Global Climate Change: The Wrong Parameter

Marco Schmidt

Technische Universität Berlin, A59, Section Building Technology and Design,
Working Group Applied Hydrology, Strasse des 17.Juni 152, 10623 Berlin, Germany

Abstract

As of recently, the assumed role of carbon dioxide (CO_2) as one of the leading causes of global warming has become widely criticized (Gerlich & Tscheuschner, 2007; US Senate, 2008). This insight conflicts with the popular political and public view which explains the cause of global warming as the increase of greenhouse gas emissions. The main evidence supporting this theory is the correlation between atmospheric CO_2 and global temperatures. This correlation, however, is not substantiated by scientifically proven methods and can therefore not verify a clear, causal connection.

The true link between atmospheric CO_2 and global temperatures is found in green plants, or vegetation, and their relation to evapotranspiration. Evaporation of water is the largest hydrologic component and most important energy conversion on earth. Just as rainfall volume depends on the amount of water that has evaporated, so will a reduction in global evapotranspiration mean the increased conversion of short-wave global solar radiation to long-wave emissions and sensible heat. Additionally, a reduction in evapotranspiration translates to a reduction in overall precipitation, effecting a further reduction in evapotranspiration, thus creating a "snowball-effect".

Global evaporation rates are being reduced in direct correlation with worldwide deforestation, sprawling urbanization, and the loss of fertile agricultural land. Reduced evaporation rates cause higher surface temperatures and contribute greatly to the "urban heat island effect". On a global scale, the reduction of evaporation is clearly responsible for global warming. As such, rainwater harvesting measures could play a key role as mitigation strategy against global warming. This approach would mean that rainwater management must focus on evaporation rather than infiltration. The close-up of the small water cycle requests a new water paradigm (Kravčík *et al*. 2007; www.waterparadigm.org).

Computer models are not suitable to attest a causal connection between parameters, especially if the processes on which the simulations are based are poorly understood. Fundamentally, climate change is caused by the ongoing deforestation, desertification and urbanization of the planet. The "new" environmental problems like global warming comprise the same issues as the old ones. This paper proposes an alternative theory to the cause, and mitigation, of global climate change.

Keywords: Evaporation, climate change, global warming, land use, rainwater management

1. Introduction

Climate scientists have made a fatal mistake: they've mixed up the cause and the effect relating to global climate change. While drought is expressed mainly as a result of increased global temperatures, in fact increased aridity is not the result of the global warming, but is rather the cause. While we may all agree that global warming is caused by man-made activities, it is no longer acceptable to attribute this to the increase of "greenhouse gas emissions".

The origin for this scientific disaster lies in the misinterpretation of evaporation, the largest hydrological and energetic component on earth, together and combined with precipitation. Up to now evaporation, has always been defined as a ***loss***. In actual fact, evaporation is the ***source*** of precipitation.

Global changes in land use are responsible for the reduction of evaporation, in particular urbanization, deforestation and desertification. Our tremendous problems due to global climate and water issues are due to unsustainable land use. The human impact on hydrology is extremely high. The cause for extreme storms, flooding, drought, and desertification can be traced to unsustainable land use on both local and global levels. The destruction of vegetation impacts global hydrology, as only precipitation that can evaporate will fall again, somewhere else, as rain. In Germany alone, urbanization continues to grow at a rate of 1 km² daily. Each day, 350 km² of forests are lost globally (GTZ, 2007), which comprise 1.3 % annual loss of the 30% forests remaining worldwide.

Since thousands of years, humankind has used wood from forests as an energy source for heating and cooking, and also as construction material. All ancient civilizations, like the Egyptians and Sumerians of Mesopotamia, did not establish their cultures in the desert. To the contrary, these early landscapes were primary fertile areas; desertification only commenced after extensive deforestation and the resulting impacts on the soils (Ponting 2007, p.73 ff). Usually, forests were first transformed into agricultural areas. The domino effect of reduced evaporation causing reduced precipitation interrupts the natural hydrologic cycle. Once evapotranspiration is signficantly reduced, landscapes begin to dry out. The ancient cultures responded by developing artificial irrigation to secure their crop production. Artifacts demonstrating this early ingenuity can be found in today's desert sands.

Remaining forests are heavily impacted by the drought, and as a final trend they burn down in forest fires. The Mediterranean region of Europe loses 45 km² of forests daily, mainly due to fire. The domino-effect of reduced evaporation and higher sensible heat release naturally impacts surrounding landscapes. Soil erosion, release of sensible heat and shift in precipitation patterns make it nearly impossible to recover these landscapes for the future.

In the area of Agadir, Morocco, 70,000 m³ water from that catchment area passes through a large treatment plant every day. After treatment, the purified water is pumped into the Atlantic Ocean. The surrounding landscapes have been drying out, as it has not rained in this area since 2 years (compare www.cycler-support.net). These 70,000 m³ per day could be converted into precipitation via irrigation and evaporation. By contrast, water which disappears into the oceans in sum is lost to the terrestrial water cycle. The evaporation from the oceans is more or less constant; increased evaporation by the oceans due to the global warming is a reverse feedback for the whole process. In any case, this increased fraction cannot compensate for the reduction of land-based evaporation.

Figure 1: Agadir, Morocco today (May 2008) looks very different from the descriptions by ancient Greek geographer Strabo: "all of the [land] between Carthage and the Pillars of Hercules [from Tunis to the Atlantic ocean] is of an extreme fertility." Morocco was often singled out as "one of the most beautiful and fertile countries of the earth" and was frequently described as "one of the granaries of Rome" (Davis 2005).

2. The impact on the climate

Global warming is generally explained by the increase of greenhouse gas emissions. Central evidence supporting this theory is the correlation between atmospheric CO_2 and global historic temperatures (Figure 2). Computer models are used to verify the process. Scientifically this theory is heavily debatable, and in most aspects it disagrees with physics and environmental science (Gerlich & Tscheuschner, 2007; US Senate, 2008). Unfortunately a cause explained with one single parameter is easy to explain. Moreover, this combines a political wish, a reduction in energy consumption, with the daily weather report.

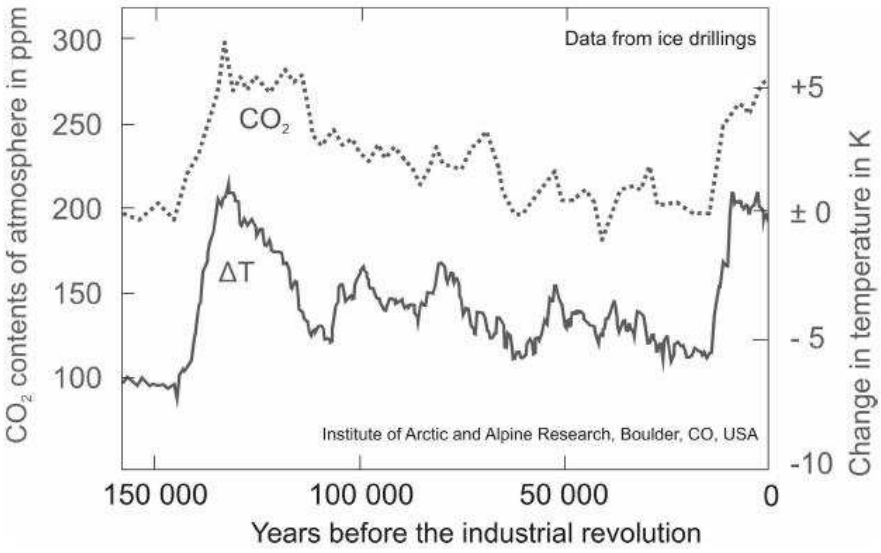

Figure 2: Correlation of CO_2-content of the Earth's atmosphere and global temperatures from 150,000 B.C to 1750 A.D. In: Krauter 2006, p.3

Several scientific publications have attempted an explicit review of the doubtful CO_2 assumption, but movies with comics like Al Gore's film "An Inconvenient Truth" are easier to accept. In fact, the superior animated movie "Wall-E" is much closer to the problem. While

there is no doubt that humankind is changing the global environment quite dramatically, it would nonetheless seem that the climate scientists have tricked us. The film “The Great Global Warming Swindle” by Martin Durkin, aired on 8 May 2007 on Channel 4 in the UK, explains the background of the ongoing political and scientific entanglement quite well. Sadly the film gives no true answer on the cause of global warming. As a rebuttal to Al Gore's 'An Inconvenient Truth,' global warming is described as a natural process, driven mainly by the sun’s intensity.

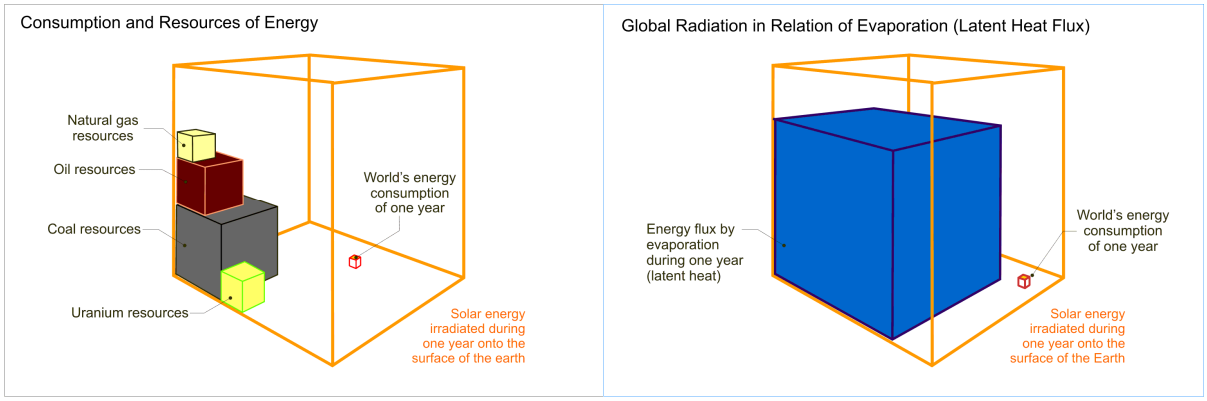

Figure 3: World’s energy consumption in comparison to all its fossil resources and its annual solar energy potential (Krauter 2006, p.2; adapted from Greenpeace) (left).

Figure 4: Energy conversion by evaporation in comparison to the solar radiation and worlds energy consumption

Fundamentally, climate change is caused by the ongoing deforestation, desertification and urbanization of the planet. The “new” environmental problems like global warming comprise the same issues as the old ones. Our intensive land use patterns are causing the planet to dry out (Ripl & Scheer, 2007; Kravčík *et al*., 2007). The correlation of global temperatures and atmospheric CO2 is in real fact a correlation between vegetation and evapotranspiration which is the earth’s biggest energy consumer.

Figure 3 shows the world’s energy consumption in comparison to all its fossil resources and the solar energy irradiated during one year onto the surface of the earth. This figure, a modification by Stefan Krauter of the Greenpeace original, is frequently used to promote renewable energy systems. Figure 4 demonstrates the huge proportion of energy converted to evaporation, compared to the global radiation and the world’s energy consumption. With consideration of these two figures, the entire global radiation balance is dominated by evaporation and condensation.

Basically, a reduction in evapotranspiration leads to the conversion of short-wave global solar radiation into long-wave emissions and sensible heat. All components in which global radiation is converted on the earths surface are illustrated in Figure 5, for a mean energy flux of one square meter per day. Of this, 7.3% of incoming solar radiation is reflected, and 38% is directly converted to thermal radiation due to the increase of surface temperatures. The total long-wave (thermal) radiation consists of atmospheric counter-radiation (7776 Wh/(m²d)) and the thermal radiation of the surface of the earth (7776 + 1724 Wh/(m²d)). Compared to other available figures about the global mean energy budget (e.g. Kiehl & Trenberth, 1997), both components are presented separately in Figure 5 since a combined figure masks the real energy balance. All surfaces above –273°C emit longwave radiation, as they receive at the same time. The energy gain and energy loss of the atmosphere has to be considered separately from this zero-sum game.

Net radiation can be either converted into sensible heat (575 Wh/(m²d)) or consumed by evaporation, a conversion into latent heat. With 1888 Wh/(m²d), the energy conversion by evaporation is the most important component of all, even more than the thermal radiation converted from incoming shortwave radiation. Additionally, the evaporation influences the longwave thermal radiation due to the change in surface temperatures.

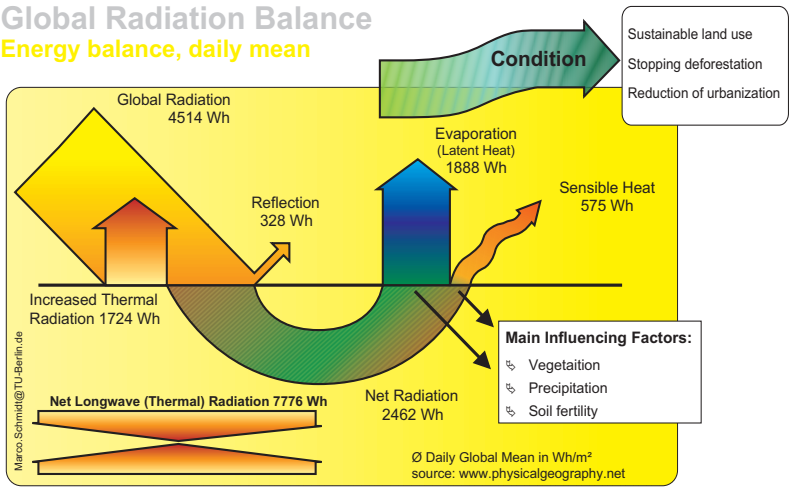

Figure 5: Global daily radiation balance as annual mean (Schmidt *et al.*, 2007). Energy data based on www.physicalgeography.net

3. Global changes to the water cycle: evaporation, condensation and precipitation

Contrary to popular assumption, a change in "greenhouse gases" has no effect on global warming. Depending on the altitude where water vapor from evaporation condenses, CO_2 and other greenhouse gases result in the opposite effect. Condensation from clouds releases the energy that was previously consumed by evaporation at the earth's surface. Several kilometers above, greenhouse gases prevent the related long-wave radiation from being emitted back to the earth.

The biggest global energy transformation is the process of evaporation-condensation, followed by the conversion of water to ice in clouds. All in all, one cubic meter of evaporated water consumes 680 kWh (water to vapor at 20°C) or releases 92 kWh (water to ice). A break in the small water cycle means that the processes of precipitation-evaporation-condensation disrupt and release thermal radiation and sensible heat, several times (figure 6)!

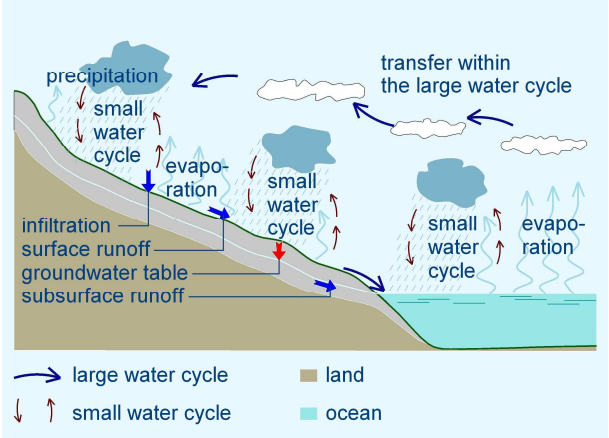

Figure 6: Large and small water cycle (Kravčík *et al.*, 2007).

The small water cycle is more relevant for local precipitation patterns than the large water cycle. If 720 mm mean global precipitation falls overland, 310 mm is from the large water cycle (i.e. Oceans) and 410 mm are from the repeated evaporation-precipitation process of the small water cycle (Kravčík *et al*., 2007, p.17). "*A fall in evaporation by 1 mm per day over the total area of the Slovak Republic (49,000 km2) leads to release of sensible heat of around 35,000 GWh for one sunny day. This is an amount of heat larger than the annual power production of all the power plants in the Slovak Republic*." (Kravčík *et al*., 2007, p.28).
The storage capacity for rainwater on land relates directly to the percentage of rainwater redirected into the atmosphere. The landscape around Berlin, for example, is characterized by 80% evaporation, compared to 20% runoff. Instead of focusing on reducing our CO_2 emissions, we need simply to restore the natural vegetation and soils. No drop of rainwater should leave the land. To this end, rainwater harvesting can play an important role to restoring denuded landscapes like urban areas (Schmidt, 2008).

4. Why does global temperature correlate with CO_2 concentrations ?

In his film, "An Inconvenient Truth," Al Gore showed the global annual change in CO_2 between summer and winter seasons, and attributed this change to different vegetation growth between the northern and southern hemispheres of the planet. This is an appropriate argument, as CO_2 plays an important role as fertilizer for plants. At 0.038% of the atmosphere, CO_2 is a minimizing factor for vegetation growth. Indeed, an increase of CO_2 in closed greenhouse systems is often used to yield a larger crop (www.watergy.de). Figure 7 shows the change in CO_2 measured at Mauna Loa, Hawaii, for the last 50 years. Quite visible is the annual cycle, driven by the change in vegetation of the northern hemisphere.

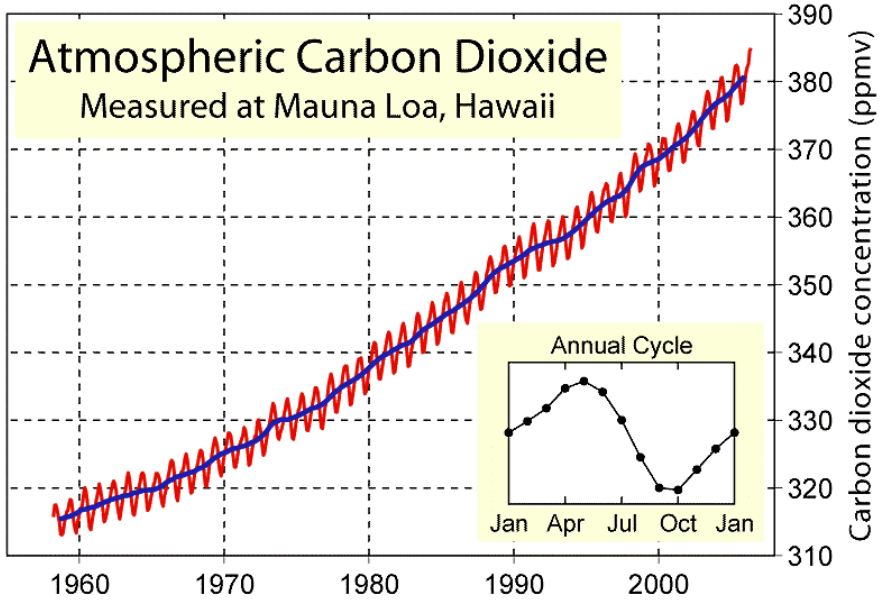

Figure 7: Measured atmospheric carbon dioxide, Keeling curve (Robert A. Rohde)

It has been popularly misinterpreted that the annual change in CO_2 is due to this seasonal change in vegetation, while the continuous increase over the years is traced to human emissions. Indeed, the increase in CO_2 is related to global plant development, especially with relation to deforestation, desertification and urbanization. However, the emissions from fossil fuel resources have been overrated and misinterpreted (compare Figure 4).
Vegetation is the main driving factor for many of earth's systems and processes, and CO_2 is an indicator for the process of photosynthesis. As mentioned above, the main energy conversion

for photosynthesis is evapotranspiration. Vegetation is predominantly responsible for the evapotranspiration on land; collectively, leaf surface area is much greater than the surface of open water. Trees, supplied with enough water, have enormous reduction capacity for sensible heat.

Correlation between global temperatures and atmospheric CO_2 does exist, but this is a very general association without any direct causes. Furthermore, the correlation in itself is insufficient for describing a direct interrelation, as quite often the temperature changes occur only after the CO_2. Given that vegetation is the main driving force for atmospheric CO_2, this is an indicator of vegetation processes.

Ecology describes cycle processes at a producer-consumer relation (Figure 8). As part of the photosynthesitic process, evapotransipiration converts CO_2 into O_2 and sugar. In turn, photosynthesis, as one of Earth's dominant processes, defines the global stock of CO_2 and O_2. At a rate of 0,038% of CO_2 and 20,9% of O_2, vegetation is the "consumer" and its respiration as part of photosynthesis determines these gas concentrations. In this regard, the emitter of greenhouse gases has nearly no influence, and the anthropogenic release of CO_2 is of low importance on a global scale. Only at a rate of 10% CO_2 and 10% O_2 in the atmosphere would the emitter start to have a larger influence on this stock than the consumer.

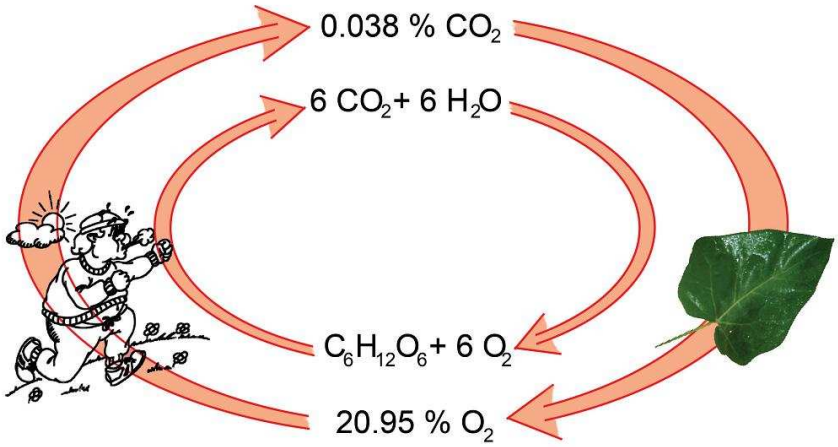

Figure 8: In the carbon and oxygen cycle, photosynthesis dominates the stock of O_2 and CO_2 (graphic courtesy of Christine Huber, TU Berlin).

5. Global warming same cause as the urban heat island effect

Along with the localized urban heat island effect, global warming shares the same causes: lacking vegetation and reduced evaporation (Figures 9, 10). Urbanization results in a huge change to the small water cycle (precipitation, evaporation and condensation). Additionally, hard materials and surfaces in urban areas absorb and re-radiate solar irradiation and increase that area's heat capacity. Nonetheless, the main driving factor for the so called "urban heat island effect" is the lack of vegetation and unpaved soils.

Figure 9 and 10: Urbanized (Rio de Janeiro) versus natural landscapes significantly alter a region's patterns of radiation and hydrology.

As an example of changes to global radiation, Figure 11 illustrates the radiation balance of a black asphalt roof. Compared to Figure 5, most of the net radiation from the urban setting is converted to sensible heat rather than evaporation. Higher surface temperatures also increase the thermal radiation. Greening buildings is a logical solution to create more comfortable air temperatures in cities and to improve the microclimate around buildings. "Green" in this sense means chlorophyll green, as building surfaces covered with vegetation will „consume" solar radiation through evapotranspiration. Currently, the green building movement is focused mainly on energy consumption by heating, cooling and ventilation rather than on vegetation and evaporation. While the energy topic is a big concern, this is not related to the problem of global warming and further environmental and social issues.

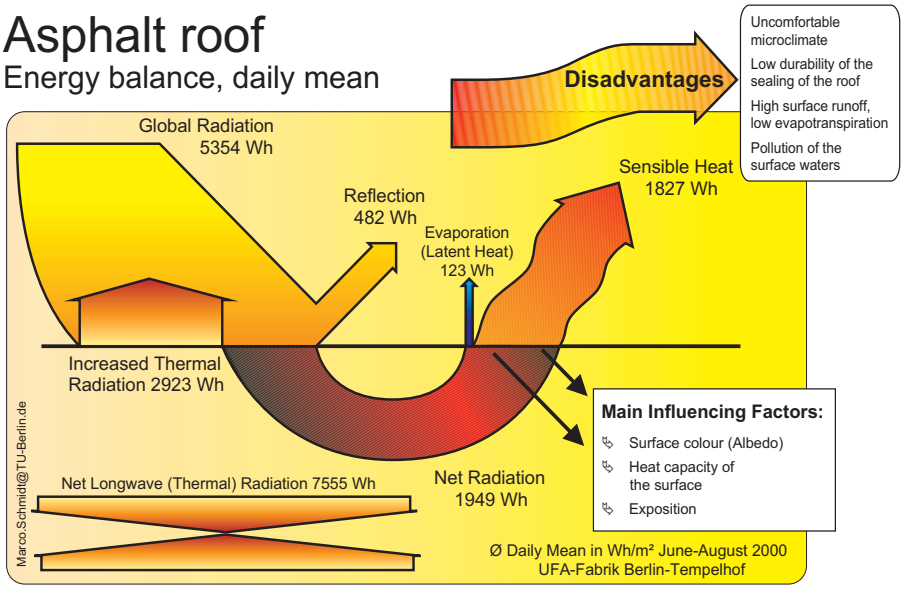

Figure 11: Radiation balance of a black asphalt roof as an example for urban radiation changes (Schmidt *et. al*, 2007)

6. Conclusions

Models which are based on poorly understood processes should be treated critically. As such, the general correlation between global temperatures and atmospheric CO_2 of the past does not mean that reduced greenhouse gas emissions will reduce global warming. As outlined above,

a more meaningful strategy would be to expand global vegetation coverage and "repair" the ongoing process of degradation and desertification through sustainable land use. Other popular alternatives such as Carbon Sequestration and Storage (CSS), biofuels and nuclear energy all benefit from the CO_2 discussion, but would only lead to a compounded environmental disaster.

As global temperatures continue to rise, a small group of scientists still work on and promote a false parameter with the support of public and political assistance and sponsorship. The tragedy of this current situation is that mankind already experienced this scenario thousands of years, when increased temperatures and drought culminated into the desertification of fertile lands (Ponting 2007). The intensity and power of this process is frightening. Substantiated by the argument of CO_2-neutral energy, public subsidies are given towards palm oil, ethanol and wood pellets. Ultimately, this conversion from fossil fuels to biomass for energy affects landscape ecology and results in the opposite, rather than the intended goals (Figure 12).

Figure 12: Europe's largest manufacturer of wood pellets at the harbour in Wismar, Germany. With the argument of CO_2-neutral energy, the subsidised use of wood pellets leads to deforestation and an increase in global warming.

All environmental strategies that were developed in the 1970s and 1980s point in the right direction. With the recent "energy-hype," however, environmental NGOs have been hijacked and the old approaches have been nearly lost or forgotten. Whoever still believes that our earth is equivalent to a greenhouse, please visit our real greenhouse projects and experiments under www.watergy.de.

There are hundreds of perfect arguments which substantiate the shift from fossil fuels to renewable energy. In cases where climate change has pushed the development and adoption of renewable energy systems, public opinion might have had a positive effect. For the associated environmental issues, however, and the complex result of global warming itself, the recent years of political ignorance have resulted in a growing environmental disaster. Whereas rich countries began mixing palm oil into gasoline, we are now facing serious repercussions as adequate food supplies for the poor are shrinking. If ever there was an argument to protect especially the poor countries from the risks of climate change, then this was either a stupid misinterpretation or an outright lie. Carbon trading has become big business, and since 1990 values for emission rights were established which are far-fetched but which represent a new international currency. This value was established in the rich already "developed" countries, these values are traded and sold.

7. References:

Davis, D. K. (2005) "Potential Forests: Degradation Narratives, Science and Environmental Policy in Protectorate Morocco, 1912-1956," Environmental History, 10(2): 211-238. http://www.historycooperative.org/journals/eh/10.2/davis.html

Durkin, Martin 2007: The Great Global Warming Swindle. Documentary film, 75 min, Channel 4, 8 March, 2007; http://www.greatglobalwarmingswindle.co.uk/

Gerlich, G.; R. D. Tscheuschner 2007: Falsification of the atmospheric CO_2 greenhouse effects within the frame of physics. 114 pp. http://arxiv.org/pdf/0707.1161v3; www.tsch.de

GTZ 2007: Reducing Emissions from Deforestation in Developing Countries. Deutsche Gesellschaft fuer Technologische Zusammenarbeit, Eschborn. 32 pp. http://www.gtz.de

Kiehl, J. T. and Kevin E. Trenberth: Earth's Annual Global Mean Energy Budget. Bulletin of the American Meteorological Society 1997, pp197-208.

Krauter, Stefan: Solar Electric Power Generation. Springer: Berlin, Heidelberg, New York (2006). ISBN: 3540313451. http://www.stefankrauter.com/

Kravčík, M.; J. Pokorný, J. Kohutiar, M. Kováč, E. Tóth: "Water for the Recovery of the Climate - A New Water Paradigm". Publisher Municipalia 2007. http://www.waterparadigm.org/

Ponting, Clive: A new green History of the World. The Environment and the Collapse of Great Civilisations. Vintage 2007, UK. ISBN 9780099516682. 452 pp.

Ripl, W., J. Pokorny, J. and Scheer H.: Memorandum on Climate Change, The necessary reforms of society to stabilize the climate and solve the energy issues. Berlin 2007. http://www.aquaterra-berlin.de

Rohde, Robert: http://www.globalwarmingart.com/; published data: http://www.esrl.noaa.gov/gmd/; http://en.wikipedia.org/wiki/Carbon_dioxide

Schmidt, M., B. Reichmann, C. Steffan: Rainwater harvesting and evaporation for stormwater management and energy conservation. Proceedings 2nd International Congress on Environmental Planning and Management, 5.-10.8.07, TU Berlin. In: Landschaftsentwicklung und Umweltforschung S20, p. 221-224. ISBN: 978-3-7983-2049-9. http://www.urbenvironcongress.tu-berlin.de/

Schmidt, Marco 2008:The contribution of rainwater harvesting against global warming. 3rd International RWHM Workshop, Session "Rainwater Harvesting and Management for Climate Change Adaptation/ Mitigation. IWA World Water Congress and Exhibition, Wien, 21. September 2008.

U. S. Senate Environment and Public Works Committee Minority Staff Report (Inhofe): More Than 650 International Scientists Dissent Over Man-Made Global Warming Claims Scientists Continue to Debunk "Consensus" in 2008. www.epw.senate.gov/minority; Released: December 22, 2008, 233 pp.

Links:

http://www.evapotranspiration.net
http://www.waterparadigm.org
http://www.watergy.de
http://www.cycler-support.net

Acknowledgements

Many thanks to Christine Thuering of Chlorophyllocity who improved my poor English.