LIVING ROOM INSTEAD OF GREEN HOUSE MODEL

explains the heating of the earth

Sjaak Uitterdijk
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Prologue

About 5 years ago I was convinced that global warming could not be caused by the Green house effect. After all, in the last 200 years it has happened four times that the global temperature dropped while the CO₂ concentration in the atmosphere kept rising.

To support this opinion more scientifically, I applied a special mathematical operation to the very noiselike graph of the global temperature, which filters out all that noise, but preserves the essence. The result was a much clearer contradiction between global temperature and CO₂ concentration, which I interpreted as a confirmation of my opinion.

Shortly thereafter I realized that the graph also shows a clear long-term increase, which ultimately shows a strong correlation with the CO₂ concentration. Eventually it could be made clearly visible that a precise sinusoidal (64-year period) change is the cause of what led originally to the qualification: conflicting observations. This curious phenomenon has to be seen as completely independent of the long-term increase in global temperature.

I was convinced of the correctness of the Green house effect.

However, in my original article: “Relation Between CO₂, Global Temperature and Energy Consumption”, I wrote already: “The increase in global temperature can thus easily and directly be calculated from the increase in the worldwide generated power, without considering CO₂ emissions”!

Based on the physical law that prescribes that all consumed energy is fully converted into heat, the idea arose that the increase of the global temperature could, in principle, be caused by direct heating due to the consumed energy. In this report called the “Living room model”.

The result of the theoretical investigation of this Living room model, shown in chapter VII, forces to the conclusion that this model is much more likely than the Green house one. This implies that the CO₂ concentration in the atmosphere does not cause the increase of the global temperature.

Investigation of the relation between the emitted CO₂, for example in terms of Gigaton/year, and its concentration in the atmosphere, learns that during the past 50 years the atmosphere did absorb relatively more CO₂ than the years before. Instead of the distribution 30 – 70 a century ago, the distribution is now 40 – 60, meaning that the atmosphere absorbs more of the emitted CO₂, due to its higher temperature, at the expense of earth’s surface absorption. The here so-called Reverse Green House effect.

The gradient of this effect, in terms of ppm/°C, during the past 100 years turns out to be “about exactly” equal to the one deduced from the curves of 5 climate cycles during the past 420.000 years. These curves have been found as a result of the so-called Vostok ice drillings in Antarctica.
I Mathematical expression for CO₂ concentration in the atmosphere

I.1 Introduction

In this chapter a purely mathematical transformation of the publicly available data, obtained by measurements of the CO₂ concentration in the atmosphere, is carried out. The mathematical aid is the fitting of mathematical functions on that data, using polynomial and curve fitting techniques.

I.2 Polynomial fitting

Polynomial fitting means that the function \( y = \sum_{k} a_k \cdot x^k \) is fitted on measurements as a function of \( x \). The variable \( k \) is the so-called order of the polynomial, which in principle can be chosen arbitrarily. The mathematical background of the way in which such a function is fitted on the measurements is given in Appendix I.

The properties of a polynomial fitting are such that the higher the order is chosen the more tendencies in the original measurements will be retained, but the more unreliable extrapolations outside the measured area will become. For that reason it is advised not to use this technique for extrapolations, but exclusively in order to show tendencies inside this measured area. These tendencies, due to the random character of the measurements, would otherwise not or hardly be observable. In this article it is only applied to the measurements of the global temperature.

I.3 Curve fitting

In this article curve fitting means: the use of 3 points of measurement out of a collection of measurement data (here as function of time), in which a clear tendency is visible. Unlike the higher order polynomial fitting described above, these fitted curves can be used for extrapolations to estimate the data prior, or predict it beyond, the measurement window. The 3 measurements are used for the solution of the 3 variables \( a, b \) and \( c \) in the function \( y = c + a \cdot \exp(t/b) \). The variable \( t \) will represent the year under consideration. As a result the dimension of \( b \) is also “year”.

Given the measuring points: \( (t_1, y_1), (t_2, y_2), \) en \( (t_3, y_3) \) the solution of the constant \( c \) is as follows:

\[
\begin{align*}
    y_1 &= c + a \cdot \exp(t_1/b) \\
    y_2 &= c + a \cdot \exp(t_2/b) \\
    y_3 &= c + a \cdot \exp(t_3/b)
\end{align*}
\]

\[
\begin{align*}
    \ln(y_1 - c) &= \ln(a) + t_1/b \\
    \ln(y_2 - c) &= \ln(a) + t_2/b \\
    \ln(y_3 - c) &= \ln(a) + t_3/b \\
    \ln(y_1 - c) \cdot \ln(y_2 - c) &= (t_1 - t_2)/b \\
    \ln(y_1 - c) \cdot \ln(y_3 - c) &= (t_1 - t_3)/b \\
    b &= (t_1 - t_2)/\{\ln(y_1 - c) \cdot \ln(y_2 - c)\} \\
    a &= (y_2 - c)/\exp(t_2/b)
\end{align*}
\]

\( c \) can only be solved numerically by means of an iteration process, applied to the function:

\[
(t_1 - t_2)/\{\ln(y_1 - c) \cdot \ln(y_2 - c)\} - (t_1 - t_3)/\{\ln(y_1 - c) \cdot \ln(y_3 - c)\} = 0
\]

\[
\begin{align*}
    b &= (t_1 - t_2)/\{\ln(y_1 - c) \cdot \ln(y_3 - c)\} \\
    a &= (y_2 - c)/\exp(t_2/b) \\
    y_1 &= c + a \cdot B_1 \\
    y_3 &= c + a \cdot B_3 \\
    y_1 - y_3 &= a \cdot (B_3 - B_1)
\end{align*}
\]

In this report an essential approach is that several times the fitting to other measured variables is started with the same \( b \) as found for the CO₂ concentration. In such a situation the solving of \( a \) and \( c \) is as follows:

\[
\begin{align*}
    B_i &= \exp(t_i/b) \\
    y_1 &= \epsilon + a \cdot B_1 \\
    y_3 &= \epsilon + a \cdot B_3 \\
    y_1 - y_3 &= a \cdot (B_3 - B_1)
\end{align*}
\]

\[
\begin{align*}
    a &= (y_1 - y_3)/(B_1 - B_3) \\
    \epsilon &= y_1 - a \cdot B_1
\end{align*}
\]
I.4 Mathematical expression for the CO$_2$

From here on, for simplicity’s sake, the variable “CO$_2$ concentration in the atmosphere” will be called: CO$_2$. The CO$_2$ measurements, as presented in reference [I], are called: Monthly Mean Concentrations at the Mauna Loa Observatory. For the purpose of this investigation their monthly registrations are transformed to yearly mean values. The measurements have been carried out since 1958. The units are in Parts Per Million or PPM.

The graphics of these measurements show a very smooth tendency, hardly possessing random deviations and are therefore very suitable for applying the curve fitting \( y = c + a \cdot \exp(t/b) \).

The outcome, based on the measurements in the years 1958, 1986 and 2014, is:

\[ y_{\text{C}}(t) = 259.4 + 6.60 \cdot 10^{-13} \cdot \exp(t/61.06) \]

Taking \( b = 61 \), so \( c = 259.5 \) and \( a = 6.37 \cdot 10^{-13} \), learned that no deviation can be detected in the graph.

Therefore the mathematical expression for the concentration of the CO$_2$ is chosen as:

\[ y_{\text{C}}(t) = 259 + 6 \cdot 10^{-13} \cdot \exp(t/61) \quad \text{[ppm]} \quad (1) \]

In this function the variable \( t \) is the actual year number, which explains the small value of the constant \( a \). Based on the fact that the calculated curve shows an excellent fit with the measurements, it is considered justifiable to extrapolate the values back to 1850. See Figure I.1.

1850 is the year in which the recording of the global temperature, to be considered hereafter, was started.

![Figure I.1: Measured CO$_2$ since 1958 and fitted curve extrapolated back to 1850 and forward to 2050](image)
II Mathematical expression for the global temperature

II.1 Short-term-trends

The measurements of the global temperature had been downloaded around 2015 from a site called: National Aeronautics and Space Administration, Goddard Institute for Space Studies, showing measurements starting in 1850. However the link to that site has been removed. The new link (reference [II]) now shows measurements starting in 1880. The measurements since 1850 have been used for the fitting described below.

The measurements have been fitted to an 8th and 9th order polynomial, shown in figure II.1
Considering the mutual rather divergent behaviour, between the 8th and 9th order curves, only during the last five years, the mean value of these two polynomials has been calculated and applied as the final high order polynomial fitting.

Figure II.1: Global temperature, measured and polynomial fitted

Over the past 10 years, the temperature of the earth no longer significantly increased (0.03 °C), despite the ongoing increase of the CO$_2$ concentration, as presented above. This means that, assuming the Green house theory is correct, seemingly other processes determine the temperature of the earth too.
This conclusion is supported by the observation that during the periods 1945-1965, 1875-1905 and ? - 1855 this temperature even decreased notwithstanding the always increasing CO$_2$ concentration.

So it might even be that the Green house theory is not correct, with the consequence that the CO$_2$ concentration in the atmosphere is not responsible for the increase of the global temperature. To investigate this in more detail a long-term-trend of the global temperature only has to be extracted.

* The question mark concerns data that started in 1834, but this data is not found at Internet anymore since about 2017.
II.2 Long-term-trend

In order to extract a pure long-term-trend of the global temperature, in first instance a 2nd order polynomial fitting has been carried out. See figure II.2. The result shows an unrealistic trend in the first four decades. To eliminate this, the curve fitting \( y = c + a \cdot \exp(t/b) \) has been applied to 3 places where the 2nd polynomial equals the high order polynomial. That means the years 1892, 1958 and 2012. At the same time it is investigated whether the curvature of the CO\(_2\), to read as the value of \( b \), can be used.

Figure II.2 shows the graph of the function:

\[
y_T(t) = 13.5 + 4.4 \cdot 10^{-15} \cdot \exp(t/61) \quad [\degree C]
\] (2)

No reason can be assigned to reject such a curvature, starting at 1890.

![Global temperature](image)

**Figure II.2: Global temperature, polynomial and curve fitted, as function of time**

II.3 Interesting spin-off

If the exponentially fitted long-term-trend curve is subtracted from the total curve a surprising periodical curve results! See fig II.3. The graphics shows 2.5 periods in 160 years. That is 64 years per period.

Interesting stuff for relevant specialists to figure out what might be causing this.

Remark: The red curve, obtained by taking the second order polynomial function as reference, shows a more perfect sinusoidal function, except the first half period. The surprising upwards trend in this period might be the reason for withdrawing the data from 1850 – 1880 from Internet.

N.B. The information shown in this chapter has been available at least until 2016.

The amplitude of this periodic phenomenon seems to decrease somewhat as a function of time, but the next decades it will certainly be 0.1 \( \degree C \).
This periodic function has been continued smoothly after 2012 by applying the function: $-A\sin\{\omega(t - 2012)\}$ with $\omega = 2\pi/64$, and $A = 0.1$, as shown in figure II.3.

Doing so, the global temperature can be predicted precisely until 2050, as shown in figure II.4.

---

**Figure II.3:** Periodic function extended after 2012 with $A\sin\{\omega(t - 2012)\}$

**Figure II.4:** Predicted global temperature (°C) until 2050, including periodical variation
III Mathematical expression for the world population

There are several sources at the Internet informing about this subject. The world population as shown in reference [III] has been taken as the first approximation. “As the first approximation”, because the graphics show such an unnatural character that it is impossible to qualify this as correct:

- an artificial nod in 1950 as well as in 1925,  
- in between the two nods and from 1925 to 1800 a straight line,

In order to obtain a more credible curve, which means: as belonging to a natural process, the exponential curve $y = c + a \cdot \exp(t/b)$ is chosen. The value of $b$ is, in advance, taken 61.

The two artificial nods have been eliminated by using the inputs belonging to 2014 and 1914. The result is:

$$y_P(t) = 0.47 + 3.2 \cdot 10^{-14} \cdot \exp(t/61) \quad \text{[billion]}$$

Figure III.1 proves that this is an entirely acceptable representation of the reality.

![Graph showing world population growth with exponential curve fit](image-url)
IV Mathematical expression for the worldwide energy consumption

IV.1 Exponential curve fit
Global administrations of the consumption of fossil fuels has led to the graph, as shown in figure IV.1, of the annual energy consumption in the past 200 years. Figure IV.1 has been copied from reference [IV.1].

\[ y_W(t) = -0.06 + 8.4 \times 10^{-14} \cdot \exp(t/61) \text{ EW} \]  \[ (4) \]

Figure IV.1 shows “humps” and “dents” that conflict with the extremely streamlined graph of the measured and backwards extrapolated CO₂ concentration in the atmosphere. See chapter I. For this reason the graph of figure IV.1 has also been streamlined by means of exponential curve-fitting. The data has first been converted to a stylized graph and at the same time to TW, applying the relation: 1 Exajoule/year = \(10^6/(3600 \cdot 24 \cdot 365) = 0.0315\) TW.

The years 2010 and 1810 have been taken as references for the curve fitting. The value of \(b\) is, in advance, taken 61. The result is: \(y_W(t) = -0.06 + 8.4 \times 10^{-14} \cdot \exp(t/61)\). The value -0.06 is not realistic, but so small that it can be ignored. So the mathematical expression for the worldwide energy consumption will be:

Figure IV.2 shows the related graphs and also that, without compromising credibility, the curvature of the energy consumption graph may be chosen as 61. The legitimate question namely is how reliable these registrations were until the discovery of the climate problem!
IV.2 Impact of sustainable energy

**Sun energy**
The net electrical power generated by means of sun cells is 15 W/m$^2$ of these sun cells. Experience learns that a mean household of 3 persons in the prosperous part of the world can generate its own need for electrical purposes by means of 20 m$^2$ of sun cells. The heating of the house excluded. Including the heating would result in about 50 m$^2$. So heating the houses with sun energy is impossible. The need for electrical energy of the meant household is, exclusive the heating, 100 W per person. The prosperous part of the world population is roughly living in Europe, North America and some other countries, together with a much lower population than the two first mentioned ones. Presented as a rounded number: 1 billion persons. These prosperous one billion persons as a result need 0.1 TW power, exclusive the heating. Such a power is a negligible fraction of the worldwide required power of 20 TW. The landscape would worldwide be destroyed significantly, if such a power would have to be generated by sun cells.

**Wind energy**
The drawing in figure IV.3, copied from reference [IV.2], shows the power of the worldwide generated wind energy. Suppose in 2017 this will be 500 GW, it presents a growth of 0.05 TW/year.

![Wind Power Global Capacity, 2004–2014](image)

Figure IV.3

The expression “Wind Power Global Capacity” is misleading. It should have been presented as Globally Installed Wind Power. The generally accepted net power is 20% of its installed power, so 0.1 TW. Completely negligible w.r.t the global need of about 20 TW at this moment. It can be directly deduced from (4) that the annual growth of the worldwide power need at this moment is: 0.3 TW/year. The annual growth of net wind power is 0.01 TW/year, so also completely negligible w.r.t. the annual growth of the need.

**Earth heat energy**
Suppose the mean family worldwide consists of 3 persons and suppose each family needs a power of 500 W to heat its house. As soon as the world population would be 3 billion of such families, the required total power to heat all the houses on the world would be 1.5 TW. That is a negligible fraction of the total need at that time: 23 TW. So even in the most extreme, and at the same time most unrealistic, situation that each house on the world would be heated by means of earth heat energy, only a negligible part of the worldwide required power would be generated by such a kind of sustainable energy.
V  Mutual relations between the variables

Given the fact that \( b = 61 \) can be applied successfully to all of the four variables under consideration, the following expressions have been found:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Unit</th>
<th>Expression</th>
</tr>
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<tbody>
<tr>
<td>CO(_2) concentration</td>
<td>ppm</td>
<td>( y_C(t) = 259 + 6.4 \cdot 10^{-13} \cdot \exp(t/61) ) (1)</td>
</tr>
<tr>
<td>Global temperature</td>
<td>°C</td>
<td>( y_T(t) = 13.5 + 4.4 \cdot 10^{-15} \cdot \exp(t/61) ) (2)</td>
</tr>
<tr>
<td>World population</td>
<td>billion</td>
<td>( y_P(t) = 0.5 + 3.2 \cdot 10^{-14} \cdot \exp(t/61) ) (3)</td>
</tr>
<tr>
<td>Globally applied power</td>
<td>TW</td>
<td>( y_W(t) = 8.4 \cdot 10^{-14} \cdot \exp(t/61) ) (4)</td>
</tr>
</tbody>
</table>

The mutual relations between these variables can be deduced as shown below by means of an example.

\[ y_C(t) - 259 = 6.4 \cdot 10^{-13} \cdot \exp(t/61) \]
\[ y_T(t) - 13.5 = 4.4 \cdot 10^{-15} \cdot \exp(t/61) \]

so

\[ \frac{y_T(t) - 13.5}{y_C(t) - 259} = 4.4 \cdot 10^{-15} / 6.4 \cdot 10^{-13} = 7 \cdot 10^{-3} \]

resulting in:

\[ \text{global temperature} = 13.5 + 0.007 \cdot (\text{CO}_2 - 259) \]

Inversely:

\[ \text{CO}_2 = 259 + 145 \cdot (\text{global temperature} - 13.5) \]

The world population (in billions) can be expressed as function of CO\(_2\) by:

\[ \text{population} = 0.5 + 0.05 \cdot (\text{CO}_2 - 259) \]

eliminating for example the necessity to count the world population!

For each 1 billion humans extra the global temperature rises 0.14 °C:

\[ \text{global temperature} = 13.5 + 0.14 \cdot (\text{population} - 0.5) \]

The global temperature as function of the globally applied power (GAP) is:

\[ \text{global temperature} = 13.5 + 0.05 \cdot \text{GAP} \]

The very fundamental deduction that can be drawn from the last shown expression is that possibly the CO\(_2\) concentration doesn’t play any role in the increasing global temperature.

This will be further investigated in the next chapter.
VI The monthly global temperature and \(\text{CO}_2\) anomalies

VI.1 Introduction

Monthly averaged records of the \(\text{CO}_2\) concentration in the atmosphere and of the global temperature show a surprisingly yearly periodic behaviour. This chapter analyses these phenomena, especially in order to investigate possible relations with the Green house model as well as with the Living room model.

VI.2 Monthly temperature anomalies

Reference [VI.1] shows a graph of the monthly temperature deviations per year relative to the worldwide mean global temperature for that year since 1880 (See Figure VI.1, copied from reference [VI.1]). The separation of the curves has been realized by adding the related long-term increase of the worldwide mean global temperature during that year. As a result the curve for the year 2017 is drawn about 1 °C higher than the curve for 1880. See note regarding the original source: reference [VI.2].

![Graph of Monthly Temperature Anomalies](image)

Figure VI.1: GISTEMP Seasonal Cycle since 1880

Possible background for the presented anomalies.

Reference [VI.3] presents that during the summer the rise in temperature around the North pole (between 60\(^\circ\) and 82.5\(^\circ\) latitude) is significantly higher than the fall in temperature around the South pole in the same months. A similar phenomenon occurs between 32.5\(^\circ\) and 50\(^\circ\) latitude. The graphs of these anomalies are shown in the figures VI.2 and VI.3. The blue line is for an early period (1980–1989) and the red line for a later one (2000–2009). The curves prove that this phenomenon is perfectly consistent.

Note:
Reference [VI.2] should have shown such anomalies, but doesn’t anymore. The person who is responsible for this data has been sent an email for clarification. It has been admitted that this data has been removed, but a clarification is not given, not even after two other attempts.
Figure VI.2: Temperature measurements between $60^\circ$ and $82.5^\circ$ latitude

Figure VI.3: Temperature measurements between $32.5^\circ$ and $50^\circ$ latitude
These graphs have been converted into data as shown in Table VI.1 in the columns marked with NH and SH. Although the differences between the red and blue lines are very small, the mean value is presented.

<table>
<thead>
<tr>
<th>month</th>
<th>latitudes (60° to 82.5°)</th>
<th>latitudes (32.5° to 50°)</th>
<th>latitudes mean °C</th>
<th>dev. latitudes mean</th>
</tr>
</thead>
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<td></td>
<td>NH</td>
<td>SH</td>
<td>NH</td>
<td>SH</td>
</tr>
<tr>
<td>1</td>
<td>243,4</td>
<td>249,5</td>
<td>255,0</td>
<td>273,1</td>
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<td>254,0</td>
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<td>242,3</td>
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<td>271,0</td>
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<td>12</td>
<td>248,5</td>
<td>246,1</td>
<td>258,0</td>
<td>272,8</td>
</tr>
</tbody>
</table>

Table VI. 1

The variable “Latitudes mean” shows the mean values of all the 4 temperatures on its left side in °C. The green value is the mean value of these mean values, used to calculate “dev. latitudes mean”. The top-top value of this variable is 5 to 6 °C, so significantly higher than the top-top value of 4 °C in figure VI.1. That is logical, because the variable “Latitudes mean” is a very poor representative of the globally mean temperature. The last one is the mean value of thousands of stations on the global surface. But their respective maximum and minimum value are in the same months (Jul-Aug resp. Dec-Jan).

This investigation thus learns that the monthly global temperature anomalies, as shown in figure VI.1, are strongly related to the orientation of the earth relative to the sun. However, it doesn't explain yet in more detail what happens on earth during summer and winter, in NH, resp. SH, that causes these mutual significant differences.

The map in figure VI.4 shows perfectly the seasonal temperature differences between NH and SH.

Figure VI.4: “Using the Berkeley Earth Surface Air Temperature (SAT) dataset the seasonal temperature range was calculated over the entire land surface of the globe. For the purposes of this map the seasonal range was defined as the difference between the warmest month and the coolest month. The difference ranges from a low of 0 degrees C in equatorial regions to a high of 60 degrees C in north eastern Russia. While not as dramatic as the ranges found in Siberia, the seasonal range in northern Canada is also large.”
VI.4 Monthly \(\text{CO}_2\) anomalies

Reference [I] shows the monthly records of the \(\text{CO}_2\)-concentration in the atmosphere in ppm since 1958. It has been used to make a graph of this anomaly averaged over the total period of measurements. Figure VI.5 shows this graph as well as the monthly temperature anomalies, also as averaged values over the whole period of measurements*. The curves have been made symmetrical around zero by subtracting the yearly mean value over the respective periods.

*The curve in figure VI.5 is based on data that was available at the original site until the end of 2017!

Figure VI.5: Mean monthly \(\text{CO}_2\) and global temperature anomalies w.r.t. yearly mean values

Figure VI.5 shows that during the summer in the NH the globally averaged \(\text{CO}_2\) concentration decreases. This can possibly understood as follows.

A property of plants is that they grow more during warm periods than during cold periods and that they thus absorb more \(\text{CO}_2\) during a growing period. During summer in the NH it is winter in the SH. However the SH has by far less area where plants grow and at all these areas it never becomes cold, because they are all located close to the equator. So the plants at the SH will not create a significant anomaly in the absorption of \(\text{CO}_2\) during a year. As a result the globally mean value is season dependent, without any relation with the long-term trend of this variable.

The question remains what the fundamental cause of the monthly temperature anomaly might be.

The generally accepted idea is that oceans absorb more heat than land. Given the fact that the SH contains by far more water than the NH, the temperature of the atmosphere at SH increases less during summer at SH (Oct-Feb) than this temperature does at NH during summer at NH (Apr-Aug).

Given these argumentations the conclusion must be that the seasonal anomalies don’t have any relation with the long-term increase of the yearly averaged global atmospheric temperature, neither of the yearly averaged \(\text{CO}_2\) concentration in the atmosphere.
VII Green house model versus Living room model

VII.1 Living room model

The Living room model is based on the idea that the air in such a room can be imagined as the atmosphere and that this “atmosphere” is heated directly by whatever kind of source. In order to make the resemblance appeal to the imagination, the room is assumed to be heated by many small objects on and near the floor. Normally a room is not isolated completely, so heat will be lost via walls and ceiling, just like the real atmosphere loses heat to the earth surface and to the universe.

VII.2 Definition of the global temperature

The global temperature is calculated as the average temperature, measured in a few thousand stations throughout the world. The measurements take place at a height of 1.5 to 2 meters above the earth's surface. The global temperature is therefore the temperature of the atmosphere at that height. For that reason, the heat capacity of the atmosphere is considered to be the most crucial parameter in the assessment of the Green house as well as the Living room model.

VII.3 Heat capacity of the atmosphere

The heat capacity of the atmosphere, expressed in J/K, determines how much the atmosphere rises in temperature, given the net heat supplied. Here "net" is defined as the difference between the supplied and removed heat. In Appendix VII.1 section 1, it has been calculated that this capacity is $5 \cdot 10^{21}$ J/K.

VII.4 Heat balance of the atmosphere

The atmosphere absorbs the heat that is generated directly above the surface of the earth and, in part, releases it to the universe and to that surface by means of radiation resp. convection. Apparently there has been a balance between absorbed and released heat for many centuries, but this balance has been severely disrupted for about 200 years. See blue graph in figure VII.1. This disturbance has an increase in the global temperature with a time-dependent gradient as shown in Table VII.1. These values can be calculated by taking the derivative to time of (2) in chapter II.

![Figure VII.1: Global temperature since the year -20000](image)

<table>
<thead>
<tr>
<th>Year</th>
<th>mK/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1850</td>
<td>1,1</td>
</tr>
<tr>
<td>1875</td>
<td>1,6</td>
</tr>
<tr>
<td>1900</td>
<td>2,4</td>
</tr>
<tr>
<td>1925</td>
<td>3,7</td>
</tr>
<tr>
<td>1950</td>
<td>5,5</td>
</tr>
<tr>
<td>1975</td>
<td>8,3</td>
</tr>
<tr>
<td>2000</td>
<td>12,5</td>
</tr>
<tr>
<td>2005</td>
<td>13,6</td>
</tr>
<tr>
<td>2010</td>
<td>14,7</td>
</tr>
<tr>
<td>2020</td>
<td>17,4</td>
</tr>
<tr>
<td>2100</td>
<td>64,5</td>
</tr>
</tbody>
</table>

Table VII.1 Gradient global temperature
VII.5 From consumed energy to thermal energy

The thermodynamic law of conservation of energy leads to the consequence that all globally consumed energy, of whatever kind, like artificially generated sun and wind energy and nuclear energy, is ultimately converted into thermal energy. Also in case basic energy is transformed into kinetic energy, such as for example with propulsion. This kinetic energy is, through friction with the medium in which the propulsion takes place, or through the friction in the machine itself, inevitably converted into thermal energy. If the propulsion leads to an increase in the potential energy of the vehicle, for example in the case of an aircraft, or a car driving up a mountain, this form of energy is still converted into heat as soon as the vehicle returns to its original height. Since, on average, all vehicles around the world return in this way, it must be said that all consumed energy, of whatever kind, has been converted into thermal energy.

In the Green house model, the incoming and outgoing radiation density is approximately 340 W/m\(^2\) and 0.6 W/m\(^2\) thereof is supposed to determine the Green house effect. See Appendix VII.2.

In 2010 the worldwide average applied power was \(17.2 \cdot 10^{12}\) W, as follows from (4) in chapter IV. This power divided by the surface of the earth \(\left(5.1 \cdot 10^{14}\ \text{m}^2\right)\), results in 0.034W/m\(^2\). This is almost a factor of 20 lower than the alleged power density in the Green house model. These sources are from now on called direct resp. indirect heating.

So the direct heating represents the Living room model and the indirect one the Green house model.

VII.6 Contribution of the direct heating

The influence of the direct heating can be calculated from the following equation:

“Atmospheric heat capacity \([\text{J/K}]\) times “atmospheric temperature gradient during a year \([\text{K/year}]\)” = “net heat energy absorbed by the atmosphere during that year \([\text{J/year}]\)”.

Because the entity \(\text{J/year}\) is equivalent to the entity power, the last mentioned variable can also be presented as: “net average heat power applied during that year”, expressed in W.

In both cases the word “net” is only applicable if the gross energy, delivered by the direct heating, is at least as large as the energy needed to increase the temperature of the atmosphere to the height as has been measured. The atmospheric heat capacity is \(5 \cdot 10^{21} \text{J/K}\), which can also be written as \(5 \cdot 10^{21} \text{W/(K/s)}\).

The global temperature gradient in, for example, 2010 is \(14.7 \text{ mK/year} = 4.7 \cdot 10^{-10} \text{ K/s}\). See table VII.1

So \(5 \cdot 10^{21} \cdot 4.7 \cdot 10^{-10} = 2.3 \text{ TW}\) heat power is sufficient to achieve that gradient.

This amount is only 13.6 \% of 17.2 TW, being the average heat power generated by direct heating in 2010. The remaining part of that 17.2 TW must have been delivered to the earth's surface via convection and to the universe through radiation. The gross generated heat energy by the direct heating is clearly much higher than the net energy needed to increase the temperature of the atmosphere as has been measured!

VII.7 Contribution of the indirect heating

The alleged net radiation density of the indirect heating is 0.6W/m\(^2\). The 14-86 rule, found above, applied to this net radiation density would lead to a global temperature increase of 15 °C. If the heat capacity of the atmosphere were to be much larger than 20 times the capacity as calculated here, the result would be that the Green house effect explains the measured increase in global temperature and that the contribution of the direct heating is negligible compared to the indirect heating.

Given the reliable check that has been applied to the calculation of the heat capacity of the atmosphere, see appendix VII.1 section 2, there is a good chance that the Green house model will be incorrect.

VII.8 Direct heating since 1810

The derivative to time of (2) is: \(7.2 \cdot 10^{14} \cdot \exp(t/61)\) \([\text{K/year}]\), being the measured temperature gradient. Taking 13.6\% of the direct heating power, expression (4) becomes: \(0.136 \cdot 8.4 \cdot 10^{14} \cdot 10^{12} \cdot \exp(t/61)\) \(\text{W}\).

This expression divided by the heat capacity of the atmosphere and multiplied with the ratio “year/sec”, results also in \(7.2 \cdot 10^{14} \cdot \exp(t/61)\) \([\text{K/year}]\). Qualifying this expression as the calculated temperature gradient, based on the worldwide consumed energy, it has been proven that the increase of the global temperature during the past 200 years can perfectly be calculated from this energy during these years. And thus be predicted too on this basis!
VII.9  Heat capacity and heating of the oceans

Given immense heat capacity of the oceans, supporters of the Green house model claim that its high power density (0.6 W/m²), compared to this variable of the direct heating (0.034W/m²), is necessary to cause the temperature increase of the oceans.

The data concerning the total oceans and world seas are:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>area</td>
<td>3.6·10¹⁴ m²</td>
</tr>
<tr>
<td>volume</td>
<td>1.3·10¹⁸ m³</td>
</tr>
<tr>
<td>specific heat capacity per kg</td>
<td>3.9·10³ J/kg/K</td>
</tr>
<tr>
<td>specific mass</td>
<td>1.0·10³ kg/m³</td>
</tr>
<tr>
<td>specific heat capacity per m³</td>
<td>4.0·10⁶ J/m³/K</td>
</tr>
<tr>
<td>heat capacity</td>
<td>5.2·10²⁴ J/K</td>
</tr>
</tbody>
</table>

Its heat capacity is indeed 1000 times larger than the one of the atmosphere.

The measured increase in global temperature will inevitably also be taken over by the oceans, but of course not to full depth. The principle difference between the direct heating of the atmosphere and of the oceans is that the first mentioned one is heated bottom up, while the oceans are heated top down. As a result the warmer water at the top keeps “floating” on the colder layer underneath. Consequently the full heat capacity of all the water in the oceans is not applicable. Hereafter a heat capacity will be calculated that is in accordance with the increase of the temperature at the surface of the oceans, based on the point of view that the temperature at the most upper surface increases with the same amount as the atmosphere did. This temperature is assumed to decrease until 0 at depth $d$. The year 2010 will be taken as reference. In this year the temperature of the atmosphere had increased with 0.85 K. The heat capacity of the upper layer will be calculated based on the assumption that the mean temperature increase of 0.42 K will be found at depth $d/2$ and that this average temperature increase is assigned to the whole layer $d$.

The related volume is $\sim 4\pi R^2 \cdot d$, because $d<<R$, with $R$ the radius of the earth (6371 km). The oceans cover 70% of the total earth’s surface, so this depth related heat capacity is $1.6 \cdot 10^{21} \cdot d$ (J/K).

The source for global direct heating is represented by $p(t) = 8.4 \cdot 10^{-14} \cdot \exp(t/61)$ TW. See chapter IV.

It is assumed that this direct heating is used to heat the atmosphere as well as the oceans. Chapter VII presents that 14% of this amount is used to heat the atmosphere, so no more than 86% can be used to heat the oceans. The variable that heats the oceans is called "Power applied to oceans" and is less than $0.86 \cdot 8.4 \cdot 10^{-14} \cdot \exp(t/61)$ TW.

In general terms: "Power applied to oceans" = $F(\text{action}) \cdot 8.4 \cdot 10^{-14} \cdot \exp(t/61)$, with $F<0.86$.

Starting at 1810 the cumulative energy absorbed by the oceans in 2010 is:

$$F \cdot 8.4 \cdot 10^{-14} \cdot 10^{12} \cdot \int_{1810}^{2010} \exp(t/61) \ dt = F \cdot 8.4 \cdot 10^{2} \cdot 61 \cdot \{(\exp(2010/61) - \exp(1810/61)\}$$

In this expression the number 61 has the dimension [year], so in order to express the energy in Joule the result has to be multiplied with $3600 \cdot 24 \cdot 365$ (seconds/year), leading to:

"Cumulative energy absorbed by oceans" = $F \cdot 3.2 \cdot 10^{22}$ Joule.

The increase of temperature in 2010 in the upper layer of the oceans, with a thickness of $d$ meter, equals the cumulative absorbed energy during those 200 years, divided by the heat capacity of that layer.

"cum. K" thus equals: "Cumulative energy absorbed by oceans" (J)/ $1.6 \cdot 10^{21} \cdot d$ (J/K), so:

"cum. K" = $20 \cdot (F/d)$

Looking for "cum. K" = 0.42 K, means : $F/d = 0.02$, or $d = 50 \cdot F$. If $F$ would be 86%, $d$ would be 43 m.

A confidence-inspiring outcome, at least to the opinion of the author, with regard to the conclusion that only direct heating can be responsible for the increase in the global temperature. And of the oceans too.
VII.10 The invalidity of the Green house model based on a fundamental argumentation

**Green house effect is unthinkable**

Suppose the sun would never have been a source of radiation. All associated planets would be ice-cold lumps of rock in such a case, unless they were hot by themselves. But the latter would not last long in an environment of 0 Kelvin.

The sun has, as long as the earth exists, provided a temperature here far above 0 K.

Without an atmosphere, which must ever have been the case, the sun warms up the earth's crust to very high temperatures during day time, in order to cool down during night time to very low temperatures. Both extremes are drastically reduced with the development of the atmosphere. Firstly, because this relatively thin layer of air dampens the sun’s rays during day time. Secondly, because it forms an insulation against the cold universe during night time. In addition, the earth is already warm from its own perspective, given the glowing hot core. Thus, for the past hundreds of millions of years, the temperature on earth, read as the temperature of the atmosphere, has stabilized to the current average value, thanks to the absorbing and insulating effect of the atmosphere, including any types of radiation.

The atmosphere consists of approximately 20% O₂, 80% N₂ and a negligible share of, for example, CO₂: 0.03 to 0.04% in the past 100 years.

*It is unthinkable that the already a hundreds of millions of years existing absorbing and insulating effect of the atmosphere is influenced by such a completely negligible part of CO₂, including any types of radiation.*

This conclusion is supported by the calculations in this article, called Living room model, which show that global warming must be a result of human energy consumption.

**Living room model perfectly explains the present global warming**

This model has a peculiar property, fundamentally different from the Green house model. As described under VII.6 mankind consumes energy that is more or less immediately converted into heat energy absorbed by the atmosphere through convection. It turns out that 14% of this energy is enough to heat the atmosphere up to the measured value of 1°C, while the remaining 86% heats the oceans. The atmosphere is held at this temperature, because mankind’s generated heat energy is not only supplied unceasingly, but also all over the world during day and night time.

This phenomenon can be compared with, for example, a pan of water on a stove. At an equilibrium of added and emitted energy, the water is at a certain temperature, higher than its environment. As long as that stove is held at the same power, the water is held at that temperature. As soon as the stove is switched off, the temperature decreases until the temperature of the environment has been reached. If the heat of the stove is increased, the temperature of the water will increase until a new equilibrium is reached.

*The pan of water on a stove can be replaced by a heated living room!*

In the situation under consideration the power of the mankind-stove is not only supplied unceasingly. It increases continuously too, as a result of the increase of the mean consumed energy per person and of the (explosive) growth of mankind.
VIII  CO₂ absorbed by atmosphere and by earth’s surface

VIII.1  CO₂ emission factor in terms of Gigaton/consumed energy

CO₂ emissions, as a result of the combustion of fossil fuels (so-called primary fossil fuel use), are for example expressed in terms of the number of tons of CO₂ per released amount of energy in TeraJoule. This emission factor depends on the type of fossil fuel.

Reference [VIII] shows the following CO₂ emission factors:

<table>
<thead>
<tr>
<th></th>
<th>ton CO₂/TeraJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>gas</td>
<td>55</td>
</tr>
<tr>
<td>oil</td>
<td>74</td>
</tr>
<tr>
<td>coal</td>
<td>100</td>
</tr>
</tbody>
</table>

*Table VIII.1*

Table VIII.2 shows the transformation to “Gigaton CO₂/TW-year”.

<table>
<thead>
<tr>
<th></th>
<th>ton CO₂/TeraJ</th>
<th>Gt/TW-year</th>
</tr>
</thead>
<tbody>
<tr>
<td>gas</td>
<td>55</td>
<td>1.7</td>
</tr>
<tr>
<td>oil</td>
<td>74</td>
<td>2.3</td>
</tr>
<tr>
<td>coal</td>
<td>100</td>
<td>3.2</td>
</tr>
</tbody>
</table>

*Table VIII.2*

The relative distribution of the consumed energy in the years 2010, 1910 and 1810 of these fuels is shown in table VIII.3 on the left side. The emission factor of biofuel/biomass is taken the same as of coal. The contributions of Nuclear and Hydro-elect energy (both 5%) to the CO₂ emissions are left away.

The column in the middle shows the related emission factor from Table VIII.2.

The right side of Table VIII.3 shows the left side, after multiplication with the middle column.

<table>
<thead>
<tr>
<th>Emission factor in Gt/TeraWatt-year</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>Gas</td>
</tr>
<tr>
<td>Oil</td>
</tr>
<tr>
<td>Coal+Biomass</td>
</tr>
<tr>
<td>sum</td>
</tr>
</tbody>
</table>

*Table VIII.3*

In the next section this “sum”, being the weighed average emission factor, will be applied in the years 1850 – 2050 in steps of 20 year. The values for the years since 1910 are found by linear interpolation between the values at 1910 and 2010. The values for 2030 and 2050 are taken the same as for 2010 is.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>factor</td>
<td>3.2</td>
<td>3.2</td>
<td>3.2</td>
<td>3.2</td>
<td>3.0</td>
<td>2.8</td>
<td>2.7</td>
<td>2.5</td>
<td>2.3</td>
<td>2.3</td>
<td>2.3</td>
</tr>
</tbody>
</table>
VIII.2 CO₂ concentration expressed in Gigaton

The CO₂ concentration in the atmosphere is normally expressed in ppm, that is to say, the number of molecules of CO₂ in relation to the total number of molecules in the atmosphere, both expressed in mol.

The total mass of air in the atmosphere is $5.3 \cdot 10^{18}$ kg.

Given the definition of ppm, this mass has to be converted to the unit mol, defined as the mass of $N_A$ atoms/molecules of that substance. $N_A$ is the number/constant of Avogadro.

The molar mass of air is 29 kg/kmol, so the number of air molecules in the atmosphere is $1.8 \cdot 10^{17}$ kmol.

A concentration of 400 ppm CO₂ is thus equal to $400 \cdot 10^4 \cdot 1.8 \cdot 10^{17}$ kmol CO₂.

The molar mass of CO₂ is 44 kg/kmol, so the weight of 400 ppm CO₂ in the atmosphere is $44 \cdot 720 \cdot 10^{11} = 3.2 \cdot 10^{13}$ kg = 3200 Gigaton (Gt)

The ppm CO₂ conversion from ppm to Gt in the atmosphere thus is $3200/400 = 8$ Gt/ppm.

This factor has been used calculating $\Delta CO_{2A}$ from $\Delta CO_{2R}$ in table VIII.5

<table>
<thead>
<tr>
<th>year</th>
<th>CO₂a (ppm)</th>
<th>ΔCO₂aR (ppm/year)</th>
<th>ΔCO₂aA (Gt/year)</th>
<th>Energy (TW/year)</th>
<th>E factor (Gt/TW/year)</th>
<th>ΔCO₂e (Gt/year)</th>
<th>ΔCO₂a (Gt/year)</th>
<th>ΔCO₂aA/ΔCO₂e (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1850</td>
<td>269</td>
<td>0.2</td>
<td>1.2</td>
<td>1.2</td>
<td>3.2</td>
<td>3.8</td>
<td>2.5</td>
<td>33</td>
</tr>
<tr>
<td>1870</td>
<td>273</td>
<td>0.2</td>
<td>1.7</td>
<td>1.7</td>
<td>3.2</td>
<td>5.3</td>
<td>3.6</td>
<td>32</td>
</tr>
<tr>
<td>1890</td>
<td>278</td>
<td>0.3</td>
<td>2.4</td>
<td>2.3</td>
<td>3.2</td>
<td>7.5</td>
<td>5.1</td>
<td>32</td>
</tr>
<tr>
<td>1910</td>
<td>285</td>
<td>0.4</td>
<td>3.3</td>
<td>3.3</td>
<td>3.2</td>
<td>10</td>
<td>7.1</td>
<td>32</td>
</tr>
<tr>
<td>1930</td>
<td>295</td>
<td>0.6</td>
<td>4.6</td>
<td>4.6</td>
<td>3.0</td>
<td>14</td>
<td>9.1</td>
<td>33</td>
</tr>
<tr>
<td>1950</td>
<td>308</td>
<td>0.8</td>
<td>6.4</td>
<td>6.3</td>
<td>2.8</td>
<td>18</td>
<td>12</td>
<td>35</td>
</tr>
<tr>
<td>1970</td>
<td>327</td>
<td>1.1</td>
<td>8.9</td>
<td>8.8</td>
<td>2.7</td>
<td>23</td>
<td>15</td>
<td>38</td>
</tr>
<tr>
<td>1990</td>
<td>353</td>
<td>1.5</td>
<td>12</td>
<td>12</td>
<td>2.5</td>
<td>30</td>
<td>18</td>
<td>40</td>
</tr>
<tr>
<td>2010</td>
<td>390</td>
<td>2.1</td>
<td>17</td>
<td>17</td>
<td>2.3</td>
<td>39</td>
<td>22</td>
<td>44</td>
</tr>
<tr>
<td>2030</td>
<td>440</td>
<td>3.0</td>
<td>24</td>
<td>24</td>
<td>2.3</td>
<td>55</td>
<td>31</td>
<td>43</td>
</tr>
<tr>
<td>2050</td>
<td>510</td>
<td>4.1</td>
<td>33</td>
<td>33</td>
<td>2.3</td>
<td>76</td>
<td>43</td>
<td>43</td>
</tr>
</tbody>
</table>

Table VIII.5

CO₂a relative CO₂ concentration in the atmosphere [ppm]
ΔCO₂aR relative increase of CO₂ in the atmosphere [ppm/year]
ΔCO₂aA absolute increase of CO₂ in the atmosphere (=8·ΔCO₂aR) [Gt/year]
Energy energy consumed by mankind during related year [TW/year]
E factor emission factor for CO₂, incl. a gain of 2.5 [Gt/TW/year]
ΔCO₂e absolute increase of CO₂ emission (E factor·Energy) [Gt/year]
ΔCO₂a absolute increase CO₂ absorbed by earth’s surface (ΔCO₂e - ΔCO₂a) [Gt/year]
Rel. ΔCO₂aA relative (to emitted ΔCO₂a) increase of CO₂ absorbed by atmosphere [%]

The symbol $\Delta$ has to be read as: “increase during the related year”.

Remark:
Surprisingly the columns “ΔCO₂aA” and “Energy” show ‘about exactly’ the same numbers.

“ΔCO₂aA” is calculated by means of the derivative of $y_C(t) = 259 + 6.4 \cdot 10^{13} \cdot \exp(t/61)$ shown as (1) in I, times 8 (Gt/ppm), resulting in $8.3 \cdot 10^{14} \cdot \exp(t/61)$ ppm/year. The number 61 represents 61 years!

“Energy” is calculated as $y_E(t) = 8.4 \cdot 10^{14} \cdot \exp(t/61)$ TW/year, shown as (4) in IV, multiplied with 1 year.
IX The Reverse Green House effect

IX.1 Short historical relations between CO₂ and global temperature

It is well known and accepted that most of the CO₂ emissions are absorbed by the earth surface. So, less of the emissions are absorbed by the atmosphere, shown in Table VIII.5 and repeated in Table IX.1.

<table>
<thead>
<tr>
<th>year</th>
<th>ΔCO₂at/ΔCO₂e (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1850</td>
<td>33</td>
</tr>
<tr>
<td>1870</td>
<td>32</td>
</tr>
<tr>
<td>1890</td>
<td>32</td>
</tr>
<tr>
<td>1910</td>
<td>32</td>
</tr>
<tr>
<td>1930</td>
<td>33</td>
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<td>1950</td>
<td>35</td>
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<td>1970</td>
<td>38</td>
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<td>1990</td>
<td>40</td>
</tr>
<tr>
<td>2010</td>
<td>44</td>
</tr>
<tr>
<td>2030</td>
<td>43</td>
</tr>
<tr>
<td>2050</td>
<td>43</td>
</tr>
</tbody>
</table>

Table IX.1 Relative absorption of CO₂ by the atmosphere

This information can be interpreted as follows. Until 1930 the CO₂ emissions were absorbed by the atmosphere and by earth’s surface in accordance to roughly a 30 – 70 distribution. After 1930 this distribution shifted gradually to about 40 – 60, so the atmosphere increased its relative absorption potential with ~10%, while the global temperature increased ~1 °C. The mentioned percentage has to be applied to the existing long-term concentration.

In chapter II it has been found that the temperature of the atmosphere changes, superimposed on the long-term-trend, with \(-0.1 \cdot \sin\{\omega(t – 2012)\}\), independent of the long-term-trend temperature increase. As a result of the mentioned phenomenon the CO₂ concentration should also show such a periodic variation, to be expressed by: \(ΔCO₂(t) = −G \cdot P \cdot 0.1 \cdot \sin\{\omega(t – 2012)\}\), with \(P \sim 10\%\) and \(G\) a constant in terms of [ppm/°C]. The time \(t\) runs from 1958 until 2018.

Calculating the quotient of the derivatives of (1) and (2) to time results in: \(ΔCO₂(t)/ΔT(t) = 145\) ppm/°C. This gradient is considered to be representative for the variable \(G\).

Figure IX.1 shows the measured CO₂ minus the exponential fitted curve + 0.5, indicated as “measured”. The “+0.5” is applied in order to make the curve symmetrical around zero, just like the calculated CO₂ sinusoidal curve is by definition. This curve has been drawn too, indicated as “calculated CO₂”. The sudden fall in the measured CO₂ concentration in 1991 disturbs the resemblance.

Another way of presenting the correlation between “measured CO₂” and “calculated CO₂” is to fit a high order polynomial curve to the differences between the measured CO₂ data and the exponential fitting of this data, as shown in chapter I. Taking a 8th order fitting of these deviations the result is as shown in figure IX.2. The resemblance is fundamentally the same as shown in figure IX.1.
Figure IX.2

Figure IX.3 shows that there is a rather high resemblance between the patterns of the CO\textsubscript{2} and of the temperature deviations. To investigate this, the derivative in each year has been calculated for both variables. The quotient of these derivatives has been calculated in case they are both positive and in case they are both negative. This turned out to happen in 32 of the 55 years. The mean value in these 32 years is $\sim 10$ ppm/$^\circ$C. It shows a remarkable good agreement with the value of $G \cdot P = 14.5$ ppm/$^\circ$C. So it can be considered as a confirmation of the existence of the Reverse Green House Effect.

Figure IX.3 Yearly deviations of global temperature and atmospheric CO\textsubscript{2} concentration
IX.2 Long historical relations between CO$_2$ and global temperature

Figure IX.4 shows very long historical relations between CO$_2$ and global temperature. This figure has been deduced from the original article, ref. [IX], in which the 2 horizontal axes are drawn in the opposite way. The abstract sounds:

“
The recent completion of drilling at Vostok station in East Antarctica has allowed the extension of the ice record of atmospheric composition and climate to the past four glacial–interglacial cycles. The succession of changes through each climate cycle and termination was similar, and atmospheric and climate properties oscillated between stable bounds. Interglacial periods differed in temporal evolution and duration. Atmospheric concentrations of carbon dioxide and methane correlate well with Antarctic air-temperature throughout the record. Present-day atmospheric burdens of these two important greenhouse gases seem to have been unprecedented during the past 420,000 years.”

From the point of view of the Reverse Green House effect it is interesting to deduce, just like it is done in figure IX.3, the ratio $\Delta CO_2(t)/\Delta T(t)$. Given the uniformity between the two curves in figure IX.4, only one sample is already considered as representative for the whole period. This sample is taken at the steep change ending exactly where “Depth of Ice” equals 2750. At that place $\Delta CO_2/\Delta T = 80/8 = 10$ ppm/$^\circ$C!

This result is considered as a confirmation of the correctness of the Reverse Green House effect: a positive change in global temperature causes a higher concentration of CO$_2$ in the atmosphere, at the cost of such a concentration on the surface of the earth. See the abstract above: “.....ice record of atmospheric composition and climate...”. Expressed in other words: the calculations carried out in the chapters VIII and IX in this report are most likely correct.

But that conclusion must not be confused with the unavoidable conclusion that by far the most part of the increase of the atmospheric CO$_2$ concentration in the past 200 years is anthropogenic.

And last but not least, that increase of CO$_2$ doesn't have anything to do with the increase of the global temperature. It is much more likely that the direct anthropogenic heating causes this increase, as the Living Room model proves.
X Global Mean Sea Level until 2100

X.1 Introduction

Global Mean Sea Level is a hot topic nowadays, because maybe we will eventually drown in the oceans. The most intricate models for its increase in the future have been created and will be created, some of them leading to the most worst thinkable scenario in 2100. See for example reference [X.1].

Several organisations realize data sets for the GMSL. They have been asked all for numerical data. The only one that did react fast as well as with appropriate data was CSIRO.

This data has been presented in de link as shown under reference [X.2] as monthly mean values in mm. These values have been transformed to yearly mean values in cm.

X.2 Mathematical expression for CSIRO measurements

The yearly mean values have been fitted with a 2nd order polynomial. After that the start, end and middle values of this fitting have been used to fit the function $y = c + a \cdot \exp(t/b)$ to them. The result is:

$$y_S(t) = -26 + 1.7 \cdot 10^{-6} \cdot \exp(t/120) \text{ cm.}$$

For “t” the year under consideration has to be applied.

This function has been used to extrapolate until the year 2100, resulting in 40 cm. See figure X.1

![Global Mean Sea Level measurements and exponential fitting](image)

*Figure X.1*

Given the expansion coefficient of the water in the oceans ($2 \cdot 10^4 \text{ K}^{-1}$), what might the GMSL increase be as a result of the mean increased temperature of 0.42 K in the upper layer, with a thickness of ~ 40 m?

Such an increase is simply $0.42 \cdot 40 \cdot 2 \cdot 10^4 = 0.3 \text{ cm}$, negligible w.r.t. the values shown in figure X.1.

A misunderstanding regarding one of the alleged causes of the raise of the GMSL is the melting of ice at both poles. The specific weight of ice is roughly 10% lower than the one of water, whether it concerns salt ice in salt water, or sweet ice in sweet water. For that reason about 10% of the volume of the ice floats above the water. It is tempting to argue that the melting of the ice thus will cause a raise of the level of the water. But due to the higher specific weight of the water the ice is after the melting eventually compressed into a 10% smaller volume than it originally was.

The only reason for the raise of the GMSL thus is the melting of the ice on the mountains, resulting in water streaming into the oceans.
Conclusions

1. The long-term trends of the variables: CO₂ concentration in the atmosphere, global temperature, world population and worldwide consumed energy can all four truthfully be represented by the function: \( y_i = c_i + a_i \cdot \exp(b_i \cdot t) \), with \( b \) the same for all of them and equal to 61 year.

2. Superimposed on this trend the global temperature turned out to have a perfect sinusoidal variation with a period of 64 years and an amplitude of 0.1 °C. This variation is many times used as argument against the correctness of the Green house model, but it hasn’t anything to do with this model.

3. Given the same curvature for all four variables, they can all be expressed as function of each other, without the variable time. For example: CO₂ = 259 + 145 ppm/°C · (global temperature − 13.5) and global temperature = 13.5 + 0.05 °C/TW · (globally applied power (TW))

4. Given the last mentioned relation under conclusion 3 the possibility has been investigated whether the increase of the global temperature might not be caused by the Green house, but by the here called Living room model: all consumed energy, of whatever kind, like artificially generated sun and wind energy and nuclear energy, is eventually converted into heat energy that heats the atmosphere directly.

5. The crucial parameter in this investigation is the calculation of the heat capacity of the atmosphere, because the global temperature is represented by the temperature of the atmosphere, measured at a height of ~2 meter above earth’s surface.

6. The investigation learned that the worldwide consumed energy during the past century has been by far sufficient to heat the atmosphere to the temperature it has reached now.

7. The remaining energy can increase an upper layer of ~40 meter of the oceans to the same increase, right at the surface, as the one of the atmosphere, and decreasing with depth until zero at 40 meter.

8. The power density, in terms of W/m², of the Green house model is so much higher than the one of the direct heating that, if the Green house model would be correct, the present increase of the global temperature would have been ~15 °C.

9. Calculations of the CO₂ emissions, expressed in Giga tons, learn that the absorption potential of the atmosphere increases with its temperature, at the expense of the absorption potential of earth’s surface: ~10% more absorption for a temperature increase of ~1 °C, here called Green House Effect (RGHE). N.B. Not to be considered as a long-term increase of the CO₂ concentration as a result of the long-term increase of the global temperature! These two increases go perfectly proportional together with the increasing worldwide consumed energy.

10. A detailed analysis of the measurements of the CO₂ concentration in relation to the sinusoidal temperature variation, period 64 years and amplitude 0.1 °C, confirms the existence of the RGHE.

11. An exponential fit has been applied to the Global Mean See Level measurements, resulting in a time constant of 120 instead of 61 years. Extrapolation to the year 2100 shows a rise of 40 cm, assumed of course that the global temperature keeps increasing with the same curvature.

12. The worldwide consumed energy has to be considered as the basic cause of the climate problem, not the CO₂ emissions. Besides that, whichever heating model is taken, sustainable energy will never be able to solve the climate problem. But mankind will not be inclined to reduce its obtained level of welfare, so the only remedy against the climate problem is a reduction of the world population.

References

[I] ftp://aftp.cmdl.noaa.gov/products/trends/co2/co2_mm_mlo.txt


[V1.1] https://data.giss.nasa.gov/gistemp/graphics/graph_data/GISTEMP_Seasonal_Cycle_since_1880/graph.pdf

[V1.2] https://data.giss.nasa.gov/gistemp/tabledata_v3/GLB.Ts+dSST.txt

[V1.3] Satellite Global and Hemispheric Lower Tropospheric Temperature Annual Temperature Cycle


[IX] Climate and Atmospheric History of the Past 420,000 Years from the Vostok Ice Core, Antarctica

[X.1] https://www.researchgate.net/publication/314295190_A_high-end_sea_level_rise_probabilistic_projection_including_rapid_Antarctic_ice_sheet_mass_loss

Appendix I  
Mathematical background of the polynomial fitting

Given the set measurements \( y_i \) as function of the variable \( x_i \). Requested: the function \( y = \Sigma a_i x_i^i \), in such a way that the sum of the quadratic deviations between the measurements and \( y \) is minimal.

\[
R = \Sigma \{ y_i - (a_0 + a_1 x_i + \ldots + a_k x_i^k) \}^2
\]

For minimization the following relations have to be fulfilled:

\[
\frac{\partial R}{\partial a_0} = -2 \Sigma i^n \{ y_i - (a_0 + a_1 x_i + \ldots + a_k x_i^k) \} = 0
\]
\[
\frac{\partial R}{\partial a_1} = -2 \Sigma i^n \{ y_i - (a_0 + a_1 x_i + \ldots + a_k x_i^k) \} x_i = 0
\]
\[
\frac{\partial R}{\partial a_2} = -2 \Sigma i^n \{ y_i - (a_0 + a_1 x_i + \ldots + a_k x_i^k) \} x_i^2 = 0
\]
\[
\vdots
\]
\[
\frac{\partial R}{\partial a_k} = -2 \Sigma i^n \{ y_i - (a_0 + a_1 x_i + \ldots + a_k x_i^k) \} x_i^k = 0
\]

Resulting in the equations:

\[
a_0 + a_1 \Sigma i^n x_i + \ldots + a_k \Sigma i^n x_i^k = \Sigma i^n y_i
\]
\[
a_0 \Sigma i^n x_i + a_1 \Sigma i^n x_i^2 + \ldots + a_k \Sigma i^n x_i^{k+1} = \Sigma i^n x_i y_i
\]
\[
\vdots
\]
\[
a_0 \Sigma i^n x_i^k + a_1 \Sigma i^n x_i^{k+1} + \ldots + a_k \Sigma i^n x_i^{2k} = \Sigma i^n x_i^{2k} y_i
\]

In matrix format:

\[
\begin{bmatrix}
\Sigma i^n x_0 & \ldots & \Sigma i^n x_i^k & a_0 & \Sigma i^n y_i \\
\vdots & \Sigma i^n x_i & \ldots & \Sigma i^n x_i^{k+1} & a_1 & \Sigma i^n x_i y_i \\
\vdots & \vdots & \ddots & \vdots & \vdots & \vdots \\
\Sigma i^n x_i^k & \ldots & \Sigma i^n x_i^{2k} & a_k & \Sigma i^n x_i^{2k} y_i
\end{bmatrix}
\begin{bmatrix}
a_0 \\
a_1 \\
\vdots \\
a_k
\end{bmatrix} = 
\begin{bmatrix}
\Sigma i^n y_i \\
\Sigma i^n x_i y_i \\
\vdots \\
\Sigma i^n x_i^{2k} y_i
\end{bmatrix}
\]

This equation can be written in a simple matrix notation:

The equation: \( y = \Sigma a_i x_i^i \) equals the matrix multiplication:

\[
\begin{bmatrix}
1 & x_1 & \ldots & x_1^k & a_0 & y_1 \\
1 & x_2 & \ldots & x_2^k & a_1 & y_2 \\
\vdots & \vdots & \ddots & \vdots & \vdots & \vdots \\
1 & x_n & \ldots & x_n^k & a_n & y_n
\end{bmatrix} = X \cdot a = Y
\]

Shortly: \( X \cdot a = Y \).

In case both sides are multiplied with the transposed matrix of \( X \) (\( X^T \)), the result is

\( X^T \cdot X \cdot a = X^T \cdot Y \), being the equation to be found.

Further elaborated: \( (X^T \cdot X)^{-1} \cdot X^T \cdot a = (X^T \cdot X)^{-1} \cdot X^T \cdot Y \).

Given the fact that \( (X^T \cdot X)^{-1} \cdot X^T \cdot X = I \), it follows that \( I \cdot a = a = (X^T \cdot X)^{-1} \cdot X^T \cdot Y \), showing the requested coefficients \( a_i \).

Note:

If the control calculation \( (X^T \cdot X)^{-1} \cdot X^T \cdot X = I \) is executed in Excel, the result strongly departs from that unity matrix \( I \) for orders greater than 6. However the 8th and 9th order polynomial seem to be calculated good enough in the current investigation, given their strong mutual agreement.
Appendix VII.1  Calculation of the heat capacity of the atmosphere

1.  T is constant as function of height

The specific heat capacity of air at 0 °C and 1 bar is 1000 J/kg/K. The specific weight of this air \( (\rho_0) \) is 1.3 kg/m³. Multiplication of these quantities leads to the conclusion that the specific heat capacity of air can also be presented as 1300 J/m³/K.

Quote from:  https://en.wikipedia.org/wiki/Atmospheric_pressure
"Altitude variation
Pressure on Earth varies with the altitude of the surface;..............
\[ p(b) \approx p_0 e^{-\frac{Mg \cdot b}{RT}} \]
with:
- \( p_0 \) Sea level standard atmospheric pressure 101325 Pa
- \( b \) Altitude m
- \( M \) Molar mass of dry air 0.029 kg/mol
- \( g \) Earth-surface gravitational acceleration 9.8 m/s²
- \( R \) Universal gas constant 8.31 J/(mol·K)
- \( T \) Sea level standard temperature 288.15 K

In stead of \( p(b) \) the variable \( sw(b) \) can be chosen. Replacing the e-power function into \( e^{C_h} \), with the boundary condition that \( e^{C_h}=1 \) for \( b=r \) (the radius of the earth), this function becomes \( e^{C_h} \).
The result for the total mass of the atmosphere is now \( sw_0 \cdot \int \frac{C_h}{b^2} \cdot \Gamma(b) \cdot \frac{db}{b}, \) with \( \Gamma(b)=4\pi b^2 \).
The integral to be calculated is therefore: \( 4\pi \cdot sw_0 \cdot e^{C_h} \cdot \int \frac{C_h}{b^2} \cdot db \).

After applying twice partial integration the result is: \( \int \frac{C_h}{b^2} \cdot db = -C_1 \cdot \frac{e^{C_h} - (b^2 + 2C_1 b - 2C_2)}{b^2} \), \( \int \)
A few calculations of \( e^{C_h} \cdot b^2 \) learn that the value of the integral is zero for \( b \to \infty \).
The result for the total mass of the atmosphere is therefore:
\[ 4\pi \cdot sw_0 \cdot e^{C_h} \cdot C_1 \cdot \frac{e^{C_h} - (b^2 + 2C_1 b - 2C_2)}{b^2} = 4\pi \cdot 1.3 \cdot C_1 \cdot (r^2 + 2C_1 r - 2C_2) \]
The constant \( C_1 \) (\( RT/Mg \)) equals: 8.31 · 288/(0.029 · 9.8)= 8420 m.
Because the temperature is expressed in Kelvin, the sensitivity of that parameter is low.
The radius \( r \) of the earth is 6371 km =6371000 m. Because \( 2C_1 r - 2C_2 << r^2 \), the result of the integral is
\[ 4\pi \cdot 1.3 \cdot C_1 \cdot r^2 \].
So the total mass of the atmosphere is 5.6 · 10¹⁸ kg.

This calculation forms the essential basis for the calculation of the total heat capacity of the atmosphere.
The mass calculated in this way is also a check on the method used. This check is that the total mass can easily calculated too as follows:
The atmospheric pressure on the earth’s surface is 101325 Pa = 1.013 · 10¹⁵ N/m² or kg m⁻¹ s⁻².
The surface of the earth is 5.1 · 10¹⁸ m². The total mass of air in the atmosphere is therefore 1.013 · 10¹⁵ · 5.1 · 10¹⁴ /g. With \( g = 9.8 \) ms⁻² resulting in 5.3 · 10¹⁸ kg.

Given the fact that the expression for \( p(b) \) is an approximation, the applied calculation model can be considered as correct.
In this model now only the specific weight of air \( (\rho_0) \) need to be replaced by the specific heat capacity, as shown at the beginning of this appendix: 1300 J/m³/K, in order to show the heat capacity of the atmosphere.

The calculated heat capacity of the atmosphere by means of the integration thus becomes 5.6 · 10²¹ J/K.

It turns out afterwards that, through the very simple calculation of the total mass of atmospheric air, this heat capacity can also directly be calculated as 5.3 · 10¹⁸ kg · 1000 J/kg/K = 5.3 · 10²¹ J/K.

That air must therefore be considered as normalized at 0 °C and 1 bar!
2. **T as height dependant**

The figure below shows how $T$ depends on the height in the atmosphere.

In order to check the influence of this variation the integral $4\pi \cdot s_b \cdot e^{C(r)} \cdot e^{-C(h)} \cdot h^2 \cdot dh$ has to be calculated numerically.

The specific heat capacity $s_b$ at $0$ °C and 1 bar is $1300 \text{ J/m}^3/\text{K}$.

The integral has now to be written as $4\pi \cdot s_b \cdot \int e^{C(h)}(r-h) \cdot h^2 \cdot dh$, with $C(h) = M_g/RT(b)$.

The numerical integration is carried out in Excel with a step in height of 100 m.

The calculation is checked by taking $T=288$ for all heights and for a maximum height of 120 km, in accordance with the maximum height shown in the figure above.

The outcome is $5.6 \cdot 10^{21} \text{ J/K}$ so fully in agreement with the analytical outcome.

Replacing the temperature in a height dependent one in accordance with the information shown in the figure above, the result is $4.6 \cdot 10^{21} \text{ J/K}$.

A good reason to take $5 \cdot 10^{21} \text{ J/K}$ as a rounded value for the heat capacity of the atmosphere.
Appendix VII.2    Earth’s Energy Budget

Source: https://en.wikipedia.org/wiki/Earth%27s_energy_budget

The KNMI uses a net radiation of 0.9 W/m².
KNMI is the Dutch abbreviation for the Royal Dutch Meteorological Institute.
https://www.knmi.nl/kennis-en-datacentrum/achtergrond/energiebalans-van-de-aarde

The author has asked them the following question
To my surprise I have to conclude that at a level of around 340 W/m² the conclusion is drawn that the net power density of all said currents is 0.9 W/m². This suggests an accuracy of an order of magnitude of 0.3 promille regarding that 0.9 W/m². After all, 0.9 is only 3 per thousand of 340. Can you explain, or make plausible, that this net power density is correct?

The answer is:
“In response to your question I inform you that the uncertainties in the individual fluxes are indeed greater than 0.9 W/m², so you cannot accurately determine the imbalance on that basis. The imbalance is therefore directly estimated on the basis of measurements of the amount of heat in the oceans (the main heat storage medium; it can store much more heat than the atmosphere and land) and can therefore be determined relatively accurately."

Comment: The heating of the oceans is supposed to be caused by that 0.9 W/m². But because that cause cannot be sufficiently adequately measured, one of its supposed effects is measured and then used to derive that 0.9 W/m². Section VII.9 details the heating of the upper layer of the oceans via the direct way.
Encore The World Population in the Past and in the Future

Introduction

In the chapters before is, on the basis of detailed analysis of a variety of measured variables, argued that the climate problem is a symptom of a much more fundamental problem: the worldwide overpopulation. The severity of this fundamental problem is emphasized on the basis of a model of the growth of the world population.

The world population is known through censuses, but up to 1950 only by approximation. The more accurate the past is known, the better the future can be predicted therefrom. The approximations, together with the more precise-looking counts after 1950, are processed into a natural looking curve for the period 1800 up to now. Using the mathematical expression for this curve, predictions can be calculated for the future. In addition an extremely simple model has been realized for the growth of a population. Mutual comparison of the two curves results in interesting conclusions, of which the most important one is that the solution of the climate problem must be sought in the reduction of the world population.

Applied growth model of a population

Given the fact that a large number of statistical variables permit to work with (only) averages, the following extremely simple model of the growth of a population is established, based on the following assumptions:

1. The world's population is made up of \( N \) humans.
2. There are \( N/2 \) male and \( N/2 \) female humans.
3. Each human dies at age \( L \), where \( L \) is the average age of the \( N \) humans.
4. The age of humans is distributed evenly, so there are \( N/L \) humans by age.
5. Each couple gets at a certain age \( x \) children, of which survive \( S \) to procreate.

The variable \( S \) thus is the net result of the birth and of the death among youth.

From this model it follows directly that if \( S = 2 \) the population is not growing nor declining.

Indeed, every year \( N/L \) humans die and every year \( S \cdot (N/2)/L \) humans procreate.

At a constant population, these two expressions are equal.

This model is realized in an Excel program in which the increase and decrease of the population in each year is calculated from the previous year. By adding this net result of the population growth to the population in the previous the population of the present year is obtained. In symbolic form:

\[
\begin{align*}
\text{Year} & \quad \text{decrease} & \quad \text{increase} & \quad \text{population} \\
Y-1 & \quad S \cdot (N_{Y-1}/2)/L & \quad N_{Y-1}/L & \quad N_{Y-1} \\
Y & \quad S \cdot (N_{Y+1}/2)/L & \quad N_{Y+1}/L & \quad N_{Y+1} + S \cdot (N_{Y+1}/2)/L - N_{Y+1}/L (=N_Y)
\end{align*}
\]

In order to verify that this model fits somewhat with actual counts/estimates (henceforth the sake of brevity from now on referred to as observations) the graph from reference [1] is taken as the reference. This graph is based on a curve fitting of the available observations. This curve fitting is based on the model \( y = \varepsilon + a \cdot \exp(t/b) \) (with the symbol \( t \) representing the year and \( y \) the number of humans. With the aid of this expression the number of humans outside the period of observation can be calculated too for each year.

The period 1800-2100 is chosen in this encore.

The variables \( L \) and \( S \) are, by trial and error, adjusted in such a way that the populations in 2100 in both models are equal. The initial value \( N_{1800} \) of the growth model is of course selected equal to the initial value of the observations. Figure E.1 shows this result with \( L = 60 \) and \( S = 3.5 \).
Figure E.1 with \( L = 60 \) and \( S = 3.5 \) in the growth model

Subsequently, the growth model is adjusted by making both variables \( L \) and \( S \) as a function of time. \( L \) in the year 1800 is, of course, chosen to be smaller than in the year 2100. In-between it increases linearly with time. For \( S \) basically the same is done.

These variables are now labelled: \( L_{1800} \) and \( L_{2100} \), respectively \( S_{1800} \) and \( S_{2100} \).

Figure E.2 shows the well-fitting result by choosing: \( L_{1800} = 60, L_{2100} = 75, S_{1800} = 3 \) and \( S_{2100} = 4.4 \)

For information: the values \( L_{1800} = 60, L_{2100} = 70, S_{1800} = 3 \) and \( S_{2100} = 4.27 \) results in equally perfect fit!

Figure E.2 with \( L_{1800} = 60 \) and \( L_{2100} = 75, \) resp. \( S_{1800} = 3 \) and \( S_{2100} = 4.4 \) for the growth model

Based on this well-fitting growth model with the observations, this model is frozen for the period 1800-2017 in order to investigate what will be the development of the population in the future, varying only the variable \( S \), so only \( S_{2100} \). The reason for this is that variable \( L \) is found to be much less sensitive. It turns out that in 2017 the variable \( S \) equals 4.008. Starting from this value, \( S \) decreases linearly down to \( S_{2100} \) in the year 2100. Figure E.3 shows the results for \( S_{2100} = 2, 1 \) and 0.
With the described, extremely simple growth model, it is possible to reproduce perfectly the observed world population from the year 1800 to the present year. The applied parameter values for the average age $L$ and the average number $S$ of people per pair that procreates again, all the way look realistic: $L_{1800} = 60$ and $L_{2017} = 71$ years, resp. $S_{1800} = 3$ and $S_{2017} = 4$. The increase of the latter parameter is representative of the global average increased human health.

The three possible future growth scenarios all show that the current one rises so steeply that only a drastic reduction of the variable $S$, translated into a drastic decrease of the global birth rate, can save nature on earth and as a result mankind.

Resume of the Encore