

# SPINNING THE CLIMATE

**THE INTERGOVERNMENTAL  
PANEL ON CLIMATE CHANGE**

**Vincent Gray**

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# **SPINNING THE CLIMATE: THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)**

**Vincent Gray**

## **PREFACE**

I have spent a lifetime on scientific research. My father was a working class intellectual, eager for knowledge. He took me to all the London museums and I remember a visit to the Royal Albert Hall to see the Exhibition which celebrated the discovery of Electromagnetic Induction by Michael Faraday. This must have been 1931 when I was 9 years old. My secondary school in London, Latymer Upper, had top scientists, as the only job those days was teaching. I won a Major scholarship to Emmanuel College Cambridge and obtained a PhD degree from war work on flame thrower and incendiary bomb fuels.

I avoided academia as I wished to help industry, and over the years I had a range of jobs with industrial research organisations working on oil, protein, plastics, fibres, paint, adhesives, building, coal and forensic science in The UK, France, Canada and New Zealand. I published well over 100 scientific papers, several patents and several Chapters on books. After retiring from my job in New Zealand in 1987 I worked for four and a half years in China on coal slurries.

The colleges, in Hangzhou, and in Kunming, where I taught English during my last year, had excellent libraries of science journals in English. I became interested in the Greenhouse Effect and gave several lectures on the subject in China. In a visit back to New Zealand in 1989 I was invited to comment on the drafts of the Supplement to the First Report (published 1992) that had been circulated to my former employer from the Intergovernmental Panel on Climate Change. These comments were submitted, amongst others, by the Director, R.S Whitney. I submitted comments as a Reviewer for all of the subsequent IPCC Reports, including the Fifth Report, which is now pending.

The IPCC is claimed by some to have provided evidence that the earth's climate is harmed by changes in the atmospheric concentrations. of greenhouse gases. These claims are false. This report explains how dubious observations and some genuine science has been distorted and "spun" to support a global campaign to limit human emissions of certain greenhouse gases which has no scientific basis and no proven capacity to forecast future climate.

## **ENVIRONMENTAL RELIGION**

Environmental religion believes that humans are destroying the "planet" and the "environment" and it requires reasons and evidence to justify this belief.

The movement became influential in the late 1960s. A number of local meetings led to the first United Nations Conference on the Environment in Stockholm in 1972. Successful attempts were made to abolish pesticides, restrict economic development in many countries from restrictive laws and in 1988, the Montreal Protocol prohibited substances that deplete the ozone layer.

In the late 1970s the environmental movement began to adopt the theory that emissions of “greenhouse gases” were destroying the earth by causing “global warming”.

## THE LEAD-UP TO THE IPCC

There were several scares that misfired. The “Nuclear Winter”, (Turco et al 1983), based on computer models of a nuclear war, was shown to be a hoax. There arose a “shopping list” of “Man’s Impact on the Global Environment” (Massachusetts Institute of Technology 1971) with the preparation of a “short list” that could be exploited further. The earliest success arose from the discovery of the “ozone hole” (Molina and Rowlands 1974).who claimed that halocarbons in the stratosphere were destroying ozone and thus enhancing ultraviolet radiation.

The United Nations Environment Conference in Stockholm, 1972, acted on this claim and set up the machinery to ban the use of halocarbons with the Montreal Protocol which came into force on January 1<sup>st</sup> 1989.

There followed what amounts to a shopping list of supposed human effects on the environment which could be souped up to impose restrictions on human activity (MIT 1979). Prominent amongst these was the emissions of carbon dioxide from combustion of fossil fuels . Bert Bolin, the Swedish meteorologist was behind the World Climate Research Programme in 1979 and several conferences in Villach, Austria.

The origins of the theory that so-called greenhouse gases enhanced global temperature, and that additions of carbon dioxide to the atmosphere would cause additional warming of the climate has recently been reviewed by Gray (2013). The idea was promoted in 1895 by the Swedish chemist Svante Arrhenius. He extended previous work by Fourier who misinterpreted the behaviour of a greenhouse and Tyndall, who showed that water vapour in the earth’s atmosphere could absorb part of the earth’s outgoing infra red radiation. He was unaware that Langley’s measurements, which he used, did not reach the absorption bands of carbon dioxide, so his results were for water vapour, not carbon dioxide. The idea became submerged under the subsequent 15 years of cooling, two world wars and an economic crisis which followed. Its second outing for the theory was in 1938 by Guy Stewart Callendar but again an extended period of cooling followed almost immediately despite the growth of greenhouse gases and the theory was quietly shelved.

The revival of the greenhouse theory in the 1980s faced several apparently insuperable problems. It depended on establishing the following unlikely facts.

- Weather forecasting services throughout the world already provided the best application of scientific meteorology
- It is possible to provide a theory of climate which is capable of explaining past and predicting future climate behaviour over much longer periods than at present
- It is possible to measure atmospheric concentrations of all the greenhouse gases over an extended period
- It is possible to measure temperatures all over the earth’s surface, and in the atmosphere for an extended period
- Changes in the climate are exclusively caused by changes in greenhouse gases, not by the factors currently accepted

It is plainly impossible to measure any of the greenhouse gases on a worldwide scale from representative samples throughout the atmosphere. This is particularly difficult with the chief greenhouse gas, water vapour whose concentration was known to vary over several orders of

magnitude in different parts of the atmosphere. The first priority, therefore, was to find some way of assuming changes in water vapour from a simplified theory. adopt Arrhenius's procedure and persuade the world that greenhouse gases were uniformly distributed, and therefore could be determined from a single, or very few measurements.

Water vapour immediately proved to be completely intractable. Its huge variability was finally concealed by making it a "feedback" to climate models and ignoring it completely as a contributor to the supposed "global warming", except as an amplifying factor.

It was known that concentrations of carbon dioxide in the atmosphere are also variable. Callendar evaded this problem by selecting those observations that fitted his theory and discarding all the others (Jaworowski 1999). The new theorists decided to extend the same procedure adopted by Callendar but to go even further by rejecting all of the measurements that had been made since 1850 and accept only the most recent ones that had been made on sites exclusively over the sea and restricted to eliminate so-called "noise"

The revival of the greenhouse theory was assisted by the testimony of James Hansen of the Goddard Institute of Space studies to the US Senate on June 23<sup>rd</sup> 1988, who had developed a technique for making use of temperature measurements from weather stations which had shown that the mean temperature of the earth was rising.

From these beginnings a number of local meetings about the environment led to the first United Nations Conference on the Environment in Stockholm in 1972

Later came successful attempts to abolish pesticides, restrict economic development in many countries from restrictive laws and in 1988, the Montreal Protocol prohibited substances that deplete the ozone layer.

The abolition of certain pesticides and supposedly ozone-depleting chemicals remain contentious to this day but the environmental movement has a habit of blending research of questionable integrity with a belief that human activity is destroying the "planet" and the "environment" to generate a powerful if rather suspect message.

Charles Keeling of the Scripps Institute for Atmospheric Research, La Jolla, California who had established equipment for the measurement of atmospheric carbon dioxide concentration near the Mauna Loa volcano in Hawaii and at the South Pole announced that he had shown that the concentration of carbon dioxide in the atmosphere was increasing.

It was then assumed that these two events were related and the theory that increased carbon dioxide would increase global temperature, were revived. The use of the recently developed computer based model techniques were applied to this idea.

## **THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (IPCC)**

The United Nations Conference on Environment and Development, the "Earth Summit" in Rio de Janeiro (3-14 June 1992) was organised to launch an attack on all forms of development on the grounds that they destroyed the environment and the "greenhouse" theory was recycled as a weapon for a campaign to impoverish the world

The Intergovernmental Panel on Climate Change (IPCC) was jointly set up by the World Meteorological Organisation and the United Nations Environmental Programme in 1988 to provide support for the forthcoming 1992 Earth Summit in its campaign to adopt the greenhouse theory.

It was set up In order to:

- Assess available scientific information on climate change: Working Group I.
- Assess the environmental and socio-economic impacts of climate change: Working Group II.
- Formulate response strategies: Working Group III.

The three Working Groups are made up of nominees of the two sponsors and of the Governments that support the greenhouse theory. The scientists are mainly Government employees, or recipients of Government finance. As Governments throughout the world have come to adopt policies dependent on the belief that greenhouse gas emissions are causing harmful effects on the climate, all of the Working Group members tend to be supporters of this view as are the "Lead Authors" of the Reports who are nominated by them.

Drafts of all the main Reports of the IPCC are circulated for comment. Initially this was only to Government Environment Departments, who then consulted with local experts and interested parties before forwarding comments received. Nowadays, almost anyone can comment, provided they tell the right story to the IPCC. There are three drafts of each Report, the third being circulated only to Governments. There is evidence that some of the most extravagant claims only appear in the Final Draft.

In order to provide a scientific basis for the greenhouse theory they faced several apparently insuperable problems. It depended on establishing the following unlikely facts.

- There was already a successful weather forecasting service which applied scientific meteorology that had been developed for several hundred year
- It is possible to provide a theory of climate which is capable of explaining past and predicting future climate behaviour over much longer periods based on completely different principles involving so-called :greenhouse gases, alone.
- It is possible to measure atmospheric concentrations of all the greenhouse gases over an extended period
- It is possible to measure temperatures all over the earth's surface sufficient to provide a scientifically acceptable average and its rate of change.

## **THE FRAMEWORK CONVENTION ON CLIMATE CHANGE**

The "Earth Summit" resulted in the 1992 Framework Convention on Climate Change (FCCC),, adopted on May 9<sup>th</sup> 1992. It came into force on 21<sup>st</sup> March 1994. By that time there were 166 signatures from National Governments, including our own.

This Convention initiated a system for compulsory reduction of greenhouse gases by "Annex I" Governments, which has become progressive to the extent that it is now causing major economic disaster in many countries.

The procedure has been implemented by a series of "Conferences of the Parties" ((COP 1,2,3, etc.), in the different major cities of the world, including subsidiary meetings for implementation of the other campaigns of the environmental movement. These meetings have now reached COP18 which took place in Doha in November 2012.

The IPCC Reports are a major contribution to the progress of the increasing restrictions on economic activity resulting from the main COP meetings, and their Reports have all been prepared in order to influence the successive meetings.

The FCCC defined "Climate Change" in Article 1 as follows:

“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”

This statement is legally binding on the Governments who signed the Convention. It amounts to an assertion that all “change” in the climate is caused by human emissions of greenhouse gases, even when it is only “attributed, directly or indirectly”, and that “change of climate” that is “natural” is mere “variability”.

It provides a license for the wholesale distortion of climate science carried out by the IPCC in its many publications.

## **THE IPCC REPORTS**

The whole IPCC exercise was set up in order to accumulate "evidence" that the "globe" is undergoing "global warming" as a result of increases in carbon dioxide and other greenhouse gases in the atmosphere. There was never any intention to provide a balanced, or an unbiased scientific assessment of climate science.

From the beginning, there have been scientists who disagreed with the theory that increases in greenhouse gases are harmful but their views have not been included in the IPCC Reports and comments made by them have been comprehensively rejected, to the extent that few now bother to comment at all. Some recognised experts have resigned or expressed their opposition to the entire exercise.

This deliberate bias was made clear in Appendix 4, of the first Working Group I IPCC Report, "Climate Change: The IPCC Scientific Assessment" published in 1990 in an introduction to a list of Reviewers, with the statement:

"While every attempt was made by the Lead Authors to incorporate their comments, in some cases these formed a minority opinion which could not be reconciled with the larger consensus".

The Governments who signed the FCCC (which included New Zealand) have accepted the FCCC definition of "Climate Change" as legally binding. This means that the Intergovernmental Panel on Climate Change has the function of seeking to provide evidence to support this definition. The 1995 and subsequent reports however, had, as a footnote on the first page a disclaimer, as follows:

“Climate change in IPCC usage refers to any change in climate over time, whether due to natural variability or as the result of human activity”.

Even in this disclaimer, only greenhouse gases are allowed to "change" the climate. "Natural" climate phenomena are only "variable"

Despite the disclaimer, the IPCC still retain the term "Climate Change" in their Title, to make their real objective plain, and throughout the report, "natural" climate influences are only considered in order to rule them out, marginalize their importance, or even recruit them as greenhouse effects.

The "Summary for Policymakers" arises because the Governments that have sponsored the Report wish to authorize it and ensure that it corresponds with their "Climate Change" policies. It

is agreed line-by-line by Representatives of the Governments. It is drafted mainly by selected scientists from the main Report, but it is sometimes not understood that they are acting on orders, not as independent scientists. The "Summary for Policymakers" is actually a "Summary BY Policymakers" as it is not just advice to other policymakers, it is a summary approved by the policymakers themselves. It is also a genuine consensus of their views, agreed by all of them, and it does not necessarily coincide with the views of any single Government, or of the scientists who participate in the Report. The Government Representatives who control the Reports are never named. They are not politicians but public servants who are taking orders from the governments who have signed the FCCC and whose voters are numerous enough for them to accept this obligation

For the First Report (1990) Working Group I (WGI) dealt with "Science", Working Group II (WGII) dealt with "Impacts", and Working Group III (WGIII) dealt with "Policy"

For the Second Report (1995) WGII became "Impacts, Adaptation and Mitigations" and was published as a separate large Report.

For the Third Report (2001) and the Fourth Report (2007) WGII became "Impacts, Adaptation and Vulnerability" and WGIII became "Mitigation" Each were now additional, large Reports and in addition was added a "Synthesis Report" which summarised all three

I confined my review comments largely to the "Science" Report (WGI). WGII and WGIII based their arguments entirely on the assumed validity of the "projections: of the WGI Report and they were staffed mainly with environmental activists, without formal scientific qualifications;

Recently their connections with environmental organisations has been questioned together with evidence their quoted papers often lacked "peer review"

Most of the papers in the WGI Report had been "peer reviewed" because the editors of the major journals have been successfully lobbied to refuse papers critical of the "climate "change" persuasion.

The Chapters of each Report are arranged in such a way as to promote the idea of climate change caused by greenhouse gas increases. Actual climate observations are either obscured, or "smoothed, "filtered", "linearized", "interpolated", with "outliers" eliminated, in order to try and find "trends" which can be fitted into the mould decided for them.

## **THE FIRST REPORT 1990 CLIMATE CHANGE: THE IPCC SCIENTIFIC ASSESSMENT**

This report was issued in 1990 and used as a background to the 1992 "Earth Summit" at Rio de Janeiro which launched the campaign to reduce greenhouse gases, in the belief that they are responsible for "global warming".

This First Report set the pattern for all of them.

### **Report Prepared for IPCC by Working Group I**

Edited by J T Houghton, G J Jenkins, and J J Epraums

Published by the Cambridge University Press 1990

## Chapter headings:

Preface signed by

G.O.P Obasi, Secretary General, Wprld Meteorological Organisation  
M K Tolba, Executive Director United Nations Environment Programme

Foreword, signed by Dr John Houghton, Chairman IPCC Working Group I

Policymakers Summary prepared by Working Group I

Contents

Executive Summary

Annex : Emissions Scenarios from Working Group III

Introduction

1, Greenhouse Gases and Aerosols.

R T Watson, H Rohde, H Oeschiger and U Siegenthaler

2. Radiative Forcing of the Climate

K P Shine, R G Derwent, D J Wuebbles and J J Morcrette

3. Processes and Modelling

U Cubasch and R D Cess

4. Validation of Climate Models

W L Gates , P R Rowntree and Q Z Zeng

5. Equilibrium Climate Change

J F B Mitchell , S Manabe, T Tokioka and V Meleshko

6. Time-Dependent Greenhouse-Gas-Induced Climate Change

F P Bretherton, K Bryan and I D Woods

7. Observed Climate Variations and Change

C K Folland, K Bryan and J D Woods

8. Detection of the Greenhouse Effect in the Observations

T M L Wigley and T P Barnett

9 Sea Level Rise

R A Warrick and H Oerlemans

10. Effects on Ecosystems

J M Melillo T V Callaghan, F J Woodward E Sa;atiand S K Sinha

11. Narrowing the Uncertainties

G M Bean and J McCarthy

Annex: Climatic consequences of emissions

Appendix 1: Emissions Scenarios

Appendix 2 Organisation of the IPCC and Working Groups

Appendix 3 Contributors (306 including some duplicates)

Appendix 4 Reviewers (241, with duplicates. My name does not appear as I submitted through the NZ Government)

Appendix 5 Acronyms Institutions

Appendix 6 Acronyms Programmes and Miscellaneous

Appendix 7 Units

The "Policymakers Summary" is "Prepared by IPCC Working Group I" for approval by the Governments.

There is no Index. Topics are difficult to find as they are often treated in more than one Chapter.

The "Observations" only appear towards the end (Chapter 8) to conceal the fact that they do not support the computer climate models which are promoted in the rest of the Report

As with all the Reports, much emphasis was placed on the "Mean Annual Global Surface Temperature Anomaly Record", which is based on scientifically unacceptable basic data (unrepresentative samples), unacceptable average daily temperatures (based on a varying mean of maximum and minimum) from sites almost never monitored for suitability, lacking an estimate of accuracy.

The Report summarized the obvious fact that their models did not fit even the biased record by the statement

"The size of the warming is broadly consistent with predictions of climate models".

Actually, they are "broadly inconsistent" since the models increase steadily whereas the so-called temperature record despite being slightly upwards, is irregular.

They thereby established the pattern they have followed throughout of qualitative, ambiguous statements without scientific support which are invariably regarded as certain proof by their sponsors.

This first Report gave a graph of past global temperatures that included the "Medieval Warm Period" and the "Little Ice Age", and they blamed the latter for the temperature rise shown in their record from 1910 to 1940. These opinions were denied in subsequent Reports.

The Report also launched the "scenarios" of the future which are exaggerated beliefs of changes in human activity for the forthcoming century. This was the birth of the "Business as Usual" scenario. Two other sets of "scenarios" have been added since then.

The details of the scenarios were kept away from the scientists by confining the work to a sub-Committee of WGIII where they could even ignore the views of reputable economists. The scientists have found themselves lumbered with scenarios they are unable to question in the WGI Science Reports.

## **THE 1992 SUPPLEMENTARY REPORT**

"Climate Change 1992: The Supplementary Report to the IPCC Scientific Assessment" was compiled specifically to provide evidence to influence signatories for the Framework Convention on Climate Change after its adoption in May 1992.

It contains the following Chapters

Foreword  
Preface

## **1992 Supplement**

A Greenhouse Gases

A1 Sources and Sinks

A2 Radiative Forcing of the Climate

A3 Emissions Scenarios for IPCC: an Update

B Climate Modelling, Climate Prediction and Model Validation

C Observed Climate Variability and Change

Annex: Climatic Consequences of emissions and comparison of IS92a and SA90

Appendix 1 Organisation of IPCC and Working Group I

Appendix 2 Contributors to the IPCC WGI Report Supplement

Appendix 3 Reviewers of the IPCC WGI Report .Supplement (my comments were included as coming from R S Whitney)

Appendix 4 Acronyms

Appendix 5 Units

Appendix 6 Chemical Symbols

Again there was no Index.

The Report repeated the procedure of the first Report in placing “Observed Climate Variability and Change” right at the end, so that readers will not notice that observations do not agree with the models.

They also separated out “Climate Variability” which might be caused naturally, from “Climate Change” which is supposedly exclusively caused by greenhouse gases.

The Report expanded the topic of aerosols. The climate models reported in the First Report gave grossly exaggerated predictions of current temperatures. This Report extended the argument that aerosols might be used to rescue the models, since their effects could cause cooling, and because these effects are so little known they could be used to “adjust” model deficiencies.

The Report also launched a new set of “scenarios, to replace the rather crude number of four scenarios promoted in the First Report, which included the notorious “Business as Usual” scenario. The “Business as Usual” scenario has never really died, because its extreme assumptions are a favourite of Government economists and failed US Presidential candidates.

The new scenarios, labelled IS92a.b.c.d.e.f were described in more detail in a supplementary Report (Leggett et al. 1992) and were used for the subsequent IPCC Reports, until they were replaced by the scenarios described in their 2000 Report (Nakicenovic 2000).

The Introductory Chapter paragraph on “Scenarios” states

“Scenarios are not predictions of the future and should not be used as such”..

Statements, such as this one by the originators, that scenarios should not be used for forecasts, have been routinely ignored by politicians, the media and Governments, without a single protest from any IPCC official.

# **CLIMATE CHANGE 1994**

“Climate Change 1994” from the IPCC, was a combination of two topics, “Radiative Forcing of Climate Change” and “An Evaluation of the IPCC IS92 Emission Scenarios”. It was provided to support the coming into force of the Framework Convention on Climate Change on the 21<sup>st</sup> March 1994,

The first part was from the first IPCC Committee WGI (Science) and the second part was from the third IPCC Committee (Impact), WGIII

The Contents are as follows

Foreword

## **Part 1**

Preface to WGI Report

Dedication (to Ulrich Siegenthaler)

Summary for Policymakers: Radiative Forcing of Climate Change.

1. CO<sub>2</sub> and the Carbon Cycle
2. Other Trace Gases and Atmospheric Chemistry
- 3 Aerosols
- 4 Radiative Forcing
- 5 Trace gas Radiative Forcing Indices

## **Part II**

Preface to WGIII Report

Summary for Policymakers: An Evaluation of the IPCC 1992 Emission Scenarios

6. An Evaluation of the IPCC Emission Scenarios

Appendix 1 Organisation of the IPCC

Appendix 2 List of Major IPCC Reports

Appendix 3 Contributors to the WGI Report

Appendix 4 Reviewers of the WGI Report (I am named for the first time under “Non-Governmental Organisations”)

Appendix 6 Acronyms

Appendix 7 Units

## **INDEX**

Part 1 introduces the topic of “Global Warming Potential” which enables them to treat all greenhouse gases (except, of course, water vapour) as if they behave like carbon dioxide.

In Part II there is the statement

"Since scenarios deal with the future they cannot be compared with observations"

So, nobody feels bound to find out whether their projections are capable of predictions about the climate.

## CLIMATE CHANGE 1995: THE SCIENCE OF CLIMATE CHANGE

"Climate Change 1995" was the second major Report of the IPCC. It was prepared to launch the first meeting of the Conference of the Parties (COP 1) of the signatories of the Framework Convention on Climate Change, in Berlin from 20th March to April 7<sup>th</sup> 1995. It was also used for the subsequent meetings of COP 2, 8-10 July in Geneva, and COP 3 December 1<sup>st</sup> to 10<sup>th</sup> in Kyoto, where the Kyoto Protocol which imposes compulsory restrictions of greenhouse gas emissions on all signatories of the FCCC, was launched.

The Chapters were as follows

Foreword

Preface

Summary for Policymakers

Technical Summary

1. The Climate System: An Overview
  2. Radiative Forcing of Climate Change
  3. Observed Climate Variability and Change
  4. Climate Processes
  5. Climate Models: Evaluation
  6. Climate Models – Projections of Future Climate
  7. Changes in Sea Level
  8. Detection of Climate Change and Attribution of Causes
  9. Terrestrial Biotic Responses to Environmental Change and Feedbacks to Climate
  10. Marine Biota Responses to Environmental Change and Feedbacks to Climate
  11. Advancing our Understanding
- Appendix 1 Organisation of the IPCC
- Appendix 2. List of Major IPCC Reports
- Appendix 3. Contributors to Climate Change 1995: The Science of Climate Change (530. including duplicates)
- Appendix 4. Reviewers (557 including duplicates. My name is included under "Non-Governmental Organisations, and spelled wrong)

The "Summary for Policymakers" is stated to have been approved in detail at the Madrid meeting 27-29 November 1995.

There is now a "Technical Summary" as well as a "Summary for Policymakers" to save people the chore of actually reading the Report. The authors of both of these are not revealed, but it is claimed that the "Technical Summary" is "not approved in detail".

As before, there is no index.

The "Observations" have been moved up to number 3, and they no longer claim that they are only interested in their greenhouse properties. However, Chapter 1 "The Climate System" and Chapter 2. "Radiative Forcing" are still there to sell the greenhouse effect first.

I could claim a major improvement. The first draft of the 1995 Report had a Chapter 5 "Validation of Climate Models" as in the First Report. I pointed out that it was wrong since no climate model has ever been "validated", and they did not even try to do so. They thereupon changed the word "Validation" to "Evaluation" no less than fifty times and have used it exclusively ever since.

Perhaps I should explain what is meant by "validation". It is a term used by computer engineers to describe the rigorous testing process that is necessary before a computer-based model can be put to use. It must include successful prediction over the entire range of circumstances for which it is required. Without this process it is impossible to find out whether the model is suitable for use or what levels of accuracy can be expected from it.

The IPCC has never attempted this process, and they do not even discuss ways in which it may be carried out. As a result the models are worthless, and their possible inaccuracy is completely unknown. The IPCC has developed an elaborate procedure for covering up this deficiency which is well described in the IPCC document on "Guidance Notes for Lead Authors on Addressing "Uncertainties". It includes attempts to "simulate" those past climate sequences where suitable adjustment of the uncertain parameters and equations in their models can be made to give an approximate "fit", but they rely largely on the elaborate procedure for mobilizing the opinions of those who originate the models. Most of them depend financially on acceptance of the models, so their opinions are handicapped by their conflict of interest.

In addition to the abandonment of "validation" they dropped all claims to be able to make "predictions". All the computer results were "projections: dependent on whether the assumptions could be considered plausible, but never tested against real future climate properties.

The outcomes (projections) of the models are classified in the following levels of confidence;

Very High Confidence. At least 9 out of 10 chance of being correct

High Confidence. About 8 out of 10 chance

Medium Confidence About 5 out of 10 chance

Low Confidence. About 2 out of 10 chance

Very Low Confidence. Less than 1 out of 10 chance.

These figures do not possess statistical significance as they are pure guesswork. As might be expected Low Confidence and Very Low Confidence are extremely rare.

In addition there are levels of Likelihood of the value of their "projections", which take the place of "predictions".

Virtually Certain: >99% probability of occurrence

Very Likely: >90% probability

Likely: > 66% probability

About as Likely as not: 33 to 66% probability

Unlikely: <33% probability

Very Unlikely: <10% probability

Exceptionally Unlikely: <1% probability

As before, you search very hard to find anything at all that is below "Likely"; and as before, the probability figures are pure guesswork and have no relationship to mathematical statistics.

These procedures are merely an orchestrated litany of guesswork.

As everything is "evaluated" but not "validated", there can never be never preferred models or scenarios, as they have no way of choosing between them.

Almost all the "opinions" expressed are based on assuming that a correlation implies a cause and effect relationship. This defies a fundamental logical principle, but it is evaded by calling the process "attribution". They agree that this is unfair, but cover it up as follows

“Unequivocal attribution would require controlled experimentation with the climate system. Since that is not possible, in practice attribution of anthropogenic climate change is understood to mean demonstration that a detected change is ‘consistent with the estimated responses to the given combination of anthropogenic and natural forcing’ and ‘not consistent with alternative, physically plausible explanations of recent climate change that exclude important elements of the given combination of forcings’”.

Since the alternative explanations are always marginalized or distorted, “attribution” to “anthropogenic change” always wins. It is strange, though, that very little credence is given to “anthropogenic” changes that do not involve greenhouse gas emissions, such as land use and urban changes.

The 1995 Report suffered from the problem which arises by agreeing the "Summary for Policymakers" after the Final Version of the Main Report has been produced. Since the conclusions of the "Summary" did not agree with the Government Approved "Summary", one of the scientists (Ben Santer) had the thankless task of altering statements in the full report to coincide with the "Summary". The details of these changes are as follows: courtesy of Fred Singer's website ([www.sepp.org](http://www.sepp.org)). They apply to Chapter 8, "Detection of Climate Change and Attribution of Causes"

The original Working Group I report was approved by the IPCC in December, 1995. The Final Draft had been circulated only to Government Departments, but I was allowed to see it by David Wratt so I was able to confirm that this paragraph is correct.

Subsequent to that approval, IPCC allowed additional edits to the document. Some changes are editorial, serving to add clarification or to correct sentence structure. However, other changes go beyond that and have the effect of changing the substance and tone of this chapter. The most significant edits are identified below. New material is italicized, deleted material has a strike through it.

## **Summary**

" ~~Many but not all~~ *The Majority* of these studies show that the observed changes in global-mean, annually-averaged temperature over the last century is unlikely to be due entirely to natural fluctuations of the climate system."

### **deleted:**

"The evidence rests heavily on the reliability of the (still uncertain) estimates of natural variability noise levels."

### **new:**

*"Furthermore, the probability is very low that these correspondences could occur by chance as a result of natural internal variability. The vertical patterns of change are also inconsistent with the response patterns expected for solar and volcanic forcing."*

"Viewed as a whole, these results indicate that *the observed trend in global warming mean temperature* over the past 100 years is ~~larger than our current best estimates of natural climate variations over the last 600 years.~~ *unlikely to be entirely natural in origin.*"

## **Section 8.1**

~~"The attribution of a detected climate change to a particular causal mechanism can be established only by testing~~ *involves tests of competing hypotheses.*"

"The claimed statistical detection of an anthropogenic signal in the observations must always be accompanied by the caveat that other explanations for the detected climate-change signal cannot be ruled out completely, ~~unless a rigorous attempt has been made to do so.~~"

**new:** *"There is, however, an important distinction between achieving 'practically meaningful' and 'statistically unambiguous' attribution. This distinction rests on the fact that scientists and policymakers have different perceptions of risk. While a scientist might require decades in order to reduce the risk of making an erroneous decision on climate change attribution to an acceptably low level (say 1-5%), a policymaker must often make decisions without the benefit of waiting decades for near-statistical certainty."*

### **Section 8.1.3**

~~"We now have: \* more relevant model simulations, both for the definition of an anthropogenic climate change signal and for the estimation of natural internal variability. \* more relevant simulations for the estimation of natural internal variability, and initial estimates from paleoclimatic data of total natural variability on global or hemispheric scales; \* more powerful statistical methods for detection of anthropogenic change, and a better understanding of simpler statistical methods and increased application of pattern-based studies with greater relevance for attribution."~~

### **Section 8.2.2 Inadequate Representation of Feedbacks**

**new:** *"Deficiencies in the treatment and incorporation of feedbacks are a source of signal uncertainty."*

### **Section 8.2.5**

~~"Current pattern-based detection work has not attempted~~ *is now beginning* to account for these forcing uncertainties."

### **Section 8.3.2**

~~"Initial attempts are now being made For these reasons and many others, scientists have been unable to use paleoclimate data in order to reconstruct a satisfactory, spatially-comprehensive picture of climate variability over even the last 1,000 years. Nevertheless, The process of quality-controlling paleoclimatic data, integrating information from different proxies, and improving spatial coverage should be encouraged. Without a Better paleoclimatic data bases for at least the past millennium, it will be difficult are essential to rule out natural variability as an explanation for recent observed changes, or and to validate coupled model noise estimates on century time scales (Barnett et al., 1995)."~~

### **Section 8.3.3.3**

**deleted:** "While such studies help to build confidence in the reliability of the model variability on interannual to decadal time scales, there are still serious concerns about the longer time scale variability, which is more difficult to validate (Barnett et al., 1995). Unless paleoclimatic data can help us to 'constrain' the century time scale natural variability estimates obtained from CGCMs,

it will be difficult to make a convincing case for the detection and attribution of an anthropogenic climate change signal."

#### **Section 8.4.1**

**deleted** : "While none of these studies has specifically considered the attribution issue, they often draw some attribution-related conclusions, for which there is little justification."

#### **Section 8.4.1.1**

~~"The conclusion that can be drawn from this body of work, and earlier studies reported in Wigley and Barnett (1990) is that the warming trend to date is unlikely to have occurred by chance due to internally-generated variability of the climate system, although this explanation cannot be ruled out. This, however, does not preclude the possibility that a significant part of the trend is due to natural forcing factors. Implicit in such studies is a weak attribution statement--i.e., some (unknown) fraction of the observed trend is being attributed to human influences. Any such attribution-related conclusions, however, rest heavily on the reliability of our estimates of both century time-scale natural variability and the magnitude of the observed global warming mean trend. At best, therefore, trend significance can only provide provides circumstantial support for the existence of an anthropogenic component to climate change, but does not directly address the attribution issue."~~

#### **Section 8.4.1.3**

~~"These empirical estimates of In summary, such studies offer support of a DT2x are subject to considerable uncertainty, as shown in a number of studies (see, e.g., Wigley and Barnett, 1990; Wigley and Raper, 1991b; Kheshgi and White; 1993b). In summary, such studies offer support for a DT2x value similar to that obtained by GCMs, and suggest that human activities have had a measurable impact on global climate, but they cannot help to establish a unique link between anthropogenic forcing changes and climate change."~~

#### **Section 8.4.2.1**

**new**: "*Implicit in these global mean results is a weak attribution statement--if the observed global mean changes over the last 20 to 50 years cannot be fully explained by natural climate variability, some (unknown) fraction of the changes must be due to human influences*".

**deleted**: "None of the studies cited above has shown clear evidence that we can attribute the observed changes to the specific cause of increases in greenhouse gases."

#### **Section 8.4.2.3.**

**new**: "*To date, pattern-based studies have not been able to quantify the magnitude of a greenhouse gas or aerosol effect on climate. Our current inability to estimate reliably the fraction of the observed temperature changes that are due to human effects does not mean that this fraction is negligible. The very fact that pattern-based studies have been able to discern sub-global-scale features of a combined CO<sub>2</sub> + aerosol signal relative to the ambient noise of natural internal variability implies that there may be a non-negligible human effect on global climate.*"

#### **Section 8.5.2**

**new:** *"Simultaneous model-observed agreement in terms of changes in both global means and patterns, as in the recent study by Mitchell et al. (1995a), is even less likely to be a chance occurrence or the result of compensating model errors."*

## **Section 8.6**

~~"Finally we come to the most difficult question of all: 'When will the detection and unambiguous attribution of human-induced climate change occur?' when the detection and attribution of human-induced climate change is likely to occur. The answer to this question must be subjective, particularly in the light of the very large signal and noise uncertainties discussed in this Chapter, it is not surprising that the best answer to this question is 'We do not know'. Some scientists maintain that these uncertainties currently preclude any answer to the question posed above. Other scientists would and have claimed, on the basis of the statistical results presented in Section 8.4, that confident detection of a significant anthropogenic climate change has already occurred. would and have claimed, on the basis of the results presented in Section 8.4, that detection of a significant climate change has already occurred. As noted in Section 8.1, attribution involves statistical testing of alternative explanations for a detected observed change and Few if any would be willing to argue that completely unambiguous attribution of (all or part of) this change to anthropogenic effects has already occurred, or was likely to happen in the next several years."~~

**new:** *"However, evidence from the patterned-based studies reported on here suggests that an initial step has now been taken in the direction of attribution, since correspondences between observations and model predictions in response to combined changes in greenhouse gases and anthropogenic sulphate aerosols:*

- *have now been seen both at the surface and in the vertical structure of the atmosphere;*
- *have been found in terms of complex spatial patterns rather than changes in the global mean alone;*
- *show an overall increase over the last 20 to 50 years;*
- *are significantly different from our best model-based estimates of the correspondence expected due to natural internal climatic variability.*

*Furthermore, although quantitative attribution studies have not explicitly considered solar and volcanic effects, our best information indicates that the observed patterns of vertical temperature change are not consistent with the responses expected for these forcings.*

*The body of statistical evidence in Chapter 8, when examined in the context of our physical understanding of the climate system, now points toward a discernible human influence on global climate. Our ability to quantify the magnitude of this effect is currently limited by uncertainties in key factors, including the magnitude and pattern of longer-term natural variability and the time-evolving patterns of forcing by (and response to) greenhouse gases and aerosols."*

## **Section 8.7**

### **APPARENTLY DELETED!**

This problem has been reduced in subsequent Reports by the use of elaborate "guidelines" which the Lead Authors are expected to impose on all contributors. It is reproduced as an Appendix to the Report.

The 1995 Report led to some disagreement in the Chapter entitled "Climate Processes", which included R S Lindzen, who is a prominent critic of the whole process, and it did develop the general theme that the models were far more inaccurate than is generally assumed. This happened also in the 2001 Report, but it has been eliminated from the 2007 Report.

## **THE SPECIAL REPORT ON EMISSIONS SCENARIOS 2000**

The Drafts of this Report were circulated only to economists and environmental activists. I can claim to have been the only scientist to have commented on the second draft, as its existence came to my notice and I was permitted to borrow the copy from the New Zealand Ministry of Environment. I had a deadline of only one week, but I made copious comments, most of which were, of course, rejected.

The "projections" of the IPCC are a combination of computer climate models and "scenarios" of what might happen in the future, neither of which has been validated by comparison with real future events.

There have now been three sets of "Scenarios"

- 1, The SA series from the First Report
2. The IS90 series from the 1992 Supplement Report, and now the SRES series which were launched by the 2000 Report (Nakicenovic et al. 2000) which was prepared by a sub-committee of the WGIII (Impacts) committee of the IPCC. This committee was staffed mainly by environmental enthusiasts committed to exaggerate future change. Their Report was not circulated to scientists for comment, or to experienced professional economists, so its exaggerated "projections" were imposed on the scientists of the 2001 and 2007 Reports in order to boost the "projections" of those reports.

I can give a personal experience of how this happened. The First Draft of the 2001 Report had a maximum "projected" global temperature rise for then year 2100 of 4°C. The next draft raised this to 5.8°C by inventing a new scenario (A1F1) and using many models, including a drastic one. The politicians must simply have issued a demand to do so.

I have criticised the scenarios in my book (Gray 2002) and so have two eminent economists (Castles and Henderson (2003).

## **CLIMATE CHANGE 2001: THE SCIENTIFIC BASIS**

The 2001 Report is the one I discussed in some detail in my book "The Greenhouse Delusion: A Critique of Climate Change 2001" (Gray 2002)

The Chapters were as follows:

Foreword

Preface

Summary for Policymakers

Technical Summary

1. The climate System: An Overview
2. Observed Climate Change and Variability
3. The Carbon Cycle and Atmospheric Carbon Dioxide
4. Atmospheric Chemistry and Greenhouse gases
5. Aerosols, their Direct and Indirect Effects
6. Radiative Forcing of Climate Change
7. Physical Climate Processes and Feedbacks

8. Model Evaluation
  9. Projections of Future Climate Change
  10. Regional Climate Information- Evaluation and Projections
  11. Changes in Sea Level
  12. Detection of Climate Change and Attribution of Causes
  13. Climate Scenario Development
  14. Advancing our Understanding
- Appendix I Glossary  
Appendix II SRES Tables  
Appendix III Contributors to the Report (15 pages, approximately 750)  
Appendix IV Reviewers of the Report (11 pages. Approximately 550. I get included under “New Zealand”)  
Appendix V Acronyms and Abbreviations  
Appendix VI Units  
Appendix VII Some Chemical Symbols used in this Report  
Appendix VIII Index

The “Summary for Policymakers” is “Based on a draft prepared by over 50 authors.  
The “Technical Summary” has defined authors, but it is “accepted” but not “approved” by Working Group I

This time, there is an Index.

The "Observations" Chapter has moved up to No 2 and "Radiative Forcing" moved down to No 6, but the rest are otherwise unchanged.

## **CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS**

The fourth major IPCC Report was prepared for the meeting of COP 13 at Nusa Dua, Bali from 3<sup>rd</sup>-14<sup>th</sup> December 2007

The following are the Chapters of the Fourth IPCC Major Report,

## Foreword

## Preface

## Summary for Policymakers

## Technical Summary

- 1 Historical Overview of Climate Changes Science
- 2 Changes In Atmospheric Constituents and Radiative Forcing
- 3 Observations: Atmospheric Surface and Climate Change
- 4 Observations: Changes In Snow, Ice and Frozen Ground
- 5 Observations: Ocean Climate Change and Sea Level
- 6 Palaeoclimate
- 7 Coupling Between Changes In the Climate System and Biogeochemistry
- 8 Climate Models and their Evaluation
- 9 Understanding and Attributing Climate Change
- 10 Global Climate Projections
- 11 Regional Climate Projections

## Annex I: Glossary

## Annex II: Contributors to the IPCC WGI Fourth Assessment Report

## Annex III: Reviewers of the IPCC WGI Fourth Assessment Report

## Annex IV: Acronyms

## Index

Since this is a copy of a section of a PDF document I have been compelled to reproduce their spelling mistake in Chapter 3

The “Summary for Policymakers” now has a list of “Drafting Authors”, making it plain that they are taking dictation from the un-named government representatives,

The “Technical Summary” is once more “Accepted, but not approved in details”. Its authors are the same as the “Drafting Authors” of the “Summary for Policymakers”.

The authors of Chapter 1 of “Climate Change 2001 "The Climate System: An Overview" signed their own death warrant when they wrote:

“The fact that the global mean temperature has increased since the late 19<sup>th</sup> century and that other trends have been observed does not necessarily mean that an anthropogenic effect on the climate has been identified. Climate has always varied on all time-scales, so the observed change may be natural”

This true statement has led to the replacement in "Climate Change 2007" of this introductory Chapter with a completely different Chapter entitled "Historical Overview of Climate Change Science" which is a highly selective history boosting the activities of the IPCC. One of its features is to conceal the very existence of measurements of atmospheric carbon dioxide concentration before 1958 which show a variability which would interfere with the IPCC calculations of "radiative forcing".

The Chapters in "Climate Change 2007" are only slightly rearranged from the previous Report and they all push the same message, enforced by an increase in gloomy "opinions" derived from the "spin" process described here. The key claim of "Climate Change 2007" is:

"Most of the observed increase in globally averaged temperature since the mid-20th century is *very likely* due to the observed increase in anthropogenic greenhouse gas concentrations"

This is a typical example of the technique they have used throughout. .

The main "observed" temperature records which disagree with their opinion are those from weather balloons, which begin in 1958 and those from satellites, which begin in 1978. So they eliminate them from consideration by selecting the only record showing an increase, the unreliable mean global surface temperature anomaly. Even this record shows only a fluctuation, with a fall from 1950 to 1976, a rise to 1998 and a fall since then. Yet this biased opinion is used as an excuse for depriving the world of cheap energy.

Then all this is merely *very likely*, based on the unsupported opinion of "experts with a conflict of interest, as they are paid to say so.

There is enough for enthusiasts to persuade themselves that the "science is settled" plus sufficient qualifications for the IPCC to claim they never said they were certain, when they are eventually proved wrong. Since there has been no "global warming" for the past 17 years, and we are currently shivering from the cold in New Zealand, and elsewhere, perhaps that day will come soon.

It is all a magnificent example of what public relations can achieve, but the consequences for most of us, and for the scientific community before it is eventually exposed for the deception that it does not bear contemplation.

As a response to a request to the British Freedom of Information Act, The IPCC published all the comments and names of Reviewers of the First and Second Drafts of the WGI Report at the website mentioned by McLean (2007). However, this website appears to have gone and the comments and responses are currently only available for the Second Draft by Harvard University (2013)

John McLean (2007, 2008) has provided a detailed analysis of this information. He found that I had submitted 1,878 comments on the Second Draft of the Report, 16% of all those submitted

The Summary for Policymakers has been commented on by Gray (2007) and by McKittrick et al (2007)

A response to the whole Report has been supplied by Fred Singer (2008).

## **MY PERSONAL EXPERIENCE.**

As a Reviewer for the IPCC right from the 1992 Supplement to the first Report I have submitted a very large number of comments on their drafts. For all of the Reports up to the fourth I had no

way of finding out whether any of my comments had been accepted except by comparing the wording of the Final Report with my comments. I devoted several of my early "Greenhouse Bulletins" to this task. The publication of all of the comments on the Second Draft of the WGI Report of the Fourth Report in Harvard University (2009) was the first time I had ever seen the replies to my comments on any Report. I submitted 1,878 comments. 16% of the total, most of which were rejected without answering them.

This special effort came about after I had already submitted comments to the First Draft and I was invited in 2006 to the Beijing Climate Center, where I gave three lectures on my views. At the time, the Head of the Center was Professor Yasui Ding, who was a co-Chair of the WGI Committee. He must have noted my comments on the First Draft and showed a willingness to permit me to express them to his staff. I therefore felt encouraged to comment liberally on the subsequent Second Draft.

When the Report was issued I was surprised to find that Professor Ding was no longer the Co-Chair, but had been replaced by his superior, Professor Qin Dehai, who was the Head of the entire Meteorology Section in Beijing. Despite this Professor Ding still remained the Senior scientist at the Beijing Climate Center, and he has contributed to the forthcoming Fifth IPCC Report for which I have contributed to both Drafts of the three Working Groups

Over the period I have made an intensive study of the data and procedures used by IPCC contributors throughout their whole study range. I have a large library of reprints, books and comments and have published many comments of my own in published papers, a book, and in my occasional Newsletters, the current number being 311.

I began with a belief in scientific ethics, that scientists would answer queries honestly, that scientific argument would take place purely on the basis of facts, logic and established scientific and mathematical principles.

Right from the beginning, I have had difficulty with the climate scientists involved with the IPCC. Penetrating questions often ended without any answer. Comments on the IPCC drafts were rejected without explanation, and attempts to pursue the matter were frustrated indefinitely.

Over the years, as I have learned more about the data and procedures of the IPCC, I have found increasing opposition by them to providing explanations, until I have been forced to the conclusion that for significant parts of the work of the IPCC, the data collection and scientific methods employed are unsound. Resistance to all efforts to try and discuss or rectify these problems has convinced me that normal scientific procedures are not only rejected by the IPCC, but that this practice is endemic, and was part of the organisation from the very beginning. I therefore consider that the IPCC is fundamentally corrupt. The only "reform" I could envisage, would be its abolition.

By drawing attention to these obvious facts, I have found myself *persona non grata* with most of my local professional associations, as I am questioning the integrity of these award-winning scientific leaders of the local science establishment. .

I somehow understood that the threshold had been passed when I viewed "The Great Global Warming Swindle" BBC documentary. Yes, we have to face it. The whole process is a swindle, The IPCC from the beginning was given the licence to use whatever methods would be necessary to provide "evidence" that carbon dioxide increases are harming the climate, even if this involves manipulation of dubious data and using people's opinions instead of science to "prove" their case.

The disappearance of the IPCC in disgrace is not only desirable but inevitable. The reason is, that the world will slowly realise that the "predictions" emanating from the IPCC will not happen. The absence of any "global warming" for the past seventeen years is just the beginning. Sooner or later all of us will come to realise that this organisation, and the thinking behind it, is phoney.

Unfortunately severe economic damage is likely to be done by its influence before that happens.

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## **APPENDIX: IPCC GUIDANCE INSTRUCTIONS ON UNCERTAINTY**

## Guidance Notes for Lead Authors of the IPCC Fourth Assessment Report on Addressing Uncertainties

The following notes are intended to assist Lead Authors (LAs) of the Fourth Assessment Report (AR4) to deal with uncertainties consistently. They address approaches to developing expert judgments, evaluating uncertainties, and communicating uncertainty and confidence in findings that arise in the context of the assessment process. Where alternative approaches are used in the relevant literature, those should be used but where possible related to the approaches given here. Further background material and more detailed coverage of these issues are available in the guidance paper on uncertainties developed for the Third Assessment Report [1] and the report of an IPCC Workshop on Uncertainty and Risk [2].

The working group reports will assess material from different disciplines and will cover a diversity of approaches to uncertainty, reflecting differences in the underlying literature. In particular, the nature of information, indicators and analyses used in the natural sciences is quite different from that used in the social sciences. WG I focuses on the former, WG III on the latter, and WG II covers both. The purpose of this guidance note is to define common approaches and language that can be used broadly across all three working groups. Each working group may need to supplement these notes with more specific guidance on particular issues consistent with the common approach given here.

### Plan to treat issues of uncertainty and confidence

1. Consider approaches to uncertainty in your chapter at an early stage. Prioritize issues for analysis. Identify key policy relevant findings as they emerge and give greater attention to assessing uncertainties and confidence in those. Avoid trivializing statements just to increase their confidence.
2. Determine the areas in your chapter where a range of views may need to be described, and those where LAs may need to form a collective view on uncertainty or confidence. Agree on a carefully moderated (chaired) and balanced process for doing this.

### Review the information available

3. Consider all plausible sources of uncertainty using a systematic typology of uncertainty such as the simple one shown in Table 1. Many studies have shown that structural uncertainty, as defined in Table 1, tends to be underestimated by experts [3]. Consider previous estimates of ranges, distributions, or other measures of uncertainty and the extent to which they cover all plausible sources of uncertainty.

Table 1. A simple typology of uncertainties

Type	Indicative examples of sources	Typical approaches or considerations
Unpredictability	Projections of human behaviour not easily amenable to prediction (e.g. evolution of political systems). Chaotic components of complex systems.	Use of scenarios spanning a plausible range, clearly stating assumptions, limits considered, and subjective judgments. Ranges from ensembles of model runs.
Structural uncertainty	Inadequate models, incomplete or competing conceptual frameworks, lack of agreement on model structure, ambiguous system boundaries or definitions, significant processes or relationships wrongly specified or not considered.	Specify assumptions and system definitions clearly, compare models with observations for a range of conditions, assess maturity of the underlying science and degree to which understanding is based on fundamental concepts tested in other areas.
Value uncertainty	Missing, inaccurate or non-representative data, inappropriate spatial or temporal resolution, poorly known or changing model parameters.	Analysis of statistical properties of sets of values (observations, model ensemble results, etc); bootstrap and hierarchical statistical tests; comparison of models with observations.

4. Assess issues of risk where supported by published work. Where probabilistic approaches are available, consider ranges of outcomes and their associated likelihoods with attention to outcomes of potential high consequence. An alternative approach is to provide information for decisions that would be robust in the sense of avoiding adverse outcomes for a wide range of future possibilities [4]. (Note that the term “risk” has several different usages. If used it should be defined in context.)

#### **Make expert judgments**

5. Be prepared to make expert judgments and explain those by providing a traceable account of the steps used to arrive at estimates of uncertainty or confidence for key findings – e.g. an agreed hierarchy of information, standards of evidence applied, approaches to combining or reconciling multiple lines of evidence, and explanation of critical factors.
6. Be aware of a tendency for a group to converge on an expressed view and become overconfident in it [3]. Views and estimates can also become anchored on previous versions or values to a greater extent than is justified. Recognize when individual views are adjusting as a result of group interactions and allow adequate time for such changes in viewpoint to be reviewed.

#### **Use the appropriate level of precision to describe findings**

7. Assess the current level of understanding on key issues and precede statements on confidence or uncertainty with a general summary of the corresponding state of knowledge. Table 2 below provides a consistent language for this.
8. Develop clear statements for key findings that are quantitative and give explicit time frames as far as possible. Define carefully the corresponding variables or outcomes, their context, and any conditional assumptions. Where scenarios are used, explain the range of assumptions and how they affect the outcome. Then consider the most appropriate way to describe the relevant uncertainties or level of confidence by going as far down the hierarchy given below as you feel appropriate (from expressions of less to more confidence and less to more probabilistic approaches) [5]:
  - A. *Direction of change is ambiguous or the issue assessed is not amenable to prediction:* Describe the governing factors, key indicators, and relationships. If a trend could be either positive or negative, explain the pre-conditions or evidence for each.
  - B. *An expected trend or direction can be identified (increase, decrease, no significant change):* Explain the basis for this and the extent to which opposite changes would not be expected. Include changes that have a reasonable likelihood even where they are not certain. If you describe a collective level of confidence in words, use the language options in Table 2 or 3.
  - C. *An order of magnitude can be given for the degree of change (i.e. sign and magnitude to within a factor of 10):* Explain the basis for estimates given and indicate assumptions made. The order of magnitude should not change for reasonable ranges in such assumptions. If you describe a collective level of confidence in words, use the language options in Table 2 or 3.
  - D. *A range can be given for the change in a variable as upper and lower bounds, or as the 5th and 95th percentiles, based on objective analysis or expert judgment:* Explain the basis for the range given, noting factors that determine the outer bounds. If you cannot be confident in the range, use a less precise approach. If you describe a collective level of confidence or likelihood of an outcome in words, use the language options in Tables 3 or 4.
  - E. *A likelihood or probability of occurrence can be determined for an event or for representative outcomes, e.g. based on multiple observations, model ensemble runs, or expert judgment:* State any assumptions made and estimate the role of structural uncertainties. Describe likelihoods using the calibrated language given in Table 4 or present them quantitatively.

- F. A probability distribution can be determined for changes in a continuous variable either objectively or through use of a formal quantitative survey of expert views: Present the PDF graphically and/or provide the 5th and 95th percentiles of the distribution. Explain the methodology used to produce the PDF, any assumptions made, and estimate the role of structural uncertainties.

### Communicate carefully, using calibrated language

9. Be aware that the way in which a statement is framed will have an effect on how it is interpreted [6]. (A 10% chance of dying is interpreted more negatively than a 90% chance of surviving.) Use neutral language, avoid value laden statements, consider redundant statements to ensure balance (e.g. chances of dying and of surviving), and express different but comparable risks in a consistent way.
10. To avoid the uncertainty perceived by the reader being different from that intended, use language that minimizes possible misinterpretation and ambiguity. Note that terms such as "virtually certain", "probable", or "likely", can engage the reader effectively, but may be interpreted very differently by different people unless some calibration scale is provided [7].
11. Three forms of language are given in Tables 2, 3 and 4 to describe different aspects of confidence and uncertainty and to provide consistency across the AR4.
12. Table 2 considers both the amount of evidence available in support of findings and the degree of consensus among experts on its interpretation. The terms defined here are intended to be used in a relative sense to summarize judgments of the scientific understanding relevant to an issue, or to express uncertainty in a finding where there is no basis for making more quantitative statements. A finer scale for describing either the amount of evidence (columns) or degree of consensus (rows) may be introduced where appropriate, however, if a mid-range category is used authors should avoid over-using that as a 'safe' option that communicates little information to the reader. Where the level of confidence is 'high agreement much evidence', or where otherwise appropriate, describe uncertainties using Table 3 or 4.

Table 2. Qualitatively defined levels of understanding

Level of agreement or consensus ↑	<i>High agreement limited evidence</i>	...	<i>High agreement much evidence</i>
	...	...	...
	<i>Low agreement limited evidence</i>	...	<i>Low agreement much evidence</i>
	Amount of evidence (theory, observations, models) →		

13. A *level of confidence*, as defined in Table 3, can be used to characterize uncertainty that is based on expert judgment as to the correctness of a model, an analysis or a statement. The last two terms in this scale should be reserved for areas of major concern that need to be considered from a risk or opportunity perspective, and the reason for their use should be carefully explained.

Table 3. Quantitatively calibrated levels of confidence.

Terminology	Degree of confidence in being correct
<i>Very High confidence</i>	At least 9 out of 10 chance of being correct
<i>High confidence</i>	About 8 out of 10 chance
<i>Medium confidence</i>	About 5 out of 10 chance
<i>Low confidence</i>	About 2 out of 10 chance
<i>Very low confidence</i>	Less than 1 out of 10 chance

14. *Likelihood*, as defined in Table 4, refers to a probabilistic assessment of some well defined outcome having occurred or occurring in the future. The categories defined in this table should be considered as having 'fuzzy' boundaries. Use other probability ranges where more appropriate but do not then use the terminology in table 4. Likelihood may be based on quantitative analysis or an elicitation of expert views. The central range of this scale should not be used to express a lack of knowledge – see paragraph 12 and Table 2 for that situation. There is evidence that readers may adjust their interpretation of this likelihood language according to the magnitude of perceived potential consequences [8].

Table 4. Likelihood Scale.

Terminology	Likelihood of the occurrence/ outcome
<i>Virtually certain</i>	> 99% probability of occurrence
<i>Very likely</i>	> 90% probability
<i>Likely</i>	> 66% probability
<i>About as likely as not</i>	33 to 66% probability
<i>Unlikely</i>	< 33% probability
<i>Very unlikely</i>	< 10% probability
<i>Exceptionally unlikely</i>	< 1% probability

15. Consider the use of tabular, diagrammatic or graphical approaches to show the primary sources of uncertainties in key findings, the range of outcomes, and the factors and relationships determining levels of confidence.

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