



M<sub>S</sub>M

MAASTRICHT SCHOOL OF MANAGEMENT

Working Paper No. 2011/31

## **How to Deal With the Dilemma of Anthropogenic Global Warming and the Natural Variability as Drivers for Climate Change**

Guido Heijdra, M.Sc. CMC MCM<sup>1</sup>

November 2011

© The author, 2011

1. *Associate Professor Water and Environmental Management, Maastricht school of Management and Senior Consultant with Royal Haskoning*



**The Maastricht School of Management is a leading provider of management education with worldwide presence. Our mission is to enhance the management capacity of professionals and organizations in and for emerging economies and developing countries with the objective to substantially contribute to the development of these societies.**

**[www.msm.nl](http://www.msm.nl)**

The views expressed in this publication are those of the author(s). Publication does not imply endorsement by the School or its sponsors, of any of the views expressed.

THIS PAPER IS A DRAFT VERSION PREPARED FOR THE 1<sup>ST</sup> ANNUAL MSM RESEARCH CONFERENCE, 11-12 NOVEMBER 2011 – IT IS INTENDED FOR DISCUSSION PURPOSES

ONLY

## 1. INTRODUCTION

Climate change and especially anthropogenic global warming AGW due to greenhouse gases is high on the public agenda. [1] Still, recent polls indicate that support is going down since 2010. [1], [2] Actually, the debate is whether AGW is the main cause for climate change and that AGW is an alarming issue for the world society. [2] The other part of the debate is that societies and especially developing countries have to deal with climate change as one of the issues. [3, 4]

It is a fact there has always been climate change. AGW is becoming an issue since 1850 in line with the industrial revolution, the use of fossil fuels and as a result the emission of CO<sub>2</sub>. [2] Since the seventies of the last century, the scientific world started to focus on AGW as part of a climate change. They could attract the attention of some politicians and some governmental staff at the end of the eighties by the establishment of the Intergovernmental Panel on Climate Change (IPCC) in 1988. The presentation of the book and film “The Inconvenient Truth” from Al Gore in 2006 [5] became the driver for acceptance of AGW in the society. The presentation in 2007 of the fourth report of the (IPCC) [2] and a little later the Nobel Peace Prize 2007 for Al Gore and the IPCC [4] created maximum acceptance for AGW as main cause for climate change.

Some years later, the international climate conferences at Copenhagen in 2009 and at Cancun in 2010 failed in getting an agreement for mitigation measures for a reduction of CO<sub>2</sub> due to an absence of political willingness. [5] The world was seeking for such an agreement as a successor for the Kyoto Protocol 1997 that lasted from 2008 till 2012. Is there a dip in the acceptance that AGW is the main driver for climate change?

Also in the last decade the number of publications [6] and the number of books from climate skeptics [7] is growing. They all indicate that there is less evidence for AGW as the main cause while the issue of a climate change is accepted as a fact.

How to deal with AGW as part of climate change if scientists, governments, research institutions, media claim that ‘science is settled’ and that there is consensus? [8] Has there ever been consensus under scientists dealing with climate related sciences? This question becomes important for politicians, governments, the business society, and for

citizens. Definitely it is also important for developing countries. Their development is very much dependent on fossil fuels as main and 'cheap' source for cooking and electricity, so for their health and development. [3]

This article will address the dilemma of AGW and the natural variability as drivers for climate change. It will indicate where it might come from and the need for the society to rephrase climate change and to review the contribution of AGW and the natural variability. Recommendations about what still can be done to limit AGW will be presented for IPCC, the government as well as for the business society and for the society.

The article will avoid the scientific debate on facts and figures related to climate change and the contribution of AGW. It will deal with the dilemma between AGW and climate change and how we can find a way out.

## **2. DEFINITIONS OF CLIMATE CHANGE AND AGW**

### *Climate Change, climate and weather*

Climate change is related to long lasting changes in average temperatures, wind, and rain of a certain region. In the debate so far climate change is often related to dramatic and extreme weather conditions like heat, storms and droughts or flooding. [2] Climate change might take place on world level as well as on regional or local level and it might have an impact on ecosystems as well as on societies. There is a lot of effort ongoing to forecast climate change. [6]

The climate of a certain place or region is defined as "the average weather" or more precise "the statistical description in terms of the mean and variability of relevant quantities over a period of time from months to thousands of years. According to the World Meteorological Organization (WMO) limited to the last 30 years". [9]

Weather is the atmospheric condition at any time or place and gives the status about temperature, cloudiness, wind, humidity, atmospheric pressure and rain. It changes from hour-to-hour, day-to-day and season-to-season [10] and can only be forecast for a couple of days with certain accuracy.

### *Reflection notes 1*

In the meteorological science there is the sentence: "Climate is what you expect, weather is what you get". [6] In our daily life we are interested in the weather forecast and it gets some time in the everyday news. So far we were not interested in our climate. We know that we live in an arctic, continental, maritime or tropical climate from what we learned at school. That climate is changing, is what we hear the last decades, especially when we face extreme weather conditions. In the past it was an act of God, now it is called climate change. [6] Referring to the climate definition it is an incorrect statement and might have the aim to dramatize climate change and to appeal to the emotions of people.

### *Anthropogenic Global Warming*

AGW is one of the causes of climate change with a gradual increase of the earth's surface and water temperature due to greenhouse gases caused by human activities. With temperature curves scientists show that the world temperature is increasing since 1900. [2] This fact is generally accepted. However, the temperature rise is or seems to be correlated to the increase of CO<sub>2</sub>. The rise has never been that quick and the temperature has never been that high since the last two thousand years are all part of the scientific debate. [6] The famous hockey stick from the end of the last century proved that but it is taken out of the fourth IPCC report due to the criticism. [2]

### *Reflection notes 2*

In the daily discussion there is confusion about weather and climate. When there has been extreme weather like hot summers, hurricanes, heavy rainfall or severe droughts in the last 25 years, a link was made to AGW. That was the case during the establishment of IPCC in 1988 [11] and for the four IPCC reports. [2] It is also the case for the discourse on climate change till today. Leroux indicated in one of the first critical books on global warming in 2005 that other causes determine the weather. [7]

In the discourse the words climate change and AGW are used interchangeable in literature. Still it is important to make that distinction for a proper argumentation as it is done in this article.

### **3. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE**

The IPCC was established in 1988 by the United Nations Environmental Program (UNEP) and the WMO. [12] According to their own information “the IPCC needs to provide the world with a scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts. The IPCC is a scientific body. It reviews and assesses the most recent scientific, technical and socio-economic information produced worldwide relevant to the understanding of climate change. It does not conduct any research nor does it monitor climate related data or parameters. Thousands of scientists from all over the world contribute to the work of the IPCC on a voluntary basis. Review is an essential part of the IPCC process, to ensure an objective and complete assessment of current information”. [12] IPCC aims to reflect a range of views and expertise. The Secretariat coordinates all the IPCC work and liaises with Governments. Currently, 194 countries are members of the IPCC. Governments participate in the review process and the plenary sessions, where main decisions about the IPCC work programme are taken and reports are accepted, adopted and approved. [12]

The IPCC has a small and virtual office and they work with hundreds up to thousands of scientists, reviewers and governmental staff who are paid by their government.

The IPCC report consists of four parts. Volume 1 is the scientific basis prepared by scientists. Volume 2 is about impacts, adaptation and vulnerability, and volume 3 is about mitigation both prepared by governmental staff and scientists. Finally, there is a summary for policy makers prepared by all member states through consensus. [8]

#### *Reflection notes 3*

The fourth IPCC report from 2007 was quite clear about the impact of human economic activities on climate change: very likely, which means almost for 90 % sure. [2] In one of the press conferences IPCC stressed that there was consensus under climate scientists. The third report of 2001 showed a similar conclusion, but the presented likelihood for AGW was less. In the second report from 1995 there was an indication of a human responsibility in climatic change while in the first report from 1990 there were no indications other than the natural climate variability. [10]

The fourth IPCC report from 2007 counted for almost 3,000 pages. [12] To prepare the report there were contributions of thousands of scientists and policymakers, about hundred authors were involved for the preparation of the documents and for the final summary for policy makers, which is the most important document, only a few core authors were involved. [9] The selection and the review of the scientific published and peer-reviewed papers till 2007 was not a transparent process. From the Climategate-emails we learn to know that the peer-review process was limited to a small number of scientists who were related to main stream of the IPCC reports. [13] Lead authors and review editors, experts as well as governmental staff, are nominated by the national focal points of IPCC like the local meteorological organizations. They have the authority to select the papers. For each chapter there are about ten lead authors and there are about ten chapters per volume. Papers could be left out of the main line of arguments and as well as reviews on individual papers can be left out. Summaries were prepared by scientists while decisions what were taken from the scientific summaries were made by governmental staff in plenary sessions by consensus. [8, 9 and 10] This type of consensus is different than the claim that there was consensus under thousands of climate scientists.

IPCC claimed to be a scientific body. But the process and procedures to prepare summaries of the volumes and the consensus approach used for the final summary for policy makers does it make a governmental or even a political body. Looking at the process and procedures the announcement of IPCC that “science is settled” or “the debate over the science of climate change is well and truly over” [8] cannot be endorsed. There is no consensus needed for the final conclusions of the IPCC from all who attributed.

Due to some mistakes in the fourth IPCC report the Inter-Academic Council (IAC) was requested by the IPCC in 2010 to review the processes and procedures of the IPCC. In their report from August 2010 they gave overall and detailed recommendations to improve the governance. Also for the process of preparing the documents and the reviews and for the procedures about the nominations for authors and reviewers recommendations were presented. [14]

#### 4. THE KYOTO PROTOCOL

The Kyoto Protocol from the end of 1997 was an international agreement to reduce by at least 5% below the 1990 greenhouse gas emission levels. Countries can achieve emission reductions through international emissions trading like the Clean Development Mechanism and Joint Implementation. It took five years to establish the Protocol and it took seven years before the Protocol came into force in 2005 for the first period 2008 – 2012. The Protocol has been signed by the majority of the member countries, which ratified the Protocol, but not the main emitters like the USA, China and India. [8]

The main purpose was to change the behavior of the subscribing nations and to manage stabilizing the climate. It established an international recognizable price for carbon. The Kyoto Protocol stimulated the social action on 'climate change' by reduction of CO<sub>2</sub> in many ways on individual, social and local governmental level in the Western countries. [6]

This Kyoto Protocol and the twenty years of discussions were not a success in terms of reductions in global greenhouse gas emissions. [11] Since 1990 the worldwide CO<sub>2</sub> emissions increased with about 45%. The ratifying countries emitted less than agreed in the Kyoto Protocol especially some European countries. China, India the USA and the developing countries emitted more to much more than the Kyoto Protocol. [11] The international conference at Copenhagen in 2009 should have replaced the Kyoto Protocol to limit the CO<sub>2</sub> emissions after 2012. It also planned to limit the increase of the world temperature below 2<sup>0</sup> C. Still this Copenhagen-conference as well as the conference at Cancun in 2010 did not end up with an agreement. [15]

##### *Reflection notes 4*

Despite, the four reports of the IPCC and the strong conclusion about AGW in their third and fourth report, there is no acceptance worldwide for the Kyoto-measures to take in order to reduce greenhouse gases. It was difficult to agree for an extension of the Kyoto-Protocol for greenhouse gases in the Copenhagen meeting as well as one year later in the Cancun meeting, despite all the preparations in the foregoing years

and the social pressure during especially the Copenhagen meeting in 2009. [5] It seems that the political basis for reducing greenhouse gases and in particular CO<sub>2</sub> is missing.

For a successful change the intention and the financial and governance conditions need to be prepared. From the negotiations of the last two decades both seems to be in place. It is the final and decisive point to get a successful change is the sense of urgency. It might be that this is lacking so far and the reason for that is not clear. The four published IPCC reports together with numerous articles about AGW during the last twenty – thirty years are in number not in balance with the publications about the natural variability. Could it be that they are more convincing or is there for instance an economic reason that politicians lack the sense of urgency? This is an interesting point for an in-depth research.

What is clear so far is that efforts from some European countries to reduce CO<sub>2</sub> emissions worked quite well.

## **5. A TURNING POINT IN 2009**

The book and film 'The Inconvenient Truth' from Al Gore in 2006 made a direct link and showed dramatic changes in our climate as a result of our human activities. [5] Both the IPCC and Al Gore got the Nobel Peace Prize 2007 for their efforts to build up and to disseminate greater knowledge about man-made climate change [4]. Together with the publication of the fourth IPCC-report in 2007 the support for AGW was at the top from interested politicians, governmental staff, and citizens. [8]

The critic of the so-called climate skeptics is mainly that the science for AGW should be settled. [12] However, this is not the case and climate scientist all over the world are not all in line. [6 and 7] The arguments of the climate skeptics were ignored, their articles could hardly be published, and the scientists themselves were pushed into the corner or even under pressure dismissed from their post. [17] When their arguments were heard the scientist were blackmailed as being supported by the energy or other industry lobby [17] or recently called as 'Merchants of Doubts' [13].

To keep it generic most of the climate skeptics agree about the global temperature rise, CO<sub>2</sub> as greenhouse gas, and the impact of greenhouse gases on climate change. They differ in the rate of the impact of CO<sub>2</sub> on climate change for several reasons [12]. The main arguments of the climate skeptics for climate change are the combination of natural processes with changes of the sun radiation, the interaction (feedback) between a higher temperature and the growing water vapor / clouds in the atmosphere, the feedback of aerosols, ocean currents, the human impact or CO<sub>2</sub> and change in land use. [18]

In 2003 the Nongovernmental International Panel on Climate Change (NIPCC) was established to provide an independent "second opinion" on the topics addressed by the initial drafts of the IPCC's Fourth Assessment Report. The NIPCC published a report in 2009 'Climate Change Reconsidered'. This report reviewed the documents used by the fourth IPCC report as well as new documents that were published between May 2006 and 2007. They come in their report of almost 900 pages to the opposite conclusion that natural causes are very likely to be dominant and that greenhouse gases are not playing a substantial role. [10]

Interesting to note is the difference in perception for the global warming from dramatic changes according to IPCC [2] into a better situation for food production and human health [10 and 14].

The year 2009 is an important year in the discourse on climate change. The publication of emails between scientists, known as Climategate, showed a hidden agenda. There was no open platform between scientists with different views on climate change. There proved to be a personal interest for some IPCC climate scientists to show evidence that AGW is the main cause of climate change. Another crucial issue is the closed and small group of authors and peer-reviewers who were dealing with AGW and with the core issues of IPCC. [13] It also became true that there were some exaggerations in the IPCC 2007 report related to the impact of climate change. [9]

As mentioned earlier the conference on Climate Change in Copenhagen at the end of 2009 was not successful in replacing the Kyoto agreement on reduction targets of greenhouse gases by 2012. [15]

In the meantime measurements of the world average temperature show that there is no increase since the last decade [14]. On the northern hemisphere the average temperature raised and on the southern hemisphere lowered [14].

#### *Reflection notes 5*

From the last few years we observe through a number of books and publications a growing disagreement in the scientific world about the causes of climate change, the impact of AGW and the absence of an impact on weather conditions. Climategate showed between 1996 and 2009 the dominance of a small number of scientists directing and overruling others. These scientists acted in way, which is not in-line with any scientific code and with only one goal to demonstrate AGW as main driver for climate change.

This growing disagreement is also visible in the publications in the media. Several journalists from pro influencing AGW newspapers (Fred Pearce from the Guardian and Christopher Booker from the Sunday Telegraph) have written books about the changed settings. The consensus under the scientists where IPCC is talking about in their publications seems to decrease at a high rate. See also a list of more than 900 peer-reviewed papers supporting skeptic arguments against AGW [6] and the list of some critical published books in the last decade [7].

At the end of 2009 and early 2010 publications can be found, which were related to the basic issue of trust about what scientists are doing compared to what the public expects from them to do. This becomes clear in the following statement: "It undermines the public trust in the unbiased ideal of the scientific process". [19]

Some basic question become important: why was and may be still is IPCC focused on AGW as a main driver for climate change, why did IPCC relate and may be still is IPCC talking about AGW in dramatic terms for changes in the weather conditions for so many people in the world? Why did IPCC talked in catastrophic terms?

## 6. HOW CLIMATE CHANGE AND AGW STARTED AND THE FOUNDING STATEMENTS OF UNFCCC

The following founding statements were mentioned when in 1992 by the UN Framework Convention on Climate Change (UNFCCC) was established: [20]

### *Definition Climate Change*

“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 change variability observed over comparable time period”.

### *The objective of the Convention is:*

“to achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system (atmosphere, hydrosphere, biosphere, geosphere and interactions)”.

### *In the principles of the Convention is stated that:*

“Parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects.....of greenhouse gases.....”.

“.....Policies and measures to protect the climate system against human-induced change .....”.

### *In the commitments the Convention Parties shall:*

- “Develop, periodically update, publish and make available to the Conference of the Parties, ....., national inventories of anthropogenic emissions .....”;
- Formulate, implement, publish and regularly update .....measures to mitigate climate change by addressing anthropogenic emissions.....”;
- “Do research, observations, and development of data archives to understand, reduce or eliminate uncertainties regarding causes, effects, magnitude and timing of climate change.....”;
- “Promote and cooperate exchange, and publication information and results related to climate system and change .....”;

- “Promote and cooperate in education, training and public awareness related to climate change and encourage the widest participation in this process ....”;
- “Promote the aim of returning to the 1990 levels of anthropogenic emissions of CO<sub>2</sub> and other greenhouse gases.....”;

### *Reflection notes 6*

In the definition of climate change two contributions are mentioned: ‘human activity that alters the composition of the global atmosphere’ and ‘alters the natural climate change variability’. However in the objective it is reduced to ‘anthropogenic interference with the climate system’. In the principles of the Convention it is stated to ‘minimize the causes of climate change’ and this can only be understood with the phrase ‘to protect the climate system against human-induced change’. Moreover, the Convention Parties shall ‘promote the aim of returning to the 1990 levels of anthropogenic emissions of CO<sub>2</sub> and other greenhouse gases’. Finally, in the objective the Convention qualified the anthropogenic interference as ‘dangerous’.

Looking at climate changes they are part of the history of the globe for millions of years as well as for the last thousands of years. This can be found in every academic textbook on global environments see for instance the textbook on ‘Global Environments through the Quaternary’ . [15] Leroux stated [7] ‘climate is driven by the receipt and redistribution of solar energy and it refers to any significant change in parameters of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer)’. According to a definition of the USA Environmental Protection Agency climate change may result from [10]:

- natural factors, such as changes in the sun's intensity or slow changes in the Earth's orbit around the sun;
- natural processes within the climate system (e.g. changes in ocean circulation);
- human activities that change the atmosphere's composition (e.g. through burning fossil fuels) and the land surface (e.g. deforestation, reforestation, urbanization, desertification, etc.).

It seems that in the founding statements of the UNFCCC the focus is directed on anthropogenic causes alone, despite what is stated in their definition of climate change.

The question here is why the Convention narrowed down climate change into anthropogenic emissions and explicitly mentioned was CO<sub>2</sub> and other greenhouse gases?

The reason behind these statements has a history of more than a century. It was Svante Arrhenius who presented in 1896 the first calculations of global warming from emissions of CO<sub>2</sub> due to human activities. That message was repeated by Guy Stewart Callendar in 1938. In 1971 the first conference in Stockholm with experts from 14 nations focused on a study of 'Man's impact on Climate' with a conclusion that serious climate shifts were possible in the next century due to man's activities. It was Stephen Schneider, James Hansen and Bert Bolin who published papers and managed conferences for scientist and politicians by WMO and UNEP in Villach in 1980 and 1985. [11] Some climate scientists were at that time very much focused on the impact of only CO<sub>2</sub> [11] and they could convince leading politicians like Margaret Thatcher to interfere on the political level. [21]

It is remarkable that in the UNFCCC objective and actions only greenhouse gases and particular CO<sub>2</sub> were mentioned. It did not leave room for other causes as it did not leave room for doubts where to focus on. The complexity of the climate study about the causes and effects, which is known all over, was reduced to greenhouse gases and especially to CO<sub>2</sub>.

With such a narrow focus the only outcome could be that throughout the years of studies since 1988 and the reports since 1990, the certainty about causes and effects increased. It is a classic example a 'closed' problem definition. As a result of that research could only lead to 'jumping to conclusions'. AGW was mentioned in the framework documents and the work later on needed to support that. From The IPCC Scientists who are in favor of other causes than CO<sub>2</sub> for climate change or with limited impact of CO<sub>2</sub> for the cause were opposed, banned and excluded from presentations and publications. [17] Even these days the CO<sub>2</sub> skeptics are labeled as biased through payments by industry. [16]

All scientists who worked in line with the CO<sub>2</sub> approach could (easily) manage governmental support and financial resources for their science and projects. [17] The budget for AGW is out of proportion [17] even compared to developing aid and military services. [4] It seems that during the establishment and later during functioning on governmental level the critical mass was lacking to stop this biased process. Is science not infected with too much concern for the environment while it needs to stay objective?

Why should scientist be putting aside and seen as climate skeptics who came up and still do come up with natural causes or with other conclusions about the impact of AGW and the contribution of CO<sub>2</sub>? They are not skeptic about climate change. They only have other interpretations and they interpret the facts in another way than the group who are connected to the theory of AGW and the work of IPCC. Is that not normal in science that there are deviations among scientists? Moreover it is the complexity of the issue climate and climate change makes that many sciences are involved. There are many aspects unresolved or underexposed and the scientists get hardly any funding to do investigations. In climate change science there is no one expert who is accepted by all scientist involved and who has an overall view. The only way is an opening up of minds and a true collaboration between scientists. After 25 yrs of an overconcentration on AGW it is time for a new scientific framework for climate change.

The first conclusion is that the presented statements of climate change as stated in 1992 by the UN Framework Convention on Climate Change are 'closed' statements that directed the research to one-sided anthropogenic cause – effect relations. From a research point of view it can be stated that the problem definition is biased and the research problem is too narrow with only measures to mitigate greenhouse gases and in particular CO<sub>2</sub>. Both the problem definition and the research problem were not in line with the unknown facts and figures in 1992 as well as today. New statements for the objectives, principles and commitments need to be rewritten in an open way with an appeal for open research for climate change so for AGW as well as all natural causes. In fact a new start must be made when the word science will be linked to IPCC.

Another question is why the Convention is using the phrase 'dangerous anthropogenic interference' while that was not sure in 1992?

A famous and often cited quote from Steve Schneider in 1989 might give some clarification:

".. we are not just scientists, but human beings as well. And like most people we'd like to see the world a better place, which in this context translates into our working to reduce the risk of potentially disastrous climatic change. To do that we need to get some broad-based support, to capture the public's imagination. That of course, entails getting loads of media-coverage. So we have to offer up scary scenarios, make simplified dramatic statements, and make little mention of any doubts we might have. ...". [22]

These scary scenarios deal with extreme weather conditions and extreme sea-level rise. [2 and 5] For both there are no indications. [7, 10, and 14] Dangerous can also be interpreted for adapting ecosystems like ensuring food supply, and for sustainable development. [8]

Dangerous might also mean that we don't know the impact of our human activities on climate change. In a small article the following three hypotheses are presented by some climate skeptics [23]:

- a) the human influence on climate change is of minimal importance;
- b) the human influence as well as natural causes are significant;
- c) the human influence on climate change is dominant.

Hypothesis c) is prevailing in the UNFCCC documents and in the IPCC reports. Hypothesis a) is so far not supported by research results so more likely is to adopt hypothesis b).

The second conclusion is that there is so far no reason to use the word 'dangerous' and it can better be avoided and so far there is no evidence for. [12] CO<sub>2</sub> is not an environmental problem; it is a necessity for life.

## **7. FINAL CONCLUSIONS**

1. Except from the first IPCC report in 1990 the next three reports from 1995, 2001 and 2007 are focused in their main conclusions mainly on human induced impact through AGW on climate change, which is in line with the statements in the UNFCCC constitution declarations.
2. Statements in the UNFCCC constitution declaration from 1992 are too focused on anthropogenic interference, while there is no consensus that this is the main cause.
3. There were and still are independent researchers, growing in numbers with critical and opposing articles and books with a balanced or even an opposing conclusion related to the high impact of anthropogenic interference compared to the IPCC reports and they were hardly taken into account.
4. Among climate scientists including most of the climate skeptics there is consensus that AGW is part of climate change, but the dispute is about the share and that needs to be investigated together with other causes.
5. Climate skeptics were frustrated and hindered in their work and publications, which is not in line with the code of science.
6. So far the debate in public is lost as long as long as trust in science is not redeemed. It is not done that the 'IPCC' climate scientists mentioned others as climate skeptics or even deniers. Blackmailing, hindering in work and publications up to ignoring need to stop and scientists need to obey the scientific process and procedures of integrity and objectivity.
7. There is no reason to panic and for the human activities we need to stay alert how cost-effective solutions can be found for reducing AGW in a balanced relation between economic development with an accepted impact on the society and on the environment.
8. The research budget for AGW is out of proportion compared to developing aid and military services.
9. Climate change is a global phenomenon and the work of IPCC and the work for the Kyoto protocol have shown that solutions will not come from global meetings. The

interest of the members is too diverse, the measures are too costly, and the conclusions from the IPCC reports are not convincing enough. The decision making process of the IPCC as well as international meetings like at Copenhagen and Cancun are not fit to draw accepted conclusions and to take accepted measures. These panels on that scale and with scientific facts and figures, emotions and political interest will not come up with proper conclusions and measures.

Climate change is a topic that shows the four aspects of life as mentioned by Bruce Mitchell in his book 'Resource and Environmental Management' [18]: change, complexity, uncertainty and conflict. "Experiential understanding often can be as, or more, significant than insight based on scientific theories and methods". [18] Experiential understanding and learning can only be applied on the local level. If we can improve our capacity to deal with these matters, the likelihood is great that we can improve our capacity for planning and management. [18]

## **8. RECOMMENDATIONS**

### *IPCC related*

1. IPCC needs to be transferred into a scientific body as originally proposed and meant to be. For policy makers and politicians there is a need for a separate body. For both institutions much more attention has to be given to regional conditions, while for the global level the attention needs to focus on the framework of principles and norms.
2. The founding statements of the UNFCCC need to be reviewed with an open statement in the objective, the principles and commitment.
3. For the objective the following sentences in the statement can be proposed:  
"...supporting scientific research that contributes to clarify the cause and effect of changes in the local, regional and global climate...".
4. A code of conduct in science could be part of renewed convention: honesty, integrity, courtesy, fairness and stewardship. [24]

An objective like stated will justify the work done worldwide by all scientists, and will give more attention for the complex issues like climate and causes for climate changes including the modeling.

Having such an open statement there will be no need for having five years cycle to publish in a collective way with three volumes and a summary for policy makers.

The IPCC can still stay reduced to a small number of staff that can keep an eye on the progress made.

One of the activities could be the establishment of a virtual journal for any scientific publication on the topic 'change of climate'. The IPCC can then be reshaped into a rotating board of editors where on a regular basis summaries can be published of new facts and figures and conclusions from scientific debates. This might help others to draw governmental and political conclusions without interference of IPCC.

#### *Government related*

5. Climate change still needs a balance research program and an open attitude for AGW and natural variability as causes for climate change.
6. According to an Expert Panel different research options are classified after a cost – benefit analysis with promising options for climate engineering (solar radiation management), energy technology and planning for adaptation. [16] Partly this is in line with two other options on low or non-carbon energy technology and energy reduction. [4] For the European Commission (EC) a roadmap for a low-carbon economy in 2050 has been published [25] and could be seen as an example to discuss in a wider context.
7. Resource efficiency is important in order to do more with less on raw materials, flow resources, land and space use and environmental aspects. For the EC a roadmap for resource efficiency has been published [26] and also this can be seen as an example and can be discussed in a wider context.
8. A plan for renewed world-wide monitoring for temperature, sea level rise need to be set up.

*Business related*

9. Energy and resource efficiency works quite well when the following principles will be applied:
  - a. Building with nature
  - b. Cradle-to-cradle
10. Also for business this time is complex, full of change, uncertain and conflicting views on profit, people and planet. The choice to make is to get a reliable organization. [18] Translated for the topic of climate change there is a need for an open mind for climate change combined with the willingness to adapt the behavior to new requirements. Results need to be reviewed with alertness for ongoing changes in climate in order to learn from recent developments. This is a fundamental appeal to stay an entrepreneurial and mindfulness organization instead of a managerial organization.

*Politicians, Governmental staff, scientists and citizens related*

11. In a globalized world with virtual connections all over the world citizens and so politicians become responsible for their behavior. The time to only listen to authorities [5] or scientists [2] is over. Information is everywhere and freedom of information should be everywhere as well. For that we need to change our mind. The use of arguments and finding arguments are the basis while the arguments need to stimulate positive actions.
12. That means that the way we go into climate change is not to manage and control so to be forced to do things but to adapt our behavior because we are motivated to do so. We as human beings are too smart to obey the rules especially when they are not in favor for us. Doom scenarios are out; we need to take everyone serious. This is also true for climate change where arguments need to play the first fiddle.

## REFERENCES FROM PUBLICATIONS (BOOKS AND PAPERS)

- Spence A., D. Venables, N. Pidgeon, W. Poortinga and C. Demski (2010), *Public Perceptions of Climate Change and Energy Futures in Britain, Summary Findings of a Survey Conducted in January – March 2010*, Technical Report (Understanding Risk Working Paper 10-01), Cardiff: School of Psychology
- IPCC (2007), *IPCC Fourth Assessment Report: Climate Change 2007 (AR4)*, Cambridge University Press
- World Bank (2010), *World Development Report 2010, Development and Climate Change*, Washington
- Lomborg B. (2007), *Cool it, The Skeptical Environmentalist's Guide to Global Warming*, Knopf, 2007
- Gore Al (2006), [\*An Inconvenient Truth: The Planetary Emergency of Global Warming and What We Can Do About It\*](#), Rodale Books and DVD
- Hulme M. (2009), *Why we disagree about Climate Change, Understanding Controversy, Inaction and Opportunity*, Cambridge
- Leroux Marcel (2005), *Global Warming, Myth or Reality, The Erring Ways of Climatology*, Springer-Verlag
- Dawson B. And M. Spannagle (2009), *The Complete Guide to Climate Change*, Routledge
- Crok M. (2010), *De staat van het klimaat, Een koele blik op een verhit debat*, Paradigma; An English translation will be published in 2012
- Idso C. and F. Singer (2009), *Climate Change Reconsidered: 2009 Report of the Nongovernmental International Panel on Climate Change (NIPCC)*, The Hartland Institute
- Olivier J.G.J., G. Janssens-Maenhout, J.A.H.W. Peters and J. Wilson (2011), *Long-term trend in global CO2 emissions. 2011 report*, The Hague: PBL/JRC
- Solomon L. (2008), *The Deniers, The World-renowned Scientists who stood up against Global Warming Hysteria, Political Persecution, and Fraud*, Richard Vigilante Books

Oreskes N. and E. M. Conway (2010), *Merchants of Doubts, How a handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*, Bloomsbury Press

Plimer I. (2009), *Heaven and Earth, Global Warming the Missing Science*, Taylor Trade

Anderson D.E., A.S. Goudie and A.G. Parker (2007), *Global Environments through the Quaternary, Exploring Environmental Change*, Oxford University Press

Lomborg B. (2010), *Smart Solutions to Climate Change, Comparing Costs and Benefits*, Cambridge University Press

Mitchell B. (2002), *Resource and Environmental Management*, Pearson Education Limited

Weick K.E. and K.M. Sutcliffe(2007), *Managing the Unexpected, Resilient Performance in an Age of Uncertainty*, John Wiley & Sons, Inc.

#### **REFERENCES FROM WEBSITES:**

BBC (2009), *Climate concerns continue to increase according to global poll*, from [http://www.bbc.co.uk/pressoffice/pressreleases/stories/2009/12\\_december/07/poll.shtml](http://www.bbc.co.uk/pressoffice/pressreleases/stories/2009/12_december/07/poll.shtml), retrieved 7 October 2011

BBC (2009), *Detailed Findings*, from [http://www.bbc.co.uk/pressoffice/pressreleases/stories/2009/12\\_december/07/detailed\\_findings.pdf](http://www.bbc.co.uk/pressoffice/pressreleases/stories/2009/12_december/07/detailed_findings.pdf), retrieved 7 October 2011

BBC (2010), *Climate Change Poll*, [http://news.bbc.co.uk/1/hi/shared/bsp/hi/pdfs/05\\_02\\_10climatechange.pdf](http://news.bbc.co.uk/1/hi/shared/bsp/hi/pdfs/05_02_10climatechange.pdf), retrieved 7 October 2011

Nielsen (2011), *Global Warming Cools off as Top Concern*, from <http://www.nielsen.com/us/en/insights/press-room/2011/global-warming-cools-off-as-top-concern.html>, retrieved 7 October 2011

Nobelprize.org, *Press Release Nobel Prize 2007*, from [http://www.nobelprize.org/nobel\\_prizes/peace/laureates/2007/press.html](http://www.nobelprize.org/nobel_prizes/peace/laureates/2007/press.html), retrieved 12 October 2011

The Science Alliance, *From Copenhagen to Cancun*, from <http://www.scientific-alliance.org/scientific-alliance-newsletter/copenhagen-cancun>, retrieved 19 October 2011

Popular Technology net (2011), *900+ Peer-Reviewed Papers Supporting Skeptic Arguments Against ACC/AGW Alarm*, from <http://www.populartechnology.net/2009/10/peer-reviewed-papers-supporting.html>, retrieved 6 October 2011

Friends of Science (2011), *Providing Insight into Climate Change, Published Books*, from <http://www.friendsofscience.org/index.php?id=110>, retrieved 12 October 2011

Logical Science (2006-2007), *The Consensus on Global Warming: From Science to Industry & Religion*, <http://www.logicalsceince.com/consensus/consensus.htm>, retrieved 28 October 2011

World Meteorological Organization, *Understanding Climate*, from [http://www.wmo.int/pages/themes/climate/understanding\\_climate.php](http://www.wmo.int/pages/themes/climate/understanding_climate.php), retrieved 20 September 2011

Environmental Protection Agency USA (2011), *Climate Change, Glossary of Climate Change Terms*, from <http://www.epa.gov/climatechange/glossary.html>, retrieved 9 October 2011

Gilland T. (2007), *Digging up the Roots of the IPCC*, from <http://www.spiked-online.com/index.php?/site/article/3540/>, retrieved 30 September 2011

Intergovernmental Panel on Climate Change (2011), *Organization*, from <http://www.ipcc.ch/organization/organization.shtml>, retrieved 12 October 2011

Costella, J. (2011), *Climategate Analysis*, from <http://assassinationscience.com/climategate/>, retrieved 19 October 2011

Inter Academic Council (2011), *Climate Change Assessment, Review of the Process and Procedures of the IPCC*, from

<http://reviewipcc.interacademycouncil.net/report/Climate%20Change%20Assessment%20Review%20of%20the%20Processes%20&%20Procedures%20of%20the%20IPCC.pdf>

and *Executive Summary*, from

<http://reviewipcc.interacademycouncil.net/report/Executive%20Summary%20and%20Front%20Matter.pdf>, retrieved 16 October 2011;

BBC News, (22 December 2009), *Why did Copenhagen fail to deliver a Climate Deal?*, from <http://news.bbc.co.uk/2/hi/8426835.stm>, retrieved 18 October 2011

Christian, Energy and Environment – Journal of choice for climate skeptics,

*Analyzing the 900+ skeptic papers Part III*, 21 Apr 2011,

*Using our paper to support skepticism of anthropogenic global warming is misleading.* Part II, 18 April 2011,

*Analyzing the ‘900 papers supporting climate skepticism’: 9 out of top 10 authors linked to ExxonMobil*, 15 Apr 2011

All from <http://www.carbonbrief.org/blog/2011/04/900-papers-supporting-climate-scepticism-exxon-links>, retrieved 12 October 2011

Lindzen R., *Climate of Fear: Global-warming alarmists intimidate dissenting scientists into silence*, Global Research, April 7, 2007 and Opinion Journal, Wall Street Journal - 2006-04-12 from <http://www.globalresearch.ca/index.php?context=va&aid=5294>, retrieved 19 October 2011

Wikipedia (2011), *List of scientists opposing the mainstream scientific assessment of global warming*, from

[http://en.wikipedia.org/wiki/List\\_of\\_scientists\\_opposing\\_the\\_mainstream\\_scientific\\_assessment\\_of\\_global\\_warming](http://en.wikipedia.org/wiki/List_of_scientists_opposing_the_mainstream_scientific_assessment_of_global_warming), retrieved 12 October 2011

[Johnson](#) K.B. (2009), *Whom Can You Trust on Climate Change?* December 8, 2009, from <http://www.insidehighered.com/views/2009/12/08/johnson>, retrieved 29 October 2111

United Nations, *United Nations Framework Convention on Climate Change*,  
FCCC/INFORMAL/84

GE.05-62220 (E) 200705 (1992), from

<http://unfccc.int/resource/docs/convkp/conveng.pdf>, retrieved 7 October 2011

Thatcher M., *Speech to the Royal Society, 27<sup>th</sup> of September 1988* and *Speech to United Nations General Assembly, 8<sup>th</sup> of November 1989* from

<http://www.margaretthatcher.org/speeches/default.asp>, retrieved 30 September 2011;

Schneider S., *Don't Bet All Environmental Changes Will Be Beneficial*, APS Physics, August/September 1996, Vol. 5, No 8, from

<http://www.aps.org/publications/apsnews/199608/environmental.cfm>, retrieved 15 October 2011

Pielke R. Sr. et al., *Climate Change: The need to Consider Human Forcings besides Greenhouse Gases*, EOS, Vol. 90, No 45, 10 November 2009 from

<http://pielkeclimatesci.files.wordpress.com/2009/12/r-354.pdf>, retrieved 19 October 2011

Singapore Statement of Research Integrity (2010),

<http://www.singaporestatement.org/statement.html>, retrieved 20 October 2011

EC (2011), *A Roadmap for moving to a competitive low carbon economy in 2050*,

[http://ec.europa.eu/clima/policies/roadmap/index\\_en.htm](http://ec.europa.eu/clima/policies/roadmap/index_en.htm), retrieved 20 October 2011

EC (2011), *Roadmap to a Resource Efficient Europe*,

[http://ec.europa.eu/environment/resource\\_efficiency/pdf/com2011\\_571.pdf](http://ec.europa.eu/environment/resource_efficiency/pdf/com2011_571.pdf),

retrieved 20 October 2011