Factors affecting climate change since the 19th century

Since mid-19th century, when rapid industrialization went on at a much larger scale, man became an active user of nature in many respects. That brings up the big question whether temperatures had risen due to the end of the Little Ice Age only or human activities had contributed to this rise. Although it is assumed that both factors were involved, our main concern is the anthropogenic aspect. How did mankind contribute to temperature rise during the modern time period?

Carbon dioxide is certainly a possible contributor to making today's world warmer, but let's not overlook the fact that it represents only one of the contributing factors. Industrializing the world during the last 150 years practically meant accelerating the use of fossil resources such as coal, oil, gas, etc. for transport and energy production. Burning and combustion of organic substances produce gases, particularly carbon dioxide, which together with methane, water vapour and nitrous oxide are called greenhouse gases. Any discussion on climate is principally focussed on this phenomenon.

There are a number of man-made contributory factors that may have had specific impacts on the atmospheric seasonal heat budget, e.g. local warming in cities *(due to housing, roads, and other resultant factors)*, smoke and dust over long distances or deforestation of huge areas. Each may have had temporary or long lasting implications, but none of these is a major source for the strong warming trend during the last 150 years.

Shipping, which is one of the presumably decisive warming factors, has been given little attention until now in contrast to the greenhouse effect caused by atmospheric gases. The contribution of shipping, fishing, naval vessels, oil platforms, leisure boats, etc. is not comparable to that of cars, power plant and air planes in feeding the atmosphere with carbon dioxide (CO2), except for a small fraction. Each and every moving boat and vessel ploughed the sea to a depth of one to 20 metres, day and night. Since moving force of ships changed from sails to coal steamers and motor vessels propulsion, they churned the sea surface layer as a kitchen blender works on a milkshake.

The main aim of this investigation is to demonstrate the absolute dominance of the ocean in climatic affairs. Insofar as we can talk about the role shipping played in the warming of earth's climate since changing over from sailing to screw driven ships, the aspect of navigation is closely related to climatic changes like the sea war issue. If it is established that two short wars can dramatically change the course of climate for decades, it can also be proved beyond any doubt that shipping had been a major contributing factor to atmospheric warming during the last 150 years as well.

Greenhouse warming gases

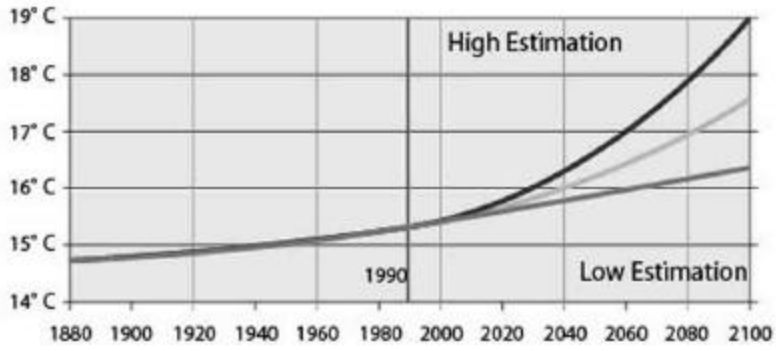
The discussion about greenhouse gases had started in the early 19th century but the thesis acquired an extraordinary success only during the last 20 years. Forceful efforts of the global

community of climatologists were recently crowned with success when the Kyoto Protocol[1] was enforced, in February 2005. The Protocol requires an overall reduction of emissions on market economy basis of offer and demand[2].

For the climate science, the group of greenhouse gases include carbon dioxide[3], methane, water vapour and nitrous oxide. They appear naturally, but are also produced through industrial processes. Inclusion of water vapour among these gases is an unfortunate if not a misleading action. Atmospheric water vapour needs to be considered on its own merits when the matter concerning air temperature warming is discussed.

Humidity and gases

Atmospheric dynamics principally happen because of the variation of heat concentrations. The term humidity refers to the water-vapor content from the atmosphere. While water vapor has the characteristic of appearing in various concentrations throughout the atmosphere, CO2 is distributed evenly. To this extent, it is a substance that is neutral for the climate and gains relevance only indirectly, in association with water vapor. The following explanations refer to this:



Temperature developments according IPCC

a) Figuratively speaking, distribution of greenhouse gases can be compared to a gridiron whose meshes are the same distance # apart. The only variable is that the mesh network can be drawn tighter (e.g. by more CO2) or loosened. This net, by the way, changes only in accordance with the seasons and never with more than 1-2%. CO2 concentration has increased with about 25 % since 1850[4].

1 The Kyoto Protocol is an amendment proposed to an international treaty on global warming -- the United Nations Framework Convention on Climate Change (UNFCCC). Countries which ratify this protocol will be committed to reduce their emissions of carbon dioxide and other greenhouse gases which are linked to global warming. It also reaffirms sections of the UNFCCC.

2 It is said that such a market mechanism will help find cost-effective ways to reduce greenhouse emissions. There is no carbon audit regime yet. A carbon audit regime is an effective means of accounting for greenhouse gas control efforts. It establishes that the claimed reductions in emissions, or carbon sequestration, have actually occurred and are stable.

3 Carbon dioxide (CO2) results from the combustion of organic matter if sufficient amounts of oxygen are present. Plants use CO2 during photosynthesis. Both carbon and oxygen are used to construct carbohydrates. CO2 is present in the atmosphere at a low concentration and acts as a greenhouse gas. CO2 is a heavy odourless and colourless gas formed during respiration and through the decomposition of organic substances; absorbed from the air by plants in photosynthesis.

4 From 280 ppmv to 360 ppmv in year 2000

b) Water vapor, on the other hand, appears in varying concentrations. A saturated cloud stores within a certain volume which is many, many more times bigger than the amount of energy of the same volume of the CO2 gridiron. A hurricane, which derives its energy from the ocean, produces about 300-400 billion kw-hours of energy daily and releases 10-20 billion tons of water.

While there is an active exchange of water and energy between the ocean and the atmosphere, the greenhouse gridiron does not change. It would be interesting to hear from IPCC with how many kilowatt-hours of energy and with how many tons of water the greenhouse CO2 gridiron contributes to a hurricane as it develops and moves through a region. As the development, strength and maintenance of a whirlwind depends on the condition of the ocean, it seems unlikely for the greenhouse CO2 gridiron to make a significant contribution to this process - except perhaps in computer simulations.

c) To this extent, it is difficult to understand how any significant amount of heat energy could be transferred from this gridiron to the ocean, thus leading to a rise of the sea level. Practical experiences show that, when the air is dry, the land heat does not come from the air, and that, when warm air encounters cold water, the ocean immediately protects itself with a defensive shield which takes the form of daze, mist or fog. Admittedly, the interaction between the ocean and the atmosphere is very complex. It requires considerable time and efforts to be explained plausibly. However, it is a mystery how anyone can explain with conviction that the seas can be heated by a cloudless sky at night, for example. The oceans are earth's central heating system. After the sun, the ocean is the second heating factor of the atmosphere. No one has plausibly explained yet how warm air coming from the bedrooms and living room is influencing the central heating system.

Dimension matter

If the sun were "turned off," the temperature of the atmosphere would be only 28°C above absolute zero, viz. -245°C. With the sun and "greenhouse gases" but without water, the average temperature on earth would be of -11°C, resulting from a daytime mean temperature of approximately +135°C and a nighttime temperature of approximately -175°C. The moon provides such conditions at night. CO2 would delay the cooling towards the absolute minimum only for a short time. Its functioning on earth is not so much different.

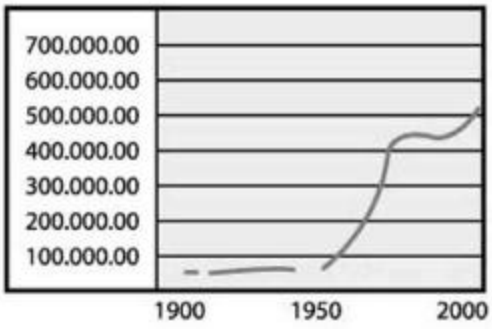
What matters is the amount and concentration of water in the atmosphere. If the atmosphere is divided into two warm or energy bearing zones, viz. water and greenhouse gases (CO_2, methane, etc.), then the atmospheric humidity has as much warming capacity as a two-meter layer of ocean/sea surface and the greenhouse gases as much as a one-meter layer. Practically, this means that a rise in the atmospheric temperature by 1°C must cause a drop of an equivalent amount in the upper three meters of the ocean. But because water vapor is usually in a much higher concentration at lower altitudes, its weather impact is much more effective then that of CO2. CO2 is permanently distributed equally throughout the atmosphere. Weather and temperature functioning are extremely different. Water vapor is about 96 to 99 % responsible for the greenhouse effect; and on a foggy day even 100%.

Since so much has been written about the greenhouse effect, whatever written here will be insignificant. Basic understanding about carbon dioxide issue is relevant only as far as it is needed to provide a comparison between possible contributors to the warming trend, including human input. While atmospheric water is a highly remote subject in IPCC reports related to climate, the shipping issue is completely inexistent.

Oceans and shipping

Oceans and shipping should have been the hottest topic in the climate change debate since meteorology was established as a science, in the late 19th century. Instead of that, oceans were ignored up to late 20th century and even today they do not enjoy the top position they deserve as a decisive climatic force, second after the sun.

a) The starting point is that the oceans are huge and deep. If all continents were leveled, the globe would then be covered by one ocean all around the sphere, at a uniform depth of 3,000 meters. It is not only quite a lot of mass, but water is also an excellent thermal store. Heat capacity ratio between ocean and atmosphere is of 1:1000. The sea can store heat for hours, days, decades or even centuries. Atmospheric heat capacity is almost completely limited to the amount of water vapor available. If not sustained by sunray or ocean heat, atmospheric heat is gone within 2 to 3 days. Humidity is particularly important for the winter seasons at higher latitudes when the sunshine is short, modest or not existent at all. Merchant and naval vessels, fishing and leisure boats plough warmer surface water to lower sea levels in the summer time. During winter, the process is reversed. The more the ships turn the surface water layer around during cold winter days, the warmer the water from lower levels will be and contribute to the rise of the air temperature.



b) Oceans and seas were subject to extensive 'stirring and mixing' since the start of the global warming, 150 years ago. There are over 30,000 registered trading ships. If half of them travel about 275 nautical miles (about 500 km) every day, then the waters of the oceans are "churned up" to a width of about 5 to 30 meters and a depth between few and 20 meters over a path which is equal to eight times the distance from the earth to the moon or 1,500 times the distance from the English Channel to the east coast of North America (all these figures are rough estimates). In a year, this would mean that the Atlantic Ocean from Iceland to the Ross latitudes is "ploughed up" to depths which have as much heat capacity as the entire atmosphere.

c) But there are not only merchantmen out in the sea. If all ships are to be taken into account, viz. fishing vessels, coast guard ships, tugs and millions of leisure boats during the summer season, we can easily double or triple the churning effect in the coastal waters and seas as compared to the figures calculated above in respect of merchant shipping. And shipping is presumably not the only contributor: dragging, sea bed drilling, off shore wind energy farms, etc. may also contribute. Actually every contribution, as little as it may be, adds to statistics, possibly resulting in a change of climatic data.

d) There are virtually no continuous series of measurements, which would lead to some acceptable conclusions about the isotherm structure and its influence on the upper layer of the ocean to a depth of at least 50 meters, over a long period of time. But the temperature difference can be of several degrees within a few meters, in summer as well as in winter.

e) The turning and churning of the sea by ships and boats is an ideal means to increase the warmth of the oceans. Any temperature increase expends simultaneously the volume of the water body. IPCC comes to the following conclusion concerning oceans[5]:

- *Tide gauge data show that global average sea level rose between 0.1 and 0.2 metres during the 20th century.*
- *Global ocean heat content has increased since the late 1950s, the period for which adequate observations of sub-surface Ocean temperatures have been available.*

Causing Sea Level changes is an important consequence of climate change, IPCC claims[6] and says: The pattern of sea level in ocean basins is maintained by atmospheric pressure and air-sea fluxes of momentum (surface wind stress), heat and fresh water (precipitation, evaporation, and fresh-water runoff from the land)[7]. That a significant proportion of ocean warming and expansion could have been caused by various uses of oceans and seas has not yet attracted IPCC's attention. This investigation will demonstrate that two World Wars were responsible for the only two major climatic changes since meteorology became a scientific discipline about 125 years ago.

5 IPCC, Climate Change 2001: WG I: The Scientific Basis, Summary for Policymakers.

6 IPCC, Climate Change 2001: WG I: Changes in Sea Level, Introduction (Sec.11.1).

7 IPCC, Climate Change 2001: WG I: Changes in Sea Level, Ocean Processes (Sec. 11.2.1)