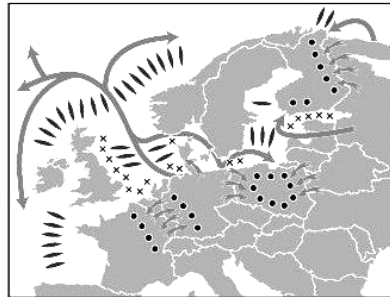


## A. CLIMATE CHANGE ISSUES

### INTRODUCTION

In the summer of 1939, a major world war was looming. British Prime Minister Neville Chamberlain desperately tried to persuade German Chancellor Adolph Hitler not to push the world into another major war. But the threat of climate change was not among the arguments Chamberlain used to convince his opponent and his efforts were in vain. Hitler wanted a war and started it in September 1939. The war lasted six years and initiated a big climate change.

The book is about oceans, wars at sea and climate changes. It focuses on two major climate changes, which happened because man abused oceans through naval warfare twice during the last century. Last and most dramatic climate change occurred during World War II, sixty-five years ago.



• Defence ↷ Attack † Sea patrol × Sea mines

Fifty million people were killed and the infrastructure and the economy of many countries ruined. But there are even more tragic consequences, which have not been tackled very seriously yet. With the commencement of the World War II, warm climate changed to a cold phase, which lasted four decades. Nowadays,

more than half a century after the above mentioned events, leading politicians and scientists warn that climate changes are the greatest threat to mankind. They claim that the threat is caused by industrial release of carbon dioxide into the atmosphere. This works like a greenhouse effect that makes the earth's temperature rise.

The British Prime Minister Tony Blair recently said that there is "no bigger long-term question facing the global community" than the threat of a climate change<sup>1</sup>. Unfortunately, the focus is misplaced. It is not the atmosphere, which determines the fate of the climate. It is the ocean that does it. J.W. von Goethe would have agreed:

*Until one has experienced the sea around one,  
One has no idea of world and its relation to the world<sup>2</sup>.*

The war at sea caused a major climate change starting with 1918 and then another one after the end of 1939. If the oceans, as the driving force of the climate, had influenced scientific research since the early days of meteorology, 150 years ago, it would then have been possible to clearly stress that, at the advent of the two World Wars during the last century, extensive fighting at sea endangered the normal course of the climate.

How would the course of international conflicts have been managed if the world's leading statesmen of the 20<sup>th</sup> century had been concerned with climatic changes due to the impact a war at sea could have had on the ocean and consequently on the climate? Could World War II have been prevented if global climate change had been as much a concern as today? Or would the leaders have tried to persuade warring navies to leave oceans and seas out of the conflict?

But no one had alerted the warring nations at any time over the last 150 years that going out on sea to fight a war would have an inevitable impact on the status of the oceans and, consequently, on the climate. In August 1939, no one demanded to Adolf Hitler, in strong diplomatic notes, to abstain from any military activities out in the oceans.

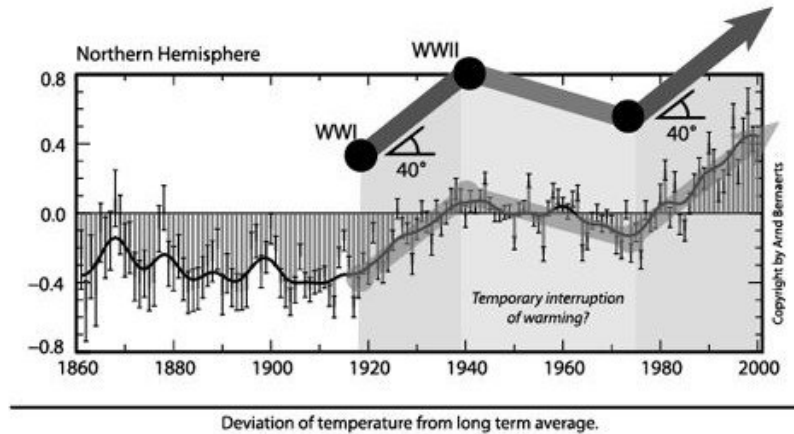
The inevitable happened. Within six months, the Second World War (WWII) commenced and Northern Europe was plunged into the coldest winter in more than 100 years. By mid-February 1940, Europe was in the grip of arctic conditions that had not been experienced since the Little Ice Age, in the 18<sup>th</sup>/19<sup>th</sup>

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1 [www.bbc.co.uk/climate/policies/uk\\_policy.shtml](http://www.bbc.co.uk/climate/policies/uk_policy.shtml) Topic: Climate Change from the BBC Weather Centre/ Policies/ UK Policy; "PM Tony Blair described climate change as 'the most important environmental issue facing the world today'";

2 Johann - Wolfgang v. Goethe , 1749-1832, "Italian Voyage", 1787;

century. And neither the scientific community nor the political leaders had any idea about the link between war and arctic temperature conditions.



It is an irony that Adolf Hitler's deputy, Field Marshal Herman Goering<sup>3</sup>, in a speech designed to boost the morale of the German population which was striving to overcome the unbelievable hardship of a cold and snowy winter, could get away with the statement he made on the 15<sup>th</sup> of February 1940:

*Nature is still more powerful than man.  
I can fight man but I cannot fight nature  
when I lack the means to carry out such battle.  
We did not ask for ice, snow and cold –  
A higher power sent it to us.<sup>4</sup>*

How wrong was Herman Goering! He, Adolf Hitler and the German Reich were alone responsible for the sudden

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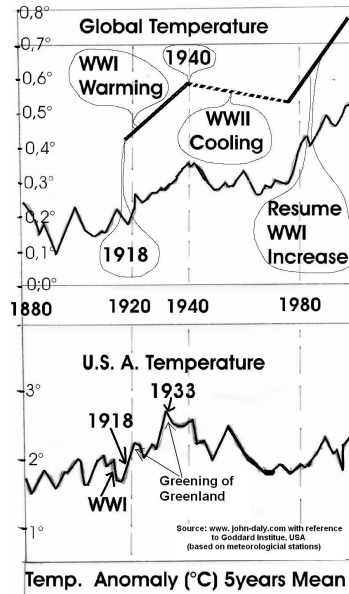
3 Hermann Goering a celebrated WWI air fighter pilot joined the Nazi movement as early as 1923 and became head of Germany's armed forces in 1938. The following year he officially became Hitler's deputy and legal heir. After WWII commenced Goering was placed in charge of the Luftwaffe. In 1946 he was found guilty at the Nuremberg War Crimes Trail;

4 Herman Goering in a speech in Berlin on the 15th of February 1940; reported by The New York Times, on the 16<sup>th</sup> of February 1940;

transformation of both regional and global climate. While the war continued for five more years and the war at sea turned global after Japan's attack on Pearl Harbour, in December 1941, it did not only generate three extreme cold winters in Europe but also generated four decades of cold that lasted from 1940 to the early 1980s. This happened after an extensive series of devastating naval activities in the Atlantic and Pacific regions.

A major climatic implication in oceanic affairs already started with the development and use of screw-driven steam and motor vessels in the mid 19<sup>th</sup> century. For almost a century, 10,000 vessels criss-crossed the seas, travelling more than 10,000,000 nautical miles every day. It can be logically assumed that, over the years, each ship cruising through the seas will force more heat into the sea than out of it. The more heat the oceans hold, the warmer the atmosphere gets.

But this simple fact had not been given any serious attention by the scientific community until recently. This book aims to raising the issue while concentrating on the two wars at sea, from 1914 to 1918 and from 1939 to 1945, when seas and oceans were turned into battlegrounds and huge water areas were turned upside-down by naval vessels and by activities such as shooting, aerial bombing, torpedoing merchant vessels, sea mining, and depth charging of submarines.



“Everything is maintained through water!” says Goethe in his drama, Faust II. Understanding global nature in this way needs to be also reflected in the field of climate research and in any definition on climate. Goethe would certainly have agreed with the definition on climate as the continuation of the ocean by other means<sup>5</sup>. In this book you will find facts, circumstances

<sup>5</sup> See: Arnd Bernaerts, Letter to Editor, NATURE, Volume 360, 26 November 1992, page 292;

and evidence about the impact of naval warfare on modern climate.

The facts presented aim to leading the way to a new thinking on climate, based on the conviction that only the one who is able to feel the eternal power the oceans have on our global nature affairs will be capable to uphold the principal driving force on earth, namely, the oceans which ultimately control the weather and climate.

### **Want to change climate?**

Is man responsible for global warming? This has been debated for more than 20 years. And most of the claims say that modern civilization is responsible for higher atmospheric temperatures caused by man-made greenhouse gases. The mouthpiece for this claim is the Inter-Governmental Panel on Climate Change (IPCC), founded in 1988.

The main argument of the IPCC is based on carbon dioxide (CO<sub>2</sub>). Proud to convey the “consensus” of hundreds of leading scientists from around the world, this organisation hardly ever hesitated to confirm its belief in the Assessments Reports<sup>6</sup> as being correct.

The IPCC Report from 1990 states:

*“Emission resulting from human activities is substantially increasing the atmospheric concentration of the greenhouse gases: carbon dioxide, methane, chlorofluorocarbons (CFCs) and nitrous oxide. These increases will enhance the greenhouse effect, resulting on average in additional warming of the earth’s surface. The main greenhouse gas, water vapour, will increase in response to global warming and further enhance it”.*<sup>7</sup>

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Arnd Bernaerts, “Legal Means for Understanding the Marine and Climatic Change Issue”, in: Thomas A. Mensah (ed.), *Ocean Governance: Strategies and Approaches for the 21<sup>st</sup> Century*, Honolulu 1994, pp. 157f;

<sup>6</sup> For example 1990, 1995; and the Report 2001 on [http://www.grida.no/climate/ipcc\\_tar/wg1/index.htm](http://www.grida.no/climate/ipcc_tar/wg1/index.htm)

<sup>7</sup> IPCC First Scientific Assessment Report, *Climate Change*, J.T. Houghton, et al (ed), Executive Summary, page XI, Cambridge July 1990;

After the end of the 19<sup>th</sup> century, the world's global surface air temperature has increased from 0.3 to 0.6°C, the 1999 Report further states<sup>8</sup>.

IPCC's CO<sub>2</sub> claim proved highly successful. The science on climate change received many billions of US dollars every year for research, in addition to meeting the costs of infrastructure, meteorological services, satellites, ships, etc., all paid from the public funds. The CO<sub>2</sub> claim was the basis on which politics has been made since the Rio de Janeiro Summit, in 1992, which agreed on the United Nations Framework Convention on Climate Change of the same year. Only five years later, a treaty on curbing greenhouse gases was negotiated in Kyoto, Japan. The negotiation resulted in the agreement that is world-wide known: The 'Kyoto Agreement'<sup>9</sup>.

The Russian Federation, an opponent of the treaty for many years, approved it in late 2004, due to the promises and persuasion of the European Union. Twenty years of hard lobbying proved to be a great success story for climate science. The last big industrial country still holding back its approval of the treaty is the USA. But with Russia on board<sup>10</sup>, the Kyoto Treaty went into force on the 16<sup>th</sup> of February 2005. The strong belief and conviction of the man-made planetary climatic catastrophe due to greenhouse gases have created a mighty political tool within the community of climatologists.

Seeking funding, having visions, lobbying for one's own belief is all fair deal. But what will happen if the greenhouse strategy is found to be grossly exaggerated or even proves wrong in due

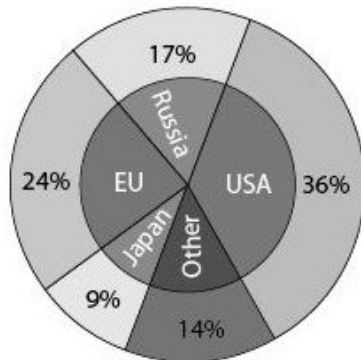
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8 IPCC First Scientific Assessment Report, Climate Change, J.T. Houghton, et al (ed), Executive Summary, page XII, Cambridge July 1990;

9 The Kyoto global warming pact, negotiated in Japan's ancient capital of Kyoto in 1997 and ratified by 140 nations, went into force on the 16<sup>th</sup> of February 2005, seven years after it was negotiated, imposing limits on the emissions of carbon dioxide and other gases scientists blame for rising world temperatures, melting glaciers and rising oceans;

10 With the United States staying out, Russia was the last hope for the treaty's supporters to get the necessary 55 countries accounting for at least 55 percent of global emissions in 1990. Russia accounted for 17 percent of emissions, second to the United States;

course? Could it all result with global community having lost dozens of years to understand the mechanism of natural climate system?



**Country share  
CO<sub>2</sub> Emissions in 1990**

Not everybody is with the IPCC and its findings by “consensus”. While the mainstream of science and climatologists support it, there are also voices opposing the IPCC’s conclusions. The most prominent document in this regard is the “Oregon Petition” from 1998 signed by 17,000 scientists protesting against the Kyoto Agreement. The petition requested acceptance through the

following statement:

*“We urge the United States government to reject the global warming agreement that was written in Kyoto, Japan, in December 1997, and any other similar proposals. The proposed limits on greenhouse gasses would harm the environment, hinder the advance of science and technology, and damage the health and welfare of mankind.*

*There is no convincing scientific evidence that human release of carbon dioxide, methane, or other greenhouse gasses is causing or will, in the foreseeable future, cause catastrophic heating of the Earth’s atmosphere and disruption of the Earth’s climate. Moreover, there is substantial scientific evidence that increases in atmospheric carbon dioxide produce many beneficial effects upon the natural plant and animal environments of the Earth”.<sup>11</sup>*

Neither the IPCC claim nor the Oregon Petition are satisfactory and reflect a fairly correct assessment and analysis of the

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11 See: Anti Global Warming Petition Project; <http://www.oism.org/pproject>

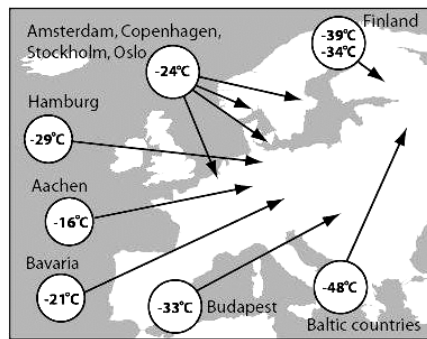
Earth's climate during the last 150 years. A thorough analysis of climate events and human activities will show that it is possible to establish considerable links between the two. After all, the global weather system is based on the law of physics. That will be explained, demonstrated and discussed in details throughout this book.

### **Want to have a freezing winter? Start a war!**

The following section will provide an initial example. It is one of the climate change experiments made by man that should have been subject to a detailed assessment when the experiment started, on the 1<sup>st</sup> of September 1939. If the meteorologists of the 1930s failed to recognise that a climate change is inevitable in case of war at sea, the post-war climatologists had 60 years to rectify the failure of their pre-war colleagues.

On the 14<sup>th</sup> of February 1940, virtually only hours before the German Vice-Chancellor and Air Field Marshal Herman Goering denied any responsibility for the weather with the words:

*"We did not ask for ice, snow and cold – A higher power sent them to us"*, The New York Times reported that a record cold gripped the European Nations and that at least 56 people died from Scandinavia to the Danube, while the Baltic Sea was frozen. The newspaper informed its readers about the situation as it follows:



Reported temperature, February 14th - 17th 1940

"Europe suffered tonight in the paralysing grip of the bitterest cold in more than 100 years".

"The cold wave extended from the Arctic fringes of Norway and Finland to the Netherlands and Hungary".

"The Netherlands Weather Bureau recorded the lowest temperature ever recorded in this country, 11.2 degrees below zero Fahrenheit." (-11.2 F corresponds to -24°C).



“Water transportation in the Netherlands is completely paralysed. The canals have been covered with thick ice for more than six weeks. Hundreds of persons abandoned their homes in the face of crushing ice packs boiling up from ice-blocked canals, rivers and seas.”

“In Copenhagen the temperature has dropped to 13 degrees below zero Fahrenheit (-25°C)”.

“The Baltic Sea was frozen over for the first time in many years. Islands along the coast of the Netherlands and the Baltic were isolated. All day they sent out SOS calls for coal and foodstuff”.

“In Estonia, Latvia and Lithuania, more than 10,000 persons suffered severe cases of frost-bite. At least five persons froze to death in the three Baltic countries where temperatures reached 54 degrees below zero Fahrenheit (-47°C) for the first time in 150 years”.

Only five and-a-half months earlier, Hitler had started a war in Northern Europe. Then there was bitter cold, lack of coal, shortages of food, frozen water pipe lines. Keeping transportation going had become a nightmare since the cold wave had started during the second week of January. To boost the morale of the population under these difficult circumstances, Herman Goering appealed to them in a speech, in Berlin, on the 15<sup>th</sup> of February 1940 (NYT, the 16<sup>th</sup> of February 1940):

*“These troubles, naturally, take precedence over yours. They are not a German patent – look at the nations around you having the same difficulties.”*

The arctic winter in Northern Europe continued for another week. In Sweden, all cold records were beaten during the days of 19<sup>th</sup>/20<sup>th</sup> of February, with 32 degrees below zero F. (-35.5°C), the coldest since 1805 (NYT, the 23<sup>rd</sup> of Feb.’40).

Only a few lines from the outstanding war time reporting of The New York Times are enough to illustrate the astonishing result of one of the most captivating climate change experiments.

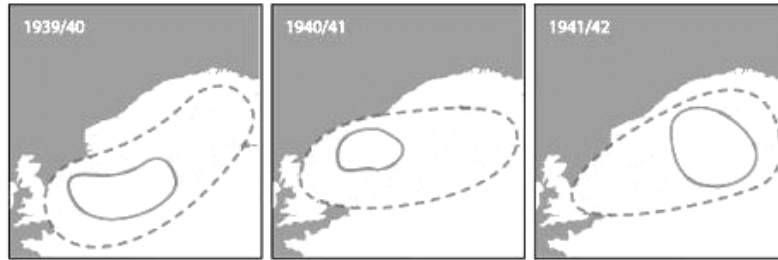
Since the 1<sup>st</sup> of September 1939, thousands of naval vessels were permanently engaged in war, guarding merchant ships, patrolling sea areas, and exchanging fire with shore batteries or with other naval vessels. Thousands of planes flew on bombing, fighting or patrolling missions every day. Up to 100,000 sea mines were dropped in the sea of which several thousands exploded. Many thousands depth charges were thrown over board to destroy enemy submarines. U-boats torpedoed vessels. Hundreds of ships were sunk in the sea. Some exploded with extreme force due to their loaded cargo consisting of ammunition or gasoline.

Baltic and North Sea waters were churned, mixed and turned upside down as never before. It was as if someone violently stirred a bowl of soup with a spoon to cool it quickly. Waters of Northern Europe went to a similar process which paved the way to the arrival of polar air which established there for many weeks. The impact on regional winter conditions should have hardly come as a surprise. The arctic cold during January and February 1940 was an inevitable result of the war at sea. It will be discussed in more details at a later stage of this presentation.

#### **Not one cold winter alone**

If the war in Europe had ended with the winter 1939/40, a few weeks after Herman Goering's speech in mid-February 1940, a description of the winter 1939/40 as "weather modification" would presumably be correct. The climate, the same as the statistics of weather data over a longer period, would hardly have left a trace. Consequently, the extreme icy January and February 1940 would have 'gone under' in the weather statistics.

But the war continued and the war winter of 1940/41 in North Europe came up with the same conditions as the year before. Same phenomenon occurred again during the winter of 1941/42 when Germany was at war with Russia since July 1941. This extreme winter is the most stunning regional weather modification event. As a result of the war at sea for over six months, the Baltic became arctic and temperature became colder than that of the North Pole.



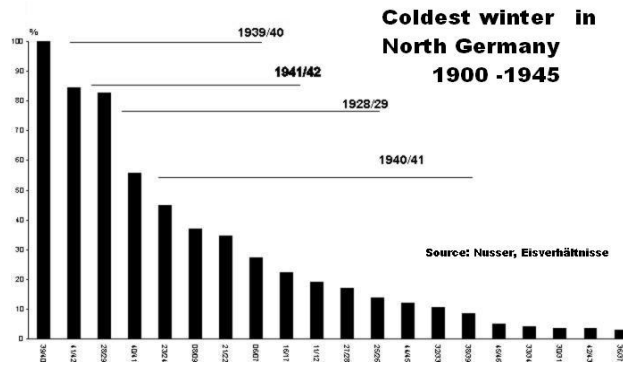
Record cold areas during the war winters 1939 to 1942.

But WWII is not the only example of weather modification as a result of fighting at sea. Even the war at sea during World War I (1914-18) left a similar trail in the weather data records of the British Isles (the winters of 1916/17 and 1917/18). Fighting in the waters of Great Britain became very fierce and deadly with newly developed military weapons, sea mines, submarines, and depth charges. Each of the mentioned five war winters proved how the war at sea left its clear fingerprint on the regional winter

conditions.

One can only wonder why meteorologists at that time were not capable of seeing a link between altered seawater

conditions due to naval warfare towards the end of a year and arrival of icy air from the north or the east during the following winter months.



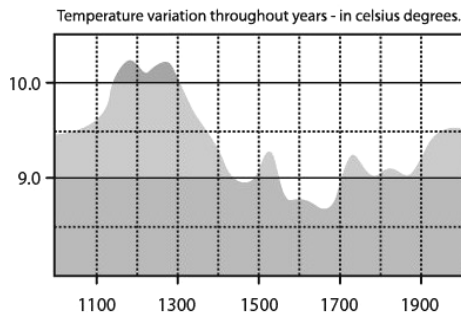
**Act together to change global weather**

But the story on how war at sea determined a climatic change will not end with some cold regional winters in North Europe. Act globally and you can globally change the climate for the better or the worst. With Japan's attack on Pearl Harbour, on the 7<sup>th</sup> of December 1941, naval warfare went global, resulting in a colder temperature phase which lasted over four decades at a global level. Therefore, the winter 1939/40 was part of an already huge global climatic change event.

After having mentioned that all cases of war at sea can be directly linked to climate-relevant events, two further highly interesting climate changes during the 20<sup>th</sup> century may have been man-made with a somewhat “extended link” to the war at sea. There is, in the first place, the sudden warming at Spitsbergen, in 1918, as a result of the naval warfare around Britain, and in the North Sea, this having an impact on the Norwegian Sea and current. The other aspect, the warming of air temperatures since the mid-1980s, is certainly a remote possibility but altogether not impossible.

Issues raised so far need further evidence and explanations, which will come step by step. But to start with, it will be necessary to give an assessment on how the world climate would presumably have looked like if man had failed to industrialize and had remained a small population.

Starting point will be around 1850 when the so-called Little Ice Age ended. Climate



would presumably have been totally unspectacular without two World Wars generating two climate changes during the last century, namely 1918 and 1940. The temperature increase after the 1980s is perhaps not a change but only a continuation

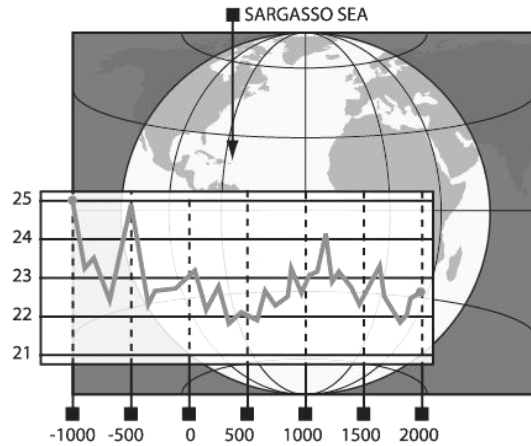
of the rising trend from 1918 to 1939. Indeed, it is one of many interesting questions. But as man-made changes to climate are a major concern, it could only have happened with the advent of industrialization one and a half century ago.

### **How modern climate evolved 150 years ago**

Global warming is not a new thing, and the matter did not started just 25 years ago. Since 1850, global air temperatures have started to get warmer. Warming in this sense can only be measured and evaluated against previous temperature records in an endless chain of repeatable cycle of Earth's climate changes going from warm periods to glacial conditions and vice versa during the past one million years. With the end of the Ice

Age, the globe became about 4-5°C warmer. More recently, a medieval warm period (between 900 and 1450 AD) was at the upper most level, followed by the so-called Little Ice Age (between about 1450 and 1850 AD). This period shall be briefly discussed as it may hold some clues to how the world climate evolved until it reached the current status, at least with regard to the general trend.

### The Little Ice Age



The world was cooler through out the Middle Ages. Even though during the Little Ice Age the temperature fluctuation was in the average just 1-2°C colder than during the previous warm period

(from 900 to 1450 AD), the social implications of this phenomenon were immense. Life in the Northern Hemisphere became rather uncomfortable. Low temperatures and higher cloud coverage affected farming severely. Several great famines occurred, which led to a number of wars in Europe.

Possible causes for this cold phase that prevailed for almost 400 years are still being debated<sup>12</sup>. The number of contributing causes is numerous and includes, among others, notions like: intensity of the sun's rays, earth's rotation around the sun, surface albedo by ice and snow, volcanic activities, ocean-

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12 Richard D. Tkachuck ([//www.grisda.org/origins/10051.htm](http://www.grisda.org/origins/10051.htm)) states: The causes for this cooling may have derived from a combination of changes in the energy output of the sun and changes in the atmosphere of the earth which resulted from volcanic activity that reduced the amount of energy absorbed.

atmosphere conveyor system, etc. Current climatic conditions and processes could be better analysed if the natural processes of the Little Ice Age were understood properly. In the absence of either an earth science or even of a reliable data collection during the above mentioned cold phase, a complete picture of the causes which triggered and sustained the cold phase would probably never be established.

Despite this incertitude, it can be said with a certain amount of certainty that a high volcanic activity had considerably contributed to this scenario. For example: the eruption of the Huaynaputina (Peru), in 1600 AD, caused the most severe short-term cooling effect in the Northern Hemisphere, in the past 600 years. The huge fissure eruption of the volcano Laki, in Iceland, between 1783 and '84, was the greatest historical volcanic eruption hitherto recorded anywhere in the world. The explosion of Mount Tambora (Indonesia), in 1815, catapulted 150 cubic kilometres of rock dust into the air, this resulting in the coldest single year on record in many places in Europe and North America and producing, in 1816, a "year without a summer". The last big one, Krakatoa, in the Sunda Strait (Indonesia), erupted with tremendous force in 1883.

### **The Krakatoa volcano and science**

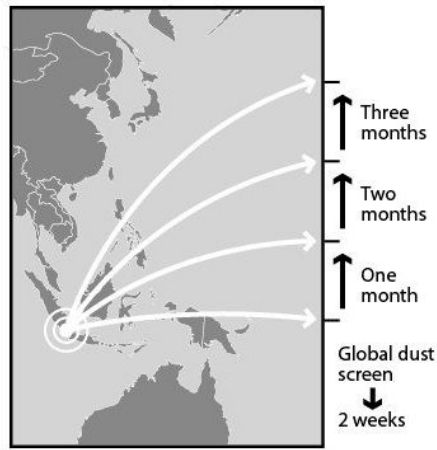
#### **(a) An event leading to climate change?<sup>13</sup>**

After a long row of severe volcanic eruptions during the Little Ice Age, the Krakatoa was the last major volcanic eruption in the world. As a result, the world got warmer. When Krakatoa erupted, on the 27<sup>th</sup> of August 1883, about 50 cubic kilometres of lava, mud and ashes reached heights of more than 10,000 metres. It took about three months for the volcano 'dust' to have circled the whole global atmosphere from the South Pole to the North Pole.

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13 From: Bernaerts, Arnd, 'Conditions necessary for the protection of world climate', Geesthacht 1992; (available on [www.seaclimate.com](http://www.seaclimate.com), Previous Essays (8\_13); published in German by Verein der Freunde und Foederer des GKSS-Forschungszentrum Geesthacht e.V. : ISSN 0934-9804

During the following years, air circulation in the atmosphere was above normal and then sank to a bare minimum in 1888<sup>14</sup>.



Krakatoa, 27<sup>th</sup> August 1883

For more than three years, the solar radiation intensity was about 10 to 15 % lower than the normal level. The minimum value of 76% was reached in the late summer of 1885<sup>15</sup>. The high drop of the radiation values during such a long period should have left significant marks in the weather records. But nothing serious happened. Neither did the Little Ice Age return, nor did 'a summer without sun' happen

again as it did in 1816. Does it really not matter if warming coming from the sun is partly blocked out? Did the laws of physics refuse to work in this case, or were the emerging community of meteorologists not able to grasp what was going on in those days?

**(b) Krakatoa raise the interest in meteorology as a science**

Eruption of Krakatoa was widely acknowledged with interest. The Deutsche Kaiser was so impressed that he ordered the establishment of a scientific institution, the German Sea Observatory, within weeks from the Indonesian event. The institute started publishing the venerable magazine *Meteorologische Zeitschrift* in January 1884. Its first article was a report on the volcanic eruptions from 1883, particularly that of Krakatoa. The first sentence says: "The year 1883 will occupy a remarkable place in the history of earth with respect

14 Wagner, Artur; Climatic Changes and Climate Fluctuations, Brunswick 1940, p.42.

15 Wexler, H., On the effects of volcanic dust on insolation and weather', in: Bulletin American Meteorological Society, Vol. 32, No. 1 & 2, January 1951, pp. 10-15, and pp. 48-52

to the effects of the earth's interior on its crust and everything found upon it." That sounded very promising. The British journal NATURE also published frequent scientific findings for a couple of years. But nothing exciting happened in climatic terms. The weather continued just as it had before. Only in some continental regions, average temperature decreased during the next five years. Because the Krakatoa eruption did not cause major changes to the weather statistics, science lost interest after a few years. Was Krakatoa so unspectacular indeed? No! The stability of the weather was extremely interesting, because only the oceans saved the world from a new dramatic cold period for a couple of years.

**(c) Ocean as a stabilizer**

After the eruption of Krakatoa, on the 21<sup>st</sup> of August 1883, unusual observations were reported. For example:

On the 3<sup>rd</sup> of September: During the past few days, there has been a fairly even, gray Cloud mass, normally covering the entire sky, above the cumulus and Stratus clouds;

On the 3<sup>rd</sup> of September: At midday hazy gray air. Hazy, gray air condensing into Dew towards evening;

On the 5<sup>th</sup> of September: Air appears yellow and watery;

On the 7<sup>th</sup> of September: The atmosphere appears to be filled with very small, evenly distributed clouds of vapor;

On the 13<sup>th</sup> of September: The yellowish "haze" continues in the upper atmosphere;

On the 11<sup>th</sup> of October: Fiery atmosphere, cloudless sky;

On the 5<sup>th</sup> of November: Pale atmosphere;

On the 10<sup>th</sup> of December: The air was very clear and looked like the air in the Southern Indian Ocean during the typhoon season;

On the 13<sup>th</sup> of December: Lead-colored sky.

These early observations could possibly have been dismissed as coincidence if the period until 1886 had not been accompanied by a permanent phenomenon, a "hazy fog", a strange, smoky cloudiness in the atmosphere, which was observed everywhere around the globe, in the tropical as well as in sub-polar areas. One of the descriptions given was: "The hazy fog appears as a constant companion of the extraordinary optical phenomena in the atmosphere during the entire period of the atmospheric-optical disturbance". How the young science viz. meteorology could not be concerned with what was going on? Had the



oceans been recognized as stabilizers, the greenhouse effect would be understood much better today. The explanation is easy.

The “hazy fog” was a compound of volcanic dust and oceanic water vapor. This “extra stuff” from the atmosphere wrapped the earth like in a blanket. This blanket protected the earth from losing heat too quickly and thus compensated for the deficiency of blocked-out sunrays (10-15%) for a few years. The interdependence is evident:

- Air circulation, initially above normal, decreased to a ‘bare minimum’ in 1888. The above mentioned blanket determined a more maritime climate during the early period, while the continuing lack of ‘usual’ energy supply for the oceans over a longer time period pushed the water body temperature so much down that high air pressure systems got the ‘upper hand’.
- The “hazy fog” was stronger at the tropics. The warm tropical oceans released more vapor than colder pole water areas.
- During the Krakatoa-relevant five years, the average temperature in inner continental areas dropped more than in coastal zones; a clear indication that the heat capacity of the oceans had weakened over the period in discussion.

Oceans as a climate factor were inexistent in those days as far as science was concerned. One can only wonder how the matter had been discussed then. One serious opinion was whether the eruption had thrown a huge amount of water vapor into the air; while an opposing opinion was that the “hazy fog” was predominantly dry dust fog. There was no mention about the highly dominant role of the oceans.

**(d) Relevance of Krakatoa in modern climatic study**

It does not seem reasonable to discuss carbon dioxide (CO<sub>2</sub>) and Greenhouse effect on climate seriously as long as the impacts of more climatically relevant Krakatoa eruption on global weather conditions are not debated. The eruption of Krakatoa was the first scientific phenomenon of its kind which

was carefully observed. But the unique and early opportunity to understand the principal mechanism of climate was not used properly because the mechanism of the weather and its reliance on the oceans were so poorly understood. Any convincing assessment on the former is still not available today. It would be particularly a matter for the Intergovernmental Panel on Climate Change (IPCC) to explain the historical conditions of the climate change issue to further and broader understanding. The perpetuation of the moderate climatic conditions from the explosion of the Krakatoa (1883) until the end of the decade was a physic-dynamical sensation, with many interesting clues on how to handle the CO<sub>2</sub> issue.

However, the Krakatoa was the last major worldwide volcanic eruption after a long row of severe volcanic eruptions during the Little Ice Age. As a result, the world got warmer. Without industrialization, global air temperature would have been rising. A strong increasing trend is therefore defiantly natural and man is not to blame. This is widely undisputed. The next section will give an overview of other possible reasons which could have contributed to global temperature status during the last 150 years.

#### **Factors affecting climate change since the 19th century**

Since mid-19<sup>th</sup> 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 (CO<sub>2</sub>), 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 19<sup>th</sup> 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<sup>16</sup> was enforced, in February

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16 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

2005. The Protocol requires an overall reduction of emissions on market economy basis of offer and demand<sup>17</sup>.

For the climate science, the group of greenhouse gases include carbon dioxide<sup>18</sup>, 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, CO<sub>2</sub> 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:

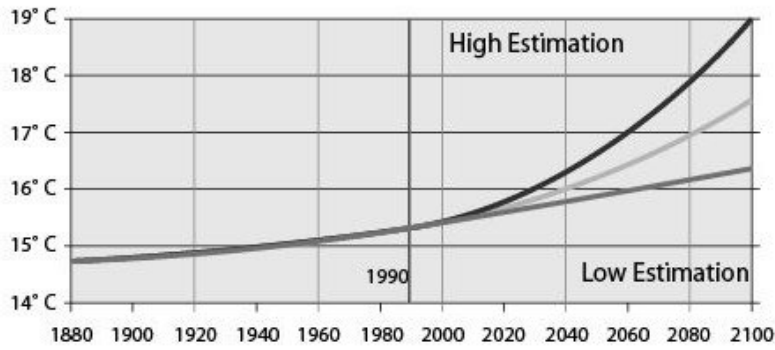
a) Figuratively speaking, distribution of greenhouse gases can be compared to a gridiron whose meshes are the same distance

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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.

17 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.

18 Carbon dioxide (CO<sub>2</sub>) results from the combustion of organic matter if sufficient amounts of oxygen are present. Plants use CO<sub>2</sub> during photosynthesis. Both carbon and oxygen are used to construct carbohydrates. CO<sub>2</sub> is present in the atmosphere at a low concentration and acts as a greenhouse gas. CO<sub>2</sub> 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.



Temperature developments according IPCC

apart. The only variable is that the mesh network can be drawn tighter (e.g. by more CO<sub>2</sub>) or loosened. This net, by the way, changes only in accordance with the seasons and never with more than 1-2%. CO<sub>2</sub> concentration has increased with about 25 % since 1850<sup>19</sup>.

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 CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> 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

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19 From 280 ppmv to 360 ppmv in year 2000

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. CO<sub>2</sub> 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<sub>2</sub>, 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 than that of CO<sub>2</sub>. CO<sub>2</sub> 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**

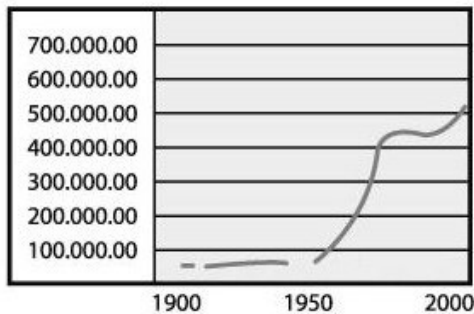
Oceans and shipping should have been the hottest topic in the climate change debate since meteorology was established as a science, in the late 19<sup>th</sup> century. Instead of that, oceans were ignored up to late 20<sup>th</sup> century and even today they do not enjoy the top position they deserve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

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<sup>20</sup> IPCC, Climate Change 2001: WG I: The Scientific Basis, Summary for Policymakers.



- *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<sup>21</sup> 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)<sup>22</sup>. 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.

### **Who contributed?**

#### **CO2 thesis supporters vs. sceptics**

The earth's temperature has been rising for several decades now. That is a fact generally acknowledged. But the question concerning the causes of this phenomenon has received a lot of different explanations from the scientists. While the vast majority is blaming CO2 as the primary cause for this rise in air temperatures, claiming that its increase is unprecedented in the last 1,200 years, a minority suggests that atmospheric carbon dioxide -- often thought of as a key component of "greenhouse gases" -- is not the cause for global warming. They claim, for example, that rising global temperatures are a natural cause for increasing the level of carbon dioxide, and not the other way round. Environmentalists warn that adverse effects of man-made causes on environment, if left unchecked, may be irreversible. Reduction of rainforests, continued growth of hydrocarbon industries, increases in livestock and depletion

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

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

of ozone, etc. are all considered crucial factors in the debate. Sceptics maintain that the climate change is a natural phenomenon and that human influence on nature is highly overrated. It is interesting that neither camp has much to say about the strong interrelation between the thermal status of oceans and atmospheric warming.

For a better understanding of the rationale of this investigation, the principal causes for global warming will be provisionally rated on the basis of their contribution, to give each possible cause a 'dimension'. If this investigation succeeds in proving that two major wars changed the course of climate twice in the last century, it will also prove that shipping and other ocean uses also contributed to global warming. Although WWI and WWII saw an aggressive churning of the seas, it was hardly more than a fraction of the turning of the seawater surface layer by vessels year after year since engine propulsion revolutionized shipping, 150 years ago.

Meanwhile, it is obvious that this investigation would identify four main causes for the warming trend which started after the end of the Little Ice Age, in 1850. These causes are: natural phenomena, carbon dioxide, shipping and naval warfare. Other interesting causes, e.g. huge deforestation, urbanisation and building of large networks of roads since industrialization started, etc., play only a distant secondary role. Although these issues deserve greater attention, they are of little interest for this investigation because they represent second or third rank contributors.

### **What matters?**

Global warming or climate change? This question should not be taken lightly as it means quite a lot for the understanding of our matter. Before suggesting a rating for major contributors, as mentioned above, it seems necessary to make clear what we are talking about.

Actually, the relevant United Nation's Convention on Climate Change (1992) should give an answer to this question. While the term "global warming" is frequently used, it is not mentioned in UNCCC. Instead, the Convention defines:

"Climate change" means a change of climate which is attributed directly or indirectly to human activity that

alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods”.

One can only wonder how a text “Climate change means a change of climate” could be presented as an international law. It is simply absurd. Instead of defining what ‘Climate’ means in the first place, it introduces the term “Climate System” as follows:

"Climate system" means the totality of the atmosphere, hydrosphere, biosphere and geosphere and their interactions."

This definition also does not make any sense either. According to common scientific understanding, ‘Climate’ refers to the weather situation over a long period of time, usually 30 years or more, or to meteorological conditions, including temperature, precipitation, and wind that characteristically prevail in a particular region. In a strict sense, ‘Climate’ is a mere accumulation of weather data expressed in statistics. If one wishes to give Climate a useful meaning, one should define it as the ‘continuation of the oceans by other means’ or as a ‘copy of the oceans’.

The common term ‘Climate’ is often accompanied with uncertainty. ‘Climate System’ is even worse. Therefore, the definition ‘Climate Change’ is an insult to common sense. All these definitions always need further explanation depending on what subject one is talking about: sunshine, rain, wind, temperature, etc.

This investigation explains the reasons for the ranking of contributors to ‘climate system changes’, then selects the temperature issue, thus concentrating on ‘global warming’.

#### **Rate of Contribution**

As a starting point, attention focuses on IPCC’s warming assessment from 2001<sup>23</sup> according to which global average surface temperature (the average of air temperature over land

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23 IPCC, Climate Change 2001: Working Group I: The Scientific Basis, Summary for Policymakers

and sea surface temperature) has increased since 1861. During the 20th century, the increase has been of  $0.6 \pm 0.2^{\circ}\text{C}$ . The record shows a great deal of variability; for example, the warming occurred with more intensity during two periods: from 1918 to 1939, and from 1980 to 2000.

Discussion on possible causes for global warming leads to heat regulators. The global heat status is largely determined by a balance between the energy that Earth receives from the Sun and the heat that Earth releases back into space. This is called global energy balance. There are many causes for the alteration of the global energy balance, e.g. aerosols and cities. Indeed, heat balance is what occurs on Earth. In this exercise, the oceans are second in place after the sun but much more relevant than any subsequent source. On distant third place comes the atmospheric water vapour. Less than 0.05% of the ocean is in the atmosphere at any time. In tandem, the water masses of lakes, seas and oceans, and evaporated water coordinate and control the global atmospheric heat balance. Weather would not exist without these two factors.

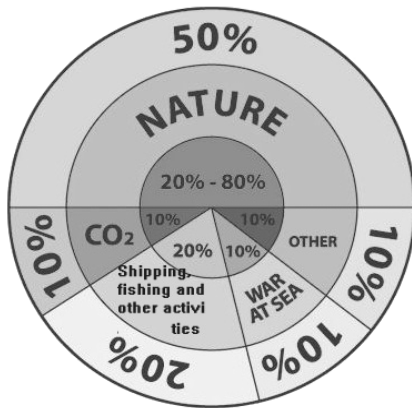
We should always be aware that the sun is the principal player as far as climate is considered. However, for this investigation, its contribution is regarded as constant and stable throughout all seasons and years.

The following rating that we suggest represents an individual guess but may be of significant importance in categorising the scope of the theme.

#### **Natural variability**

Any 'natural variation' of the atmospheric conditions will have something to do with earthly water conditions, as they exist in the oceans and in the atmosphere. These conditions can suffer diverse influences. The Little Ice Age is certainly such a case. Volcanic dust may not only alter radiation but also influence the amount of water vapour and its height above sea level. A recent NASA study observed that the eruption of Mount Pinatubo (in 1991), a very small volcano compared to Medieval Age eruptions, increased Arctic Oscillation. During the two years following the volcanic eruption, the Arctic Oscillation caused winter warming over land areas, at high and middle latitudes in the Northern Hemisphere, despite a cooling effect due to volcanic particles blocking the sunlight. This winter

warming is a strong demonstration that the oceans and water vapour compensated for the loss of sun radiation. A similar situation after Krakatoa had been explained in a previous chapter. But if the amount of volcanic particles is severe and sunrays are blocked out for a longer period, oceanic heat capacity will weaken after some time and a cooling is inevitable. That was presumably one of the principal reasons for severe winter conditions during the Middle Ages. The latest Intergovernmental Panel on Climate Change (IPCC) report (2001) reaffirms in much stronger language that the climate is changing in ways which cannot be accounted for as being natural variability. How did they know?



One can, with high certainty, assign a considerable amount of responsibility for warming to natural variations due to absence of serious volcanic activities during the last 120 years. However, the margin will be somewhere between 20% and 80%. In so far, it seems reasonable to work with an assumed figure of 50%.

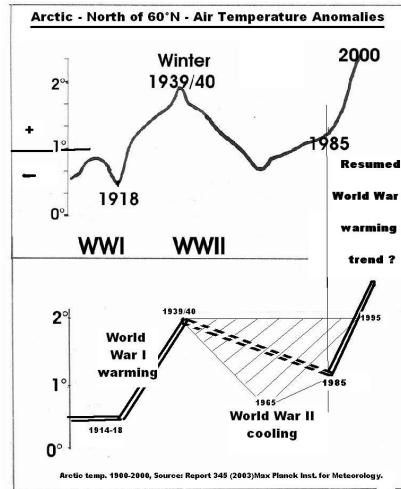
**The role of Carbon Dioxide**

The higher the concentration of carbon dioxide, the greater the warming: this is the conclusion of the IPCC on this matter. According to them, the rising levels of CO2 anthropogenic emissions (primarily through use of fossil fuels) are responsible for the sustained temperature increase.

Since the beginning of the industrial revolution, atmospheric concentrations of carbon dioxide have increased with nearly 30%, methane concentrations have more than doubled, and nitrous oxide concentrations have risen with about 15%. IPCC experts believe that the increasing concentrations of greenhouse gases are likely to accelerate the rate of climate change. Scientists expect that the average global surface temperature could rise with 0.6°C-2.5°C during the next fifty years, and with 1.4°C-5.8°C during the next century. Of

course, there will be significant regional variations, claiming that there is a “high” level of understanding among experts concerning the mechanism of greenhouses gases.

There is little one can do against the established ‘beliefs’ in certain circles. This investigation gives CO<sub>2</sub> only a marginal rank as a contributor, viz. 5 to 15 % of 10%. This low rating derives particularly from the fact that the atmosphere is not the driving force for the warming mechanism but a mere appendix of the oceans. Furthermore, since its first report, in 1988, IPCC has never offered as an explanation more than the conclusion, by consensus, that there is a link between the rising of CO<sub>2</sub> and the rising of the temperature level. This is hardly a convincing argument.



### Shipping and ocean uses

Why shipping, as a major user of oceans, has not crossed the mind of the scientific community as a potential contributor to global warming since motorization of vessels took place, in the 19<sup>th</sup> century? We are of the opinion that shipping is considerably more relevant to global warming than various greenhouse gases, at the same time not hesitating to place it at a rank twice or thrice higher than CO<sub>2</sub>, or at least of a percentage of 20%. As this argument is currently difficult to prove, the turning and churning of oceans and seas by naval warfare shall be presented instead as causes for major climatic changes and global warming with a rating of 20% contribution to global warming.

### War at sea issue

Central point of this investigation is how naval warfare during two world wars, in the 20<sup>th</sup> century, contributed to global

warming. An in-depth analysis will show that the overall picture provides clear clues. World War I initiated a two-decade warming, from 1918 to 1939. World War II initiated a four-decade cooling period, from 1940 to about 1980. What makes things even more interesting are the three consecutive arctic war winters between 1939/40, 1940/41 and 1941/42, caused by military activities in the North and Baltic Sea. The emergence of these three winters will be presented as a powerful demonstration of how naval warfare drove temperatures to Ice Age level, changed regional weather conditions and left a significant imprint on climatic statistics. This phenomenon is commonly called climate change.

Rating the impact of war at sea on global warming during the last century is somehow not easy as the warming period during WWI was largely neutralized by a much longer cooling period after the beginning of WWII. Furthermore, it cannot be completely excluded that the warming period initiated during WWI re-emerged after the end of the cold period, around 1980. It cannot be completely excluded as well that the forceful warming process which took place during the last 10-20 years has some connections with WWII naval activities.

As the prevailing opinion in this investigation allocates to various kind of ocean uses more relevance for warming than to the war at sea activities, the rating for the war at sea contribution is set at 10%.

#### **Other contributors and summary**

One could possibly name many dozen aspects and sources, alone or in combination with others that might contribute to warmer or colder regional and global air temperature. To the best of today's knowledge, none of them belongs in the premier league as a major player. Not to be ignored, they are given a rating of 10 %.

An overall allocation of the causes of the warming process could be divided evenly between natural and anthropogenic forces, at 50% each. More interesting are the assumed positions concerning anthropogenic contribution: direct ocean-related contribution represents 60% of the total while contribution related to other causes is only 40%, including 20% due to CO2 and other related gases.

The war at sea as significant factor will be elaborated in detail in order to demonstrate that modern naval forces were strong enough to force serious weather modification, including two major climate changes during the last century. The main aim of this investigation is to raise the awareness that anthropogenic atmospheric changes derive primarily (50% and more) from making use of the seas and oceans.