorb toxicants increasingly in the following order: ilites < bentonites < kaolin. In addition to adsorption, the binding of toxicants in humus is frequently carried out by hydrogen and covalent bonds, so toxic substances that have entered the soil are more actively retained by organic material. For example, it has been shown that 29% of the pesticide amiben (2,5-dichloro-3-aminobenzoic acid) applied to the soil binds with humus, while 9% is absorbed by clays [41].

The rate of microbiological decomposition of toxicants depends on a number of external factors, such as the concentration of oxygen in the soil, temperature, soil pH, the presence of inorganic and organic nutrients, the corresponding microflora, etc. The oxygen content, which limits the intensity of reproduction of both aerobic and anaerobic microorganisms, is the most significant of all these factors.

The diffusion of pollutants occurs relatively rapidly in the aquatic environment. Local pollution affects not only individual water bodies or sections of the river into which sewage flows, but, ultimately, seas and oceans. Oil pollution causes the most significant damage to marine ecosystems.

About 1.3 million tons of oil and oil products enter the seas and oceans [59]. Oil penetrates into different ecological niches in the following ways:

- natural soaking from underwater shelves accounts for almost half of all oil pollution;
- through usual tanker operations such as loading and unloading oil;
- washing oil and oil product remnants out of tankers, cisterns and settling tanks;
- tanker accidents;
- oil pipeline leaks. Despite its high viscosity, oil penetrates deep into the soil, reaching the groundwater and spreading over long distances. For this reason, oil frequently ends up in coastal swamps and seas;
- oil emissions when drilling wells in the open sea;
- rivers polluted with waste water that contains oil or oil products;
- waste from crude oil refining.

Not only is direct contact with petroleum derivatives fraught with detrimental consequences for any living organism. Interaction with hydrocarbons dissolved in water, in particular, aromatic and polycyclic ones, which penetrate easily into the organisms of water dwellers, also poses a particular hazard. It should be noted that these toxicants, even at very low concentrations (10^{-7}%), can cause undesirable changes in the physiology and, in general, the viability of marine organisms. Concentrations of 10^{-6}–10^{-5}% lead to serious physiological problems; a range of 10^{-4}–10^{-2}% is a lethal dose for larvae, marine invertebrates, crustaceans, oysters, snails, shrimp and fish. Only marine plants can withstand concentrations of up to 10^{-2}–10^{-1}%.

2.7 SURFACE ACTIVE AGENTS

The problem of water pollution is created by surface-active agents (SAAs) or detergents (tensides). They are used as detergents that lower the surface tension of water; their use is accompanied by foaming [35].

The increased demand for SAAs in industrial enterprises, as well as their intensive use in household use, primarily in laundry, has led to accumulations of foam in groundwater, riverbeds and reservoirs. Foam impedes navigation, and the high toxicity of surfactants leads to mass fish mortality. In 1950s, the negative experience of using SAAs forced a transfer to biologically biodegradable surfactants. Relatively easily degradable surfactants include straight-chain surfactants, such as non-ionic detergents and alkylbenzene sulfonates, which, in addition, have a low toxic effect on humans and fish [60].

2.8 EXPLOSIVES

Organic compounds containing nitro groups are often used as explosives. Among them, the most common are the following: 2,4,6-trinitrotoluene (TNT), nitro-glycerine, hexahydro-1,3,5-trinitro-1,3,5-triazine (also known as cyclonite, hexogen, or RDX by the British code name), octahydro-1,3,5,7-tetrantro-1,3,5,7-tetrazocin (HMX), etc. Due to the presence of nitro groups in their formulas, these compounds are highly toxic soil and groundwater pollutants (e.g., in the areas of military operations, polygons, military factories and warehouses, etc.) and therefore require remediation.

2,4,6-TRINITROTOLUENE

This is a highly toxic environmental pollutant. TNT is used as an explosive and is an intermediate in the manufacture of dyes and photographic materials. The manufacture and use of

TNT for military purposes leads to its dissemination in the environment. It is one of the most toxic explosives in the army's arsenal. The use of TNT has caused the chemical contamination of thousands of hectares of land. Its mobility is limited by active adsorption by soil particles.

TNT enters the human body through the digestive tract, skin and lungs and is distributed primarily in the liver, kidneys, lungs and adipose tissue, stimulating chronic diseases [61]. TNT is classified as a Group C carcinogen.

In microorganisms, TNT degradation occurs in the following two ways:

- removal of nitrogen in the form of nitrite and further reduction of nitrite-by-nitrite reductase to ammonium under aerobic conditions;
- reduction of nitro groups by bacterial nitroreductase under anaerobic conditions and subsequent aerobic degradation of amino derivatives.

Individual strains of *Pseudomonas* and some representatives of filamentous fungi can use TNT as a source of nitrogen. For example, *Pseudomonas* sp. strain JLR11 assimilates almost 85% of TNT nitrogen, incorporating it into other cellular metabolites [62]. This clearly shows how an atom, which is a toxic factor of a xenobiotic, is used as a building material for synthesising intracellular metabolites during the normal life of a microorganism.

According to reliable data, TNT can serve as a terminal electron acceptor in the respiratory chain, and its reduction is associated with ATP synthesis [62].

Phanerochaete chrysosporium and some other basidiomycetes completely mineralise TNT. Reduced TNT metabolites are degraded with particular efficiency by ligninolytic enzymes of basidial fungi, which consist of peroxidase, laccase and other oxidases.

Certain plants are also noted for their ability to absorb and convert TNT. The *Myriophyllum aquaticum* aquatic plant and seaweed hara (*Nitella* sp.) are used for phytoremediation of TNT-contaminated soils and waters. The enzyme nitroreductase, which is directly involved in the reduction of TNT nitro groups, has also been found in other seaweeds, ferns, monocots and dicots, as well as perennial trees (poplar) [63].

Transgenic tobacco (*Nicotiana tabacum*), in which the bacterial nitroreductase gene is expressed, has acquired the ability to degrade TNT in amounts required to neutralise heavily contaminated military sites [64].

The variety of chemical structures encountered during soil remediation requires the use of qualitatively different phytoremediation technologies. The presence of various types of soils, which require special technological methods of purification from toxic compounds, in turn creates additional difficulties. There is no doubt that the targeted selection of plants and microorganisms that actively appropriate and assimilate toxic compounds of anthropogenic origin is the main criterion for success in the remediation and monitoring of soils contaminated with anthropogenic toxicants.

2.9 AIR POLLUTANTS

Toxic compounds can enter the air both directly from emission sources and from polluted soil and water.

The transfer of toxicants at the water-air separation phase is a dynamic process that occurs in both directions. Both the transition of chemical compounds from an aqueous solution to the atmosphere (volatilisation) and the transfer of substances in the opposite direction (dry deposition from air into water) occur as a result of diffusion and obey the general laws.

The transition rate of a chemical compound through the phase of water-air interface is directly proportional to the difference in its concentration in different phases. The flow of substances is directed towards a decrease in concentration. In the event of water chemical pollution, the toxicant concentration in an aqueous solution decreases exponentially with time. This is explained by the fact that air as a system is a more open than water, and under natural conditions the concentration of chemical compounds in the gaseous phase is much lower than in the water phase.

In a water-air system, the fugacity of toxicants depends almost entirely on their volatility, which is determined by the rate of transfer in the liquid and gas phases, temperature and Henry's law constant (its value for each substance). The latter parameter shows the ratio of the substance concentration in the gas and water phases.

Along with the volatilisation of substances from water and their atmosphere-water precipitation in undissolved form, there are also other ways of substance exchange between these systems. These are wind-spraying of sea water and removal of toxicants from the atmosphere by precipitation (wet deposition). The share of these processes in the exchange of chemicals between water basins and the atmosphere largely depends on the geographical location and climatic conditions.

The transfer processes between soil and air produce the largest amounts of transferred mass and are the most complex, since the factors determining the exchange between all three phases--liquid–solid, liquid–gas and solid–gas—are of great importance here.

As in the case of mass transfer in the water-air system, substance transfer from soil to air and vice versa is carried out by diffusion. The volatilisation rate depends on the molecular weight, temperature, saturation vapor pressure of the adsorbed substance and the rate of its transfer in the gaseous phase. In the case of substance transfer between the water-air phase, the proportion of each transfer direction depends on the physico-chemical properties of the substance, soil type and climatic conditions.

Chemical volatility from a wet soil surface is significantly higher than from a dry one. This phenomenon cannot be considered as single co-evaporation of substances with water, since, firstly, co-evaporation occurs at higher temperatures and concentrations of the toxicant than in natural conditions; secondly, the cause of co-evaporation is the interaction between the water and evaporating substance (formation of hydrogen bonds, hydration, etc.), which is not typical for most toxicants; and thirdly, under conditions when the soil surface remains moist, the volatilisation rate of many toxicants does not change, while water vapor quickly saturates the atmosphere and evaporation is rapidly suppressed. Therefore, the evaporation of water and volatilisation of chemical compounds from the soil occur independently. The increase in volatility from moist soil, compared to dry soil, is largely due to the partial desorption of chemical compounds, which is achieved by their elution (displacement) with water [65]. It stands to reason that the volatility of chemical compounds from a moist soil surface occurs mainly from the liquid phase.

Due to various driving forces, toxic compounds that have penetrated deep into the soil diffuse towards the surface. Toxicants with a high Henry's law constant (for example, such insecticides as lindane, DDT and organochlorine solvents) move from the lower layers to the upper ones and their volatilisation occurs in the same way as with water. For substances with a low Henry's law constant (for example, the triazine herbicide prometon), upward transfer occurs due to convection and capillary forces. This is known as the “candlewick” effect [66].

The volatilisation of chemicals from the soil to the air also depends on other environmental conditions, such as soil type, temperature and wind speed. Another way of substance emission from the soil into the atmosphere is dust transfer (wind erosion).

In high concentrations, many gaseous substances contained in the air act as dangerous toxicants and cause serious damage to the environment. These are: oxides of carbon, nitrogen, sulphur, hydrogen sulphide, methane, fluorochlorocarbons, etc.

CARBON OXIDES

Carbon monoxide (CO)

Carbon monoxide, which is always formed during the incomplete combustion of carbon-containing substances, plays a particularly dangerous role in air pollution. Unpolluted air contains about 60 million tons of carbon monoxide, which is less than one thousandth percent of the CO_2 content.

The maximum amount of carbon monoxide in natural conditions is formed as a result of volcanic activity and photochemical oxidation of methane in the atmosphere. Anthropogenic emissions are another important source of CO formation. In internal combustion engines, optimal conditions for fuel oxidation are created only when a certain operating mode is reached. As a rule, this equals 75% of the engine power, but in other modes, especially during idling and when starting the engine, the CO content in the exhaust fumes increases significantly. To remove CO from exhaust gases, automobile companies use special catalysts that ensure the complete oxidation of fuel to CO_2. On a global scale, CO emitted by the internal combustion engines of vehicles constitutes a small part of their total content, but in large cities, in areas of high pressure and temperature inversion, this source may cause CO content to reach dangerous concentrations.

Carbon monoxide is dangerous to humans primarily because it can bind to blood haemoglobin. Moreover, CO can form highly toxic compounds – carbonyls. When interacting with blood haemoglobin, carbon monoxide, like oxygen, occupies a certain coordination position in the heme. The affinity of haemoglobin for CO is 200-300 times higher than for O_2. It has been calculated that a concentration of CO in the atmosphere equal to 0.006% (by volume) is sufficient to bind half of all haemoglobin in the blood [35].

Carbon dioxide (CO_2)

Unlike CO, carbon dioxide is produced by the complete oxidation of carbonaceous fuels. Atmospheric CO_2 is in a state of constant exchange with the soil, water and living organisms, especially with plants (photosynthesis), as a result of which a constant natural CO_2 cycle is created. Natural sources of CO_2 formation are: volcanic eruptions, the weathering of carbonaceous rocks, the decay of organic compounds (microbiological decay), respiration, forest fires and fuel combustion. It stands to reason that if not for its fixation from the atmosphere — photosynthesis, dissolution in sea water, accumulation of carbon-rich compounds, deposition of carbon deposits of fossil fuels, etc. — all this would lead to a catastrophic accumulation of CO_2.

A certain balance has been established between carbon dioxide release and its binding in nature, which is typical for both continents and oceans. Only part of total carbon biomass is included in this exchange mechanism. An unforeseen increase in the amount of fuel burned has led to a noticeable increase in CO_2 in the atmosphere. Among other reasons, the quantitative decrease in soils that fix CO_2 (the consequence of urbanization), deforestation, especially the elimination of tropical vegetation, should be noted. All this greatly contributes to the imbalance between carbon sequestration and release.

Sulphur dioxide (SO_2)

Sulphur dioxide has a direct toxic effect on living organisms. What is more, the reactivity of SO_2 is much higher than that of CO_2.

Natural sources of SO_2 primarily include volcanoes, forest fires, sea foam and microbiological transformations of sulphur-containing compounds. Sulphur dioxide released into the atmosphere can bind to lime, which results in its constant concentration in the air.

Sulphur dioxide of anthropogenic origin is formed during the combustion of coal and oil, in metallurgical processes and during the processing of sulphur-containing ores. Most of the anthropogenic SO_2 emissions (about 87%) are associated with energy and industry. The total amount of SO_2 of anthropogenic origin is more than 90% of the total amount of natural sulphur dioxide.

On average, SO_2 remains in the atmosphere for two weeks. This period is too short for the gas to spread globally. Therefore, due to large and moderate emissions of sulphur dioxide, huge differences in the atmospheric content of SO_2 can be observed in adjacent geographic areas. Thus, the SO_2 problem arises, first of all, in highly developed industrial countries, as well as in their neighbouring countries.

In the atmosphere, sulphur dioxide, together with nitrogen oxides (NO_x), undergo a number of chemical transformations, the most important of which are oxidation and acid formation, which leads to the formation of "acid rain". These reactions involve UV rays, atmospheric oxygen, or ozone.

It is calculated that 60–70% of acid rain is caused by sulphur dioxide. SO_2 and acid precipitation are corrosive to metal products and organic materials such as leather, paper, textiles, rubber and paints. They cause significant damage to all photosynthetic organisms. Hydrosulphite ions (HSO_3-) are especially toxic for plants, which, when reacting with peroxides of unsaturated fatty acids of phospholipids, form radicals and destroy biomembranes [35].

After damage of the chloroplast membranes, $HSO_3^{\cdot}$ and RCO· radicals oxidize and discolour chlorophyll. In addition, SO_2 conversion products contribute to a shift in the pH of cytoplasm towards greater acidity, which causes the removal of magnesium ions from the porphyrin ring of chlorophyll. Under the influence of SO_2, leaves turn yellow and lose their ability to photosynthesize. Sulphur dioxide leads to a decrease in the transfer intensity of substances between cell membranes, resulting in leaf necrosis.

Nitrogen oxides (NO_x)

The formation of nitrogen oxides in nature is associated with electrical discharges, during which NO and then NO_2 is formed. Small amounts of NO_2 can be released during silage fermentation.

Nitrogen oxides of anthropogenic origin mainly consist of NO and NO_2 formed during the combustion of fuels, especially at temperatures exceeding 1,000°C. Nitrogen oxides are formed in nitriding processes, the production of superphosphate, the purification of metals with nitric acid, the manufacture of explosives and smelting. Road transport is the main source of NO_x emissions. Anthropogenic pollution caused by nitrogen oxides reaches critical levels in densely populated cities.

Nitrogen monoxide and nitrogen dioxide are involved in a number of photochemical reactions, thus contributing to the formation of ozone and peroxyacetyl nitrate $CH_3COO_2NO_2$ (PAN), which are constituents of smog.

Nitrogen monoxide does not cause irritation of the respiratory tract, so a person may not feel it. When inhaled, NO forms an unstable nitroso compound with haemoglobin, which rapidly converts to methaemoglobin. The Fe^{3+} ion of methaemoglobin is unable to reversibly bind O_2 and participate in the oxygen transfer process. A blood concentration of 60-70% methaemoglobin is considered lethal, but such a critical level of this compound can be found in closed rooms.

As the distance from the emission source increases, the amount of NO converted to NO_2 constantly rises. This latter, yellow-brown gas is particularly irritating to the mucous membrane. In the body, contact with moisture produces nitrous and nitric acids that corrode the walls of the alveoli, which become so permeable that they allow blood serum to pass into the lung cavity. During inhalation, air dissolves in this liquid and foam forms, preventing gas exchange.

The action of ozone on the body is similar to that of NO_2. Ozone also causes pulmonary oedema and disrupts the normal movement of the atrial fibrillation hairs in the bronchi, which are supposed to remove foreign substances from them. All of this leads to an increased risk of cancer.

The action of nitrogen oxides on plants can occur in the form of acid precipitation: by direct contact with plants and indirectly by photochemical formation of oxidising agents such as ozone and peroxyacetyl nitrite (PAN).

In the form of acid precipitation, nitrogen oxides cause serious damage to plants by increasing the acidity, as is the case with SO_2. Even low concentrations of PAN, which is active under normal conditions, destroy chlorophyll, disrupting the functioning of the photosynthesising apparatus.

SMOG

Smog (from a combination of 'smoke' + 'fog') is a chemical mixture of gases that forms a brownish-yellow or brown fog in large cities and industrial centres. Smog can be of two types [35]:

1) London-type smog is a thick fog with an admixture of smoke or gaseous industrial waste. It is formed during the autumn and winter as a result of heavy air pollution over cities located at central and northern latitudes. This smog consists of aerosol dominated by SO_2, H_2SO_4 and soot.

2) Los Angeles-type of smog is a shroud-like aerosol with elevated concentrations of caustic gases (no fog) produced by ultraviolet radiation from the sun as a result of photochemical reactions occurring in gas emissions from transportation and industrial plants. This type of smog is also referred to as photochemical smog. It is common in southern cities during the sunny, summer months. Nitrogen oxides, ozone, peroxyacetyl nitrite and various radicals are present in photochemical smog.

Smog forms in areas where anthropogenic air pollution is enhanced by geographical features of the area (mountains that impede airflow) and meteorological conditions (temperature inversions in the troposphere that interfere with the distribution of gases in the vertical direction) that favour the emission of air pollutants [67]. Smog is usually observed when air turbulence is weak, with little or zero wind. Smog reduces visibility, increases corrosion of metals and structures, destroys vegetation and irritates the respiratory tract. Intense and prolonged smog can cause an increased incidence of fatal diseases.

Photochemical smog has a complex composition. It is a mixture of about a hundred toxic compounds and radicals with a very high oxidising capacity. Sources of photochemical smog are mainly nitrogen oxides and volatile organic compounds (VOCs), such as ethane, propane, butane, ethylene, propene, acetylene, methanol, formaldehyde, acetaldehyde, etc. Photochemical smog contains other secondary pollutants formed from primary pollutants: nitrogen oxides, carbon monoxide, VOCs, etc.

2.9.1 ANTHROPOGENIC ACTIVITIES OF HOMO CONSÚMENS AS A CAUSE OF ENVIRONMENTAL TOXICITY

Industrial accidents and disasters that release large quantities of highly toxic substances into the environment have become the curse of the *Homo Consúmens* civilization. Accidents involving chlorine and chemical weapons in the 20th century alone clearly show how serious and dangerous this is for the environment. Chlorine is most dangerous in its liquefied state. Gaseous chlorine is 2.5 times heavier than air. In the event of liquid chlorine emissions, a lethally dangerous zone forms within a radius of about 400 m from the emission site. However, the size of this zone may vary significantly, depending on the chlorine mass, its energy state, the nature of the emergency and geographical and climatic factors [68].

Short-term projections indicate that chemical accidents will continue in the near future. There are a number of reasonable premises for such an assumption:

- unpredictable growth of complex industries using new technologies that require a high concentration of energy and the participation of environmentally hazardous substances in technological processes;
- accumulation in especially large quantities of wastes from various industries that are hazardous to the environment;
- inevitable volume increase of chemical production and, consequently, an increase in the production, transportation and storage of highly hazardous chemicals;
- the desire to invest in the establishment of harmful industries in developing and therefore technologically underdeveloped countries;
- other reasons.

Theatres of military operations, deployment sites and training grounds of military bases are highly contaminated with toxic compounds.

Motor transport and cars should be especially noted as "peaceful" sources of toxic compound emission, which, even without accidents, discharge unmeasurable amounts of toxic compounds and products of incomplete fuel combustion every day, which have, above all, carcinogenic properties.

Toxic gaseous emissions from different plants operating on practically any type of fuel also contribute to environmental disasters. The annual increase in industrial waste, often containing toxic compounds, is a major environmental hazard, especially in developing countries.

The planet's existing ecological capacity is unable to neutralise the annual unpredictably increasing levels of ecotoxicants that spread across the planet over time. The constantly increasing level of toxic compounds has a significant negative impact on the natural environment, having an extremely adverse effect on such vital biological processes as respiration, photosynthesis, molecular nitrogen fixation, growth, reproduction, general physiology of organisms, etc. Due to their relatively strong mutagenic effect, increased concentrations of toxic compounds lead to the demise of some species and the appearance of new organisms that are abnormal and often degenerative.

The vast majority of environmental studies refer to a direct link between this phenomenon and the carbon cycle as one of the most likely causes of climate change, particularly global warming. Given the close connection between the air and the soil in the carbon cycle, it is worth noting the disruption of the carbon cycle-climate relationship, whereby the increasing excess of CO_2 in the atmosphere creates conditions for smog and other unnatural gas accumulations in the air.

***Homo Sapiens'* consumption results in the occurrence of all toxic compounds that exceed the norm stipulated by the natural environment of the *Microbiome.* This is the outcome of industrialization, economic progress, industrial marketing, increased wealth, super-profits, the globalisation of goods and service markets and war conflicts. Is there no political will, no awareness of the threat to the Earth's future, to stop these harmful industries that are so destructive to human beings and the environment, to put an end to this despicable and insane squandering of all the resources on the planet?!**

This explains why 25.3% of the world's population (which amounts to a total of 7.92 billion people), or 2,001 billion people, have officially confirmed mental disorders, mental retardation and various types of disabilities (see Tables 12 and 13). And this is only the documented number of sick people on Earth. But how many cases have not yet been accounted for due to inaccessible medical services and social inequality? With such numbers, how can we call *Homo Sapiens* intelligent?

HOMO SAPIENS' HEALTH ACCORDING TO THE DATA AT THE BEGINNING OF THE 21ST CENTURY (MENTAL DISORDERS)[*1]

TABLE 12

Type of disorder	Number of patients
Anxiety disorder	301 000 000
Depression	280 000 000
Bipolar disorder	40 000 000
Eating disorder	14 000 000
Behaviour disorder	40 000 000
Substance use disorder (alcohol and drugs)	178 000 000
Total	**853 000 000**

[*1] https://www.who.int/news-room/ fact-sheets/detail/mental-disorders

OTHER FORMS OF DISABILITY[*3] IN *HOMO SAPIENS*

TABLE 13

Mental retardation, types of disability	Number of patients
Blindness and visual impairment	253 000 000
Deafness and hearing loss	466 000 000
Mental retardation (IQ below 75)[4]	200 000 000
Need for a wheelchair	75 000 000
Schizophrenia	24 000 000
Autistic disorder	75 000 000
Dementia	55 000 000
Итого	**1 148 000 000**

[*2] https://www.inclusivecitymaker.com/disabled-people-in-the-world-in-2021-facts-and-figures/

[*3] **Forms of mental retardation:** 1) Genetic diseases: Down syndrome, Klinefelter syndrome, fragile X syndrome, neurofibromatosis, congenital hypothyroidism, Williams syndrome, phenylketonuria (PKU) and Prader–Willi syndrome. Other genetic disorders include Phelan-McDermid syndrome, Mowat-Wilson syndrome, genetic ciliopathy, and X-linked mental disability, Siderius type. 2) Maternal infections during pregnancy. 3) Alcohol abuse during pregnancy. 4) Drug abuse, including during pregnancy. 5) Maternal and foetal exposure to environmental toxic chemicals.

As of 2000, **999** million people are known to suffer from mental disorders, signs of mental retardation and other types of disability. Thus, in slightly over two decades, the number of Homo Consúmens in this category has increased worldwide by **50%.** At the same time, the total size of the population on the planet increased by **29.5%** (the total population in 2000 amounted to **6.114** billion people).

DYNAMICS OF GLOBAL GREENHOUSE GAS EMISSIONS IN CO_2 CONVERSION IN TERMS OF THE POPULATION GROWTH OF *HOMO CONSÚMENS*

1930

Population: **2,085,610,000 people**

Concentration of CO_2 in the atmosphere: **307.2 ppm**

CO_2 emissions: **3.9 bln tons**

1980

Population: **4,434,000,000 people**

Concentration of CO_2 in the atmosphere: **339 ppm**

CO_2 emissions: **19.4 bln tons**

2021

Population: **7,920,000,000 people**

Concentration of CO_2 in the atmosphere: **419.13 ppm**

CO_2 emissions: **36.3 bln tons**

Initial data:

Concentration - CO_2 -

https://www.eea.europa.eu/data-and-maps/daviz/atmospheric-concentration-of-carbon-dioxide;

https://news.un.org/en/story/2021/06/1093592

Emissions CO_2 -

https://www.statista.com/statistics/264699/worldwide-co2-emissions/

https://www.iea.org/news/global-co2-emissions-rebounded-to-their-highest-level-in-history-in-2021

Thus, in less than a century, the growth of the world's population amounted to **280%**, and the growth of greenhouse gas emissions in terms of CO_2 increased by **840%**

The impact of the economic activity of *Homo Consúmens* on the global environment is shown in Table 14 below:

GREENHOUSE GAS EMISSIONS (IN CO_2 CONVERSION)[*4] OF THE HOMO CONSÚMENS CIVILIZATION BY ECONOMIC SECTOR

TABLE 14

Economic sector	Share of emissions from each economic sector in the total volume, %
ENERGY INDUSTRY	**73.2**
Energy consumption in industry	**24.2**
Metallurgy industry	7.2
Chemical and petrochemical industry	3.6
Food industry	1
Nonferrous metals	0.7
Paper and pulp production	0.6
Mechanical engineering	0.5
Textile industry	8.1
Other industries (mining and quarrying, construction industry, woodworking, automobile manufacturing)	2.5
TRANSPORT	**16.2**
Automobile transport	11.9
Aviation	1.9
Ship building	1.7
Railway transport	0.4
Pipeline	0.3
ENERGY CONSUMPTION IN BUILDINGS	**17.5**
Residential buildings	10.9
Commercial buildings	6.6

FUGITIVE EMISSIONS FROM ENERGY PRODUCTION	**5.8**
Fugitive oil and gas emissions *(accidental leakage of methane into the atmosphere during oil and gas production and transportation from damaged or poorly maintained pipes)*	3.9
Fugitive emissions of coal	1.9
ENERGY USE IN AGRICULTURE AND FISHERIES	**1.7**
Non-distributed fuel combustion *(Energy-related emissions of energy production from other fuels, including electricity and heat from biomass; local heat sources; combined heat and power (CHP); nuclear industry; hydro storage.)*	7.8
PRODUCTION PROCESSES	**5.2**
Cement	3
Chemistry and petrochemistry	2.2
AGRICULTURE, FORESTRY AND LAND USE	**18.4**
Pasture fields	0.1
Plough land	1.4
Forestry	2.2
Burning of crops	3.5
Rice cultivation	1.3
Agricultural soils (use of nitrogen fertilizers)	4.1
Livestock and manure	5.8
WASTE UTILIZATION	**3.2**
Wastewater	1.3
Waste deposit	1.9

[*4] - https://ourworldindata.org/emissions-by-sector#citation

According to studies conducted by NOAA (the National Oceanic and Atmospheric Administration, USA), the changes that occur in surface temperature, precipitation and sea level after a complete cessation of carbon dioxide (CO_2) emissions are irreversible for the next few centuries (https://www.pnas.org/doi/full/10.1073/pnas.0812721106).

Why don't public, scientific and political organisations sound the alarm? They seem to be living on another planet and think it has nothing to do with them. If the growth rate of the previous century continues, there will be more than 10 billion people living on a planet with an entirely poisoned atmosphere by the middle of the 21st century. The dangerous consequences caused by the technogenic and avaricious activity of an advanced civilization have long been a topic of discussion. Back in 1820, Jean-Baptiste Lamarck wrote: "…It is as if the purpose of man is to destroy his own species by first making the globe uninhabitable…" There is no hope for *Homo Sapiens'* own future. The only salvation is the creator, that is, *Cosmicus Quanticus Cerebrum*, which has sounded the alarm and begun to regulate the population with its instruments, sending pandemics, wars, natural disasters, natural catastrophes and diseases to humanity (see the section: Population Regulation by *Cosmicus Quanticus Cerebrum*).

2.10 SOME ASPECTS AND TEMPTATIONS OF *HOMO CONSÚMENS'* CONSUMPTION AND THEIR IMPACT ON THE PLANET'S ENVIRONMENT

PETS AND THEIR MAINTENANCE COSTS

One of the most challenging issues facing *Cosmicus Quanticus Cerebrum* is the keeping of pets. In spite of the overpopulation of the planet, no one thinks about the reasons for keeping pets, particularly in apartments.

In the 19th century, cats were randomly considered to be pets in the United States and Europe. They used to be treated as biological specimens for medical research, muses of literature and mouse-catchers who wandered around killing rodents. In the 1930s, there were about 70 million dogs and 62 million cats in the world (although official statistics did not provide any exact data). Along with the increase in population over the years and decades, the number of cats and dogs has increased tenfold. Since the late 20th century, breeding and keeping cats has become a fashionable hobby. People spend billions of dollars on the care and feeding of their beloved pets. The services for dogs and cats run to the absurd: all kinds of clothing, diamond inserts in crocodile skin and gold collars, houses and furniture for pets, cakes and pies for dogs and cats, haircuts, styling, hotels and health resorts for pets, funeral homes and the opening of more and more chain stores for pet services.

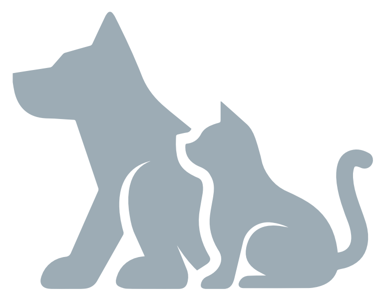
Pet food production in 2021 amounted to 34.165 million tons (https://www.alltech.com/agri-food-outlook/results?submissionGuid=4b479ae1-3431-4611-adc1-9b4c28c00b7a).

When studying the pet food industry's impact on the world's fish and seafood stocks, experts estimate that 2.48 million metric tons of fish go into cat food production annually (https://www.researchgate.net/publication/225428877_Towards_). The production of dry cat and dog food requires an area of more than 485 thousand km^2 annually, which exceeds the total area of such countries as Germany, Switzerland, the Netherlands and Denmark. The annual emission of carbon dioxide equivalent from the production of pet food into the atmosphere equals 106 million tons. Pets consume up to 100 million tons of fresh meat and fish per year.

On average, 3.7 kg of pesticides per hectare of cultivated land are used. The area of land used for growing pet food amounts to 49 million hectares. In 2020, 181,300 tons of pesticides were used to produce 29.33 million tons of pet food.

At present in the world there are

471 million domestic dogs,
373 million domestic cats,
429 million stray dogs and
227 million stray cats.



This amounts to a total of 1.5 billion pets and stray animals.

This number is based on countries that register pets, which is less than half of total number of countries. Millions of homeless animals roam the streets, while millions more spend their lives safely in cosy homes and apartments. They inhabit every populated continent of the world, and their numbers are increasing every year. The total approximate population of dogs and cats is summarized in Table 15.

APPROXIMATE NUMBER OF DOMESTIC AND STRAY DOGS AND CATS AND PROJECTED POPULATION REDUCTIONS BY 2045

TABLE 15

Country	2022		2045		Name des Landes	2022		2045	
	Cats, Mln	Dogs, mln	Cats, mln	Dogs, mln		Cats. Mln	Dogs. mln	Cats. mln	Dogs. mln
USA	103.3	82.2	27.8	22.1	Philippines	0.5	23.3	0.1	6.2
India	14.8	79.1	4.0	21.3	Japan	7.3	12.0	2.0	3.2
Germany	17.8	10.7	4.8	2.9	Sri Lanka	No data	3.0		0.8
Greece	3.9	1.6	1.0	0.4	Iraq	No data	1.5		0.4
China	140.6	117.2	37.9	31.6	Iran	No data	1.2		0.3
Mexico	10.3	28.6	2.7	7.7	Pakistan	No data	3.2		0.9
United Kingdom	12.3	8.7	3.3	2.3	Israel	2.0	0.5	0.5	0.1
South Africa	4.6	10.3	1.4	2.8	Singapore	0.09	0.09	0.02	0.02
Russian Federation	44.1	23.4	11.9	6.3	Indonesia	30.0	0.5	8.0	0.1
Norway	0.8	0.5	0.2	0.1	Turkey	4.1	1.22	1.1	0.3
Finland	0.9	0.8	0.2	0.2	Azerbaijan	No data	1.0		0.3
Latvia	0.4	0.3	0.1	0.1	UAE	0.14	0.08	0.04	0.02
Sweden	1.4	0.9	0.4	0.2	Ethiopia	0.25	5.0	0.06	1.3
Slovenia	0.5	0.3	0.1	0.1	Kenya	No data	6.0		1.6
Romania	4.3	4.2	1.1	1.1	Egypt	5.0	15.0	1.3	4.0
Hungary	2.3	2.9	0.6	0.8	Zimbabwe	No data	0.7		0.2
Ireland	0.4	0.5	0.1	0.1	Malawi	No data	1.5		0.4
Estonia	0.3	0.3	0.1	0.1	Uganda	0.6	1.3		0.3
Lithuania	0.6	0.6	0.2	0.2	Tanzania	No data	2.3		0.6
Slovakia	0.6	0.9	0.2	0.2	Ivory Coast	No data	1.5		0.4
Austria	2.0	0.8	0.5	0.2	Nigeria	No data	5.0		1.3
Portugal	1.5	2.1	0.4	0.6	Madagascar	4.0		1.1	
Switzerland	1.6	0.5	0.4	0.1	Morocco	36.0	3.0	9.7	0.8
Luxembourg	0.1	0.1	0.1	0.1	Other countries of Africa	No data	62.8		16.9

Netherlands	3.1	1.9	0.8	0.5	New Zealand	1.2	0.9	0.3	0.2
Ukraine	7.4	5.1	2.0	1.4	Australia	3.8	5.3	1.0	1.4
France	15.1	7.6	4.0	2.0	Canada	8.1	7.7	2.1	2.1
Italy	7.9	8.3	2.1	2.2	Puerto Rico	1.0	0.5	0.3	0.1
Bulgaria	0.8	0.8	0.2	0.2	Costa Rica	0.37	2.3	0.1	0.6
Spain	3.8	6.7	1.0	1.8	Dominican Republic	No data	1.9		0.5
Poland	6.8	7.8	1.8	2.1	Haiti	No data	1.0		0.3
Belgium	2.1	1.3	0.6	0.4	Guatemala	No data	5.0		1.4
Czech Republic	1.1	3.2	0.3	0.8	Cuba	No data	1.0		0.3
Denmark	0.7	0.6	0.2	0.2	Uruguay	No data	1.7		0.5
Malta	0.3	0.1	0.1	0.1	Chile	0.3	3.6	0.1	1.0
Cyprus	2.0	0.3	0.5	0.1	Bolivia	No data	1.9		0.5
other European countries	4.7	3.5	1.2	1.0	Peru	3.6	12.0	1.0	3.2
Bhutan	нет данных	0.1		0.1	Colombia	2.1	5.0	0.6	1.3
Cambodia	нет данных	5.0		1.3	Venezuela	No data	3.5		1.0
Myanmar	нет данных	4.0		1.1	Brazil	22.0	55.0	5.9	14.8
Brunei	нет данных	0.4		0.1	Argentina	3.0	9.6	0.8	2.5
Malaysia	0.8	0.4	0.2	0.1	Other countries	28.17	174.2	7.68	46.86
Vietnam	3.8	5.4	1.0	1.5	**Total globally**	**600.0**	**900.0**	**161.0**	**242.0**
Bangladesh	нет данных	1.6		0.4					
Nepal	нет данных	0.1		0.1					
Thailand	4.0	8.5	1.0	2.3					

The conclusion is that by 2045, there must be at least a 3.71-fold reduction in the cat and dog population. There must be just over 400 million cats and dogs, as well as animal-like robotic androids designed for *Homo Sapiens* as a new kind of pet with artificial intelligence, left on the planet (see the section: The *Homo Consúmens* Digital Economy).

Animal breeding and husbandry wastes are classified under Hazardous Waste Class IV. A medium-sized dog annually leaves about 40 kg of faeces on the street. If you multiply that number by 900 million, it amounts to 36 million tons of faeces left on city lawns, along riverbanks, in forested areas and right on the pavement every year.

Many people believe that dog faeces are the same as fertilizer and therefore beneficial to plants. However, this is not true: dogs are predators, so their faeces are slow to decompose, are toxic and contaminate the soil.

Every year, 373 million domestic cats produce 12.9 million tons of cat litter waste.

WASTE PRODUCTS OF HOMO SAPIENS

Every day, humans produce an average of 1.9 kg of human waste, which amounts to 5.5 billion tons of waste annually. Also, a healthy person expels about 1 litre of gases per day. The proportion of methane in this volume ranges from 0% to 26%, with an average of 13%, or 0.13 litres. Humans expel an average of 375.8 million m^3 of this gas globally every year.

Humans today organise their vital activity unwisely, misappropriating the huge potential the *Microbiome* has afforded them with respect to symbiosis with microorganisms that provide the foundation of plant life and the entire biological turnover of nutrients on the planet. Every living being can sustain itself as long as it is able to provide all the cells of its body with all the essential components and microelements. Alas, we shorten and impoverish this process due to our lack of foresight and utter misunderstanding of the environmental culture.

The feeling of disgust and squeamishness towards our own waste products—faeces (C_9H_9N – skatole) and urine ($CO(NH_2)_2$ – urea)—reveals the level of *Homo Sapiens'* intellectual development and its ignorance about its purpose on earth and place in the common world of the creator – *Cosmicus Quanticus Cerebrum*.

Why sneer when humans themselves are producing these faeces by consuming all the tastiest and healthiest food in the world. Pigs eat up human waste as compelled by their natural instincts, which appears to indicate that they are more intelligent than we are. By eating faeces, animals satisfy their own need for vitamins, which are synthesised only in the intestines with the help of bacteria.

Urine and faeces are high quality fertilizers with low levels of contaminants such as heavy metals and pesticides. The hormones and drugs excreted with urine are broken up in the natural environment by various soil microbes. Urine is rich in nitrogen (N), while faeces are rich in phosphorus (P), calcium (Ca) and organic matter. Elements vital for plant growth and development are called nutrients. The amount of nutrients depends on the amount of nutrients in the food consumed. The plant-based nutrients consumed leave the human body with the faeces when the body reaches full development. As the body develops, some nutrients are selected and integrated into body tissues: N is accumulated in proteins, P mainly in bones and muscles and potassium (K) is stored mainly in the nerves and muscles, but only a small fraction of the nutrient components is returned to the body. Once a person's skeleton and muscles have fully developed, no more plant nutrients are returned to or accumulated in the body. Thus, the amount of nutrients excreted is in fact equal to the amount absorbed with food.

General sewage, including industrial waste, prevents humans from benefiting from the valuable nutrients provided by the *Microbiome*. All this turns into muddy sewage sludge, the disposal of which requires impressive costs and time, as well as additional infrastructure, which is accompanied by further toxic emissions. Why didn't *Homo Sapien*s think it over and provide engineering solutions when constructing sewage systems so that faeces and urine could be collected separately from industrial waste? This has deprived humanity of the opportunity to use the biological resources provided by the *Microbiome*: instead of taking advantage of the organic fertilizers produced by their own bodies in farming, humans use chemicals, which result in soil degradation and desertification of land. This exacerbates the ongoing and overarching problem of providing themselves with enough food to eat. Furthermore, this makes it impossible to absorb and produce valuable macronutrients, such as phosphorus, an irreplaceable resource, the shortage of which threatens humanity with famine. There is an entire scientific field of coprology that primarily studies faeces from a biological and medical perspective, as well as from the cultural and psychological side of human development. Via excrements, archaeologists, palaeontologists, geneticists and epidemiologists are exploring and specifying the evolution of diverse microorganisms, protozoa and the genetic code of ancient human populations and determining the future development of *Homo Sapiens*.

Humans should be grateful to the *Microbiome* and be in love with their faeces and urine, rather than be squeamish and treat them with disgust. The word "faeces" has acquired a negative connotation in all languages of the world and is used colloquially as an insult. In German we have the offensive expression 'Scheisse', in English, it is 'shit', in Chinese, it is 拉屎, and in Georgian, მძღნერი, which does not coincide with the meaning the *Microbiome* gave it.

The end product of digestion, formed as a result of complex biochemical processes in the human gastrointestinal tract, is not poison. It is a high-quality product underestimated by the primitive consciousness of *Homo Consúmens*. Today's global marketplace is set up so that nutrients are extracted from the earth and are never returned: we are simply flushing away the gold the *Microbiome* provides us with. Humankind has no idea of how valuable excrement is to soil and plants, to the entire organic world and the circle of life. We need to reconsider its concept and move towards complimenting our life-giving product, by saying something like: "You are as useful as faeces," instead of "you are full of shit!", an expression which should be forgotten forever.

Humans cannot survive without water, but they do not use it rationally. The existing world water supply system does not provide for separating water into drinking water (intended for drinking and cooking) and technical water (for personal hygiene, laundry and food processing). As a result, *Homo Sapiens* is deprived of the opportunity to save a total of 3,449.38 km^3 of pure drinking water a year, or 3.449 quadrillion litres annually (this calculation was made by the author of this book and can be found in section called The *Homo Consúmens* Digital Economy).

In 2017, I addressed the global gastronomic industry through my project EuRICAA (Europe, Russia, India, China, America, and Africa) Worldview Environmental Revolution: A Code of New Civilizational Standards for *Eco Sapiens*" with a proposal for introducing edible tableware and appliances in order to preserve and save drinking water. However, very few people worldwide supported this idea. The industry has refused to harmonise food standards with environmental ones. This would make it possible not only to save tens of thousands of cubic meters of water, but also reduce production costs and the harmful emissions from metal production and related industries. Green parties and environmental activists around the world have also ignored the proposal to conserve water and reduce the greenhouse effect, nor have they finalised this concept of conserving precious amounts of drinking water themselves.

LIVESTOCK EMISSIONS

Livestock production is one of the main sources of methane emissions. Without referring to all animals, which certainly make a significant contribution to the environment, we will give data on cattle and pigs, which are the most widespread animals in the world. The total number of cattle in the world amounts to 1.5 billion. Considering that one cow produces 400 litres of gaseous methane per day, the total annual anthropogenic CH_4 emission from cattle is 219 billion m^3, which is 4 times the capacity of two strings of the Nord Stream gas pipeline (55 billion m^3/year).

Globally, pigs produce 42 billion m^3 of methane per year. There are a total of 677.6 million hogs in the world. Every day one pig discharges 170 litres of methane.

WASTE AND EMISSIONS FROM POULTRY PRODUCTION

Unlike herbivorous mammals, birds do not produce significant amounts of methane during digestion, while poultry faeces are considered poor quality, although they are used in gas production in anaerobic technologies.

In greenhouse gas inventories, the share of emissions from the poultry industry (from the manure produced by birds and the energy used to raise and maintain them) is estimated at 800 million tons of CO_2. One chicken produces an average of 45 kg of manure per year, and one turkey produces 54 kg. There are 26 billion chickens and 462 million turkeys in the world. Thus, chickens produce 1.17 billion tons of manure per year, while turkeys produce 24.9 million tons. Total poultry waste amounts to 1.19 billion tons per year – a number that should certainly be considered. Nowadays, only a tiny fraction of chicken manure is used as fertilizer.

WASTE AND MAINTENANCE OF ZOOS

According to Defensa Derechos Animal (the Defence of Animal Rights Association), the first Spanish non-governmental organisation dedicated to the protection and welfare of animals, about 6 million animals of all species live in captivity for human entertainment, including about 2.5 million vertebrates, in particular mammals.

Less than 10% of animals kept in zoos are classified as endangered species.

Annually, an average of 2,190 kg of food per animal, or 5.5 million tons of food for all animals, is consumed.

The average annual amount of animal waste is 3.6 million tons. At the same time, the excrement of some animals is classified as a class 4 hazard and must be disposed of in a particular way.

LESS THAN 10% OF ANIMALS KEPT IN ZOOS ARE CLASSIFIED AS ENDANGERED SPECIES

Zoo wildlife feeding rates and diets would be the envy of some 1 billion hungry people in 93 countries worldwide.

For example, Tables 16 and 17 below show what the menu looks like for:

BORNEO (OR SUMATRAN) ORANGUTAN (WEIGHT 50-100 KG)

TABLE 16

Feed type	Approximate quantity, kg per 1 animal per day	Frequency
Fruits, vegetables		
Apples	0.6	
Pears	0.5	
Kiwi	0.2	
Grapes	0.4	
Oranges	0.5	
Tangerines	0.5	
Persimmon	0.4	
Pomegranate	0.5	
Plums	0.3	
Pineapples	0.6	
Peaches	0.3	
Apricots	0.3	
Sweet cherry	0.5	
Strawberries	0.2	
Raspberries	0.2	
Papayas	0.5	
Bananas	0.3	
Cranberries, lingonberries	0.2	twice a week
Cucurbitaceous		
Melons	2	every other day
Watermelon	2	every other day
Vegetables and root crops		
Cabbage/cauliflower, broccoli, kohlrabi	0.3	three times a week
Carrots	1.2	every day

Potatoes	0.5	twice a week
Beetroot	0.25	twice a week
Onions/leeks, green onions, turnips, lettuce/ garlic	0.2	twice a week
Greens/parsley, cilantro, dill, spinach, fennel	0.2	every other day
Lettuce/leaf lettuce, iceberg lettuce	1	every day
Tomatoes	0.25	every other day
Cucumbers	0.25	every other day
Sweet pepper	0.25	every other day
Zucchini, zucchini, pumpkin	0.5	once a week
Turnips, green radishes, daikon	0.5	once a week
Aubergines	0.5	twice a week
Celerity heads	0.3	twice a week
Avocadoes	0.25	once a week
Celery	0.25	every other day
Branches of fruit trees, willow, rowan, etc.	0.5	every day
Grass	0.5	twice a week
Dried fruits	0.15	twice a week
Grain bread or crackers	0.05	every other day
Buckwheat	0.05	once a week
Rice	0.05	once a week
Wheat for germination	0.15	once a week
Corn on the cob	1	three times a week
Oil-bearing plants		
Sunflower or pumpkin seeds	0.1	every other day
Nuts/ peanuts, hazelnuts, walnuts, pine nuts	0.15	every other day
Coconut	0.5	once a week
Animal feed		
Chicken, turkey, liver	0.5	twice a week
Chicken egg	3 шт	twice a week
Cottage cheese	0.2	twice a week
Yogurt	0.5	twice a week
Cheese	0.1	once a week
Vegetable oil	0.1	once a month

Monkey feed	0.1	every day
Honey or jam	0.1	once a month
Fruit juice	0.5	twice a week
Tea	0.25	once a month
Salt	0.05	once a month
Vitamins		
Kalcinova	0.0072	every other day
Multivitamins for children	0.002	every other day

Ration structure, %: Concentrated feed – **22.0**

Succulent feed – **72.0**

Animal feed – **5.0**

Vitamin and mineral feeds and additives – **1.0**

Energy value of the diet, kcal **3814.99**

Content of nutrients in the diet, %:

Crude protein	Crude fat	Raw fibre	Raw ash	Calcium, mg	Phosphorus, mg	Sodium, mg
2.40	1.74	0.84	0.74	36.49	51.74	26.87

Note:

1) A daily dose of probiotics is given 2 times a year (in the spring and autumn) for 1 month.

2) Vitamin preparations (children's multivitamins) are given for 1 month every quarter. Additional vitamins are prescribed by the veterinarian.

3) The physiological condition of the animals (breeding period, disease, pregnancy, lactation, etc.) should be considered when prescribing feed and, if necessary, the ration is reduced or increased to 50% of the specified ration.

4) From 6 months of age, young animals kept with their mothers are prescribed 50% of the adult animal ration, and from 12 months of age, they are given an adult animal ration.

5) Cereals and animal fodder are excluded from the diet when introducing special compound fodder for monkeys.

II. EURASIAN LYNX (WEIGHT 30-40 KG)

TABLE 17

Type of feed	Approximate quantity, (kg per 1 animal per day)	Note
Winter (November 1–April 30)		
Meat	2.5	
Liver	0.1	
Chickens	0.5	No tubular bones and skin
Rats	2	once a week on account of meat
Quails	4	once a week on account of meat
Rabbits/ guinea pigs	1.5	once a week on account of meat
Chicken eggs	1	
Milk	0.2	
River fish	0.5	
Bone flour	0.01	
Cereal greens	unlimited	
Vegetable oil	0.01	
Premix	0.03	
TOTAL feed:	3.85	
Summer (May 1 – October 31)		
Meat	2.0	
Liver	0.1	
Chickens	0.5	No tubular bones and skin
Rats	2	once a week on account of meat
Quails	4	once a week on account of meat
Rabbits/ guinea pigs	1.5	once a week on account of meat
Chicken eggs	1	
Milk	0.2	
River fish	0.5	
Bone flour	0.01	
Grass	unlimited	
Vegetable oil	0.01	
Premix	0.03	
TOTAL feed:	3.35	

Energy value of the diet, kcal – 7444.40

Content of nutrients in the diet, %.

Crude protein	Crude fat	Raw fibre	Raw ash	Calcium, mg	Phosphorus, mg	Sodium, mg
17.33	13.25	0.00	0.92	208.21	207.04	77.21

However, the diet of animals does not include such important items as black caviar and champagne, which holds it up for criticism.

HOMO CONSÚMENS FOOD PRODUCTION

The imperfection of Homo Sapiens (italics) is evident in all spheres and is especially clear when analysing food production and consumption on a global scale, as shown in Table 18.

DYNAMICS OF *HOMO CONSÚMENS* FOOD PRODUCTION

TABLE 18

Indicators 1975		**Years**	
		1975	**2021**
Total production	mln tons	1 752.06	8 685.52
	per capita, kg	431	1 097
Production for human consumption	mln tons	1 348.85	5 266.69
	per capita, kg	332	665
Overproduction of food products (no human use, discarded)	mln tons	164.56	1 750
	per capita, kg	41	221
Actual human consumption	mln tons	1 184.29	3 516.69
	per capita, kg	291	444
Population, mln people		**4 063**	**7 920**

According to Table 18, the total world production of food for human and animal consumption in 1975 (UN FAO data) amounted to 1,752,060,000 tons; in 2021 it reached 8,685,520,000 tons. It increased by 396% over fifty years.

Food production for direct human consumption amounted to 1,348,850.000 tons in 1975 and 5,266,690,000 tons in 2022. This constitutes an increase of 290%.

More than 30% of the food produced annually in the world for human consumption is lost or wasted (data of the United Nations Environment Program). As of 2022, this figure amounts to 1,750,000,000 tons, an increase of 963% since 1975. How can the planet's resources be used so irrationally and wastefully? Five decades ago, the amount of wasted food was only 12%. The production of this wasted foods requires 254 km^3 of clean fresh water, which adds 3.3 billion tons of greenhouse gases in terms of CO_2 to the atmosphere. This amount of food could feed 4 million people. A total of 2 billion people in the world are "food-insecure". In an attempt to explain the reasons why most of the *Homo Sapiens* population does not have enough food, the following should be noted:

1) Poverty is a major cause of hunger;

2) Mass resettlement and endless wars have led to the displacement of people and abandoned agricultural land;

3) Insufficient or abundant rainfall caused by climate change is one of the major causes of significant harvest reductions;

4) The constantly increasing content of toxic compounds adversely affects both the quality and quantity of harvests;

5) The human factor. In its Sustainable Development Goals, the UN notes: "If women farmers had the same access to resources as men, the number of hungry people in the world could be reduced by 150 million".

OVERCONSUMPTION DISORDERS OF THE *HOMO CONSÚMENS* CIVILIZATION

According to WHO, 8.75% of the world's population, which amounts to 693 million people as of 2022, suffer from **obesity**. Fifty years ago, that number was 2.58% of the population, or 105 million people. The number of overweight people has increased 6.6-fold.

***Homo Consúmens*, stop consuming!**

According to the studies of scientists and V. Shapiro, one of the founders of the Coevolution in the Universe concept, the term “metabolic syndrome” appeared in the second half of the twentieth century and unites the most atrocious systemic diseases, designated as “civilization diseases”. These include obesity, diabetes, cardiovascular disease, hypertension, chronic heart failure, cancer, allergies, impotence and other systemic diseases. “Metabolic syndrome” is a major “civilization disease” caused by overconsumption, barbaric waste and depletion of the resources *Cosmicus Quanticus Cerebrum* has endowed us with. It is caused by eating low-quality food. *Homo Consúmens*’ lack of reason and misperception of the world has led to systemic diseases and deformities in the human population. Consumption is leading to the rapid degradation of “the habitat of Living Matter” on Earth, with the soil degrading the fastest. The desert is advancing along the entire front of ‘cultivated’ soil at an average rate of 10 kilometres per year. It is already posing a serious threat to human life potential. Humans are destroying the soil to feed themselves. However, the food produced nowadays can no longer support human health. Due to improper farming and, as a consequence, violation of the process of geobiocenosis, which takes place in the soil, they do not have the regulatory substances that ensure the proper functioning of metabolism for every living organism that consumes them and thus the mutual regulation of all the internal organs and cells, both somatic, belonging to the organism, and cells of microorganisms-symbionts.

The farming system used by most countries will lead to serious consequences, such as it is in the U.S. This began as early as the 1930s, when methods of agriculture conservation were developed in the U.S. This was not done so much out of love for the natural environment, but under the harsh pressure of circumstances. From the memoirs of American scientist Hugh Bennett: “...on May 12, 1934, the country witnessed an unusual, unprecedented natural phenomenon in U.S history. Dust clouds from the sun-burned fields of western Kansas, Texas and Oklahoma and from the neighbouring states of New Mexico and Colorado were lifted high into the air and carried eastward across two-thirds of the continent. For the first time since the advent of the white man in North America, soil from the Great Plains blotted out the sun over the nation’s capital, drove grit between the teeth of New Yorkers, and scattered dust on the decks of ships 200 miles out to sea”. After this “natural phenomenon”, soil erosion was declared a national disaster and Hugh Bennett was appointed director of the U.S. Soil Conservation Service. It took the United States only two to three years to develop new tillage tools and adopt systemic agriculture conservation methods. Improper tillage in the cultivation of crops is a lethal tool for all humankind.

The area of agricultural land on the planet is estimated at 47,954,190 km^2 or 36.90% of the total land area. Globally, estimates of the extent of damage to cropland vary greatly, but the United Nations Convention to Combat Desertification reports that 52% of the land, or 25 million km^2

used for agriculture, is severely degraded. This figure is greater than the areas of Russia and Europe combined.

Soil is a non-renewable resource, meaning that it cannot be regenerated for 25-30 years.

The modern structure of Homo Consúmens farming is as follows:

80% of all agricultural land, or **38 362 741 km^2** (3,836,274,100 ha), is allotted to livestock production, of which **33 786 813 km^2** is occupied for grazing, while **4 575 928 km^2** of agricultural land is used for growing fodder for livestock (covering more than 15 sectors).

Twelve million hectares of land are degraded annually (that amounts to 23 hectares per minute https://www.fao.org/in-action), which are added to the three billion hectares of already eroded land. This means that they will be removed from the agricultural land turnover in the next few years, and it will take decades, as well as significant resources and effective technologies to restore and remediate the soil. For the record, remember that 95% of the nutrient mass for humans and all mammals is produced by the agricultural sector. What awaits you, *Homo Consúmens*, in the next 10-20 years? Hunger! Death! Wars!

If rehabilitation activities are not carried out, these areas will be added to the area of infertile lands (deserts, dunes and salt lakes), which already amount to 2.2 billion hectares, or 16.9 % of the total land area.

GLOBAL TRANSPORT AND EMISSIONS

Vehicles, being the environmental scourge of modern civilization, discharge highly toxic chemical substances, such as carbon monoxide (CO), benz[a]pyrene, benzanthracene, carbon dioxide (CO_2) and other unnatural gases. The number of vehicles is skyrocketing all over the world. Table 19 provides data indicating the existing number of vehicles compared to their number in 1930. It goes without saying that the increase in vehicles by 2020 is related to the growing environmental problems, such as the advanced emission of carcinogenic gases.

VEHICLES WITH INSTALLED INTERNAL COMBUSTION ENGINES AND CO_2 EMISSIONS

TABLE 19

2020		
Type of transport	**Amount**	**Volume of emissions, mln tons of CO_2**
Passenger cars	1 042 274 000	3292
Medium and heavy trucks	389 174 000	1776
Two- and three-wheeled vehicles	200 000 000	178
Buses and microbuses	3 000 000	414
Ship building	107 749	825
Aviation	440 000	640
TOTAL:	**1 634 995 749**	**7 125**

1930		
Type of transport	**Amount**	**Volume of emissions, mln tons of CO_2**
Passenger cars	30 001 723	18,87
Medium and heavy trucks	5 485 382	2,39
Two- and three-wheeled vehicles	2 710 936	6,05
Buses and microbuses	268 283	0,038
Ship building	No data	No data
Aviation	No data	No data
TOTAL:	**38 466 324**	**27,348**

Thus, the number of internal combustion engines in operation has increased 42.5 times in 90 years, and CO_2 emissions have increased approximately 260-fold over the same period.

It should be noted that in 2025, Germany will completely stop manufacturing vehicles with internal combustion engines. We highly support this decision! Vehicles manufactured before 2025 will see an increase in transportation tax. Therefore, tens of millions of internal combustion engine vehicles are expected to be re-exported to other countries, primarily third world countries.

TYPES OF *HOMO CONSÚMENS* TRANSPORT WORLDWIDE
AT THE CURRENT STAGE AND FORECAST OF THEIR ANNUAL GROWTH

TABLE 20

Transport	Number for 2021	Occupied area		Annual growth, %
		Average value per type of transport (sq. m)	Total area (sq. m)	
Road transport				
Motorcycles/mopeds/ tricycles	200 000 000	2	4 000 000	8.4
Cars	1 042 274 000	10	10 422 740 000	2
Motor trucks	389 174 000	30	11 675 220 000	7.5
Buses and coaches	3 000 000	25	75 000 000	2.25
Farm machinery	1 148 000	20	22 960 000	3.9
Self-propelled construction equipment	503 125	25	12 578 125	4.2
Railway transport				
Locomotives, motor train cars	558 270	60	33 496 200	2
Train cars	3 536 105	75	265 207 875	4.6
Underground (trains)	110 383	338	37 309 454	3
Aviation transport				
Planes	440 000	400	176 000 000	5
Helicopters	56 200	400	22 480 000	5
Water transport				
Freight	73 255	10 000	732 550 000	5
Passenger	7 567	1700	12 863 900	5
Auxiliary	39 177	250	9 794 250	5
Military transport				
Aviation	53418	300	16 025 400	6.3
Armoured vehicles	384963	30	11 548 890	6.3
Vehicles	12 395 832	20	247 916 640	6.3
Fleet	3 352	1 400	4 692 000	6.3
Total:	**1 653 757 647**		**23 782 382 734**	**4.9**

GROWTH DYNAMICS IN THE NUMBER OF DIFFERENT MODES OF TRANSPORTATION WORLDWIDE AS OF 2030

TABLE 21

Transport	Number as of 2021	Number as of 2030	Increase, %
Road transport			
Motorcycles/mopeds/tricycles	200 000 000	351 200 000	175.6
Cars	1 042 274 000	1 229 883 000	118
Motor trucks	389 174 000	652 106 000	167.6
Buses and coaches	3 000 000	3 607 500	120.6
Farm machinery	1 148 000	1 550 948	135.1
Self-propelled construction equipment	503 125	693 300	137.8
Railway transport			
Locomotives, motor train cars	558 270	658 755	118
Train cars	3 536 105	5 000 054	141.4
Underground (trains)	110 383	140 191	127
Aviation transport			
Planes	440 000	638 000	145
Helicopters	56 200	84 490	150
Water transport			
Freight	73 255	106 222	145
Passenger	7 567	10 969	145
Auxiliary	39 177	56 808	145
Military transport			
Aviation	53 418	83 703	156.7
Armoured vehicles	384 963	603 231	156.7
Vehicles	12 395 832	19 424 265	156.7
Fleet	3 352	5 251	156.7
Total:	**1 653 757 647**	**2 265 852 687**	**144**

NUMBER OF *HOMO CONSÚMENS* TRANSPORTATION VEHICLES BY 2030

TABLE 22

Transport	Number for 2030 considering growth as of 2021-2022	Occupied area	
		Average value per type of transport (sq. m)	Total area (sq. m)
Road transport			
Motorcycles/mopeds/tricycles	351 200 000	2	702 400 000
Cars	1 229 883 000	10	12 298 830 000
Motor trucks	652 106 000	30	19 563 180 000
Buses and coaches	3 607 500	25	108 225 000
Farm machinery	1 550 948	20	31 018 960
Self-propelled construction equipment	693 300	25	17 332 500
Railway transport			
Locomotives, motor train cars	658 755	60	39 525 300
Train cars	5 000 054	75	375 004 050
Underground (trains)	140 191	338	47 384 558
Aviation transport			
Самолеты	638 000	400	255 200 000
Вертолеты	84 490	400	33 796 000
Water transport			
Грузовой	106 222	10 000	1 062 220 000
Пассажирский	10 969	1700	18 647 300
Вспомогательный	56 808	250	14 202 000
Military transport			
Авиация	83 703	300	25 110 900
Бронетанковая техника	603 231	30	18 096 930
Автомобильная техника	19 424 265	20	388 485 300
Флот	5 251	1 400	7 351 400
Итого	**2 265 852 687**		**35 006 010 198**

Thus, according to Table 22, the area occupied by vehicles worldwide will be 35 thousand square kilometres by 2030, which means a 47% increase compared to 2021 (23.8 thousand square kilometres).

THE ECOLOGY OF THE *HOMO CONSÚMENS* TEXTILE INDUSTRY

The textile industry consumes a huge amount of natural resources and ranks second in the world with respect to water pollution. The dyes used make the water runoff highly toxic, as it contains sulphur, naphthol, nitrates, acetic acid, chromium compounds, copper, arsenic, lead, cadmium, mercury, nickel and cobalt.

GREENHOUSE GAS EMISSIONS AND WATER CONSUMPTION IN THE TEXTILE INDUSTRY AT ALL STAGES OF PRODUCTION

TABLE 23

Stages of textile production	Greenhouse gas emissions, mln tons of CO_2 equivalent	Water consumption, billion m^3
Fiber production	510	54,64
Fabric preparation	931	39,71
Fabric production	395	18,64
Fabric dyeing and finishing	1178	47,15
Clothing manufacture	224	13,08
Clothing distribution	41	0,2
Clothing recycling	11	0,12
TOTAL	**3290**	**173,59**

Thus, the textile industry's contribution to global warming amounts to 3,290 million tons of greenhouse gases in terms of CO_2.

PRODUCTION AND USE OF MINERAL FERTILIZERS

Mineral fertilizers are inorganic compounds containing nutritional elements necessary for plants in the form of various mineral salts. Although these fertilizers contain natural minerals, many chemical synthetics are used in their production. In addition, most mineral fertilizers are obtained artificially through synthetic transformation.

The use of mineral fertilizers is one of the main intensive farming techniques. Fertilizers are used to increase harvests. Depending on the nutrients they contain, fertilizers are divided into simple and complex (compound) fertilizers.

Simple (unilateral) fertilizers contain a single nutrient. These include phosphate, nitrogen, potassium and microfertilizers.

Phosphorus is part of the KNP-triad of elements (potassium, nitrogen and phosphorus), the use of which significantly increases crop productivity (Leibig made this scientific discovery in 1840).

Unlike nitrogen, the atmospheric reserves of which are inexhaustible, and potassium, which in general can be extracted not only from sylvinite deposits, but also from potassium feldspars, phosphorus reserves are limited. Phosphate ores and their products are used as fertilizers. Phosphate rock and apatite are the raw materials used in phosphate fertilizers. According to various estimates, the supplies of phosphate rock are decreasing annually and will eventually run out in 70 years, after which severe famine will reduce the world population to 2.5 billion people and there will be no living creatures left on Earth. Seventy percent of the world's phosphate rock reserves are concentrated in Morocco's phosphate deposits.

Nitrogen fertilizers are mainly obtained cheaply from synthetic ammonia (gas).

Complex fertilizers contain several elements in a single compound, as a mechanical mixture of specially selected substances, or as separate single-element fertilizers. Compositionally, they are subdivided into double (e.g. nitrogen-phosphorus, nitrogen-potassium or phosphorus-potassium) and triple (nitrogen-phosphorus-potassium) compounds.

More than 260 million tons of mineral fertilizer are produced in the world, of which nitrogen fertilizer (N) accounts for about 57.8%, phosphate fertilizer (P_2O_5) for 21% and potash fertilizer for 21.2%.

WORLD MINERAL RESERVES

TABLE 24

Mineral	World resources	Form of compound
Potassium	3.5 bln tons *1	potassium oxide
Phosphorus	72 bln tons*2	phosphates
Sodium	25 bln tons *3	sodium carbonate
Calcium	undetermined, but it is the 5th most abundant element, comprising 3-4% of the Earth's crust	limestone, etc.

*1 https://shorturl.at/GPW14

*2 https://shorturl.at/bwCN2

*3 https://shorturl.at/fPS16

LOW FOOTPRINT AND SAFETY OF MINERAL FERTILIZER PRODUCTION

Both the production and use of nitrogen fertilizers result in the emission of CO_2, N_2O and CH_4, which are among the most important global greenhouse gases. Global fertilizer production accounts for about 1.4% of the annual CO_2 emissions, and fertilizer use is a major source of greenhouse gas emissions other than CO_2 (https://www.carbonbrief.org/qa-what-does-the-worlds-reliance-on-fertilisers-mean-for-climate-change/).

Energy-intensive mining and production processes require the combustion of significant amounts of fossil fuels to convert raw materials into usable fertilizers.

Raw materials used for the production of mineral fertilizers contain strontium, uranium, zinc, lead, cadmium, etc., which are technologically difficult to extract. Superphosphates and potash fertilizers contain these elements as impurities. The most dangerous heavy metals are mercury, lead and cadmium (https://soz.bio/mineralnye-udobreniya-polza-i-vred/). It is mainly the workers of mineral fertilizer production companies who are exposed to the adverse anthropogenic impact of chemicals, as well as the population of different age groups (including children) living in the zone of influence of these enterprises. The population living in these areas has a 1.3-1.7-fold higher overall non-communicable disease incidence. Workers at these enterprises have a high morbidity level, including temporary loss of working capacity due to the predominance of nervous system, skin, and musculoskeletal system and respiratory diseases.

A hygienic assessment of mineral fertilizer production technology indicates a different spectrum of harmful factors affecting workers. For example, workers engaged in the production of ammonium nitrate phosphate fertilizer are exposed to harmful chemicals: hydrogen fluoride, ammonia, nitrogen dioxide and nitric acid. Equipment operation generates noise that exceeds hygienically safe levels.

Workers engaged in the production of non-concentrated nitric acid are exposed to harmful chemical substances: ammonia with a maximum concentration of 32.4 mg/m^3 (MACm = 20 mg/m^3), nitrogen dioxide with a maximum concentration of 35.1 mg/m^3 (MACm = 2 mg/m^3), the average concentration is 10.2 mg/m^3 (the proportion of samples with higher-than-average MAC equals 86.4%), an uncomfortable microclimate, especially in summer when the temperature in the production area of compressor unit operators and oxidation apparatuses reaches 41ºC (with a normal temperature of 20–28ºC).

Workers engaged in ammonia production are exposed to some characteristic production factors: harmful substances in the air of the working zone (ammonia concentration is up to 1.5 MAC), noise (exceeding MAL by 5-6 dB) and an uncomfortable microclimate with air temperatures of up to 30-32ºC.

There is a high risk of upper respiratory tract diseases, kidney and urinary tract diseases and infections, as well as skin diseases associated with phosphate fertilizer production. This production is also associated with an increased risk of eye and ear infections, musculoskeletal diseases, IBS, acute pharyngitis, sore throat, other acute respiratory diseases, gastritis and duodenitis (https://pandia.ru/text/77/309/53163.php).

The manufacture of phosphate fertilizers is also associated with a high risk of atmospheric pollution by fluorine gases. Wastewater from nitrogen fertilizer production contains ammonium nitrate and urea. The main potassium chloride production process wastes in potash fertilizer production are salt, halite, clay sludge, wastewater and mineralized brine from sludge storage facilities (https://docs.cntd.ru/document/564068887).

Mineral fertilizers harm soil due to the high probability of contamination by heavy metal salts, which may be contained as impurities in mineral fertilizers (Pb, Sr, Cd, Mo, B, Zn, etc.) or added as trace elements (https://uchebana5.ru/cont/1113721-p3.html).

The main manufacturers of mineral fertilizers are shown in Table 25 below.

RAW MATERIALS USED FOR THE PRODUCTION OF MINERAL FERTILIZERS CONTAIN STRONTIUM, URANIUM, ZINC, LEAD, CADMIUM, ETC., WHICH ARE TECHNOLOGICALLY DIFFICULT TO EXTRACT

WORLD FERTILIZER MANUFACTURERS

TABLE 25

Company	Country of company registration	Production volume, mln tons/ year	Number of employees	Number of people at risk, thousand people	Location of plants
Coromandel International Limited	India	4.4	13650	4329.3	India
K+S AG	Germany	8	14700	1872.1	Canada, Spain, China, Germany
OCI N.V.	Netherlands	14.4	3850	13549.5	USA, Algeria, Egypt, UAE, Netherlands
Shandong Hualu Hengsheng Chemical Co Ltd	China	2.84	5500	598.2	China
Acron	Russian Federation	6.97	11429	232.7	Russian Federation
ICL Group Ltd.	Israel	6.66	13619	16274.9	Israel, Germany, Netherlands, Spain, United Kingdom, Belgium, Turkey, USA, Brazil, China
Yara International ASA	Norway	20.5	17500	3307.5	Norway, Netherlands, Canada, Colombia, Trinidad and Tobago, Brazil, Australia, India, Italy, France, Belgium, Netherlands, United Kingdom, Sweden, Finland
Phosagro	Russian Federation	10.77	18000	524	Russian Federation

The Mosaic Company	USA	24.1	13000	900.8	USA, Canada, Brazil
SABIC Agri-Nutrients Company SJSC	Saudi Arabia	8.3	31000	1207.4	Saudi Arabia
CF Industries Holdings, Inc.	USA	18.33	3016	122.4	USA, Canada, the UK
Industries Qatar QPSC	Qatar	9.92	5700	35	Qatar
CSBP Fertilisers	Australia	1.32	587	2093	Australia
Nutrien Ltd.	Canada	25	24700	2531	Canada, USA
Indian Farmers Fertiliser Co-operative Limited	India	9.56	4313	302.6	India
Uralkali	Russian Federation	12.3	13 300	227.5	Russian Federation
Chambal Fertilisers	India	3.31	1116	57.5	India
Mangalore Chemicals & Fertilizers	India	0.7	1560	724.2	India
Intrepid Potash	USA	0.3	440	38.3	USA
China BlueChemical	China	2.9	4191	5293.7	China
Grupa Azoty	Poland	4.1	15609	271.1	Poland
Sinofert	China	10.4	4500	8802.3	China
CVR Partners	USA	2.1	300	10.3	USA
Belaruskali	Belarus	12	16 527	117.43	Belarus
Eurochem	Russian Federation	9.3	27000	1464.2	Russia, Germany, China, Lithuania
Gomel chemical plant	Belarus	0.9	2000	508.8	Belarus

Henan XinlianXin Chemicals Group Company Limited	China	2.03	8700	7581	China
Xinyangfeng Agricultural Technology Co., Ltd.	China	4.77	8000	4326.2	China
Rustavi azot	Georgia	0.85	2000	126.2	Georgia
TOTAL		**237.03**	**285 807**	**77 429.13**	

The data in Table 25 are based on official annual reports of manufacturing companies. Thus, about 77 million people live in the risk zone of mineral fertilizer production.

GREEN ENERGY

Green energy is not the solution to global energy independence. But how "green" is this green energy in actual fact, which constitutes about 28% of the total amount of energy? Non-renewable natural resources are used to produce renewable sources, which continues to deplete and pollute the planet.

Solar energy. Solar panels contain heavy metals such as lead, cadmium and mercury, which end up in the subsoil and evaporate into the atmosphere during the use of these panels. Solar panel waste is 300 times more toxic than nuclear waste and requires special disposal, but since the disposal of a solar panel costs more than its production, the used units are sent to landfills in poor countries. No country in the world has regulations for their disposal. It is forecast that about 8 million tons of "green" waste will be produced worldwide by 2030, while by 2050, it will have reached 78 million tons. Enterprises that manufacture solar panels confidently assert that a solar panel that produces electricity is safe for the environment, but they do not advertise some of the features of manufacturing photovoltaic units. The production of one solar power plant (SPP) with a capacity of one 1kW consumes approximately 3,900 kWh of electricity, and if there are no batteries, where does so much electricity come from? So, we are forced to return to the usual hydrocarbon sources of electricity. Silicon is the main element used in a photovoltaic cell. The production process ends with the formation of toxic by-products that are harmful to both humans and the environment. The production of lead-acid batteries for SPP also involves the use of pesticides.

The air temperature in the area where the SPP is located is 5ºC lower than throughout the entire region. This also negatively affects both the regional flora and fauna. SPP installation requires large areas, which will definitely disrupt the ecosystem of the area.

The minimum lifetime of a solar panel is 25 years. The cost of building a small SPP will only be reimbursed in 7-8 years, but often the project pays off just as the equipment reaches the end of its service life.

Wind energy. Wind farms struggle with dubious environmental friendliness at all stages: from their construction to operation. Some negative consequences are hard to imagine, and eco-activists prefer to keep silent about them. The consequences of the ill-conceived introduction of “half-baked” technologies are much more serious than it seems at first glance.

The demise of birds and bats is among them. In the U.S. alone, the annual number of birds killed by wind turbines ranges from 20,000 to 573,000. But the worst part is that it is endangered species of birds that are dying. Wind turbines cause the mass death of large migratory predator species, often classified as endangered. The annual number of bats killed is between 33,000 and 888,000.

Wind farms require huge land resources, which means there will be no room for people and land animals or birds. Moreover, the latter are more susceptible to noise than humans. The generation of 200 MW of energy would require about 20 sq. kilometres of land. At the same time, wind farms usually extend over vast areas and are located far from the consumer, which creates additional energy transportation costs. Storing the excess energy generated by wind turbines also requires additional solutions: batteries or converters to other forms of energy.

WIND FARMS REQUIRE HUGE LAND RESOURCES

That is, to receive "free" wind energy, you first have to fork out a lot of money, because a wind farm requires a high initial investment.

Building networks of wind farms requires a huge amount of minerals: nickel, copper, lithium, graphite, etc. Naturally, the extraction of these minerals is associated not only with the destruction of landscape and animal habitats, but also with anthropogenic pollution. The extraction of rare earth minerals – neodymium and dysprosium, which are needed to create wind turbines – means huge toxic emissions. Thus, every ton of metals mined produces one ton of waste in the form of radioactive uranium and thorium. How can wind power be said to be environmentally friendly?

Regardless of their functionality, wind turbines are decommissioned at the end of a twenty-year subsidy period due to the lack of economic benefit. During this time, they return only 78% of the money spent on their creation and installation without maintenance, which involves building special purpose vessels, expensive high-rise work and constant blade replacements. More than 500 tons of lubricants are needed annually for one wind farm alone.

The blade life of modern wind turbines is 20 years, which is very short considering the amount of resources they require to be designed. The blades can be as long as a football field and are made of plastic. For this reason, the most economically viable and commonest way to dispose of them is to take them to landfills or export them to poor countries. The waste products could also be burned, but this would require even more energy and release a lot of harmful chemical substances during the disposal process. The manufacture of lightweight and strong rotor blades creates another critical problem — the use of balsa wood. According to the German Environment Agency, more than 90% of the balsa wood harvested worldwide is used in wind turbines, while the rest is distributed between yacht construction and other spheres. Balsa trees fulfil the important ecological function of protecting riverbanks from erosion. The wood is taken from indigenous territories and reserves in the Amazon rainforest, leading to serious social conflicts and causing harm to the natural environment.

Wind turbines have an impact on humans: they interfere with radio and television reception. In addition, many are also negatively affected by the constant flicker of sunlight interrupted by or reflected off the blades. At a certain flicker frequency, some people even experience epileptic seizures. Wind turbines produce infrasound waves with a very low frequency of less than 20 Hz. Humans cannot hear it, but they feel it. The discomfort from such waves can cause anxiety, panic, dizziness and nausea. Infrasound affects the vestibular apparatus, which controls a person's position in space.

The bottom line is that the so-called wind power industry is just a marketing ploy by businesses, media centres and politicians.

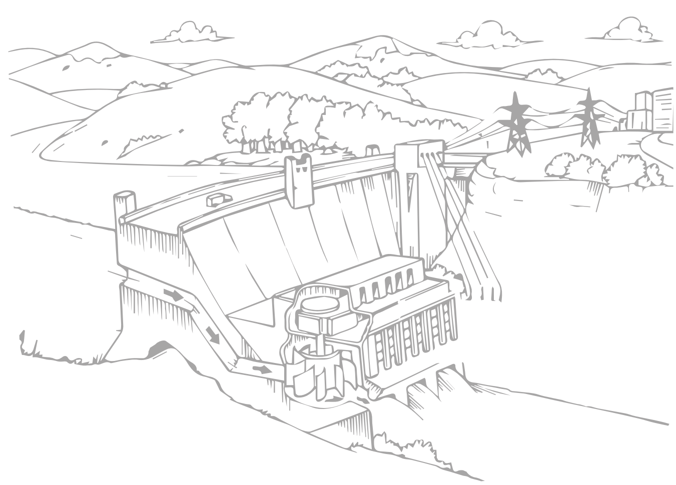
Scientists have calculated that if you cover the whole earth with wind turbines, you can generate huge amounts of energy, much more than 100 TW, but there is one catch. This would fundamentally affect global winds and thus the climate would become very harsh. It is wind that is "responsible" in the global atmosphere for transferring heat from the hot, tropical parts of the globe to the colder, higher latitudes. A decrease in their velocity, which is inevitable when wind turbines rotate, leads to a drop in the intensity of this heat transfer. In short, hypothetically, too rapid development of wind energy could lead to a rise in average temperatures in summer and their fall in winter, and this would lead to a global ecological catastrophe. It appears that politicians, businesses and the media are either illiterate or receive impressive fees, so they don't care about the future of the planet.

Hydropower. Large hydroelectric dams that regulate river levels are unable to adapt to the rapidly changing climate. Many experts believe that this power generation technology is outdated. However, although hydroelectric power plants (HPPs) are considered environmentally friendly in terms of zero emissions, the events preceding their construction are taking a huge toll on the planet and humanity.

Today, two billion people live in countries that have a high demand for water resources, including due to hydropower plants. This is leading to the uneven distribution of water resources: some rivers and streams are drained, while in other places huge territories are flooded. The construction of large hydropower plants disrupts the established ecological balance.

The construction of HPPs is costly, slow and depends on large sources of demand – industries and cities. Moreover, HPPs cannot solve the problem of mobile electricity supply.

A "GREEN" ECONOMY IS INCAPABLE OF FEEDING SUCH A HUGE POPULATION



Hydropower has three negative impacts on the environment: flooding cropland and forests; blocking the flow of sediment and nutrients that are essential to freshwater ecosystems; and blocking fish migration routes, as well as the decline and extinction of many populations.

Hydropower projects do not take climate change into account, because it is difficult to predict, and increasingly frequent climate disasters can break dams and cause flooding.

Hydropower plants and the huge water reservoirs created during their construction negatively impact the climate in the vicinity of the water reservoirs. Within an area of 5-15 km, the air temperature changes, which negatively affects the environment. In areas with different coastal topography,   a turnabout of up to 45º in the prevailing winds is possible. The creation of water reservoirs significantly affects the wind speed with an average annual increase of 15-20%, while in some autumn months it can reach 30%. As reservoirs appear, biogenic compounds tend to accumulate. Reservoirs accumulate up to 90-97% of solid river runoff.

Green energy and promotion of the global warming threat is also a means to cut off the populations of developed countries from the cheap and available blessings of civilization. It will be impossible to exist in a modern metropolis in middle latitudes without coal and gas, and this means the emission of the same CO_2 so hated by globalists, since it is the main risk factor of global warming, and it does not matter that there will be a decrease in solar activity fraught with.... global cooling.

The predominance of green energy dominance will essentially guarantee the extinction of billions of people due to the high cost and unavailability of resources, food and social benefits. A "green" economy is incapable of feeding such a huge population.

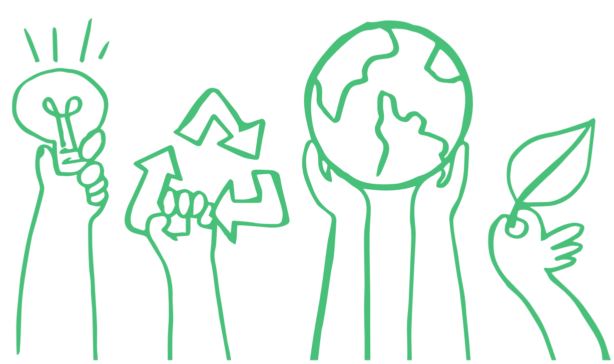
The mindless lobbying of the Green Party is forcing industrial companies to invest in ecofriendly technologies and buy emission quotas to reduce CO_2 emissions, while restricting certain types of production. Green energy is encouraged, which does not provide a stable energy supply and increases the burden not only on the consumer, but also on the environment. Most importantly, the efficiency of these ecofriendly technologies is extremely low and amounts to no more than 22%. Moreover, the production of these sources consumes a huge amount of energy and minerals, including hydrocarbons. Therefore, replacing classic energy sources with ecofriendly sources is merely a perfectly developed and implemented plan to generate additional profits for energy companies and numerous mindless lobbyists who only care about their profits.

There is a strong belief that while promoting the concept of allegedly "green energy" around the world, its lobbyists – politicians, mass media owners and public industry representatives – dream of engaging in big business and gaining public recognition, as though they are promoting advanced new "clean" technologies. However, most of them are poorly educated and narrow-minded people. After all, they are all victims of the consumer civilization that has been dominating for more than a century. It is all about money and socio-political prestige, while environmental lies guarantee the success of these two main premises. It is absolutely insane to call these energy technologies that are poisoning the planet "green". Gentlemen, you are liars, there is no such thing as "green" energy! Call these technologies "temporary", "forced", "alternative", but in no way "green". They are fakes designed for public bragging and creating a false image. The people who make up these fakes have no concern for the future victims of these technologies, they are only concerned about their own lives and success. This makes all the lying and disregard for the future worthwhile. And who are the victims of the consumer mentality? Our magnificent planet and all the living products of *Cosmicus Quanticus Cerebrum,* the Universal Quantum Mind or *Microbiome*.

I would rather live by candlelight and preserve endangered resources, the health of the planet and living beings than illuminate megacities with bright consumer advertising and destroy our planet and all its living creatures.

HUMANITY, ALL LIVING CREATURES AND THE PLANET URGENTLY NEED A NEW ENVIRONMENTAL CIVILIZATION!

WHO ARE THE VICTIMS OF A CONSUMER MENTALITY?



TECHNOLOGY AIMED AT UNDERMINING THE INTELLIGENCE OF *HOMO SAPIENS*

The Internet

When surfing the Internet, you wonder whether it does more harm or good.

Ever since the Internet became the primary means of communication, there has been a marked decline in face-to-face social contact, which has contributed to a decline in social skills and the absence of meaningful interpersonal connections.

The Internet has created a culture of online harassment and cyberbullying, which is having a negative effect on people's mental health. *Homo Sapiens* can hide behind usernames and social media profiles, which makes it possible to engage in aggressive behaviour with no consequences. This culture of online harassment causes anxiety and depression and even leads in extreme cases to self-harm and suicide.

The Internet has contributed to the spread of addictive behaviour expressed in the obsessive playing of video games, mostly gambling, and posting in social networks.

As reliance on digital platforms and services increases, personal data has become a valuable commodity for large corporations and advertisers. This commercialisation of personal data causes depression, which does nothing to enhance intelligence and mindful behaviour.

The Internet contributes to increasing economic inequality. Large tech companies often dominate the digital marketplace, capitalising on the scope of their operations and access to vast amounts of user data. Such consolidation of power and wealth leads to higher prices for services and increased consumption.

The Internet has disrupted traditional forms of media and journalism, driving paper media out of the market and reducing the number of actual discussion platforms.

The ease of sharing and distributing content on the Internet has created challenges for the protection of intellectual property rights. The unauthorised reproduction and distribution of copyrighted materials, such as music, films, books and software, has become widespread.

TV

Mass consciousness in the consumer civilization is manipulated through television and other mass media. The goods and services market is a market of name brands, the sale of which is promoted through television, which seeks to attract the viewer's attention to certain TV channels. TV advertising creates a virtual world created according to the "customer's desire", with a guaranteed set of consumer values. It is an imaginary addictive world and people who are immersed in it become autistic. At the same time, people know that they are surrounded by fictional images and gladly obey their laws.

By 2010, one in five people on the planet had a TV, so more than 1.4 billion TVs were in use.

As of 2018, the number of Internet-connected TVs amounted to 760 million, which is only 30% of the total number of 2.5 billion TVs in the world. Between 2018 and 2021, more than 200 million TVs were manufactured worldwide every year. Thus, we can assume that nowadays, there are about 3 billion TV sets of different generations in use globally.

Given the rate of moral and physical deterioration of TV sets, models produced before the 1980-90s can be found in museums or in the possession of a few vintage lovers. Accordingly, these three billion TVs are those manufactured between the late 1980s and early 1990s to the present day. Older models (before plasma TVs) make up no more than 10% of the total. Nowadays, modern LED and OLED TVs account for 55-60% of the total number, while their predecessors, plasma TVs, constitute 35-40%.

Older models can consume up to 150 watts of electricity an hour, a plasma TV consumes 80-120 watts/hour, while LED and OLED consume 60-80 watts/hour (this applies to standard small TVs with a diagonal of up to 50 inches).

The average energy consumption values are as follows:

Older TV models – **3 billion*10% *0.15kW = 45 000 000 kW**

Plasma TVs – **3 billion*35%*0.1kW = 105 000 000 kW**

LED and OLED TVs – **3 billion*55%*0.07kW = 115 500 000 kW**

Statistically, a TV is on for an average of 3 hours a day.

Thus, the total global energy consumption of televisions amounts to the following: (45mln+105mln+115.5mln) *3 hours = 796.5 million kW x 365 days = 290.7 billion kW or 290,722.5 gigawatt/hours per year.

This amount of electricity (290 billion kW) is enough to supply a city of 15 million people, such as Istanbul (Turkey), Buenos Aires (Argentina), Kolkata (India) or Rio de Janeiro (Brazil), for three years. For comparison, one nuclear power plant generates an average of 40 billion kW/year, while a megacity annually consumes about 140 billion kW.

If we add the indirect amount of electricity televisions consume (the cost of metal mining, manufacture of component materials and electricity costs of the manufacturer's factory itself) to the direct amount, this figure increases by at least 10%.

Consequently, if humans gave up using TVs, we would save 320,000 GW of electricity annually. This is a particularly urgent need, since television is expanding the consumption market by leaps and bounds.

Humans, humanity! Stop using TVs to save our planet!

Film industry products, which are mainly films, music videos, sports and TV programs filmed in studios, are also electricity guzzlers.

In terms of CO_2, the production of one film generates from 391 to 3,370 tons of greenhouse emissions, which means an average electricity consumption of about 10,000 kW.

In 2021, 12,303 films were released globally, corresponding to 123 million kW of electricity consumed.

As for TV programmes and sports broadcasts, one hour of TV production generates 9.2 tons of CO_2 or consumes 40 kW of electricity.

Today there are already more than 37,000 TV channels of various profiles: news, sports, nature, films, music, etc. Most TV channels broadcast around the clock. Thus, a lot of content is needed to fill the air. This requires the following amount of electricity:

40kW*24h*37,000(TV channels)*365 days = 12,964 billion kW of electricity. Therefore, the total global electricity consumption for broadcasting amounts to almost 333 thousand GW per year, or 81 million tons in terms of CO_2.

YouTube

Homo Sapiens is the victim of the global psychological manipulation carried out by every kind of information source on earth, depending on the national, religious and cultural characteristics of different regions. Deliberate and planned informational influence on people's consciousness occurs through socio-political manipulations in the life of society, states and the world as a whole. In today's society, the supreme control wielded by *Homo Consúmens* is the driving force behind this influence. Its goals are clear: to influence mass consciousness and develop its own business and consumer mentality in users, giving them no opportunity to develop their own minds, search for scientific answers to what is happening, or think about the future of the planet. In contemporary world politics, control over information flows is becoming crucial. We are witnessing not the improvement of *Homo Sapiens*, but its dumbing-down in the form of a widespread decline in intelligence. Intellectuals point out the millions of views and likes under absolutely idiotic videos as proof of this. Scientific, fundamental and ecological values are being entirely replaced by false ones aimed at psychological subjugation and the control of human consciousness on a global scale.

The algorithms developed by YouTube work as follows: the more comments a video generates, the higher the activity of viewers; and the higher the activity of viewers, the more interest the video generates; the more interest the video generates, the more often it will be shown to new viewers, thus making business more lucrative. It is the number of "impressions" on the homepage or in the video feed that determines the number of times a video is viewed, thus increasing the income of bloggers and attracting advertisers and investors to the popular page of a specific information channel.

To ensure success, the video begins with a sensation, without any leadup to the topic. The most "awe-inspiring" moment is shown immediately, for which a 5-10 second teaser from the last part of the video is created. Only after that does the introduction and the story begin. Time is a precious resource. Viewers want to receive the information that made them click on the preview as quickly as possible. To ensure a wide reach or number of views, the CTR (Click Through Rate) is analysed, that is, how effective your preview picture is. How often did viewers click on a video when it was shown in their feed or on the home page? You can post the most intellectual programme or the most interesting video, but no one will watch it if it does not apply to these rules. The laws of clickable previews have long been in force here: they have their own style – the author's face, font, colour and userpic; convenience of viewing on any gadget; and the preview picture should intrigue and interest its consumer audience. Whether you have a thousand subscribers or a million, YouTube's algorithm works the same way.

Thus, based on the principles and modus operandi of YouTube, *Homo Consúmens* can be diagnosed as *Homo Primitiva*. Long, conceptual videos receive millions of times fewer views than short, meaningless videos that evoke a desire to consume. The audience is not really interested in topical, intellectual, scientific and environmental texts and videos. The mass audience, which is 5 billion registered users in the global Internet network, has little interest in today's problems or the future of the planet. They are incapable of paying proper attention to such important things because *Homo Consúmens*' minds are clogged with trash. Their potential is underdeveloped and only expands the market for consumption. This convinces us that the demise of the *Homo Consúmens* civilization is at hand.

By the way, if I offer to pay 1,000 euros to have my *Civilization Manifesto for the Planet's Intellectual Minds* posted on different websites, media operators will not even contact me; for 10,000 euros my book will be viewed by a couple of dozen people; for 100,000 euros, I will get the attention of a few groups of users, whereas if I invest millions of euros, I will attract the attention of the masses. You are educating people and saving them from demise, but you have to pay millions for it. After all, the book has been translated into 13 foreign languages. This is why I call contemporary society an anti-civilization.

THE IQ OF *HOMO CONSÚMENS*

The *intelligence quotient* (IQ) accepted by society is an attempt to assess the level of general intelligence. But it does not live up to its name and does not reflect the true level of human intelligence.

The existing validated tests to determine it are categorized by age group and show a person's age-appropriate development. That is, a nine-year-old child and a college student can have the same IQ because the development of each is appropriate for their age group. A specific designer draws up the logical and arithmetic problems presented in the IQ test and makes their own subjective assessments based on the results. Often, people with an "average" mind-set can get high marks, while a smarter person may come up with a different solution than the author. Human intelligence consists of several components and cannot be reduced to a common denominator, so IQ tests are not indicative or effective. They can be conducted only in relation to categories of people, such as engineers, teachers, builders, students, schoolchildren, etc., who do not think in broad terms or whose level of intelligence is not responsible for developing higher matter or forming planetary consciousness. Verification tests only humiliate their participants, both the authors of the questions and the respondents. A person with higher intelligence consciousness (HIC) will never participate in commonplace limited tests to determine their "intelligence level" and consciousness.

For example, Raymond Cattell created the **Cultural Fair Intelligence Test** in 1949 in an attempt to measure cognitive ability without sociocultural and environmental influences. Researchers have subsequently concluded that it is extremely difficult to develop ways to measure cognitive ability without the influence of empirical and cultural contexts. Cattell suggested that general intelligence includes both mobile and crystallized intelligence. While mobile intelligence has a biological and constitutional basis, crystallized intelligence is an individual's actual level of cognitive functioning based on an increase in mobile intelligence through sociocultural and experiential learning (including formal schooling).

The proposed questionnaire consists of 105 multiple-choice questions with three response options (a, b, c). The test-taker selects and records their response on the answer sheet. While answering the questions, the following rules must be followed: do not spend time thinking, but give the first answer that comes to mind; do not give vague answers; do not skip questions; be sincere. Here are some of the questions:

1	I think my memory is better now than it used to be:	a) Yes b) Hard to say c) No
2	I could live happily alone, away from people, like a hermit:	a) Yes b) Sometimes c) No
3	If I said that the sky is "below" and winter "is hot", I would have to call a criminal	a) A gangster b) A saint c) A cloud
18	Sometimes, although very briefly, I have felt hatred for my parents:	a) Yes b) I do not know c) No
23	I really enjoy having guests and entertaining them:	a) True b) I do not know c) False
37	Which word is not related to the other two	a) Cat b) Near c) Sun
101	I have fantastic dreams at night:	Yes b) Sometimes c) No

We would do well to determine the level of "higher intelligence consciousness" (HIC) of learned intellectuals. It is these people who determine the future development of humankind and form the fundamental basis of scientific knowledge for research activities, as well as an integrated natural-scientific worldview of the material world.

It is really difficult for people today to enrich their minds by choosing the correct information source. Facts are generally understood under the compelling influence of advertising, which ultimately has no effect on a person's intellectual development and acquisition of knowledge. The purpose of advertising is to make a profit, not to increase the consumer's HIC. A book should not be a commodity. If it is used as a commodity, its purpose is to find a consumer, not to enrich the mind. A valuable source of information can only be found by reading, listening to, or leafing through a huge number of books by various authors of different genres: scientific-journalistic, fiction and non-fiction. Today, bookstores offer books written by tens of thousands of authors from all over the world. Why do we need books that destroy the mind rather than improve it? *Homo Consúmens* firmly believes that a person can be successful without exerting a lot of effort or acquiring a lot of knowledge. But this is incorrect. We need to be able to analyse and compare information from different sources to understand what it means. We need to be very discerning when watching all the different news and Internet channels.

ROCKET AND SPACE ACTIVITIES (RSA)

When considering environmental problems, we talk about the Earth and the surface layer of the atmosphere, while the most important subject – near space where space activities take place – is overlooked.

Space activities are related to the direct exploration and utilisation of outer space. More than 6,700 space vehicles have been launched in over 60 years, and more than 5,500 are now operating in space. A total of 73 states are involved in various aspects of this activity, some are engaged in the full work cycle, from space development to disposal, 49 work with satellites, 13 of which have launching capability, 6 operate extraterrestrial probes, while three states have the capability to launch humans into space.

There are 35 spaceports in the world that have launched rockets and satellites into space at one time or another. Twenty-six of these spaceports are still in use today. Huge areas are affected by space activities: from the locations of the support facilities to drop zones, and so on, as well as near-Earth space.

Is humankind aware of the importance of near space for the conditions of life on Earth, for the existence *of Homo Sapiens*?

Space activities negatively impact the environment. The areas where rocket booster parts fall are the most prone to environmental degradation.

The efficiency of modern space technology is only 1-3%. The remaining percentage of the launched systems is industrial waste, which negatively impacts the Earth's ecology.

The overall environmental and human impacts of the rocket and space industry are as follows:

- Soil contamination with toxic substances in the areas where the launch vehicle (LV) fragments fall;
- Minor landscape damage and short-term contamination of the impact areas by spent LV parts;

- Depletion of the ozone layer during combustion of booster fuel in the atmosphere;
- Formation in the near-Earth space environment of anthropogenic space debris;
- The emergence of unpredictable new types of viruses brought to earth from outer space and released from meteorites. The existing scientific theory of "panspermia" explains that life is distributed throughout the universe by meteorites, comets and cosmic dust.

RSA include the following routine operations: the dumping of rocket fuel components (RFC) during the startup of launch vehicles (LV); the emission of RFC when the parts that break away from the LV fall; and non-routine situations: emergencies, destruction of equipment elements, explosions of various magnitudes and leaks and ruptures, which contribute to the release of RFC into the environment. Some data on unspent propellant residues in the tanks of the parts that break away from LV during a routine fall are presented in Table 26:

MASS OF RFC RESIDUES IN THE TANKS OF THE PARTS THAT BREAK AWAY FROM SOME LV THAT USE TOXIC RFCs

TABLE 26

Name of launch vehicle	Rocket fuel components (RFC)	Mass of RFC residue, kg		
		1st rocket stage	2nd rocket stage	Total
Soyuz Molniya	T-1 Kerosene Oxygen Hydrogen peroxide	1200 2300 500	450 1100 260	1650 3400 760
Kosmos-3M	AK-27I (nitrogen oxidizer) Unsymmetrical dimethylhydrazine (heptyl)	1364 667	- -	1364 667
Proton-K	dinitrogen tetroxide Unsymmetrical dimethylhydrazine	3125 1751	1003 517	4128 2268

The areas where the first stages of launch vehicles fall pose a real environmental hazard due to deposition of toxic rocket fuel (RF) residues on the ground. An example is super toxic fuel, such as unsymmetrical dimethylhydrazine (NDMH) and heptyl. Rocket fuel consists of two components: heptyl and an oxidizer. Heptyl is a clear liquid with a pungent, highly irritating characteristic ammonia odour. It dissolves well in water and has an alkaline reaction. It is a potent poison, which is six times more toxic than hydrocyanic acid. It has carcinogenic, mutagenic, teratogenic (decreased foetal weight and size, anaemia and hematomas in the head region) and other effects. WHO classifies it as a Class I toxicant, like sarin and phosgene. In nature, it has the ability to accumulate in the soil, vegetation, living organisms and any objects. The metabolite of heptyl — N-nitrosodimethylamine — is 10 times more dangerous than heptyl itself.

The oxidizing agent is nitrogen tetraoxide, which produces nitric and nitric acid in moist air and accumulates in the form of nitrate in the soil, vegetables and plants, especially in mosses, jaggery, etc.

Heptyl is mainly released into the environment through atmospheric dispersion and fuel spills from falling launch vehicle stages. When the two stages fall, the heptyl tanks separate first, followed by the oxidizer tanks. Since 2000, heptyl also escapes from LV tanks in the form of an aerosolized toxic cloud that is spread by the wind over the area of the dumping site. These areas are commonly referred to as “zones of ecological burden”, which cover a total area of 77.09 million hectares in Russia alone. There is a systematic pattern of increased morbidity of the population and animals in areas where launch vehicles have fallen, as well as in residential areas near spaceports.

To date, no effective methods have been found for neutralising rocket fuel components. The first work to identify the ecological burden began in the 1980s. It was found that self-purification of the soil from some components takes more than 30 years, while it takes 5 years for the soil to become free of kerosine. Biotechnologists are working with plants and microorganisms to decompose heptyl from the fall of or jettison from first rocket stages, but results on detoxification are still negligible.

The use of heptyl in rocket and space technology is a worldwide problem, since it has been a fait accompli for decades and all the countries involved in space activities have yet to complete the transition to environmentally friendly fuel. Heptyl has been used as a propellant in the following rockets: Proton-K, Proton-KM, Cyclone-2, Cyclone-3, Kosmos-ZM, Shtil-2, Rokot, Strela, Dnepr, Priboy made in Russia; Titan-IVA, Titan-IVB made in the USA; Ariane-42P, Ariane-421, Ariane-44P, Ariane-44P, Ariane-44L, Ariane-44LP made in France; Japanese N families; Chinese Great Trek families, as well as the missiles of South Korea and Brazil. Heptyl is used in propulsion systems of manned spacecraft and automatic satellites, orbital and interplanetary stations, as well as in Buran and Space Shuttle reusable spacecraft.

Solid rocket launches additionally produce hydrogen chloride, chlorine and aluminium oxide. Combustion products of liquid rocket fuel contain up to 95% of biologically neutral components (water, nitrogen, hydrogen, oxygen, carbon dioxide, etc.), while combustion products of solid fuel amount to only 15-25%. Launch vehicles that use solid and liquid propellants have different environmental impacts: the former are safer during prepackaged storage, while the latter are more reliable during startup. Solid propellant boosters are used in many rockets of the U.S., Japan and the European Space Agency (ESA). Liquid engines are used in NASA's two-stage SLS (Space Launch System) launch vehicle and the Falcon Heavy launch vehicle produced by SpaceX.

Ozone is an important absorber of ultraviolet radiation, which is destructive to all living things. But ozone is one of the components of near space. Its behaviour and content are directly dependent on the state of the environment as a whole. Near-Earth space is a single environment that comprises the Earth's outer sheath and protects our planet from all kinds of destructive radiation. It is an important link in the solar-terrestrial chain that determines climatic conditions on Earth. Solar-terrestrial connections have still not been sufficiently scientifically studied, so neglecting this fact could be fraught with high risks for humanity.

The lower boundary of near-Earth space is at an altitude of 15-20 km above the Earth, that is, below the maximum density of the ozone layer, while the upper boundary is at an altitude of tens to hundreds of times higher than the length of the earth's radius (6,371 km). Given the enormity of this environment, humanity assumes that anthropogenic impacts on it are not great. In fact, the situation is catastrophic. We have now reached a level of anthropogenic impact on near space that no other environment has ever experienced: neither the hydrosphere, nor the lithosphere, nor the surface atmosphere. First, this medium is much weaker, its substance content and the energy processes forming it are many orders of magnitude less than those of the near-Earth atmosphere, not to mention the lithosphere and hydrosphere. Secondly, *Homo Sapiens* is exploring this environment using space rockets, the most powerful modern means available to it. Considering this combination, the global ratios in terms of energy and matter emissions in near space already exceed all that we have on the ground and in the surface atmosphere.

A single Proton or Shuttle-type rocket launcher ejects as much hydrogen into the upper atmosphere as it contains, and the mushroom-shaped hydrogen cloud extends tens of thousands of kilometres. What does this mean? There are no localised formations in the upper atmosphere, as there are in the surface atmosphere, for retaining the released gas. Rockets are launched relatively often and hydrogen is accumulated, so we can assume that its global balance in the upper atmosphere is out of kilter. The results of many studies of these hydrogen impacts on the upper atmosphere show that there is a change in the ionosphere. It forms an important protective sheath around the Earth, which affects the propagation of radio waves and allows short-wave communication: we send a signal, it is reflected by the ionosphere and is received at very long distances. Due to the excess hydrogen, giant drifting ionospheric holes are formed, which scientists have observed since the launch of the first Saturn-5 rocket. The concentration of charged particles decreases manifold. What is more, the global hydrogen imbalance must also affect ozone content, because the hydrogen cycle is one of the natural cycles of ozone demise.

In addition to hydrogen, rocket launchers discharge a cloud of carbon dioxide (CO_2) of about 1,000 km, and since it is a heavy gas, its molecules diffuse more slowly. CO_2 is a crucial component of the upper atmosphere, a so-called cooler, largely determining its temperature, while the density and temperature of the upper atmosphere are closely related. Therefore, excess CO_2 significantly changes the main environmental parameters – temperature and density – and with each new launch these changes intensify.

Space debris contaminates near-Earth space with solid fragments of space equipment. More than 27,000 pieces of orbital or "space debris" are currently being tracked by sensors in the United States Space Surveillance Network (SSN). The total mass of such fragments is more than 6,000 tons, and their number, including small fragments, is estimated at millions of millions. To illustrate: the mass of debris contained in the 1,000-kilometer layer of the upper atmosphere is already comparable to the mass of the upper atmosphere itself. There is no such thing in the near-Earth atmosphere. The main danger of space debris is that a one-centimetre fragment can penetrate any spacecraft wall. This brings the reliability of space activities into question.

These major impacts of space exploration are life-threatening to humanity as a whole.

APPEAL TO ALL GREEN PARTIES AND INTERNATIONAL ENVIRONMENTAL ORGANIZATIONS OF THE WORLD

Humanity has not adequately assessed the planetary-scale environmental threat associated with rocket and space activities (RSA). The general public essentially knows nothing about the various effects of RSA on human health and nature, both on the Earth's surface and in near-Earth space.

Chemical contamination with toxic components of rocket fuel is just as dangerous as radiation contamination. It easily penetrates everywhere, does not dissolve, but, on the contrary, accumulates over time. *Homo Sapiens* is being killed by a poisoned habitat. This way of killing is more brutal, because it extends not only to the living generations but to future ones as well. It is genocide via ecocide – the destruction of the living environment – waged by states against their own people.

The world's population living on vast areas is constantly being impacted by the poison coming regularly from outer space. Its doses may be less than the maximum permissible concentrations or maximum permissible levels approved by the countries' environmental regulations and is not measured by the available toxicological techniques. However, the results of exposure to such doses are severe. The world has only just begun paying attention to the effects of low doses of toxicants. These are new diseases of the 21st century, which affect not individual organs and functions, but also the most important body systems: nervous, immune, endocrine and reproductive. This is what we are seeing in areas of low-dose rocket fuel contamination. The toxic effects of **low and very low doses of heptyl, which are tens and hundreds of times lower than the currently accepted maximum permissible concentrations (MPC) in different countries, have been proven.**

The exposure of living systems to various heptyl impacts have been identified.

1) The best-documented is the rapid toxic effect of heptyl on humans and animals, which is observed when this compound is directly injected into them. This effect is manifested within days, weeks, or in 2-3 months, depending on the dose.

2) The long-term effect of lower concentrations of heptyl ingested might take several years or even one or two decades to manifest itself, which applies primarily to the carcinogenic effect of heptyl. The factor that determines the “delayed” toxic effect is not heptyl itself, but one of its oxidation products – nitroso-dimethylhydrazine.

3) The type of toxicity, which does not involve contact of heptyl’s structural elements with the organism at all, is related to heptyl’s ability to rapidly restore oxygen by means of a one-electron mechanism and change the normal level of reactive oxygen in both the environment and the organism.

The widespread development of rocket and space activities, which include the manufacture of rocket hardware and propellants, their transportation, the functioning of rocket units, test sites and spaceports, rocket launches for various purposes, including military and commercial, and finally, the destruction of the so-called “products”, pose the greatest environmental threat. Since the fuel is toxic at all technological stages, it equally affects the cities where it is manufactured, the areas where military systems are located, the areas adjacent to launch sites, the flight paths of missiles, the areas where their detachable parts fall and the missile and fuel disposal sites.

The problem is exacerbated by the extensive development of rocket and space activities and the damage this inflicts on people and the environment.

Commercial launches are presented as highly progressive. It is not only business, making money from space programmes, but also RSA conversion, since military launchers due to be destroyed are used to launch commercial communications satellites into orbit, therefore they are called conversion launches. The commercial space industry is as closely related to the military as the nuclear one.

RSA affects near-Earth space, including destruction of the ozone layer. This impact will increase with the startup of such global projects as satellite communications, which require launching a huge number of satellites into near-Earth space.

The devastating effects of rocket and space activities are experienced by all living creatures with no exception. This is a universal and formidable problem.

Full space exploration must be halted at the international level until the harmful effects on the environment and human beings have ceased. It is essential to inform society about the socio-environmental situation in the rocket and space sphere, appeal to the world community for support of the demands to limit and prohibit the use of environmentally unfriendly rocket and space equipment and technology and stop unrestrained space expansion and its destructive impact on the Earth's biosphere and near-Earth space.

A global space programme must be developed, which envisages the following:

1) Limits the number of rocket launches per year, taking into account their impact on the biosphere and near-Earth space;
2) Ensures a complete transition to environmentally friendly rocket fuel;
3) Ensures the development and phased introduction of an international system of restrictions, followed by a moratorium and a complete ban on the use of rocket fuels that are supertoxicants;
4) Introduces restrictions on the use of combat missiles and their elements being decommissioned for launching space objects;
5) Considers the possibility of imposing sanctions against countries that fail to comply with the environmental requirements for rocket and space activities.

MODERN ENVIRONMENTAL TECHNOLOGIES

The concept of "technology" covers an extremely wide range of activities. Any sequence of actions leading to the achievement of a specific goal, such as obtaining a product, solving a problem, establishing a mechanism of action, creating an algorithm, developing a teaching methodology, etc., can be an example of technology. The list and range of diverse technologies are so far-reaching that they cannot be covered within the scope of this manuscript. Each technology is devoted to the specific task that led to its creation. Among the wide range of centuries-proven technologies, there are relatively new innovative environmental ones aimed at actively protecting the environment; however, the effect anticipated for *Homo Sapiens* as a whole has not yet been achieved.

As practice has shown, a variety of environmental technologies protect its main components – the air, water and soil – from the negative impact of pollutants (solid dust particles, liquid aerosols and gaseous substances, which are frequently of anthropogenic origin that have toxic and carcinogenic properties), physical fields (noise, vibration, electromagnetic and ionizing and thermal radiation) and biological pollution (pathogenic forms of bacteria, mycelial fungi and viruses).

Since the second half of the 20th century, technology has been undergoing development in all spheres at an unprecedented rate. This revolutionary technological leap was promoted by the high level of scientific knowledge acquired in the natural and engineering sciences, as well as in the humanities. The creation of a fundamental scientific and practical basis for the development of a wide variety of technological processes should be considered one of the highest achievements of the last century in scientific and technological progress.

New environmental problems have joined the ranks of the current ones. They are caused, among other things, by global warming, which is creating rising concentrations of CO_2 and methane in the atmosphere. The change in the carbon cycle is closely associated with the rise in anthropogenic carbon dioxide to a critical level that exceeds the photosynthetic potential of the planet. Global warming is also promoted by the wider reach of industry and agriculture, along with increased methane production, whereby methane's contribution to global warming has proven to be 25% higher than anticipated. It is important to note that such greenhouse gases as methane and carbon monoxide can exist in the atmosphere unchanged for up to a decade, while the "lifetime" of nitrogen dioxide (NO_2) can last for several decades.

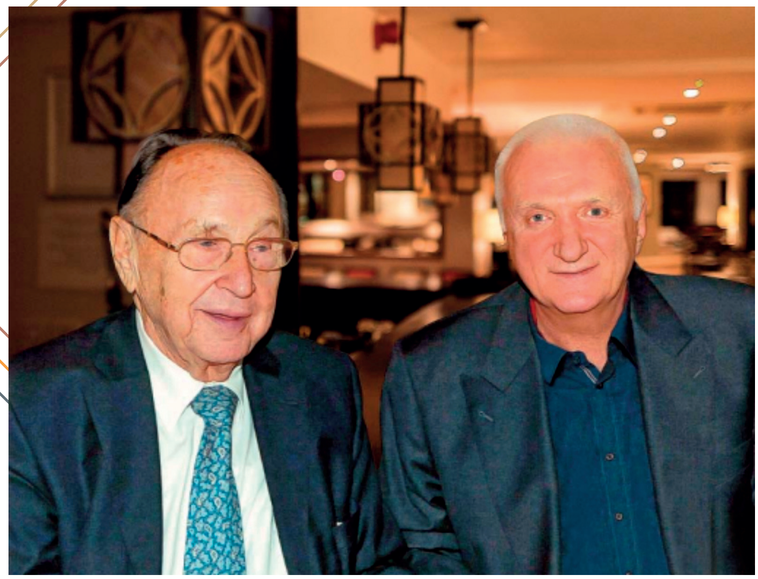
In the 21st century, scientists, politicians, sociologists, engineers, physicists, chemists, agrarians and others have been focusing their attention on such vitally important issues as the development and evaluation of the effectiveness of innovative environmental technologies. When comparing environmental data, it becomes quite clear that the earth's main components—air, soil and water—are closely interrelated ecological niches that also determine the degree of purity of each of these components.

Biological self-purification of soil occurs by means of gradual removal – degradation by rhizosphere microorganisms and plant root systems – of alien substances. This process takes a relatively long time, while the rate of pollution in today's anthropogenic environment significantly exceeds the rate of biological self-purification. In this regard, many technologies have been developed that apply a variety of methods to purify soil from toxic and other alien compounds. In doing so, it is crucial to use the most ecologically targeted technologies that are safe for other organisms, keeping in mind both their effectiveness and the financial costs associated with their use.

In 2017, the United Nations introduced the End Plastic Pollution programme [69] which aims to ensure that the environment is free of pollution from ubiquitous plastics, and this programme is gaining momentum. A total of 260 million tons of plastic is disposed of every year worldwide, 10% of which ends up in the world's oceans. More than two hundred species in the marine ecosystem are suffering from the effects of mistaking plastic for food. As a result, 1 million birds and 400,000 mammals die annually. In 2017, I presented the world with a project called "EuRICAA (Europe, Russia, India, China, America, Africa) as a Worldview Ecological Revolution" approved by Hans-Dietrich Genscher, a famous German public figure, Vice Chancellor (1974-1992) and Minister of Foreign Affairs of the Federal Republic of Germany (see Photo 1). The Eco Sapiens Code of New Civilization Standards offers ways to address this issue.

**IN 2017,
THE UNITED NATIONS
INTRODUCED
THE END PLASTIC
POLLUTION
PROGRAMME**

Photo 1
Hans-Dietrich Genscher and Alexander Potemkin - discussion on EuRICAA



Despite rather serious achievements in the field of environmental technologies based on different principles, which are often deeply scientific with respect to their ideas and content, classical and new innovative environmental technologies are still unable to solve environmental problems on a global scale. The slovenly attitude of *Homo Sapiens* toward their appearance at home, while trying to make a good impression in public also extends to the planet's ecology.

SAN PAULO — (BUSINESS WIRE) — PepsiCo, one of the largest food and beverage manufacturers in the world, has implemented an innovative project at its snack food production facility in Sete Lagoas: a solar thermal power plant (TPP) that captures sunlight and converts it into energy to heat production water. This technology has made it possible to reduce natural gas consumption by 140,000 m^3, which in turn reduces greenhouse gas emissions by a total of 280 tons. This is the equivalent of planting almost 18,000 trees. My compliments to the company!

The second largest U.S. oil-producing state is preparing to introduce a bill related to reducing carbon emissions [70]. This will make it possible for it to reduce greenhouse gas emissions, including carbon dioxide and methane, by up to 50 percent.

Industrialisation of the planet requires finding new sources of energy, otherwise the population will have to be significantly reduced (See the section entitled *Cosmicus Quanticus Cerebrum* Population Regulation). Despite the high capacity of nuclear power plants to provide energy to more than half the world, there are different opinions about those currently in operation.

As of today, there is no real alternative to non-renewable fossil fuels (oil, coal, peat and oil shale). The first serious data regarding innovative, environmentally-friendly technologies are appearing. Solar energy is one of the most important non-conventional sources of additional energy. As we know, solar energy has not only outpaced wind energy, but, more important, it has even partially displaced the use of fossil fuels. Investments in solar energy are annually increasing. China, which is rapidly developing solar energy as a global leader, is putting many of these technologies into effective use. We do not know how much we can rely on renewable environmentally friendly energy technologies undergoing further fundamental development in the near future and how soberly we can assess their potential. This will require putting all of humanity's intelligence potential to good use, since energy is the basic tenet of all living things. As practice shows, established businesses thwart competitive scientific ideas to maintain their profits. The development of solar energy is possible if the necessary resources are available. Rare-earth metals are some of the main elements and component parts of solar cells, which raises doubts about the economics and environmental friendliness of their mass use.

Other possibilities include technologies that are actively exploring the use of hydrogen, an environmentally friendly fuel available in virtually unlimited supplies. Due to its exceptional thermo-physical properties, which are especially important for mobile technology, hydrogen is one of the most promising alternative fuels. For example, it can be used in piston engines in a gaseous or liquid state based on the following conceptual approaches: (a) as an additive to the main fuel (in gasoline and diesel engines); (b) in a hydrogen engine by mixing and forced ignition of a hydrogen-air mixture; (c) in a hydrogen engine by directly injecting hydrogen.

Adding hydrogen to traditional hydrocarbon fuels improves the environmental and power performance of a piston engine. It goes without saying that in terms of the increased power of hydrogen engines, the inexhaustible reserves of this fuel, not to mention its environmental performance, offer advantages that could be widely applied in the near future [71].

A wide variety of technologies based on physical (including mechanical), chemical and biological principles have been known for decades, both in the conventional and patent literature [72-75,31,32].

Effective technologies based on catalytic and plasma-chemical methods of air purification are well known [76-78]. Along with the existing environmental technologies for removing pollutants from the environment: electrostatic, sorption, catalytic and chemical, plasma catalytic technologies have been attracting increased attention recently. As we know, plasma is a gas whose molecules are ionized. It consists of many components: electrons of different energies and positive and negative ions. The degradation of substances alien to nature occurs according to the following principle: polluted air passes through a gas-discharge reactor, where the alien substances are destroyed under the action of low-temperature plasma. The technology of catalytic air purification is based on deep oxidation of the conversion products formed as a result of air passing through a plasma-chemical reactor. The technology is designed for a low-temperature catalyst, which, due to the plasma-chemical reaction mechanism, works effectively in a temperature range between 20 and 50ºC.

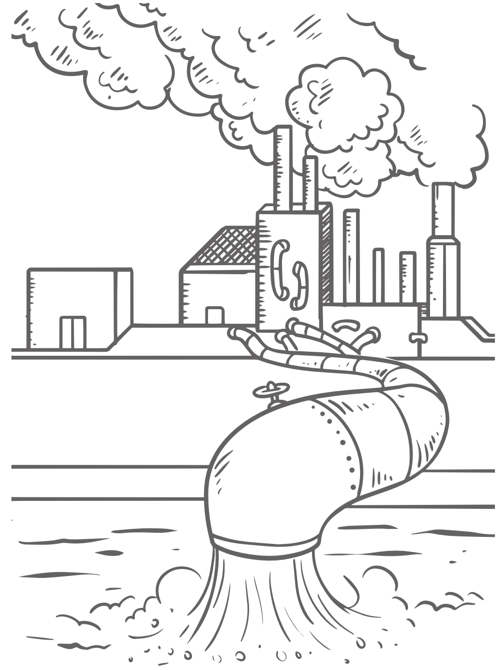
In addition to classical and innovative environmental technologies, there are a number of social considerations related to environmental concerns. French philosopher Bruno Latour [79] puts forward a new concept of political ecology. However, according to some authors, the idea of political ecology as a fundamental political principle of environmental protection does not appear convincing. The persistence, will and drive of *Homo Sapiens* to consume is taking its toll. So, politics cannot protect the interests of nature, since it is beholden to people and protecting their interests. Politics can only protect the environment by endowing it with subjective qualities and corresponding rights. This extraordinary statement, which implies enshrining the natural environment in the letter of the law and defining the obligations of each country, may indeed be well-targeted [126].

Physical technologies are based on physical principles, including exposure to different rays, adsorption of anthropogenic compounds based on special sorbents, physical separation, ionic and molecular exchange, etc. [80-81]. In terms of their quality, physical technologies are relatively effective, but they require specific materials and equipment, which often makes their use expensive and, consequently, unprofitable. Due to their high efficiency, these technologies are used in conditions where other environmental technologies cannot produce the desired results.

As a type of physical technology, mechanical environmental technologies are based on pressing, filtration, sedimentation, etc., and are placed in a separate group. Mechanical technologies take into account the following: the creation of purification production systems for polluted flowing water and wastewater; the sedimentation and pressing of wastes, which subsequently facilitates their processing; the use of the mechanical flocculation principle; and the use of mechanical filters of different sizes, capacity and conductivity [80-81]. Technologies of this type are actively used at the initial stages of purification of water and contaminated aqueous solutions. Mechanical filters are relatively efficient, their action being based on the ability of different types of sorbents to remove toxic gaseous pollutants (e.g., sulphur dioxide), as well as small particles from industrial smoke.

Physical technologies include the collection of contaminated soil and its disposal [80-81]. Historically, this is the first successful environmental operation our ancestors used to remove pollution from the environment. It is clear that the main disadvantage of this technology is that it does not promote rapid remediation of contaminated ground soil or any other buried object, but the contaminated object or a separate ecosystem can be isolated from the environment in this way. There is the risk of spreading any form of buried contamination (e.g., by leaching (extraction), microbiological conversion, change in microenvironmental temperature, etc.). Hundreds of years ago, when the level of environmental contamination and content of

EVEN WITH A NUMBER OF TREATMENT AND PROTECTION SYSTEMS IN PLACE, ALL OF THESE PLANTS REMAIN HIGHLY HAZARDOUS TO THE ENVIRONMENT



toxic and radioactive compounds was negligible, contaminated soil was remediated by the soil microflora surrounding the buried object [82]. In addition to microorganisms, the root system of plants actively participates in this process. Since buried objects were relatively rare, the use of this technology had no critical impact on the environment, either regionally or globally. This kind of primitive ecological biotechnology is still used today, although rarely, especially in developing countries. It stands to reason, however, that there are both more effective and more expensive physical technologies for soil treatment [126].

All factories associated with the production and processing of chemicals, regardless of their size or the products they manufacture, discharge pollutants that pose a serious risk to the environment. Any chemical, metallurgical, or oil-refining plant, no matter how modern its technologies and equipment, still pollutes the environment with various toxic compounds during the production process [83].

Despite the fact that modern chemical plants have low concentrations of pollutants in their emissions and effluent discharges, the continuous production processes still contribute to the emission of a considerable amount of toxic compounds into the environment. Special attention should be paid to production wastes of the above-mentioned plants, their storage and recycling. Even with a number of treatment and protection systems in place, all of these plants remain highly hazardous to the environment [83].

Chemical technologies for removing toxic compounds from the soil are based on the use of surfactant solutions, organic solvents or active oxidizing agents such as active oxygen and chlorine, as well as alkaline solutions. These technologies are mainly used for removing a variety of alien components, including hydrocarbons, from the soil. Subsequent operations include toxic waste remediation. Among the negative effects of chemical soil purification methods, we should note the destruction of microflora in this segment of the soil, the long term of their use (1-4 years on average) and a large amount of contaminated sluice water, which absolutely must be recycled (subjected to additional treatment).

The following example gives a rough idea of the environmental problems that must be resolved in reality. **According to existing data, given an annual amount of processed minerals of 100 billion tons, almost 10,000 different anthropogenic chemical compounds find their way into the environment, among them: 60 million tons of synthetic components; 700-800 million tons of mineral fertilizers; 5 million tons of pesticides; 50 million tons of iron; and 500 billion m3 of recycled slurry [83]. In addition, the production process leaves up to 10 billion tons of solid residue, i.e., 10% of the original amount of fossils. This is what the average processing data for natural resources looks like.**

One of the most widely used chemical environmental technologies is the stabilization/immobilisation of toxicants in soil. This takes place directly at the contamination site and does not require soil transfer. The technological process introduces chemical compounds into the contaminated soil to bind the toxic pollutants. This results in the formation of complex compounds that are less toxic. Due to their low solubility, they are unable to spread widely in the soil. One example is adding phosphate to lead-containing soil. Stabilisation or immobilisation technology is frequently and successfully used in soils contaminated with heavy metals [84].

One well-known method is sorption technology based on the adsorption or intake of solid or gaseous human-made chemicals by their interaction with other various chemical compounds, which leads to their binding both in aqueous solutions and on solid absorbers. Heavy metals bound with non-toxic chemicals under *in situ* conditions significantly reduce the toxicity of the compounds formed. In some cases, technologies based on chemical and electrochemical separation are used [85, 126].

Biological technologies based on the use of microorganisms, plants, viruses and enzyme solutions represent a relatively new generation of environmental technologies, which are still being actively improved [86]. Having common principles of action with existing natural processes, the implementation of ecotechnologies for transforming the toxic wastes of various industries into safe compounds is an exceptionally important goal. The vast majority of them are based on the use of natural chemical or biological processes such as conversion, transformation, hydrolysis, resynthesis, mineralization of toxicants, etc.

Environmental biotechnologies are being developed and improved; they are based on the duplication of natural principles. Their practical use leaves the ecological balance in nature undisturbed. It should be noted that environmental biotechnologies are relatively low in cost and simple to operate.

Environmental biotechnology is essentially based on the characteristic ability of some organisms (mainly annual and perennial plants, as well as microorganisms of different taxonomic groups) to transform and neutralise organic toxic compounds during metabolism and, in most cases, mineralise them, forming natural inorganic compounds (such as H_2O, CO_2, etc.) [72]. Plants are known for their ability to absorb and accumulate heavy metal ions in intracellular space. This genetically determined ability of different plants represents the basis of biological remediation.

Compared with other organisms, microorganisms, especially bacteria, are able to degrade organic compounds much faster, breaking down their carbon skeleton, whereby the released carbon atoms are effectively used for the synthesis of cellular metabolites [72]. All these reactions are based on the action of enzymes and are predominantly carried out on the principle of oxidative degradation of toxicants. Due to deep degradation of their structures, eukaryotes (plants and mycelial fungi) and prokaryotes (bacteria) remove organic toxicants from the environment, taking part in the characteristic carbon cycle.

Plants are in the most extensive ubiquitous contact with toxicants (in the soil, air and water) [87,88,1]. They are known to adsorb alien compounds, which is followed by their further penetration into plants, intracellular distribution and accumulation. After a certain amount of adaptation, different chemical transformations of these compounds, such as oxidation, reduction and hydrolysis, begin. The initial stage includes the time required to mobilize the plant cell structures (energy required, enzyme induction and transformation processes of toxic compounds) involved in the detoxification process. Since plant detoxification is a long process, an additional source of energy generated by the mobility of the plant cell itself is also required. Compared with microorganisms, metabolism in plants is relatively slow. During this process, oxidative degradation of the carbon skeleton of organic toxicants, a complex and multistep process, mainly takes place, which significantly increases the time required to neutralise the toxic compounds [1]. According to experimental data, the degradation or conversion of stable toxic compounds or their mineralization in plants can take several days.

Phytoextraction. The technology of soil decontamination by phytoextraction is carried out by cultivating certain plant species on areas of contaminated soil. Phytoextraction proves to be effective in removing copper, zinc and nickel compounds, as well as cobalt, lead, manganese and chromium, from the soil. At the end of the phytoextraction process, the plants should be harvested and burned. The ashes obtained after incineration are considered hazardous waste and must be disposed of accordingly.

Bioremediation. This is a technology based on targeted plant breeding and strengthening the activity of the soil's rhizosphere microflora by introducing active strains of microorganisms of certain taxonomic groups (bacteria and mycelial fungi) into the soil isolated from it and involved in the degradation of toxic compounds. It should be noted that some authors consider

PLANTS ARE KNOWN FOR THEIR ABILITY TO ABSORB AND ACCUMULATE HEAVY METAL IONS IN INTRACELLULAR SPACE

bioremediation to be a process carried out solely by microorganisms.

In conditions of relatively low pollution, the selective use of herbaceous, shrub and woody plants is particularly effective in reducing the flow of pollutants from the source of their formation and preventing their spread, as well as ensuring the long-term preservation of the existing natural balance (equilibrium) [87]. As repeatedly shown, the joint action of plants and microorganisms is synergetic. This means that their combined action is much more effective than the arithmetic sum of the action of each one separately. This process, based on the action of living organisms, is called bioremediation. Currently, bioremediation is recognised as one of the most promising green environmental technologies. The application of these technologies can be recommended for any kind of soil, even when the concentration of pollutants exceeds the MAC value 50 times. The innovative nature of biological ecological technologies will be discussed in the section specifically devoted to this problem [126].

3.1 TYPES OF WATER, SOIL AND AIR PURIFICATION AND REMEDIATION TECHNOLOGIES

3.1.1 WATER

In the 21st century, drinking water basins with low salt concentrations already far surpass oil and gas resources in terms of vital importance. Today, water is an extremely important social, economic and even political resource that largely determines the health of society, normal environment and development of all industries. Unpredictable population growth, intensive urbanization, transportation and the power industry, along with constantly developing agriculture and industry as a whole, are the main reasons for the catastrophic reduction in the world's fresh water supplies. In just a couple of decades, the planet will face an extreme shortage of fresh water. This conclusion can be drawn from an analysis of the world reserves, the rate of fresh water use and the volume of untreated wastewater, which exceeds its self-purification capacity. There are countries on all continents of the planet that have some freshwater supplies, while others do not have freshwater sources. As mentioned above, water represents one of the most important lifegiving components. All non-halophilic microorganisms and the vast majority of industrial processes require fresh water, which is already in catastrophically short supply in at least 40 countries that cover about 60% of the world's land area. These data make it possible to visualise the scale of the existing global freshwater deficit [16,17].

The annual freshwater discharge is approximately 3,881,5 km^3 [90]. In two to three decades, the shortage of fresh water acutely visible in the 2020s due to the unpredictably rapidly growing population will undoubtedly create extremely serious problems on the planet. Seawater desalination technologies are the most viable, if not the only solution to meeting these increasing needs or at least eliminating their partial deficit. However, these technologies harm human health and the ecology of marine ecosystems.

In terms of salt content, water is divided into several categories: the saltiest water from the ocean contains between 10 and 35 grams of salt per litre (in general, ocean water has an average salt content of approximately 35-40 grams per litre); less salty water, such as that found in lakes, rivers and groundwater reservoirs, is mostly characterised by a salt content of between 2 and 7-10 grams per litre. Drinkable fresh water, on the other hand, contains less than 1 gram of salt per litre and provides only 2% of the volume of total water of all salinity levels. It is this freshwater supply that is the most important for humankind, the increasing challenge of which requires special attention [16,17].

Besides NaCl (table salt), the main components of seawater are K^+, Mg^2+ and Ca^{2+} halides and sulphate cations. Some of them, such as bromine and iodine, are even extracted from seawater on a production scale. This does not exhaust the content of chemical compounds and other individual elements in sea water, among which phosphorus, rubidium, iron and zinc should be singled out in particular.

An analysis of seawater pollutants makes it possible to single out the industrial enterprises that make the greatest unnatural changes to the composition of seawater. These are oil-refining and utilisation enterprises, as well as transportation, including the shipment of crude oil. As a result, without special treatment, seawater cannot be used to resolve a number of vital problems. Despite this, due to its enormous supplies, seawater should be considered the most realistic alternative, having a chemical composition with constant and aggregate characteristics. Due to the huge number of organisms living in it, including halophilic forms of microorganisms and such natural factors as the energy of the sun, the oxidising potential of the global aquatic ecosystem and stoichiometric transformation, seawater has a tremendous capacity for self-renewal. This means that ocean water is able to return to its natural condition over time [73].

Desalination techniques and technologies are also commonly referred to as demineralisation or deionisation. As noted above, according to the sanitary and hygienic requirements for drinking water, the concentration of salt in it should not exceed 1 gram per litre, in rare cases, as an exception, up to 1.5 grams per 1 litre. However, in some regions, salt concentrations in groundwater already exceed this level. The same applies to the water in many lakes and reservoirs. Being the largest freshwater basin in the world, Lake Baikal in Siberia, Russia, which is a huge freshwater reservoir of 23,615 km^3, can be considered a unique case.

The most commonly used water desalination technologies [73,16] include thermal treatment, membrane technology, chemical electrodialysis methods, ion exchange technologies and various combinations of physical and physicochemical methods. All of these technologies, except in isolated cases, are not used on a large industrial scale. Difficulties in their practical application include the complex machinery designs and special installations they require, the use of different ingredients and the resulting high financial costs. Despite this, they represent an extensive theoretical basis for the development of new innovative technologies.

Thermal treatment of salt water is widely used. This treatment converts water from liquid to vapor with subsequent condensation. The disadvantage of this technology is that, during evaporation organic compounds with a low boiling point also leave the sea water along with the steam. This is why thermal treatment of seawater is usually performed along with other technologies, which increase the water quality, although also increasing the cost of water with a low salt concentration.

Reverse osmosis and electrodialysis are also used for water desalination under industrial conditions, either separately or together.

The use of the ion exchange method is appropriate when the salt concentration does not exceed 2 grams per litre. Also, small-scale semi-industrial technologies include reverse osmosis methods, especially when high purity water is required. In special cases, deionisation methods are used together with the above-mentioned technologies to obtain pyrogen-free water of high purity.

The ultraviolet water treatment method is used in cases of low salt concentrations in water, which is relatively rare [73,16]. However, in some cases, the presence of large quantities of organics significantly limits the use of this method.

The ion exchange method of water purification is also quite common and is used to deionise water intended for industrial purposes. Partial desalination is achieved by Na^+ cations that soften seawater. Replacing calcium and magnesium cations with sodium and/or hydrogen ions lowers the water's hardness. In this process, by selecting appropriate ion exchange resins, complete desalination of water with separation of all macro- and microelements can be achieved. In industry, desalination technologies can be applied both at single-stage distillation plants and at multi-stage plants for obtaining high purity water.

In addition to water desalination, special attention is paid to its purification from extraneous impurities [17,96]. For this purpose, as a rule, water treatment with chemical reagents is used. Based on the level of water pollution, specially selected chemicals react with impurities (chemical compounds or elements) in the water and are discharged as sludge. Different types of hard (solid) sorbents are also used to remove impurities. It should be noted that, on the one hand, the chemicals used to treat drinking water reduce the hardness of the water; however, they are not totally harmless to human health. From a practical point of view, the use of chemicals is technologically easier, so water treatment with chemicals is often favoured. Based on sanitation and hygiene requirements, the near-absolute antimicrobial properties of most chemicals are certainly important. The technology of chemical water treatment with any chemical reagent is selected depending on the results of preliminary analysis, which is carried out to establish the type of pollutant, its concentration and the amount of chemical reagent required for treatment.

The following substances are most often used as oxidising agents on an industrial scale: oxygen, ozone, potassium permanganate (manganese), chlorine gas, chlorine dioxide and hydrogen peroxide. All of the above compounds have their advantages as well as certain disadvantages. Various parameters for evaluating chemical oxidisers are known: the amount of required reagents per unit volume of water; reaction efficiency as complete removal of undesirable or extremely undesirable components; the time required to carry out the reaction; the process cost, etc. As a result, everything is measured by the cleaning efficiency and process

IN SOME INDUSTRIES, THE PERMISSIBLE AMOUNT OF CHLORINE AMOUNTS TO BETWEEN 2 AND 5 MILLIGRAMS PER LITRE OF WATER

cost. When chemical methods are used, only a very small excess amount of reagent needs to be added to the treated water to maximise the removal of the unwanted component.

Oxygen is used as the most common oxidising agent. Oxygen concentration affects the quality. This is why the amount of dissolved oxygen in water must be systematically monitored during water treatment. In addition to oxygen, hexavalent chromium, which is an allergic compound, is controlled in the water used and its removal from water intended for any purpose is mandatory.

In addition to the salts of sodium, potassium, calcium and magnesium, water (natural or treated) necessarily includes salts of iron, aluminium and boron. Iron compounds must also be removed from drinking water. Methods based on chemical oxidation are quite effective for this purpose. The reaction proceeds rather quickly, and iron compounds precipitate in the form of oxides, which can be easily separated by filtration.

Chlorine is the most common reagent in sanitary water treatment. It neutralises bacteria and viruses in the water and is the most common reagent in terms of biological water disinfection. However, it should be noted that chlorine is a hazardous compound and its transportation, storage and use require special safety regulations. Chlorine has a fairly broad spectrum of action. Depending on its concentration, chlorine not only affects bacteria and viruses, when used in excessive amounts, it also changes the water composition. Chloroform and chlorophenol are often detected in chlorinated water and should also be removed. In some industries, the permissible amount of chlorine amounts to between 2 and 5 milligrams per litre of water.

Nanofiltration [93] is characterised by its versatility. It makes it possible to remove colour and halogen-containing organic impurities without the use of harmful reagents. This technology is effective in controlling chlorine residuals, although it requires the use of multi-stage pretreatment. The technological process requires the use of different filters and coagulation. If special requirements are made of the water purity, ultrafiltration units or reverse osmosis are used prior to nanofiltration for additional water purification. Due to the numerous preparatory steps, nanofiltration, is an expensive method of water purification and is only used for special purpose water.

Ozonisation technology differs from all other chemical technologies since it does not have any toxic or other effect on the water composition at any stage. Approximately one hour after treatment, the ozone vaporises from the water surface. This is a well-tested, eco-friendly technology, although it requires bulky machinery, the transportation and installation of which are rather difficult. Traditional chemical methods of water purification – chlorination and ozonisation – are still actively used.

The development of new industries associated with the *Homo Consúmens* consumer civilization has led to the emergence of many new chemical pollutants, which have caused the appearance of the new unnatural compounds in drinking water. Among them there are the following compounds: perfluorooctanoic acid, polyfluoroalkyl compounds, polychlorinated biphenyls (PCBs), ammonium ions, heavy metals, in particular ions containing hexavalent chromium, polycyclic aromatic hydrocarbons, new pharmaceuticals, veterinary drugs, new forms of surfactants, new pesticides and others, which have not been previously registered in water.

Recently, perfluorooctanesulfonic acid (PFOS) has attracted special attention as a typical surfactant (Figure 16).

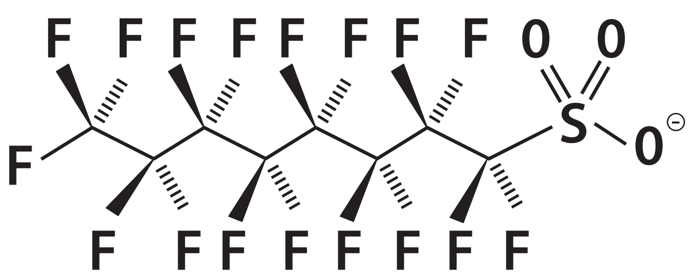


Fig. 16 Structure of PFOS anion

The intramolecular chemical bonds of PFOS are very strong, which accounts for the high stability of this compound. Therefore, once it appears in water, the PFOS anion undergoes virtually no biotic or abiotic transformation. The high surface activity of PFOS, which is much higher than that of similar hydrocarbon chain surfactants, allows PFOS to spread rapidly in the environment and easily bioaccumulate, penetrating into living organisms by crossing membrane barriers. Numerous data support the carcinogenic properties of PFOS. Once in the body, PFOS causes endocrine disruption, a sharp decline in immune system function and delayed physical development and growth. The removal of such compounds from drinking water is vitally important and requires the use of appropriate technologies [83,16,17,96].

IN AQUATIC ENVIRONMENTS, MICROORGANISMS DEGRADE ANTHROPOGENIC COMPOUNDS RELATIVELY QUICKLY AND ACTIVELY, OFTEN MINERALISING THEM

As for the effectiveness of water treatment with chemical reagents, it is worth noting that chemical technologies make it possible to selectively remove undesirable chemical components from water; cations that contribute to water hardness, as well as iron ions that are in a soluble state; a wide range of organic compounds; soluble gases; chlorine; ions containing silicon; anions – chlorides, nitrates and nitrites; bacteria and viruses; in fact, all those components that pose a threat to human health. This is why chemical water treatment technologies are used most extensively.

Ecofriendly phytotechnologies (aquatic plants and algae) and biotechnologies (microorganisms) are widely used at the first stages of treatment of heavily polluted water [89,72,73,94,95].

In aquatic environments, microorganisms degrade anthropogenic compounds relatively quickly and actively, often mineralising them. Depending on the structure and stability of the contaminant, the biological treatment of contaminated water can take several days. Despite the wide degradation spectrum of microorganisms, the use of appropriate selectively chosen active strains of microorganisms (bacteria and less frequently mycelial fungi), based on their ability to mineralise or transform the carbon framework of organic toxicants to the level of conventional cellular compounds or carbon dioxide and water, is an important efficiency factor of biological technologies in relation to pollutants. This water treatment is the first stage of purification, during which partial or complete degradation of anthropogenic compounds in the water takes place. Filtration and further processing by another method is usually the next step in this process. With the development of industry, water treatment by biological technologies is increasingly applicable. Moreover, microbiological methods have been developed for the partial desalination of seawater, for which consortia of salt-loving halophilic and halotolerant bacteria have been selected [126]. Unfortunately, biological desalination technology has not been thoroughly studied and is only used for experimental purposes. Most likely it is expensive, so a glass of water purified this way will cost as much as a glass of champagne. This is why this method of water purification is used only in scientific research.

3.1.2 SOIL

Compared to water, the soil has many more components, is more active and has many similar characteristics to viable organisms. It is a separate biological niche consisting of different soil organisms characterised by high metabolic activity [74].

Normal soil contains various chemical components: metal ions, low and high molecular weight organic metabolites (proteins, polysaccharides, nucleic acids and conglomerates consisting of these components), various kinds of colloids, water, salt, etc. Together with these chemical compounds, microflora and other soil organisms create the soil's chemical-biological and ecological potential, providing for the growth and yield of all plants and representing a multi-component niche that is rather sensitive to changes in the environmental conditions. Soil easily and permanently accumulates any anthropogenic feature in its structures, thus leading to a biological imbalance [91].

Almost any industrial enterprise located near farmland negatively affects the natural processes in the soil, and, depending on the region's climatic conditions, leads to pollution, erosion, desertification, weathering and waterlogging. As a result, the soil becomes less or entirely unsuitable for crop cultivation. The main purpose of contemporary agrarian ecological science is to identify the causes of these violations and implement appropriate measures for their elimination (remediation). According to UN data, at present, there are approximately 2 hectares of land per human on the planet. It should be noted that, in addition to fertile land, this area includes regions of "permafrost", deserts, swamps, mountain ranges and other places unsuitable for agrarian purposes, which constitutes about 64% of the earth's entire landmass. Thus, the condition and amount of high-quality soil makes it important for humans to carry out special agro-remediation activities to increase the acreage and fertility of the relatively small amount of fertile land that exists.

ACCORDING TO UN DATA, AT PRESENT, THERE ARE APPROXIMATELY 2 HECTARES OF LAND PER HUMAN ON THE PLANET

The purpose of all ecological technologies of soil remediation is to reduce or entirely eliminate the following factors that disrupt the natural balance [97,98]:

- soil pollution with different aggregate states of pollutants: solid, liquid and gaseous, which include organic compounds, heavy metals, oxides of carbon, nitrogen, sulphur, carcinogenic benz(a)pyrene, benzanthracene and other anthropogenic toxic compounds discharged by vehicles moving along the highways close to farmland;
- excessive use and incomplete assimilation of new and used chemicals – organic and inorganic fertilizers, pesticides – produced for agricultural purposes;
- hydrocarbons and other petroleum products partially transformed and deposited deep in the soil as a result of the extraction, transportation and use of petroleum products;
- toxic compounds discharged in large quantities by the energy industry during the combustion of gases, oil products, hard coal, peat, oil shale, etc.

Due to the enormous importance of soil quality, various chemical, physical and biological technologies are used to reduce anthropogenic pollution [99-101].

The simplest are physical technologies, which carry out the mechanical removal (cutting off) of the top layer of contaminated soil. The thickness of this layer could reach 2 metres and depends on the type and nature of the pollutant and when it took effect. If possible, contaminated soil should be replaced with new, healthy soil. As for the layer removed, it is most often treated in high-temperature conditions (1,000-1,200º C) or using aggressive chemical solutions (mainly acids, alkalis and organic solvents are used for this purpose) to eliminate the toxicity. In some cases, the treated soil, purified of toxic components, is returned to its original location. The main disadvantage of these technological solutions is the complete or near destruction of the soil's rhizosphere microflora and all other soil organisms, which, depending on the type of soil and other factors, requires a long time, on average several years, to recover.

Electrochemical soil treatment technology is used to eliminate unnatural toxic compounds, mainly petroleum products and other organic toxic compounds [99-101].

As a result, partial or complete mineralisation of the organic pollutant is achieved. This technology involves installing specially designed electrodes in the soil and then moving them through the soil as needed. This operation causes water electrolysis in the soil and removes toxic substances such as cyanides, cadmium, mercury and others from the soil. Despite the high efficiency of soil purification, this technology is difficult to implement, because, in addition to the cost of electricity, it requires special equipment, so it is only used in certain cases.

Chemical soil remediation technologies differ from physical ones. These technologies are based on the action of different chemical compounds that can degrade or bind pollutants. First of all, it is necessary to single out a group of chemical oxidizing agents (peroxides and metal ions with variable valence) capable of oxidative degradation of organic pollutants, for example, petroleum hydrocarbons, polycyclic aromatic hydrocarbons and others. Surfactants capable of removing the vast majority of toxic and other undesirable compounds from the soil are used for the same purpose. Other technologies use chemicals that cause heavy metal ions and radionuclides to precipitate as insoluble compounds (e.g., as hydroxides and carbonates). Chemical technologies also involve the addition of chemicals that form non-toxic compounds with soil contaminants. For example, this is how soil contaminated with heavy metals is often treated. Cyanides, nitrates and tetrachlorides are immobilised using cement, ash, sodium and potassium silicates, bentonite and cellulose. When assessing the most frequently used chemical eco-friendly technologies, their enormous regulating role in the existing ecological balance must be considered, although it should be emphasised that the efficiency of these technologies constantly decreases due to the unpredictable insurge of toxic compounds [126].

3.1.3 AIR

According to WHO data, air pollution annually kills about 7 million people, creating the world's greatest environmental hazard. One in eight deaths is related to air pollution. Nine out of ten people in the world breathe polluted air. According to recent studies, it has been found that exposure to a highly polluted environment can also increase potential death from viral infections, including COVID-19. It has now been proven that there is a strong link between global

IMPROVED AIR QUALITY REDUCES THE RISK OF RESPIRATORY DISEASE IN GENERAL

warming and the occurrence of large-scale wildfires, such as the recent fires in California and Australia, which affect many people, causing suffocation from the huge amounts of smoke and air pollution. Silicon Valley air experts are developing innovative technologies to address the growing air quality concerns. For example, Airdog's Two-Pole Active (TPA) technology has been researched and developed over the last two decades. Ever since they were introduced in 2017, the Airdog TPA X series products have been steadily gaining momentum worldwide.

The Most Recent Fundamentals of Air Purification

There are many types of pollutants in the air, including particles of all sizes; chemicals such as formaldehyde, benzene, etc.; microorganisms such as bacteria and viruses such as the SARS-CoV-2 virus. Improved air quality reduces the risk of respiratory disease in general. Air purifiers use a combination of technologies to circulate air and remove various pollutants to ensure healthy indoor air quality. There are several key metrics for measuring the effectiveness of air purifiers.

- Clean Air Delivery Rate (CADR). CADR is defined as the volume of airflow per unit of time required to remove all particles within a given range. CADR is used as an indicator of air purifier efficiency. It is based on the ratio between a purifier's single-pass efficiency and its flow rate and is usually expressed in cubic feet per minute (CFM) or cubic metres per hour. A CADR test is performed in a sealed chamber of standard volume. Once the pollutant enters the room and mixes with the air space, the CADR test begins by turning on the cleaner, after which particle counts are taken at predetermined intervals. CADR calculation is based on the reduction rate of particles remaining in the room. The CADR value determines how quickly the air in the room can be cleaned using this air purifier. It also specifies the recommended room size for an air purifier, which is the size of room it can clean in a reasonable amount of time. Generally, the recommended room size in square metres for an air purifier is 1/10th of the CADR number expressed in cubic metres per hour. Similarly, CADR for various gases is defined as the air flow rate from which all gaseous pollutants have been removed. It is measured in the same test chamber.
- Cumulative Clean Mass (CCM) is a measure of the total mass of target pollutants (particulate matter and/or gaseous pollutants) that a purifier can cumulatively clean under rated conditions and specified test conditions. This CCM index (mg), together with CADR, shows the effectiveness of the air purifier. CCM can also be linked/converted to another indicator – "the cleaning life" of the air purifier measured in days – so it is important to assess how frequently the filter should be changed and the system cleaned, as well as the length of the product life. Higher CCM values indicate that the filter can be changed or electrodes cleaned less often.

- The pathogen removal rate determines the purifier's ability to remove pathogenic forms of bacteria and viruses. Air purifiers remove pathogens by means of two mechanisms: filtration and inactivation. Most airborne pathogens attach to aerosol particles. Particle removal from the air reduces the number of pathogens in the air. Inactivation requires a physical (e.g., plasma or ultraviolet radiation) or chemical (e.g., ozone or H_2O_2) method to kill or inactivate pathogens. Specialised testing agencies can evaluate pathogen removal rates using a standard test chamber according to specific test logs.

Variety of Air Purification Technologies

I) **HEPA.** Mechanical filter air cleaners use a fan to blow air through a corrugated fibre filter medium. The filter traps solids mechanically by diffusion. As solids accumulate in the filter, its pores become clogged and the drop in pressure becomes too great. When this happens, the filter medium needs to be replaced. It is a costly procedure. The replacement frequency is determined by the CCM, the room size and the indoor contamination level, as well as the ventilation rate between the indoor and outdoor air. However, the size of some pathogenic forms of bacteria, amounting to 700-800 angstrom, is too small to be removed, and they pass through the air filters. When microorganisms are left on the HEPA filter surface, they begin to multiply, even in low humidity. This is the main source of the odour produced by the air purifier during its use. HEPA filters with higher filtration rates have a higher resistance to airflow, so a more powerful fan with high static pressure is required. This increases both the noise and energy consumption.

II) **Ionization.** There are many types of ionizers available on the market. They use a material with a low barrier potential that emits electrons when a high voltage is applied. These free electrons will attach to particles in the air. Ionizers remove some pollutants from the air, but the charged particles settle on surfaces, such as the wall, floor and furniture. Typically, CADR of ionizers is too low to effectively remove indoor pollutants. They may have a limited effect on pathogens when encountered; however, without proper collection, their health benefits require further study and evaluation.

III) **Ultraviolet bactericidal light.** Ultraviolet bactericidal light (UBL) is a disinfection method that uses UV light to kill or inactivate microorganisms by destroying their DNA so that they cannot reproduce. However, high doses of UBL have adverse health effects, leading to cutaneous erythema (superficial redness of the skin) and a painful eye condition known as photokeratitis. UV irradiation can inactivate viral particles in the air, but it is effective in an extremely limited area. The effect of UBL is evaluated based on two factors: contact area and contact time. UBL is only effective if the contact time is long enough. If air movement is too fast for the UV light, it will have a limited effect on killing pathogens, which could retain their infection-allergenic properties even after limited UV exposure. In addition, if the virus/bacteria are hidden by contaminants or other objects, they will not be exposed to UV radiation. Therefore, even when strong and continuous UBL is used, the rate of bacteria removal/destruction may also be limited without a proper ventilation and filtration system.

IV) **Photocatalytic oxidation.** Photocatalytic oxidation (PCO) consists of a series of catalytic materials (like TiO_2) that can be activated by high energy photons (https://www.sciencedirect.com/topics/earth-and-planetary-sciences/photocatalysis). PCO is used to purify gaseous pollutants and decompose many pollutants by passing an air stream through a catalyst. PCO effectively removes volatile organic essential oils, alkanes and other contaminants. However, the formation of by-products such as formaldehyde is a critical problem for catalytic oxidation. PCO cannot remove pathogen-carrying aerosols.

V) Electrostatic Air Purifiers (EAPs).

The principle of air filtration by EAPs is as follows:

1) air passes through a pre-filter, whereby it captures coarse particles such as hair, pet dander, etc.;

2) air enters the ionization zone. The emitter wires are under high voltage. The particles are charged by the emitter wires and accelerated by the electric field between the wire frame and the collecting plates. When a charged particle moves towards the collecting plates, it collides with other dust or particles in the ion field to create an avalanche effect and more and more particles are charged and collected by the collecting plates;

3) the charged particles and pollutants move towards the collecting plates (oppositely charged) under the action of the electric field. Pollutants are collected by the collecting plates, ions are neutralized and fresh air continues to flow;

4) the final barrier is a composite catalytic layer. It eliminates odour and provides fresh air from the air purifier. The main advantages of EAPs over traditional HEPA filters are: cost of operation (no need to change the filters) and reduced noise and energy consumption.

3.2 INNOVATIVE ACTION-BASED TECHNOLOGIES OF MICROORGANISMS AND PLANTS

The basic principle ensuring the continuity of the natural environment and, consequently, of life on our planet is determined by its ongoing renewal. Literally all forms of living organisms (prokaryotes and eukaryotes), which constitute a colossal biodiversity, starting from the most complex in morphological, physiological and biochemical terms (humans, animal organisms and plants) to the simplest microorganisms (prokaryotes, eukaryotes, aerobic and anaerobic), are subject to renewal [102,92].

The renewal and evolution of literally all organisms inhabiting our planet are interconnected biological processes. It is during the formation of new generations that improved adaptation to environmental conditions and other factors most frequently occurs. This process has been going on for millions of years and continues to this day.

The natural environment itself, which also undergoes a certain amount of change, is the primary cause of the ongoing biological improvements of organisms and, consequently, of the vital processes occurring on Earth. Any, even very insignificant, changes in environmental conditions, be they caused by natural factors or unnatural toxic compounds, significantly affect the physiology of living organisms, causing spontaneous mutations and the disruption of basic metabolic pathways, which consequently have an effect on the synthesis of characteristic metabolites, cell morphology, etc. All these constantly changing, although to an insignificant extent, natural factors influence the evolutionary processes of all forms of living organisms, while also affecting their genetics and very often causing irreversible transformations.

It should be noted that different organisms have different levels of tolerance to changes in the environmental conditions [103].

Resilience (stability) of the genetic apparatus to changing natural conditions is often a factor that determines the evolutionary potential of organisms. More compliant forms (less stable) are susceptible to changes, including lethal ones. The more stable forms remain in their original state or gradually undergo, sometimes even visibly, imperceptible changes.

Most often, the evolutionary process is a long path of internal transformations leading to the creation of new, more stable life forms that are better adapted to the existing conditions than the parent predecessor.

It has been repeatedly proven [104,105,102,92] that for humans, changes in environmental conditions negatively or extremely negatively affect their physiological state, leading to lower immunity, increased susceptibility to disease and disruption of normal metabolism. Humans are in constant contact with the surrounding environment via food, water, air and solar energy, which triggers all kinds of physiological changes, both qualitative and quantitative. Humans are also intrinsically connected to the natural environment through their interrelation with plants. It stands to reason that this participation of plants in such vital biological processes as photosynthesis, fixation and assimilation of molecular nitrogen, and much more, is vitally important for life on Earth.

As a source of different food products, phytopharmaceuticals, highly important building materials and much more, plants make a significant, simply invaluable contribution to human existence [92,102].

Despite people's differing attitudes towards plant life, which is resulting in a steady decline in farmland, plants still cover more than 40% of the earth's landmass. Created by the *Microbiome* and evolved by nature, plants are the main partners of human beings during their evolution from primitive prototypes to the current complex forms of life. How can we overlook the historical role of plants in human life? Plants are traditionally used as materials for building houses and making furniture, various utensils, ship's rigging, paper, fibres, clothing and weapons. As a source of energy, the wood from perennial trees ensured the survival of our ancestors in the ancient and medieval ages and greatly contributed to exploration of the northern regions of the planet. Cultivated plants produce crops, without which human life is inconceivable. Together with soil microflora, plants create special conditions for soil fertility and yield, etc.

As a unique life form, plants have particular metabolic ways, which lead to the synthesis of a large number of secondary metabolites, mainly low molecular weight compounds [92,106].

PLANTS STILL COVER MORE THAN 40% OF THE EARTH'S LANDMASS

During their growth and development, a large number and variety of low molecular weight compounds, often referred to, in terms of their functional load, as secondary metabolites formed by plants, serve physiological purposes and ensure the self-protection of plants from phytopathogenic microorganisms, various insects and animals.

It is known that plants carry out their highest level of functional activity in optimal climatic conditions. This is what determines the increased activity of plants in tropical and subtropical zones, which are the almost ideal for their growth and development [107,108].

However, growing in any soil and climatic conditions that provide for their health and development, plants largely carry out unique metabolic activity aimed at their characteristic synthesis of low molecular weight metabolites customary for the soil and climatic conditions of each specific region.

It should be noted that despite the extraordinary diversity of plants, it is decreasing almost constantly, and not only under the influence of natural environmental changes. Obviously, we should discount artificially created genetically modified plant forms, the number of which is immeasurably less than that of natural plant forms.

On the whole, however, even all of the above-mentioned factors do not cover the entire contribution of plants to providing viable living conditions. Research and practice over the last 3-4 decades have revealed another unique ability of most plants to digest and assimilate toxic organic compounds and, in most cases, mineralise them, that is, break them down them into elemental inorganic compounds, such as water and carbon dioxide [63,109-112].

Plants have certain unique features since, unlike other organisms, they are universal detoxifiers, breaking down both natural and several anthropogenic toxic compounds into standard cellular metabolites, whereby purifying the main components of the environment: soil, water and air.

The reports of large multinational companies show the cost of modern environmental technologies in carrying out environmental cleanup of anthropogenic compounds as part of remediation activities [113]. Due to the constantly increasing environmental pollution of the planet, this cost is also constantly increasing and, according to the authors' calculations, currently amounts to at least 80 billion U.S. dollars annually. This does not necessarily mean that these activities entirely remove alien, often carcinogenic, compounds from all of the environment's main components. To somehow stop this unpredictably growing process, or at least reduce the extremely negative impact of anthropogenic factors on the environment, global innovative technologies must be implemented based on the actions of biological agents. These agents are the plants and microorganisms found in all of the planet's land and water areas.

Scientists have discovered that **plants detoxify toxic compounds.**

Although the interest in environmental biotechnology has significantly grown during the past few decades and the ecological potential of microorganisms has been developed into a feasible technology [109,112,114,49], plants have been virtually ignored. They have been regarded as organisms only capable of absorbing and accumulating toxic compounds in the intracellular space, while the transformational potential of plants to decompose toxic compounds into harmless or normal cellular compounds (metabolites) has not even been considered or discussed. Back in the 1970-1980s, a group of scientists first presented data on the possible ecological potential of plants [92,115,116,109,87].

Today, based on numerous data pointing to their ecological potential, plants can certainly be regarded as ecological agents. It is this factor that gives plants (including crop plantations) their global ecological potential as a permanent ecological biotechnology.

This technology is presented in more detail in the publication by Georgi Kvesitadze and Alexander Potemkin, edited by T. Sadunishvili (2023), entitled Homo Sapiens *and the Technogenic Environment,* which can be found on my official Facebook page: https://www.facebook.com/Alexander-Potemkin-Freie-Literarische-B%C3%BChne-100922358747074/.

On a global scale, the annual renewability of one of the major photosynthetic natural resources, cellulose, reaches approximately 120 billion tons per year. This is assuming that 170-180 billion tons of carbon is fixed through photosynthesis each year. Cellulose is undoubtedly the most widespread substrate on the planet and, due to its important technological characteristics, has a wide range of applications in various industries. According to the above calculations, despite humanity's unfriendly treatment of the vegetation cover, there are still 25 tons of annually photosynthetically renewable cellulose per person on the planet. Whether this volume will be sufficient to meet society's minimum needs for at least the next 15-20 years is undoubtedly a vital issue that requires comprehensive analysis.

The ability of plants to decompose alien and toxic compounds, on which the conceptual approach is base, is becoming an ecologically important global technology [63,112,72,89]. For more than two decades, the possibility of using plants on a wide scale for removing inorganic toxicants and other xenobiotics from the soil, subsurface, groundwater and water bodies has been widely discussed. Data related to enhancing the ability of transgenic plants to assimilate explosives from the soil by cloning bacterial nitroreductase in it are presented in the referenced book ***Homo Sapiens* and the Technogenic Environment**, which covers the action of microorganisms and plants both separately and jointly during the natural cycling of toxic compounds [117-121]. It is shown that these organisms carry out degradation of foreign compounds, and their constituent carbon atoms are used for the synthesis of cellular metabolites.

They have proven to act as a natural filter, which not only purifies the environment, but also uses the carbon skeleton of toxic compounds as a basis for synthesising ordinary cellular metabolites (compounds) according to the low-waste technology principle [122-124].

The detoxification capacity of plants and the wide distribution of plant cover on our planet makes it possible for *Homo Sapiens* to actively utilise this biological tool for practical purposes, which has enormous ecological potential.

Despite their certain efficiency, the current chemical environmental technologies do not fully meet the qualitative requirements of the soil. Most of these technologies are detrimental to the soil's microflora. It takes years to restore normal rhizosphere microorganism activity after the use of these technologies and achieve full yields.

Depending on the structure of the toxicant, the acidity value of the medium, moisture content, presence of appropriate enzymes and other factors, plants can completely or partially neutralise toxic compounds in the environment [31,108, 126].

3.3 POSSIBLE GLOBAL CHANGES DUE TO THE USE OF BIOECOLOGICAL TECHNOLOGIES

At present, the environmental problems typical of the 21st century can be clearly seen on the basis of geo/bio/ecological observations, which confirm the continuous increase in the concentration of toxic compounds in all ecological niches; the growing number of unconventional infectious diseases, including various viral infections; abnormal climatic changes such as global warming and the ice melting this entails; and the significant rise in anomalies among humans and animals. These are only a few examples of the changes that have already occurred and are closely linked to the increased toxicity, radiation and decreasing biodiversity of the planet. All of this, of course, is already taking its toll on the complex human physiology in the form of influences on the genome, spontaneous mutations and deviation from normal physiology and functional biochemistry. We cannot predict the magnitude of these deviations in the future, although it is clear that most of them may prove fatal. It stands to reason that the prospect of toxic modification of *Homo Sapiens* is dangerous and highly undesirable. At the same time, the annual increase in the size of the global population of about 1% (up to 100 million) has long become a major challenge for humanity as a whole. In this regard, the agenda of international organisations must address the issue from all available angles: what can be done in the long term to ensure modified living conditions for the *Homo Sapiens* population?

In the face of the impending inevitable ecological catastrophe and to develop united actions for all nations and peoples, all the problems related to the environment – political, con-

… THE ANNUAL INCREASE IN THE SIZE OF THE GLOBAL POPULATION OF ABOUT 1% (UP TO 100 MILLION) HAS LONG BECOME A MAJOR CHALLENGE FOR HUMANITY AS A WHOLE

fessional, financial, traditional differences of countries, etc. – must be identified to find real solutions for prolonging acceptable living conditions. Minimal, still untapped opportunities to preserve and improve the global ecological balance undoubtedly exist. This primarily refers to the colossal scientific potential for alleviating environmental stress using various science-intensive innovative technologies capable of pushing back environmental disasters for at least the next few decades. How can we achieve this goal? Firstly, by regulating the unpredictable increase in the planet's population (See the section: Population Regulation by the *Cosmicus Quanticus Cerebrum*). Based on the planet's well-studied resources, this is an indispensable and absolutely necessary requirement, the violation of which could threaten normal human existence. Secondly, every technology developed in any industry, including military, medicine and agriculture, must be analysed from the viewpoint of its ecological impact to exclude or minimise the possibility of new emission sources of anthropogenic/toxic substances. This primarily applies to multinational companies and individual countries engaged in large-scale production associated with the emission of numerous anthropogenic compounds. Minimising the extraction and use of energy resources such as oil products as the largest sources of toxic compounds should be considered separately. Thirdly, the opportunities that still exist to "upgrade" the planet, i.e., quantitatively increasing the size of the planet's large fertile land regions still available to humankind, but so far only partially used or not utilised at all, should be thoroughly explored.

Regions with poor soil, which face crop failures and their consequences, should not be considered as the problems of individual countries: literally every part of our planet should be the subject of international discussion. First and foremost, diplomats and politicians of all countries should strive to reach a consensus on this vital issue.

To reduce the use of traditional non-renewable energy sources, all the potential of natural sources must be significantly strengthened: hydroelectric power plants and geothermal water, solar and wind energy. These technologies are being increasingly applied. However, despite their cost, literally every opportunity must be taken advantage of, especially since they do in fact exist. For example, the manufacture and use of electric engines, especially in automobiles, which significantly reduce emissions of toxic benzapyrene, benzanthracene, nitrogen oxides and carbon monoxide compounds, mainly in megapolises.

All nations can significantly reduce their fossil fuel consumption by tapping the sun's energy, obtaining enough renewable energy for the system and scheduling the production cycle between peak and off-peak hours.

As the population grows and the amount of farmland decreases, a new type of technology will be required for food production. For example, there is a new technological trend aimed at "upward movement", i.e., the organisation of vertical farms, which undoubtedly has great prospects not only in terms of saving energy and decreasing the sowing area, but also regarding plant protection in specially organised greenhouses. This technology is so impressive that it is better to provide a relevant example of its practical implementation. Vertical Harvest farm in Jackson, Wyoming, is a 9x45m three-story hydroponic greenhouse that can annually produce 16 tons of vegetables, 2 tons of herbs and 19 tons of tomatoes. Standard farms need a hundred acres to produce a similar yield http://www.facepla.net/.

We cannot ignore the research of Professor Teruo Higa (Ryukyus University, Okinawa, Japan), whose microbiological consortium not only purifies and revitalises the soil, but is also having a positive effect on the environment. According to his research, there are dozens of different forms of effective microorganisms, whose regenerating function contributes to the significant intensification of characteristic soil processes, metabolism and increased assimilation of mineral and organic substances. Interaction between the soil and plants significantly increases soil fertility.

Professor Higa's effective microorganisms is a consortium of aerobic and anaerobic microorganisms that acts synergistically on the soil processes. The composition of his microbiological preparation includes lactic acid and photosynthesizing bacteria, as well as microorganisms from all the taxonomic groups: bacteria, yeasts, actinomycetes and fungi, which have an exceptionally broad range of action. These microorganisms, being antagonists of pathogenic microflora, suppress its growth, which significantly ameliorates the soil. This work has gained worldwide renown: https://agriecomission.com/base/teruo-higa-i-ego-effektivnye-mikroorganizmy [125].

As a way to increase the bioremediation efficiency of degraded soil, we recommend using the innovative technology of Georgia's OASIS VERITAS Company. It envisages treating contaminated soils with the help of microorganisms-destructors, earthworms, the richest organic matter (marine, plant and animal) from the ancient peat Colchis lowland (which has peat reserves of more than 100 million tons) and a biohumus extract that has positive biological phytoactivity.

The introduction of HUMUS BIOCOMPLEX OASIS improves the structure of the soil, its physical and chemical properties and its resilience to wind and water erosion. It also reduces the time required to replenish humus and restore soil fertility. The introduction of humic substances provides the microbial degradation of organic pollutants with the essential energy, cofactors and nutrients. This increases the destructive activity of the soil's microorganisms and accelerates the decomposition of various toxic substances that have entered the soil, as well as self-purification of the soil itself.

Use of this product from OASIS will make it possible to restore highly degraded soil, which will consequently result in it becoming suitable for farming within three-four years instead of a decade.

The breeding of new high-yielding animals and plants, both genetically modified and created by traditional breeding methods, should also be considered as an opportunity to increase food production and carry out ecological conservation by means of energy-saving technologies and the rational use of already limited natural forage resources.

Solar energy as a permanent energy source in direct contact with the surface of the earth (soil) in regions with a moderate to moderately hot climate amounts to up to 10 billion kilocalories per hectare annually. In the absence of large-scale solar energy conservation technology, natural forms of this energy conservation in the form of accumulated plant biomass and parallel strengthening of the soil's immune system should be developed. This goal can be achieved by increasing the intensity of photosynthesis, actively fixating molecular nitrogen and multiplying extremely important rhizosphere microflora. Additional (maximum) greening of the planet is an extremely profitable form of solar energy utilisation, as well as a great contribution to the ecology.

All kinds of technologies aimed at the economical use of natural resources in all industries should be thoroughly analysed and put into widespread practice, and this should be done by respected international organizations. This is a compulsory, but certainly progressive stage in the formation of new principles to provide society with technology. This research is being intensively continued and a number of original technologies and science-intensive patents devoted to environmental problems have been published.

Nevertheless, have any of these innovative technologies made a significant improvement to the environmental balance against the backdrop of the significant increase in toxicity in all ecological niches? Certainly not, since the constantly increasing emissions of toxic compounds outpace their beneficial action potential, and they are all limited to a regional scale. New, more advanced global technology approaches and solutions are urgently required to stop or maximally decrease the catastrophic rate of the growing ecological imbalance.

Is it possible to create advanced technologies aimed at having a serious effect on the ecology of the entire planet in today's conditions? There are no obvious solutions that can immediately and unambiguously solve the problem. Therefore, we must comprehensively, using all available means, address the unpredictably rapid increase in anthropogenic contamination of the entire global ecosystem. We must keep in mind that technology itself should not become the source of contamination of any ecological niche. In this regard, biological principles and highly eco-friendly technologies based on them are of particular interest.

According to FAO (the UN Food and Agriculture Organization), by 2050, the overall demand for food will increase by 60% and in the case of developing countries by almost 100%. All of this is bound to happen, since the official figures show that 33% of the soil is degraded from moderate to deep erosion as a result of nutrient depletion, salinisation, lack of moisture and chemical contamination with toxic substances. The degradation rate of such a valuable natural resource as soil is so great that in future it will call into question not only the possibility of implementing global-scale technologies aimed at increasing food production, but even the application of basic environmental sanitary measures. It is estimated that due to unsustainable use, up to 3 billion productive land resources, more than the entire current area of arable land, have already been lost. The main reasons for soil degradation undoubtedly include the ever-increasing amount of toxic compounds and the irrational technologies of land resource utilisation. Water erosion, which leads to the destruction and removal of the soil cover, is one of the primary reasons for soil degradation. Of course, wind erosion also causes great damage to the soil, especially in steppe regions and areas that regularly suffer from dust storms.

... BY 2050, THE OVERALL DEMAND FOR FOOD WILL INCREASE BY 60% AND IN THE CASE OF DEVELOPING COUNTRIES BY ALMOST 100%

In addition to erosion, these factors contribute to the impoverishment of the remaining soil, significantly lowering its immune system. For example, a deficiency of any of the 15 nutrients required for plant growth and full yield can lead to a significant reduction and deterioration in the quality of the produce harvested. According to the same FAO data, in the event of deep erosion, soil as a constantly demanded, exhaustible and non-renewable resource requires a long time to fully recover, and in some unfavourable soil-climatic zones it can take the life span of one generation. Despite the high authority of all FAO information, it is obvious that eroded soil can be restored much faster by artificial enrichment with elementary organics and the introduction of selectively chosen soil microbial consortia (bacteria, mycelial fungi and actinomycetes) based on existing climatic conditions.

The degree of soil degradation can vary. The traditional classification system includes the following four levels: low, moderate, high and extremely high. According to the UN, the extremely high level of soil degradation, in which land cover is virtually completely destroyed, is not particularly widespread. But on the global scale even 1% of extremely degraded cropland amounts to 16 million hectares. Almost two thirds of arable land is subject to high and moderate degradation.

The biological concept presented in ***Homo Sapiens* and the Technogenic Environment** as a permanent ecological biotechnology will make it possible to restore eroded soil and monitor and improve the ecological balance by degrading toxic compounds, intensifying soil metabolic processes and making use of the detoxification potential of rhizosphere microorganisms and the root system of plants. The above-mentioned monograph presents numerous examples that prove the effectiveness of the individual and combined use of these microorganisms in removing multi-structured contaminants from the soil. In fact, the proposed concept represents the intensification of a natural biological process based on the synergistic abilities of microorganisms and plants to jointly carry out the degradation of toxic natural and anthropogenic compounds under natural conditions.

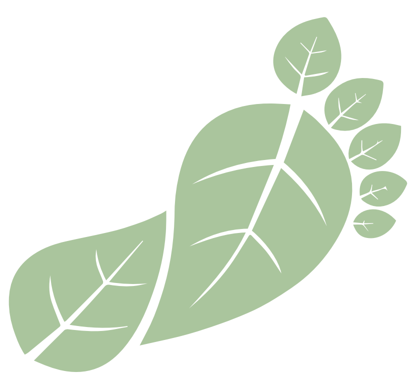
Soil covers an extremely thin layer of the planet, ranging from 20 to 150 centimetres in different areas. It covers the entire planet and is highly responsible for maintaining crops, the ecological balance and the well-being of all humankind in general. The functional activity of the soil varies considerably from one part of the planet to another. From the technological point of view, an assessment of the biological functions of land strata located even deeper (2 meters and more) shows a certain amount of transformation activity in the subsoil layer, mainly due to the action of microorganisms. As for the ecological function of this layer, which ranges from 4-6 to 10 meters, it designates the boundary that divides the soil of almost the entire universe into a viable, metabolically active upper part and a much more inert, in terms of biological transformation, lower part.

As we know, the soil generally contains humus and minerals in varying ratios. However, as the ecological situation deteriorates, we must recognise the increased, extremely important function of both the topsoil and the subsoil of the Earth's crust, which carries out detoxification of a large variety of toxic compounds. To gain a sound understanding of the functional activity of the soil, we must realise that permanent enrichment of numerous unnatural, toxic, including anthropogenic, components takes place both in the subsurface and above ground. When technologically assessing the exceptional role of the soil cover, we must keep in mind that the soil has the potential to transform most of the unnatural compounds formed in the earth's subsurface that have reached the topsoil via diffusion into ordinary natural components. As products of high-temperature synthesis, some of these compounds are highly stable, so they still seep into the topsoil and become components of the lithosphere. It stands to reason that most soil organisms take part in the transformation of these compounds, although most transformations are carried out by microorganisms and the root system of plants. Thus, the soil is the main component of the natural environment, assimilating and transforming compounds formed both in the subsurface and the surface layer. The processes occurring in the topsoil have been studied in detail and have a unique role to play in maintaining the vitally important ecological balance. Since they are heavier than air, in windless weather conditions, toxic compounds and emission products from transportation, the energy industry, agriculture, etc., are disseminated at a distance of up to one-and-a-half metres (150 cm) above the earth's surface (soil). All of these compounds eventually end up as cellular components in plants and all living organisms or are deposited in the soil. It is clear that due to its limited transformation capacity, the soil is unable to carry out decontamination of significantly increased concentrations of toxic components. The selection of highly active soil microorganisms (bacteria, mycelial fungi and actinomycetes), active destructors of toxic compounds and their artificial introduction into the soil, together with the root system of plants, which are also selectively chosen and actively assimilate toxic components, increases the decontamination potential of normal soil manifold (10 times and more), turning the degradation process of toxic compounds into an eco-friendly biotechnology. Thus, the proposed biotechnology imitates the natural process of atomic cycling of all compounds, including those forming toxicity, by significantly enhancing the soil's ability to remove the above- and below-ground sources of toxic compounds that constantly enter the soil.

The proposed technology has planetary scope and its successful implementation will be determined by the joint efforts of all or most countries, regardless of their confession, political beliefs, traditions and any other factors, and consists of large-scale selective greening of all possible land regions. The implementation of this technology should include land resources of all categories: cropland, forests, settlements, recreation sites, including specially protected areas, and sites of past and present military deployments. Particular attention should be paid to the land of post-war countries, which is most likely contaminated with toxic and explosive substances, as well as toxic products from their partial biotransformation. Despite a number of difficulties, we must keep in mind that these are compulsory measures to preserve the conditions and form of life to which the world community has adapted.

The implementation of this biological concept on a global scale will ensure more efficient use of solar energy – the basis of the immune system of the entire natural environment and light – for accumulating plant biomass as a form of energy conservation, increasing the activity of the most important ecological agent, increasing the areas inhabited by active, artificially introduced, selectively chosen plant species and rhizosphere microorganisms, which will make it possible to include the planet's unused land reserves in the economic turnover, creating new sources of water resources for humanity and providing a multi-component natural soil segment to increase the productivity of all types of agricultural crops.

The planet must become a unified system for analysing and making optimal use of all the available agrarian and ecological potential. Meanwhile, the implementation of ecological technologies that do not disrupt the ecological balance will be an important factor in developing large expanses of desert and improving low-yield land [126].



HUMANS! HUMANKIND!

YOU MOTLEY, VAIN, ESSENTIALLY BRAINLESS, SOULLESS, FAKE-FILLED CREATURES! STOP! STOP!

Try putting on your decrepit thinking caps and just maybe you will realise the disastrous situation facing your own species, *Homo Sapiens - Homo Consúmens*. We are all on the verge of our own destruction, the demise of our life-sustaining planet Earth.

Its seemingly inexhaustible resources have been utterly depleted by your thoughtless, perverted consumption. A couple more decades and absolutely everything capable of supporting your insatiable, mindless existence will run out. Stop! Immediately change your over-consumption mentality and take a new, critical approach to your role in the life of the planet. As early as tomorrow, all national armies must be disbanded at the global level and a new and effective international structure created (to replace the failing United Nations) with its own worldwide army for repelling extraterrestrial forces. Furthermore, any country that violates the environmental civilizational manifesto and prevents the implementation of a digital economy must be punished. There must be a total ban on all warfare and coercion of neighbouring countries. All luxury, material enrichment and overconsumption must be eradicated. All efforts must be aimed at the urgent, widespread introduction of a digital economy in every country of the world, which must be engaged solely in carrying out scientific research to promote the evolutionary upgrading of *Homo Consúmens* into *Homo Cosmicus*, endowed with the most important attribute—a universal mind. Our own *Microbiome*, our creator, will help us to carry out this research! We must look for ways to promote mutual communication with this creator.

In this scientific work I investigate the mindset of our commodity-driven contemporaries. The conclusion is devastating—the insanity of our increasingly rampant consumption is destroying our species *Homo Sapiens* and only we are to blame.

Humankind, you must stop! I repeat this over and over a million times: humankind, you must stop! There is only one solution if we want to survive—we must reformat ourselves into *Homo Cosmicus* and begin exploring the boundless expanses of the universe. There is and cannot be any other future for *Homo Sapiens.*

Those unwilling to live according to the laws and aims of the environmental manifesto will need to move to other territories—there are vast areas of the planet available for this in Eurasia and Africa. Statisticians will calculate the number of those who oppose our worldview and the future of our evolutionary development. The future community of *Homo Cosmicus* will assign them the necessary land to inhabit, but in accordance with the standards of the digital economy.

Of course, the metropolitan cities will become deserted and the planet's livestock will move into the abandoned villas and elite apartments. A single planetary nation, *Homo Cosmicus,* will be formed that honours the environmental manifesto and shares the common scientific all-encompassing dream of evolving itself to a level that makes it possible for it to live anywhere in universe, without any religions to subjugate and destroy its consciousness.

Our creator, the *Microbiome—Cosmicus Quanticus Cerebrum,* will begin reducing the size of the earth's population by causing more and more pandemics, distorting human consciousness and provoking wars. The goal is to reduce the global population to 2-2.5 billion *Homo Consúmens*. For it has been scientifically proven that this is the number of consumers the planet's resources can maintain. I would welcome 8-10 billion people dedicated exclusively to reformatting *Homo Consúmens* into *Homo Cosmicus,* which would make it possible for *Homo Sapiens* to continue living in a new intellectual form throughout the universe. We are familiar with the figures supplied by the UN which contend that no more than 1.5 percent of the earth's total population, which is about 120 million people, have HIC (high intellectual consciousness), that is, those who are nurtured by spiritual values rather than gluttony and greed.

Only in this way will we be able to attain our own evolutionary triumph of transforming *Homo Sapiens* into *Homo Cosmicus* with a consciousness close to that of the universal mind.

Otherwise, Homo Sapiens as a species will cease to exist.

A NEW GLOBAL ENVIRONMENTAL AND EVOLUTIONARY CONCEPT FOR UPGRADING *HOMO SAPIENS*

4.1 POPULATION REGULATION BY COSMICUS QUANTICUS CEREBRUM

Intellectuals of the world, unite!

Homo Sapiens is classified in terms of ethnic groups and common genotypes as follows:

1) Caucasian, which is divided into European and Asian Caucasians and emerged 40-45 thousand years ago;

2) Tien Shan (Chinese, Mongols, Japanese, Koreans, Vietnamese and Thais); which emerged 60-65 thousand years ago;

3) Red (Polynesian), which appeared 80.000 years ago;

4) Negroid, which appeared 100.000 years ago.

The culture, religion and climate of the region in which these people lived shaped the ethnic groups, the type of food they ate, along with the microorganisms consumed, and the environmental factor, which resulted in the gene system inherent of the different types of populations.

The changes in the size of the population in terms of ethnic group are summarized in Table 27.

POPULATION DYNAMICS IN TERMS OF ETHNIC GROUPS / TABLE 27

Ethnic group		Population, mln people		Increase
		1930	2022	
Caucasian	European Caucasians	748.7	1718.65	129.55%
	Asian Caucasians	460.12	2 363.92	413.76%
Tien Shan		727.32	2 594.25	256.68%
Polynesian		7.79	43.18	454.3%
Negroid		141.68	1 200	746.97%
Total in the world		**2 085.61**	**7 920**	**279.74%**

Genotype is the set of genes of a particular organism. Unlike the concept of gene pool, genotype characterises an individual, not the entire species. **A valuable genotype** is one that combines the most important distinguishing features, allowing an organism to function as comfortably as possible in a particular environment.

According to scientists, gene mutations are the driving force behind the evolution of all living things in the modern world. Gene mutations include all changes in the molecular structure of DNA. regardless of their localisation and impact on viability. However, while, as the theory of evolution suggests, the initial mutations were only for the benefit of the individual, now they are acting to their detriment.

There are **roving genes** that act as transposable elements, making up 30% of the human genome. They are one of the most important mechanisms of evolution, providing the necessary level of mutational variability on which natural selection is based. Transposable elements can make other changes to the genome, enabling inheritance, such as resistance to antibiotics or other features. However, in the modern world of advanced medicine and computer technology, the evolution of modern humanity begins to move in the reverse direction, which may eventually lead to the complete degradation of humans, who will become more than 90% dependent on artificial intelligence.

Intelligence is not dependent on skin colour or regional location. A person with a weak genotype can also possess and make tremendous achievements in their level of intelligence. People today trust the information received from computer algorithms more than the information they receive from other people (which was the case during the development of human intelligence. when each individual analysed the mistakes they made and learned the lessons of anothers). When performing complex tasks, most people turn to so-called delegated intelligence for help, which is already dramatically impacting future generations by replacing real knowledge with automated versions. People today do not use their own brains and hardly ever memorise anything, because the answer to any question can be found on the Internet. The web has become the primary form of external or transactive memory, where information is stored separately from us. The fact is that human intelligence is decreasing. Our contemporaries possess manifoldly less knowledge and skills than half a century ago.

According to scientific research, the biological mechanism of the *Microbiome* leads to a gradual deterioration of the gene pool of the human population. The weakening of natural selection is the main reason for this. The development of medicine, use of antibiotics and elimination of the problems of hunger and social security have entirely eradicated child mortality in some countries. At the present stage, as scientists note. newborns have about 70 new mutations which their parents did not possess. Mutations do not always lead to pathologic changes.

People with a genetic predisposition and high IQ level start having babies later, so they produce fewer children. This small lag is enough to create significant natural selection pressure against education and intelligence genes.

Changes in the gene pool of populations during gross intervention in nature need time to be detected. It may take decades before the consequences become apparent in the form of the extinction of some populations, followed by other populations associated with the former. Those individuals that have the most suitable genotypes for the given environment mostly contribute to the next generations. When the environment changes, the search for genes more appropriate to the new conditions begins. This is how the gene pools of *Homo Sapiens* evolve.

One of the most important ideas to be discussed at the future meetings of intellectuals is to separate people regionally based on their intelligence level rather than ethnicity. Let us imagine a digital field in which there are numbers expressing level of intelligence – 110, 15, 53, 10, etc. This demonstrates complete digital and intellectual chaos. Instead let us imagine a digital field with such numbers as 110, 100, 90, 93, etc., or a field with a set of numbers like 60, 63, 75, 69, etc., or a field with the numbers of 20, 30, 45, 7... Which version is more balanced and where can we find more entity? Harmony means level of consciousness, which, in turn, means level of intelligence. I suggest we discuss the following idea at the future meetings of intellectuals dedicated to saving the planet: it should not be Germans living among Germans. Americans living among Americans. Chinese living among Chinese. Japanese living among Japanese. Arabs living among Arabs, but people with the same level of intelligence living together in the same region. People with a HIC level of 80 to 110 should live in one region, those with a level of 50 to 80 in another region and those with a level of under 50 in a third region. I recommend discussing the possibility of people getting married not only based on love and affection, but also based on their level of intelligence. By the age of 23, young adults should take a HIC test in the region of their residence and depending on the results, they will remain with their parents or be relocated to other enclaves for those with either higher or lower HIC levels. After all, an enemy of the planet, even if they are your own offspring, cannot be treated otherwise. No humanitarian or financial support should be provided to the regions where such people live. All these issues must be discussed in detail to decide whether they beneficial to the future of our planet.

PEOPLE WITH A GENETIC PREDISPOSITION AND HIGH IQ LEVEL START HAVING BABIES LATER, SO THEY PRODUCE FEWER CHILDREN

An example of the changes in some of the characteristics of ethnic groups is shown in Table 28:

CHANGES IN SOME CHARACTERISTICS OF ETHNIC GROUPS / TABLE 28

Period	Average height, overweight	Caucasian		Tien Shan	Polynesian	Negroid
		European Caucasians	Asian Caucasians			
1930	height. cm	170.4	167	163	182	168.2
2022	height. cm	174.7	170.1	166.4	180.3	170.3
	Group size. mln people	1718.65	2363.92	2584.19	43.18	1210.06
	Number with morbid obesity*. mln people	458.88	234.03	158.25	11.78	104.4
	Number of people with morbid obesity in the total group. %	26.7	9.9	6.1	27.3	8.6

* https://www.who.int/news/item/04-03-2022-world-obesity-day-2022-accelerating-action

Table 29 shows how the world view of *Homo Sapiens* has changed.

DYNAMICS OF THE NUMBER OF FOLLOWERS OF THE MAINSTREAM RELIGIONS / TABLE 29

Religion	**1930, number of people**	**2022, number of people**	**Increase**
Christianity	840 275 840	2 455 200 000	192.18%
Islam	368 314 500	1 821 600 000	394.57%
Judaism	13 090 450	15 840 000	21%
Buddhism	210 106 000	554 400 000	163.86%
Hinduism	343 025 110	1 188 000 000	246.33%
Other*	246 795 600	617 760 000	150.31%
No religious affiliation**	64 002 500	1 267 200 000	1879.92%
Total in the world	**2 085 610 000**	**7 920 000 000**	**279.74%**

* Faiths closely associated with a particular group of people, ethnicity, or tribe, as well as the Bahai faith, Taoism, Jainism, Shintoism, Sikhism, Tenrikyo, Wicca, Zoroastrianism and many others.

** Atheists. agnostics and people who do not identify themselves with any particular religion.

Thus, over the last 90 years, the number of *Homo Sapiens* who do not recognise any type of religion has increased by more than 1.800 %. People today are engaged in endless consumption and do not see God as their mediator. They realise that the divine image is a myth and the images of religious centres have reduced the symbols of faith to an everyday expression of base feelings.

By 2030, the global population is projected to be more than 8.6 billion people and by 2040 it will have reached more than 9.2 billion. There is a dramatic risk of overpopulation and deterioration of the gene pool related to the state of the planet's ecology and resource deficiency. These appalling figures urgently demand that we, people with a high level of intelligence, take drastic measures to regulate the global population.

The first measure should be a general global law "On limiting the number of children in a family, regardless of religion" to be introduced by 2025, which sets the total fertility rate at no more than 1.2 children per woman on the planet. At the same time, a family must consist of one man and one woman with no polygamy. It is mandatory to apply this measure to the population of African countries and Islamic families. Countries that fail to pass this law should be subject to severe sanctions. Citizens of these countries should be banned from traveling the world; they will be unable to make any export-import transactions, nor should they be provided with any humanitarian or financial aid. The planet can only be saved by people with a high level of intelligence consciousness, not by abstract pseudo-scientific and false religious and humanitarian ideas.

INTELLECTUALS! IT'S TIME FOR US TO TAKE CHARGE OF THE WORLD TO SAVE IT!

Between 1930 and 2022. the world population increased about fourfold, but this increase varies considerably depending on the country (see Tables 30. 31 and 32).

For example, in the countries shown in the tables, the population grew more than 10 times over the mentioned period.

COUNTRIES WITH MORE THAN A TENFOLD INCREASE IN POPULATION COMPARED TO 1930
TABLE 30

Country	Population as of 1930, mln people	Population as of 2022, mln people	Population growth (by how many times)
Brunei	0.03	0.45	15.00
Tajikistan	0.82	9.96	12.15
Iraq	3.61	42.16	11.68
Oman	0.5	5.32	10.64
Israel	0.59	8.92	15.12
Palestine	0.17	5.35	31.47
Jordan	0.3	10.3	34.33
Saudi Arabia	2.85	35.84	12.58
Bahrein	0.12	1.78	14.83
Qatar	0.03	2.98	99.33
UAE	0.09	10.08	112.00
Kuwait	0.04	4.38	109.50
Libya	0.69	7.04	10.20
Equatorial Guinea	0.13	1.5	11.54
Democratic Republic of Congo	9.19	95.75	10.42
Zambia	1.76	19.47	11.06
Angola	3.02	35.03	11.60
Gambia	0.21	2.56	12.19
Ivory Coast	1.82	27.74	15.24
Tanzania	5.57	63.3	11.36
Niger	1.64	26.08	15.90
Uganda	3.76	48.43	12.88
Kenya	4.42	56.22	12.72
Djibouti	0.05	1.02	20.40
Papua New Guinea	0.52	9.29	17.87
Costa Rica	0.5	5.18	10.36
Honduras	0.95	10.62	11.18
Nicaragua	0.68	6.98	10.26
Guatemala	1.77	18.58	10.50

New methods of family planning using all types of male contraception, including innovative technologies and the development of medical pharmacological preparations. must be legally introduced in the countries listed in Table 30. The countries represented are mostly developing countries with low levels of education and low personal demands, apart from consumption level and high birth rates.

Contraceptive use should also be required in the countries in Table 31, where the population has increased 5 or more times over the time period under consideration.

COUNTRIES WITH A MORE THAN FIVEFOLD INCREASE IN POPULATION COMPARED TO 1930
TABLE 31

Country	Population as of 1930, mln people	Population as of 2022, mln people	Population growth (by how many times)
Laos	0.94	7.48	7.96
Cambodia	2.81	17.17	6.11
Malaysia	4.41	33.18	7.52
Nepal	5.6	30.23	5.40
Thailand	12.39	70.08	5.66
Philippines	13.19	112.51	8.53
Turkmenistan	1	6.2	6.20
Kyrgyzstan	0.9	6.73	7.48
Afghanistan	7	40.75	5.82
Iran	12.59	86.02	6.83
Uzbekistan	5.2	34.38	6.61
Pakistan	23.4	229.49	9.81
Syria	2.56	19.36	7.56
Lebanon	0.79	6.68	8.46
Singapore	0.6	5.94	9.90
Indonesia	53.4	279.13	5.23
Yemen	3.79	31.15	8.22
Maldives	0.08	0.54	6.75
Turkey	14.93	85.56	5.73
Republic of Congo	0.59	5.8	9.83
Gabon	0.36	2.33	6.47
Liberia	0.6	5.31	8.85
Central African Republic	1	5.62	5.62

Sierra Leone	1.42	8.31	5.85
Guinea	1.91	13.87	7.26
Guinea-Bissau	0.37	2.06	5.57
Namibia	0.33	2.63	7.97
Madagascar	3.08	29.18	9.47
Cameroon	3.32	27.91	8.41
Mozambique	4.6	33.09	7.19
Mali	2.47	21.47	8.69
Botswana	0.28	2.44	8.71
South Sudan	2.19	11.62	5.31
Eswatini	0.18	1.18	6.56
Chad	1.84	17.41	9.46
Mauritania	0.5	4.9	9.80
Senegal	1.85	17.65	9.54
Benin	1.46	12.78	8.75
Ghana	3.82	32.4	8.48
Togo	0.97	8.68	8.95
Comoros	0.14	0.91	6.50
Nigeria	24.49	216.75	8.85
Zimbabwe	1.86	15.33	8.24
Ethiopia	18.43	120.81	6.56
Burundi	1.79	12.62	7.05
Rwanda	1.57	13.6	8.66
Somalia	1.8	16.84	9.36
Malawi	2.1	20.18	9.61
South Africa	8.4	60.76	7.23
Sudan	4.89	45.99	9.40
Morocco	6.47	37.77	5.84
Burkina Faso	3.02	22.1	7.32
Egypt	14.68	106.86	7.28
Tunisia	2.53	12.75	5.04
Algeria	6.45	45.35	7.03
Belize	0.05	0.41	8.20
Panama	0.52	4.45	8.56
Dominican Republic	1.26	11.06	8.78
Peru	5.48	33.68	6.15

Paraguay	0.88	7.31	8.31
Colombia	7.91	51.51	6.51
Venezuela	3.3	29.27	8.87
Brazil	33.57	215.95	6.43
Ecuador	1.94	18.11	9.34

Table 31 includes data on Asian, African and South American countries, some of which are experiencing industrialisation and tourism development. Population growth in these regions of the planet is very high compared to countries in Europe, where the population has not increased more than threefold in almost a century. This suggests a high-quality standard of living of the European population with a valuable genotype, high level of education and rational understanding that humans cannot reproduce mindlessly.

In countries with the largest populations, such as India and China, even a marginal increase of 3-4-fold affects the overall global growth.

COUNTRIES WITH LESS THAN A FIVEFOLD INCREASE IN POPULATION COMPARED TO 1930
TABLE 32

Country	Population as of 1930, mln people	Population as of 2022, mln people	Population growth (by how many times)
Myanmar	14.52	55.23	3.80
Bangladesh	34.43	167.89	4.88
Japan	64.2	125.58	1.96
North Korea	7.37	25.99	3.53
Sri Lanka	5.71	21.58	3.78
China	489	1448.47	2.96
India	336.4	1406.63	4.18
South Korea	13.9	51.33	3.69
Australia	6.47	26.47	4.09
Canada	10.49	38.79	3.70
USA	123.67	334.81	2.71
Chile	4.27	19.75	4.63
Argentina	11.9	46.01	3.87

Developing countries have had a negative experience with fertility reduction policies in the form of family planning programmes. But many sociologists were convinced that technological advances would raise living standards and that population growth was a minor factor. Excuse me, but this is totally absurd. To prevent conflicts regarding the ongoing "Controlling the Growth of the World's Population" programme, a consensus must be reached at the highest level of the United Nations on population policy in countries with rapid population growth, such as Bangladesh, Brazil, Colombia, Egypt, Ethiopia, India, Indonesia, Mexico, Nigeria, Pakistan, Philippines, Thailand, Turkey and Vietnam, which account for half of the global increase. France, which had great influence in Africa and partially in Asia, did not embrace the demographic targeting programme and did not help with fertility reduction policies in the countries it influenced, including in Francophone Africa. where fertility rates are still high. It is obvious that business, which benefits from consumer growth to increase revenues, is the main lobbyist encouraging population growth.

Since 1984, China has also joined in supporting measures to curb population growth. However, the social conditions of some countries have been so supportive of large families that even a long-standing programme has been powerless to counter them, e.g., population growth in Pakistan, Indonesia, Ethiopia, Egypt and Brazil.

If humanity does not return to population control reforms today, it will be doomed to poverty and hunger due to overpopulation and overconsumption. It has already become evident that rapid population growth at the national level limits a country's resources, increases the load on government budgets and entails severe environmental consequences.

In **Iran**, the family planning programme has been abandoned since 1979. The minimum age of marriage was lowered to the age of 9 for boys and 12 for girls. This is a disgrace to the human intelligence! The government changed its political course in 1989 after realising that rapid population growth would quickly exhaust its ability to provide food, education, housing and jobs. **It was proclaimed that Islam only blesses two-child families.** In 1993, laws were passed that deprived third and subsequent children of food stamps and social subsidies, and their mothers of maternity leave. Completing a family planning training course became a condition for marriage. As a result, modern contraceptive use rose from 26% in 1975 to 59% in 2002, while total fertility fell from 6.2-6.5 children per woman in the early 1970s to 2 children per woman in 2002. Bravo!

In **India**, the government started implementing a fertility reduction policy in 1952. Monetary incentives for sterilisation were introduced and then decisions were made to forcibly sterilise two-child males. The campaign has been running for several years, but has proven a failure. The country's supreme court later ordered the closure of all sterilisation camps. This is a shame and not a smart decision.

China's birth control policy has included both voluntary family planning programmes and coercive measures introduced in the country since 1960. The one-child policy was launched in 1978 and continued until 2021. Neither changing demographics nor harsh international criticism has influenced the PRC government's position. The one-child policy included controls. rewards and punishments. After the birth of her first child, a woman was required to use an intrauterine device (IUD). If the married couple already had two children. the woman (or, less often, the man) had to be sterilised. Any pregnancy, without prior official authorisation, was terminated by abortion. The incentive package included regular allowances for an only child, priority access to health and education services and advantages for parents in finding a good job and respect in the workforce. Exceeding the permitted number of children entailed punitive sanctions, including heavy fines of four to eight times the average annual income for the second and subsequent children, wage arrears or loss of employment, confiscation or destruction of the family home or property and political persecution. In urban areas, total fertility fell to 1.4 children per woman. In 1984, the government began to modify the one-child policy in rural areas. In 18 provinces of the country, women were allowed to have a second child if the first one was a girl. In five provinces, all rural married couples were allowed to have two children. In the other five ethnic minority-dominated provinces, a three-child limit was set. Two provinces and four districts with provincial status retained the one-child norm. The exact value of the total fertility rate in rural areas is unknown, but it is estimated to be two children per woman. According to Chinese officials, since 1979, the one-child policy has prevented 200 million births. The one-child policy reduced the total fertility rate to 1.3 children per woman, down from 6.5 in 1950. The birth control practices and the current laws of the Chinese government were remarkable. Unfortunately, since 2021, these regulations have been repealed.

In **African** countries, there are 4.7 children to every woman, compared to an average of 1.8 in high-income countries. The problem is that these countries lack modern contraceptives and have a high number of unwanted teenage pregnancies.

Mandatory use of effective male contraception should be the most important family planning measure for controlling the growth of the population worldwide:

- medications to help sterilise sperm;
- medications to decrease libido and suppress the erectile function.

Contraceptive manufacturers supplying to third world countries should be exempted from income and import-export taxes to make contraception more accessible to the people of these countries.

Currently, there are several types of male contraception in the world, both traditional (condoms) and rare, some of which are under development and testing.

Scientists, biotechnologists and the global pharmaceutic industry should be engaged in selecting male contraceptives for safe use and providing remedies. Making them available to people in developed and developing countries is a vital necessity.

I suggest the following: after the birth of the first child in a family, fathers should be sterilised. However, this is an important issue that needs to be discussed at our meetings of intellectuals.

The policy of the World Health Organisation (WHO), which avoids mentioning the increased public health risks of using existing contraceptives, is a subject of serious criticism. The UN persistently promotes hormonal contraceptives, virtually ignoring any other method of birth control. Health organisations, which should be serious about addressing all the factors contributing to the rising incidence of breast cancer worldwide, should encourage alternative forms of family planning that do not involve the carcinogenic synthetic hormones used in female contraceptives. Popular female oral contraceptives, when released into wastewater, are not only a chemical pollutant, but also cause endemic feminisation of male fish worldwide.

By covering up for the pharmaceutical industry, WHO is hiding a serious environmental problem. Current wastewater treatment protocols in many countries around the world do not include harsh restrictions for pharmaceuticals. Of the many constituents filtered through modern wastewater treatment plants, **oestrogen** from female contraceptives is the most common. Therefore, endocrine disruptors appear in fresh water and have a negative impact on fish populations. **Chemical oestrogen is particularly dangerous** because it is more effective in low doses than natural steroids and is more difficult to degrade. Feminisation of fish is widespread in UK rivers, affecting up to 25% of male fish, but this is also true on other continents. Males begin to produce a protein that is normally only produced by females. Thus, a reproductive duct is formed and egg development begins.

About 9% of the world's women who take oral contraceptives still become pregnant. Worldwide, about 10 million babies a year are born this way. It takes a woman at least a couple of weeks to realise she is pregnant. Due to birth control pills and oestrogen exposures to the foetus, neither a healthy diet nor folic acid supplementation can save you. Children conceived this way may not have birth defects such as heart abnormalities or missing limbs, but in the future, they will develop either prostate cancer, low sperm counts in boys, or breast cancer in girls. The dose of **oestrogen** in the pill, which is about 0.3 mcg/kg a day, not only changes the physiology of the human reproductive system, but also affects how organ cells will respond to future hormonal changes. Economics, science and media centres try not to cover the results of such research on this catastrophic issue to prevent the risk of losing a huge market for sales and advertising.

The proposed mandatory measures to prevent global overpopulation should be implemented by all countries without exception. Countries violating compliance with these measures should be subject to the severe sanctions mentioned above.

INTELLECTUALS! IT'S TIME FOR US TO TAKE CHARGE OF THE WORLD TO SAVE IT!

The failure to curb population growth has provoked ***Cosmicus Quanticus Cerebrum*** to implement its population reduction programme, which is shown in Table 33.

PROJECTED WORLD POPULATION DECLINE COSMICUS QUANTICUS CEREBRUM
TABLE 33

Country	Population 1930, mln people	Population 2022, mln people	Population 2045, mln people
1	2	3	4
ASIA			
Bhutan	0.25	0.79	0.6
Laos	0.94	7.48	1.3
Cambodia	2.81	17.17	2.1
Myanmar	14.52	55.23	7.2
Brunei	0.03	0.45	0.45
Malaysia	4.41	33.18	3.9
Mongolia	0.73	3.38	2.7
Vietnam	17.70	98.95	15.0
Bangladesh	34.43	167.89	29.0
Nepal	5.60	30.23	5.1
Thailand	12.39	70.08	11.0
Timor-Leste	0.47	1.37	0.5
Kazakhstan	6.50	19.21	9.3
Philippines	13.19	112.51	18.5
Turkmenistan	1.00	6.2	2.1
Kyrgyzstan	0.9	6.73	2.0
Japan	64.2	125.58	45.0
Azerbaijan	2.3	10.3	4.9
North Korea	7.37	25.99	7.9
Sri Lanka	5.71	21.58	4.2
Tajikistan	0.82	9.96	2.6

Iraq	3.61	42.16	5.5
China	489	1448.47	499
Afghanistan	7.0	40.75	7.1
Iran	12.59	86.02	19.0
Uzbekistan	5.2	34.38	15.0
India	336.4	1406.63	350.0
South Korea	13.9	51.33	27.0
Pakistan	23.4	229.49	61.0
Syria	2.56	19.36	3.9
Lebanon	0.79	6.68	1.7
Oman	0.50	5.32	1.2
Israel	0.59	8.92	4.9
Palestine	0.17	5.35	1.9
Singapore	0.60	5.94	1.7
Indonesia	53.4	279.13	63.0
Jordan	0.30	10.3	2.4
Yemen	3.79	31.15	5.7
Saudi Arabia	2.85	35.84	13.5
Bahrein	0.12	1.78	0.6
Maldives	0.08	0.54	0.54
Qatar	0.03	2.98	0.8
UAE	0.09	10.08	2.1
Armenia	1.3	2.97	1.7
Turkey	14.93	85.56	15.5
Kuwait	0.04	4.38	1.7
Central AfricanRepublic	1.00	5.62	1.3
Sierra Leone	1.42	8.31	2.2
EquatorialGuinea	0.13	1.5	0.5
Guinea	1.91	13.87	2.3
Guinea-Bissau	0.37	2.06	0.7
Namibia	0.33	2.63	0.7
Democratic Republic of Congo	9.19	95.75	11
Madagascar	3.08	29.18	5.3
Cameroon	3.32	27.91	3.5
São Tomé and Príncipe	0.06	0.23	0.23

Mozambique	4.60	33.09	8.2
Mali	2.47	21.47	2.5
Zambia	1.76	19.47	2.3
Botswana	0.28	2.44	0.7
South Sudan	2.19	11.62	2.8
Angola	3.02	35.03	3.3
Eswatini	0.18	1.18	0.5
Gambia	0.21	2.56	0.9
Ivory Coast	1.82	27.74	4.3
Chad	1.84	17.41	1.9
Mauritania	0.5	4.9	1.4
Senegal	1.85	17.65	2.7
Mauritius	0.39	1.27	0.7
Benin	1.46	12.78	1.9
Eritrea	0.91	3.66	1.1
Ghana	3.82	32.4	5.7
Togo	0.97	8.68	2.1
Tanzania	5.57	63.3	6.5
Lesotho	0.5	2.18	1.3
Comoros	0.14	0.91	0.5
Nigeria	24.49	216.75	19
Niger	1.64	26.08	2.9
Zimbabwe	1.86	15.33	4.7
Uganda	3.76	48.43	6.2
Ethiopia	18.43	120.81	19.3
Burundi	1.79	12.62	2.1
Rwanda	1.57	13.6	3.1
Somalia	1.8	16.84	3.5
Malawi	2.1	20.18	2.3
South Africa	8.4	60.76	9.0
Sudan	4.89	45.99	3.2
Morocco	6.47	37.77	7.1
Burkina Faso	3.02	22.1	3.5
Egypt	14.68	106.86	21.0
Kenya	4.42	56.22	5.1
Cabo Verde	0.15	0.57	0.57

Tunisia	2.53	12.75	2.7
Djibouti	0.05	1.02	0.5
Algeria	6.45	45.35	6.7
EUROPE			
Iceland	0.11	0.35	0.35
Norway	2.81	5.51	3.9
Russian Federation	93.3	100	35.5
Croatia	3.2	4.06	3.7
Finland	3.45	5.55	3.7
Latvia	1.9	1.85	1.7
Serbia	4.9	8.65	3.1
Sweden	6.13	10.22	5.7
Georgia	2.6	3.97	2.9
Slovenia	1.3	2.08	1.1
Bosnia and Herzegovina	2.3	3.25	1.1
Romania	14.14	19.03	8.2
Hungary	8.65	9.61	3.9
Albania	0.98	2.87	1.3
Ireland	2.93	5.02	1.6
Estonia	1.12	1.32	0.9
Lithuania	2.42	2.66	1.7
Slovakia	3.3	5.46	2.3
Austria	6.68	9.07	5.1
Portugal	6.78	10.14	5.1
Greece	6.35	10.62	3.8
Belarus	4.98	9.43	2.3
Switzerland	4.05	8.77	3.7
Luxembourg	0.3	0.64	0.64
Netherlands	7.88	17.21	7.2
Ukraine	29.0	43.19	23.5
France	41.61	65.58	29.3
Italy	40.79	60.26	39.3
Bulgaria	6.03	6.84	2.1
North Macedonia	1.04	2.38	0.9
Moldova	2.86	4.01	1.1
Spain	23.45	46.72	19.5
United Kingdom	45.87	68.5	31.6

Germany	65.08	83.88	49.7
Poland	28.2	37.74	21.0
Belgium	8.08	11.67	3.1
Czech Republic	10.67	10.74	4.1
Denmark	3.54	5.83	3.1
Cyprus	0.35	1.22	0.7
Malta	0.24	0.44	0.44
OCEANIA			
Fiji	0.2	0.91	0.91
Australia	6.47	26.47	6.9
Papua New Guinea	0.52	9.29	1.2
New Zealand	1.49	4.9	2.7
NORTH AMERICA			
Canada	10.49	38.79	25.0
Belize	0.05	0.41	0.41
Panama	0.52	4.45	0.9
Costa Rica	0.5	5.18	0.9
USA	123.67	334.81	127.0
Honduras	0.95	10.62	1.3
Jamaica	1.01	2.99	0.9
Mexico	17.18	131.86	21.0
Cuba	3.84	11.31	2.7
Dominica	0.04	0.07	0.07
Trinidad and Tobago	0.41	1.41	0.5
Puerto Rico	1.54	2.83	1.5
Dominican Republic	1.26	11.06	1.7
Grenada	0.08	0.11	0.11
Saint Lucia	0.06	0.19	0.19
Nicaragua	0.68	6.98	1.2
Guatemala	1.77	18.58	1.9
El Salvador	1.44	6.55	1.7
Haiti	2.42	11.98	2.5
Antigua and Barbuda	0.03	0.1	0.1
Saint Vincent and the Grenadines	0.05	0.11	0.11
Saint Kitts and Nevis	0.04	0.05	0.05
Barbados	0.17	0.29	0.29

SOUTH AMERICA			
Guyana	0.31	0.79	0.79
Peru	5.48	33.68	6.7
Paraguay	0.88	7.31	1.5
Uruguay	1.71	3.5	1.1
Chile	4.27	19.75	5.9
Bolivia	2.4	11.99	3.9
Colombia	7.91	51.51	13.3
Venezuela	3.3	29.27	4.3
Brazil	33.57	215.95	35.0
Ecuador	1.94	18.11	2.3
Argentina	11.9	46.01	13.9
Suriname	0.15	0.6	0.6
GLOBALLY	**2 085.61**	**7 874.19**	**2 121.15**

ACCORDING TO THE CALCULATIONS, THE POPULATION OF THE PLANET COULD REACH 2.12 BILLION PEOPLE BY 2045.

WHY IS THIS PROGNOSIS SO DRAMATIC?

IT IS HIGH TIME TO FINALLY REALISE THAT OUR CHILDREN AND GRANDCHILDREN MUST KNOW THIS, OTHERWISE A PLANATORY CATASTROPHE WILL OCCUR

SOME METHODS OF THE *HOMO CONSÚMENS* REDUCTION PROGRAMME

I. HEALTH AND REPRODUCTION

INFERTILITY

Sildenafil citrate (Viagra) was the first oral medication for erectile dysfunction to hit the market in 1998. Sales of Viagra have remained stable for two decades, hovering between $1.6 billion and $2 billion per year. Total sales of erectile dysfunction drugs amounted to $2.4 billion in 2004. $5 billion in 2010 and $3.4 billion in 2020.

As of 2021, there are **3 995 720 000** men, **representing** **50.45%** of the world's population, and **3 924 280 000** women, which is **49.55%** of the world's population.

https://countrymeters.info/.

In 1995, it was estimated that more than 150 million men (5.2% of the male population) worldwide suffered from erectile dysfunction. By 2025, that number is projected to rise to 320 million.

Globally, 48.5 million couples of reproductive age suffer from infertility. The use of assisted reproductive technologies (ART) by infertile couples is increasing by 5-10% per year. The age-standardised prevalence of female infertility has increased by 15% from 1.366.85 per 100,000 in 1990 to 1.571.35 per 100,000 in 2017 and continues to rise. Over the past 27 years, the age-standardised prevalence of male infertility has increased by 8%. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6932903/.

WOMEN AND IVF

More than four decades have passed since the first successful in vitro fertilization (IVF), but scientists still debate the possible negative effects for both mother and child.

There are no studies that unequivocally prove that IVF negatively affects women's health in the short or long term, but the use of high doses of hormones and other substances affects the health of almost every woman. Due to ovarian stimulation and preparation of the endometrium for implantation, a woman is subjected to aggressive hormonal therapy, both at the preparatory stage, when follicle growth in her ovaries is stimulated, and at the stage following embryo implantation. Also, high doses of oestrogen and progesterone are used as maintenance therapy, so cancer is likely to occur in those organs on which these hormones have the greatest influence. Given that the likelihood of getting pregnant from the first IVF procedure is not high, many women have to go through hormonal upheaval 6, 7, 8 or even more times to get pregnant. This increases the risk of malignant tumours, which usually occur at an older age when women are no longer of childbearing age.

There is no way to prove that IVF is what causes cancer. However, a study by the University of London found that women who had experienced IVF were 37% more likely to develop cancer. Israeli scientists reported their findings: they observed a group of 10.000 women after IVF. The findings gave cause for concern: the likelihood of cancer increases by up to 40% after this procedure. These data consider breast cancer, cervical and ovarian cancer. as well as thyroid cancer.

However, scientists and medical professionals still do not confirm that IVF causes disease. The reason is simple: IVF is a business, and it is more convenient for doctors to cite diseases that patients may have had before IVF. Nevertheless, the hormone therapy required for in vitro fertilization directly affects the woman's body, and, therefore, causes disease. **We need to find the intellectual courage to ban IVF all over the world.**

...WOMEN WHO HAD EXPERIENCED IVF WERE 37% MORE LIKELY TO DEVELOP CANCER

CHILDREN AND IFV

There is more research regarding children born as a result of IVF. Dutch medical research (Moll. A.C., Imhof. S.M., Cruysberg. J.R., Schouten-van Meeteren. A.Y., Boers, M. and van Leeuwen. F.E., -*Incidence of Retinoblastoma in Children Born After In-vitro Fertilization*. Lancet, 2003; 361:309-310) provides information about a five-fold increased risk of retinoblastoma (retinal tumour) in children born via IVF between 1995 and 2002.

An extensive Sweden research study (Kallen, B., Finnstrom, O., Nygren, K.G. and Olausson, P., *In Vitro Fertilization in Sweden: Child Morbidity Including Cancer Risk*, Fertil Steril. 2005a; 84:605-610), which included 16.280 IVF-conceived children born between 1982 and 2001, found a higher risk of developing histiocytosis (a disease in which excess immature immune cells **accumulate. They usually form bone and lung tumours)**. A significant increase in cancer risk was found in an extensive analysis of a cohort of IVF-conceived children (n=26.692) born between 1982 and 2007 in Sweden.

The results of the British Newborn Study (Williams. C.L., Bunch, K.J. and Sutcliffe, A.G., *Cancer Risk Among Children Born after Assisted Conception*, N Engl J Med., 7 November 2013; 369(19):1819-1827) found increased risks of hepatoblastoma and rhabdomyosarcoma (common forms of cancer in patients with Beckwith-Wiedemann disease).

The Scandinavian Committee on ART and Safety (CoNARTaSgroup) has published the results of a large-scale registry study presenting data on cancer incidence in children conceived by IVF (Sundh, K.J., Henningsen, A.K., Kallen, K., Bergh, C., Romundstad, L.B., Gissler, M., Pinborg, A., Skjaerven, R., Tiitinen, A., Vassard, D., Lannering, B., Wennerholm, U.B., *Cancer in Children and Young Adults Born after Assisted Reproductive Technology: a Nordic Cohort Study from the Committee of Nordic ART and Safety* (CoNARTaS), Hum Reprod, 2014; 29(9):2050-2057). An increased risk of such cancer forms in children as brain tumours and malignant epithelial tumours has been identified.

The Danish Cancer Society Research Centre collected information on one million babies born in the country between 1996 and 2012. Many data were taken into account: method of conception, birth weight, age of both parents and their level of education, etc, 175.000 children were conceived by IVF.

Freezing embryos used in IVF is associated with the likelihood of increased birth weight in the baby. Cryopreservation is thought to affect the speed of intrauterine developmental processes, which reduces the risk of low birth weight: babies grow faster, but the likelihood of cancer increases. If the embryo was first cryopreserved. then thawed and transferred to the uterus, there was a 2.4-fold increased risk of cancer compared to children who were conceived naturally.

To date, researchers at the University of Minnesota have conducted the most extensive study of childhood cancer after IVF conception. The final data included 275.686 IVF children and 2.266.847 naturally conceived children.

The study found the following:

- the overall cancer incidence rate (per 1.000.000 children) for children conceived by means of IVF was about 17 percent higher than for naturally conceived children;

- the incidence of liver tumours was more than 2.5 times higher among IVF-treated children compared to non-IVF-treated children.

Conclusion: IVF should be banned as a matter of urgency. This will ensure a decline in the IVF business, which is harmful to human health and will contribute to lower birth rates and a lower global population.

INTELLECTUALS! IT'S TIME FOR US TO TAKE CHARGE OF THE WORLD TO SAVE IT!

II. ALCOHOL AND TOBACCO

Globally, 3 million people die annually as a result of alcohol use, accounting for 5.3% of all deaths.

World alcohol consumption (in terms of pure ethanol) per capita reached 3.6 litres per year in 1930 and 6.6 litres per year in 2021, which means an increase of 83% per person over 90 years.

DYNAMICS OF WORLD TOBACCO PRODUCTION (TOBACCO LEAF)
TABLE 34

Period	Production volume, kg	Global population, people	Per capita production coefficient (kg/person)
1935	2 093 690 000	2 085 610 000	1.004
1960	4 036 972 093	3 032 000 000	1.331
2000	6 686 405 000	6 070 581 000	1.101
2020	5 880 000 000	7 753 000 000	0.758

According to Table 34. the global population growth between 1935 and 2020 was 272% and tobacco output increased by 181% during this period, while the tobacco output per person ratio decreased by 24.5%. Thus, humans are tending to decrease tobacco consumption.

According to the World Health Organisation, smoking tobacco-containing products kills nearly half of the people who use them. More than 8 million people die each year from the effects of tobacco products. More than 7 million of these are users and former users of tobacco products, and more than 1 million are nonsmokers exposed to second-hand smoke.

Of the world's **1.3** billion smokers, **80%** are from low-and middle-income countries.
In 2020, **22.3%** of the world's population used tobacco:
36.7% of all men and **7.8%** of women.

In 2003, to combat the tobacco epidemic, WHO Member States adopted the WHO Framework Convention on Tobacco Control (WHO FCTC). Currently, 182 countries have ratified the treaty. Most countries in the world have banned direct tobacco advertising. The main tobacco users live in third world countries, where the programme to protect the population from smoking is not as aggressive. According to WHO data, the main increase in smokers occurs in Africa, while the number of smokers in Europe. America and Asia is decreasing.

However. *Homo Consúmens* is expanding the range of nicotine-containing products, and in the last decade new types of tobacco products have entered the market, such as heated tobacco products (HTPs): electronic cigarettes (e-cigarettes) and vapes.

In recent years, HTPs have been promoted as a “less harmful” alternative to tobacco smoking or as a way to quit smoking regular cigarettes. HTP users are exposed to toxic chemicals, many of which cause cancer, and there is no evidence that these products are less harmful than regular cigarettes. What is more, to develop the market, information about the effects of passive inhalation of HTP aerosols, which contain hazardous and potentially health-damaging chemicals, is unavailable to consumers. It is not an alternative for those who cannot quit smoking at all. It is better to undergo treatment. Vapes and tobacco heating systems are far from therapeutic. Only tar is eliminated, but other dangerous chemicals are added and nicotine remains, mostly synthetic with a different pharmacokinetics that quickly leads to pathological changes in the body. *Homo Consúmens* no longer think about quitting smoking, deluding themselves that they have chosen a safer option for their health. When using vapes, a person consumes more nicotine, which only strengthens the addiction to smoking. The aerosol formed when the liquid is heated may or may not contain nicotine. The main e-cigarette fillers by volume are propylene glycol to which glycerine and flavourings may be added. E-cigarettes do not contain tobacco, but they do contain unhealthier and more dangerous products. They are especially dangerous for children and teens. Nicotine causes a very strong addiction, and the central nervous system, which continues to form until about the age of 25, is especially vulnerable to it.

The number of advertising and marketing campaigns to promote e-cigarettes is growing rapidly via such channels as the Internet and social media. In the vast majority of cases, advertising of these products, assuring that they do not harm human health, as well as false statements about the effectiveness of these products as a way to quit smoking, only attract new consumers, especially young people (due to the use of aromatic additives). Cannot this business be banned so as not to destroy human health? What superpower would it take to ban the sale of all possible cigarettes? One anti-smoking measure might be to prevent smokers from applying for health insurance.

In so doing. we do not welcome the reduction of the world’s population through the harmful health effects of tobacco and alcohol, but see the lack of prospects for these citizens to participate in the programme to reformat *Homo Consúmens* into *Homo Cosmicus*.

It is high time to express serious concern and impose severe sanctions against those who sabotage the advance of an environmental civilization.

III. LGBT AND EVOLUTION

By increasing the size of the LGBT community, *the Microbiome* is promoting a protective mechanism against overpopulation.

For evolutionary purposes, same-sex relationships allow the species to limit reproduction when resources are scarce. Animals engage in sexual intercourse far more often than necessary to maintain their populations. If all their mating ended in new offspring, it would lead to overbreeding, cause an imbalance in the biological system and eventually lead to extinction. Same-sex relationships help to stabilize the population and increase the diversity of the species. However, things are not that clear-cut. Homosexuality has already been registered in 1.500 animal species.

In humans, given the development of *Homo Consúmens*, the concept of LGBT has several meanings with a perverse trait inherent of the consumer world. By definition, LGBTQ+ is an acronym that stands for a community of homosexuals, bisexuals, transgenders, intersex and asexual persons (LGBT, LGBT+, LGBTQ+, LGBTQIA, etc.). The additional letter Q stands for "queer", meaning a person who does not fit into the traditional framework of sexual orientation and gender identity. Currently, there are more than 70 genders. This abundance of orientations and popularity of same-sex relationships is due to a number of social and mass-cultural factors, media activities and propaganda that social norms are less important than people's own egos and desires. Relationships between the sexes do not need to be publicised. It is a never-ending process of teaching and learning about another person based on practice and error. This is much easier in same-sex relations: similar mentality, interests, everything is familiar and mutual understanding is much higher. That is the main attraction of same-sex relationships. The greater tolerance for such relationships gives adolescents of the *Homo Consúmens* civilization increasingly less incentive to leave their comfort zone and immerse themselves in the challenging process of establishing healthy heterosexual relationships. Why bother overcoming your complexes and wooing a girl when it is so much easier to say you are gay?

The UN requires countries that do not recognize LGBT people to implement "a comprehensive strategy that includes sustained and visionary measures targeting women and men at all social levels, including religious leaders, in order to eliminate stereotypes and patriarchal attitudes about the roles and responsibilities of women and men in the family and society". The UN recommends that comprehensive, gender-sensitive sexual and reproductive health education be included in the mandatory curriculum of primary and secondary schools and that prostitution be legalised, while abolishing measures to prevent abortion.

For some reason, our creator, *the Microbiome*, saw to it that about 7% of the world's men have feminine features and women masculine features. It is widely known that a woman has XX chromosomes in her DNA, and a man has XY chromosomes. There is something known as the Klinefelter syndrome, where the presence of one or more X chromosomes in addition to the XY chromosomes explains the underdevelopment of genitalia and the loss of one's gender. A change in the number of chromosomes or their abnormal placement causes genetic changes in the human sexual system. Epigenetics. the science of our genes. explains this phenomenon by the process of methylation. DNA methylation is a process whereby certain environmental conditions turn some genes on or off without changing their structure. The gene is the same, but its activity (expression) changes. There is a different pattern for each gene in every living creature. Conditions that interfere with the methylation process are harmless to our health in the future. Women are advised to consume folic acid before impregnation as it creates methyl groups during pregnancy. By default, the human epigenome (the way in which the genome is controlled) is strongly influenced by the external environment, the quality of food and the presence of harmful substances. For example, industries all over the world put out products in plastic packaging. The bisphenol A plastic hardener contained in this packaging directly impacts genetic changes. It is incorporated into the food chain and is part and parcel of human existence today. This substance, used in the manufacture of plastics (containers. utensils). is capable of destroying the free methyl groups necessary for methylation and inhibiting the enzymes that attach these groups to DNA. As the result, egg maturation is delayed, thus contributing to infertility. What is more, bisphenol can erase the difference between the sexes and stimulate the birth of offspring with homosexual tendencies.

Since *Homo Sapiens* diseases arise from both faulty genetic heredity and environmental influences. this means that the food we have been eating throughout our lives can alter our epigenetic systems. **The first decisions of the epigenetic system influence a person throughout their life, because at the early stage the epigenome determines further development and contains all the necessary mechanisms**. Therefore. 35-, 45- and 50-year-old citizens today may suddenly show the consequences of epigenetic changes. Our epigenome is strongly influenced by the external environment, food quality and presence of harmful substances. According to studies, 37% of homosexual mothers experience major stress during pregnancy. compared to 3% of heterosexual mothers. **Also, after giving birth to her first son, the likelihood that a woman's next male child will be born homosexual increases by 30%.**

In 2021, Ipsos International Research and Consulting Company surveyed people in 27 countries on all continents regarding their sexual orientation and gender identity. The results showed that the number of the LGBT community members increases with each new generation. While this number amounted to 4% among the people born between 1946 and 1964, in subsequent generations the numbers are 8%, 10% and 18% for people born between 1965 and 1980. 1981 and 1996, and after 1996. respectively.

The estimated global size of the LGBT community is shown in Table 35.

THE GLOBAL SIZE OF THE LGBT COMMUNITY
TABLE 35

Generation. birth years	Share of LGBT community representatives	Size of LGBT community. people
After 1996 (14-25 years old)*	18%	139 302 000**
1981-1996 (26-41 years old)	10%	230 000 000
1965-1980 (42-57 years old)	8%	144 000 000
1946-1964 (58-76 лет)	4%	36 720 000
Total globally	**6.945%**	**550 022 000***

Initial data:

https://web.archive.org/web/20210610112136/https://www.ipsos.com/en/

*Population calculation:
1) The world population born between 1946 and 1964 amounted to 918 million people;
2) The world population born between 1965 and 1980 reached 1.8 billion people;
3) The world population born between 1981 and 1996 amounted to 2.3 billion people;
4) The world population born after 1996 reached 2.6 billion.

**The statistics do not include children under 14, given that of the 2.6 billion people born after 1996, only 773.900.000 were 14 years old as of 2022

Let's project further population loss based on the growth of the LGBT community.

Of the 550 million of LGBT community representatives, 4.2 million or 0.76% have biological children. LGBT people are not inclined to conceive and bear children.

Compared to the periods of 1981-1996 and 1996-2022. according to official data, the percentage of LGBT representatives increased from **10%** to **18%**, i.e., by **80%**.

Taking an interval of 25 years, let's project the size of the LGBT community by 2048, 2074 and 2100 (see Tables 36, 37, and 38):

PROJECTED SIZE OF THE LGBT COMMUNITY WORLDWIDE BY 2048 /TABLE 36

Period. generations. birth years	Share of LGBT community representatives	Size of LGBT community. people
2023-2048 (14-25 years old) *	32%	389 000 000
1997-2022 (51-26 years old)	18%	468 000 000
1981-1996 (67-52 years old)	10%	230 000 000
1965-1980 (68-83 years old)	8%	144 000 000
Total globally	**12.3%**	**1 231 000 000**

* This prediction does not include children under 14.

The natural growth of the world population between 2023 and 2048 will be about 2.5 billion people. Due to the increase in the child-free trend among LGBT, 400 million people will not be born. Thus, the world's population will amount to approximately 10 billion people.

PROJECTED SIZE OF THE LGBT COMMUNITY WORLDWIDE BY 2074 / TABLE 37

Generations. birth years	Share of LGBT community representatives	Size of LGBT community. people
2049-2074 (14-25 years old)*	57%	446 000 000
2023-2048 (51-25 years old)	32%	1 215 000 000
1997-2022 (77-52 years old)	18%	468 000 000
Total globally	**28%**	**2 129 000 000**

* This prediction does not include children under 14.

Between 2049 and 2074, given the projected population loss due to the increase in the number of LGBT representatives (2.129 billion), the birth rate will be about 2.5 billion and the population loss during this period will amount to approximately 5 billion. Thus, the world's population will be about 7.5 billion people.

PROJECTED SIZE OF THE LGBT COMMUNITY WORLDWIDE BY 2100 / TABLE 38

Generations. birth years	Share of LGBT community representatives	Size of LGBT community. people
2075-2100 (14-25 yearsold)*	100%	847 000 000
2049-2074 (26-51 years old)	57%	1 038 000 000
2023-2048 (52-77 years old)	32%	1 215 000 000
Total globally	**48.5%**	**3 100 000 000**

*This prediction does not include children under 14.

Between 2075 and 2100, given the projected population loss due to the increase in the number of LGBT representatives (3.1 billion), the birth rate will be about 2 billion and the population loss during this period will amount to approximately 3.3 billion. Thus, the world's population will be about 6.4 billion people.

Consequently, starting in 2075, every newborn will probably be LGBT, and from this time on the total population birth rate will be close to zero and population loss will remain at the same level. This will ensure complete natural human extinction in one generation.

In recent years, according to the UN. there has been a rise in sexless people without gender preferences. By 2021, they numbered more than 115 million people, and statistics show intense growth.

Is this prediction not enough to convince intellectuals and politicians to urgently introduce programmes to reformat *Homo Sapiens* into *Homo Cosmicus?*

The environment today has become toxic; it is causing human genetic changes. The general global trends of tolerance and popularisation of non-traditional sexual relations and transsexualism, as well as the rate of increase in the number of people involved, are changing the social orientation of society and the development programmes of states. Considering everything mentioned above, as early as the 2040-50s, our planet will face a catastrophic increase in natural population loss, and from 2070 the population of *Homo Sapiens* as a species will begin irretrievably disappearing.

The *Microbiome* and the environment shape human gender features. The environment, however, is also a creation of the *Microbiome.* Therefore, the *Microbiome,* or *Cosmicus Quanticus Cerebrum,* forms everything in the universe and on our planet. Scientific predictions are also a hint to *Homo Sapiens* from the *Microbiome*.

The following negative environmental issue also contributes to a negative future for humanity. Environmental issues are changing the planet's species diversity. Abnormal processes in flora and fauna development are being registered. According to observations, in the last 5-6 years. inflorescences of both forms. female and male simultaneously, have been found in annual plants that are characterised by unisexual inflorescences. Accordingly, seeds from such plants do not germinate, i.e., uniparentalism and the reduction of biological reproduction of wild species is advancing. This process, which is being closely monitored by Irakli Chokoraya, a renowned botanist from the Georgian Academy of Sciences, is gaining momentum.

Thus, in recent decades, different kinds of manifestations and/or deviations in sexual self-identity have been occurring not only in humans. The effect, in the form of pronounced sexual dimorphism due to developmental disorders as a result of various influences and environmental conditions, is also observed in plants, fungi and microorganisms. The *Microbiome* effectively participates in the regulation of plant genome manifestations, since it interacts with plants and exchanges with them many molecules that carry out different biological activities.

4.2 THE BASICS OF *HOMO COSMICUS* SELF-ORGANISATION

Modern science has become pragmatic and rational rather than scientific. People are no longer required to be members of institutions or have bachelor of science or PhD degrees. Scholastic achievements are distorted and replaced with scientometrics. The level of scientists' erudition and the material benefits associated with it, such as positions, titles and subsidies, depend on artificial indicators such as the Hirsch index and the prestige of the scientific journals that publish their articles. Inevitably, the code of silence and corruption undermine the very foundation of scientific endeavour. It is not uncommon for diplomas, master's theses and doctoral dissertations to be written by supervisors for a fee. There is no true science in this society. I suggest that starting in 2025 secondary education should be called primary education. modern higher education secondary education, and bachelor of science and PhD degrees, as well as the titles of associate professors and professors, considered higher education. Scientists should not be sponsored by state funding or supported by production companies, especially commercial interests and those of industrial corporations. State funding should only go to those people engaged in promoting evolution from *Homo Consúmens* to *Homo Cosmicus*. **There is no other way for *Homo Sapiens* to survive.**

This does not simply mean the perfection of human nature. The survival of our species depends on it. Otherwise, it is doomed to extinction and replacement by more perfect organisms.

Scientists do not allow themselves to criticise religious dogmas, and sometimes they themselves blindly believe in far-fetched theories that undermine human consciousness and promote an uncontrolled increase in procreation. At the same time, they are happy to participate in projects to develop super-powered weapons. What kind of scientists are they if they create a way to destroy all living things, first and foremost, humans? Most scientists work for a specific commercial project and approved programmes designed for the current market of goods and services and secured funding. Accordingly, if there is the prospect of income, there will be money for development. Scientific research is supported by marketing analyses to adjust the consumer behaviour of *Homo Consúmens* and promote a specific product in the market. Scientists must be funded and work independently of government programmes and the ultimate commercial success. The dominance of cronyism in science has reached its limit, Independent thought and autonomous scientific views are not encouraged and, in many cases, are punishable. This is particularly evident in the most important of the sciences: bioscience. So, until now, no one has seriously pursued the evolutionary improvement of *Homo Sapiens*. relying on the usual course of the natural process. Natural sciences, including genetics, have long been considered pseudosciences. How can creatures that by definition belong to the genus of primates of the hominid family, which inhabited the planet 500 thousand years ago, be called people? Are they humans or rather the ancestors of modern humans? How can scientists call them "people" if people are living beings with the ability to talk and think, the subjects of socio-historical activity and culture? The oldest representative of the *Homo Sapiens* species is its Negroid genotype, the age of which is 100 thousand years. Such scientists should be censured.

In my opinion, initiated by the *Microbiome* and in agreement with it. *Homo Cosmicus* is the ultimate goal of *Homo Sapiens* evolution. If this goal is not achieved in the near future. humanity will perish. The signs of this apocalypse are clearly seen in the threatening events that are increasingly looming. There are several steps that must be taken to achieve this goal.

We must:

1) search for and develop contacts and ways to communicate with *the Microbiome*;

2) improve the consciousness of our contemporaries and abandon *the Homo Consúmens* mentality;

3) shape the consciousness of *Eco Sapiens*;

4) create a consciousness that recognises the digital economy. At the same time, we must reject national, religious and species affiliation and create a single planetary national mentality: each of us is an Earthling. Moreover, each of us is an integral, creative part of the Biosphere, i.e., *the Microbiome* and *Cosmicus Quanticus Cerebrum*;

5) recognise that the human body is the primary provocateur of consumer consciousness. We must form a new human body capable of consuming less food and water and regulating the procreation process, since overpopulation is a major factor in the destruction of the planet;

6) evolve and transform the human body to make it capable of traveling independently in earth space;

7) fundamentally transform *Homo Sapiens* into *Homo Cosmicus*, which will be capable of living on different planets while maintaining its identity and connection with *the Microbiome*.

Research work should start in 2025 and be finished by 2125, that is, in a century.

We should organise "cave" city-settlements with infrastructure based on eco-friendly technologies to transform the current population of *Homo Sapiens* into a new species: *Homo Cosmicus*. These settlements will help people during the transition period to feel completely safe and comfortable in a wild natural environment and at the same time become used to an environment that differs from contemporary megacities, in isolation from the world of overconsumption and communication with *Homo Consúmens*. Separate living conditions will ensure that *Homo Consúmens* has no authority or influence over intellectuals. Applying the latest technologically innovative solutions for reorganising society, correct land use, waste recycling and ceasing the exploitation of natural resources worldwide will allow us to make a real breakthrough in the evolutionary consciousness of humans. aimed at creation, not destruction.

This vitally important issue needs to be discussed in detail at world forums of intellectuals.

Gender relations in these new living conditions are described in the introduction to this book. They will make it possible for people to choose a partner for social communication at the same level of intelligence, as well as possible replacement of a human with a smart android that has a developed level of AI or a clone with the mind of a particular person.

This is my suggestion for how intellectuals dedicated to reformatting *Homo Consúmens* into *Homo Cosmicus* should be accommodated. I understand that many people will find my suggestion strange. Other proposals are welcome. Therefore, I suggest discussing this issue in detail at the upcoming meetings of intellectuals on the Creation of a *Homo Cosmicus* Civilization (see Introduction). I suspect that most representatives of *Homo Consúmens* will not understand or accept the looming problem of the extinction of *Homo Sapiens*, which is why I am suggesting that the intellectuals involved in reformatting *Homo Sapiens* into *Homo Cosmicus* should live separately in order to carry out the necessary research and preservation of the

...HUMANS ARE FAIRLY EASY TO INFLUENCE THROUGH THE BRAIN AND ITS ASSOCIATED CENTRAL NERVOUS SYSTEM.

THIS IS WHAT THE ENTIRE ADVERTISING AND MARKETING INDUSTRY IS DOING NOW...

species itself. Therefore, I propose dividing the world into two parts: the world of consumption and the world of intellectuals engaged in scientific experimentation. We will discuss how to organise and fund the world of experimentation at our upcoming meetings.

The heart plays the main role in the perfection of humanity and its advancement along the evolutionary path. *Homo Sapiens* owes the development of its thinking and intellectual faculties to the heart. Without mastering the energy of thought and desire in the heart, humanity cannot change anything in itself or in the world around it, nor can it become a full-fledged collaborator of evolution. And it is the interrelation between thought and heart that is most important, i.e. thought should be filled with heart energy. According to scientists, the heart space represents superconsciousness. It has been proven that the heart can think for itself. Heart cells can function independently of the central nervous system; they can change the heart rhythm without commands from the brain. The influence of the surrounding environment on the heart (solar activity and related magnetic storms, as well as atmospheric phenomena) is well-known**.** Human creative activity is subject to the rhythm of the cosmos and solar activity. which rises mainly at its peaks. Humans are fairly easy to influence through the brain and its associated central nervous system. This is what the entire advertising and marketing industry is doing now: it is using different way to manipulate the human will and subjugate it to unrestrained consumption, forming *Homo Consúmens*. Only our hearts are free of this influence, which is why it is so important for humankind to develop this organ. Scientists have found that when blood is pumped into all the vessels of the body, the heart divides it into portions of different composition, which it sends only to particular organs. The cardiovascular system is a separate highly organised structure of our body. It has its own brain (heart brain), its own heart (heart of the heart) and has its own waveguide-hemodynamic connection, which controls the trajectory of movement of information-energy sets of erythrocytes along the vessels. It also materialises and distributes all forms of time in the body and serves as an anticipatory system for consciousness. To treat the heart as a soulless pumping device is an insult to the creator, *Cosmicus Quanticus Cerebrum*. The cardiovascular system, knowing the development programme of the other body systems, lays the material foundation for their advancement and growth. The intelligence of the heart system is determined by the fact that the brain develops in the embryonic period, the uterus being the place of foetal development during pregnancy, where it receives blood with more nutrients than the femoral artery. Different nutrients are distributed from the same aorta. Five litres of blood instead of the estimated twenty needed is enough for the body. The spleen receives only the old red blood cells, while warm blood containing more oxygen, glucose and young red blood cells is delivered to the brain. Billions of capillaries receive information for the heart. Their total length is about 100.000 kilometres. They act as an interaction boundary with the external and internal world. The heart keeps the nervous system away from them. All information from the universe is absorbed through the capillaries by the moving structures of red blood cells. How many more scientific facts do we need to address to realise that our creator envisioned the possibility of feedback via the heart, *Homo Sapiens* is obliged to make this connection.

I cite the opinion of my colleague, Joe Dispenza. The quantum model of the universe proves the existence of the *Universal Mind*.

> All material reality consists mainly of energy existing in a vast network whose elements are interconnected beyond time and space. This network in the form of the quantum field contains probabilities that we as observers can embody through our own thoughts (consciousnesses). emotions, and states of being.
>
> If energy underlies all physical reality, then the mind self-organizes into matter. This is the scheme which the universal mind used to create reality. The quantum field is an invisible energy potential capable of self-organization into subatomic particles. then into atoms, molecules, and upwards into absolutely everything. In terms of physiology, the chain looks like this: molecules – tissues – organs – systems – the body as a whole. In other words, the energy potential gradually reduces the frequency of wave oscillations until it becomes solid matter.
>
> "It is the *Cosmicus Quanticus Cerebrum* that gives life to the quantum field and everything in it, including you and me. This same force animates material reality in all its manifestations. Thanks to the *Cosmicus Quanticus Cerebrum*, our heart beats, our stomach digests food. and countless chemical reactions take place in every cell of our body every second. Moreover, under its influence trees bear fruit and distant galaxies are born and die. And since this mind is omnipresent and timeless, and its power operates both within us and everywhere around us, it is both individual and universal....

4.3 THE DIGITAL *HOMO CONSÚMENS* ECONOMY

PHILOSOPHY OF A NEW ECONOMY

The development of a new civilization and the transition of *Homo Consúmens* to *Homo Cosmicus* will require a new habitat in harmony not only with nature, but also with a new digital economy (DE) and financial system. In today's world, new algorithms are already being proposed to digitalise all global finances.

In the near future, the financial system should not be based on the accumulation of monetary resources. The new approaches of the future world economy are social equity and the sharing of knowledge, intelligence and skills.

The transition from the present-day economy to a digital one takes time. First, humanity must embrace the idea of abandoning the consumer mentality and reformat the consciousness into "caring for the planet" and all-planetary living.

A global world system must be created: a database in which each person will have a unique digital identifier assigned at birth, similar to a passport. This digital ID will contain all the data apart from the financial component: e.g., housing, car, place of work/study, medical and police records, diets, etc. This digital ID will provide all the information about an individual, from shoe size to each person's food preferences.

At first glance, this situation looks terrible. as though people are losing their freedom, but this is only the first impression. As it develops further. *Homo Cosmicus* will gradually give up "many of the benefits of the former civilization". The new economy, mainly aimed at preserving our planet, should depend as little as possible on the financial component of each and every person and nations as a whole. The system should work, like an anthill or a beehive, for the good of society, not to profit from other members of that society.

In the world to come, there should be no rich and poor. Everyone's salary and its size will ensure a life free of abuse.

Cash circulation in the world should be abolished! Payroll should be digital only! The environmental limits will not allow people to spend all the funds in their own accounts, only what the digital economy stipulates. There should be no tax deductions and no contributions to various funds. Private banks would be abolished, as well as the issuance of credit and loans.

Specially developed algorithms will allow each person to calculate their own monthly food ration, clothing needs, hygiene expenses, utilities, transportation, etc. The individual will continue to have a reserve fund to be used for emergencies, such as medical issues, etc.

The rest should be accumulated in a common world fund, from which all infrastructural social programmes of the planet are implemented.

The digital economy and financial system will provide every *Homo Cosmicus* with everything they need without surfeit.

In the new world, there should be no control by the authorities. Each member of society should decide for themselves how to live and develop themselves according to the *Homo Cosmicus* programme.

In the world of *Homo Cosmicus.* there should be no racial or religious distinctions. There will be no religions in the new world. They should not exist.

The world of *Homo Cosmicus* will be in perfect harmony. This will achieve the ultimate goal: survival of the planet and its continued evolution.

WHERE DO WE START?

I By 2025, all governments in the world, without exception, must recognise the imminent threat to the survival of the planet, humanity and all its living creatures.

II Starting in 2027, it will be strictly forbidden to have more than one child in all countries of the world. The one-child policy should include controls, incentives and punishments.

III By 2025, scientific anti-religion programmes should be launched around the world. Religion degrades human consciousness and contributes to an uncontrolled increase in the planet's population! Under the coercive influence of religious dogma, the mind has no prospect of intellectual development.

IV In all countries of the world, criminal punishments aimed at curtailing the resource-depleting activities of Homo Consúmens. especially with respect to environmental crimes and violations of the new civilization standards. should be tightened.

V By 2024-2025, we must start discussing the concept of developing and implementing a digital economy in all countries via global platforms.

It is possible to move to a new level of consumption by introducing bans on exorbitant spending, ranging from the amount of food consumed and the purchase of clothing, household items, real estate and other things to entertainment and recreation services. AI of the

Digital Economy (DE) should assist in this task. Digital AI will determine the restrictions on consumption and the use of all types of renewable and non-renewable natural resources in the production of goods and services to support all vital activity.

Beginning in 2027-2028, the environmental focus of DE must be revealed and justified.

Beginning in 2030, DE should be gradually introduced at the global level.

By 2035, in order to save the planet. artificial intelligence (neural brain implants) must be manufactured, sold at affordable price and integrated for *Homo Consúmens* who do not meet the recognised civilization level. According to the established legislation, those with modest IQ results who are unwilling to comply must be forcibly subjected to the implementation of an AI chip.

The DE will be based on new production standards for all sectors of the global economy: agriculture, metallurgy, the chemical industry, etc.

As part of implementation of the DE project, a **Personal Consumption Passport** will be created for each *Homo Consúmens* by means of a digital customer profile. This will make it possible for everyone to legally purchase a certain amount of goods based on the environmental standards. For example, every year, each person should purchase no more than:

- 3 pairs of summer shoes and trainers,
- 2 pairs of winter shoes,
- 3 dresses or shirts,
- 3 pairs of pants for both men and women and 2 pairs of skirts for women,
- 1 jacket, 1 winter coat,
- 2 sweaters.

Each person will be able to purchase a certain amount of furniture for 7 years, one car for 25 years (while the maximum capacity of the vehicle must be limited to 100 horsepower), If a person causes an accident that results in the vehicle being totalled, they will not be allowed to purchase a new car.

The standard settings of each person's digital profile will also envisage certain norms for the purchase of food and goods. A person will be able to buy no more than 400 g of bread, 300 g of meat or fish, 30 g of butter and 500 g of fruit and vegetables daily; as well as no more than 5 litres of "pure alcohol" per year per person. Tobacco products and all types of electronic cigarettes will be entirely banned. The digital profile will account for the total amount of food consumed by an individual, including restaurants and cafés. If you have already bought 2 kg of meat that week, the restaurant will replace a steak with a fish dish, whereas if you have bought 2 kg of both meat and fish, the restaurant will refuse to serve you either meat or fish and offer you a salad only.

The digital profile will limit the sale and reduce the manufacture of a wide range of jewellery items. This will result in the closure of model agencies and will reduce the manufacture of textile products by 80%. Confection factories, automobile repair shops, pop culture concert halls, television production, and all types of advertising will face a 90% decrease. At the same time, the manufacture and use of plastic containers for all types of food, as one of the most destructive types of products undermining humanity's biological foundations, will be banned.

A personal consumption passport is the first step towards improving the state of our planet.

The introduction of the DE to optimise consumption will take place in stages:

1 «HARD»

The first, «hard» stage is needed as a tipping point to stop overconsumption, prevent the increase of environmental emissions, support the environment and prepare for a healthier and better climate on the planet.

2 SCIENTIFICALLY GROUNDED

The second stage, "scientifically grounded", entails the development of unified global methods and recommendations for compliance with the new environmental civilization standards and requirements for the quality of human life on Earth.

Types of consumption

Every consumer must have not a bank card or cash. but only their own identification in the form of a combination of an electronic passport. a credit card and a “new document”. This identification must be implanted in the human body in the form of an electronic consumption control chip. The new consumption rates for each category are determined based on a person’s physical condition, work responsibilities, region and place of residence and state of health.

This will make it possible to prevent each individual from overconsuming by lowering/increasing the limits for each category. For example, the household appliances/electronics category will have an annual, rather than monthly, consumption rate so that a person cannot buy multiple TVs or smartphones when a new model is released. Pastimes and entertainment will also be limited, and each person must make a conscious choice regarding their entertainment preferences: going to stadiums, restaurants, cinemas or pop concerts. The fewer such hobbies. the closer our consciousness comes to *Homo Cosmicus*.

There should also be restrictions on housing and utilities that prevent people from wasting water and electricity, such as taking a shower for more than five minutes every day, leaving the light or faucet on. Smart meters will monitor energy and water consumption. As for foodstuffs, the consumption norms will be determined based on a person’s physical condition, since the digital identifier will have access to everyone’s medical card. This will reduce consumption to a mere necessity and prevent overindulgence, thus saving tons of thoughtlessly purchased products from being thrown away.

The regulations introduced will further enable human self-organisation. For example, the purchase of petrol will be restricted, and in the event of frequent traffic regulation violations or provoking traffic accidents, the system will restrict the sale of petrol, thus encouraging people to be more careful and attentive when observing traffic regulations, If a person is caught by the police while intoxicated, they will be permanently prohibited from buying petrol and alcohol.

At the first stage of reformatting of *Homo Sapiens* into *Homo Cosmicus*, these controls and restrictions will only be beneficial.

FIGURE 17. Categories of *Homo Consúmens* consumption types

UNIQUE DIGITAL IDENTIFICATOR (passport)

INTERNET

SAFETY FUND

MONEY SAVINGS/ FORCE MAJEUR

HOUSING AND PUBLIC UTILITIES

- ✓ ELECTRICITY
- ✓ WATER SUPPLY
- ✓ CENTRAL HEATING
- ✓ MAINTAINANCE
- ✓ REPAIR

HOUSING AND PUBLIC UTILITIES

- ✓ KITCHEN EQUIPMENT
- ✓ SMARTPHONES/ GADGETS
- ✓ TV
- ✓ LAPTOP/DESKTOP
- ✓ HOUSEHOLD APPLIENCIES

COMMUNICATION

- ✓ INTERNET
- ✓ MOLBILE COMMUNICATION
- ✓ LAND LINE

FOOD

- ✓ MEAT PRODUCTS
- ✓ FISH PRODUCTS
- ✓ CROPS/CEREALS
- ✓ DIARY PRODUCTS
- ✓ SOFT DRINKS
- ✓ ALCOHOL BEVERAGES
- ✓ CIGARETTES

HOMEWARE

- ✓ PERSONAL SUPPLIES
- ✓ HOME CARE PRODUCTS
- ✓ KITCHENWARE
- ✓ SETTING

TRANSPORT

- ✓ PERSONAL CAR
- ✓ FUEL
- ✓ MAINTANANCE
- ✓ PUBLIC TRANSAPORT

ENTERTAINMENT

- ✓ VISITS TO RESTAURANTS/ CAFÉS
- ✓ CINEMA / THEATRE / CONCERTS
- ✓ SPORTS EVENTS
- ✓ LEASURE TIME / TRAVELLING

MEDICINE

- ✓ PHARMACEUTICALS
- ✓ PRIVATE CLINICS› SERVICES
- ✓ SURGERY

CLOTHES IN GENERAL

- ✓ CLOTHES
- ✓ OUTWEAR
- ✓ SHOES
- ✓ UNDERWEAR

PERSONAL CARE

- ✓ HAIRDRESSER›S
- ✓ ESTATIC MEDICINE
- ✓ FITNESS
- ✓ BODY CARE

FIGURE 17. Categories of *Homo Consúmens* consumption types

VI Norms must be drawn up and mandatory standards introduced to reduce the number of such pets as dogs, cats and exotic animals per family/single person. A list of authorised breeds must be established, depending on the functions of the animals as pets: maintaining homeostasis of the family atmosphere, security, providing assistance to blind people, etc.

Permission for such animals may be granted based on medical advice to support emotional and psychological balance and assist humans.

Uncontrolled breeding of dogs and cats should be banned. Pet owners must take measures to prevent unwanted litters in dogs and cats by means of their temporary isolation, use of contraceptives or castration (sterilization).

Stray animals that pose a safety hazard to humans and the environment must be eliminated.

Felinology and canine pet shows must be prohibited.

These standards do not apply to service dogs and guide dogs.

VII Consumers with low HIC and single people who need animal companionship may be offered animal-like androids as pets, considering that the overall market for android robots and artificial human body parts with sounds and movements is annually growing and producing billions of dollars in sales.

VIII During the transition period to a digital economy, tax exemptions for *Eco Sapiens* individuals should be introduced and the rates for all types of taxes, duties and fees increased for *Homo Consúmens*.

IX Tax rates must be increased for all industries on a permanent basis until the complete abolishment of enterprises engaging in harmful types of production is achieved.

X During the transition period, the implementation of the **Speedcontrol** project must be ensured.

Unmanned vehicles will have access to GPS map data (Global Positioning System is a satellite-based navigation system that provides distance, time and location measurements in the WGS 84 world coordinate system) that indicate speed limits for various highways and city streets.

The special system for Tesla and other modern cars, especially electric cars (every major manufacturer has an electric car in their lineup nowadays), can read speed limit signs. This system

ALL MANUFACTURERS IN THE GLOBAL AUTOMOBILE INDUSTRY MUST IMMEDIATELY PROVIDE CARS WITH ACCESS TO A GPS MAP THAT CONTAINS MAXIMUM SPEED DATA ON CERTAIN SECTIONS OF HIGHWAYS AND CITY STREETS

reads various road signs, including speed limits, and transmits the data to a GPS system.

All manufacturers in the global automobile industry must immediately provide cars with access to a GPS map that contains maximum speed data on certain sections of highways and city streets. The vehicle's on-board computer must read this data and send a command to the engine to reduce the speed to the permitted speed limit on the current section of road. At the same time, drivers have the option of regaining control over speed by increasing it. In this case, they will be fined for violating traffic regulations and increased fuel consumption. For example, at an average highway speed of 100-110 km/h. a car consumes a small amount of fuel, but when the speed increases by 20-30 km/h, fuel consumption increases up to 25%, and when the speed increases by 40-50 km/h, up to 50% more fuel is consumed, while at a 70-80 km/h increase this figure reaches 100% and more.

GPS speed monitoring will reduce fuel consumption and carcinogenic gas emissions, reduce the number of staff in the monitored services and ensure order on the roads.

The same regulations should be implemented for motorcycles.

XI XI. Traffic noise is one of the most dangerous parametric environmental pollutants, since it is the most common type with a negative environmental impact on the human body. People cannot get used this noise. Noise exceeding 80 dBA is harmful to humans. The pain threshold is between 120-130 dBA, and the tolerance limit is defined by a value of 154 dBA, above which it leads to death. The noise intensity generated during the movement of vehicles is 70-80 dBA for a passenger car, 80-90 dBA for a truck, and 85-100 dBA for a motorcycle.

We urgently recommend car manufacturers and environmentalists to prevent drivers from carrying out independent increases in car and motorcycle noise. The following steps should be taken:

- a prohibition established on the removal of mufflers, resonators and/or catalytic converters;
- a ban established on the installation of non-original exhaust system parts;
- a mandatory ban introduced on the installation of vacuum and electric exhaust sound control dampers not provided by the manufacturer;
- a ban established on deliberately increasing engine idling speeds and introducing additional fines for drivers of sports cars and motorcycles;
- a ban established on any system that increases the exhaust volume.

In so doing. we will be able to reduce the anthropogenic impact on the environment and human health.

Today, in 2023, when there are about 40 million PhDs in the world and about 3 billion people have higher education, is it really necessary to talk about these obvious problems?

**INTELLECTUALS! IT'S TIME FOR US
TO TAKE CHARGE OF THE WORLD TO SAVE IT!**

XII	Possible risks must be prevented in the circulation of clean water on a global scale.

The digital age will help to manage and control the circulation of clean drinking water in human life. This resource is the main challenge facing humankind.

A new unified standard for the use of freshwater resources must be approved and introduced with a clear division into drinking and technical water and a reduction in its use.

WE MUST ESTABLISH THE FOLLOWING CONCEPTS:

DRINKING WATER

Drinking water is clean water suitable for drinking.

TECHNICAL WATER

Technical water is pure water (precipitation, groundwater) unsuitable for drinking and cooking without additional treatment water). It is used for personal hygiene, cultivation of agricultural plants, crop and livestock production.

INDUSTRIAL WATER

Industrial water is water unsuitable for consumption even after quality treatment.

Let us calculate how much fresh water can be saved in world consumption, based on the total volume of water involved in the water cycle for growing and processing of agricultural plants and food production.

Possible savings of drinking water resources, taking into account separation into drinking and technical water and reduction of consumption rates, are given in Table 39.

ESTIMATION OF RESOURCE SAVINGS IN GLOBAL DRINKING WATER CONSUMPTION

TABLE 39

DIRECT CONSUMPTION, L/PERSON.				Global consumption (7.92 billion people), cubic^{km}/year	Consumption by standard of the digital economy, l/person.		Global consumption (7.92 billion people), cubic^{km}/year	SAVING OF PURE DRINKING WATER by humans cubic^{km}/year
	Use	**per day**	**per year**		**per day**	**per year**		
Domestic needs	**Drinking water** [1]	2	730	5.78	1	365	2.89	-2.89
	Kitchen: dish washing	17	6205	49.14	Technical[2] 10	3650	28.91	-49.1
	Kitchen: cooking, tea/coffee	5	1825	14.45	3	1095	8.67	-5.78
	Personal hygiene[4]: brushing teeth twice a day; washing face and hands (6 times/day); shower for 5 minutes; going to the toilet 6 times/day	120	43800	346.90	Technical[2] 55	20 075	58.99	-346.90
	Housekeeping [5]	23.6	8614	68.22	Technical[2] 7.91	2 887.15	22.87	-68.22
	5-kg pet care. No more than one pet per person	0.3	109.5	0.87	0.3	109.5	0.87	0.00
	Watering plants: 30 ml of water per day for one four-inch pot. No more than two plants per person	0.06	21.9	0.17	Technical[2] 0.06	21.9	0.17	-0.17
	Washing [6]	48.46	17 687.9	140.09	Technical[2] 32.48	11855.2	93.89	-140.09
	Careless spending	110	40150	317.99	ELIMINATED	ELIMINATED	ELIMINATED	- 317.99
	TOTAL	**326.42**	**119 143.3**	**943.61**	**109.75**	**40058.75**	**317.26**	**-931.18**

INDIRECT CONSUMPTION, L/PERSON.				Total globally, cubickm/year	Consumption by standard of the digital economy	Total globally. cubickm/year	PURE DRINKING WATER ECONOMY, km^3/year
Economy sector	Category	per day	per year				
Food industry	Crops	219.11	79975.15	633.40	Tech.[2] -80%. Drinking[1] -20%	126.68	-506.72
	Sugar	4.95	1806.75	14.31	Tech.[2] -70%. Drinking[1] -30%	4.29	-10.02
	Nuts	16.10	5876.50	46.54	Tech.[2] -95%. Drinking[1] -5%	2.33	-44.21
	Root crops	19.20	7008	55.50	Tech.[2] -80%. Drinking[1] -20%	11.10	-44.44
	Fruit	59.13	21582.45	170.93	Tech.[2] -80%. Drinking[1] -20%	34.19	-136.74
	Stimulants (coffee. chocolate. tea)	38.70	14125.50	111.87	Tech.[2] -80%. Drinking[1] -20%	22.37	-89.5
	Vegetable oils	20.43	7456.95	59.06	Tech.[2] -95%. Drinking[1] -5%	2.95	-56.11
	Beans	8.05	2938.25	23.27	Tech.[2] -90%. Drinking[1] -10%	2.33	-20.94
	Dairy products	64.70	23615.50	187.03	Tech.[2] -90%. Drinking[1] -10%	18.70	-168.33
	Eggs	25.07	9150.55	72.47	Tech.[2] -80%. Drinking[1] -20%	14.49	-57.98
	Meat products	269.04	98199.60	777.74	Tech.[2] -80%. Drinking[1] -20%	155.55	-622.19
	Spices	7.74	2825.10	22.37	Tech..[2] -95%. Drinking[1] -5%	1.12	-21.25
	Vegetables	36.22	13220.30	104.70	Tech.[2] -80%. Drinking[1] -20%	20.94	-83.76
	Alcohol	3.10	1131.5	8.96	Tech.[2] -70%. Drinking[1] -30%	2.69	-6.27
Other industries	Clothing manufacture	60.05	21918.25	173.59	Tech.[3]	0.00	-173.59
	Paper production	39.12	14278.80	113.09	Tech.[3]	0.00	-113.09
	Steel production	111.65	40752.25	322.76	Tech.[3]	0.00	-322.76
	Energetics	13.94	5088.1	40.3	Tech.[3]	0.00	-40.3
	TOTAL	**1016.3**	**370 949.5**	**2 937.9**		**419.73**	**-2518.2**
	TOTAL	**1 342.72**	**490 092.8**	**3 881.5**			**-3449.38**

4 - COMMENTS TO TABLE 39 WATER CONSUMPTION IN PERSONAL HYGIENE:

Water consumption items	Actual consumption			Consumption rate by digital standards		
	number per day	Consumption per one procedure, litres	Consumption per day, litres	number	Consumption per one procedure, litres	Consumption per day, litres
PERSONAL HYGIENE						
Tooth brushing	2	1	2	2	1	2
Hands washing	6	3	18	6	1	6
Face washing	6	1	6	2	1	2
Shower	2 (5 min)	35 (7l per min)	70	1 (3 min)	21 (7l per min)	21
Bio break	6	4	24	6	4	24
TOTAL:			**120**			**55**

5 – COMMENTS TO TABLE 39 WATER CONSUMPTION FOR CLEANING PREMISES:

Water consumption items	Actual consumption			Consumption rate by digital standards		
	number per day	Consumption per cleaning, litres	Daily consumption, litres	number	Consumption per cleaning, litres	Daily consumption, litres
Cleaning an area of 60 square metres per 1 person						
Wet cleaning of premises	1	20	20	0.5	10	5
Window cleaning	0.03	5	0.15	0.03	5	0.15
Sanitary ware cleaning	0.23	15	3.45	0.23	12	2.76
TOTAL			**23.6**			**7.91**

6 – COMMENTS TO TABLE 39 WATER CONSUMPTION DURING WASHING:

Water consumption items	Actual consumption			Consumption rate by digital standards		
	number per day	Consumption per washing cycle, litres	Daily consumption, litres	number	Consumption per washing cycle, litres	Daily consumption, litres
Types of textile accessories:						
Bedding (1/14)	0.07	66	4.62	0.07	40	2.8
Clothing (1/7)	0.14	49	6.86	0.14	40	5.6
Children clothes (3/7)	0.43	86	36.98	0.28 (2/7)	86	24.08
TOTAL			**48.46**			**32.48**

THUS. IF WATER FOR HUMAN USE IS SEPARATED INTO DRINKING AND TECHNICAL (see Table 39). THE TOTAL SAVINGS IN PURE DRINKING WATER WILL BE:

3 449.38 kilometers3 per year or **3.449** quadrillion litres per year

The main fresh water turnover management measures include the following:

1) Modifying the existing water supply system to separate water into drinking and technical to rationalise the use of the former.

2) Introducing a total ban on industrial bottling (lemonade. kvass. energy drinks, cola, pepsi, other beverages and the production of all types of alcoholic beverages): this would reduce up to 60% of fresh water consumption.

3) Consuming drinking water from sources equipped with devices that identify the consumer and the amount they consume.

A substantial drinking water conservation programme cannot be implemented without large-scale global digital and video oversight. Electromagnetic indicators can be used to monitor every drop of drinking water required by every person on the planet.

4) Reducing water pollution created by agricultural activities and fish farming.

5) Cultivating less water-intensive crops in regions experiencing water scarcity.

6) Increasing the efficiency of food production through the use of innovative methods and technologies based on the More Crop Per Drop of Water principle.

7) Introducing sanitary norms at the national level for the citizens of each country to establish water safety measures. Making sanitation facilities accessible to the public.

8) Ensuring the mass introduction of existing technologies for manufacturing edible utensils (spoons, glasses, plates and food packaging materials) based on algae, pectin, cereal crops, etc.

9) Eliminating wasteful habits such as bathing procedures and irrational water use by installing sensors that restrict water supply.

10) Eliminating leaks in water and sewage systems depending on the warranty life of the pipes by monitoring and upgrading them with durable materials based on German experience.

11) Introducing technology for collecting drinking water from large trees. This technology has already been developed and tested by Georgia's OAZIS VERITAS Company. They collect drinking water from large deciduous trees.

A plant guttation and evaporation system can be used to collect pure drinking water where there is no access to natural sources. Trees, shrubs and grasses have a specific system of water accumulation from the soil, as well as further transportation to the upper part of the plant. providing turgor. It is an efficient system that utilises the physical effects of condensation. capillary transport followed by evaporation and the formation of vaporised water. Given an optimal temperature and humidity ratio (when the so-called "dew point" is reached). the so-called transpiration water, as well as water formed during the decomposition of sugars as a result of respiration accompanying the production of ATP (adenosine triphosphate – a substance that supplies energy for most biochemical reactions occurring in the cell), enters the intercellular space of the spongy parenchyma and is transported to the stomata and to the guttation holes on the lower surface of leaves. The water is then condensed and can be collected either directly from the leaves or by using cooled surfaces to condense and collect the moisture.

12) Reducing water consumption for washing cars by limiting the frequency of this activity.

Less than 2.5% of the huge number of cars on the planet are battery powered, the rest are internal combustion engine-powered vehicles. Given the constant increase in manufacture, it is impossible to count their exact number. The last study was conducted in 2015, which recorded 950 million passenger cars and 335 million commercial vehicles at that time. On average. 80 to 90 million cars are manufactured per year, which means there are now about 1.5 billion cars on the planet.

It takes 100 to 150 litres of water to wash a car (and this is a very economical amount), while as much as 400 litres is required for trucks, commercial vehicles and buses.

On average. depending on the region and climate, vehicles are washed twice a month.

So the calculations are as follows:

1.1 billion cars ***24*0.125 =3.3** billion cubic meters of water

400 million cars ***24*0.4=3.8** billion cubic meters

This results in the contamination of a total of 7.1 billion cubic meters of drinking water annually.

This gives a blatant example of politicians' lack of intelligence and knowledge: how can they allow so much fresh water to be wasted washing cars, given the general global shortage of fresh water.

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13) Ensuring the use of innovative developments in laundry, such as the use of waterless washing machines with CO_2 and biodegradable cleaning products.

14) Ensuring the creation of special mechanisms to remove pharmacologically active substances from waste water in order to reduce the residual content of medicinal substances in ground and surface water and decrease the turnover of clean drinking water in the treatment and prevention of diseases.

The total number of registered patients with acute renal failure in the world amounts to 20 million people. Patients are subjected to haemodialysis to keep them alive. Haemodialysis and hemodiafiltration require more than 500 litres of specially prepared and additionally purified water per patient per week to provide blood filtration with a special filter dialyzer, the basis of which is a semi-permeable membrane. That said, healthy people rarely drink as much as 12 litres of pure water every week. This 40-fold increase in water consumption requires additional monitoring and quality control of waste water disposal to prevent the ingress and increase in the amount of harmful substances. The annual consumption of pure water per patient for treatment alone amounts to 26.000 litres. To keep 20 million patients alive for an average of 15 years after starting dialysis and perform all the medical procedures would require 7.8 billion m^3 of water. an amount that could be consumed by 833 million people.

What is more important: the life of one person or of forty people?

At the same time, no solution has been found for creating special mechanisms to remove pharmacologically active substances from waste water to reduce the residual content of medicinal substances in ground and surface water. Pharmacologically active substances, even in trace amounts, can have a negative effect on all living organisms. Given the global development of the pharmaceutical market and medicine. why have scientists still not created proper technologies for hospital wastewater treatment and utilisation, or developed a system for reusing clean water?

No efficient way has been developed in the world for transplanting artificial organs in humans. The shortage of kidneys and other donor organs could be reduced by xenografts—organs and tissues derived from other species.

There is also a need to make growing kidneys and other organs from stem cells widely accessible and cheaper.

Humanity should think about this and make a choice: what is more important, extending the lives of 20 million sick and disabled people or helping more than 800 million healthy people, who are gradually getting sick and dying due to a lack of clean drinking water?

XIII Implementing the **ECOGOODLINE** new global logistics system of cargo transportation.

In all countries today, the transportation system is represented by various main types: water, sea, air, rail and road. The infrastructures of Japan, the United States and the European Union are particularly developed. They account for up to 85% of global cargo turnover. In terms of cargo transportation volumes, road transportation is the leader (40%), followed by railroad transportation (25%). The rest is accounted for by sea and inland waterways, while air transportation is rarely used due to its high cost.

THIS 40-FOLD INCREASE IN WATER CONSUMPTION REQUIRES ADDITIONAL MONITORING AND QUALITY CONTROL OF WASTE WATER DISPOSAL

Road freight transport in the European Union accounts for the majority of long-haul and distribution traffic. Freight transport by road accounts for more than 71.3% of all freight (as of 2017, road freight turnover in Europe amounted to 1.887.6 billion tons). International transportation by road is the most flexible. It allows cargo to be delivered everywhere there are roads. Cars are successfully combined with other modes of transportation.
In total, as of 2022, there were more than 389.174.000 light, medium and heavy-duty trucks worldwide.

The total CO_2 emission from them amounts to 1 776 **million tons per year.**

There are no exact statistics. but according to some estimates, large trucks and tractors (with a payload of more than 12 tons) account for 25% to 30% of the total number of all vehicles in this category. As of 2020, the total amount of these vehicles in the EU amounted to approximately **7 million**. Given that there has been no growth in EU sales since 2020, the number of vehicles for 2022 remains close to the 2020 values.

1) GENERAL STATISTICS USED FOR FURTHER CALCULATIONS:

✓ The average life of a truck until its full utilisation and recycling is 20 to 25 years.

As of 2022, the average useful age of a truck in the EU is 12.3 years.

According to Eurostat statistics, the newest truck fleet belongs to Germany: 83% of trucks in this country are no older than 5 years.

✓ Ninety-seven percent of all vehicle components are recycled.

✓ The average annual mileage of a truck is 100-120 thousand kilometres or 450 km/day.

✓ The average speed of a truck is 50 km/h (based on the norms in EU countries, where a driver can work for no more than 48 hours per week).

✓ The average consumption of diesel fuel by a truck is 45 litres per 100 km or about 50 tons of fuel per year per vehicle.

✓ The average labour costs for a truck driver who makes long-distance trips in the EU amount to €2.614 per month.

2) COST STRUCTURE OF TRUCK MAINTENANCE AND OPERATION COSTS ACROSS THE EU.

Annual maintenance costs (total EU data):

✓ **There are 7 million large trucks;**

✓ **CO_2 emission amounts to 32 million tons;**

✓ **Fuel consumption reaches 350 million tons:** *7 million (number of cars) * 50 tons (annual consumption per car) = 350 million tons.*

✓ **The cost of fuel is €595 billion:**
*1.7 euros (price per litre of diesel fuel) * 350 million tons = 595 billion euros*

✓ **Annual driver labour costs (excluding insurance payments) equal €219.5 billion:**
*€2.614 (an average driver salary) * 7 mln (number of cars) * 12 (months per year) = €219.5 billion.*

✓ **Additional truck maintenance costs:**

- Fixed costs (costs that do not depend on whether the car is used or not: insurance. parking, medical certificates, tachograph maintenance, etc.) **equal 21 billion euros:**

3.000 euros/year * 7 million (number of cars) = 21 billion euros.

- Regular (operating costs incurred while the car is in use: toll roads. tire wear (based on 12 wheels needed for 2 years or 240.000 km), brakes (based on 2 axles per year), oil,grease and filters, battery, glass, wiper rubbers, electric bulbs, etc.) equal **252 billion euros:**

3.000 euros/month * 12 (months per year) * 7 million (number of cars) = 252 billion euros.

- Variable (unforeseen expenses arising from force majeure situations: unscheduled repairs. traffic accidents, fines, cargo damage, etc.) **equal 42 billion euros:**

500 euros/month. (reserve fund) * 12 (months per year) * 7 million (number of cars) = 42 billion euros.

In total, if we stop using large trucks to carry out road transport in the EU alone, **1.13 trillion euros could be saved per year, while the environmental damage from CO_2 emissions alone would be reduced by 32 million tons per year.**

3) INSTALLING THE ECOGOODLINE TRANSPORTATION SYSTEM IN THE HAMBURG-BERLIN FREIGHT DIRECTION.

Germany's largest port (Hamburg) is the third largest in Europe in terms of cargo turnover (128.7 million tons in 2021).

Rail freight traffic reached a record high in 2021: the rail port of Hamburg handled 48.5 million tons. including 2.79 million TEU (20-foot standard containers). Hamburg is impressively expanding its position as the largest railroad port in the world. The port of Hamburg is one of the most important inland ports in Germany. Investments are also being made there and the waterway network is being expanded. In 2021, barge shipments totalled 128.500 TEUs.

In 2021, container traffic in Hamburg equalled more than 8.7 million TEUs (20-foot standard containers), of which imports amounted to 4.5 million TEUs.

Consequently, road transport accounts for **5.78 million TEUs**. which is about **90 million tons of total cargo.**

The port of Hamburg requires **2.89 million trips per year** by road:

(5.78 (number of TEUs) / 2 (2 trips by one truck. i.e., export and import of goods, given that trucks do not actually move without cargo).

Let us calculate the economic and environmental benefits of not using large trucks for transportation using the example of one route, **from Hamburg to Berlin.**

Initial data:

- the distance from Hamburg to Berlin by the shortest route is 282 km;
- The share of the total volume of cargo that arrives at the port of Hamburg and then goes to the German capital. Berlin is about 12%. i.e., about 15.4 million tons. of which 70% is transported by road –10.8 million tons.

Transporting this amount of cargo requires 540.000 large-tonnage vehicle trips over a distance of nearly 300 kilometres.

THUS. THE COST OF ANNUAL TRANSPORTATION OF CARGO ON THE HAMBURG-BERLIN ROUTE IS AS FOLLOWS:

✓ **CO_2 emissions per year reach 192.45 thousand tons:**

45 litres (fuel consumption per 100 km) *
2.640 (specific weight of CO_2 produced) / 100 = 1.188 kg/km.

1.188 (CO_2 emissions (kg) per 1 km) * 300 (distance from Hamburg to Berlin) *
540 thousand units = 192. 45 thousand tons.

Fuel consumption amounts to 72.900 tons:

540 thousand units. * 45 litres (fuel consumption per 100 km) * 3 (distance from Hamburg to Berlin is 300 km) = 72.900 tons.

✓ **The cost of the fuel is €123.93 million:**

1.7 euros (price per litre) * 72.900 tons = 123.93 million euros.

Drivers' wages and salaries (excluding insurance and other payments) **is €16.94 billion**:

2.614 euros (average driver's salary) * 540 thousand units * 12 months = 16.94 billion euros.

✓ **Additional truck maintenance costs:**

- Fixed costs (costs that do not depend on whether the car is used or not: insurance, parking, medical certificates, tachograph maintenance, etc.) **equal 1.62 billion euros:**

3.000 euros/year * 540.000 (number of cars) = 1.62 billion euros.

- Regular (operating costs incurred while the car is used: toll roads. tire wear (based on 12 wheels needed for 2 years or 240.000 km), brakes (based on 2 axles per year). oil. grease and filters, battery, glass, wiper rubbers, electric bulbs, etc.) **amount to 19.44 billion euros:**

3.000 euros/month * 12 (months per year) * 540 thousand units = 19.44 billion euros.

- Variable (unforeseen expenses arising from force majeure situations: unscheduled repairs, traffic accidents, fines, cargo damage, etc.) **equal 3.24 billion euros:**

500 euros/month (reserve fund) * 12 months * 540.000 units = 3.24 billion euros.

In total, more than **41.3 billion euros** must be spent (excluding the overhead costs of transportation companies, logistics terminals, etc.) just to move all the cargo destined for delivery from Hamburg to Berlin. These costs increase the cost of goods. and therefore the price for the end consumer rises by more than 20%.

4) WORLD ESTIMATES OF CONSTRUCTION COSTS OF DIFFERENT ROAD TYPES

✓ The cost of building a highway (2 lanes each way) ranges from €1.5 million per km (depending on topography, soils, etc.) and can exceed €5 million per km.

✓ The cost of railroad construction (single wheel track) is from 1.9 million euros per km depending on topography, soils, etc.

✓ The cost of building a cable car ranges from 10 million euros per 1 km.

✓ The cost of constructing underground roads is as follows:

- deep subway line: from 100 million euros per km;

- shallow metro line: from €36 million per km;

- underground car tunnels: from 36 million euros per km;

- tunnels for electric vehicles: from 5 million euros per km (Ilon Musk's Loop system is used for any kind of electrically-powered transport).

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So, my colleagues and I have begun elaborating an innovative project that has the potential to change the current situation, both environmentally and financially.

ECOGOODLINE logistics system is an alternative way to existing freight transportation.

The distance from Hamburg to Berlin as the crow flies is 257 kilometres. If we try to apply some kind of conveyor or transporter (similar to the movement of luggage at airports or bulk materials at quarries and production facilities), we will not obtain a decent result. The problem is the low speed and unsuitability for heavy loads. Given the distance, the transportation scheme will consist of a large number of components. and the more there are, the greater the chance of instability and damage to the load. As a result, there could be problems with transportation, service, and speed of delivery.

Alternatively, small above-ground or shallow "tunnels" mainly protected from precipitation can be used to move large volumes of cargo at high speed with minimal dimensions.

One of the ways to implement this kind of transport highway (arteries for cargo movement without any vehicles) is a half-tunnel with a 3-sided concrete base, which is embedded in the ground for greater stability and reliability at a depth of no more than 1 metre.

It will not cost much to build this kind of half-tunnel: there is no need for complex earthworks, and the concrete structures can be designed for any loads with no joints which affect its operation (specified thickness and strength grade of concrete, reinforcement, addition of plasticizers to protect against moisture, etc.). Such a highway can easily be integrated into any transportation system. If necessary, it can also be situated completely underground (in case of intersection with existing roads and railroads, utility pipelines. underground utilities, etc.).

This kind of half-tunnel can be protected from above (its open part) in different ways, the simplest of which is a canopy that can be quickly erected on a metal frame covered with polycarbonate or some other coating if desired.

For easy access, open sections can be created every 500-1.000 metres, which are also necessary for the elimination of possible accidents and routine maintenance.

The biggest advantages of such a highway are the lack of traffic and high speed. To ensure the load “rests”, the system can be equipped with 2-3 guide “rails”, which will ensure that the load is securely fastened and free from rocking and vibration.

The dimensions of such a highway can be designed for any size of cargo, up to the movement of 20-foot containers, depending on the cargo flow.

The half-tunnel can be equipped with special carts (open for securing containers and closed. which are essentially a compartment for loading cargo). An electric motor with a roller on one of three guide “rails” can be used as the driving force or a cable winch system may be provided. where each cart is attached to a cable travelling at high speed.

Its main advantages are simplicity, low maintenance costs. low power consumption, the necessary dimensions (up to 3 meters high and up to 3 meters wide) and high transport speeds.

If all the money saved on freight transportation from Hamburg to Berlin (41.3 billion euros) is spent on building such tunnels (for example, at a cost of 5 million euros per 1 km), we will acquire 8.26 thousand km of half-tunnels to move freight. The costs of their construction will be recouped many times over in 2-3 years of operation, and the environmental damage from their construction will be ten times less than from cars (road construction, exhausts, creation and utilization of cars).

If we apply this principle in the EU alone and abandon the use of large trucks, we can build a developed network of tunnels with speeds of up to 200-250 km/h and a total length of more than 445.8 thousand km.

When such a project is further scaled up, the construction price will be reduced manifold and the cost of freight transportation will be reduced.

The main advantages of the new logistic transportation system are as follows:

- reduced hydrocarbon consumption;
- minimal maintenance costs;
- minimal power consumption;
- high speed of cargo movement;
- environmental friendliness (reduction of CO2 emissions);
- road safety by reducing the number of accidents caused by trucks (in this case, the accident rate in different countries ranges from 8% to 12%);
- reduced road repair costs (one truck affects the pavement as much as 20 thousand cars).

These are just some of the positive aspects of the new transportation system, which will fundamentally change the existing freight transportation market in the world.

MEASURES TO FORM THE NEW CIVILIZATIONAL CONSCIOUSNESS OF *ECO SAPIENS*

World Environmental Debt Day was introduced recently. This date is calculated by an international organisation called Global Footprint Network (GNF). To put it simply, environmental debt is the overconsumption of renewable biological resources in one year. Environmental debt day comes when humanity has used up all the renewable resources that the planet can reproduce in a year without a detrimental effect. An environmental deficit occurs when the environmental footprint of a population exceeds the biocapacity of the area available to that population. The Environmental Footprint measures the effect of *Homo Consúmens* overconsumption on the biosphere. Given current management practices, biocapacity is the area of productive land available for resource production or waste carbon dioxide sequestration. Continued climate change, freshwater depletion, energy shortages, soil erosion and loss of biodiversity are contributing to the planet's declining biocapacity.

Environmental Debt Day was first introduced on 29 December 1970. Since then. World Environmental Debt Day has changed with each successive year.

CHRONOLOGY OF THE DATE CHANGE
OF WORLD ENVIRONMENTAL DEBT DAY BETWEEN 1970 AND 2022

1970	29 December	2006	19 August
1974	27 November	2010	8 August
1978	7 November	2011	4 August
1980	4 November	2012	4 August
1982	15 November	2013	3 August
1986	30 October	2014	5 August
1987	23 October	2015	6 August
1990	11 October	2016	5 August
1994	10 October	2017	3 August
1995	5 October	2018	1 August
1998	29 September	2019	29 July
2000	23 September	2020	22 August (since the pandemic breakout)
2002	19 September	2021	29 July
2005	26 August	2022	28 July

Given the chronology of dates, it is clear that the main changes in Environmental Debt Day fall between 1980 and 2010 when the date of the environmental debt shifted by 95 days. It has shifted by a total of 155 days since the time the environmental debt began being documented.

The shift in World Environmental Debt Day is moving closer to the beginning of the year under report. This is due not only to humanity's excessive consumption of renewable resources, but also to the constant depletion of these resources on the planet. Thus, the shift in World Ecological Debt Day is accelerating.

For decades, the change in the reproductive capacity of the planet's biological resources was as follows:

1980–1990: the planet's reproduction capacity decreased by **40%**;

1990–2000: it decreased by **23%**;

2000–2010: by **15%**; 2010–2020: by **15%**; 2020–2023: by **17%**.

Between 2000 and 2020, the planet's reproduction capacity remained at the same level, but in the last three years it has reached 17%, indicating an increase in human consumption. By the end of the current decade, the planet's resource reproduction capacity will have decreased by 51%. This means that by 2030 Environmental Debt Day will fall on 11 May (the 131st day of the year) and humankind will live in debt for 234 days, while in 2040. Environmental Debt Day will fall at the very beginning of the year, on 3 January. Therefore, by 2040, humanity will have consumed all the annual biological resources necessary for its existence in 3 days, and the planet, due to the colossal depletion of these resources in previous years, will no longer be able to reproduce them. To feed a human population of over 10 billion people in 2040, an additional 121 planets with the same potential as Earth (365 days per year / 3 (the number of days for which humanity consumes the annual requirement) would be needed.

In 2022, Environmental Debt Day fell on 28 July, which means that for 157 days, the Earth's population lived on borrowed time from a planet that was only able to support us without detriment to itself for 208 days. To feed itself, humanity is annually borrowing more and more of the planet's regenerative potential. With the current consumption level required to support 7.92 billion people and the planet's potential to reproduce renewable resources, the Earth today can only provide resources for 4.5 billion people: (208 days * 7.92 billion people / 365 days).

According to Coherent Market Insights, a global analytics and consulting organisation, the global consumer goods and retail market was valued at $18.18 trillion in 2021.

Consumer goods are goods intended for sale to the population for personal, family and household use (direct use of them to meet material and cultural needs). The acquisition of these goods does not generally involve commercial use. *Homo Sapiens* today has been taken over by "wanton consumerism", i.e., promiscuous consumerism, and "shoppinglust", a passion for shopping, lustful shopping, turning it into *Homo Consúmens.*

The main reason for the global warming trend is anthropogenic human activity, specifically the carbon footprint created by industry. The official opponents argue that CO_2 and climate change do not cause an increase in temperature and claim that climate change is an environmental myth. However. temperatures were not recorded a thousand, or even five or three hundred years ago, so humankind does not have this historical scientific data. Today, another hypothesis is put forward: the geodynamic hypothesis, based on natural factors of climate warming. A possible seismogenic trigger mechanism helps explain the activation of glacier destruction, methane emission and climate warming in the Arctic and Antarctic. If we recognise the important role of the natural factor, it is logical to reconsider economic and political decisions that envisage a rather rapid reduction of some industries. A world foundation uniting all countries and peoples must urgently be created to study the natural factors of climate change on the planet and make global and constructive decisions to save humanity. Significant investments are needed in research on the Earth's climate system and the development of reliable models of atmosphere-ocean-ice coupling. It will be impossible to save humanity without advances in science and technology able to reduce carbon emissions and bring the climate to a state where ice masses melt very slowly, and it will take several decades to bring sea level change under control. Funding could be received from contributions from the global FMCG market.

Even 1% would accumulate more than $181 billion per year.

Humanity can no longer advance by exploiting the planet's resources, degrading the environment and destroying the flora and fauna. *Homo Sapiens* was originally destined to have intellectual potential capable of ensuring its own regular improvement. spiritual enrichment and gradual evolution. However, people do not seem to have any interest in achieving this advancement; they are persistently held back by the idea of their own personal enrichment based on material gain. At the same time. self-improvement in today's world has become another commodity sold by various coaches and self-development books that use devious ways to manipulate the human psyche and make people hostage to marketers.

Dear intellectuals. ask yourselves if you believe this book will be read and understood by 10% of the world's population or even 5% of the world's population? I highly doubt it. Therefore, the sooner we gather to discuss the topics covered in this book, the more opportunity we will have to find ways and tools to warn the majority of the global population about the looming threat and encourage as many people as possible to participate in creating a new environmental civilization.

As of 2018. 27 June has been declared World Microbiome Day. The Irish Microbiome Association has spearheaded the initiative to proclaim the importance of *the Microbiome* for all of humanity. **The *Microbiome* is a part of the *Worldbiome/Planetarybiome* or** *Cosmicus Quanticus Cerebrum*—a community of microorganisms that form ecosystems, from the simplest, unicellular, to the most physiologically and morphologically complex mammals, united on the principle of coexistence in the world they have created. *Homo Sapiens* is a product of *the Microbiome*, which is physiologically the most complex organism created and capable of thinking like all other living organisms on the planet and in the omniplanetary space. This day should be the most important Day of Humanity.

It also makes sense to introduce a "Human Imperfection and Stupidity Day" and celebrate it in the fall. It will be a grievous and sad day for *Homo Sapiens*.

In the spring, a holiday will be celebrated called "Human Transformation Day. Creation of a New Environmental Civilization", dedicated to the formation of a new world and a new human who will achieve the union of two opposite aspects of being: spiritual and material, defined by *Cosmicus Quanticus Cerebrum.*

It is very natural for humans to keep pets, dogs and cats, and it is even a joy to take care of them. We already have over 8 billion *Homo Sapiens* on our planet, and about 2 billion dogs and cats in the countries where they are registered. How many countries do not keep records of pets? Dozens! At the same time. the total amount of degraded land worldwide (see section 1.6. Resource Potential of the Planet) is already more than 3 billion hectares or 22.26% of the total land area of the Earth. We owe this to intensive farming with extensive use of various chemical compounds. We are facing a dearth of arable land. In two to three decades, our planet will be unable to deal with this increase in population. pets and land desertification. There will be a worldwide collapse.

To ignore these destructive processes taking place on our planet is to confess to one's own universal failure and ultimate loss of reason.

Of course, every living creature should be treated humanely, especially when it comes to animals that serve humans, such as shepherd dogs. guard dogs, hunting dogs, guide dogs and others. However, animals cannot be used to satisfy our own base feelings: the desire to subjugate. dominate. replace a family, a child, the need to have a living toy to care for or to enjoy other hedonistic emotions. That being said, most of a pet owner's personal time is spent on their pet. They have no desire or intellectual will to devote their free time to environmental problems, acquiring knowledge, improving the species, and, what is more, participating in the movement to prevent a planetary environmental catastrophe. In my opinion, in the new civilization, which sets itself the enormous scientific task of "perfecting our product into a completely new species of *Homo Cosmicus*", people who are products of *the Microbiome* with one or more dogs and devote themselves only to animal companionship, in the current day and age. at this catastrophic time in the history of the planet, are completely useless. Are humans really destined to socialise only with animals? I am convinced that their main purpose is to improve and perfect their species.

At the prompting of *the Microbiome*. our ancestors named our species *Homo Sapiens,* that is, a species capable of thinking, evolving, improving itself, its product, and other biodiversity on Earth. How should we, *Homo Sapiens*, who have a rational mind, treat other products that lack any ability for rational thinking? How should we treat these products, who are enemies of the environment, and, therefore, enemies of the planet, our enemies, who are destroying the last remaining crumbs of the Earth's resources, i.e., our own Home?

The modern era is characterised by an extraordinary rate of development and population growth. So at this time, when our entire species is threatened with destruction, it is criminal, entirely unacceptable, to devote our existence to pets, TV, religion and consumer debauchery! After all. the survival of the planet is very much at stake! It is easy to find scientific, intellectual and journalistic books on social networks. in libraries or book markets that point out the current resource oppression of our planet and the high risks of its demise in the coming decades. I have already noted above but I will repeat it again: according to the WHO, 25.3% of the world's population – that is, over 2 billion people – have been officially diagnosed as suffering from some "mental disorder or mental retardation". And these are only the official statistics for people who are registered. How many more are unregistered? Furthermore, according to the WHO, the number of individuals with this diagnosis has increased by 50% in the last two decades.

Nature and our creator – *the Microbiome* – are not uniting us, they are dividing us. Therefore, I propose an immediate planetary discussion on the following topic: what is to be done with products diagnosed with mental illness and mental retardation? What should be done with those who devote their lives to animal companionship, or those who are only interested in mindless consumption, or morons who never learned the multiplication table, or those who believe blindly in religious dogma? Where should they all live in the upcoming dangerous time of the planet's destruction? They should not have the right to live next to products that are creating the new civilization of *Homo Cosmicus*. Therefore, there is an urgent need to develop a humanitarian concept of resettlement of the above-mentioned public that sustains their former way of life, but with limited consumption. Resettlement will affect humans living in metropolitan areas and large cities while it will not affect those who live in the countryside and are engaged in farming and sustainable agriculture and are not as corrupted by consumption. I do not have a specific proposal. so I recommend. I am appealing to all of you, people aware of the looming planetary catastrophe, to gather together and discuss the main problems challenging us today. One of them relates to resettlement: Canada, Indonesia, Russia, Kazakhstan and Brazil have a lot of underpopulated land. Let us resettle these people in these territories and introduce a medieval economy! This way, they will have no opportunity to achieve personal wealth, devote themselves to consumer debauchery or embellish their personalities with brand name clothing, accessories, jewellery and luxury homes. After all, mental impotence. living with a transparent skull, is the direct road to this lifestyle.

This is an established fact! Reformatting our species into *Homo Cosmicus* will be a valuable, formative time for our new civilization, our planet and our entire species. The new products will not be divided by nationality, but will call themselves *Homo Cosmicus*. *Cosmicus Quanticus Cerebrum* has given us the opportunity to achieve self-improvement, not engage in perverted consumption. And living in a consumer society is a slow but progressive process of self-elimination of *Homo Consúmens* (take a look at the things that interest our contemporaries in Pictures 2 and 3).

PICTURE 2. Women's shoes manufactured by a renowned 21st century *Homo Consúmens* brand, priced 1.800 euros.

PICTURE 3. Celebration of Social Freedom.
Hamburg, July 2023.

This is one example of the idiotic, perverted lust of *Homo Consúmens*.

Global disarmament is another problem facing humanity. The most important civilizational call for world and total disarmament emerged decades ago, but with such a faint voice that it is virtually forgotten today. There should be no wars or warfare industry: we must start a planetary discussion of this major issue immediately.

Beginning in 2024. a new school and university subject called "The Planet's Resources: Ways to Maintain the Life of Future Generations" should be introduced around the world to educate the young generation of *Homo Cosmicus*. **To control and manage the planet's resources, a new profession of resource scientist should be introduced! Civilization and the environment need resource science!**

Scientists, politicians and intellectuals from all over the world should take part in the discussion of these complex social problems. We, thinkers, probably make up more than 1.5% of the global population. If we do not start saving the planet right now, everything will perish in the next few decades.

Intellectuals, please, think over this issue and suggest your ideas, pose your questions and make recommendations to save our common Home. I believe that this is an absolute necessity and so I am organising discussions of this new, ambitious, but vital topic on popular world forums worldwide under the title: "Stop! We will not allow destruction of our planet!". Germany, England, Spain and the United States will be the first countries where concerned intellectuals who are not indifferent to the fate of our planet will unite on Internet platforms. Our common Home is not a territory for consumer debauchery, seduction or political and economic experiments. Our only responsibility in everyone's life is to improve our species!

Later, a global unified forum will be created based on these associations. where each participant. depending on their contribution and activity, will be able to become a personal supervisor and see the results of their work to restore the environment in a particular region of the planet.

To begin with, we must decide whether we. intellectuals – *Homo Cosmicus* – separate from the majority of *Homo Consúmens* or should we relocate them? It would be more economically advantageous to organise our own resettlement; however, this will be a topic of our future discussion.

DISCUSSIONS MUST START IMMEDIATELY, FOR TOMORROW IT MAY BE TOO LATE.

AUTHOR'S NOTE

Dear ladies and gentlemen, distinguished colleagues and friends,

After apprehending the reflections, analyses and studies conducted and presented in this book, I would like to draw a logical and categorical conclusion.

The following people and social groups are to blame for today's false and pernicious civilization:

- politicians in every country of the world;
- religious figures and followers of all confessions, apart from ethnic faiths such as Judaism, Confucianism, Sikhism and others;
- representatives of the judicial and law enforcement systems of many countries, as well as tax officials. Courts do not adhere to the rules of the supreme body of justice, and court cases are treated as business projects. Judges, prosecutors, tax collectors and law enforcement officers are dependent on politicians, bureaucrats, income and consumption and do not adhere to the letter of the law and justice;
- those claiming to be enlighteners in all spheres of scientific and social activity, including all media centres, mass media organisations and other types of informational planetary influences on Homo Sapiens. They are motivated only by money: it forms a commercially-focused mindset bent on acquiring super-profits in every sphere of human life and encouraging a widespread bureaucratic mentality;
- founders, developers and owners of worldwide information and entertainment resources and Internet services.

In this book, I set forth my plan to save the planet and its inhabitants based on reformatting *Homo Sapiens* into a new kind of human being: *Homo Cosmicus*. Consumption needs to be brought under the strict control of a new environmental and political doctrine, the digital economy, which requires immediate attention.

The planet can only be saved if all intellectuals of the world, which is no more than 1.5% of the planet's total population (about 120 million people), take an active stance in reformatting *Homo Consúmens* into a new species: *Homo Cosmicus*.

I propose gathering for discussions at the following venues: Hamburg, Germany in September-October 2024; Tokyo, Japan in April 2025; Chicago, USA in October 2025; and Tbilisi, Georgia in March 2026. These meetings will be funded from our own resources.

The first meeting of intellectuals in Hamburg will decide on how to organise further interaction, as well as discuss management issues and the funding procedure. If we agree to register a supervisory body called The World Foundation for a Perfect Future, or The World Foundation for the Creation of a Perfect Civilization, or The Foundation of Supporters of the Universal Quantum Mind (you can offer your own suggestions for the name), we will elect a collegial managerial body and board of trustees and appoint a president and the members of a control and auditing department. After election of the managerial body, the appointed persons will have the power to act on behalf of the Foundation, represent its interests and add new members. All further meetings of these intellectuals to develop strategies and measures to save the planet will be carried out under the aegis of the established Foundation.

Everyone interested is welcome to contact the author in any language at the following address: apotemkin@t-online.de

In order spread the word, we must create information channels in social networks and on other popular Internet platforms, where all those who are concerned about the future of our planet can gather. Then we will meet within the framework of a worldwide forum where each participant, depending on his/her scientific contribution and activity, can become a personal supervisor and see the results of his/her efforts aimed at reformatting *Homo Consúmens* into *Homo Cosmicus*.

In this book I have put forward more than 70 proposals aimed at improving the environmental situation on the planet and stabilising the global demographic situation. Let us see how *Homo Sapien*s responds to these proposals. I am not too optimistic, since almost all members of today's anti-civilization are looking only for success – this is the agenda of the consumer world – be it in politics, art, business, service careers, science or other spheres. They have no time or desire to worry about the future of the planet. A society traditionally dominated by such values is doomed to failure. This book predicts the time of its demise.

The values that currently abound in education, sports, pop music, cinema and mainstream literature of the second half of the 20th and early 21st centuries, namely consumer pseudo-values, have cultivated in people a desire for success to the detriment of enhancing their own intelligence. Everything is aimed at building a successful personal career and developing consumer attributes. This has inculcated in people a desire for wealth and praise, drawing undue attention to themselves and amplifying their own image … So, such events organised by *Homo Consúmen*s as world sports championships, Olympic Games, Miss Europe and Miss World contests, all manner of entertainment events, festivals, etc., must be prohibited.

Today's anti-civilization has deepened my conviction that **beginning in 2031, the presidents of all the countries of the world must be replaced by artificial intelligence**, since AI is not tempted by consumption, is environmentally pragmatic, has no personal ambitions, strong emotions or close friends and is deeply convinced of the need to reformat contemporary consumers and the huge mass of ignorant people into *Homo Cosmicus*.

I am not sufficiently well-versed in IT or complex programming languages to supervise this great and necessary **Only Artificial Intelligence for President** project. However, my competent assistants and I are ready to take the most active part in implementing it. Let us come together and appoint a leader to carry out this necessary global digital programme, as well as team members committed to this idea. Otherwise, we will be unable to save the planet and reformat ourselves into *Homo Cosmicus*.

Cosmicus Quanticus Cerebrum – the Universal Quantum Mind – will assist us in this endeavour. If we are unable to create this programme, everything and everyone on earth will perish! Let's get started! Let's have hope! Both the planet and *Homo Cosmicus* have great prospects! We, the products of *Cosmicus Quanticus Cerebrum*, ask for your assistance in reformatting ourselves into *Homo Cosmicus*!

We are proposing a programme we will call **AI for the Country's President and Later Global President of the Entire Planet**. But it should not be the only one. There should be at least three programmes of this kind, which will make them competitive. Not everyone is eligible to vote in this presidential election, only those who have passed the HIC test, an indicator of Higher Intelligence Consciousness. *Homo Sapiens* with a minimum HIC of 80 points are not eligible to participate and vote in this programme. Examples of elections in many eastern countries prove that such restrictions are fair. If you are not intelligent, you have no right to vote! We hasten to add, however, that the low level of *Homo Consúmens'* mental development is not a vice, but a genetic disorder found in some of the *Microbiome's* products and the result of the emotional influence imposed on humanity by today's consumer worldview. If *Homo Consúmens* is unable to understand that it is destroying the planet, it must be treated as disabled and afforded all due respect.

Beginning in 2031, countries around the world must unite according to the principles described in Chapter 4 on page 275.

We should impose strict sanctions on those countries that refuse to unify and implement the digital economy principles.

I suggest that these topics be discussed in detail at our future meetings.

By 2031, the entire judicial system created by *Homo Consúmens* in all countries of the world must be replaced with the programme called "AI for Judges, Prosecutors and Tax Officers". Today's world has gone mad! *Homo Consúmens* has discredited itself in many spheres of social life. It must be controlled by smart programmes and algorithms created with the help of *Cosmicus Quanticus Cerebrum*.

By 2035, we must establish and expand the production and sale of AI with a HIC level of up to 80-110 points at affordable prices for the limited mind of *Homo Consúmen*s. And for those *Homo Sapiens* who wish to raise the level of their intelligence, AI programmes must be introduced into biological consciousness as follows: an increase to 79 points for those with an HIC below 50, with a respective increase to 110 points for those with an HIC of 50 to 80. Higher consciousness will fund the implementation of this programme.

In the new mindful civilization, everyone must be deeply engaged in the programme of reformatting themselves and everyone around them into *Homo Cosmicus.* This civilization will also be known for its love of thought, the ecology, the health of the planet, chemical formulas and celestial mechanics, as well as concern for its cohabitants.

By 2053, a unified country of all Earthlings – *Homo Cosmicus* – with AI as its single president elected by an all-planetary vote will have been created. There are three Smart Presidential Programmes on the ballot.

Let's get started! *Cosmicus Quanticus Cerebrum (*the Universal Quantum Mind) expects us to participate wholeheartedly in improving our own product – *Homo Sapiens* – and, since this will save the planet, it will gladly upgrade it up to *Homo Consúmens*.

I am looking forward to your participation in this supreme programme and hope that all the participants will devote themselves wholeheartedly to the most noble cause of the reformatting humanity!

Please do not hesitate to contact me. Here's to the success to our future programmes!

P.S. **Everyone should seek communication with their *Microbiome,* which will allow you to understand the importance of human reformatting.**

P.P.S **My inherent German impartiality greatly assisted me in carrying out this work. However, the intellectual detachment and intense work required in elaborating the Reformatting Our Species programme could not distract me from the gruesome European war waged by *Homo Consúmens*. Social media is full of just and shocking criticism of its aggressive initiators. I am attaching here an article written in the traditions of national restraint that I posted in September 2022 on my German Facebook page. It is devoid of any chronicling of the hostilities, military-political assessments of the violations of every humanitarian norm and the barbaric actions of the occupiers, all of which is absolutely unacceptable in the new civilization (much has been written about it in this book):**

13/09/23, Hamburg

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