Climate change, health, agriculture and food
Proceeding towards COP 21 in Paris

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1. Introduction

ISDE Italy has developed in the past previous documents on climate change, in preparation of the Conferences of the Parties (COP), taking place as a result of the Kyoto Agreement.
In particular, ISDE Italy signed in 2009 the "*Appeal of Italian doctors, researchers and scientists to control climate changes*", in view of the 15th COP in Copenhagen.
This document stated "*the globally concentration of carbon dioxide has increased by 1.6 ppm (parts per million)/year in the period 1980-2008, and 1.9 ppm/year from 1993 to 2008.*
Considering the current CO2 concentration rate (387 ppm), it likely will reach 410 ppm in 2020. Global emissions of GHGs from human activities increased by 70% since 1970, largely exceeding pre-industrial values". The document also stated: "*Since 1850, 11 of the last 12 years are among the 12 warmest years as global average temperature. This temperature has risen by 0.74 °C over the period 1906-2005, compared to an increase of 0.6 °C in the period 1901-2000. In the next two decades, enduring the current conditions, it is estimated a warming of about 0.2 °C per decade"*.
The global average precipitation at sea level has risen by 1.8 mm/year (1961) to 3.1 mm /year (1993). The extent of Arctic ice has shrunk, since 1978, by 2.7% per decade and the Alpine Glaciers have retreated in both hemispheres.
It has been estimated that in the lack of a reduction in greenhouse emissions by the end of the twenty-first century, the global earth warming will rise from 1.8 to 4 °C.
The time to prevent the physical and chemical environmental catastrophe, the biological ecosystem devastation and the death of individual living organisms (then Earth final downfall), has been estimated in 5-10 years, in which it becomes essential to reduce and to stabilize greenhouse emissions.

The following effects of environmental changes have began and they are addressed to get worse:
· Raising of sea-water level, coastal erosion, flooding inland, retreat of glaciers and the polar ice

caps;

· Intense variations in the amount of precipitation;

· Increase of ocean salinity and eutrophication of coastal waters;

· Structure of the winds;

· Extreme weather events (drying, exceptional rainfalls, floods, tropical cyclones, heat waves);

· Extinction of 20-30% of species classified until now, unable to adapt to the rapid changes taking place, if the global average temperature exceed 1.5-2.5 °C that of 1980-1999.

In addition, the following risks have to be considered:

· Reduction of agricultural production due to drying and floods;

· Reduction of forests and desertification;

· Reduction in water availability and deterioration of its quality;

· Loss of habitat.

As regards to the effects on health, the WHO has estimated the yearly loss of 5 million years of healthy life (DALYs) and a 3% increase in mortality for each degree of increment in global temperature.

Specific risks may arise from:

· Malnutrition for agricultural and economic crisis;

· Extreme weather conditions;

· Air pollution;

· Relocation of carriers of infectious and parasitic diseases (i.e. malaria, yellow fever, dengue, chikungunya, West Nile virus, Lyme disease, Chagas disease, leptospirosis, leishmaniasis, schistosomiasis) from the tropics to the north and south of the planet .

For these reasons, it was requested precise commitments to the governments and, in particular:

- To stabilize carbon dioxide concentrations within the critical threshold of 450 ppm, in order to avoid the risk of exceeding 2 °C (as compared to pre-industrial era) of Earth's average temperature. This is considered the threshold beyond which climate change would produce irreversible damages to ecosystems and humanity;

- To reduce carbon dioxide emissions by 80% by 2050 in rich countries (50% globally), as compared to 1990 carbon dioxide rate;

- To promote development finalized to minimize emissions from coal, not only promoting citizens' choices for low power consumption but also encouraging governments to put into practice adequate

policies for energy saving, energy efficiency and the increase of renewables in construction industry, freight transport, agriculture, industry and tourism.

The following year, in a document[1] developed jointly with Greenpeace, we deepened the scientific aspects of global warming and the causes of the increase in greenhouse gases (GHG[2]).
First of all, the document states that "Climate change threatens the entire planet biodiversity (it involves the death of 20-30% of the known species if the global average temperature exceed 1.5-2.5° C that of the period from 1980 to 1999).
Neither we, as Homo sapiens, the dominant species of all terrestrial ecosystems, will rescue from the climate disaster we have caused; our inaction will only get worse circumstances.
Summer fires and floods are alarm bells increasingly clear to all. Scientists are rightly cautious in linking a specific weather event to climate change, but some of them are beginning to speak more clearly about the link between GHG emissions, the increase in global temperatures, and what we are experiencing in real life.
If we do not reduce our GHG emissions immediately by changing the way we produce energy, we transport ourselves and our goods, we produce our food, if we do not stop planet deforestation (causing the 20% of GHG total emissions), what is happening to us is only the prologue of much more serious and widespread disasters.
The document clarifies the relationship between climate change and agriculture: "Climate change directly threatens agricultural production, for example with floods and drying, but also in a more problematic manner: for example, changes in temperature, humidity etc. change the breakdown of pathogens that affect plantations and livestock . If we consider the term "agriculture" in its broadest sense (also including fisheries and aquaculture), the alteration of general ocean circulation, the melting of polar ice caps and ocean acidification, must be considered as a serious threat to the world food production system.
On the other hand, the agricultural activities are among those that contribute to climate change: animal husbandry and forestry (including deforestation) contribute to around 30% of GHG.
The report concludes that the world's leaders, who are losing valuable time to address and solve the climate issue, are taking a tremendous responsibility.

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[1]ISDE Italy, Greenpeace EVERY MAN FOR HIMSELF - The social and health impacts of climate change (2010) http: //www. isde. it/wp-content/uploads/2015/06/ISDE-Greenpeace-Report-impatto-clima- on-salute. pdf
[2]Carbon dioxide (CO2) is the main but not the only, GHG. CO2 emissions, which are estimated to have responsible for 55% of climate change, stem primarily from the burning of oil and coal but also by deforestation. The second GHG is methane (20% of the effect). Followers gases such as nitrous oxide (N_20), the hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6). The percentages shown are based on estimates not always shared by the whole scientific world.

Citizens of the Planet can also act individually adopting good behaviour but their main responsibility today is to exert firm pressure on their representatives in order to reach immediately a fair, ambitious and binding Agreement for saving the Earth's climate and our common future.

2. Latest knowledge on climate change

How facts and knowledge have changed over the past five years?

In 2014 the UN report on climate reaffirmed that human kind is responsible for 95% of the changes taking place and that the main causes of global warming are deforestation and the burning of fossil fuels, used for human activities.

Concentrations of GHG in the atmosphere have reached the highest levels "*in 800000 years*"[3], "*time is short*" to be able to keep the temperature increase below 2 degrees Celsius: this is the summary of the report of the Intergovernmental Panel on Climate Change (IPCC) [4] .

Global emissions must be reduced by 40-70% by 2050 and must disappear by 2100. The average surface temperature of the Earth and Oceans has increased 0,85°C between 1880 and 2012, IPCC experts clarified in Copenhagen.

This is a brief summary of the report:

1. Global warming and the influence of human activities on it is a fact and it can not be denied (globally estimated at 0.85 ° C from 1880 to 2012).
2. Changes observed from the fifties to today are unprecedented.
3. The thirty years between 1983 and 2012 were probably the warmest of the last 1400 years.
4. The oceans have warmed, absorbing over 90% of additional energy accumulated in the climate system from 1971 to 2010, with an increase of 0.11 °C per decade in the first 75 m from the surface. Furthermore it is likely that the last half century a heating occurred also between 700 and 2000 m of depth.
5. The effects of warming are already visible all over the planet: oceans' acidification, the melting of Arctic ice and lower crop output.
6. The deglaciation continues worldwide, with losses of glacial mass of 275 billion tons of water equivalent per year (more than 7 times the volume of the Italian Lake Maggiore) in the period 1993-2009. Melting has intensified in Greenland and West Antarctica, from which the main contribution to sea-level increase.
7. The ocean levels rose, thanks also to thermal expansion of the water gradually warmer and warmer, about 19 cm from 1901 to 2010, with average growth of 3.2 mm/year between 1993 and 2010 .

[3]Thursday, May 9, 2013 the survey station on the volcano Mauna Loa, Hawaii, recorded a concentration of carbon dioxide (CO2) in the air exceeding 400 parts per million (ppm).

[4] Climate Change 2014 - Synthesis Report - Summary for Policymakers http: //www. ipcc. ch/report/ar5/syr/

8. Without a coordinated action to reduce CO2 emissions, temperatures will rise in the coming decades and by the end of this century could be five degrees above pre-industrial levels.
9. To oppose the trend, the countries would have to reduce emissions to zero by 2100.

As we see the situation has worsened and continues to worsen, highlighting the inability of the governments of the various countries to find a solution, in spite of many declarations and agreements (turned out to be useless)

3. Causes of the greenhouse effect

According with the European Commission program "*Climate Action*" (http://ec.europa.eu/clima/change/causes/index_it.htm), man has a growing influence on climate change and global temperature with activities as the burning of fossil fuels, deforestation and livestock. These activities add huge amounts of GHG to those naturally present in the atmosphere.
What are the gases able to affect the climate by increasing the greenhouse effect (i.e. letting the solar radiations - but not infrared radiation - pass through) ?
Many of these gases are present in nature, but human activity increases the concentrations of some of them in the atmosphere, in particular:

- Carbon dioxide (CO2)
- Methane (CH4)
- Nitrous oxide (N2O)
- Fluorinated gases

1) **CO2** is a GHG produced mainly by human activity (combustion, extraction and use of hydrocarbons, farms). It is responsible for 63% of the global warming caused by man. Its concentration in the atmosphere exceeds now the 40% level recorded at the start of the industrial era. The ocean has absorbed about 30% of the carbon dioxide of anthropogenic origin emitted, causing acidification of the seas.

Other GHG are emitted in smaller quantities, but grab heat much more than CO2 (sometimes a thousand times more, as fluorinated gases).

2) **Methane** is responsible for 19% of global warming emissions and nitrous oxide for 6%.
The main anthropogenic sources of methane are the extraction of fossil fuels, dams and reservoirs, digestion of livestock, rice paddies, landfills, animal manures, and biomass burning.

3) **Nitrogen oxides** are primarily a by-product of the biological process of denitrification in anaerobic environments and of the biological process of nitrification in aerobic environments, but also derives from chemical activities and combustion processes.
In recent years, human activities such as agriculture (in particular the use of fertilizers), led to a significant increase in these emissions.

4) **Fluorinated gases** are produced on an industrial scale, but the application of chloro-fluoro-carbons (CFCs) is now prohibited in most countries according to the 1987 Montreal Protocol on substances altering the ozone layer.

Thus, to reduce GHG is necessary to limit/eliminate fossil fuels, to reduce all types of combustion, to improve energy efficiency and to use renewable sources, to pay attention to the type of industrial production, to promote more sustainable mobility, to transform agriculture from a source of GHG in a system aimed to accumulate and retain these gases, to change/reduce intensive farming and to consume less animal products, to avoid further deforestation.

4. Climate change and human health

The climatic changes, together with the progressive loss of biodiversity and the increase in toxic and climate-altering emissions, have now reached critical levels, and pose a serious threat to human health on a global level.

According to World Health Organization, the expected effects on health, particularly those due to the gradual warming of the planet, are considered among the most important health problems that need to be addressed in the next decades[5].

The heat wave in Europe in 2003 caused an estimated 70,000 excess deaths in 12 European countries, with greater effects reported in France, Germany, Spain and Italy, in particular for cardiovascular and respiratory disease[6].

In Kenya has been demonstrated, by examining changes since 1975, a correlation between the local climatic changes (increase in atmospheric temperatures, reduced rainfalls) and growth interruption in children, with enormous risks in terms of food needs and safe nutrition in case of further growth of population, temperature and drying[7].

There are well-defined relationships between high-air temperatures, morbidity and mortality [8], and there are substantial scientific evidences documenting an increased mortality in different geographical areas due to high temperatures as a result of climatic changes [9].

The WHO has estimated, in 2014, 250,000 possible deaths/year between 2030 and 2050 due to the the negative effects of well-known climatic changes, being aware of the possible underestimation of such forecast due to the lack of consideration of indirect economic damage effects, extreme weather events, drying, tensions and conflicts caused by the scarcity of primary resources (food, water)[10].

[5]World Health Organization G. Climate change and human health - risks and responses. Summary. Geneva: World Health Organization; 2003.

[6] Robine JM, Cheung SL, Le Roy S, Van Oyen H, Griffiths C, Michel JP et al. Death toll exceeded 70, 000 in Europe during the summer of 2003. Comptes rendus biologies 2008; 331: 171-8.

[7]Grace K, Davenport F, Funk C and Lerner A. Child malnutrition and climate in Sub-Saharian Africa: an analysis of recent trends in Kenya. Appl Geogr 2012; 35: 405-13

[8]Astrom C, Orru H, Rocklov J, Strandberg G, Ebi KL and Forsberg B. Heat-related respiratory hospital admissions in Europe in a changing climate: a health impact assessment. BMJ open 2013; 3.

[9]Smith KR, Woodward A and Campell-Lendrum D. Human health - impacts adaptation and co-benefits. . Climate change 2014: impacts, adaptation, and vulnerability Working Group II contribution to IPPC 5th Assessment Report. Cambridge, UK and New York, NY, USA; 2014.

[10]Hales S, Kovats S, Lloyd S and Campbell-Lendrum D. Quantitative risk assessment of the effects of climate change on selected causes of death, 2030s and 2050s. Geneva: World Health Organization; 2014.

The climate has important consequences on food safety and health influencing agriculture, livestock, distribution of species and the spread of disease.

Environmental degradation, in fact, reduces water and food availability and it is likely to exacerbate malnutrition and diseases related to it.

The complexity of climatic changes and its environmental and social consequences are therefore able to generate health risks of different types, schematically classified in Table 1[11] [12].

Table 1

Causes of increased health risk from climatic changes

Risk Category	Causal mechanism
Primary	Direct biological consequences linked to heat waves, extreme weather events and high levels of temperature-dependent air pollutants (i.e. ozone).
Secondary	Risks mediated by changes in bio-physical and environmental processes and systems. In particular: food requirements, water availability, vectors of infectious diseases and (in the case of zoonoses) ecological consequences on the intermediate host.
Tertiary	Most common effects (i.e. mental health problems in communities with farming production crisis, migrations); Consequences of tensions and conflicts related to the scarcity of primary resources (water, food, wood, habitats) originated by climate changes.

[11]Butler CD and Harley D. Primary, secondary and tertiary effects of eco-climatic change: the medical response. Postgraduate medical journal 2010; 86: 230-4.

[12]McMichael AJ. Globalization, climate change, and human health. The New England journal of medicine 2013; 369: 96.

Most of the health risks result from climatic influences on social and environmental systems that affect the availability of food and water, the trend of infectious diseases and the integrity of the defences against natural disasters (natural or man-made: forests, windbreaks, dams, water drainage systems in urban areas), and the adverse consequences of altered social cohesion, migrations and conflicts [12].

No one in the world can consider himself exempt from the damage caused by climatic changes, since these have only different consequences in populations with various economic, social and physical charateristics[13] or living in different geographical areas.

Low-income populations living in remote areas are more susceptible to under-nutrition, dysentery and infectious diseases.

Those who live in coastal areas (i.e. Bangladesh) are in a high risk of storms and flooding due to the sea level rise.

In circumpolar arctic regions the risk is linked with forced variations in nutritional habits, due to the reduction (and migration) of the animal populations with increasing difficulties of access to traditional sources of food[14].

The more densely urbanized areas are at a greater risk than rural areas, and people living in urban areas are more vulnerable to climatic changes[15]. In particular, those who live in densely populated urban areas are at an high risk for:

- premature death caused by sudden heat waves or extreme weather events;
- diseases (mainly cardiovascular and respiratory) due to pollutants whose emissions are closely dependent on fossil fuels burning for air conditioning of buildings (i.e. nitrogen and carbon oxides) and from the development of secondary pollutants (i.e. ozone and secondary particulate).

It has been estimated that the acute mortality from ozone in the US could increase by 4.5% between 1990 and 2050 only due to climatic changes[16].

Furthermore, some groups are particularly exposed to the effects of climate change due to physiological or pathophysiological conditions such as pediatric age, elderly, chronic diseases or disabilities, economic and social disadvantage.

The major health risks for people living in densely urbanized areas are particularly relevant due to an expected increase in the urban population of developing countries from 2.3 billion in 2005 to

[13]McMichael AJ and Lindgren E. Climate change: present and future risks to health, and necessary responses. Journal of internal medicine 2011; 270: 401-13.

[14]Evengard B and McMichael A. Vulnerable populations in the Arctic. Global health action 2011; 4: 3-5.

[15]McMichael AJ, Wilkinson P, Kovats RS, Pattenden S, Hajat S, Armstrong B et al. International study of temperature, heat and urban mortality: the 'ISOTHURM' project. International journal of epidemiology 2008; 37: 1121-31.

[16]Knowlton K, Rosenthal JE, Hogrefe C, Lynn B, Gaffin S, Goldberg R et al. Assessing ozone-related health impacts under a changing climate. Environmental health perspectives 2004; 112: 1557-63.

about 4 billion by 2030[17].

Not to be underestimated is also the increase of diseases caused by infectious agents transmitted by vectors (i.e. mosquitoes, rodents), expanding in a direct proportion with the increase of atmospheric temperature.

Populations living in large geographical areas not adequately prepared (in terms of immunity) to face these "new" infections are considered at high risk for diseases as malaria (in particular in large areas of the African continent), encephalitis, Dengue , West Nile virus, Chikungunya (Europe, USA).

Climate change promote the spread of Dengue, causing an increment in the survival of the vector (Aedes albopictus) and its migration in geographic areas not previously endemic[18]. Based on long-term projections, it is expected that about 50-60% of the world population will live in areas at risk of Dengue transmission by the end of this century[19].

Although Europe has been free of Dengue for most of the twentieth century, the expansion of virus and carriers is likely to spread in the coming decades in those regions[20]. For the same reasons also the Chikungunya has been recently defined an "*emerging disease*" in Europe[21].

Finally, the analysis of the direct and indirect health costs generated by climate change is particularly relevant.

According to a recent study by the Stanford University[22], the "*social costs*" of CO2 emissions (all costs from health and agriculture damages, various consequences of climate change, etc.) are very high, amounting to about $ 220/ton CO2 emitted .

The European Commission has calculated that, only in the EU, reducing air pollution through political control and mitigation of climate change would generate (thanks to a reduction in the mortality) benefits estimated in 38 billion euros/year by 2050. In a broader perspective, the EC predicts that considerably reducing coal consumption would shrink the costs involved in emissions control (excluding CO2) of about 50 billion Euros by 2050[23].

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[17]UN DoEaSA, Population Division. World urbanization prospects: the 2005 revision. . 2006.

[18]Astrom C, Rocklov J, Hales S, Beguin A, Louis V and Sauerborn R. Potential distribution of dengue fever under scenarios of climate change and economic development. *EcoHealth* 2012; **9**: 448-54.

[19]Hales S, de Wet N, Maindonald J and Woodward A. Potential effect of population and climate changes on global distribution of dengue fever: an empirical model. Lancet 2002; 360: 830-4.

[20]Murray NE, Quam MB and Wilder-Smith A. Epidemiology of dengue: past, present and future prospects. Clinical epidemiology 2013; 5: 299-309.

[21]Horcada ML, Diaz-Calderon C and Garrido L. Chikungunya fever. Rheumatic manifestations of an emerging disease in Europe. *Reumatologia clinica* 2014.

[22]Moore FC and Diaz DB. Temperature impacts on economic growth warrant stringent mitigation policy. *Nature Climate Change* 2015; **5**: 127-31.

[23]Commission E. Communication from the Commission to the European Parliament, the Council, the European

The greatest benefits are expected in East Asia, with 220,000-470,000 premature deaths/year avoided by 2030, and a financial saving of 70-840 dollars/tCO2[24].
In the USA, it is estimated that the benefits (mainly in terms of health costs avoided) from policies reducing CO2 emissions can be up to ten times higher than the costs required for the implementation of these policies[25].

Stop and make reversible climate changes would therefore, also in short time intervals, improve health and reduce costs of primary and secondary current damages. Ignoring climate changes and related consequences could make the problem unsolvable.
For these reasons, a rapid turnaround should be considered a primary target for the whole world population.

Economic and Social Committee and the Committee of the Regions: a roadmap for moving to a competitive low carbon economy in 2050. . Brussels: European Commission; 2011.

[24]West JJ, Smith SJ, Silva RA, Naik V, Zhang Y, Adelman Z et al. Co-benefits of Global GHG Mitigation for Future Air Quality and Human Health. Nat Clim Chang 2013; 3: 885-9.

[25]Thompson T, Rausch S, Saari R and Selin N. A systems approach to evaluationg the air quality co-benefits of US carbon policies. Nature Climate Change 2014; 4: 917-23.

5. Role of the agriculture on climate change and effects of climate on agriculture and food

Following the ratification of the Convention on Climate Change (UNFCCC) and of the Kyoto Protocol, each member state is required to edit a national emissions inventory adopting IPCC methodology, to ensure comparability of estimates among countries.

National emissions inventory is divided into six sectors (Energy, Industrial Processes, Solvents, Agriculture, LULUCF-Land use, Land use change and Forestry and waste).

Farming sector estimates methane (CH4) and nitrous oxide (N2O) emissions for the following categories: enteric fermentation, manure management, agricultural soils, paddy fields and the burning of agricultural waste.

Emissions of these two GHGs of agricultural origin are evaluated starting from statistical indicators of activities (official statistics) and emission factors, including the peculiarities in each country.

Emissions of carbon dioxide (CO2) related to the agricultural sector are estimated and reported in the LULUCF sector.

In recent years much attention was paid to the impact on climate change of factory farming, especially cattle, owing to methane emissions produced in their intestine.

In 2009 it was published by the Worldwatch Institute an article ("*Livestock and Climate Change*"[26]) which analysed the impact of livestock animals on GHG emissions, considering the whole life cycle.

This analysis allocates to the livestock farming the 51% of GHG global emissions. It is a very high value and it is at variance with other data, including the IPCC or the FAO ones of 2006[27], which reports an incidence of 18%.

It is hard to say which of the two evaluations is more exact than the other. However, in any case, the weight of factory farming (about 1.5 billion cattle breeding, 2 billion sheep and goats and about a billion pigs, plus several million winged animals) is definitely relevant, as confirmed by an article published in Lancet in 2007[28] , which states that livestock farming is globally responsible for a fifth of GHG emissions.

Agriculture and animal husbandry are jointly responsible for climate change and this has

[26] World Watch | *Livestock and Climate Change* November/December 2009 - www. worldwatch. org/files/pdf/Livestock%20and%20Climate%20Change. pdf

[27] FAO "Livestock's role in climate change and air pollution", 2006 ftp: //ftp. fao. org/docrep/fao/010/A0701E/A0701E03. pdf

[28] Anthony J McMichael, John W Powles, Colin D Butler, Ricardo Uauy, *Food, livestock production, energy, climate change, and health,* The Lancet, September 13, 2007

implications for agricultural production.
One of the negative consequences of global warming will be, in fact, a decline in worldwide food production despite an increasing population.
Regions in which there is already a food security problem will bump into hardest difficulties, causing problems for farmers, fishermen and all those people who depend on forestry resources.
The 2600 pages of the IPCC report published in March 2014 contained the word "*risk*" for 230 times, most of which closely related to food scarceness and risk margin of conflicts due to starvation.
While it is expected that the world population will reach 9 billion by 2050, food production will decline due to a drop in agriculture field's yield, already underway, such as wheat and corn.
A warming of 2 °C or more will be able to penalize cereals production in tropical and temperate zones, with significant differences based on regions and agronomic variety used.
A warming of more than 4°C, particularly together with an increase in demand for food, is expected to provoke bigger risks for food security in particular at low latitudes (tropical and equatorial belts).
Fishing industry will share the same fate. The catch of some marine areas will drop from 40% to 60% with serious reverberations on the livelihood of tens of island states which base their nutrition on fishing resources.
In Africa and Asia is already in progress a “land grabbing” by multinational food companies, that in the medium-long term could also be a reason of conflicts and armed rebellions.
Even the availability of groundwater and surface water, although expected to increase at high latitudes, will fall significantly in many subtropical regions currently dry (around Mediterranean too), thereby increasing the competition for direct access to water resources.
In addition, rising temperatures and presence of sediments and pollutants will threaten the quality of drinking water even with the employment of water treatment.

6. Expected scenarios and potential proposals

Scenarios provided by IPCC depend on economic and social models projected worldwide. Outlines with strong economic growth do not allow significant GHG reductions, while an evolution towards a new economic and social model pointing to information and services, with reductions in the employment of primary materials and the introduction of technologies for efficient and clean resources and for material recovering, can allow a containment in the growth of GHG and global temperature.

According to the *IPCC Report on Climate Change 2013* future scenarios are expected as follows:

-Warming expected in the period 2081-2100, as compared to 1986-2005: between 0.3°C and 4.8°C (0.3-1.7°C in the most favourable scenario, with low GHG emissions; 2.6-4.8°C in the worst scenario, with high GHG emissions).
- Heat waves more frequent and prolonged, cold waves more sporadic.
- Irregular changes in the water cycle. In high GHG emissions scenario it is expected an increase of average precipitation at high latitudes of both hemispheres and at the Pacific Equator. Possible decrement of average precipitation in temperate and subtropical regions, already dry (i.e. Mediterranean),
- Expansion of areas affected by the monsoons, whose season could be longer (more water vapour in the warmer atmosphere).
- Extreme precipitations more frequent and intense in the mid-latitude and equatorial regions.
- Further warming of oceans from the surface to the depths (0.6°C -2.0 ° C within the first 100 meters by the end of XXI century), with alteration of circulation regimens.
- Disappearance of Arctic icecap during summer after mid-century, but still uncertain scenarios.
- Reduction of glaciers volume: from 15-55% (best-case scenario) to 35-85% (worst-case scenario) by 2100.
- Reduction of areas covered by snow during springs in the Northern Hemisphere: -7% in the best-case scenario, -25% in the worst-case scenario, by 2100.
- Growth of sea levels probably between 26 and 82 cm by 2100, as compared to 1986 to 2005, in addition to the 19 cm increase already observed (larger increments due to the possible collapse of the Antarctic ice cap are not currently predictable with reasonable reliability).

Thus, the presented scenarios allow to state that even in the most favourable case there will be significant environmental, health and economic impacts.
For these reasons it is strongly needed that governments take radical and brave decisions, aware that the economic model of consumerism, of commodification and privatization of natural resources dominant in the planet is not sustainable and provides costs higher than a reversal of this tendency.

Clear and mandatory decisions are necessary to lead to a GHG reduction of at least 70% by 2050. Since most of the GHG emissions come from the combustion of non-renewable energy (mainly coal), in order to tackle climate change we must convert our entire energy system stopping extraction and use of fossil fuels with a great polluting and climate-altering power.
Renewables sources, material recovering and techniques ameliorating the energetic efficiency are already capable of replacing such fuels.

Regarding agricultural policies, we endorse requests by "*La Vía Campesina*":
"We in La Vía Campesina declare once again that Food Sovereignty – based on peasant agro-ecology, traditional knowledge, selecting, saving and sharing local adoptive seeds, and control over our lands, biodiversity, waters, and territories – is a true, viable, and just solution to a global climate crisis largely caused by multinational corporations.

To implement Food Sovereignty, however, we need far-reaching change. Among other things, we need comprehensive agrarian reforms, public procurement of peasant production, and an end to destructive free trade agreements (FTA's) promoted by multinational corporations. In short, we need justice – social, economic, political, and climate justice.

In the COP21 they promise a "universal, legally binding agreement". We in La Vía Campesina, representing about 200 million farmers in over 150 peasant organizations, call on governments to prioritize people's needs over corporate interests and agree to real climate solutions – including peasant-based food systems that cool the planet – when they meet at COP21. Corporate solutions are false solutions, and will not solve the climate crisis. Our solutions are real solutions, and should be prioritized by the UN. "

For the reasons set out so far, a reduction of environmental and health risks caused by GHG and global warming should be considered a priority target globally, to be pursued in the short term (next 5 years) through specific actions:

1. The economically more advanced countries should invest resources to reduce the impact of climate changes on health and well-being not only of their peoples but also of those living in low and middle income countries.

2. Morbidity, mortality and environmental pollution should be reduced by ensuring a rapid and progressive abandonment of pet coke and coal, also through international cooperation and agreements. This strategy should also involve currently operative plants, by a fast planning of an exit strategy from highly polluting fossil fuels.

3. All efforts should be made to promote a rapid transition to a greater energy efficiency, to reduce waste production, to improve recycle and recovering of materials, to promote biological agriculture and, above all, to promote the use of renewables, also strengthening researches in these areas.

4. To encourage the transition of urban areas to healthier and more sustainable lifestyles and consumption's models both individually and globally. Examples can be considered the construction of buildings with high energy efficiency, low-cost and high sustainable mobility plans, availability of large green areas, promotion of sustainable forms of agriculture. All these measures enhance the communities adaptive capacity and promote the reduction of urban pollution, GHG emissions and the frequency of acute and chronic diseases such as cardiovascular and respiratory diseases, but also cancer, obesity, diabetes, psychiatric and neuro-developmental illnesses.

5. To promote an adequate economic analysis of the savings (in terms of primary and secondary costs, health costs and externalities) reached through the implementation of measures aimed to reduce GHG emissions. Results should be extensively disseminated. This could contribute to a more rapid implementation of the cultural revolution necessary, in governance, to achieve climate changes interruption and regression.

6. To encourage the involvement of the Ministry of Health and of all stakeholders involved in health care (both at a local and national level) in decision making processes potentially generating climate changes and health damages.