

Latest news regarding the Climate

Most salient news from the Fifth Assessment Report (Part 2)

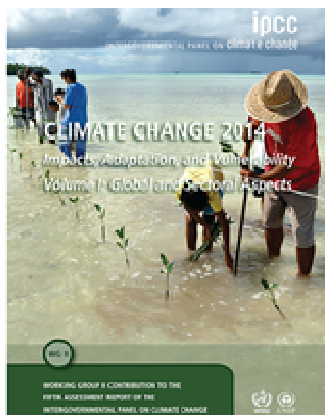
Polar temperatures in the USA, days in March that are almost like summer, extremely violent typhoons ... global climate seems to have gone crazy! What is happening to the Planet?

As you know, the climate is a complicated subject, that must not be confused with meteorology, which it is quite distinct from. And so, what to do? Have you ever wondered how scientists explain to the public what they know about the climate and climate change and how they relate with the governments and inform them of their discoveries?

In order to discover what is happening, every 6-7 years the scientists of IPCC¹ tell the world all the significant information they are aware of, through a very important document: the *Assessment Report* (AR) on climate. In other words, the Assessment Report on climate (here onwards AR) is a report that contains all we know about the climate of our Planet, on the impact and the vulnerability of natural, social and economic systems and the possible ways to mitigate them.

The Report was published the very first time in 1990 and after this first edition, other editions followed in 1995, 2001, 2007 and the last in 2014, the fifth (AR5). As in the case of the previous reports, AR5 is subdivided into three parts, each one is managed by a Working Group - WG I, WG II, WG III - that studies and examines a particular aspect of the topic in further detail. We have spoken of the history and of the part of the Report dedicated to scientific and physical evidence of the climate, some time ago, and now we shall discover the second and the third part of the Report, AR5 WGII and WGIII.

AR5 WGII - impact, adaptation and vulnerability



Now that we know what will happen from a physical point of view, we must also learn what the impact of climate change will be on our territory.

As already mentioned, the second volume, edited by WGII, regards the impact of climate change on a global and regional scale, the vulnerability of human and natural systems and the adaptation options, i.e. the possible changes in the natural and human systems in response to global heating or its effects, in order to reduce potential damages. The aim of the Report is to provide a guide for the governments when making future decisions, and to contrast the effects of climate change, which will be negative from an environmental, social and economic point of view, in the best possible manner.

The Report consists of a total of 2562 pages, 1000 more than AR5 WGI, and it weighs about 7 kg – a truly huge amount of work! In order to highlight the different aspects that are dealt with, it has been divided into two parts.

The first volume, consisting of 20 chapters, analyses the topic on a global scale, and concentrates on aspects of the various sectors that are analysed (from fresh water resources to marine and terrestrial ecosystems, to coasts, food, rural and urban areas, energy and industry, human health and safety, human settlements and poverty).

The second volume, divided into 10 chapters, evaluates the risks and opportunities of the response, region by region, analysing these in the different geographic areas (Africa, Europe, Asia, Australasia, North America, Central America, South America, Polar regions, small islands and oceans).

The summary for policy makers has already been accepted, approved and presented at the end of March 2014, while the complete Report still has to be approved by all the parties, but has already been accepted on 29th March 2014 in Yokohama, in Japan (here, on the left, the cover of AR5 WG II, volume 1).

¹ If you want to know about IPCC and what it does, go to the eniscuola webpage <http://www.eniscuola.net/it/aria/contenuti/cambiamenti-climatici/left/effetto-serra/che-cos-lipcc/>

What are the most important points with regard to impact, adaptation and vulnerability? From the point of view of the impact, it is already pointed out that not only the natural ecosystems and animal and plant species populating them are endangered, but also the **wellbeing and survival of human beings are threatened!** For example, from the point of view of the natural systems, it has been observed that many marine, fresh water or terrestrial species have changed their migrating routes and the geographic areas for their reproduction and growth, and the melting ice is influencing the hydrogeological systems and the availability of water resources. Also we human beings are beginning to experience the difficulties of living in a world in a bad state of health. We have to, or will have to face the decrease in availability of fresh water, problems in the food sector, the rise in the sea level and erosion of the coastlines. All these impacts could imply adaptation costs and policies, that are very expensive. In particular this edition focuses greatly on the risks tied to food safety due to the decrease in the global and regional production, with consequent economic losses, specially for the agricultural communities, and for those living in urban areas in the south of the world. Not even we in Europe are immune: as you will remember from the special report on the water footprint, the decrease in the availability of water, due to climate change will lead to a marked decrease in agricultural yields in Italy.

Besides the points we have already mentioned, a strong negative impact on biodiversity and the quality of natural ecosystems, on precipitation (in some areas more intense and in others increasingly scarce) is foreseen, and also a probability (proportional to the increase in temperature) of reaching the so-called **tipping point**, i.e. catastrophic events triggered by an increase in the temperature greater than +4°C.

If we concentrate on Europe, some of the principal impacts that have been foreseen, besides those which have already been mentioned, are:

- an increase in the temperatures in all the regions, accompanied by a marked increase in the precipitation in North Europe and a significant decrease in South Europe; an increase in extreme events (for example heat waves) and correlated phenomena (such as fires);
- an increase in the risks associated with floods and the possible loss of human lives, coastal erosion and damages to the infrastructures; the risk may however be reduced to acceptable limits with the help of measures to adapt to the circumstances, such as structures to defend the territory, warning plans and strengthened civil protection, and urban and territorial planning strategies;
- the rise in the sea level which can lead to the degradation of great cultural heritage and sites of historical value; furthermore some heritage landscapes may be lost for good.

Fortunately Europe has a greater adapting capacity than other regions of the planet, however there are limits to the possibilities of adaptation to many of the risks that have been identified by the scientists, mainly in the case of increases in temperature that are over 4°C. However, the Mediterranean region (which Italy is a part of) is identified as one of the European areas that are most at risk, due to the numerous factors that are impacted: tourism, agriculture, forest activities, infrastructures, energy, health of the population, with the introduction of further economic disparities in Europe. If we look beyond our continent, we must remember that in the world there are other problems that lead to situations at risk: poverty, inequality, urbanization, globalization of the food sector and conflicts, are some of the elements that contribute to defining different degrees of vulnerability to climate change. As it often occurs, it is the poorer regions and the more underprivileged social classes to be more vulnerable to climate change and also less able to develop adaptation responses.

The poorer regions of the world, the less privileged social classes, people who are discriminated for social reasons are more vulnerable and less able to develop adequate adaptation responses, but also people who live in the regions with a high development rate are in danger. What risks will we have to face in the future?

It is because the risk depends on many factors that there is a certain amount of uncertainty attached to it. However **it is certain that some impacts are already taking place and are inevitable, and therefore adaptation is no longer a possibility but a necessity.**

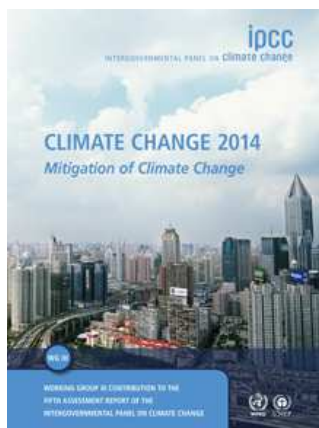
Having acknowledged that climate change is taking place and that we are responsible and that we are all more or less exposed to its consequences, what can we do? The most innovative aspect of AR5, compared to the previous report, is the addition of a detailed analysis of the **adaptation measures** that have already been carried out and that can be

carried out to adapt to climate change in the various regions of the world. Many of these strategies are actually measures that should be carried out anyway, and for which it is worthwhile investing, **because the future benefits will be greater than the initial costs**. What are these strategies? For example, measures for hydrogeological instability and protection of biodiversity, reforestation, protection of parks, measures to protect terrestrial and marine species, etc.

Are these precautionary economic efforts worthwhile? The scenarios proposed by IPCC clearly state that our investment is a long-term investment and that for the first 15-16 years we will not see substantial differences between one scenario and another due to the resistance to variations (inertias) of the climate system. However, as we move beyond 2030-2040, it will be increasingly evident how significant our change in route has been, if we have behaved well and have reduced our emissions we will be in the more optimistic scenarios of the rise in temperature, otherwise we will face the more pessimist scenarios with consequences that are very alarming.

How to react when faced with this risky and problematic situation? In order to see a half full glass, we could think of global warming as an opportunity to reduce our pressure on the Planet. We can concentrate on the potential benefits because even if we are not totally sure of the gravity of the future impacts, actions that can reduce our vulnerability will however improve human health and the health of the ecosystems, increasing the quality of the environment, and therefore our wellbeing.

We cannot be sure of what the future will be like, **but we know certainly that everything depends on our choices**, of the present and the future and on the course of the opportunities that we decide to face.



AR5 WGIII, mitigating climate change

At this stage, we know the scientific evidence and we know the impacts, therefore what to do? What are the possible ways for mitigation? The third volume AR5 WGIII describes this. In numbers, the last effort of IPCC is not less important than the others, editing the volume involved about 400 authors and examined almost 10000 scientific publications., to these we must add 900 proof-readers who contributed with 38000 comments to the report. The volume consists of 16 chapters divided into three main parts which regard an overview of the topic, the different ways of mitigation and lastly the evaluation of the policies, the institutional context and the financial support that is required, for a total of over 2000 pages (on the left, an image of the cover).

From the work of the third Working Group, it appears that the situation is not particularly promising. Unfortunately, **notwithstanding the measures taken to reduce the effect,**

the emissions of greenhouse gas continue to grow at a rhythm which has no precedents.

Most of these emissions (78%) come from use of fossil fuels and industrial processes, while the only sector in which a decrease can be seen is in the forests sector, thanks to a minor deforestation in the last few years. So, if political and technological choices to reduce these emissions are already available and visible, how is it possible that there is an increase? Even if Europe has undertaken to bring about a reduction, many of the emerging countries, or the counties which up to only few years ago were considered emerging countries (for example China, India and Brazil that are now considered "average income" countries) have remarkably increased their emissions of greenhouse gas.

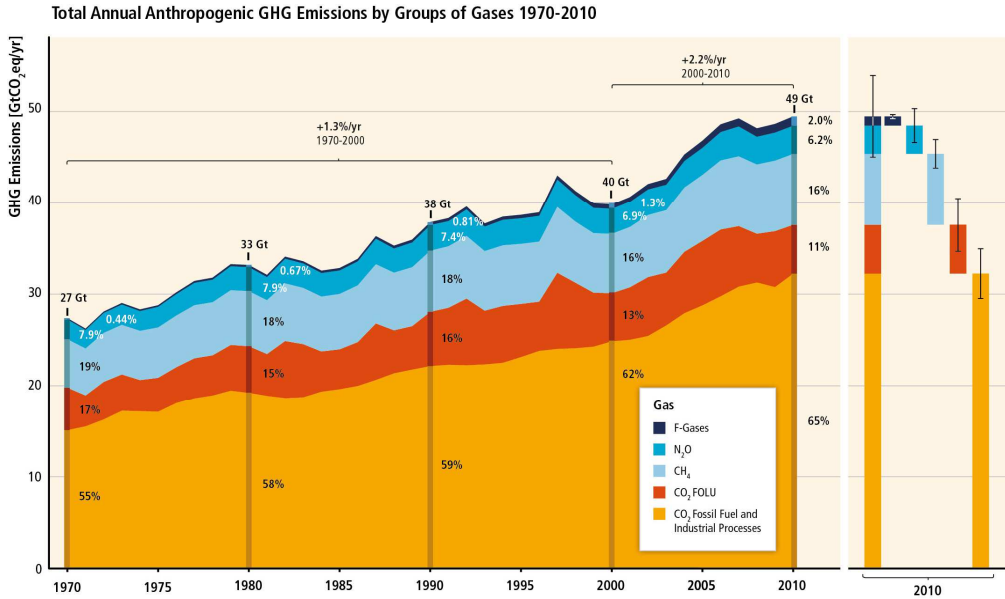


Fig.1 Anthropogenic greenhouse gas emissions from 1970 to 2010, subdivided by gas: CO₂ from fossil fuels and industrial processes (orange); CO₂ from forests and other soil uses (red); methane CH₄ (light blue); nitrous oxide N₂O (turquoise blue); fluorinated gases (blue)

The principal cause of the increase in the emissions is the rapid urbanization and use of fossil fuels with high CO₂ emissions in the industries in these countries. Besides the increase in the emissions of the emerging countries we must also add the already high emissions in the industrialized countries. This means that **it is very important that efforts are made together**, so that a decrease in the emissions in one country are not nullified by an increase in another country. Climate change is a **global problem and challenge**, because most of the greenhouse gases accumulate in time and are mixed on a planetary scale.

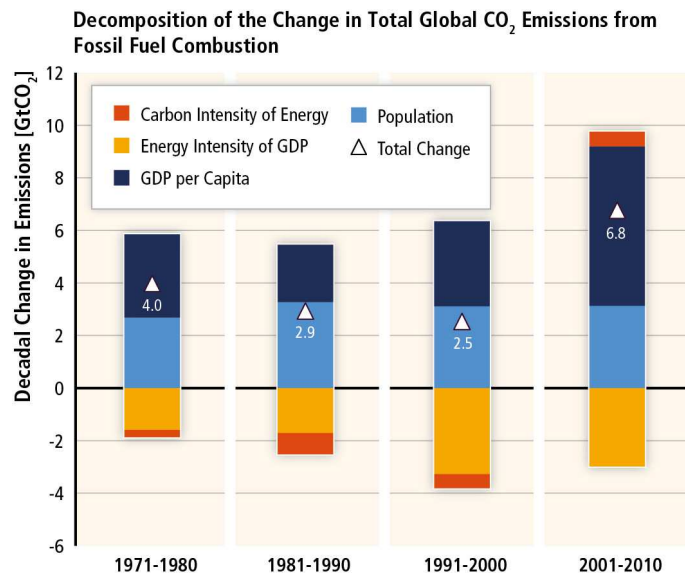


Fig.2 Variation in the emissions of four principal factors: carbon intensity, CO₂ emissions per unit of energy (red), intensity of energy of the GDP (yellow), GDP per capita (blue), population (light blue). Observing the figure you can note the increase in emissions due to population growth and use of fossil fuels with greater CO₂ emissions.

Where must we intervene? The key sectors for mitigation intervention are: **the production and use of energy, transports, building, industries, use of the soil and human settlements**, and there are numerous possible solutions and combinations. These range, for example, from interventions in the sector of waste, to actions on energy efficiency and use of renewable energies, to the management of forests. There is no single solution or a single combination of possible solutions, but a series of ad hoc measures and interventions that each country will have to apply depending on its characteristics and requirements.

If these actions are not carried out, and we continue to emit greenhouse gases at this rate, in 2100 a 3.7 to 4.8°C increase is foreseen in the global mean temperature – which is very far from the aim of 2°C, which is hoped for by scientists in order not to interfere dangerously with the climate system.

Is there something that we can do to reach this aim? There is something that we can do, but it involves a gigantic effort: a substantial cut in the emissions of greenhouse gas (40-70% compared to the levels in 2010) to be reached by 2050, and zero emissions of greenhouse gas by 2100. To act now, even though it is a demanding effort, is however important because the more we delay the cut in the emissions, the further we will be from the prospect of creating a clean economy, and the more the costs that are necessary to mitigate the impacts will increase in the future!

The key year, indicated by scientists as a possible turning point (positive or negative) is 2030: if the emissions continue to grow, to successfully remain within the limit of 2°C will be very difficult, and very great efforts will be necessary, if instead we are able to reduce our emissions, the effort would be half.

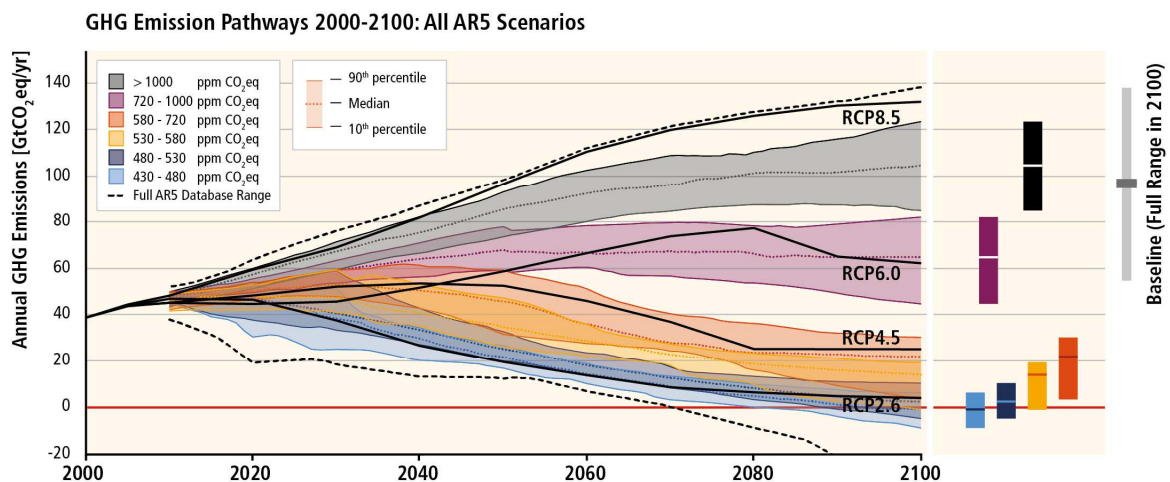


Fig. 3 Future scenarios of an increase in the temperature, with regard to emissions of greenhouse gas and concentrations in the atmosphere

So action is required, but how much would it cost us? Less than what we might think, and we would have a lot to gain! IPCC has calculated that in order to remain in the scenario of a 2°C rise in the temperature, this would lead to a decrease in the GDP (Gross Domestic Product, an economic index that measures the value of goods and services of a country) from 1% to 4% by 2030, and from 2% to 6% by 2050, without however counting the benefits that we would obtain in terms of ecosystems, air quality and much more! For the first time, finally, also the investments that are necessary have been calculated. The investments in technologies for the production of clean energy will have to increase two fold, while investments in fossil sources will decrease 20%.

So is it worth it? Surely yes, an excellent long term investment for all of us!

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Sources and detailed research:

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(communication: the 195 IPCC member countries have approved the new report, on the physical basis of climate change)

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