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Which Factors Influence the Life of our Earth?

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The Life of the Earth

The life of our Earth can be separated into two periods. The first was the biological lifeless one and the second can be characterized by the presence of biological life. In the first period its matter and energy were appeared about 4,567 milliard years ago - in connection with a black hole event in accordance with the laws of conservation of mass and energy - and they were determined from their beginning by the effect of the outside circumstances and energy of the total Universe. That period of our Globe was an intensive atomic exothermic process. This was the time when atoms were formed. The outside energies which came from the Sun as well as from the cosmos had unknown effect on the Earth's own energetic and material processes. Since that atomic period the radiated energy of the Earth has decreased due to the subsidence of the internal processes, and intensive energy eruptions could only occur in the form of volcanic activity. This condition could last until the solidification of the Earth's surface and the appearance of the atmosphere. We do not know when and how the formation of the atmosphere happened. It is supposed that the circumstance of the Earth was reductive and the atmosphere consisted of methane, N_2, ammonia, noble gases, H_2. The CO_2 and CO mean a big question-mark because of the appearance of oxygen was unknown and also which of the three compounds - CO_2, CO as well as H_2O – was the first? Water vapor became from H and O and that process had to be exothermic. Appearance of water vapor was a very important event because circulation of water could start which is one of the main thermoregulator of the World. The water appeared only when the temperature was under 100 °C. In consequence of the decreasing temperature of the Earth importance of the energy coming from the Sun and cosmos has grown. At present approximately 174,000 TW of energy reaches the Earth's upper atmosphere. About 30% of it reflected. The average power received per square meter at the top of the atmosphere is about 1353 W. About 23% of the energy is absorbed by the atmosphere, and 47-48% of that reaches and warms the Earth's surface. That was the basic energetic situation and the arriving energy before biological life could only exert its effect on the Earth's atmosphere and surface through physicochemical means in a form corresponding to the greenhouse gases envelop of that time. Greenhouse gases keep our planet livable. Without them, Earth’s surface temperature would be colder. This period was the chemical development, during which the conditions for the appearance of the biological life were formed.

Appearance of Biological Life

The second period of the Earth’s life started with the appearance of biological life. Life of a living being is a biological phenomenon which has first appeared about some 100 million years after the birth of the Earth supposedly in reductive environment. It was most likely formed in the primeval ocean, in a volcanically active environment which could help the biogenesis. It is very likely that the origin of the life was an one-time phenomenon which is nothing other than a continuous and well-regulated energy (electron/ion) migration/the metabolism existing in the living being/in a cell at different level and complexity which having the ability of multiplication (from the primordial microorganism and its descendants till the different living individuals of today), too. These primordial bacteria were, for example, chemo-litho-autotrophs and anaerobes, using carbon-containing compounds for example CO_2 to form their own organic building stones (- among those which direct their genetical processes, too -,) and methane, or depending on their species, they oxidized sulfur. The electron donor was the H. The metabolism of these microorganisms resulted in a new energetic situation on the Globe. The energy which originated from the Sun and/or cosmos was mediated by an inorganic lifeless compound/by the donor into a life candidate unite which was ready to accept it for life. After the energy acceptance the unite metabolism stared and could produce own organic compounds containing energy as well as could multiplicate. Since that point of time utilization of “C” or atmospheric CO_2 started the bio-energy and its storage appeared, as well as the transformation of the environment, and its loading with bio-heat and bio-products began. The remains of the dead organisms became organic components of soil as well as their substances were transformed into the energy sources of today. In the same time the Earth has radiated its own remainder energy, which according to geophysicists, currently originates from the Earth's inner core, the Sun's energy continued to arrive in the form of photons ($e=h \cdot f$) and the cosmic radiation is also reaching the Earth. It is generally believed that, apart from certain fluctuations, the amount of energy arriving at the Earth from the Sun as well as from cosmos can be considered to be the same. That was the basic energetic situation after appearance of the life.

Importance of Photosynthesis

The next stage of evolution was the appearance of photosynthesizing microorganisms which were oxygen non producer bacteria (they appeared about 3,5-3,8 milliard years ago) and O_2 producer ones (they are present 2,4-2,7 milliard years ago), as well as later the plants and trees also with aerobic metabolism – it is thought the trees appeared only 400 million years ago. This state resulted in a new situation, because solar and cosmic energies, which until the photosynthesis acted on biological way only through the chemo-litho-autotrophic and anaerobic, primordial bacteria using carbon-containing compounds for example CO_2 - now they were utilized by aerobic metabolism. The aerobic organisms produced not only their own organic materials, i.e., storing energy but also free O, too. which has remained in the atmosphere in growing concentration. With this event the aerobe metabolism has started. Among the new aerobe environmental circumstance, the number and kinds of species of living beings increased very rapidly. The essence of this process can be described with the following equation: $6\ H_2O + 6\ CO_2 + \text{photon} = C_6H_{12}O_6 + 6\ O_2$. 1 mol of sugar contains 2,872 KJ of energy. The remains of the dead organisms are not only the organic sources of soil but also the fossil energy of today, too.

In the course of continuous evolution, higher-order cold-blooded organisms appeared more than 300 million years ago, and then warm-blooded living creatures appeared also 230-170 (233?) million years ago. As a result of these changes the load on the environment also increased due to the metabolic products of large animals, which in the case of warm-blooded animals was further increased by their thermal effect, too. The proliferation of herbivorous animals also created favourable conditions for the growth of carnivores. After a long biological evolution 50 million years ago the earliest undisputed anthropoid organisms, such as those of the genus *Eosimias* lived in the late Middle Eocene in Asia China. Later these creatures appeared in East Africa where the first pair of prehumans lived about 30 million years ago and from where approx. 50,000 years ago, they began to spread throughout the world and the anthropoid period of our Earth began.

The Anthropoid Life Period of the Earth

Humans can be distinguished from animals by some characteristic qualities. These are: their familiarity with ***fire*** and conscious use of ***fuels***, (this means the appearance of a new source of increasingly effective energy and CO_2 as well as ash production – see Table 1. - , by their sexual life independent from the estrus serving only pleasure and its aberrations, by the cultivation of plants which started about 8-10 thousand years ago, by the domestication and keeping of animals in the same time, by the ability to read and write, by conscious care of environment, by the production of consumer goods, by the accumulation of wealth, by the appearance of demands regarding the way of life, by the use of means of transport, by the **utilization of *natural energies* - water, wind, sun** - and nowadays by the use of ***thermonuclear, solar and H energy*** - which represent the newest group of energy – see Figure 1. and 2. All before mentioned energies which became effective as a result of human activity have an increasing cumulative heat effect not only by their ones but also that of the sun as well cosmos. Their common effect has determined the condition of the Earth, that is its climate.

Table 1: Data to the Circlation of Substances and Energy on the World

Specification	Years Mass and Average Heat Value of Fuels; Quantity of CO_2 Liberated from them					
	1860	1935+37	1958	1980	2000+05	2009+14	2017 2024
Oil × 10^6t	1	279,5	809,8	3059	3590	4117	4365 5272
40,5 MJ/kg	$4{,}05\times10^{10}$	$1{,}13\times10^{13}$	$3{,}27\times10^{13}$	$1{,}23\times10^{14}$	$1{,}45\times10^{14}$	$1{,}66\times10^{14}$	
CO_2 m^3	$3{,}17\times10^{9}$	$8{,}86\times10^{11}$	$2{,}56\times10^{12}$	$9{,}69\times10^{12}$	$1{,}13\times10^{13}$	$1{,}3\times10^{13}$	
Coal × 10^6t	136	1280	1762	2805	5878	7823	7549 9150
20,35 MJ/kg	$2{,}76\times10^{12}$	$2{,}6\times10^{13}$	$3{,}58\times10^{13}$	$5{,}7\times10^{13}$	$1{,}18\times10^{14}$	$1{,}59\times10^{14}$	
CO_2 m^3	$3{,}12\times10^{11}$	$2{,}92\times10^{12}$	$4{,}05\times10^{12}$	$6{,}45\times10^{12}$	$1{,}37\times10^{13}$	$1{,}72\times10^{13}$	
Gas × 10^9m^3	-	71	400	1531	2778	3479	3768 4124
37 MJ/kg	-	$2{,}62\times10^{12}$	$1{,}48\times10^{13}$	$5{,}66\times10^{13}$	$1{,}02\times10^{14}$	$1{,}28\times10^{14}$	
CO_2 m^3	-	$1{,}37\times10^{11}$	$7{,}72\times10^{11}$	$2{,}95\times10^{12}$	$5{,}36\times10^{12}$	$6{,}72\times10^{12}$	
All together							
MJ/kg	$2{,}8\times10^{12}$	$3{,}99\times10^{13}$	$8{,}33\times10^{13}$	$1{,}8\times10^{14}$	$3{,}66\times10^{14}$	$4{,}53\times10^{14}$	
CO_2 m^3	$3{,}15\times10^{11}$	$3{,}94\times10^{12}$	$7{,}38\times10^{12}$	$1{,}9\times10^{13}$	$3{,}01\times10^{13}$	$3{,}69\times10^{13}$	

In addition to the first table we have to mention the quantity of fuelwood and charcoal also which were summarised by FAO for about 1.9 billion m^3 (1330 billion t) in 2020, which will rise to between 2.1 and 2.7 billion m^3 (1470 and 1890 billion t) by 2050. 1 kg fuelwood produces roughly 4.4 to 5 kWh of energy. In the same time depending heavily on the species of wood and its moisture content about 1,65 and 1.85 kg of CO_2 is produced.

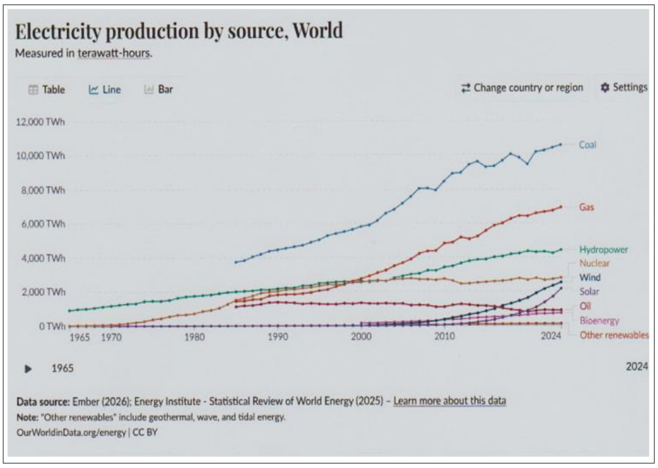

Figure 1: Electricity Production on the World 1965-2024

On the basis of the data of 2024 year of Energy Institute the global primary energy consumption rose by 2% to a new record of 592 Exajoules (EJ). Energy-related CO_2 emissions grew by 1%, exceeding 40.8 Gigatonnes—marking a record high for the fourth consecutive year. Electricity demand grew by 4%, outpacing overall energy demand growth. Fossil fuels accounted for approximately 86.6% of global energy consumption, a slight decrease from 87% the previous year.

Global daily energy demand can be divided into two parts. One is the external energy consumption required by technological life of the society. The second is the biological energy needed for human and farm animal life together with that which is necessary for all wild createres. In 2024–2025 the total primary energy consumption of the world was at record level. Its value was roughly 1.7 billion gigajoules (GJ), or 465 terawatt-hours (TWh) per day. Globally the average person used about 55–57 kWh of primary energy daily but this value was extremely unequal (between 21-202 kWh) dependig on the state of development of the given country. The global energy demand grew by 2.2% in 2024.

The biological energy demand in case of an average adult is about 2,000 kcal (kilocalories) per day, which is roughly equivalent to 2.3 kWh. In case of total population which is more than 8 billion people has required only 18.4 TWh energy per day but the life is more than a direct energetic problem. As to the farm animals some data can be seen in Table 4 and 5.

Although unpleasat environmental events connected with human beings have already begun at least 50 thousand years ago and they have accelerated since 1769 (– the industrial revolution started then -) the first alarming visible real picture appeared in Africa during the fifties when the snow of Kilimandjaro desappeared. At present warming and melting are general on the total World. We shall demonstrate some of the important changings happened during last time in the text of this article as well as on its figures and tables.

Number of People

Since the appearance of man, the number of mankind, even if it has shown significant fluctuations in certain periods, in the end, is constantly increasing. This is confirmed by the following data. 1850: 1.17; 1937: 2.1; 1950: 2.5; 1980: 4.4. billion. The rate of reproduction is currently accelerating. This can be determined from the following numbers: While on 20th April 2022 the Earth's inhabitants were 7,944,521,000, on 2nd April in 2023 there were already 7,993,210,376, i.e., there were 48,686,376 more people. And now, on 4th April 2026, we were 8,285,200,295 because our number has increased by one in less than 1 second. In the beginning, people's place of residence was less permanent (gathering, fishing, hunting, then grazing period). With the increase in their number and needs, as well as with the change in their way of life (the spread of farming and domestic animal husbandry), permanent settlements developed and the communal problems related to them appeared.

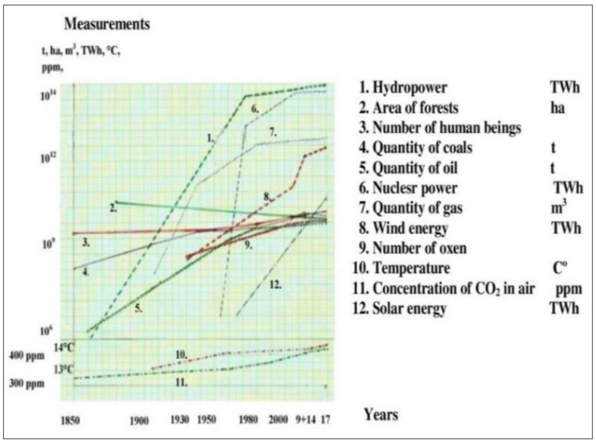

Figure 2: Changings on the World between 1850-2017

Although cities and even city-states existed in ancient times, urbanization was slow until the period of industrial revolution.

The increase in the number of people, the development of agriculture, trade, transport, mining and industry helped the formation of (large) cities. The urbanization process began to accelerate in the 18th century in Europe while on other continents, depending on the circumstances, in the 19th and the 20th century and this process is still taking place today, in many places in an explosion-like form. In 2003, there were 409 cities/agglomerations on the world with more than one million inhabitants. In total, more than 1.15 billion people lived in them, using more than 70% of the world's resources. On the basis of the newest data of the UNO the population of the World have lived in at least 12000 cities but the proportion varies from country to country.
Megacities (**10M+**): 33 cities
Large Cities (**5M to 10M**): 49–51 cities
Medium-sized Cities (**1M to 5M**): about 429–494 cities
Small Cities (**Under 1M**): Over 11,600 settlements

Settlements, especially cities, differ from the natural environment and have denaturing effect. For example: the sunlight absorption and heat emission of buildings and roads are different from that of the natural environment. Wind condition, air pollution, noise, and light load are also bigger. In cities, the so-called "desert climate" is characteristic. Think about how different are the values of individual parameters over a city with 10 million inhabitants from an area of natural environment of the same size!

It should also be mentioned that currently, the majority of people live on the northern hemisphere of the Earth, which is not surprising for several reasons, but this fact also has its consequences. Temperature values of the Earth are higher (redish colour) on the northern hemisphere than on the others. Demands – for foods, drinking water, communal, energetic needs and services of the increasing number of people are also growing.

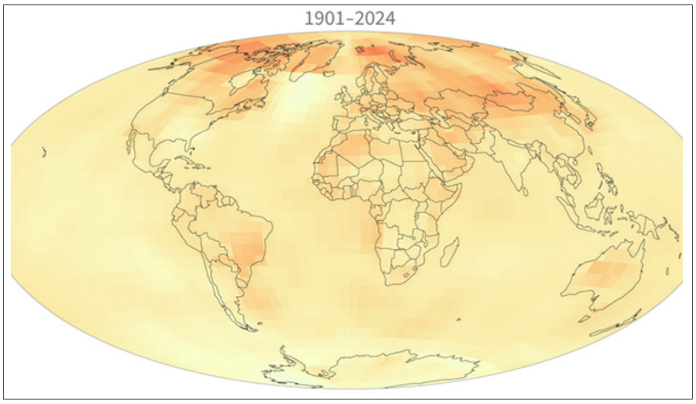

Figure 3: Warming can be seen on the Picture in Redish Colour by Noaa

Farm Animals

The history of farm animals started with the domestication about some thousend years ago when humans changed their nomadic hunter-gatherer lifestyles to settled agriculture at the Middle East. The number of livestock has increased substantially over the past 100 years, in line with the growth in the number of people and their needs. At present about 30 billion land animals have been kept manly in great factory farms containing some thousand organisms with standardized feeding in the best indoor environment.

Table 2: Number of the Different Farm Animals between 1930-2023

Time	Animals and their Number x 10^6				
	Oxen	Horses	Pigs	Sheep	Hens
1930th	438,9	68,1	193,3	563,0	-
1999-2000	1351,4	58,2	922,8	1056,1	14860,0
2017 2021-2023	1491,6 1913,7	60,5 -	967,3 1913,8	1202,4 1266,0	22,8x10^3 34.4x10^3

The increase in the number of animals and changes in husbandry practices have not only unpleasant consequences (methane, CO_2, heat, manure, urine, production and so on) but also greater need for fodder and drinking water. According to the latest IEA data, agriculture is responsible for about 40% of the methane released into the atmosphere. According to other experts the distribution of sources within agriculture is the following: rice production about 20%, animal husbandry 15-25%, and microbial decomposition of organic matter. According to the date, 74% of methane of animal origin comes from cattle, 9% from sheep, 5% from buffalo and small amount of the gas are also formed in the rectum of pigs and poultry.

Table 3: Number of different Farm Animals on Various Continents

Specification	Animals and their Number x 10^6				
	Goats	Buffalos	Donkeys + Mules	Camels	Lama's species*
Europe	17,9	0,2	0,8	-	-
Asia	465,2	160,9	18,8	4,2	-
Africa	218,6	3,4	15,4	15,1	-
N., C. and S. America	35,8	1,1	7,8**	-	5,3***
Oceania	0,7	-	-	-	-
World total in 1999-2000 and 2017	738,2 1034,4	165,6 200,9	42,8 55,3	19,3 34,8	5,3 -

Rövidítés: * = Lama, alpaca, vicuna és guanaco together; ** = datum only from C.-America; *** = datum only from S. -America; - = datum is not known

These authors do not even mention methane due to the activity of free-living animals and non-animal anaerobic microbes.

Table 4: Living Conditions of different Farm Animals

Specifications	Species of Animals and their Number x Million									
	Oxen		Horse		Pig		Sheep		Hen	
NEEDS	**1 anim.**	**1351,4**	**1 anim.**	**58,2**	**1 anim.**	**922,8**	**1 anim.**	**1056,1**	**1 anim.**	**14860,0**
O_2										
*calf l/day	390	5,27x10^{11}	-	-	-	-	-	-	-	-
*calf l/year	1,42x10^{5}	1,92x10^{14}	-	-	-	-	-	-	-	-
CALORIE										
kcal (kJ) x kg^{0,75} daily	Basal Metabolism in Case of all Animal Species in General 70 (293)									
yearly	2,55x10^{4} (1,07x10^{5})									
kJ x kg0,75 daily	Existential Metabolism in Case of all Animal Species 475-575 in General 525									
yearly	1,91x10^{5}									
*calf daily kJ	7712,9	1,04x10^{13}	-	-	-	-	-	-	-	-
yearly kJ	2,86x10^{6}	3,8x10^{15}	-	-	-	-	-	-	-	-
kg**/kJ daily	600/3,5x10^{4}	4,77x10^{13}	500/3,09x10^{4}	-	100/9207	-	50/5400	-	2/502	-
yearly	1,29x10^{7}	1,75x10^{14}	1,12x10^{7}	-	3,36x10^{6}	-	1,98x10^{6}	-	1,83x10^{5}	-
METABOLISM										
kg/W/day	600/411	-	500/358	-	100/10^{6}	-	50/62,9	-	2/5,8	-
W/year	1,5x10^{5}	-	1,30x10^{5}	-	3,88x10^{4}	-	2,29x10^{4}	-	2,11x10^{3}	-
* calf W/day	89,16	-	-	-	-	-	-	-	-	-
* calf W/year	3,25x104	-	-	-	-	-	-	-	-	-
WATER (drinking)										
ml/kg	129	-	78	-	108	-	76	-	-	-
kg/l/nap	600/77,4	-	500/39	-	100/10,8	-	50/3,8	-	0,25***	-
kg/l/év	2,82x104	-	1,42x104	-	3,94x103	-	1,38x103	-	73-110	-
WATER (technological)										
l/day	-	-								
	-	-	15	-	-	-	-	-		
l/year	-	-	-	-	5,47x103	-	-	-	-	-

Abbreviations
* = experimental datum of one calf of 75 kg body weight; ** = effective body weight; *** = in case of one animal; 1 anim. = one animal; - = datum is not known

The IEA estimates that the oil and gas sector are responsible about 37% of the methane in the atmosphere, waste contributes about 27% and other sources about 2.8%. They do not mention the release from natural living organisms, or from land and sea due to ice melting (the permafrost phenomenon). If the greenhouse effect of CO_2 is 1 unit, that of methane is 21 times.

Table 5: Emissions of different Species of Farm Animals

Specifications	Species of Animals and their Number x Million									
EMISSIONS	**Oxen**		**Horse**		**Pig**		**Sheep**		**Hen**	
	1 anim.	**1351,4**	**1 anim.**	**58,2**	**1 anim.**	**922,8**	**1. anim..**	**1056,1**	**1 anim.**	**14860,0**
CO_2 when O_2 demand 390 l										
*calf l/day *calf l/year	311 1,13x10^{5}	4,2x10^{11} 1.53x10^{14}	- -	- -	- -	- -	- -	- -	- -	- -
METHANE										
l/day	100-500	1,35-6,75x10^{11}	-	-	0,3-1,5	2,7-13,8x10^{8}	<50	<5,3x10^{10}	-	-
l/year	3,65-18,2x10^{4}	4,94-2466x10^{11}	-	-	1,09-5,4x10^{2}	1-5x10^{10}	<1,8x10^{4}	<1,92x10^{13}	-	-
HEAT when 50% of metabolism										
**kg/ W/day W/year	600/205,6 7,5x10^{4}	2,77x10^{11} 1,01x10^{14}	500/179 6,53x10^{4}	? ?	100/53,2 1,94x10^{4}	? ?	50/31,4 1,14x10^{4}	? ?	2/2,9 1.05x10^{3}	? ?
*calf W/day	44,58	6,02x10^{10}	-	-	-	-	-	-	-	-
*calf W/year	1,62x10^{4}	2,18x10^{13}	-	-	-	-	-	-	-	-
WATER										
by evaporation g/ 100 kg animal/hour	240									
g/m2/hour	10-200	-	-	-	-	-	-	-	-	-
by perspiration l/hour	-	-	some litre	-	-	-	-	-	-	-
URINE										
l/day	10-15	1,35-2,02x10^{+}	4-5	2,3-291x10^{8}	2,5-4,5	?	0,6-1,0	?	-	-
l/year	3,6-5,4x10^{3}	7,39x10^{12}	?	7,3x10^{11}	?	?	?	?	-	-
FAECES										
kg/day	10-30	1,35-4,05x10^{10}	15-23	?	0,5-3		1-3		0,1-0,15	1,48-2,22x10^{9}
kg/year	3,6-10,9x103	1,47x1013	?	?	?	?	?	?	?	5,4-8,1x10^{11}
Water content in %	80-85	-	70-80	-	55-75	-	55-75	-	-	-
MANURE										
kg/animal/day	Is different dependig on the animal species and the way of breeding									
SEWAGE										
l/day	30***	4,05x1010	1,74x109	-	-	-	-	-	-	-
l/year	1,09x104	1,47x1013	6,3x1011	-	-	-	-	-	-	-

Abbreviations: * = Experimental Datum of one Calf of 75 kg body weight; ** = Effective Body Weight;
*** = in general 30 l/day in each single animal (500 kg); - = datum is inknown, ? = datum is not written because of the narrow place bigger and that of N-oxides 310 times greater! There is also a view that water vapour has the greatest greenhouse effect. Some of the other consequences of animal husbandry are shown in the Table 4 and 5.

Forest Area

Forests currently cover approximately 4.14 billion hectares (roughly 31-32% of global land area). Based on data from the World Bank between 1990 and 2015, 89 countries reported a decrease of their forest area in the last 25 years, 80 countries reported an increase in size of their forests, and 37 countries reported that there was no change. During the mentioned period, the total amount of forests as an extremely important source of energy and raw materials decreased by 1.3 million square kilometres, and the indispensable role of the forests and their bio-systems living there was also lost. The data described here are already sown in Figuer 1. The annual rate of net forest loss fell from 10.7 million hectares in the 1990s to about 4.12 million hectares for the 2015–2025 period. About 34% of tree loss worldwide between 2001 and 2024 is likely permanent, meaning the land has been converted for uses where trees will not regrow naturally.

On the basis of FAO's latest forest products statistics in 2022 about 3.9–4.0 billion m³ per year of roundwood was cut down continuing the plateau that has existed since the early 1990s. Fuelwood and charcoal accounted for about 1.9 billion m³ in 2020, which will rise to between 2.1 and 2.7 billion m³ by 2050.

Occurrence of CO_2

As for the CO_2 content of the atmosphere, this gas has been present since the early life of the Earth and it is persisting there for a long period of time (its life time is 5–200 years) varying amounts since the beginning (Figure 4). Human life and activity, as well as keeping of livestock and changes in the population of natural living creatures and various geological events, influence the quantity of different gases in the atmosphere. Among these, carbon dioxide, methane, sulphur oxides, water vapour and, more recently, nitrous oxide and fluorine-containing gases have been and are of particular importance because they cause the greenhouse effect and thus accelerate global warming, i.e., climate change. During ice age cycles concentration of CO_2 levels naturally fluctuated between 180 and 280 ppm. The average was in 1750: 250 ppm; in 1957: 315 ppm; in 1987: 350 ppm; in 2015: 403 ppm. The annual amount of CO_2 which was emitted by the countries of the world between 2012 and 2022 in million tonnes per year was 32,219.8; 32,676.8; 32,779.0; 32,773.7; 32,818.0; 33,306.2; 34,013.9; 34,044.0; 32,284.9; 34,052.2; 34,374.1. The only decrease was in 2020 due to Covid epidemy. In 2024 the annual CO_2 quantity exceeded 40.8 Gigatonnes. On 2 April 2022, atmospheric carbon dioxide concentrations reached their highest level measured at present time at the Mauna Loa monitoring station in Hawaii. The concentration was 420.86 ppm. But the increase has continued and its value 433.24 ppm was in April 2026.

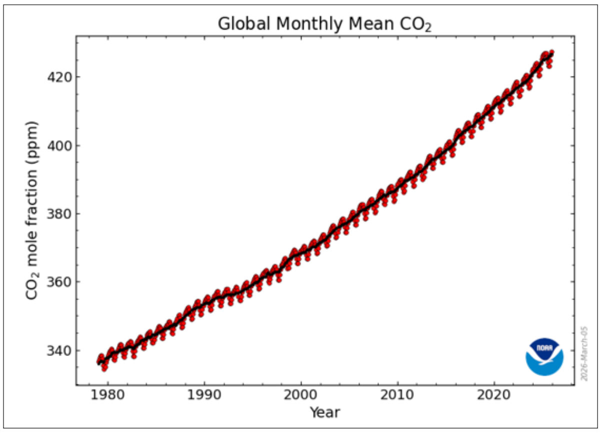

Figure 4: Concentration of CO_2 in the Atmosphere by NOAA

The years with the largest annual carbon dioxide growth tend to be associated with the strongest El Niños—the warm phase of a natural climate pattern in the tropical Pacific—which lead to high temperatures over land and sea and an expansion of global drought area. In turn, these weather conditions typically lead to less plant growth, which reduces carbon dioxide uptake, as well as increased decomposition of carbon in soil and increased carbon dioxide emissions from forest fires. Together, these impacts cause atmospheric carbon dioxide levels to rise faster than normal. Over the Northern Hemisphere 500 ppm value was already measured before!

An average person, if not actively exercising, produces approximately 1kg of carbon dioxide per day that means that 8 billion kg-s CO_2 are emitted worldwide. Besides this the animals have also produced that gas and then we did not mention the other sources.

Presence of Methane

It seems that methane is one of the most abundant hydrocarbons in the atmosphere. It plays important roles in atmospheric chemistry and the radiative balance of the Earth. The Fig. 5. shows the full NOAA time-series starting in 1983. Concentration of methane in the atmosphere in ppb: 1700: 1000; 1986: 1700; 2021: 1875,7! was. According to IEA experts, methane is responsible for 30% of warming. They also reported that emissions from the oil and gas industry have recently fallen substantially. They also published that the amount of methane released into the atmosphere in 2023 was 349, 476 kt-s and therefore its concentration became more than 1,900 ppb which means a slight increase compared to 2022.

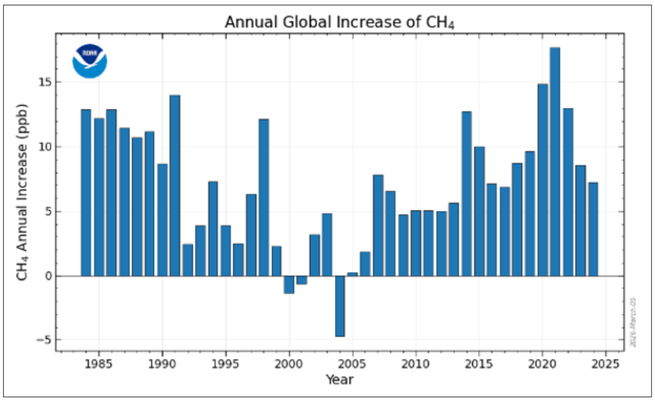

Figure 5: Concentration of CH4 in the Atmosphere by NOAA

In November of 2026 1946 ppb was which means further increase. Scientists estimate that this increase is responsible for 20% to 30% of Earth's warming since the Industrial Revolution.

Atmospheric Nitrous Oxide

Concentrations of N_2O have risen by approximately 25% since the pre-industrial era (from ~270 ppb in 1750). Its lifetime is121 years. Its level is now higher than any recorded in the last 800,000 years (Figure 6). Agriculture is one of the largest driver, contributing over 65% of emissions, primarily from the use of nitrogen fertilizers and animal manure. Emissions from China have seen the biggest increase since 1980. In contrast, European emissions have declined, and U.S. emissions remained relatively stable or decreased slightly (3% since 1990). Besides vehicles as largely run on petrol or kerosene emit CO_2, CO, nitrogen oxides (NOX), hydrocarbons (CMHN), aldehydes (R-CHO), H_2O, additives, carcinogens and soot into the atmosphere. As to the planes they use kerosene and release water (in the order of 100 million tonnes/year), CO_2, CO, NOX (in the order of million tonnes/year), (CMHN) and various nano-particles in the order of millions of tonnes.

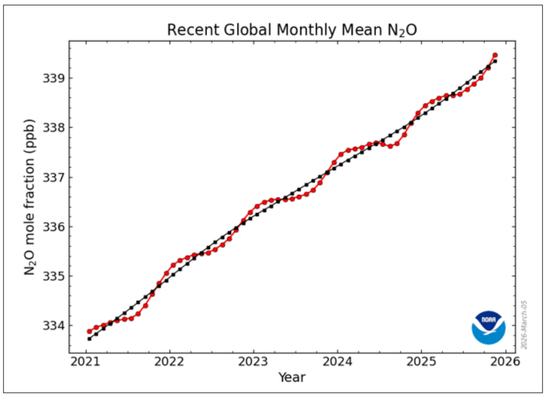

Figure 6: Concentration of N_2O in the Atmosphere by NOAA

Global concentrations of N_2O reached a new record high of 337.7 parts per billion (ppb) in 2024 from 336.59 ppb in 2023. Recent trends show that the accumulation of this gas is accelerating faster than at any other time in human history. The globally-averaged mean reached 337.71 ppb in 2024 up from 336.59 ppb in 2023 remains significantly higher than the average annual increase of 0.8 ppb/year recorded in the early 2000s. Human activities now exceed natural "sinks" (processes that remove the gas) by about 35%. This fact is a critical concern for two main reasons. It is roughly 270–300 times more powerful than at trapping heat over a 100-year period. It is currently the leading human-linked substance depleting the stratospheric ozone layer.

Water Vapor in the Atmosphere

In short, it's true that water vapor is in some sense the "biggest" greenhouse gas involved in climate change, but it's not in the driver's seat. CO_2 is still the main culprit of the global warming we're experiencing today. Water vapor is just one of the features of our climate that our CO_2 emissions are pushing out of balance—well beyond the stable levels humanity has enjoyed for thousands of years.

Carbon dioxide, for example, absorbs energy at a variety of wavelengths between 2,000 and 15,000 nanometers — a range that overlaps with that of infrared energy. As CO_2 soaks up this infrared energy, it vibrates and re-emits the infrared energy in all directions. About half of that energy goes out into space, and about half of it returns to Earth as heat, contributing to the 'greenhouse effect. Greenhouse gases keep our planet livable as Earth's surface temperature would be about 33 degrees Celsius colder without them. Water vapor is a key part of Earth's water cycle. Since the late 1800s, global average surface temperatures have increased by about 1.4 degrees Celsius. Data confirm the amount of atmospheric water vapor is increasing as the climate warms. Report states total atmospheric water vapor is increasing 1 to 2% per decade. For every degree Celsius that Earth's atmospheric temperature rises, the amount of water vapor in the atmosphere can increase by about 7%, according to the laws of thermodynamics. Increased water vapor doesn't cause global warming. Instead, it's a consequence of it. Increased water vapor in the atmosphere amplifies the warming caused by other greenhouse gases.

Average Temperature of the Earth

Average temperature of the Earth is influenced by several factors in their own way. These are: the Earth's own energy, solar and cosmic radiation, greenhouse gases, the production of previously unknown hydro, wind, solar, nuclear and H energy, heat from burning fossil raw materials, waste and woody plants, heat emitted by humans, warm-blooded animals and micro-organisms, heat from industry, transport, agriculture, architecture, housing, space exploration, heat from wars and because of the new situation related to denaturing of nature, etc. Since the Earth was born, it has been emitting energy, the value of which has decreased over the time and is now estimated by experts at between 43 and 49 TW. Without its own energy, the Earth's temperature would be below freezing point. Despite the supposed 'uniformity' of solar and cosmic radiation, the average temperature of the Earth has never been the same over long or shorter time periods. Ice-ages and warming up periods have alternated each other due to terrestrial or extraterrestrial influences. For example: from the early 1000 years there was a so-called little ice age, which was replaced by a warming period due to the changes brought about by the industrial revolution from 1778 on. There is now ample evidence that air and ocean temperatures are rising, snow and glaciers are melting and the sea level is increasing. Between 1905 and 2005, the temperature rose by 0.74 ± 0.18°C every ten years. In the second half of the period under study, the rate of warming doubled compared to the value observed at the beginning (from 0.07 ± 0.02 °C to 0.13 ± 0.03 °C, per decade).

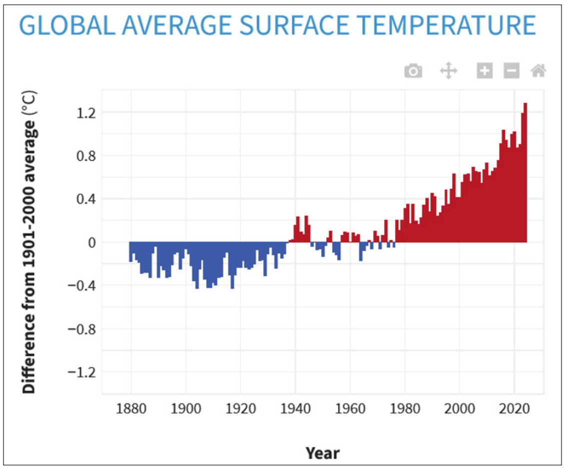

Figure 7: Average Surface Temperature of the Earth

This phenomenon is the so-called climate change. On 21 November 2023, for a short period of time, the Earth's temperature was already more than 1,3°C warmer (14.9°C) than the global average temperature before the industrial revolution (13,6°C), which was an unprecedented record, reported by the Europe-based Copernicus Climate Change Service. The unpleasant process has continued and in 2025 the temperature was more than 15,0°C! March 2026 was the fourth-warmest March globally, with an average surface air temperature of 13.94°C, 0.53°C above the 1991-2020 average for March, according to the ERA5 dataset.

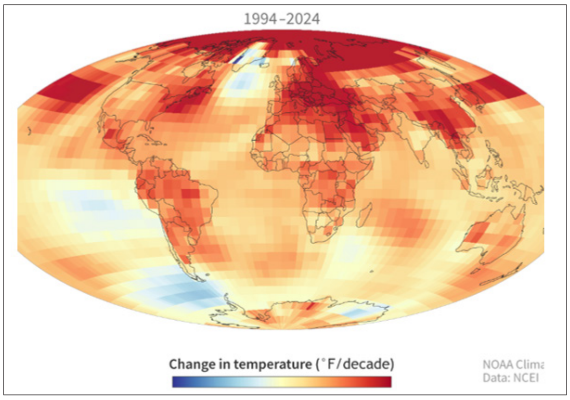

Figure 8: Changing of the Surface Temperatre of the Earth During last Century by NOAA

The warmest March on record was in 2024. March 2026 was 1.48°C above the estimated 1850-1900 average used to define the pre-industrial level.The changes on the World has became faster since industrial revolution.

Role and Utilization of Solar Energy

The average temperature of the Earth is now largely determined by the amount of energy from the Sun, which is thought to be constant, the amount of which was considered earlier to be 3.86×10^{33} erg/s, i.e., 3.86×10^{23} kW of power. In addition, it is also influenced by the Earth's own energy and by the effects of the existence of living organisms and the consequences of human activity. Not all of the solar energy emitted reaches the Earth's surface, because about 30% of the Sun's energy is reflected from the upper surface of the atmosphere. The rest is absorbed by clouds, surface water, ice, snow and land. These represent the Earth's heat capacity.

On the upper surface of the Earth's atmosphere, in the case of a perpendicular radial position, the energy coming from the Sun represents a power of 1.36 kW/m². The amount of solar energy received and reflected from the Earth's surface depends on environmental influences. In addition, there is the Earth's own energy, and the ever-increasing energy generated by the existence and activity of humans or extracted from the Earth by them and emitted by the living organisms. Together, these add up to the total energy under the envelope of greenhouse gases and water vapour. The natural escape of these energies is uniformly retained by the envelope according to the laws of nature, promoting the warming of the Earth's surface, where ideally the energy input would have resulted in a heat load of 1kW/m², equivalent to 1 kJ/s. This value is the so-called solar constant. We do not know what the solar constant and all the other energy values are today. In 2000, a huge development started in the field of solar energy utilization, because the installation costs of the systems decreased to an unexpected extent and people's attitudes changed a lot. The annual amount of solar energy collected in the form of electricity between 2012 and 2022 in each year on the world was 104,212; 140,515; 180,712; 228,920; 301,082; 395,947; 489,306; 592,245; 720,429; 861,537 and 1,053,115 MW. It is not known that what is the consequence of the energy captured by the solar collectors on the global temperature?

Conclusion

We think that further analysis is needed to determine which of the listed factors play role, and exactly what is their role, in the climate change process, because in the nature there is no energy change without effect and cause. The question is what is the role of the different factors and how can we protect because the possibilities of our Earth are limited and the circumstances of the biological life are determined and unchangeable. It is a fact that the effect of each of the factors listed are increasing and their energetic and environmental loading importance compared to their 1769-year value is steadily growing. The effect of the Earth's own energy within the envelope, together with the solar as well as cosmic energies, the biological heat production of the living organisms and the use of fossil as well as non-fossil energies by human beings, that is the energy release from all combustion processes at present is too much for our Globe. The recent profit-oriented system appears to be unsustainable. If we continue that money determined economic policy and spend huge amounts of money on goals (wars, military investments, unnecessary space explorations, international and intercontinental tourism, fashion, rising of unnecessary endless living standard etc.) that are irrelevant to our survival instead of stopping the climate change than our life will be hard therefore it is very necessary to finish all military actions and menace all over the World. To solve the problems by discussions. To stop the further increase of surface temperature of the Earth as soon as possible. To ensure identical rights for every nation and for their minorities independently from their size. To control the number of birth in every such population where the increase of the number of inhabitants is over the optimum steady state. To educate people that the possibilities of the globe are limited and there is not endless progress. To determine global rules of steady state life of human society which would be the only possibility for the survive [1-19].

Appendix

The Impact of Modern Transport on our Environment

The first car with an internal combustion engine was made by Benz Carol Frederick in 1886. The number of cars was 9,504 in 1900, 1 million in 1910, 10 million in the early 1950s and 60 million in 2010. Summing up the production values, more than 2.7 billion vehicles left the factories between 1886 and 2014, and currently their number is increasing by 40 million annually. (Of course, scrapping has also taken place in the past period.) These vehicles largely run on petrol or kerosene and emit CO_2, CO, nitrogen oxides (NOX), hydrocarbons (CMHN), aldehydes (R-CHO), H_2O, additives, carcinogens and soot into the atmosphere. The amount of thermal energy released during vehicle use is unknown.

Aviation was launched with the successful first flight of the Wright brothers (Wright Orville and Wright Wilbur) in 1903. The first civil aircraft carrying people on a regular basis took off in the USA in 1914. In 2013, 3.1 billion passengers were carried on 37.4 million flights by 25,332 aircrafts. The planes use kerosene and release water (in the order of 100 million tonnes/year), $_2$, CO, NOX (in the order of million tonnes/year), (CMHN) and various nano-particles in the order of millions of tonnes. The visible image of the release of combustion products into the atmosphere is the contrail. The amount of kerosene used for various purposes in the world is currently about 190 million litres per day. The amount of thermal energy released during air transport is unknown.

Introduction Data

Units of measurement and their notation:
exa - E = quintrillion 1018; peta - P = quadrillion 1015; tera - T trillion = 1012; giga - G = billion 109; mega - M = million 106; kilo - k = thousand 103.

- 1 kcal/h = 1.16 W = 4.185 kJ; 1 W = 1 J/s; 1 Wh = 3600 J; 1 kWh = 3.6x106 J or 3.6 MJ
- 1 MJ/kg = 1000 kJ/kg; 1MJ = 0.27778 kWh;
- RQ (respiratory quotient/ratio) = CO2/O2 - when burning carbohydrate: 1; when burning fat: 0.7; when burning protein: 0.8-0.9; when eating a mixed diet: ≈0.83. 1 litre of O2 used by the body, depending on the composition of the food, is 4.5-5 kcal.
- In our calculations, the m3 weight of each gas was assumed to be 1.98 kg for CO_2 and 0.69 kg for natural gas. The amount of CO_2 released per kg of fuel was assumed to be 2.3 kg for coal, 3.17 kg for oil, 2.8 kg for natural gas and 1,65 – 1,85 kg for fuel wood.

Typical Data of the Earth

- Surface Area: 5.101x108 km² or 5.101x1010 ha; of which Land area: 29.2%, or 1.48949x1010 ha., Forest area: 5.5 billion ha (36.9%) in 1882, which decreased to 4.0 billion ha by 2005. Settlement area: cities occupy at least 2% of the land
- area. Territorial conditions of other settlements are not known.
- Waters: 70.8%, or 3.611x1010 ha. Of this, 97-98% is sea and 2-3% freshwater, of which about 10% is surface water, 70% snow and ice and 20% groundwater.
- The northern hemisphere (2.55x1010 ha) contains about 59.4% of the total land area, which is about 0.884x1010 ha.
- The southern hemisphere (2.55x1010 ha) covers about 40.6% of the total land area, which is about 0.605x1010 ha.
- The quantity of gases in the atmosphere (water vapour, CO_2, methane, CFCs, N-oxides, sulphur oxides, fluorine derivatives, etc.) varies.

Mean Near-Surface Temperature: in 1905: 13.6 °C; in 1960: 14.6 °C; in 2014: ≥14.8 °C; in 2023: 14.98 °C!
Melting Ice: general, but more significant in the northern hemisphere than in the southern one.

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