Ccycling - the end of the climate catastrophe

A feasibility study

Index Ccycling - The End of the Climate Catastrophe

Summary

How do we get independent from the fossil fuels, retain the advantages of the present technology, dispose of the exhaust fumes of four generations and nevertheless enter the solar age of the third millennium seamlessly and fast? The answer is contained in this study.
We stop the climate catastrophe before it gets catastrophic in just one generation. Each one who is interested becomes a shareholder in an organization that constructs a system for sun energy production for all mankind. The carbon of the combusted fossils is recycled from the atmosphere with sun energy to oil by sun energy, to 'soloil' for renewed combustion in the cars and power plants worldwide. The conventional technology for this recycling process already exists. We just need to take the initiative.

The long text following can be read in three ways:

1. **Quick-readers just read the bold-formatted text and thus get an overview over the main statements.**
2. More interested readers read the normal-formatted text too.
3. Those, who want to check and calculate this feasibility study, additionally read the small-formatted text. Thus they achieve the total understanding of this project and the certainty to bring in their money ingeniously.

0. Foreword

We are standing at the beginning of a climate catastrophe. We have suspected this since approximately 1970. Since approximately 1990, the facts were clear for each one interested. The last doubters were probably convinced by 2006 and the professional hypocrites will fall silent gradually. All realizations of the scientists and also our own experiences with the 'Century' summers, storms, precipitations, floods, landslides, glacier meltdowns, etc. leave no more doubts. The weather extremes and their consequences will increase further, because the carbon-dioxide concentration of the atmosphere is too high to give a stable climate and its temperature rises inexorably further. A mere reduction of the CO_2-outlet lets the catastrophe increase further. It cannot stop the catastrophe and can not reverse it at all.

What is therefore to be done if we do not want to endure this fate any further and if we do not want to let it aggravate any further either?

In this text I - a diploma-physicist - describe here how we can stop the climate catastrophe with relatively low expenditure within 30 years and then can reduce it again and even eliminate it.

We therefore capture the CO_2 from the atmosphere. We can reduce it again into carbon, into C, and we can deposit it as C. Then, when the catastrophe has been reversed, **we commence with the cycle process, the recycling of the carbon, as acronym C-recycling or even more shortly 'Ccycling' for being able to use further our optimized combustion technology – just without its faulty aspects.**

The carbon from the fossils mainly from coal, from petroleum and from natural gas by combustion is released into the atmosphere as CO_2 and is collected again from it with solar energy. The collection of the CO_2 from the atmosphere takes three years after completion of this project. It is reduced to C and it is stored at first as anthracite, as solid coals.

We then - with the same technology - **build a new energy production and distribution system for the entire mankind. It changes the solar energy into technically usable energy.** The surface of approximately 2 million square kilometres is covered with particular sun collectors at the edges of the deserts of all continents, for each human approximately 330 m^2. **The collected energy is transformed into electric energy, then directly into chemical energy in form of hydrocarbons, that is petrol, gasoline, diesel fuel or fuel oil**, and also in pure carbon in the form of coal or anthracite for deposition.

The liquid fuel is distributed with pipelines worldwide, the electric current made from it in the cities of the world is distributed over shorter distances with high voltage nets, and the coal is secured in deposits for the future. The carbon is Ccycled from the CO_2 of the atmosphere. Without the carbon in the form of CO_2 from the air this simple Ccycling would not work: **The CO_2 is the pure and easily accessible carbon treasure of mankind like it is for life itself. Life recycles its carbon and likewise we will recycle our industrially produced CO_2 with our technology. With this treasure we can achieve a planetary wide energy flow, its source being the sun.**

1. Concrete

We take for example one trillion (10^{12}; US-counting used here: 1 billion in European counting = 1 million millions) **Euros (€) per year**, gathered from less than 5 percent of the income of all sufficiently earning people of this earth. **With it we erect 6.000 sun power plants each of 1.000.000 kilowatts in the desert regions of the earth in the course of 30 years.**

That is a total price of approximately 5.000 €/ human being, or 167 € per human being and year for the duration of 30 years, or of 46 cents per day for everyone. - The world national product 2006 amounted to 44,4 trillion dollars (44,4 x 10^{12} US$); 5% of it are 2,2 trillion dollars. That is much more than the required money quantity per year.

This is a 'Mankind Project': The entire mankind is affected by the catastrophe. 5.000 Euros/ human being within a generation is not much, for smaller organizations or states 1 trillion Euros per year however is very much - 'too much'.

The sun power plants optimally suited for this purpose are **Thermic Power Plants, 'TPPs'**, also called upcurrent power plants, solar updraft towers, solar chimneys, solar towers or Solar Aero-Electric Power Plants, SAEPPs. These are very big, open, circular greenhouses with glass roof and with a high chimney in the centre that generate strong updraft through warming of air, therefore through 'Thermic'.[1]) Several turbines with current generators are at the bottom of the chimney of the TPP. With the wind, generated by the pressure difference between outside and inside, the TPP generates electric energy in the current generator. **Simultaneously, the CO_2 is filtered out of the used air, and it is transformed to carbon 'C' with the generated energy.** For this purpose inside of the TPP a felt textile is put up, through which rinses down a watery solvent for CO_2. It picks up the CO_2 from the used air.

[1]) For descriptions and images:
http://www.solarmillenium.de/ > Technologie > Aufwindkraftwerke; >Fakten; & >Funktionsweise; & >Pilotprojekt;
http://www.vdi-nachrichten.com/vdi_nachrichten/aktuelle_ausgabe/akt_ausg_detail.asp?source=mail&cat=2&ID=12158
http://de.wikipedia.org/wiki/Thermikkraftwerk

The CO_2 is reduced to carbon, to 'C' in a chemical process. This process needs the same energy that becomes free, when carbon is burned. This energy is available from the sun through the TPPs.

The carbon is final-deposited in non corroding steel or concrete receptacles. **In 35 to 60 years (according to urgency) from the beginning of the project for 30 trillion Euros not only the climate catastrophe is eliminated but even the CO_2-level of the atmosphere of 1880 is restored.** Thereafter the solar energy is available to mankind as **sol**ar generated fuel **oil**, as **'soloil'**, or as electric current or in any other form - including Ccycling - with **one kilowatt per human being.** The maintenance costs of the TPPs are very low, far under 1 cents per kilowatt hour, for example 0,32 c/ kWh [2]).

[2]) Aufwindkraftwerke: Jörg Schlaich; FVS Themen S. 85 - 89; 2002;

The big investment was invested already in the long time stable installations. Fuel costs do not accrue, because the sun shines gratuitously for us all and gives its energy free of charge to us all. **This energy system belongs to mankind, because they paid it with '5 percent' themselves – without making debts.**

If something like a so-called 'ice age' or another atmospheric crisis ever should come again, then the so generated carbon depots stand ready in order to warm up the climate again by finely dosed combustion, if it is wished then. They are fast accessible energy reserves likewise, if unexpectedly more energy is required than was installed.

Mankind hereby attains **control over the temperature of the climate of our spaceship, the earth,** by being able to correct the deviations from the average of that climate in which we as humanity have been evolving.

We get out of the atmosphere the surplus carbon share of 170 billion tons, that is **28,3 tons of carbon per human being - and that already was all! That is a cubus with sides of 2,44 m, a small room, and that is the threat of mankind! For how long will we want to go on suffering and dying from it?**

Each of the 6 billion people must raise 258.000 kWhs for it in order to even out the disused atmospheric dump of mankind's last four generations (including our own).

For investment costs of 2 cents per kilowatt hour, we can eliminate the climate catastrophe (5.000.00 c/ 258.000 kWh = 1,94 c/ kWh):

5.000 € / human being altogether for the end of the climate catastrophe and also simultaneously for the erection of a new, additional, complete, world-wide, decentralized, non-polluting, secure, compatible, solar, long-lasting and furthermore Ccycel-capable energy system almost without operating costs: - A dream to be materialized!

The climate catastrophe not only can be stopped completely with it in approximately three years after completion of the project but the atmosphere even can be restituted again, in that all of the superfluous CO_2 will be removed from it.

Incidentally: In order to become free from fossil energy with nuclear energy, we accordingly needed 6.000 **N**uclear **P**ower **P**lants (**NPP**s) with 1 GW or one million kilowatts each. As the nuclear power was installed on earth, it was said conciliatorily: Statistically only each 10.000 years there will be a 'Greatest Reasonable Accident' a GAU. The 'greatest reasonable accident' in Tchernobyl in the year 1986 proved this statistical statement emphatically and concretized its meaning.

Today, approximately 440 nuclear power plants work on earth.

10.000 Years/ 440 NPPs = 22,7 years: This is the average time from 'greatest reasonable accident' to 'greatest reasonable accident'. 1986 + 23 years = 2009. Someday soon, a 'greatest reasonable accident' will take place again statistically on earth.

With 10.000 years / 6.000 NPPs = 1,67 years/ 'greatest reasonable accident' mankind's sorrow would be indescribably big. Which clear-headed human being wishes himself and his family such a future? Just money-driven minds who want to get their share from money already invested in nuclear technology can respect their money more than mankind's destiny. The investments for NPPs would be bigger than for the equal power of TPPs - and in 70 years the Uranium deposits of earth are exhausted anyway…

The following detailed text shows that the idea of the Ccycling is practicable. It is a 'feasibility-study.' It is written in a way that it is relatively easily legible for scientifically not trained people too.

Here are **the abbreviations, figures and rules** that I use in this text:

This text was translated from German into English by me, so that more people can obtain information about Ccycling. It is broken English, but sufficient to understand the information. Whoever feels inclined to correct it is very welcome. Please do not confuse the English style with the content!

The newly created term **'Ccycling'** for the concept 'Carbon Recycling' is spoken like the English word 'Recycling', but with the English 'C' instead of 'Re:' 'Cee-cycling.' The regular verb is called 'to Ccycle.'

The newly created term **'soloil'** for 'fuel oil generated by solar energy' is also pronounced English.

I use the abbreviations **'TPP'** for 'Thermic Power Plant', 'CO_2' for 'carbon-dioxide' and 'C' for 'carbon.' I use numbers like in the German and international convention: The comma ',' is the decimal point, the point '.' marks each three powers of ten, e.g. one million point zero = 1.000.000,0, following the **International System of Measurement Units**.

I use the units 'a' for 'year,' 'd' for 'day,' 'h' for 'hour' and 's' for 'second.' I use the units of 'ppmv,' 'parts per million volume,' measured per one million parts after its volume and 'ppmm,' 'parts per million mass,' measured per one million parts after its mass.

1 ppmv is 0,001‰ of the volume, 1ppmm is 0,001‰ of the mass.

I mostly use the energy units **'kW'** for 'kilowatt' of power (energy/ time) and **'kWh'** for 'kilowatt hour' of energy, because they are the clearest for each human being. I use the unit **'GW'** for 'Gigawatt' (10^9 W = **1 million kilowatts**) additionally.

'1-GW-TPP' means: One Gigawatt Thermic Power Plant.

I use **'x'** as multiplication symbol and **'/ '** as 'division' symbol. The symbol **'| x' or '| /'** means: I multiply or divide the last equation with the hereupon following expression.

I use the round number of **6 billion** as number of the now living people.

Since I had recognized the actuality of the climate catastrophe in the year 1990, I frequently thought about how it is to be remedied. On a car ride in the year **1992 the idea for this project came to me,** when I had sufficient time in order to weigh up the principles of this catastrophe thoroughly.

I publish it now in 2007 because I hope that the time for this idea finally came.

If ten million Euros are met, then the planning of the details can begin, if half a billion (= 500 million) Euros are met, the construction of the first TPP can begin as a pilot project and for the energy production of the following other TPPs of the first 1-GW-TPP. If it should be used for the energy supply, then it admittedly does not contribute to the end of the climate catastrophe, but at least it decreases the output of CO_2 through the energy won with it like any other non fossil power plant, **just with more energy per invested money. Each investor hereby is called upon to start with it now.**

In this text I describe the future of this idea in indicative because the most favourable idea will prevail.

2. The present situation

Since approximately 1990, it was clear that mankind caused an eco-catastrophe that almost is irreversible: Through the combustion of fossils that consist of carbon or carbon compounds, CO_2 comes into the atmosphere that lets through the visible rays of the 6.500 Kelvin hot sun, but as greenhouse gas it absorbs the very long-wave infrared-rays of the 300 Kelvin warm earth. So the energy remains on the earth and can be emitted less effectively into space.

At the beginning of the industrial age by 1750, even still by 1880, just four generations ago, there were 280 ppmv (280 parts per million volumes) CO_2 in the air, in 2005, it was 380 ppmv CO_2, an increase by +36 percent compared to the starting value, by more than one third of the natural share. The annual increase amounts approximately to 1,5 - 2 ppmv / year at the beginning of the third millennium.

Mankind burns the carbon of the anthracite and the hydrocarbons of the petroleum and natural gas in order to generate energy. This used energy including their waste heat can be disposed of without problems from the earth as infrared radiation into space. This energy is not the problem.

The chemical waste, the 'airy ash' of the combustion that is the carbon dioxide, now provides, however, that the sunlight itself can be disposed of no more.

The sun as source of energy radiates 1,37 kilowatts per square meter earth surface. Of those is emitted again 37 percent as visible light: The Albedo of the earth amounts at the moment to 37 percent. 63% are absorbed by the earth and heat it.

That is 108 trillion kilowatts per earth, therefore approximately 18.000 kilowatts of duration performance per human being.

The calculation to this is like follows:

The surface of the sun-shone earth corresponds to a circle-disk with the diameter of the earth:

$d_{Erd}^2 \times \pi / 4 = (12.600 \text{ km})^2 \times 0,785 =$

$= 158.760.000 \times 10^6 \text{ m}^2 \times 0,785 \approx 125.000 \times 10^9 \text{ m}^2$

With the performance of the sun of 1,37 kilowatts/ m^2 (in the distance of the earth from the sun) follows:

| x 1,37 kilowatts/ m^2 = 171.250 x10^9 kilowatts/ earth incident radiation

With the absorption of the earth of 63 percent follows:

| x 0,63 = 107.888 x 10^9 kilowatts/ earth radiation absorbed

Divided through 6 billion people:

| / 6 x 10^9 people = 17.981 kilowatts/ human being ≈ 18.000 kilowatts/ human being

The sun beams on the earth 24 hours per day. This therefore is the duration performance.

About one percent of it additionally heats up the earth now, every year proportionally somewhat more, tendency: Over the years constantly further increasing without end, until we stop it, or better, until we invert it.

The estimate calculation to the warming of the earth is:

The energy radiation E of a body is proportional to the fourth power of ten of its absolute temperature T: $E \sim T^4$. The earth warmed in the last decades by approximately +1℃, from approximately $T_1 = 300K$ to approximately $T_2 = 301K$:

$T_2^4 / T_1^4 = 301^4 K^4 / 300^4 K^4 = 8,2085 \times 10^9 / 8,1 \times 10^9 = 1,0134 =$ +1,34 percent. The energy radiation increased by approximately 1,3 percent through the temperature increase of +1℃.

The difference between in-radiation and out-radiation leads to the warming. The out-radiation increases through the warming.

The additional insulation of the earth through the CO_2 increases the temperature of the earth. Therefore the out-radiation increases, to bring it again into a new balance with the always constant in-radiation of the sun. If the insulation becomes stronger, so the temperature must increase accordingly further. This simple energetic consideration exposes all claims that the climate change is not existent as frauds.[3]) This consideration just uses the universal law of the conservation of energy.

[3]) http://blog.rainbownet.ch/umwelt/klima-schwindel-die-klimaluge-bei-rtl , etc.

Mankind quite naively began a large scale experiment four generations ago with the spaceship earth without suspecting that we did this - and still we keep on doing it.

It consisted of using the fossils, the peat, the lignite, the stone coal, and then also the petroleum and the natural gas, in order to heat and to run machines with the energy contained in it. The ash emerging with the combustion was disposed of. About the waste

disposal of the smoke, no one needed to concern, because the atmosphere of the planet was 'sufficiently' big so that it could pick up the exhaust fumes without side effects. In the atmosphere, through the winds they were supplied to the plants again, so that they could recycle the smoke.

The sooty skies,

the stench of the industry exhaust fumes,

the 'sour rain' and the forest decay,

the fine dust and the increase of allergies,

the extinction of many animal and plant species

were indications that also the entire planet is overburdened with the waste disposal of the waste of ten billions of additional 'horse powers, HP' (that is 6 billion people with 1 kW/ human and 1 HP = 735 W = 0,735 kW; 1 kW = 1,36 HP; 1,36 HP x 6 x 10^9 humans = 8,2 x 10^9 HP ≈ 10^{10} HP/ human).

This large scale experiment with the spaceship earth went wrong. It leads guaranteed into the catastrophe. It already now leads in supply difficulties that shock our whole social system. It gave already two 'oil crises' after 1970. Euphemically so-called 'preemptive wars' and euphemically so-called 'civil wars' are led about the petroleum areas.

We now are in the third oil crisis. It began 2006 with the Peak Oil [4]), the maximum production of petroleum on this planet. Since then, the output of the petroleum decreases principally and inexorably. The market counteracts shortages with price increase. The petroleum price increases up to the drying up the oil wells, or only as long as we need this much petroleum - until we become independent from it.

[4]) A Crude Awakening - The Oil Crash; A Film by Basil Gelpke und Ray McCormack (P,B,R); CH; 1h22'57"; © 2006 Lava Productions AG; www.oilcrashmovie.com
http://www.peakoil.net/; http://egan.blogs.nytimes.com/2008/03/05/oils-end/
http://www.energywatchgroup.org/fileadmin/global/pdf/2007-12_EWG_Oelstudie_kurz_d.pdf

This end of the petroleum age is withheld on purpose from the population so that the price increase can continue as long as possible. Now, the time of the really big profits of the petroleum companies begins, because it was missed on purpose to invest big into alternative energy forms so that we get involved into a shortage of the energy.

It must be acted anyway, in fact in quite big scale and very fast.

The concrete question is:

How do we get independent from the fossil fuels, retain the advantages of the present technology, dispose of the exhaust fumes of four generations and nevertheless enter the solar age of the third millennium seamlessly and fast?

The emphasis is on the word '**fast**', because a retarded development like until now costs too much: Human lives, species lives, labor and quality of life - and also money.

I propose a project here that stops the situation in a way not thought of until now and that even can turn it back. I portray the project with elaborate calculations so extensively that each reader himself can check exactly that this project actually is

successfully practicable. Because **each reader should be intentionally willing, having thoroughly read the text, to pay this project voluntarily with 5 percent of his income that is over the poverty line.**

I describe many details, so that they - after publication of this text - are no more patentable, if they possibly could have been patentable previously.

I show the feasibility at first and afterwards (in Annex 3) the financiability of the Ccycling project. It contains the following synergically connected part projects:

1. The production of solar energy with 1 kilowatt per human being
2. The collection of CO_2 from the air and its storage
3. The CO_2-transmutation to C
4. The depositing of the C
5. The transmutation of the C to soloil
6. The distribution of the soloil with pipelines over the whole earth
7. The distribution of the electricity over the whole earth
8. The cultivation of food for all mankind in the TPPs
9. The transportation of the food over the whole earth (Annex 1)
10. The desalination of sea water (Annex 2)
11. The greening of the deserts of this earth (Annex 2)

3. Some more concrete considerations to the actualization of the Ccycling

The locations of the CCyclers should lie at approximately 23° north and 23° south. The first TPPs should lie with inferior distance to an ocean at the edge of deserts.

The big deserts of the earth largely lie approximately at the two tropics near 23° north and south. There the air masses warmed up at the equator, having rained, sink down to earth, thereby warm up again and therefore are very dry. The dryness of this air is the cause of the deserts. At 23° north, they lie in

1. North Africa,
2. the Arabic peninsula and
3. the southwest of North America (Mexico);

at 23° south, they lie in

4. South Africa,

5. Australia and

6. the west of South America.

7. In Asia, they lie in higher latitude at 40° nort h east of the Caspian sea,

8. likewise in the USA in Arizona.

These eight regions are so gigantic, that it is easy, to find optimized locations and to equip them with infrastructure. The Sahara alone has a surface of nine million km^2. The most suitable locations lie at stone deserts, in which the danger of sandstorms is low. (The danger of the sandstorms is low anyway for the CCyclers, because of the felt material covers around the turbines.) The locations have strong sun radiation because of a high standing sun in dry air almost daily. At the tropics, the sun stands in the zenith in the local summer at noon. In the winter, it stands at 90° - 2 x 23° = 44° over the horizon.

sin 44° = 0,7. The effectivity of the TPPs sinks to a minimum of 0,7 = 70% at winter solstice.

Until approximately 45° latitude it is possible to erect big TPPs economically. In the winter, the sun at 45° latitude still stands at noon 90° - 45° - 23,5° = 21,5° above the horizon, in the summer 90° - 45° + 23,5° = 68,5° ab ove the horizon. The farther the sun stands from the zenith, the surface of the thermic power plant must become bigger for the same performance (according to the sinus of the angle from the horizon plus atmospheric extinction), the other considerations remain the same. At 20° above the horizon the sunlig ht must pass three times the amount of air compared to 90°.

The effectiveness of the utilization is optimal with 23° latitude. The southern TPPs power the southern hemisphere of the equator as far south as to the South tops of the continents; the northern TPPs power the northern hemisphere of the earth with solar energy as far north as to the northern polar circle.

The CCyclers are almost self sufficient at the beginning of their utilization: Their energy comes from the sun, their raw material from the air, their final product C is deposited in their proximity. Only later, the other utilization forms of the solar energy join:

Pipelines for soloil,

Pipelines for water desalination and desert irrigation,

High voltage networks for the transportation of the electricity in the near surroundings.

Settlements and cities of a new lifestyle are built around them in the parks of the again awakening nature having enough water for growing and flowering.

Only **streets** to the building sites, **villages** for the construction workers and co-workers with their **infrastructure** and a water connection with an ocean with **two saltwater pipelines** must originate at the beginning of the construction works, so that the large scale building sites can work and afterwards the CCyclers too. From the saltwater, freshwater is won and the concentrated saltwater is disposed again into the ocean - or it is partly used for cheap production of healthy sea salt.

There already are different sun power plant types that work with different conversion principles, some of them tried large scale technically:

Photovoltaic with big silicon surfaces,

Photovoltaic with concentrating mirrors as parabolic furrows with approximately 30fold concentration and more,

Heating of water or other liquids in parabolic furrows to steam, whose energy is used by electro generators,

Central towers with a recipient, which is lent to very high temperatures. Very many flat heliostat mirrors are directed to it.

The effectiveness of their utilization of the solar energy is approximately 15 percent.

And there are TPPs, ThermicPowerPlants or UpcurrentPowerPlants, solar updraft towers, solar chimneys, solar towers or Solar Aero-Electric Power Plants, SAEPPs**. [1])[2]) I describe them more exactly, because they form the basis of the Ccycling: They work with big circular surfaces that are roofed with clear glass.** The sun radiation under the glass is absorbed in the ground. The ground becomes heated through it. It gives off its heat to the air over it.

[1]) Descriptions and images:
http://www.solarmillenium.de/ > Technologie > Aufwindkraftwerke; >Fakten; & >Funktionsweise; & >Pilotprojekt;
http://www.vdi-nachrichten.com/vdi_nachrichten/aktuelle_ausgabe/akt_ausg_detail.asp?source=mail&cat=2&ID=12158
http://de.wikipedia.org/wiki/Thermikkraftwerk

[2]) Aufwindkraftwerke: Jörg Schlaich; FVS Themen S. 85 - 89; 2002;

The air is warmed up, expands and so gets thinner and therefore in the middle of the circular surface the air rises into a very high central ‘chimney’. The air drives several air turbines with current generators that are at the bottom of the chimney. The pressure difference at both sides of the turbines is transformed to energy. In the chimney there is more than a kilometre of heated air that is thin, around the chimney there is colder and thicker air pressing the air into the turbines. ThermicPowerPlants are a type of gigantic round greenhouse that is open at the periphery and has a very high chimney in the middle.

These power plants can generate energy 24 hours per day, in fact all the more even, the bigger their heat buffer is. They will form the energy ground load supply of the earth.

A form of the heat buffer could look like this:

The ground consists of heat storages in form of once filled, extensive water reservoirs that are less than 1 m deep. They are thermally insulated below and have covers of dull black electric oxided aluminium with big cooling ribs up to the air and down to the water that are directional to the center of the TPP. With these heat storages, the TPPs can work uninterruptedly without sun radiation with full performance even several days, according to the depth of the basin. They have a ‘sun storage ground heating’ so to speak.

With 1 m of depth there are 1.000 l H_2O / m^2 with 1000 cal / (l x ℃) = 10^6 cal / (℃ x m^2). (1 cal = 1 calory = +1℃ for 1ml water)

With 4,2 Ws / cal and 3,6 x 10^6 Ws / kWh follows: (1 Ws = 1 watt second and 3.600 s/h x 1.000 W/ kilowatt = 3.600.000):

[10^6 cal/ (℃ x m^2)] x 4,2 Ws/cal / (3,6 x 10^6 Ws/kWh) = 3,9 kWh/ ℃ x m^2 of energy storage.

The sun radiation is approximately 1 kW or 1 kWh/ h. With 20℃ temperature reduction of the reservoir, I can drive the TPP without sun radiation approximately 80 hours or 3,3 days.

(3,9 kWh/ ℃ x m^2 x 20℃ = 78 kWh/ m^2). The heat storage is thermally filled in about a week and from then on is available for the entire term.

TPPs even work with diffuse sun radiation, because the radiation does not become concentrated. Buffered through the heat storages the TPP works extremely economically with almost constant energy output.

The glass roof consists of prefabricated quadratic double glass elements in modular series production. The glass of the collector surfaces should be double glass in order to minimize the losses through heat conductivity. The glass should be anti-reflection coated, so that the reflection losses of approximately 16% (4 % at each four glass surfaces) are decreased to approximately 5%. Anti-reflection treatment for optical systems is a series process that still nevertheless is expensive today, because it is a treatment of a few square meters per day. If however the glassworks make an anti-reflection treatment for over 1.000 square kilometres of glass, then, the price per square meter only amounts to a few cents: The additional expenditure in order to achieve some 10 percent more effectiveness with the TPPs is worthwhile.

The bearers of the roof are 2 to 10 m high steel armoured concrete pillars with streamlined cross-section directed to the centre, so that the friction resistance to the airflow is minimized.

The usable sun radiation has approximately 1 kilowatt/ m^2 for daily approximately seven hours or 0,29 days, therefore approximately 290 W/ m^2 continuous input. The efficiency of big TPPs is low unfortunately, approximately only 0,7 percent. For smaller collector surfaces, the efficiency sinks even further.[2]) Only very big TPPs are therefore economic. However, by the measures described here, the efficiency can be increased by over 50 percent of the standard value from 0,7 percent to far over 1%:

1. dull-black absorbers from
2. high heat conductivity aluminium with
3. cooling ribs and
4. constant water temperature,
5. anti-reflection
6. double glass,
7. low turbulence formation in the airflow.

A slightly costlier investment presumably is more favorable with very long terms than a less effective savings version.

The higher the chimney is the bigger the efficiency, with which the incident radiation can be used. Since the high heated air column in the interior of the chimney and also over it is much thinner than the cooler air column, that surrounds the chimney outside, a hypotension is created in the interior of the chimney that is all the bigger, the higher the chimney is. It drives the air upward that streams in below, and it drives in the cooler fresh air at the outside periphery of the TPPs.

A practically realizable TPP could have a circular glass surface of 38 km^2, therefore a radius of 3,5 km. The chimney could have a height of one kilometre, an inner diameter of 120 meters with wall strength of 99 cm below and 25 cm above. In the interior of the chimney, streamlined pre-stressed steel spokes are appropriate to the stiffening against torsion forces. The pre-tension originates through montage of the spokes between an inner ring with small diameter and the outside ring that is tense at the chimney-outside-wall.

The chimney seems gigantic at the first moment. It is to be built relatively simply, however, different than a skyscraper of this height: It has the form of a tube. It has a height not even eightfold the diameter. The static is simple, the wind strengths are low. Nevertheless, its

foundation must be a big and thick concrete plate, because the weight of the chimney amounts to approximately 400.000 tons.

This TPP has a continuous output of approximately 77 kilowatt (**without** the 7 described methods to the increase of the efficiency. Possibly the continuous output power will be two times as high.).

13 such single power plants construct a unit, that has 1-GW = 1 million kilowatts of continuous output, a '**1-GW-TPP**.' The diameter of the entire unit is approximately 40 km, comparable to the surface of a city of several million inhabitants. More than half of the surface serves to the influx of the air into the individual TPPs.

6.000 such units must be erected in order to have 6 billion kilowatts of continuous output.

The calculation to this:

r = 3,5 km; d = 7,0 km; F = d^2 x π / 4 = 49 km^2 x 0,785 = 38,5 km^2 = 38,5 x 10^6 m^2 collector surface of a TPP

| x 290 W / m^2 = 11,2 x 10^6 kilowatts incident performance

| x 0,7 percent of efficiency = 78 kilowatts of continuous output per TPP

| x 13 TPPs = 1.015.000 kilowatts = 1,02 GW. 1 million kilowatts of continuous output of the installation.

38,5 km^2 x 13 = 500,5 km^2 = collector surface of the 1GW-TPP

D = 40 km; F_{total} = 40^2 km^2 x π / 4 = 1.256 km^2 total surface of the 1GW-TPP / 325 km^2 = 2,51-times.

6.000 x 1.256 km^2 = 7.536.000 km^2; | / 2,51 = 3,0 million km^2 collector surface of the Ccycling Project

6.000 x 1 million kilowatts = 6 billion kilowatts / mankind

The surface of the earth is 510.000.000 km^2.

3.000.000 km^2 / 510.000.000 km^2 = 0,00588 = 5,9‰. **The collector surface is 0,6 percent of the surface of the earth.**

The used materials are concrete, glass, steel and aluminium as immovable, once to build structure and additionally the classic turbines with current generators as single moving parts. Concrete and glass are products that can be produced simply and cheaply on the whole earth. The energy required to their manufacture can already be delivered by the first TPPs. For the realization of this mankind project, the accordingly big production places must be erected at the borders of the deserts of the continents.

The main wear-parts are the turbines with current generators with very long terms until the next maintenance like in conventional power plants. They furthermore run day and night with constant performance; therefore they run wear-poor. And they run very slowly. One takes several turbines for one TPP, so that each one is small and cheap and that the others keep on working if one should fail. The turbines are Kaplan turbines that collect energy from the pressure difference of the moving air. They are tested in water power plants worldwide since 1913.[5])

[5]) http://de.wikipedia.org/wiki/Kaplan-Turbine

The most important cost factor of a TPP is the labor that is needed mainly for the construction and afterwards only to a very low extent for the operation and for the maintenance.

A part of the maintenance is **the cleaning of the glass roof**. A roboter for high-pressure water cleaning, that sucks up the water with the mud again, with 10 m of width and a speed of one meter per second cleans on one day, consisting of 24 x 60 x 60 s = 86.400 seconds: 864.000 m^2 = 0,864 km^2, therefore in one month it cleans over 25 km^2 glass roofs. Such a cleaning machine, that is sufficiently light-weight, belongs to each TPP in order to be able to drive on the glass roof. Experience has shown that the glass is cleaned automatically by the wind. So this roboter is more than sufficient.

TPPs work with conventional, long tried technology (greenhouse and turbine generator). They are long time stable. **They now are already - positioned in deserts - more favorable than conventional fossil power plants and essentially more favorable than nuclear power plants.**

Tornado power plants are a possible advancement of the TPP. In them the air in the chimney is caused to rotate quickly. By this means it is assured that the whirlwind rising quickly into the atmosphere stays there over the chimney for some hundreds of meters. So the chimney is virtually much higher than the concrete tower. The effective height of the chimney multiplied with the surface of the glass roof collector defines the efficiency of the TPP.

Another possibility to increase the output power with less investment costs could be to use **a plastic tube on top of the concrete chimney**, its walls consisting of two layers of plastic filled with air with excess pressure for stiffening. Experiments in that direction are made. Its opening in the atmosphere could be **lifted up with a stationary Helium balloon** fixated with three ropes.

Another possibility to increase the efficiency of a TPP consists in the combination with the principle of the **fall wind power plant** or catabatic wind power plant, that is applied here vice versa (therefore outside): The vaporization of freshwater generates vaporization cold. It makes the air cooler, therefore denser; therefore it effects a higher pressure outside the chimney. If spray nozzles for freshwater are installed at the outsides of the chimney of the TPP and through it cool the outside air that therefore becomes denser, then the pressure difference between the warm air that streams in the interior of the chimney and the cooled down outside air rises. The turbines are driven more strongly according to the greater pressure difference. The outside air already is cooler over the glass roof than the environment air of the desert area anyway, because the glass roof consists of double glass so that it remains cool outside. The sun radiation is absorbed only in the ground in the interior. Glass is impermeable for long-wave infrared radiation; the inner glass warms by the warmth of the air and by the infrared radiation of the ground and the outside glass remains cool ('greenhouse effect'). The heat remains in the interior of the glass roof.

TPPs constructed on slopes
For the northern hemisphere of the earth the following description is correct, for the southern hemisphere 'south' is to be replaced by 'north':
At southern slopes of valleys or also of hills in the flat landscape TPPs are asymmetric: The glass roofs of a TPP are parallel to the slope with the chimney at the top of the hill. The glass roofs have an opening in the valley and they are closed at the sides and the chimney is not in the middle of the glass roof but at the highest point of the slope that is falling down to the south. In this way, the height of the slope can be used in addition to the altitude of the chimney and the narrowing of the slope in direction to the top serves for the concentration of the air and therefore of its pressure.
In the plain this concentration is achieved by planting the chimney in the centre of the roof in form of a circle.
The slope in southern direction also has a better angle to the sun so that these places are to be preferred to flat surfaces.

There are other sun power plants that work essentially more effectively than the TPPs, calculated in output power to input radiation of the sun. Efficiencies of 15 percent already are exceeded. But calculated as **'investment in money' to 'continuous output', measured in Euros / kilowatt nevertheless the TPP possibly has the lowest number**, because the investment in square meters of double window glass probably can not be undercut. Also the maintenance costs are extremely low because of the simple wind turbines with current generators, exactly like with the technically ripe normal wind power plants. Likewise, **the long-time stability** probably is not surpassable, because of the simplicity of the TPPs. Practically no 'high tech' is used. On the other hand the big surface used by the TPPs is especially good for the collecting of air for the recycling of the CO_2.

Nevertheless it should be considered whether the energy of other sun power plants cannot be shared in order to use it in the conversion of C from CO_2 if the CO_2 was already gathered by the TPPs.

4. Collecting and transmuting of the CO_2 from the air

The energy capacity is the prerequisite for the second and third step of this mankind project: Collecting of the CO_2 out of the air and its transmutation to C.

The air that streams into the TPP is led through liquid chemicals in the inside of the installation, for example through a watery solution of Lithiumhydroxid (LiOH) or alternatively through soda-lye (Natriumhydroxid, NaOH) or through **lime-water ($Ca(OH)_2$)**. These materials bind the CO_2, with which they come in connection.

A felt material curtain is vertically fixed at the glass roof construction and at the ground around an inside periphery of the TPP. The liquid for the absorption of the CO_2 is supplied by the edge of the glass roof and slowly runs vertically downward in the felt material from above through its weight. The air streams horizontally through this felt into the TPP. This felt with the absorption liquid works like a filter, that binds the CO_2, but lets the air pass through. It decreases the effectiveness of the TPP a little because an inferior pressure difference prevails on both sides of the felt material. Furthermore, some water is evaporated at the passageway of the air. The air becomes somewhat cooler through it.

The hypotension in the interior of the TPP drives the air through the moist felt. The liquid gathers in grooves below the felt filter, and comes to the chemical processing of the CO_2, while the regenerated liquid streams anew through the felt.

The absorption liquid as addition to the water is necessary, because the solubility of CO_2 in water (from air with 1 bar) is 0,5 mg/ l (at 20℃); approximately 0,2 mg/ l at the higher desert temperatures.) Here is the calculation:

With 380 ppmv CO_2 in air, a $m^3 = 10^6$ cm^3 of air contains 380 cm^3 CO_2.

CO_2 has a density of 1,98 kg / m³ (under normal conditions), air has1,293 kg / m^3.

(1,98 kg/ m^3) / (1,293 kg/ m^3) = 1,53.

The mass parts per millions ppmm of the CO_2 in the atmosphere are 1,53-fold the ppmv.

It is therefore 380 ppmv x 1,53 = 582 ppmm (parts per millions masses) CO_2 in the air. 1 m^3 air contains 380 cm^3 CO_2 or 582 mg CO_2. With pure water as solvent, one needed for this quantity 582 mg CO_2 / 0,2 mg/l = 2.907 liters ≈ 3 m^3 H_2O per m^3 air. That is unrealistically much. One therefore needs another solvent that works more effectively, for example, one of these above mentioned watery solutions.

Possibly, other procedures are even more suitable, for example the **electro chemical separation** or **Aluminiosilicates** as receivers of the CO_2-molecules or a unification of several of these procedures. However, the collecting-effect for CO_2 with the streaming of the air through the wet felt material is presumably the biggest and at the same time cheapest method.

Alternatively it could be also done additionally with **a mist of the solvent in an area between two felt material filters** if even higher CO_2 collecting-effectiveness is wished. The mist is collected with the inner felt filter.

Because of the wind speeds in the interior of the TPP, the felt material must be very stable. It can, for example consist of a thick web of micro fibers from polypropylene, that is reinforced with fiberglass or coal fibers.

With the gigantic quantities of air, that stream through the felt, the evaporation of the water is not to be neglected, and the supplies of the water in the desert must be solved, which is done by the freshwater production that is necessary anyway.

On the other hand, air with higher humidity is created through it in the desert regions. The moisture can rain, because the air directly after moistening reaches a height of several kilometres and cools down very fast very strongly. **This will essentially improve the weather in wind direction behind the TPPs.** Trees, that are planted there, can thrive better through it.

The first forest plantations are therefore positioned in the main wind direction of the TPPs.

The **water** supplies are guaranteed through a double pipeline of non-corroding steel to the next-situated ocean that is put to any 1-GW-TPP. It leads 3,5% salty sea water to the TPP. It is pressed at high pressure through ion-filters with solar energy and so is changed to **freshwater**. The thinner return-pipeline with 10 percent of the cross-section of the sea

water pipeline leads the 10:1 concentrated saltwater back into the ocean at an outlet sufficiently far away from the inlet, as well as to salina fields in the coast region, in which the sea salt is harvested that was up-concentrated with solar energy. With the saltwater pipelines, it also is secured that enough water is available for the construction and for the workers.

During the construction phase of the first TPP of a group, however, the energy must be available through a small extra-power plant for the construction and for the water desalination. After completion of construction this conventional power plant can be removed to the next construction site.

Later, when the atmosphere has the wanted CO_2-concentration, **the freshwater production can be one of the main goals of the TPPs in order to make the deserts fertile and afterwards also, in order to lift the ground-water level under the deserts again** - another century project that then is possible to be realized.

(**Compare Annex 2: Freshwater Production**)

It can be necessary, to erect TPPs for the production of freshwater for the supply of the inhabitants of arid zones independently from the Ccycling, because of the water shortages in many areas of the world.

There are more greenhouse gases than CO_2, for example **Methane CH_4, from the warming permafrost grounds and from other sources: The nitrogen of the air - it is no greenhouse gas - can be processed to nitrogen-fertilizer.** If this is done, the nitrogen is secreted from the air by fractional distillation of liquified air. In this case it is easy to sequester all the other **G**reen **H**ouse **G**ases too. **In the process of air liquefaction and fractional distillation for nitrogen production the other GHGs (CH_4, N_2O, O_3, CFCs,…) can be collected too by fractional distillation, practically without additional costs.** In the chemical factory they are treated differently: CH_4 is combusted and the energy is used, the other GHGs are transformed to nitrogen, oxygen and to harmless inert solid products. But they can only be collected from a part of the air, because the cooling of the air is very energy consuming. The CO_2 in contrary can be extracted from all of the used air.

From the watery solution, the CO_2 is processed further with chemicals that reduce the carbon at 1000℃.

The reaction-equation is:

$$CO_2 + 393\ kJ/\ mol <=> C + O_2$$

('kJ/ mol' is called 'kilojoule per mol.' 1 kilojoule is one kilowatt-second; 1 mol is the atomic weight as well as the molecular weight in grams. This conversion-equation runs in both directions (<=>): To CO_2 with the combustion (<=), to $C + O_2$ through the Ccycling (=>).

The conversion of kJ or kilowatt-seconds to the unit kilowatt-hour, that is more current in daily life, is:

393 kJ = 393.000 Ws │ / (1000/k x 3.600 s/h) = 0,1092 kWh. The reaction-equation therefore is rewritten:

$$CO_2 + 0{,}1092\ kWh/\ mol => C + O_2$$

The mol is the atomic or the molecular weight in grams:

C has 12 mol, O has 16 mol, O_2 therefore has 32 mol and CO_2 44 mol. The equation therefore further rewritten is:

$$44\ g\ CO_2 + 0{,}1092\ kWh <=> 12\ g\ C + 32\ g\ O_2$$

12 grams carbon therefore yield approximately 0,1 kWh with their combustion.

The conversion of 440 g CO_2 **to 120 g C** + 320 g O_2 **therefore costs approximately 1 kWh.**

This is the reverse step to the combustion. Because of this relatively very large energy quantity it is too much CO_2 in the air at all. Therefore, mankind uses this reaction since centuries. The 0,1092 kWh/ mol are won with the combustion, that is the exothermic process that the industry uses - and with the C-production, they must be inserted into the conservation of the high temperature so that the endothermic reaction can run in the reverse direction. Whichever type of chemical conversion is chosen: All processes lead to the giving/ receiving of this energy quantity.

The Bosch process produces C directly in that it burns hydrogen at an iron catalyst between 530℃ and 7 30℃ with CO_2: (The hydrogen is previously energy-lavishly produced for example through electrolysis of water)

CO_2 + 2 H_2 => C + 2 H_2O + heat

This procedure generates carbon directly. It then is pressed strongly and is deposited as **anthracite** coal.

The Sabatier process transmutes CO_2 to methane at a nickel or cobalt catalyst in an inter-step between 300 and 400℃:

$CO_2 + 4\ H_2 \Rightarrow 2\ H_2O + CH_4$ + heat

Possibly this process is the suitable one in order to produce **fuel oil - soloil**.

5. ThermicPowerPlants are ideal for Ccycling

In ThermicPowerPlants, TPPs, large air masses are warmed up, whose buoyancy is converted into air speed, whose energy drives the turbines that are coupled with current generators. From these air masses, the CO_2 can be extracted simultaneously during the process of the energy production. The produced energy immediately flows into the chemical conversion-reactions.

In this project, the power plants primarily do not serve the production of energy but the production of carbon in very large scale. They must therefore be optimized for this purpose and must have big dimensions, so that they can be effective.

The TPP-production of a standard type takes place in series production at the conveyor belt in module construction manner (for example: 6000 1GW-TPPs x 13 TPPs/ 1-GW-TPP = 78.000 TPPs). With this method the construction costs can be lowered essentially compared to the construction of one single TPP. Likewise, the speed, with which the TPPs can be erected, accelerates. That is important.

The modules, their number and their construction are optimized according to increasing knowledge while producing.

It is ingenious to form groups of several such 1-GW-TPPs (One-Gigawatt-ThermicPowerPlants) as suppliers around a central chemistry factory that produces the carbon and deposits it. **The infrastructure of the chemistry factory and the receptacles of the depot, the pipelines and the high voltage managements, the saltwater**

pipelines and the desalination installations are needed only once in that structure. If one component fails, the others can jump in.

The (for example) 20 times 1-GW-TPPs of a group are arranged in a line 90°to the normally prevalent wind direction in the respective region, so that each 1-GW-TPP can suck in 'unCcycled' ground air - comparably like today large wind power plants are arranged, so that each of them receives the original wind without whirls from its neighbors. The 'unCcycled' air slowly pouring in horizontally still contains the full CO_2-content, the exhaust air in approximately 1 km height streaming out with high vertical speed has only a very strongly reduced CO_2-content.

Any 1-GW-TPP is planned in a way that it can be enlarged without problems later by simple enlargement of the base, by mounting of stronger generators with changed turbines or through further TPPs that are erected at the outskirts of a 1-GW-TPP.

Supposed the felt curtain with the absorption liquid has a diameter of 500 meters around the centre of the chimney, the surface outside of it is **usable additionally as a real greenhouse for growing plants – leading to a slightly lesser amount of produced energy.** We have the option to choose, which we want more and can construct the TPPs or just some of them to real greenhouses for mankind's food production. The circle inside the felt curtain has just a small amount of CO_2 anymore, so plants will not grow there. 99,5% of the total surface of a TPP is usable for food production. So about 38 km^2 are usable for food production. The calculation is:

(7.000 m)^2 x 3,14/4 – (500 m)^2 x 3,14/4 = 38,5 km^2 – 0,2 km^2 = **38,3 km^2** = 99,5%.

The wind speed at the chimney is about 7 to 15 m/s = 4 to 7 Beaufort, that is breeze to moderate gale. Maintenance of the turbines and the chimney is possible and the force of the wind pressure to the curtain material is manageable.

With 13-times 6.000 TPPs (= 6.000 1-GW-TPPs) we therefore have a possible greenhouse surface of over

13 x 6.000 x 38 km^2 = 2.964.000 km^2 | / 6.000.000.000 people =

= 0,000494 km^2 / human = 494 m^2 / human being.

This arable land with sufficient water for irrigation is more than sufficient for the vegetarian life of a human being (1 kg per day), above all, since it is in best situation and additionally still in the greenhouse with constant, soft air flow. **All the 'rest' of the earth surface is free for uncultivated nature as it is, for parks, for new self-sufficient settlements in the middle of the loneliness, etc. and for an emergency reserve in case of any grave accident.**

The fertilizer for the gigantic number of plants at the edge of deserts for supply of the whole mankind can also be produced by the TPPs:

The plant quantity is in the magnitude:

1 kg/ (human being x day) x 6 x 10^9 human beings = 6 x 10^9 kg/ day │x 365 days = 2,19 x 10^{12} kg / a ≈

≈ 2 x 10^9 t / a = 2 km^3 / a

(1 kg / human x d) x 365 d/a = 365 kg / a │ / 494 m^2 / human being = 0,74 kg / (m^2 x a)

Per square meter should be harvested 0,74 kg of food per year - in three to four harvests -. That is very little. Normal profits **per harvest** are 0,4 to 0,8 kg/ m^2 dry-mass of plants or grain mass (for example wheat), according to 1,6 to 3,2 kg of dried food per 4 harvests.

Therefore the greenhouses are built only at some 25% of the TPPs.

The nitrogen-fertilizer for the plants is processed from the nitrogen of the air in the chemistry factory through cooling and liquefaction and through ammonia-manufacture by the Haber-Bosch process. The high energy consumption of this procedure, in order to produce the chemical compounds of the nitrogen, is delivered by the TPPs likewise.

(Compare **Annex 1: Pipes - the global transport system for food**)

6. How long does it take until the necessary energy capacity is available?

What, if we start this energy project with one trillion Euros per year and with a high urgency?

To the comparison: The Iraq war of the USA 2005/06 has cost the taxpayer of the 'conqueror' power in one year over 0,3 trillion U.S.$. The USA contain 5 percent of mankind's population (0,3 billion people / 6 billion people = 5 percent).

This war corresponds to approximately 6 trillion Euros per year as financial burden for the whole mankind.

The organization 'Ccycling.org' is established and its funding is regulated, as soon as more than ten million Euros are met. It is structured strictly logistical.

The planning starts

for a Standard-TPP in module construction manner with its infrastructure, (streets, factory-buildings, worker-homes, grids for power, water, information, …),

for a group of these TPPs with central chemistry factory, (receptacles, pipelines for salty water and soloil, pipes, desalination-factorys, …),

for the large-scale factories to the manufacture of concrete, glass, armament steel, noble-steel, aluminium, polyurethane, …,

for the factories, in which the TPP-modules are produced, (window-cases, concrete-pillars, water-receptacles, cooling-rips, insulations, turbines, current-generators, steel-blades, towers, …),

for quality-testing,

for the optimal locations in the eight regions of earth.

Big value is put on **optimization of the quality and durability for decades or better centuries,** on corrosion solidity, resistance to wear, etc., because the TPPs should run generation-long without interruption and breakdowns. Then, they are the most economical.

Glass and concrete and steel and aluminium factories are erected everywhere at central points of desert-near and at the same time ocean-near regions of the continents. (Polyurethane can be produced in the chemistry-factories of the Ccyclers.) The streets are traced. The water pipelines are put. The mass production of the series parts starts. The turbines and current generators are produced in big numbers of pieces. **The many million of until now unemployed persons are trained to construction workers and skilled workers world-wide.** The building sites are levelled. And after three years of construction time for a TPP it goes into operation. The capacity of the concrete , steel , and aluminium factories and glassworks allows for the maximum speed of the construction.

Everywhere on earth, the wealth grows. Poverty and hunger and thirst decrease in the surroundings of the construction sites more and more each year. The building sites are simultaneous in all eight desert regions of the earth. **The beauty and the benefit of the project cause a zest under all participants,** that is bigger and essentially more justifiable than the one for the project of John F. Kennedy in the USA 1961 for the 'lunar-landing in this decade.'

The participants - that is the whole mankind that takes their way out of the climate catastrophe by themselves.

The TPPs can be created also in the vicinity of cities until about 45° geographical latitude afterwards . **When the goal of 6.000 1-GW-TPPs is achieved, the production of the TPPs can go on and on, according to the needs of energy, food, water and practicability, also in the vicinity of cities (embedded in nature parks).**

Assumed, at the beginning simultaneously 30 times 1-GW-TPPs per year and per region can be in construction, therefore, 30 x 1-GW-TPP x 8 regions = 240 1-GW-TPP / earth get done in three years construction time, therefore 240 x 1-GW-TPP / 3 years = 80 x 1-GW-TPP per year on the earth could be done after first attempt-postponements. Later, when the series production is running, when the production bottlenecks are removed and when the money flow of 1 trillion Euros per year goes on, then the construction will go even faster with the then-developed special machines, etc., with maybe **300 completed 1-GW-TPPs per year.**

A rough estimation to the number of employees and workers, that can be employed for one trillion Euros per year: If the average gross monthly wage is 1.500,- € per employee (from worker to CEO), then he earns 18.000,- € per year. With investments into his workplace of the same size of 18.000,- €, it is 36.000,- € / job per year (including buildings, machines, raw materials like sand for glass, iron ore for iron, bauxite for aluminium, pipes, pumps, turbines, and other expenses).

10^{12} € / 36.000,- € **= <u>27,7 million jobs</u> │ / 300 1-GW-TPPs = 92.330 workers per unit in construction.**

With 300 x 1-GW-TPPs per year and one trillion Euros per year we have

1 trillion € / 300 1-GW-TPPs = 3,33 billion Euros per 1-GW-TPP. An individual 1-GW-TPP in mass production approximately costs about 3 billion Euros.

(The price for a nuclear power plant of this performance today would be well over 5 billion Euros - without the nuclear fuel uranium and its subsequent final depositing, which after 40 years of testing is still unresolved! And too without the insurance costs for a greatest reasonable accident with 1 million deaths.)

These costs include

the chemistry factory for the transmutation of the C, later also from C to soloil,

the depot receptacles for the CO_2 as well as for the C,

the two pipelines for the saltwater,

the pipeline for the soloil and the pipes,

the water desalination installation,

the high voltage managements for the current,

the highways,

the settlements and cities for the factory workers, the construction workers and co-workers and their families, their education and the other social benefits for them.

This means **20 years of intensive construction activity with 20 x 300 = 6.000 1-GW-TPPs after approximately 10 years for the start up of the production.**

Possibly the costs will sink with **mass production and synergy of 1-GW-TPP-groups** in a way that not even the amount estimated here will be required.

The complete changeover to Ccycling can be managed in barely one generation. That means: Far over 100 percent of the world-wide generated CO_2 is recycled then. After all the surplus CO_2 was removed from the atmosphere it is switched gradually to the production of pure solar energy in form of soloil and electricity inclusive Ccycling.

7. How much energy is needed in order to free the atmosphere again from its surplus CO_2?

The atmosphere had a thickness of 7.992 meters ≈ 8 km, if it had the same density everywhere as with atmospheric pressure at sea level. The calculation to this is:

The normal-pressure of the atmosphere at normal-zero amounts to 1.013,246 hecto-Pascal.

1 Pascal = 1 Newton / m^2 = 101,9716 g weight (pond) / m^2

1 hecto-Pascal = 1 hPa = 1 Newton / (1/100 m^2); 1/100 m^2 = 100 cm^2

1.013,246 hPa = 1.013,246 x 101,9716 pond / 100 cm^2 =

= 103.322,3 pond / 100 cm^2 = 1.033,223 pond / cm^2 = 1,033 kp / cm^2

The air under normal-conditions has the density 1,2928 g / 1.000 cm^3.

1.033,223 pond/cm^3 / 1,2928 g/1.000 cm^3 = 799,21 x 1.000 cm = 7.992,1 m

An air column of the density of air at sea level of 7.992 meters height lies on average on the entire earth surface.

The total earth surface (with all oceans) has the size 510.100.933,5 km^2. The atmosphere therefore (theoretically) has a total volume at normal-pressure of

510 x 10^6 km^2 x 8 km = 4.080 x 10^6 km^3.

How much CO_2 is in the atmosphere?

1 m^3 air contains 380 ppmv = 380 cm^3 CO_2 or 582 mg CO_2 = 0,582 g. (see above)

4.080 x 10^6 km^3 x 10^9 m^3 / km^3 x 0,582 g CO_2 / m^3 = **2,37 x 10^{18} g CO_2 / atmosphere.**

The 100 ppmv = 153 ppmm CO_2, that came in additionally since the beginning of the industrial age, shall be extracted from it. Therefore

2,37 x 10^{18} g CO_2 / atmosphere x 153 ppmm / 582 ppmm = 0,623 x 10^{18} g CO_2 =

= 623 x 10^{15} g CO_2 x 12 g C / 44 g CO_2 = 169,9 x 10^{15} g C ≈ 170 x 10^{15} g C = **170 x 10^9 t C** | / 6 x 10^9 people =

= 28,3 t C / human.

170 x 10^{15} g C x 0,1092 kWh / 12 g C = **1,55 x 10^{15} kWh / Ccycling** | / 6 x 10^9 people

= 258.333 kWh / (human x Ccycling).

In words condensed:

2,37 trillion tons CO_2 are in the atmosphere. We get out the surplus carbon share from the atmosphere again in level of 170 billion tons of C in the entire Ccycling process, therefore 28,3 tons C per human being – and that is all already!

We require 1,55 Peta-kilowatthours for all the CO_2, that the human being brought into the atmosphere, to change it back again into carbon. **Each of the 6 billion people therefore must produce 258.000 kWh in order to even out the disused dump of mankind's last four generations again.**

130 years have (130 a x 365d x 24h/d) / a = 130 a x 8.760 h/a = 1.138.800 hours. Our ancestors (they were fewer than we are now…) of the last four generations therefore have used altogether - with us at the moment -:

258.000 kWh / 1.138.800 h = 227 W duration power / human being – with climbing tendency.

8. What does this cost?

To the estimation: With an arbitrarily assumed price of for example 0,10 Euro / kWh (a sub-'normal' price today) this is the sum of

258.000 kWh x 0,1 € = 25.800 €.

These nominal 25.800 € we give in a generation contract for the objective, that we could build our industry culture from it, without also taking into account in any form **the effects on our co-worl**d. We now do this by **levelling them out again.** The price for the prevention of the catastrophe is low, that otherwise would accompany us over millennia 'till to the fourth generation' as it is called in the Bible (Ex34,7). How much money is this altogether?

Nominally 25.800 € / human being x 6.000.000.000 people = 154,8 trillion Euros. That is about the BIP, the **B**rutto **I**nland **P**roduction of mankind of three to four years.

With one trillion Euros per year and thirty years of construction time we on the other hand get an investment price for the kilowatt hour of only
(30 a x 10^{12} €/ a) / 6 x 10^9 men = 5.000 €/ man
| / 258.000 kWh = 0,01937 €/ man = 1,94 c/ man, therefore
< 2 c / kWh. The operating expenses, that add to the investment, are approximately 0,32 c / kWh today [2]).

This price is staggered after the height of each citizen's income, distributes therefore justly: Everyone pays only 5 percent as 'Ccycling fee' comparable to a Ccycling tax.

For 2 cents per kilowatt hour, we can eliminate the climate catastrophe.

To summarize: 30 years x 1 trillion Euros / (year x 6 billion people) =

= **5.000 € / human being. That are the costs for the end of the climate catastrophe and for returning to the CO_2-values of 1880 and simultaneously for the erection of a complete new world-wide energy system, that delivers clean energy as soloil or current practically gratuitously from then on, that provides mankind with food, that greens the deserts, etc**

9. How long does it take, until this energy is generated by the 6.000 1-GW-TPPs?

(1.000.000 kilowatts / 1-GW-TPP) x 6.000 1-GW-TPP = 6 x 10^9 kilowatts of performance are at the disposal altogether. In one year, they generate an energy of

6 x 10^9 kilowatts x 8.760 h / a = 52.560 x 10^9 kWh / a = 0,0525 x 10^{15} kWh / a.

(1,55 x 10^{15} kWh / Ccycling) / (0,0525 x 10^{15} kWh / a) = 29,5 a / Ccycling

It therefore takes approximately thirty years or barely one generation until all the CO_2 is Ccycled to C, if all TPPs work continuously (that is about 50 years after beginning of the project).

10. How long does it take until the entire atmosphere was led averagely once through the TPPs?

In order to answer this question, I must know the wind speed at a certain diameter of the TPP to know the volume per second. The wind speed at the entrance of the chimney is 15,5m/s, the diameter of the chimney is 120 m.

The surface of the chimney is d^2 x π/ 4 = 120 x 120 x 3,14/ 4 m^2 = 11.304 m^2.

The surface multiplied with the air speed is the air volume per second: 11.304 m^2 x 15,5 m/s = 175.212 m^3/s.

With 31,5 million seconds per year one gets the volume per year: 175.000 m^3/s x 31,5 x 10^9 s/a = 5,5 x 10^{12} m^3/a =

= 5.500 km^3/a air volume per TPP | x 13 TPP/1-GW-TPP = 72.000 km^3/a air volume | x 6.000 1-GW-TPPs =

= 430 million km^3 air volume per year.

In chapter 7 we found the total volume of the atmosphere as 4.080 x 10^6 km^3.

4.080 x 10^6 km^3 / (430 x 10^6 km^3 /a) = 9,5 years.

If we estimate the collecting efficiency of the Ccycling as 80% of the CO_2, then: 9,5 a/ 0,8 = 11,9 years:

In 12 years **all** of the CO_2 will be collected from the atmosphere.

So in 12 years after completion of the construction there would be just 0 ppmv CO_2 remaining from the now 380 ppmv CO_2. A new ice age would be caused with it ;-)

To collect the first 100 ppmv from the total of 380 ppmv CO_2 one needs less time:

12 a x 100ppmv/ 380ppmv = 3,16 a, that is about three years:

In just three years the climate catastrophe is returned to the state of 1880.

That is almost incredible – But the calculation is correct.

The total conversion to C takes 29,5 a / Ccycling (Chapter 9). So the collecting of the CO_2 from the air is about ten times faster.

Even if the yield of the collecting from the atmosphere is not 80 percent, this does not amount to much. Also, the blown out and cleaned air mixes again with the remaining atmosphere. Also the concentration of the CO_2 in the air diminishes in the run of the Ccycling, so the extraction will be less effective. A sufficiently big rest-concentration of over 280 ppmv nevertheless remains, however. In this respect it is very good that all these effects do not matter much: The generated energy is the standard that determines the speed of the Ccycling.

This tosses up the question:

11. How to store the faster collected CO_2?

The CO_2 can only be processed to C completely with an energy amount of 6.000 GW x 30 a (i.e. in less than 30 years after completion of the construction).

The CO_2, which cannot yet be processed to C, because the energy was not yet generated for it, must therefore be deposited, 'sequestered' for the time being.

With the depositing of the CO_2, the climate catastrophe can be eliminated very fast after starting of the project.

>From the atmosphere, 100ppmv will be removed in 3 years. In 29,5 years (with 6000 1GW-TPPs) there is processed (chapter 10)

170×10^{15} g C x 44/12 = 623×10^{15} g CO_2 = **623×10^9 t CO_2**.

In form of water with a density of 1,0 kg/ l this would be 623 km^3.

Methods for the storage of CO_2 are in the testing:

Storage in deep sea basins is one of the ideas that come from the thinking of the last millennium: Throwing away, just like it also happened with the nuclear waste. Nature shall see, how it continues. 'I don't care if the sea becomes sour, if the creatures suffocate!' 'It doesn't matter what happens when I've gone.'

Storage in exhausted natural gas deposits and later retrieval, just like previously the natural gas was won, maybe is a possibility for small amounts of CO_2, because the total storage volume is not sufficient by far.

A very elegant possibility for the storage is: Refrigeration of under -78,5℃ and **storage as dry-ice in big cooling containers** directly beside the TPPs. An inferior part of the energy of the TPPs is taken for the refrigeration. If sufficient CO_2 is collected, the sun-energy is used no more for the collecting the CO_2 but only for the processing of the dry-ice to carbon.

I imagine e.g. big spherical receptacles of non-corroding noble-steel, just like petroleum reserve receptacles, with for example 50 meters diameter (if technically possible also essentially bigger). They could be embedded half into the underground beside the TPPs. They are totally surrounded by a polyurethane layer for heat insulation with a metallic blanc outer surface. We have to calculate with desert temperatures, with temperature differences of the dry-ice opposite the air of 120℃ at day and 90℃ at night and oppos ite the cooler underground of approximately 100℃.

This receptacle of 50 m of diameter has the volume of

$V_{Sphere} = 4\ \pi/3 \times r^3 = 4{,}19 \times 25^3\ m^3 = 65.400\ m^3$.

Alternatively, insulated noble steel cylinders standing upright similarly big would be a probably cheaper depot possibility – but the price for the insulation leak is naturally higher. They are also used today for the storage of oil.

Alternatively half-circle depots are even cheaper: **Very long depots of insulated non-corroding steel with a cross-section of a half-circle e.g. with 30 m interior diameter upon a fundament of insulated concrete**, constructed in form of a circumference of a circle (toroidal) around the 1-GW-TPPs. They have a volume per meter of
$d^2 \times \pi/8 = 30\ m \times 30\ m \times 0{,}39 = 353\ m^3$, therefore
per kilometre $V = 0{,}35 \times 10^6\ m^3$. That is the volume of about 5 of the sphere receptacles.

Each of the 6.000 1-GW-TPPs gets out of the atmosphere during Ccycling:

623×10^9 t CO_2 / 6.000 1-GW-TPP = $103{,}8 \times 10^6$ t CO_2

With a density of 1, I needed for the storage of the entire CO_2 of one 1_GW-TPP:

$103{,}8 \times 10^6$ t $CO_2 \times 1$ t / m^3 / 65.400 m^3 = 1.588 sphere receptacles.

The density of dry-ice amounts to 1.56 g / cm^3, so we have 399,4 $km^3 \approx 400\ km^3$ of dry-ice instead of 623 km^3.

Therefore I need only 1.588/ 1,56 = 1.018 such receptacles per 1-GW-TPP =

$1.018 \times 65.400\ m^3 = 66.559.000\ m^3 = 66{,}6 \times 10^6\ m^3 = 0{,}067\ km^3$ / 1-GW-TPP.

This corresponds to one of the big national oil storage fields as security reserves that exist in each big industrial nation at the moment. Germany's reserves are $25 \times 10^6\ m^3$, the reserves of the USA are more than $60 \times 10^6\ m^3$.

The TPPs immediately after completion begin with collecting of the CO_2 and with its conversion to C.

I calculate the amount of energy that is needed to **cool the half-circle receptacles**:

Per running meter they have a surface of
$d \times \pi/2 + d = 30\ m \times 1{,}57 + 30\ m = 77{,}1\ m^2$, so per running km 77.100 m^2.
The specific heat-conductivity of foam of polyurethane as insulation is 0,028 W/m x K, so at one meter thickness and one degree heat difference 0,028 W per square meter are conducted in the form of 'temperature'. For simplicity I assume that the insulation has a thickness of one meter, a realistic assumption. Per running kilometre of the half-circles and a temperature difference of 100℃ = 100K it is conduct ed:
(0,028 W/ m x K) x (77.100 m^2 surface/1 m thickness) x 100K = **216 kW** energy/ km
I need 0,067 km^3 = 67 x 10^6 m^3 / 1-GW-TPP storage volume.
I have per kilometre $V = 0{,}35 \times 10^6\ m^3$, so I need
67 x 10^6 m^3 / 0,35 x 10^6 m^3 = 191 km length of the half-circle receptacles per 1-GW-TPP, encircling one 1-GW-TPP roughly 1 ½ times. They have the surface of
$O_{h\text{-}c}$ = (77.100 m^2 / km) x 191 km = **14.700.000 m^2** ($_{h\text{-}c}$ = half-circle)

They need the cooling of
$E_{h\text{-}c}$ = 14.700.000 m^2 x (0,028 W/ m x K) x 100 K = 41.233 kW **= 41,2 MW | / 1.000 MW = 4,1%**

The output is 1 GW = 1.000 MW, so **the amount for cooling with the half-circle-depots is just about 4% of the total output – at maximum. That is tolerable.**

With the other solutions of the receptacles I get slightly better amounts of cooling. I calculate the 1.018 spheres:

1.018 spherical receptacles of 50 m diameter have a surface of and a cooling need of
$O_{S1} = 4\pi r_S^2 = d_S^2 \times \pi = (50\ m)^2 \times 3{,}14 = 2.500 \times 3{,}14\ m^2 = 7.850\ m^2$ | x 1.018 receptacles
O_{S1018} = **8.000.000** m^2 | x (0,028 W/ m x K) x 100K =
E_{S1018} = 22,4 MW | / 1.000 MW = 2,24% = 55% x $E_{h\text{-}c}$

The spheres are about half as expensive energetically.

The energetically best solution I can achieve with one single sphere as a giant receptacle. I calculate that solution too:

With one big spherical receptacle halfway buried in a valley I get the smallest cooling surface possible. I need a sphere of
$V_S = 67 \times 10^6\ m^3 = 4\pi/3 \times r_S^3$;

$r_S = (67 \times 10^6\ m^3 \times 3/4\pi)^{1/3} = (16{,}00)^{1/3} \times 10^2\ m = 2{,}52 \times 100\ m = 252\ m$ radius;

d_S = **504 m diameter – a huge construction, somewhat bigger than the biggest super tankers nowadays.** Half of the sphere can be built of reinforced concrete, the fundament, and possibly the other half too. Possibly the upper half can be constructed as a hyperboloid that is stable in itself in the gravitational field of the earth.
Compare the huge hyperble in just two dimensions, **the Gateway Arch, 192 meters high**, the emblem of Saint Louis, Missouri, USA. [6])

[6]) http://de.wikipedia.org/wiki/Jefferson_National_Expansion_Memorial ; Ch. 11

The difference of the surface of this hyperboloid from a sphere can roughly be neglected. With this receptacle I get the cooling losses of

$O_S = d_S^2 \times \pi$ = **797.000 m^2** | x (0,028 W/ m x K) x 100K **= 2,23 MW** | / 1.000 MW = 0,**223%**.

2,23 MW is one tenth of the 50 m diameter receptacles and about one twentieth of the half-spherical torus.
Since the cooling is needed for roughly 30 years, till all of the CO_2 is reduced to C, possibly the one spherical container of about 500 meters diameter is the most effective.

This construction is comparable to **the radiotelescope in Arecibo, built in a valley with a diameter of 306 meters from 1960 to 1963** – but here in concrete. It is a challenge like the whole project. Much can be learned by its realization and **it can be earned – by not spending - the amount of energy worth over 6 trillion Euros** in all 6.000 1-GW-TPPs:

Per 1-GW-TPP in 30 years it is not spent (at least)
(22,4 MW - 2,23 MW) x 30 a x 8.760 h/a = 20 x 30 x 8.760 h = 5.256.000 MWh ≈ 53 x 10^9 kWh | x 6.000 1-GW-TPP

= 315.000 x 10^9 kWh | x 2 c/kWh = 6.300,00 billion Euros **= 6,3 trillion Euros = 6,3 x 10^{12} Euros**.

So even if this one sphere is expensive (and even if 2 c/ kWh is calculated inexpensively), it still is a possible economic solution, especially when built 6.000 times. Moreover the cost of the insulation itself is cheaper. I hope that all of these mentioned possibilities are tried to know better afterwards. Possibly the handling and the security of the storage is best with the half-circles. In the following I will be calculating with the 1.018 spheres for ease of visualization. The conversion into the other types of storage is easily calculated. The task of storage hopefully is not as gigantic as described here (compare Ch. 13).

It might be possible to alternatively use another method of insulation that I will just mention here: With a vacuumized distance between the outside and the inside of the receptacle the insulation can be almost ten times as efficient as with foam of Polyurethane that has tiny bubbles of air inside: The Vacuum Isolation Plate VIP has a heat conductivity of just λ = 0,003…0,006 W/ m x K ≈ 10 …20% of PU-foam. [7]) But possibly the costs are too high and the stability of the vacuum is not sufficiently good.

[7]) http://de.wikipedia.org/wiki/Vakuumd%C3%A4mmplatte

With for example 600 1-GW-TPPs, therefore with just 10 percent of the total project, in approximately 32 years it is possible to collect from the atmosphere all the superfluous CO_2 and store it as dry-ice. With the generated energy of the 6.000 1-GW-TPPs in approximately one generation it can be Ccycled to C.

Assumed, the beginning of the realization of the project is the year 2010. From the year 2020, 300 1-GW-TPPs per year are built. In approximately 2025, the climate catastrophe is eliminated already, turned back to 1880. Until approximately 2060, the CO_2 will be Ccycled completely to C.

The CO_2-technology will spread enormously, because the CO_2 is so cheap. For example it will substitute poisonous substances as solvent completely, that are used until now.

Overcritical carbon-dioxide possesses a high solubility for non-polar materials and can replace poisonous organic solvents. It is used as extraction-means, for example for the extraction of natural materials like caffeine (manufacture of decaffeinated coffee) and as solvent for cleaning and degreasing of wafers in the semiconductor industry for example, and recently also for textiles (dry-cleaning). Currently it is also researched intensively, to use hypercritical carbon-dioxide as reaction medium in the fine-chemical-manufacture (for example) for the manufacture of aroma materials, since isolated enzymes often remain active here and no solvent residues (in contrast to organic solvents) remain in the products.

To increasing extents, carbon-dioxide is put into action as natural refrigerant in air-conditionings.[5])

[8]) http://de.wikipedia.org/wiki/Kohlendioxid

12. How much ppmv CO_2 per year can be Ccyceled to C?

It is 100 ppmv CO_2 / 29,5 a = 3,39 ppmv / a.

At the moment the yearly increasing of the CO_2 in the atmosphere amounts to almost 2 ppmv / a. This number will remain approximately constant with mankind's present efforts to the reduction - viewed optimistically;-)

The decrease of the CO_2-contents in the atmosphere is about the same speed as calculated; just the Ccycling to C therefore seen realistically needs more time because additional fossil CO_2 still pollutes the air.

But with -3,39 ppmv + 2 ppmv = -1,39 ppmv per year the transmuting to the final product C goes almost as fast into the correct direction like at the moment into the wrong one.

The measure of the **intermediate-storage of the CO_2 is very important** because of the further increase of the CO_2 in the atmosphere through the industrial output, **until sufficient energy exists for its conversion to C.**

This 30-Trillion Euros method described here therefore is a minimum of expenditure. Anything below it remains a drop in the bucket and will not end the climate catastrophe.

13. Which deposit size do the carbon depots have after the end of the Ccycling?

The solid C accrues in form of soot, of small particles of carbon. It can be pressed under high pressure to briquettes of pure carbon, to micro crystalline anthracite blocks.

Anthracite has a density of 1,95 g / cm^3.

Altogether, 170 x 10^{15} g C are Ccycled (chapter 7).

170 x 10^{15} g C / (1,95 g / cm^3) = 87,18 x 10^{15} cm^3 / (10^{15} cm^3 / km^3) = 87 km^3.

Approximately 87 km^3 of anthracite will therefore accrue (instead of 400 km^3 dry-ice, that is just 22% of the depot size of CO_2.)

With 6.000 1-GW-TPPs we have for a single 1-GW-TPP

87 km^3 / 6.000 = 0,0145 km^3 / 1-GW-TPP = 14.500.000 m^3, a cube of 244 m of edge-length - or divided through 65.400 m^3, the volume of a sphere of 50 m of diameter,

222 spheres of 50 m of diameter per 1-GW-TPP.

1.018 such spheres per 1-GW-TPP are required for storing of all the necessary CO_2, the initial product of the Ccycling (see above).

The C, Ccycled from the CO_2, therefore can be end-deposited in the depots of the CO_2 that get free by Ccycling. Possibly, the construction of only 250 such receptacles per 1-GW-TPP suffices for the CO_2-inter-storage. This corresponds to a CO_2-reduction of the atmosphere of approximately -25 ppmv CO_2. While these receptacles are being filled with CO_2 rapidly, the CO_2-depots at the same time are changed to C slowly so that more and more of the receptacles are filled with C. If all are filled with C after 30 years, all the CO_2 is Ccycled.

These thermally insulated, pressure-resistant, corrosion-stable receptacles that are buried half in the underground of the earth and that have a sufficiently big distance from each other,

are the carbon depots of mankind, that are very well protected against fires.

They are spread world-wide, therefore secured very well against local catastrophes.

They are easily accessible.

They are extremely well equipped against earthquakes by their thermal insulation of 1 m thickness.

They are directly beside the chemical factorys that could process the C further, if there is demand to it.

14. The result and the beginning

The anthracite is available world-wide if it should be necessary to increase the CO_2-content of the atmosphere again. Reasons for it could be:

The climate becomes colder again,

big volcano outbreaks occur that filter away the sunlight in the dusted atmosphere,

the so-called 'nearing of a new ice age' for whatsoever reasons.

If a huge volcano outbreak happens (e.g. in Yellowstone National Park, Wyoming, USA) the atmosphere might get far more opaque than normal so that the receiving of solar energy is not possible for a long time, then we can use this buffer with very little delay, since all is planned for this possibility too. With additional unforeseen big energy needs that cannot be covered by the existing TPPs from the current solar production **this coal depot represents an energy buffer. It is as big, as all the fossil fuel that was used by mankind until now, namely 1,55 x 10^{15} kWh and it is stored ready for instant consumption worldwide as the optimized fuel, namely soloil.**

The combustion of this type of coal takes place residue-free to just CO_2 and nothing else.

There are suggestions to bury the CO_2 in the earth in forms that cannot be retrieved easily (e.g. adsorption in Peridot $(Mg, Fe)_2SiO_4$ in the process of Carbon Dioxide Capture and Storage, short CCS). That is a huge waste: **The CO_2 is the source from which we can collect our treasure** – not the hard way from within the solid earth as normal resources, but easily: **directly from the air**. We are lucky that it is still around us in sufficient quantity – if we take the chance to harvest it, to reform it to coal and to Soloil. If we don't harvest it, it stays there like the sword of Damokles – and it will fall on us - surely.

This anthracite is the energetic treasure of mankind: With the energy quantity of the 6.000 C-depots mankind obtained to arrive in its technological development from the state of the 19th century to the state of the 3rd millennium. It did not know what it got involved in as it naively began with the experiment to use coals for the heat production and later as well petroleum and natural gas.

In its totality mankind still now does not know really that it got involved in an experiment with a planet as spaceship that has - almost - led to the energetic breakdown by it.

Maybe just in time we with this project manage to prevent the breakdown: **We build a second energy system** with help of the first. It is bigger than the first and gets rid of the consequences of the first. **It will replace the first, when the fossils will have become too expensive compared to the Ccyclable, cheap, waste-free and healthy solar energy.** (The fossils are more expensive already since several years.) It then is available for us in every form we can wish for, in fact **practically free**: Only the operating costs and the conservation of the installations and the distribution of the energy must be paid for by

the coming generations. **The CO_2 situated still in the atmosphere, from then on is taken in order to make soloil from it that is released into the atmosphere again as CO_2 into the energy cycle of the renewed Ccycling.**

Is there a more beautiful gift that we can leave our children, grandsons and granddaughters, and their great-grandsons and great-granddaughters?

The time for this idea came.

This time is called (in beautiful German): '<u>Je</u>de-<u>T</u>at-<u>Z</u>ei<u>t</u>', (any deed time) short: "<u>Jetzt</u>!" -

"Act Now!"

15. Some additional considerations – Soloil

In the deserts of this earth on all continents, there is sufficient easily convertible solar energy for transmuting the CO_2 chemically, to then store it in the deserts in the simplest case in carbon, shortly C. **The storage as 'anthracite' in big receptacles, as solid carbon, as maximum valuable stone coal is simpler and surer, as if we stored it in form of gaseous or liquid hydrocarbons or in the commencing product CO_2.**

The CO_2 is equally available at each point of the earth world-wide, because it is part of the atmosphere. With its wind currents, it takes care that all the air of the earth is evenly mixed everywhere within a few months. The proof is:

1. Chernobyl: The radioactive cloud from the explosion of the gassed nuclear fuel rods of the reactor of the nuclear power plant of Chernobyl reached the USA after 14 days (to the west) and reached Japan after 10 days (to the east).

2. The dust cloud of the 1980 eruption of Mount St. Helens, Washington State, USA went around the whole earth in a few days. The red sunsets after big eruptions of volcanoes are other examples.

3. At a wind speed of 4 Beaufort the wind travels with 25 km/ h, that is with (25 km/ h) x 24 h = 600 km per day and with (600 km/ d) x 30 d = 18.000 km in a month that is halfway around the earth.

4. The CO_2-catastrophe is not limited to the part of the earth, where the CO_2 is produced.

The energy of the sun cares that air currents originate that distribute the CO_2 evenly everywhere on earth. Therefore, naively the CO_2 can be gathered in stationary Ccyclers at arbitrary points of the earth. But the situation is even better: Especially in the desert zones, where there are few plants which consume the CO_2, the concentration of CO_2 is the biggest. Compare the picture in [9]) http://de.wikipedia.org/wiki/CO2 - So to collect the CO_2 there is the easiest and most favourable solution.

[9]) http://de.wikipedia.org/wiki/CO2 ; Ch. 15

It ‘just’ is important,

1. To have solar energy in enough quantity to the use,

2. To have installations, that let through sufficiently much air,

3. To get the CO_2 out of the air in these installations,

4. To transmute the collected CO_2 chemically to C + O_2,

5. To release the O_2 into the air again,

6. To bring the C into the form of anthracite and to deposit it safely.

This idea is very simple. Simultaneously with this idea the gate is opened fully into the age of the solar energy for electric current, for heating, for chemistry and for traffic.

If carbon is stored sufficiently once and if more of it could be stored anytime, according to demand and then ruling better insight, then, the additional carbon can thereafter be further recycled to liquefied soloil with the solar energy. This could happen to all of these installations after approximately thirty years of work, therefore from approximately 2060.

Several procedures stand at the disposal for the manufacture of the soloil that are large-scale technically tried, for example the Fischer-Tropsch process and the Bergius process.

With the Fischer-Tropsch process, carbonic-monoxide is formed of carbon and is changed with hydrogen at iron or cobalt catalysts to paraffins. The reaction runs under high pressure and with a temperature of 200 - 350℃ af ter the chemical formula: n CO + (2n+1) H_2 => C_nH_{2n+2} + n H_2O; n = 1, 2, 3,…

So, C_nH_{2n+2}, that is fuel gas and diesel fuel (and water as ‘waste’-product), are created with differently long chained paraffins according to the reaction conditions. This procedure is large-scale technically tried since 1934 and is improved further since then. Today one single targeted hydrocarbon can be produced with this reaction, for example with n = 8 Octane C_8H_{18}, with the ‘octane’-number ‘100 octane,’ (highly antiknock). Normal Diesel-fuel has n = 10 to 22.

In the 1970s after the first oil crisis (1973) the German state started a large-scale technological project in the Ruhr area with billions of ‘Deutsche Mark’ expenditure in order to become independent from the petroleum with the stone coal by optimizing all conditions for the coal liquefaction. It was said at that time that the petroleum production from stone coal would be competitive from a price of 2 DM / litre = 1 Euro per litre of fuel. Today, the coal liquefaction of ‘CtL’ (Coal to Liquid) is competitive from a price of 60 U.S.$ / Barrel petroleum = 0,38 U.S. dollars / litre petroleum. It is therefore competitive since 2006, since the Peak Oil. [10])

[10]) http://de.wikipedia.org/wiki/Kohleverfl%C3%BCssigung ; Ch. 15

The pure hydrocarbons created from the carbon can stand to the disposal with **fewer than 80 pipelines world-wide.** The pipelines have a length on average of approximately 2.500 km, to supply with the entire earth as far as to the polar circle.

The distance of 23° north and south, the tropics, t o the equator is 23 x 111 km = 2.553 km. The distance of 23° north to 67° north, the polar circle is (67° - 23°) x 111 km = 44 x 111 km = 4.884 km.

South America is at end at approximately 50° south, Africa at approximately 35° south. Australia lies aro und 23° south. The big islands of the Pacific and Indian ocean will have their own Ccyclers. The deserts in USA in Arizona and in China, Asia too lie more northern than 23° north. The settl ing at the polar circle is so low that just one to two small pipelines per continent suffice for the supply high up north in America, Europe and Asia. The main settling of the continents is less than 2.500 km away from the tropics (Japan, China, Northern France). The pipelines proceed directly in North-South direction in the ideal case. Their distance from each other can be for example 2.000 km. The equator-perimeter amounts to 40.000 km. So, **less** than 20 x 4 = 80 such pipelines are necessary for the supply of the earth. The total length of this only energy distribution system for long range use in the distant future has a total length of about

80 x 2.500 km = 200.000 km. Today there exist about 3.000.000 km of pipeline length on earth. Each year about 25.000 km of new pipelines are built.

Many of the pipelines today already exist for natural gas and petroleum. The soloil can be converted into any other energy form with the present technology of the petroleum use. Each continent should have so many Ccyclers that it is energetically self-sufficient with the exception of Europe and its Ccyclers in Africa.

The transportation of petroleum over the oceans with trouble-susceptible and energy-costly oil freighters stops. And too the extremely dangerous and expensive exploitation of fossil oil from deep sea grounds stops.

This pure sun fuel of 'soloil' exactly like petroleum consists of hydrocarbons (C_nH_{2n+2}) and is exactly used like it. The soloil is burned like the oil until now and it transmutes into pure $CO_2 + H_2O$ (and nothing else) and it is released into the atmosphere, and the CO_2 then is Ccycled in the deserts of the earth. Fossil petroleum, natural gas, coal, etc. still can be used, like until now. They are replaced by the soloil when it (seen economically) is cheaper than the fossil fuels that are coming to an end. **Already because of these final days of the fossil fuels, it immediately is necessary to transfer into the new technology. This transfer however must take place as fast as possible.**

The strongly risen oil prices compared to the 20th century average also make it economically meaningful to immediately invest big capital amounts into the solar energy production instead of giving it to the fossil energy concerns over the petroleum prices like until now.

'To relinquish on the energy industry with the transfer to the solar energy utilization means to leave mankind to ruin.' (From:

[11]) Hermann Scheer: Sonnenenergie - Politik ohne Alternative [Solar energy - politics without alternative]; ISBN 3-492-12135-7; Piper-Verlag 1995; page 182 [written in German; Hermann Scheer is member of the German federal legislative assembly 'Bundestag' since 1980 for 7 election periods])

The motor vehicles still can go with the previous motors with the previous technology.

The **'Hydrogen'-fuel**-variant is interesting only for cars with electric motors, in fact only then, **if** the conversion of hydrogen from electricity and back to it **should** have been solved satisfactorily and also the storage of hydrogen easy, space-, and mass-saving and accident-safe (Think of the challenging 'Challenger' catastrophe). That does not seem possible at our state of technology now.

The electric car alternative with Li-Ion-battery is far more expensive, the tank up lasts extremely much longer, the energy density is less than 0,2 kWh/ kg (instead of 10 kWh/ kg for Soloil), the battery just lasts several hundred cycles and is the most expensive part for just some years of usage, the distance between two tank ups is really small, the resources of Lithium are very limited – the next change of technology has to come soon with new investments, the energy consumption for traffic in Germany 2005 was 1,43 kW/ person, but the total current energy production is just 0,91 kW/ person [12]). This technology is a dead end street.

[12]) http://de.wikipedia.org/wiki/Elektroauto#Elektromobilit.C3.A4t states ; Ch. 15:
1.000 Terawatthours /a are consumed in Germany for traffic:
1.000 TWh/ a = 10^{12} kWh/ a = 10^{12} kWh/ 8.760 h = 1,14 x 10^8 kW | / (80 million persons = 0,8 x 10^8 persons)
= 1,43 kW/ person.
> http://de.wikipedia.org/wiki/Stromerzeugung states:
In 2005 the current generation in Germany was 639,1 TWh/a = 0,91 kW/ person

A soloil tank lasts indefinitely, when made of non corroding material, and it costs about 1% of a battery and it has an energy density of 10 kWh/ kg. The safety, efficiency, price, and all of the other parameters are optimized through more than 100 years of evolution, and soloil is the pure form of fuel - yet to be developed. The only thing left to develop is: Cars today consume about two- to three-times the necessary energy-amount, a leftover of the 'Energy wasting age' that we are going to leave. Electricity may be used for short-time storage of braking and downhill energy in the amount of less than 5 kWh per car, all other solutions are futile.

I am calculating here with '1 kW/ human'. That is a sufficient amount for traffic, current, food, water, etc., when the efficiency is corrected, which will happen in the near future. Heating of houses with sufficient insulation is a by-product of the waste-heat of the current production in soloil electric power plants with heat coupling and of additional solar water heaters on the roofs with sufficiently big reservoirs.

Incidentally: Other projects, that are seemingly cheaper, to generate fuel or coal with plants 'unfortunately' are completely uneconomic: The efficiency, with which plants produce combustible substances from solar energy, theoretically lies under 0,25 percent. (The 'Biomass to Liquid' process, 'BtL', the most successful until now, in that it processes the entire plant body to fuel, just renders 0,23 percent of the incoming solar energy.)
Do I really want to fire green, fertile nature surface around me as a petroleum substitute?
How much surface is needed for humanity? - The calculation is:

1 kilowatt / human being x 6 x 10^9 people = 6 x 10^9 kilowatts = 6 x 10^{12} W

\| / (333 W / m^2) x 0,23 percent = 0,8 W / m^2 ;

= 7,5 x 10^{12} m^2 = **7,5 million km^2** = 750 million hectares.

This corresponds to 1.250 m^2 / human being.

Europe's entire country surface (together with the sterile areas and the inhabited areas) amounts to **10,5 million km^2**.

Do I really want to fire wheat or corn, in order to use it as electric light in this form, or does my conscience oppose it? Do I really want mono-cultures of 'energy plants' around about myself worldwide so that I can go on living further as I want to, as I however can do it no more, exactly because of it?

It occurs that this form of the solar energy conversion is very labor-intensive, it is plowed with tractors, it is fertilized with fertilizer, it must be sprayed with insecticides and pesticides, it must be harvested with tractors, it must be converted to fuel chemically. Earth still is further exploited by it. The total-efficiency of this method sinks to far under 0,2 percent, possibly to less than 1‰ if optimized and moreover the price is much higher, because of the labor invested in the production each year and the food for the workers.

The social subsidy of farmers should not be connected to uneconomic and unethic projects!

Who wants to risk the starving of millions of people voluntarily for being able to drive a car?

For the transportation of energy over big distances, the pipeline is the most economic way. It costs only the energy for the pumping of the soloil and doesn't have any further losses. The energy can be stored like now easily and cheaply in large quantities in the regionally existing security reserve receptacles (reserves for several months energy consumption already exist everywhere). So, mankind's energy supply is secured. **The conversion into other energy forms like electricity**, that practically can not be stored because it is a 'current', can take place in the respective states **in power plants with heat coupling** that will be inside the cities and release pure CO_2 into the atmosphere, without expensive filtration. The current then is distributed favorably in distances of far under 200 km with the existing high tension mains. The electricity power plants for the combustion of soloil in the cities are connected to the big pipelines with small side-branches. A diameter of 10 cm can transport 1 GW = 1 million kW.

A soloil pipeline with one meter of diameter and a flow speed of for example 5 m/ s **can transport an energy quantity of 138 GW.** One therefore needs only one 1-m-pipeline for more than 100 times 1-GW-TPPs, or **one minimally needs approximately 45 such pipelines for the 6.000 1-GW-TPPs for the whole earth.** High voltage managements cannot compete with it, not from the investment and not from the loss performance. It is just the energy of the pumps with the pipelines. The loss performance gains something with higher current speed of the soloil through turbulence losses, a current speed of ≤ 5 m/ s is approximately the economic optimum. (In the Baku-Tbilisi-Ceyhan pipeline, starting in 2005 with 1.768 km length and about 1 m diameter the flow speed of crude oil, which is thicker than soloil, is just over 2 m/ s with 8 pumping stations, transporting 160.000 m^3/d or transporting 67 x 10^6 kW, calculated with 1 l = 10 kWh.) However, in crisis times, the flow speed could be more than doubled. This also is one point that would not be possible with high voltage managements without further investments, blocking the lines for months.

The calculation to this: **A tube of d = 1 m** of diameter has a cross-section of d^2 x π/ 4 = 3,14/ 4 = 0,785 m^2. With 5 m/ s of oil speed, 3,925 m^3 / s = 3.925 l/ s of soloil flow through. Diesel fuel has an energy density of 9,8 kWh/ l (> Wikipedia > Diesel fuel). 1 kWh = 1.000 W x 3.600 s = 3,6 x 10^6 Ws. Therefore per second flows through:
(3.925 l x 9,8 kWh/l x 3,6 x 10^6 Ws/kWh) / s = 138.474 x 10^6 Ws / s = 138 GWs / s = 138 GW = **138 million kilowatts. That is an energy quantity that is sufficient for 138 million people.**

The other forms of the utilization of solar energy should be developed further independently from the Ccycling: The **wind energy utilization**, the hydraulic power plants, the tides power plants, the ocean-wave power plants, and too the utilization of the earth warmth. They are used for the autarchy of the energy supply in the future in their nearer surroundings (< 500 km).

Likewise, the private autarchy of the individual people and families should further been promoted with private sun collectors for heating water and its storage in insulated water basins for the winter. Likewise, the **photovoltaic with concentrated solar energy** can be an interesting source of energy for the autarchy of private houses. (**Compare: PS – Personal Sun: Bernd Upnmoor 2005**)

The Ccycling assures mankind's ground supply with energy and the stability of the climate and it makes unnecessary the CO_2-collection near the soloil users (Carbon Dioxide Capture and Storage, CCS).

"We must not be afraid of dreaming the seemingly impossible
if we want the seemingly impossible to become a reality."
- Vaclav Havel

“Our Cathedral can only be built
Through Faith and Charity.
Sagrada Familia is being created
Solely through People’s gifts.
Not by any specific church group.
Not with the help of the government.

But by the People.
By individuals who are committed to building
A beautiful structure to the Glory of God."

- Sign at the church Sagrada Familia [1883 – 20..] in Barcelona by Antoni Gaudi found at:

[13]) http://www.sacredmirrors.org/flash/sm_full.html ; Ch. 15

"For island states, time is not running out. It has run out. And our path may very well be the window to your own future and the future of our planet."
- Avaaz.org message of 9/3 2008

16. An Alternative Solution

A more economic solution with less investment and more usable energy at once is:

Just leave all of the CO_2 in the receptacles of the first 600 1-GW-TPPs and use the other TPPs directly for the production of soloil for use around the globe. Then the climate catastrophe is stopped within (3 years/ 10%) = 30 years after completing the 600th 1-GW-TPP (compare chapter 10). The costs for stopping the climate catastrophe then will be 10% of 30 trillion Euros or just 3 trillion Euros. The total storage volume is 400 km^3 of dry-ice in isolated receptacles (compare chapter 11). They have to be built at these 600 1-GW-TPPs. Part of the power output of these 600 1-GW-TPPs is used for cooling, the other part is used for the slow transformation to anthracite in the following centuries.

The other investments then are for constructing the new soloil age and for ending the fossil fuel age. The investments are immediately earned in form of inexpensive and clean solar energy in the form of soloil.

A further advantage of this solution for example is: If a big volcano outbreak occurs with darkening of earth's atmosphere and freezing of the surface of the earth, then the release of all the collected CO_2 is possible within weeks by blowing it into the central towers of the Ccyclers. The combustion of anthracite takes far longer time in the order of years.

17. Sources – Chapter (Ch…)

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[13]) http://www.sacredmirrors.org/flash/sm_full.html ; Ch 15

[14]) http://www.spiegel.de/wissenschaft/mensch/0,1518,530501-2,00.html ; Annex 4

[15]) http://de.wikipedia.org/wiki/Bestechung ; Annex 5

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Annex 1: Pipes

Comments to chapter 5:

In the Ccyclers greenhouses are built for mankind's ground supply of food.
So the question arises: Is it meaningful to harvest the food so far away from the people? How can the problem of the distance be solved?
Here is the answer:

Pipes - the global transportation system

In the Ccyclers food is generated in the magnitude of 2 km^3 / a = 2 x 10^{12} liters/ a.

Food has approximately the same density as water that is 1 kg/ l.
We have per 1-GW-TPP and year
2 x 10^{12} kg/ (6.000 x 1-GW-TPP) = 0,3 x 10^9 kg/ 1-GW-TPP.
This quantity is to be transported to the people of the earth in one year.
How is this done optimized, therefore economical, energy-saving, fast and global?
One year has 365 d x 24 h/d x 60 min/h x 60 s/min = 31.536.000 s ≈ 3 x 10^7 s.
Each 1-GW-TPP produces 10 kg per second:
0,3 x 10^9 kg/ (3 x 10^7) s = **10 kg/ s**.

I will describe a transportation system, the **'pipes'** that has the following qualities:

Parallel to the soloil pipelines, **a second pipeline system**, the 'pipes' are built as a compact unit. The system consists of **two tubes, each of 1 m of inner-diameter**. Therefore, there are three parallel, equally big tubes side by side - or with demand also one on the other, the first being the soloil-pipeline. These two 'pipes' are **thermally insulated** on the outside through a layer of polyurethane of for example 10 centimetres thickness and through blanc metallic or white color.

So, the temperature in the interior can be held sufficiently cool.

Its mechanical stability is adjusted to the outer conditions over ground or undersea by thinner or thicker noble-steel.

In the interior, these tubes consist of **two halves**, the left and the right half. They are both **electrically conductive** and are **electrically isolated against each other**. For example the left half has an electric tension and the right half is grounded. So, the entire pipe is used for the conducting of the current. Therefore the **voltage can be held low** and the entire metal cross-section of the tube serves for the current and energy transportation.

In the interior of these 'pipes' **transportation vehicles called 'cars'** can move. They are driven with the electric energy that is led by the halves of the pipeline wall. It is transferred to the cars by their **rubber tires. The rubber is electrically conducting** by admixture of soot, etc. The wheels run in grooves that are on the left and right underside of the pipes. The cars have a round cross-section of for example 90 cm and a length of for example 10

m. They consist of a chassis with two times three tires of for example 10 cm diameter. All tires are driven directly by one electric motor each.

The power of a car is laid out in a way that for example it can drive 10 metric tons = 10.000 kp weight with a velocity of 5 m/ s up a 5 percent slope. This corresponds to a performance of:

5 m height/ 100 m of length with 5 m/ s that is 5 m height / 20 s.
10.000 kp x 5 m/ 20 s = 2.500 kp x m/ s | / (75 kp x m/ s = 1 bhp)
= 33,3 bhp (brake horsepowers) | x 0,735 kilowatts/ bhp
= **24,5 kilowatts**.

If the wheels have a distance from each other of 2,50 m and a distance of 1,25 m from the front and rear-edge of the cars, then, there are three wheel-pairs per car or 6 wheels (1,25 m + 2,50 m + 2,50 m + 2,50 m + 1,25 m = 10 m).

Therefore, **each wheel** needs an electric motor of 24,5 kW/ 6 **≈ 4 kW**.

The cars are firm tube-racks, into which the 'containers' can be clicked in. The wheels are fitted into the racks so that **the clearance of the containers amounts to approximately 85 cm.**

The '**containe**rs' consist of a tube that can be tucked up at the side on its whole length. So, they easily can be loaded with corresponding '**palettes'**. We also have 'semi-containers'. They are just 5 meters long so that two of them fit on a car.

When loading, the palettes are clicked in to the interior of a container, the hinged cover of the container is shut, and the container is clicked on to a car. The car then comes into the **loading stations, named 'loads'**, on the threading rail and is threaded into the stream of the other cars.

The distance of the loads from each other at all pipes is approximately **100 km.** At these loads the line of the cars can be threaded out or in for a single car or also for several cars. Big shunting-stations are used for the loading and unloading of the containers or their **transhipping on automobile trucks for the supply of the nearer surroundings.** Four or six of these containers are clicked on one truck.

At the loads, crossings and branch-lines of transverse pipes can be realized likewise, in each case **controlled per computer and radio**.

Each container has an RFID-Chip with an unambiguous identification. So, the cars with their containers destined for a load can automatically be threaded out or in.

Big ventilators are at each load: at the Ccyclers, at the service-loads, at the endloads with the users in the cities, and at the cross-loads, where two pipes cross and east-west-pipes take over the cross-transportation approximately along the degrees of latitude. The ventilators make an overpressure in the pipes 'from behind' and a hypo tension 'from in front.' So, the cars drive without headwind, but in the contrary they can be driven from this pressure difference, like in a tube mail. This pressure difference is so low that a **wind speed** is generated in the pipes of approximately 20 m/ s that are approximately 72 km/ h. So, **the cars can go along with the wind with very little power of their own.**

The cars have a **clutch** at the back and in front, that closes automatically with contact and that can be solved per radio. So, they themselves can construct chains of cars of many

kilometres that can immediately be solved totally or partially with demand. If long chains are formed, mountains can be run over with high speed, because the cars that drive downhill pull the cars that drive uphill. A high performance of one single car therefore is not necessary. However with inferior traffic also one single car can drive slowly downhill and uphill.

So, we have an autarchy of each individual car and simultaneously all advantages of a train system of almost infinite length.

When for example an **average-speed of 70 km/ h** is used, then the wind-speed is set so and the rotational speed of the wheels of the cars is regulated in accordance. This corresponds to a wind speed of 8 Beaufort. A trip of 2.500 km from the greenhouses of the Ccyclers to the loads near the consumers lasts with this speed
2.500 km/ (70 km/ h) = 35,7 h or **1,5 days**. There are no traffic jams. Human labor is used only for loading and unloading. The energy consumption of this transportation system is very low and consists of a low pressure difference in the pipe through the ventilators and in the electric performance of the motors of the cars for a **horizontal movement without air friction only against the friction resistance of the rubber-wheels.** This may be in the magnitude of less than **1 kilowatt / car**. The electric motors therefore run with less than 10% of their maximum performance.

The pipes are built in connection with the soloil pipelines as a unit of approximately four meters of width. They run if possible **along the highways** of the states.

There are **service-cars to the maintenance of the pipes** in each load, with which accidents can be cleared in these pipe units of approximately 100 km length. Broken down cars are pushed forward to the next load. Spray-cars with own accumulators clean the walls of the pipes, directed and observed by the men of the staff, when the power supply is switched off. So, accident-places are passable again within hours.

In each container, a piece of e.g. **10 kg dry-ice - that is frozen CO_2 of -78,5℃ -** can be put, according to the length of the trip and the wished cooling temperature. So, the driven **food is well cooled during the trip of one to two days without own cooling equipment.** Each container is cooled, and **so the entire pipe is cooled too. The in-blown air can also be pre-cooled**, for example to 0℃. So, low cooling temperatures are possible for each freight - from for example + 10℃ to for example - 50℃ for special deep-frozen food, freely chosen for each single container independently. The insulation lies around the pipe only once and is not transported.

The remaining maximum distance to the people between the loads is 50 km along a pipe. Between two pipes, however, it can be up to 1.000 km in east-west-direction. When the practicability of this system is proven, it can be further extended in east-west-direction to a **general long-range transportation system for every type of things on the surface of the earth.**

A container of l = 10 m length and a cross-section of d = 85 cm on average (not exactly circle-round, but approximately) has a volume of

$V = l \times d^2 \times \pi / 4 = 10\ m \times 0{,}852\ m^2 \times 0{,}785 = 5{,}67\ m^3 = 5.670\ l$

| / 10 l/ s = **567 s ≈ 9 minutes**.

The **transportation capacity** should be at least 10 litres per second; therefore a container should depart each 567 seconds. With a speed of 70 km/ h = 19,4 m/ s we need for 10 m

of length / (19,4 m/ s) = 0,515 s, that is 567 s/ 0,515 s =1.100. The capacity of one pair of pipes is 1.100 times the needed capacity for food. The capacity is

5.670 l/ 0,515 s = 11.000 l/ s = 11 t/ s | x 31,5 x 10^6 s/ a = 346,5 x 10^6 t/ a = 0,35 km^3 / a.

So about **6 pipes are capable of the transportation of the food for all humanity of 2 km^3 / a**.

The speed and with it the capacity can be changed if needed. There is plenty of capacity left for any other goods to be transported.

There are **two parallel pipes**, one for each transportation direction. The **air-turbines** for the wind in the pipes at the loads therefore **suck in the air from one pipe and blow it into the other pipe** simultaneously and chill it on that occasion according to demand. With 70 km/ h = 19,4 m/ s the turbines have to move air and cool it in the amount of

0,785 m^2 pipe cross-section x 19,4 m/ s = **15,3 m^3/ s** - if no container is in the pipe, otherwise accordingly somewhat less.

The containers normally drive back to the Ccyclers on their cars, filled with compost of already processed organic mass. This cycle of the food therefore consists of the recycling of the compost to the greenhouses and in the recycling of the cars and containers to renewed loading. With the nutrients for the plants that are won as nitrogen-connections from the air and additional minerals **a complete recycling-system is formed here. So, mankind's food can grow in the deserts.**

This system is essentially **more effective** than the previous truck system.

It needs **much less energy**.

It almost does not need **any personnel** - no waste of human labor.

The drivers are free for activities that are more interesting.

It needs much **less space (according to one highway-lane per pipes)**.

It transports **much faster** and

much more and

much safer

over longer distances

and **more effectively cooled**

also **cheaply underwater between neighboring continents**.

And the **investments will be inferior to another lane of the highways**, above all, when this system is integrated with the design and the construction of the highways of the continents.

When Asia and America are connected with pipes via the Bering Strait (64 km width), then the four largest continents are connected via pipes for worldwide land transportation of any

goods. The largest distance between two points between Cape of Good Hope in South-Africa and Cape Horn in South-America is less than 50.000 km or 700 hours or 30 days of transportation forming a possible alternative to sea transportation or also to air transportation.

Annex 2: The greening of the deserts (compare Chapter 4)

The freshwater-production with TPPs

If I use one of the 13 TPPs of a 1-GW-TPP for the production of freshwater from sea-water then I have 82,5 MW for it, that means in one year I have the energy of

82,5 MW x 24h x 365 d = 722.700.000 kWh/ a **≈ 720 million kWh/ a**.

Present-day big-installations for the so-called **reverse-osmosis from saltwater to drinking water have an effectiveness of 1 m^3 of produced drinking water per 2 to 3 kWh.** With the reverse-osmosis, saltwater is pumped with very high pressure through a semi permeable membrane, through which only H_2O-molecules pass, but no salt-ions. The pressure overcomes the naturally existing osmotic pressure, which would lead to equally dense concentration on both sides of the membrane. The energy is used in order to drive the pressure-pumps for up to 80 bars. This is at the moment by far the most effective form of sea water desalination.

The next favorable freshwater-production method would be with the procedure of electro-dialysis with approximately 10 kWh/ m^3. Vaporization or evaporation use much more energy (over 20 kWh for one cubic meter).

If I take the value of 3 kWh/ 1 m^3 freshwater, then I can generate 240 million cubic meters of freshwater per year:

With 82,5 MW x 24h x 365 d/ (a x 3 kWh/ m^3) = 240 million m^3 drinking water/ year ≈

≈ 0,25 km^3 / year.

I can therefore desalinate 0,25 cubic-kilometre of water per year. **This is enough for over 6 million people with 100 liters per human being and day:**

240 million m^3 / [0,1 m^3 / (human being x d) x 365 d] = **6,57 million people**.

A long pipeline in the magnitude of a few hundred kilometres connects the installation with a water-removal-place in an ocean that lies in greater water-depth of about 50 to 100 meters. Before the openings of the big area of removal-tubes, strainers are appropriate with increasing delicacy that keep back all solid particles until approximately 15 microns of diameter. The cross-sections of all removal-openings together should amount to approximately 100 m^2 so that the current-speed of the removal certainly is under 1 m/ s and does not evoke any dangers.

With a rustproof **noble steel tube of d = 1m diameter** and a pressure of 100 bar I can reach water speeds of approximately 30 m/ s with tubes of 100 km length. With it I can transport 0,7 km^3 saltwater per year:

d^2 x π/4 = 0,785 m^2

| x 30 m/ s = 23,55 m^3 / s

| x 31,5 million s/ a = 742 million m^3 / a **≈ 0,7 km^3 / a**.

A pipeline of 1 m diameter therefore is fully sufficient in order to provide up to three TPPs with saltwater for the freshwaterpreparation. The return pipeline for the up concentrated saltwater can have 10 percent of the cross section, with approximately 35 percent of salt concentration:

$0{,}0785\ m^2 = d_{return}^2 \times 0{,}785;\ d_{return} = 0{,}32\ m$

Sea-salt can be gained at the coast with demand from a part of the concentrated salt solution. The total amount of the sea salt per year from the 24 million cubic meters of concentrated salt water is

$240 \times 10^6\ m^3\ H_2O \times 0{,}035\ NaCl/\ H_2O = 8{,}4 \times 10^9\ kg\ NaCl =$ 8,4 billion kg sea salt ≈ 1 kg salt/ (person x a).

The technology of the salines with sun-evaporation of the water is many millennia old and becomes ten times more efficient through the application of concentrated saltwater.

The salt-consumption for food-purposes of human beings and animals from biologically more valuable sea-salt is covered by it more inexpensively. The consumption of sea salt will spread, while now mainly NaCl from industrial mines is used.

Assumed, one needs approximately 2.000 mm precipitation per year or 2.000 liters = 2 m^3 per square meter for an optimal plant-growth with the strong heat in the desert-regions, then, 500 km^2 need 1 billion cubic meters = 1 km^3 per year. One therefore can rinse agriculturally about 500 km^2 x 0,25 = 125 km^2 ≈11 km x 11 km with 0,25 km^3 water. In Chapter 5 is calculated that 99,5 % of the surface of a TPP or 38,3 km^2 is usable as a greenhouse and that 25% of the 6.000 1-GW-TPPs are sufficient for the food production for all mankind.

125 km^2 / 38 km^2 = 3,3 times. **With the amount of freshwater of one TPP I can use 3 TPPs as greenhouses for food production** and I can use all of them at the same time for the absorption of the CO_2 and for the other necessary purposes. 3 TPPs / 13 TPPs = 23%.

1 TPP for freshwater production and 3 TPPs for food production (one of them makes the freshwater too) and 10 TPPs optimized for CCycling in the 13 TPPs of a 1-GW-TPP are a good mix for CCycling plus food production for mankind.

The greening of the deserts

The freshwater crisis of mankind is a problem often talked about. When the 6.000 1-GW-TPPs went into operation and the CO_2-concentration of the atmosphere declined and all the TPPs are used for the soloil-production, then it is worth to consider whether 1-GW-TPPs should be built further in order to get rid of the drinking water-shortage of the people in the areas with low rainfalls. The expenditure for such TPPs is certainly no more as high as at the beginning after a series of 6.000 x 13 = 78.000 TPPs.

With one TPP I can produce the freshwater for 6 million people with 100 liters per day. With 1.000 TPPs I can solve this problem for mankind. 1.000 TPP / (13 TPP/ 1-GW-TPP) = 77 1-GW-TPP. **With the energy of 77 times 1-GW-TPPs I can solve the drinking water problem for humanity.** The food production and the freshwater for it is solved independently with 23% of the 6.000 Ccyclers. The drinking water obviously is just a small problem compared to the climate catastrophe.

When also mankind's drinking water-problems are solved, then it is time to think about another improvement of our earth and to execute it vigorously.

The groundwater mirror in the deserts sank after the end of the ice age, and especially in the last century more and more, also and above all through the human consumption of the reserves, particularly in the last decades by the industrial and agricultural exploitation of the reserves in big depth.

A large-scale project of mankind can be to turn parts of the deserts of the earth to fertile land again. That admittedly is simple, but nevertheless costly:

By planting of trees the increase of the humus-layer is provided. With artificial irrigation and with sufficient humus per plant, less than $1m^3$ / tree, **the forests and parks are regrown that grew there approximately 10.000 years ago.**

They are available for the isolated settlement of people, for hermits, for small village-communities, but also for vacation-installations. The particularly remarkable nature-landscapes of the desert are put under nature conservancy as desert-regions.

These projects are generation treaties and mankind projects: The deserts of the earth around the 1-GW-TPPs will be blooming paradises again in a generation if we want it.

The calculations showed that one single TPP can generate 0,25 km^3 / year freshwater, therefore a **1-GW-TPP can generate 13 x 0,25 km^3 / year = 3,25 km^3 freshwater per year.**

For the saltwater-transportation I need 5 noble-steel-pipelines with 1m of diameter or **one pipeline with 2,15 m of diameter and a return-pipeline of 0,68 m of diameter.**

(3,25 km^3 / a) / (0,7 km^3 / a) = 4,64 ≈ 5

4,64 x 0,785 m cross section = 3,64 m^2 = d^2 x π/4; **d = 2,15 m**

d_{return}^2 x π/4 = 3,64 m^2 / 10 = 0,364 m^2; **d_{return} = 0,68 m**

With this water-quantity I can rinse 1.625 km^2 with $2m^3$ / m^2 irrigation per year. That is the surface of a circle of 46 km of diameter:

3,25 x 10^9 m^3 / 2 m = 1,625 10^9 m^2 = 1.625 km^2 = d^2 x π/4 with d = 46 km.

If I therefore build 1-GW-TPPs especially for the freshwater-production, then I can rinse and cover with greenery a desert-surface of 46 km of diameter with each of such 1-GW-TPPs.

If sufficiently big woodlands are grown, they will become self-sufficient gradually and provide for their own climate: The evaporation of cubic-kilometres water through the trees will generate rain that is used additionally to the artificial irrigation.

In this situation, the no more additionally required freshwater can finally be led into the underground reservoirs, that are under many deserts. In the underground are strata that are impermeable for water. Through a rain-excess 10.000 years ago a high water level had established over them that could be used by the vegetation at that time. That water level lowered itself again since then, however. If these reservoirs are replenished again, then, the deserts that do have such reservoirs, become green again just like at that time.

Human then just must provide enough water so that the water level does not fall again. Irrigation then is not necessary any more. The suitable feeding points for the replenishment of these reservoirs are for example the oases in the deserts. With our present-day technology, we can turn back again the process of the desiccation that lasted for 10.000 years.

A reservoir of for example 1.000 km x 5.000 km of expansion and 50 meters of depth, has a volume of 10^6 m x 5 x 10^6 m x 50 m = 250 x 10^{12} m^3. It is approximately filled by 50 percent with sand and stones. The other half can be filled with water between the sand-grains, therefore 125 x 10^{12} m^3. A 1-GW-TPP produces 3,25 x 10^9 m^3 freshwater per year. **6.000 1GW-TPPs therefore need**

125 x 10^{12} m^3 / (3,25 x 10^9 m^3 x 6 x 10^3 1-GW-TPP) = 125 / 19,5 = **6,4 years, to fill such a reservoir.** Maybe 1.000 1-GW-TPPs suffice thereafter, to keep it filled with the consumption of a forest from this reservoir.

This surface of 1.000 km x 5.000 km = 5 million square-kilometres is approximately half as big as the surface of Europe of approximately 10,5 million square-kilometres.

This consideration illustrates that **the greening of the deserts of this earth is just as big a project as the Ccycling-Project.** With the Ccycling, it is only about the balance of 4 generations, with the irrigation of the deserts, it is about the balance of 300 generations, therefore of 10.000 years. It can be begun when we got out of the climate catastrophe, solved the water-shortage, and when we want it as **persons being responsible for our spaceship earth.**

Annex 3: The financing of the Ccycling

A critical part in a feasibility study is the financing of a project. Here is a possible model of it. Several alternatives are presented.

The climate catastrophe is stopped in less than a generation and can then be turned back at will to the level, that is the best for all people, in very big speed after the discretion of the then living people.

And not only this.

‘We’ built a new energy system with it:

1. It is non-polluting.

2. It is sure.

3. It is totally recycling.

4. It is in the property of all people and delivers cheap energy that is released without profit margin,

5. since all people are the entrepreneurs. They all together took part in the transaction of this project after their abilities with 5 percent of their productivity.

6. It grants all energy wishes of mankind until into the most distant future.

7. It is built to very long term stability.

8. It is variable almost at will.

9. It can also be enlarged in the surroundings of the cities up to approximately 45° of geographical width.

10. It can be used as gigantic greenhouse simultaneously for the food production in the power plants.

11. The nitrogen of the air is processed to fertilizer.

12. The other climate gases like methane become recycled too.

13. It works with conventional technology, ‘low tech’ that has been tested since decades or centuries and that is ripe.

14. It is decentralized. It is spread over the five continents of the earth (even in Southern Europe).

15. It brings together mankind in cooperation to common welfare.

16. It regenerates the deserts to again greening nature paradises.

17. They turn into settlement areas for new forms of human living together.

18. It gets rid of mankind's freshwater problems.

19. It does end with the old unclean combustion technology, with which many pollutants accrue. It just burns to $CO_2 + H_2O$.

20. It enables to uphold the present individual traffic on oil basis.

21. It connects seamlessly to this running out technology model.

22. The gone wrong global experiment reaches completion in a technology that is optimized for this spaceship earth: We circle around an (almost) inexhaustible source of energy.

The world economy is increased very strongly with the realization of the project through the gigantic building sites on all continents and the world-wide activity of many people that are unemployed until now and that want to work meaningfully.

Nevertheless, this project is not unrealistically big: In the one year 2005 over 10 trillion Euros were raised as foreign-investments by capitalism alone. This is 10-fold the here required means and this just through the rich people, the investors alone. (Foreign investments are all investments outside the own country of the investor.)

And in the same year 2005, there were 200 million job-hunting people on this earth without work possibility.

Nothing actually hinders the successful transaction of the project, since

1. The information of this text will become known fast enough.

2. Its representation convinces sufficiently many people.

3. An organization is established that is under public law, non-profit, government-independent and state-independent, democratic and international, that belongs to all human beings to same sharing: **Ccycling.org**.

4. Capable and ethically proven and organizationally outstanding people are found that are ready to collaborate in leading this project.

5. **The states of the earth** agree to this project and **grant their support through freedom from tax, through collecting of the membership rates** like for example with the church tax (in Germany), **through lending of ground for the required surfaces** (at the edges of the deserts) and through other suitable laws. **The costs for the states are zero.**

6. **Each human being of the earth can put 'just 5 percent' of his income that is over the poverty line into this project, on average 167 €/ human being and year or 46 c/ day**.

7. The unemployed people of the earth that are free to collaborate, are paid to take part in this work after they were trained for it. That part of the productive ability of mankind that until now is lying fallow, because capitalism does not need it, is used for mankind's own general advantage.

8. Possibly, **a CO_2-tax is drawn in by all states competition-neutrally additionally world-wide and handed over to Ccycling.org.** This tax serves exclusively the goal to pay the complete Ccycling of the carbon. (It does not serve the goal to stuff the holes in the pension insurance - like the energy-tax in Germany today;-)

   Until now, the price for the waste disposal of the exhaust fumes is practically not taken into account, but only the price for the first half of the cycle: to the support of the petroleum, its preparation and its distribution before its utilization. **A Ccycling tax of for example 1 Euro per litre of fuel renders 1 trillion Euros per 1 km^3 fuels.** The members of Ccycling.org could possibly be freed from this tax if the citizens of the democracies wish it of the majority.

   1 km^3 / a = 10^{12} liters/ a | x 10 kWh/ l = 10 x 10^{12} kWh/ 8.760 h = 1,14 x 10^9 kW = 0,19 kW/ human

9. **The money for emission certificates to the output of CO_2 can be used for this project** as well, if the citizens of the democracies wish it.

   'The EU-commission expects 50 billion Euros revenues annually from the now planned auction of the contamination rights. The money *should* be put in for climate innovations *above all*.' [7])

[7]) http://www.spiegel.de/wissenschaft/mensch/0,1518,530501-2,00.html of 23rd January 2008 in German: ‚Von der jetzt geplanten Versteigerung der Verschmutzungsrechte erwartet die EU-Kommission jährlich 50 Milliarden Euro Einnahmen. Das Geld soll vor allem für Klima-Innovationen eingesetzt werden.'

   With 300 million Europeans, this auction gains per European: 50 x 10^9 €/ 300 x 10^6 Europeans = 166,67 €/ European. **If the emission certificates are auctioned world-wide like in Europe, then, this is per 6 billion people:**

   6 x 10^9 people x 166,67 € / human being = 1 trillion Euros per year.

Annex 4: The Organization of the Ccycling

This is a mankind project. It has the characteristics:

1. It serves the entire mankind.

2. It is too big to be executed by one of the existing organizations.

3. It is paid by all human beings **proportionally** after their respective possibilities, comparable to the state taxes.

4. The labor is executed mainly from people that until now are **unemployed**, independent from other differences.

5. The co-workers are paid with a salary above a **minimum salary**, like the majority of all people hold it for just. **Each human being should perform the work as a co-worker for this salary gladly and should like to pay the salary as an employer likewise gladly.** As **social benefits** for the construction workers and for the future co-workers of Ccycling.org and for their families originate useful lasting settlements at the edges of the Ccyclers that are offered additionally to the salary.

6. **Patents are not given by the patent offices of the states for procedures that are developed for mankind projects, in principle.** Existing patents that are used are paid a fee for these purposes with an appropriate amount. They of course can also be 'donated', that is put to the disposal gratuitously.

7. An organization, in which **each human member has exactly one voice**, carries out the project. This organization is under **public law, non-profit, 'transparently open', government-independent and state-distant, international and democratic.**

8. Its name is **Ccycling.org**

9. Each member has exactly **one voice**, independent from the membership rates (of 5%) or from the donation height.

10. The **communication** with its members, therefore with mankind, takes place **over the internet**; likewise the planning of the project, the public opinion formations, decisions, elections, improvement suggestions and stimulations.

11. **Ccycling.org must not pick up credits.** It must not get into **any debts**. It can only invest the money quantity that it gets as membership rates, donations, taxes, contamination rights, etc. It must by no means repeat the mistake that (almost) all states of this earth are to blame for and that restricts their freedom of action narrowly. The states must do what their money lenders want. Ccycling.org must remain capable of acting in the sense of their members.

12. Very big value is put on '**Glasnost**', on glassy openness of all processes to the prevention of corruption, felt and nepotism, because very big sums of money are at stake that belong to us all, and also an utmost high quality is at stake that should serve us all.

    That is possible through **complete enlightenment** of all suspicions and public protocol in the internet, because each living human being is involved in the organization ideally and in fact as owner and therefore information-justifiable. **A censorship of its web**

site does not take place in any country of the earth. Only long-time proven, ethically perfect managers may practice leading functions. Own 'Glasnost departments' are directly responsible for the enlightenment of every single irregularity. Each reported suspicion - also anonymously - is cleared up completely.

Passive **bribery** of the Ccycling.org co-workers is punishable by disproportionately high contract penalties. Therefore only these men will become co-workers that detest and fight any bribery. Each active bribery leads to public proscription and to the call to long-term boycott of the products of the organization responsible by all Ccycling.org-members - additionally to the legal penalty.

13. The structure of Ccycling.org principally is **decentralized and synergic**: Self-sufficient part-organs build and administer the individual factories and TPPs. Additionally, there are a steering central administration and a system-planning.

14. Leading co-workers get salaries that must not be over comparable salaries in the region or in the remaining market economy. Their total profit must not exceed certain upper limits. **It is an honor** to actively and meaningfully be able to collaborate with this essential mankind project.

15. Through these and many further measures and through the constructive and communicative business climate **the very severe corruption danger is minimized**. Here too, the politics of all countries deliver sufficient illustrative-material. ('field-clearing'; 'landscape-cultivation'; 'loopholes'; 'Amigo-Affair'; ...) [8])

[15]) http://de.wikipedia.org/wiki/Bestechung ; Annex 5

15. As a first step in the formation of Ccycling.org the CEO (Chief Executive Officer) and the **leading managers are elected** in the inaugural meeting of Ccycling.org. These managers build the organization structure of Ccycling.org that can begin to work.

16. **Each member gets his percentage share of the generated energy** as return for the membership rates **completely gratuitously,** that is nominally a duration performance of **1 kilowatt/ person** from 40 years after beginning of the project (compare chapter 9). It is inherited tax-free. (With 365 days at 24 hours that is 8.760 kWh/ a. The membership rates will decrease by under 1 percent of the income after completion of the CCyclers and their infrastructure, therefore to approximately 30 €/a or approximately 3 c/ kWh.)

National borders play a subordinate role with mankind projects. The best suitable places of the earth are chosen as locations for the Ccyclers. If some governments should decide, not to support this project, then their territories are not used. At the selected locations, test-installations are built in rationally big standard already at the beginning that are enlargeable, because the time is scarce. Every year counts. With the experiences in the operation of the first installations, the following ones are further optimized continuously. **All installations are constructed flexible and modular so that all possibilities of improvement remain realizable in the future.**

Every detail of construction and all experiences with this project are published without exception in the internet so that the new technology upswing immediately is available to the entire mankind without patent dues. All members are asked for constructive cooperation as for example with the Open Source Culture (Linux, etc).

A learning process of mankind begins, against which the moon-landing of the Americans in the 1960s was ‘one small step for mankind.’

Neil Armstrong at the moon-landing: "One small step for man, one giant leap for mankind."

This is a gigantic jump for the whole mankind. All experiences benefit each human being directly and indirectly (Anti-mirror-coating, thermic insulation, food production, transportation,…). Because almost all people are the entrepreneurs, some of them are also the workers, that are paid for it by the others and they again themselves are their own entrepreneurs with 5 percent of their salary.

The affluence in the surrounding regions rises. Through mankind projects mankind grows together like with the internet.

Mankind projects promote peace among the people. **The ‘defence’ budgets of the states can be put in for these projects, if the majority of the citizens of the democracies wish it.** For which better and surer arms are developed until now than

peace-making measures and

full employment in meaningful labor and

supranational cooperation and

general, democratically assigned justice and

personal and stately energy and food and water autarchy and

work to the common survival in the affluence on our spaceship.