



Società Chimica Italiana

The Italian Chemical Society's Position on Climate Change

Premise

Considering the long term trends, significant variations in the climate have become clearly evident and have been proven by indisputable scientific observations. Said variations will increasingly affect both terrestrial and marine ecosystems and significantly condition human activities such as fishing and agriculture, the availability of natural resources such as fresh water in addition to determining problems specific to coastal areas owing to rising sea levels. Climate change represents one of the primary threats to sustainable development and, precisely for this reason, has been included among the UN Agenda 2030 objectives which emphasizes the urgent need to reduce greenhouse gas emissions and to adopt measures to mitigate the negative impact as projected by current climate patterns.

Fully aware of the gravity of the present situation yet confident in the joint commitment of international institutions, the **Italian Chemical Society**:

- applauds the agreement reached at the **Paris United Nations “COP-21” Conference** undertaking a course of action aimed at attaining a low greenhouse gas emission economy and to structure adaptation plans for the global changes currently underway;
- fully supports and reiterates all the declarations set forth on the subject by other **Chemical Societies** such as the **American Chemical Society**¹, the **Royal Society of Chemistry**² and **EuCheMS**³;
- has identified the **drastic reduction of the use of fossil fuels** as a high priority strategy in striving towards mitigation of climate change through decreases in greenhouse gas emissions.

The contribution of the Italian chemical scientific community

The problem in the relationship between man and the environment is, above all, cultural in nature. Understanding this intrinsic, essential relationship and encouraging one which is not based exclusively on exploitation yet, at the same time, acknowledging that human activity is not something extraneous, but rather, integral to the natural environment is a cultural task to which the community of chemists can and must give a significant contribution, beginning with schools and proper environmental education.

The following is a presentation of several aspects more specifically related to the problem of climate change to which chemical research - particularly that conducted by the Italian scientific community – may offer a special contribution.

¹ Please see <http://www.acs.org/content/acs/en/climatescience/about.html> as well as the “Position Statement 2013-2016”: <http://www.acs.org/content/dam/acsorg/policy/publicpolicies/promote/globalclimatechange/climate-change.pdf>

² Cfr., specifically: 1) “Climate Communiqué” <https://royalsociety.org/~media/policy/Publications/2015/21-07-15-climate-communicue.pdf> (in conjunction with other scientific societies); 2) “Statement” (in conjunction with the “Institution of Chemical Engineers”): <http://www.rsc.org/campaigning-outreach/global-challenges/climate-change/>

³ European Association for Chemical and Molecular Sciences, letter to the President of the European Parliament and the European Commission, 3/11/2014 (http://www.euchems.eu/wp-content/uploads/EuCheMS_letter_greenhouse.pdf): “EuCheMS agrees with the chemical arguments that lead to the conclusion that it is extremely likely that the current increases in atmospheric carbon dioxide and other greenhouse gases, as well as the increase in global temperatures that have occurred over the last 100 years arise as a result of human activity”



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Significant scientific research has been dedicated to the reconstruction of past climates (paleoclimate), through chemical, physical and isotopic stratigraphies in marine sediment and ice cores. These studies have established a relationship between temperature variations and concentrations of greenhouse gases (especially methane and carbon dioxide), amount of particulate matter suspended in the atmosphere and environmental factors such as orbital parameters, solar activity, volcanic eruptions and meteorological events. The results obtained from this inter-disciplinary research, characterized by decisive chemical contributions, have determined that the current concentrations of CO₂ in the atmosphere are the highest in the last 800,000 years.

The close relationship between global warming and biosphere pollution, two of the most serious threats to human and environmental health, was also proven: not only certain gases produced by civil and industrial activities, such as carbon dioxide, methane, dinitrogen monoxide, sulphur hexafluoride, halocarbons (CFC, HFC, PFC), but also certain anthropogenic aerosol components, such as black carbon, contribute to global warming. On the contrary, other components (such as ammonium sulphate and ammonium nitrate) contrast the effects of green house gases through direct phenomena (solar radiation distribution) and indirect phenomena (cloud formation and modification). Chemical analysis of the atmosphere has proven to be an indispensable element in attaining an accurate calculation of overall radiation determined by various forcings which influence the climate and make it possible to project reliable forecasts of the evolution of global changes.

Moreover, in relation to climate changes, studies have been conducted on the distribution and toxicity of chemicals present in the environment in order to forecast how these substances may act upon the capacity to adapt of living organisms to future climatic conditions and increase their vulnerability. Therefore, one of the greatest challenges confronting chemical research is that of increasing our knowledge of risk assessments by integrating the effects of climate change on environmental variables (temperature, salinity, pH and nutrient concentrations) of aquatic ecosystems. These factors directly or indirectly alter the behaviour and health of living organisms.

In addition to the negative effects of global change on tourism and the agro-food sector, no less important are the effects that global change may have on cultural heritage, in particular those elements which are directly exposed to the external environment, an extremely important consideration for Italy; the results of several international projects have identified the increase in average temperatures and precipitation as one of the main causes of an increase in the deterioration processes related to oxidation (on a basis proportional to the specific vulnerability of artefacts); a secondary, but no less worrisome, effect is the overall increase in biofilm development and microbial colonization.

These considerations regarding the impact of climate change may produce a rigorous response in terms of overall re-assessment of productive processes in order to limit the emissions of greenhouse gases to the maximum.

*Based on the principles of **Green Chemistry** and industrial ecology, the efforts of the chemical industry, whose processes are both energy and material intensive, are gradually being oriented towards greater sustainability: recent data reveal a*



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57% decrease of specific emissions of greenhouse gases, calculated on the basis of 1990 production levels⁴. A rather particular area in which much research is currently underway is aimed at identifying new means to capture and recycle carbon dioxide, as a starting reagent for the synthesis of new compounds. But in more general terms, considering the life cycle of products and systems, chemical research contributes to extending the impact range from various possible scenarios in order to foster the most favourable alternatives in terms of overall results from an environmental perspective.

Lastly, given that greenhouse gas emissions for energy use in Italy exceed 80% of total GHG emissions⁵, it follows that a key factor in containing this amount is the transition towards a decarbonised economy through improving the efficiency of processes and services, which would result in energy savings as well as energy production which would be progressively less reliant on fossil fuels. Currently, much of the research currently underway in the field of chemistry is aimed at making better use of renewable energy sources, especially solar energy through the use of new devices and materials which, as opposed to solutions already on the market, have enhanced conversion efficiency or which may be composed of renewable organic composites. This is also true of chemical research which, in an attempt to compensate for fluctuations in solar and/or wind energy sources, is aimed at the development of new devices for the storage of electrical energy and is proving to be decisive.

Conclusions and Recommendations

Membership in the **Italian Chemical Society** includes recognized authorities and experience well suited to analyze the dynamics and effects of climate changes already under way and possible actions of mitigation and adaptation. Well aware of its leading role in Italian society the Society forcefully reiterates the need to undertake a course of structural reassessment of productive processes that is oriented towards **reducing greenhouse gas emissions**.

Within this perspective, the Society urges political decision-makers to rapidly implement the obligations assumed in the recent Paris Conference and, in particular, to accelerate **the transition towards greater efficiency and renewable energy sources, thus progressively lessening dependence on the use of fossil fuels**.

For this purpose, the Italian Chemical Society is fully available in offering scientific and multidisciplinary technologies in the fields briefly cited in this document so that our country may strive towards significant objectives of sustainability and make a concrete commitment in ensuring a better future for present and future generations.

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⁴ Federchimica, "Responsible Care. 21° Rapporto Annuale", 2015: http://www.federchimica.it/docs/default-source/responsible-care/rc_2015-navigabile.pdf.

⁵ ISPRA, "Emissioni nazionali di gas serra", 2015: http://www.isprambiente.gov.it/files/pubblicazioni/rapporti/Rapporto_220_2015.pdf