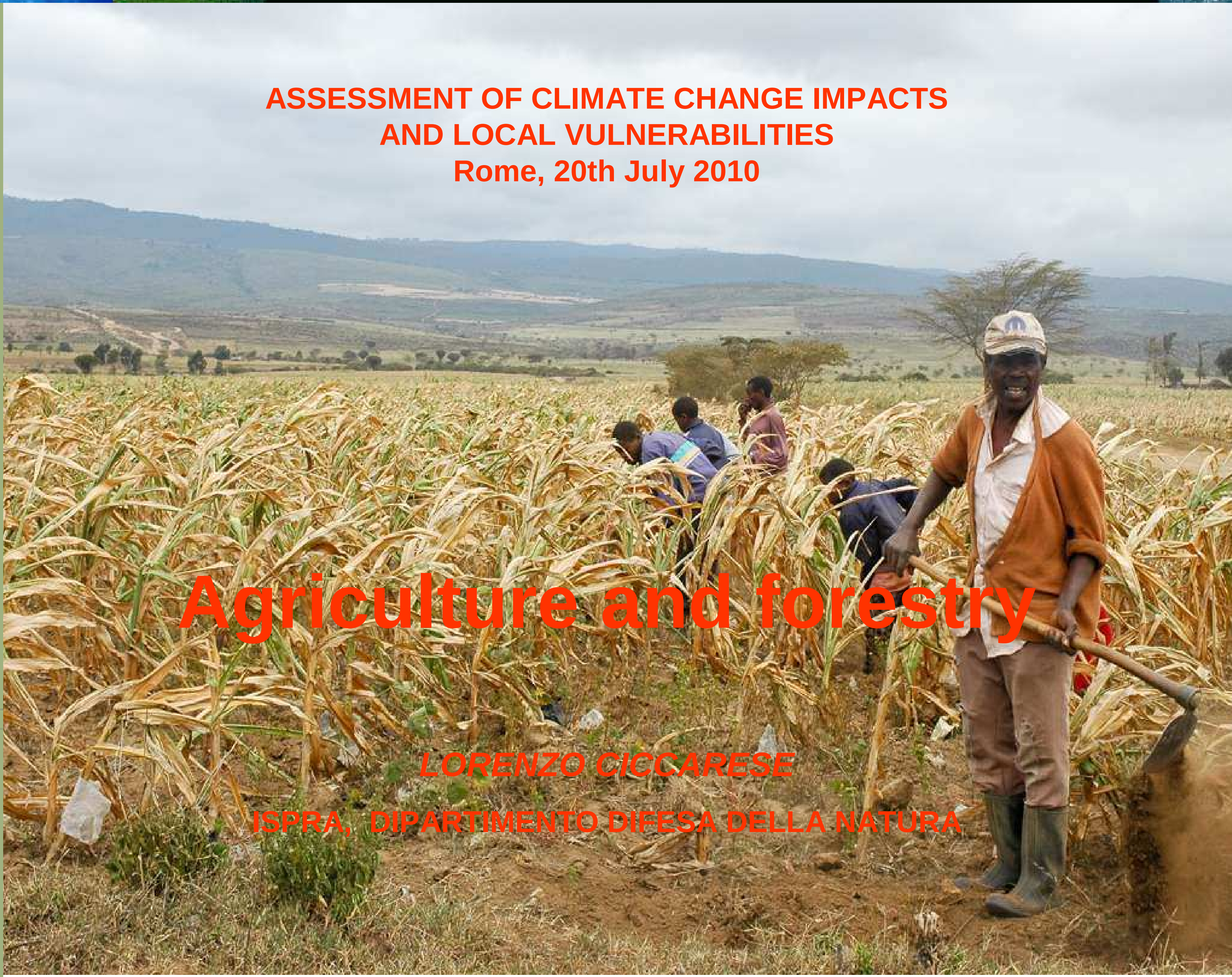
ASSESSMENT OF CLIMATE CHANGE IMPACTS AND LOCAL VULNERABILITIES
Rome, 20th July 2010



# Agriculture and forestry

*LORENZO CICCARESE*

ISPRA, DIPARTIMENTO DIFESA DELLA NATURA

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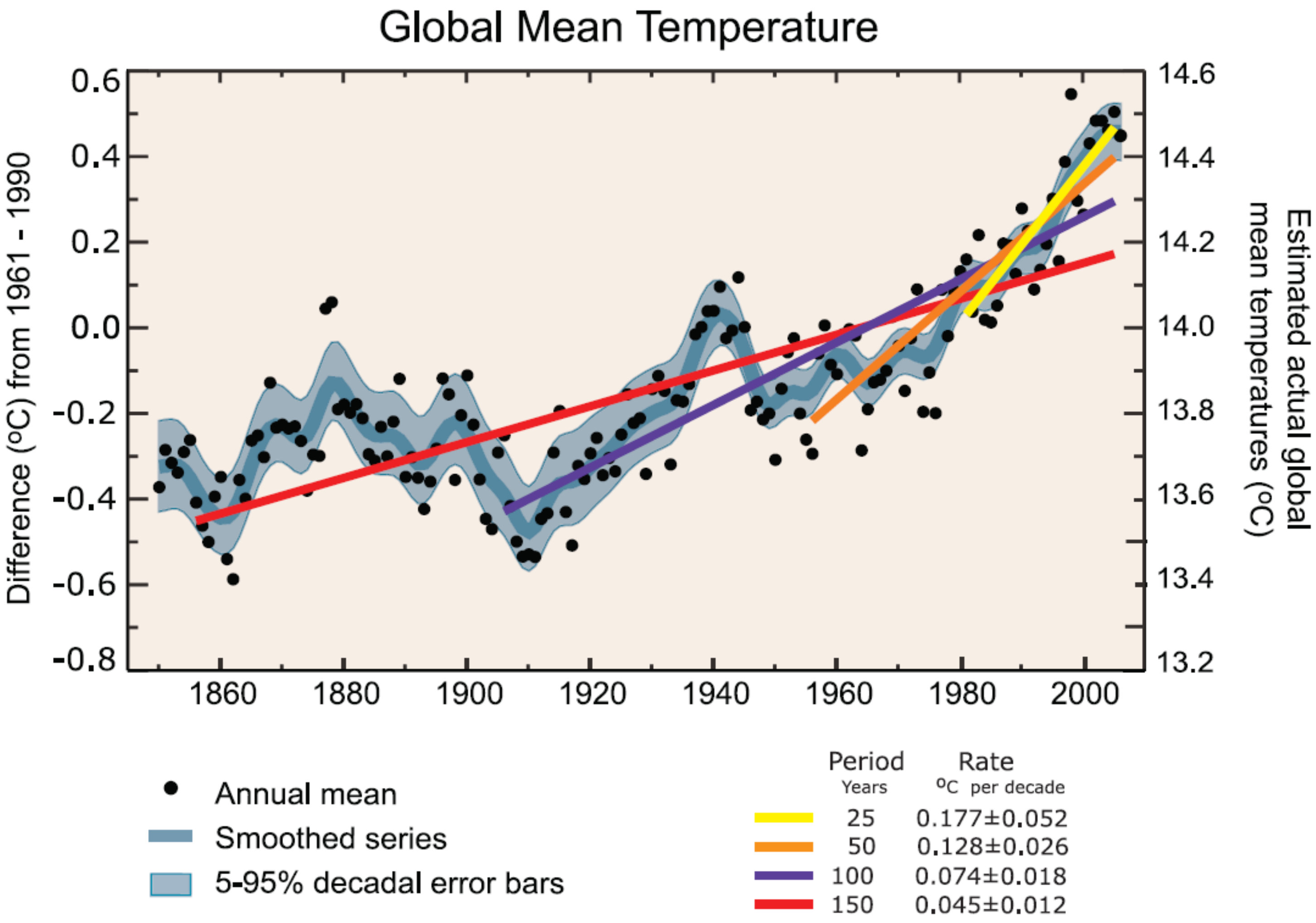
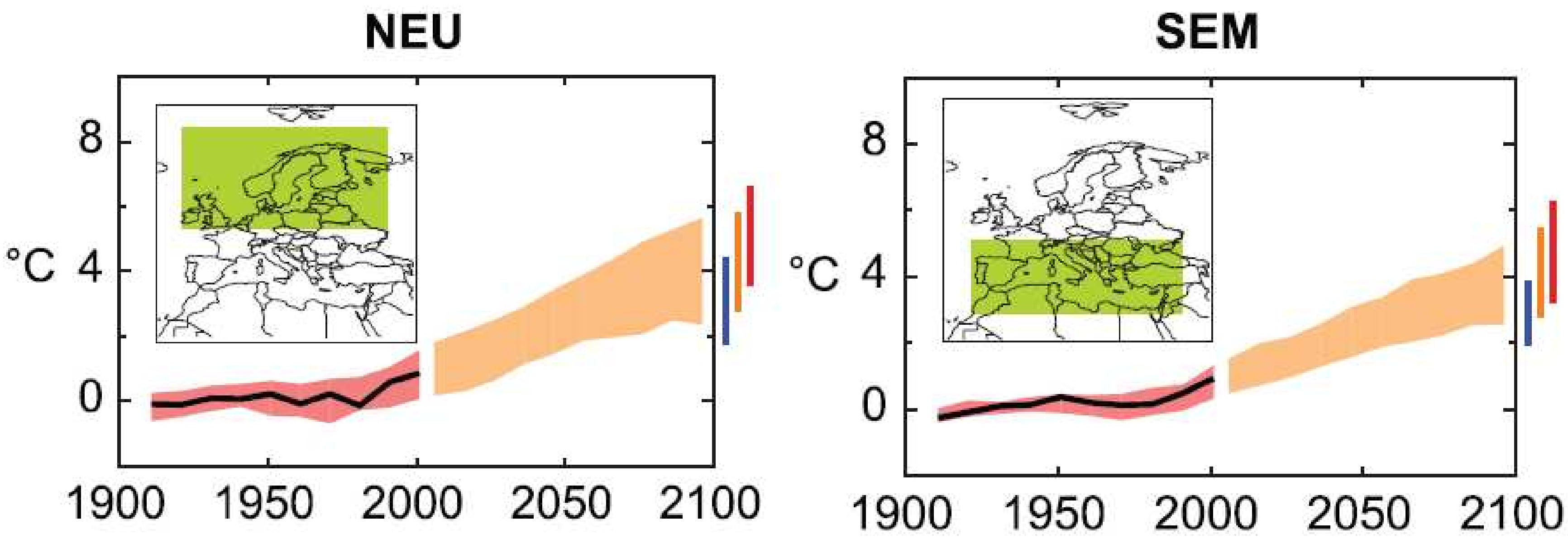

Global Mean Temperature
Difference (°C) from 1961 - 1990
Estimated actual global mean temperatures (°C)
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
14.6
14.4
14.2
14.0
13.8
13.6
13.4
13.2
1860
1880
1900
1920
1940
1960
1980
2000
Annual mean
Smoothed series
5-95% decadal error bars
Period Years
Rate °C per decade
25 0.177±0.052
50 0.128±0.026
100 0.074±0.018
150 0.045±0.012

**Anomali termiche dal 1906 al 2005 (fascia rossa) dai modelli MMD; e proiettati dal 2001 al 2100 dai modelli MMD per lo scenario IPCC A1B (fascia arancione) (IPCC FAR, 2007).**



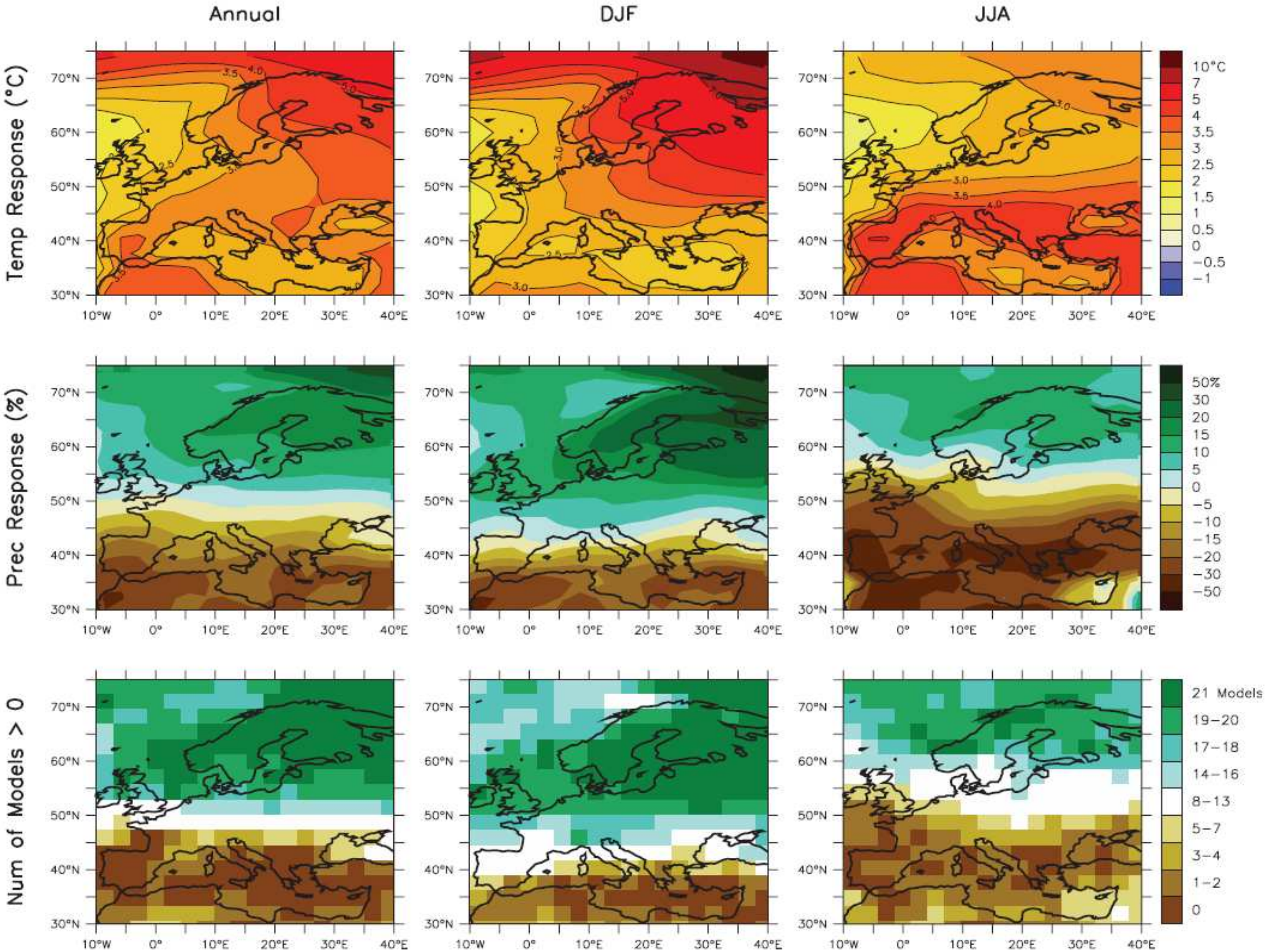



**Figure 11.5.** *Temperature and precipitation changes over Europe from the MMD-A1B simulations. Top row: Annual mean, DJF and JJA temperature change between 1980 to 1999 and 2080 to 2099, averaged over 21 models. Middle row: same as top, but for fractional change in precipitation. Bottom row: number of models out of 21 that project increases in precipitation.*

| | 1985 | 2007 | Change 1985-2007, % |
|---|---|---|---|
| Utilised Agricultural Area, ha | 15,601,000 | 12,707,486 | -18.5 |
| Forest land, ha | 8,675,000 | 10,475,658 | +20.8 |
| Irrigable agric. area, ha | 3,950,503 | 3,972,666 | +0.6 |
| GDP, % | 4.7 | 2.3 | -51.1 |
| Farm holdings, # | 3,123,344 | 1,677,766 | -46.3 |

IMPACTS

Gli impatti già osservati dei cambiamenti climatici riguardano:

•gli ecosistemi: distribuzione, composizione, struttura, funzione, fenologia, servizi ecosistemici;

•le specie: variazioni della distribuzione (migrazione verso nord e quote più elevate, contrazione del *range*), fenologia e crescita, della popolazione (temp., precipit., eventi estremi, competiz., patog. e parass., disponibilità di cibo, fecondità e riproduzione), estinzione;

•la diversità genetica.

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ne, War, and Global Warming: Food Politics : gourm...







JOCELYN C. ZUCKERMAN

# WINE, WAR, AND GLOBAL WARMING

08.20.09

What does it take to make people care about climate change? In France and the U.S., very different kinds of arguments.

wine war global warming

Can a direct appeal to our palates succeed where pleas to intellect and conscience have repeatedly come up short? That's the hope of a group of French chefs, sommeliers, and chateau owners who last week published an op-ed in the newspaper *Le Monde* calling on President Nicolas Sarkozy to ensure that strict targets on carbon emissions be adopted at the UN climate summit this December in Copenhagen. If not, they warned, the nation's vaunted wine industry will likely go up in smoke.

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# Best wines will come from Scotland if climate change is not stopped, French chefs say

Prominent French chefs have given warning that the country's wines will lose their complexity and the best produce will come from Scotland if the effects of climate change are not tackled.

By Henry Samuel in Paris
Published: 7:00AM BST 17 Aug 2009

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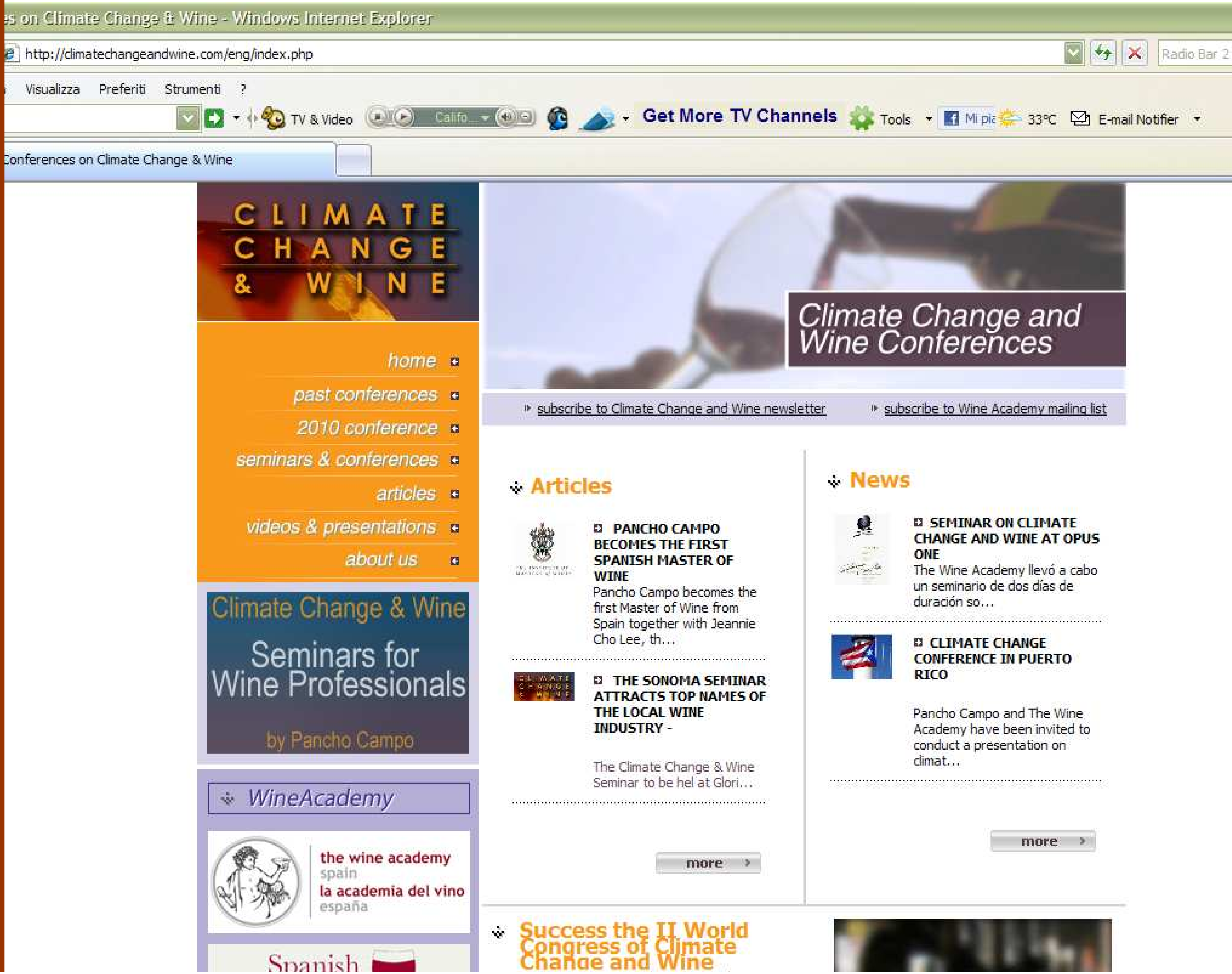

es on Climate Change & Wine - Windows Internet Explorer
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THE SONOMA SEMINAR ATTRACTS TOP NAMES OF THE LOCAL WINE INDUSTRY -
The Climate Change & Wine Seminar to be hel at Glori...
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SEMINAR ON CLIMATE CHANGE AND WINE AT OPUS ONE
The Wine Academy llevó a cabo un seminario de dos días de duración so...
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Pancho Campo and The Wine Academy have been invited to conduct a presentation on climat...
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by Pancho Campo
WineAcademy
the wine academy spain
la academia del vino españa
Spanish
Success the II World Congress of Climate Change and Wine

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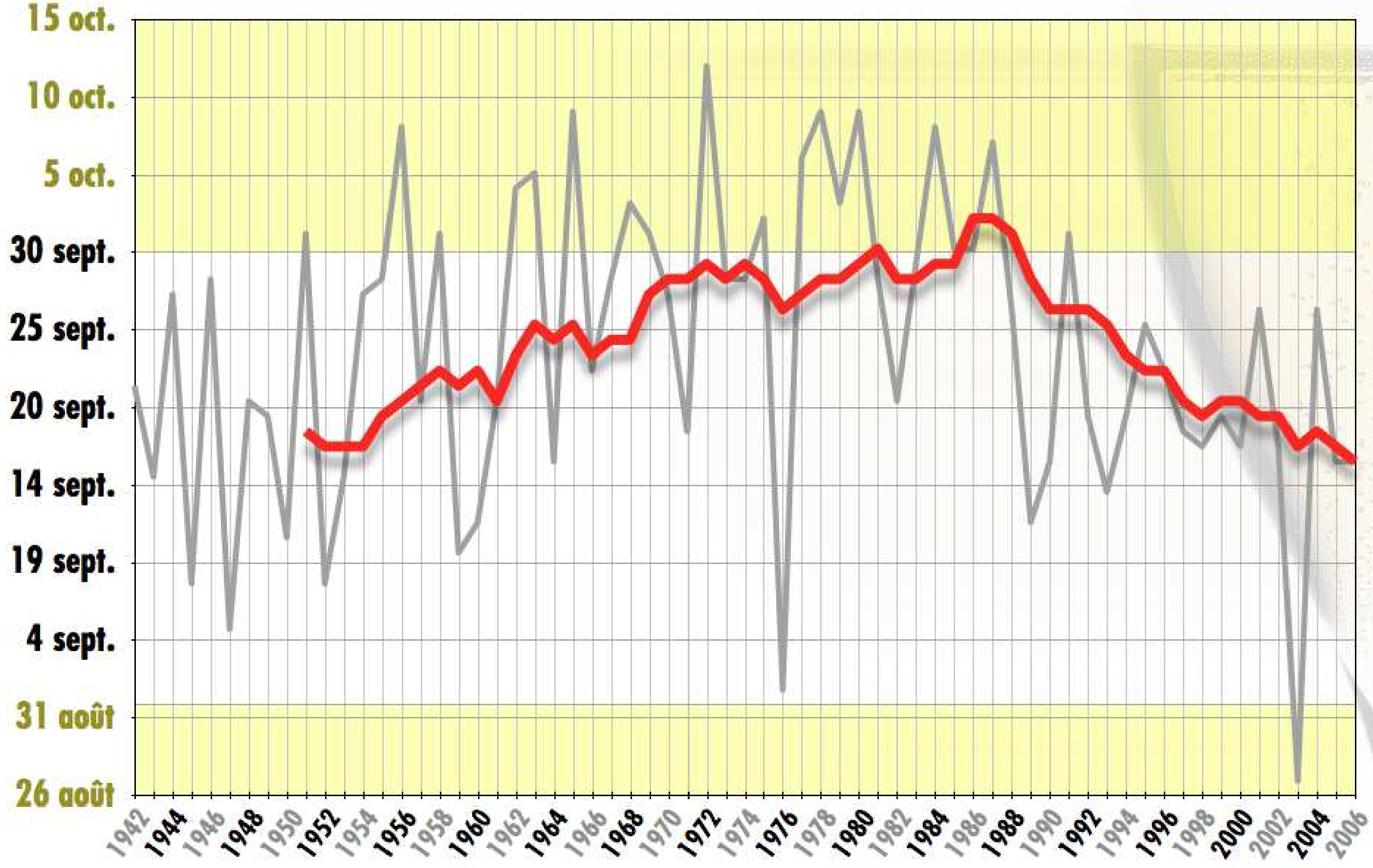
## Dates des vendanges depuis 1942



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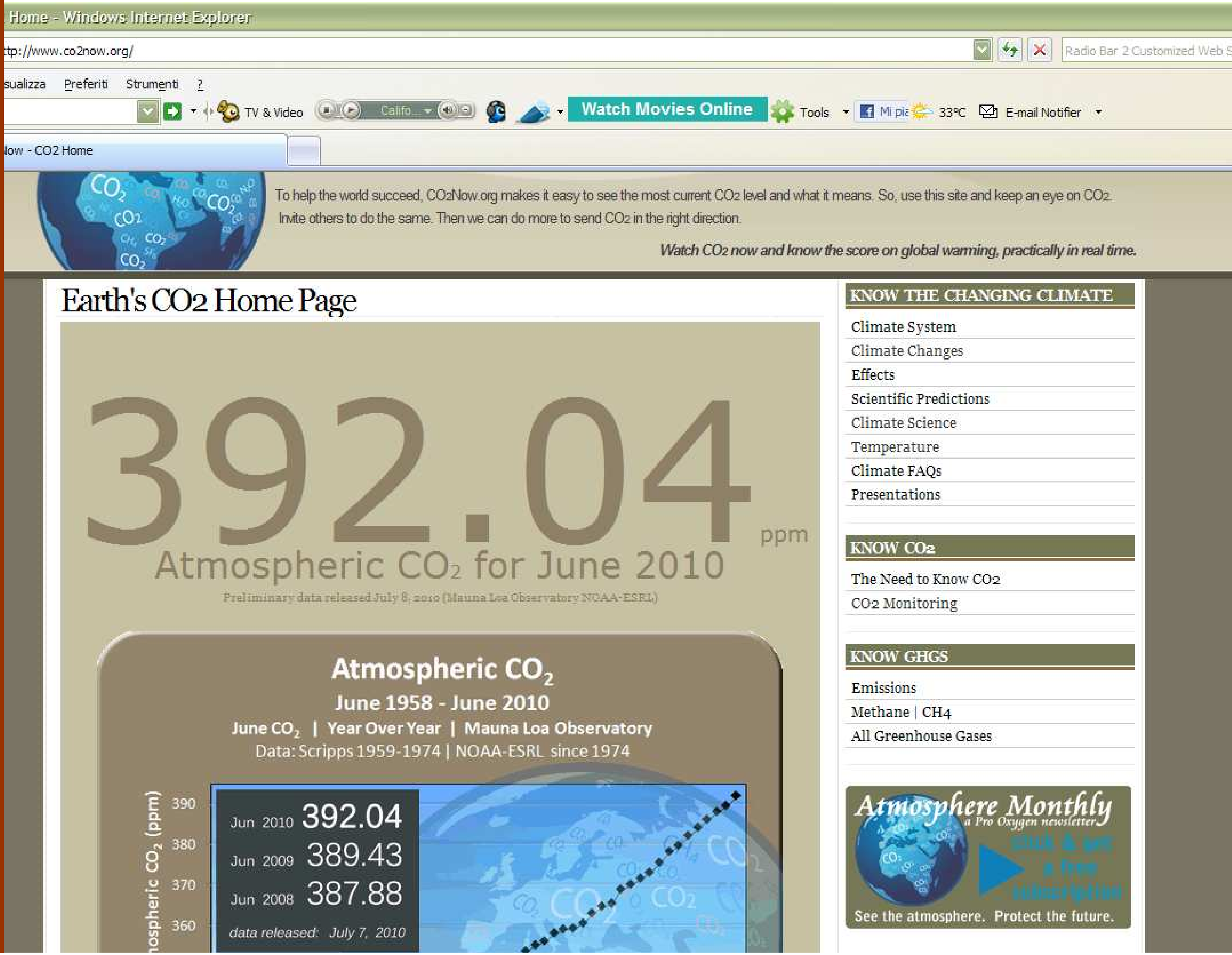
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To help the world succeed, CO2Now.org makes it easy to see the most current CO2 level and what it means. So, use this site and keep an eye on CO2. Invite others to do the same. Then we can do more to send CO2 in the right direction.
Watch CO2 now and know the score on global warming, practically in real time.
Earth's CO2 Home Page
392.04 ppm
Atmospheric CO2 for June 2010
Preliminary data released July 8, 2010 (Mauna Loa Observatory NOAA-ESRL)
Atmospheric CO2
June 1958 - June 2010
June CO2 | Year Over Year | Mauna Loa Observatory
Data: Scripps 1959-1974 | NOAA-ESRL since 1974
Jun 2010 392.04
Jun 2009 389.43
Jun 2008 387.88
data released: July 7, 2010
390
380
370
360
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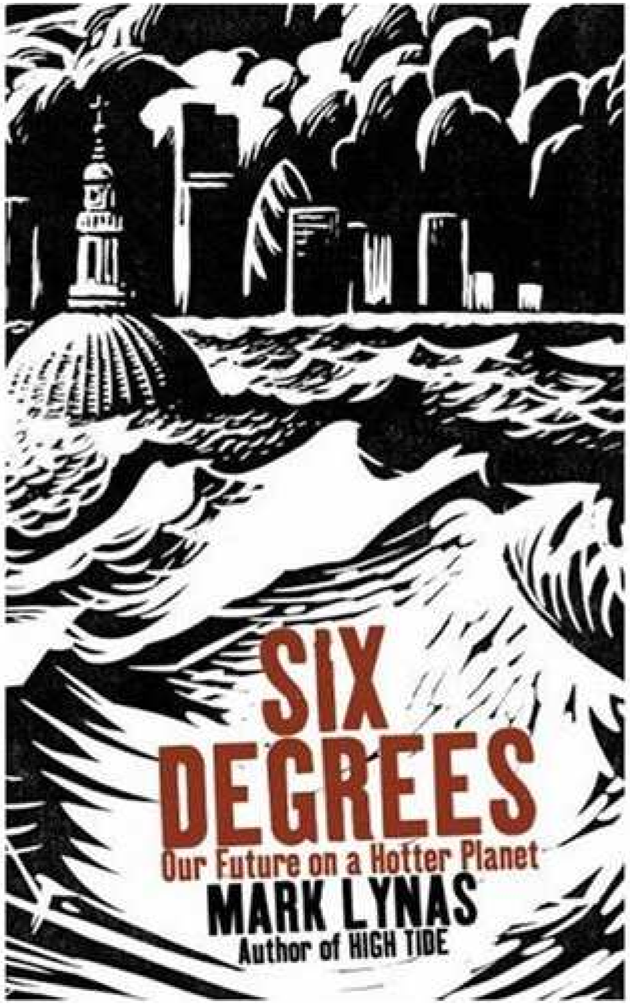
Table 1 Important cause–effect chains for carbon cycling

| No. | Rate* | Perturbation | Cause–effect chain | Strength† | Knowledge‡ |
|---|---|---|---|---|---|
| 1 | Fast | $[CO_2]$↑ | NPP ↑ ⇒ N demand ↑ ⇒ Soil N availability ↓ ⇒ NPP ↓ | Strong | High |
| 2 | Fast | N↑ | NPP ↑ | Strong | High |
| 3 | Fast | T↑ | NPP ↑ ⇒ N demand ↑ ⇒ Soil N availability ↓ ⇒ NPP ↓ | Strong | High |
| 4 | Fast | T↑ | Soil respiration ↑ ⇒ Soil carbon ↓ ⇒ Soil respiration ↓ | Strong | High |
| 5 | Fast | $[CO_2]$↑ | Allocation to roots and mycorrhiza ↑ ⇒ Soil respiration ↑ | Medium | High |
| 6 | Fast | T↑ | Turnover of fine roots ↓ ⇒? | Medium | Medium |
| 7 | Intermediate | T↑ | N mineralization ↑ ⇒ NPP ↑ ⇒ See mechanisms above | Strong | High |
| 8 | Intermediate | N↑ | Root allocation ↓ ⇒ Root litter ↓ ⇒ Soil C store ↓ | Medium | Medium |
| 9 | Intermediate | N↑ | Mycorrhizal turnover ↑ ⇒ Litter input in soil ↑ ⇒ Soil C store ↑ | Weak | Weak |
| 10 | Intermediate | N↑ | Litter N concentration ↑ ⇒ Litter decomposition rate ↑? ⇒ Soil C store ↓ | Weak | Unclear |
| 11 | Intermediate | $[CO_2]$↑ | Litter N concentration ↓ ⇒ Litter decomposition rate ↓?⇒ Soil C store ↑ | Weak | Unclear |
| 12 | Intermediate | N↑, $[CO_2]$↑ | NPP ↑ ⇒ Litter production ↑ ⇒ SOM ↑ | Weak | High |
| 13 | Intermediate | N↑ | NPP ↑ and root allocation ↓ ⇒ N uptake ↓ ⇒ NPP ↓ | Medium | Medium |
| 14 | Intermediate | $[CO_2]$↑ | NPP ↑ and root allocation ↑ ⇒ N uptake ↑ ⇒ NPP ↑ | Medium | Medium |
| 15 | Intermediate | N↑ | Soil respiration ↓ ⇒ N mineralization ↓? ⇒ NPP ↓ | Medium | Weak |
| 16 | Intermediate | N↑ | Litter decomposition rate ↑↓ ⇒ Soil C store ↓↑ | Medium | Weak |
| 17 | Slow | N↑ | SOM decomposition rate ↓ ⇒ Soil C store ↑ | Medium | Weak |

*Rate at which cause–effect chains respond: fast, within-year; intermediate, a few years; slow, decades; very slow, centuries.
†Strength of the effects.
‡Knowledge of the links in the chain.
NPP, net primary production; SOM, soil organic matter.


SIX DEGREES
Our Future on a Hotter Planet
MARK LYNAS
Author of HIGH TIDE

Climate change impacts can be roughly divided into two groups:

*biophysical impacts*:

■ physiological effects on crops, pasture, forests and livestock (quantity, quality);
■ changes in land, soil and water resources (quantity, quality);
■ increased weed and pest challenges;
■ shifts in spatial and temporal distribution of impacts;
■ sea level rise, changes to ocean salinity;
■ sea temperature rise causing fish to inhabit different ranges.

*socio-economic impacts*:

■ decline production and supply of other ecosystem services;
■ reduced marginal GDP from agriculture;
■ exodus from rural areas food insecurity.

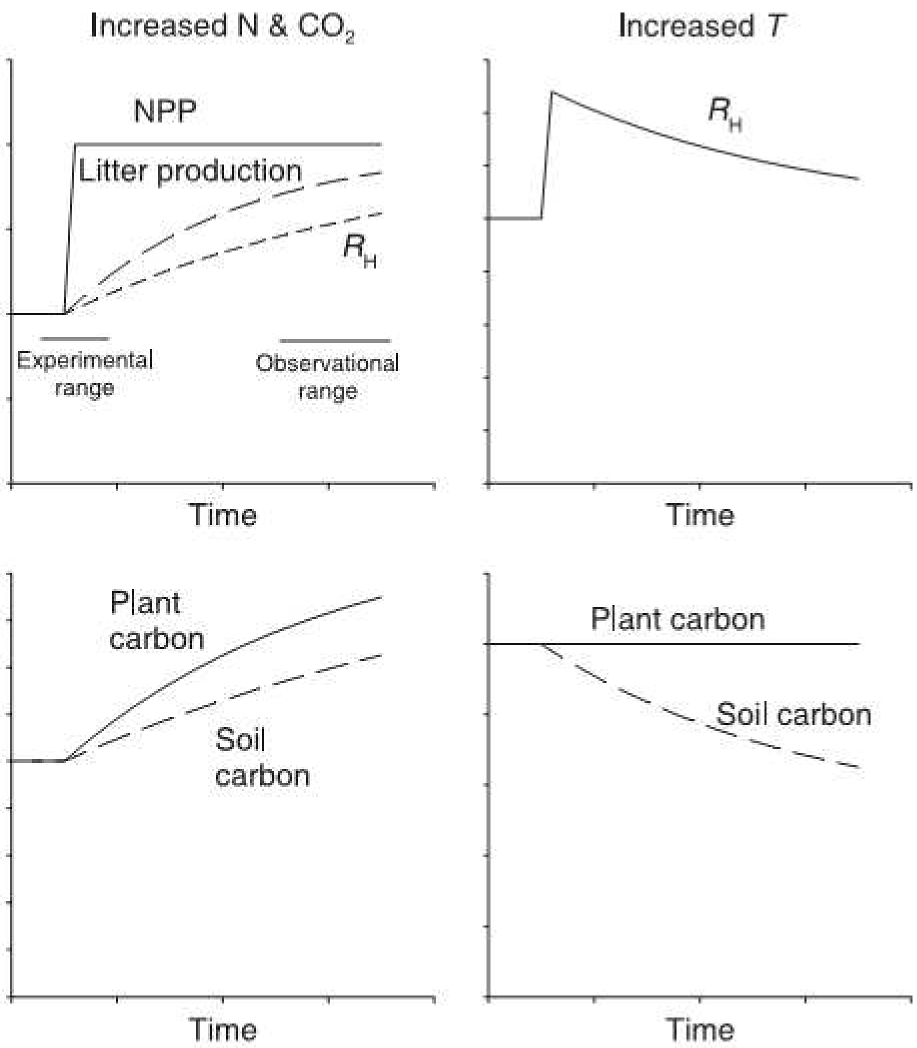



**Fig. 4** Qualitative responses of net primary production (NPP), litterfall, heterotrophic respiration ($R_H$), and plant and soil carbon pools to step changes in [$CO_2$], nitrogen and temperature ($T$).

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**Table 12.4.** *Summary of the main expected impacts of climate change in Europe during the 21st century, assuming no adaptation.*

| Sectors and Systems | Impact | North | Atlantic | Area Central | Mediterr. | East |
|---|---|---|---|---|---|---|
| Water resources | Floods | ↓↓ | ↓↓ | ↓↓ | ↓ | ↓↓↓ |
| | Water availability | ↑↑ | ↑↑ | ↓ | ↓↓↓ | ↓↓ |
| | Water stress | ↑↑ | ↑↑ | ↓ | ↓↓↓ | ↓↓ |
| Forest, shrublands and grasslands | Forest NPP | ↑↑↑ | ↑↑ | ↑ to ↓ | ↓ | ↑ to ↓ |
| | Northward/inland shift of tree species | ↑↑↑ | ↑↑ | ↑↑ | ↑ to ↓ | ↓↓ |
| | Stability of forest ecosystems | ↓↓ | ↓ | ↓ | ↓↓↓ | ↓↓↓ |
| | Shrublands NPP | ↑↑↑ | ↑↑↑ | ↑ | ↓↓↓ | ↓↓ |
| | Natural disturbances (e.g., fire, pests, wind-storm) | ↓ | ↓ | ↓ | ↓↓↓ | ↓↓ |
| | Grasslands NPP | ↑↑↑ | ↑↑ | ↑ to ↓ | ↓↓↓ | ↑ |
| Agriculture and fisheries | Suitable cropping area | ↑↑↑ | ↑↑ | ↑ | ↓↓ | ↓ |
| | Agricultural land area | ↓↓ | ↓↓ | ↓↓ | ↓↓ | ↓↓ |
| | Summer crops (maize, sunflower) | ↑↑↑ | ↑↑ | ↑ | ↓↓↓ | ↓↓ |
| | Winter crops (winter wheat) | ↑↑↑ | ↑↑ | ↑ to ↓ | ↓↓ | ↑ |
| | Irrigation needs | na | ↑ to ↓ | ↓↓ | ↓↓↓ | ↓ |
| | Energy crops | ↑↑↑ | ↑↑ | ↑ | ↓↓ | ↓ |
| | Livestock | ↑ to ↓ | ↓ | ↓↓ | ↓↓ | ↓↓ |
| | Marine fisheries | ↑↑ | ↑ | na | ↓ | na |

Alcamo, J., J.M. Moreno, B. Nováky, M. Bindi, R. Corobov, R.J.N. Devoy, C. Giannakopoulos, E. Martin, J.E. Olesen, A. Shvidenko, 2007: Europe. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 541-580.

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http://peseta.jrc.ec.europa.eu/

## Crop yield changes under the ECHAM4/ RCA3 A2 scenarios [%]

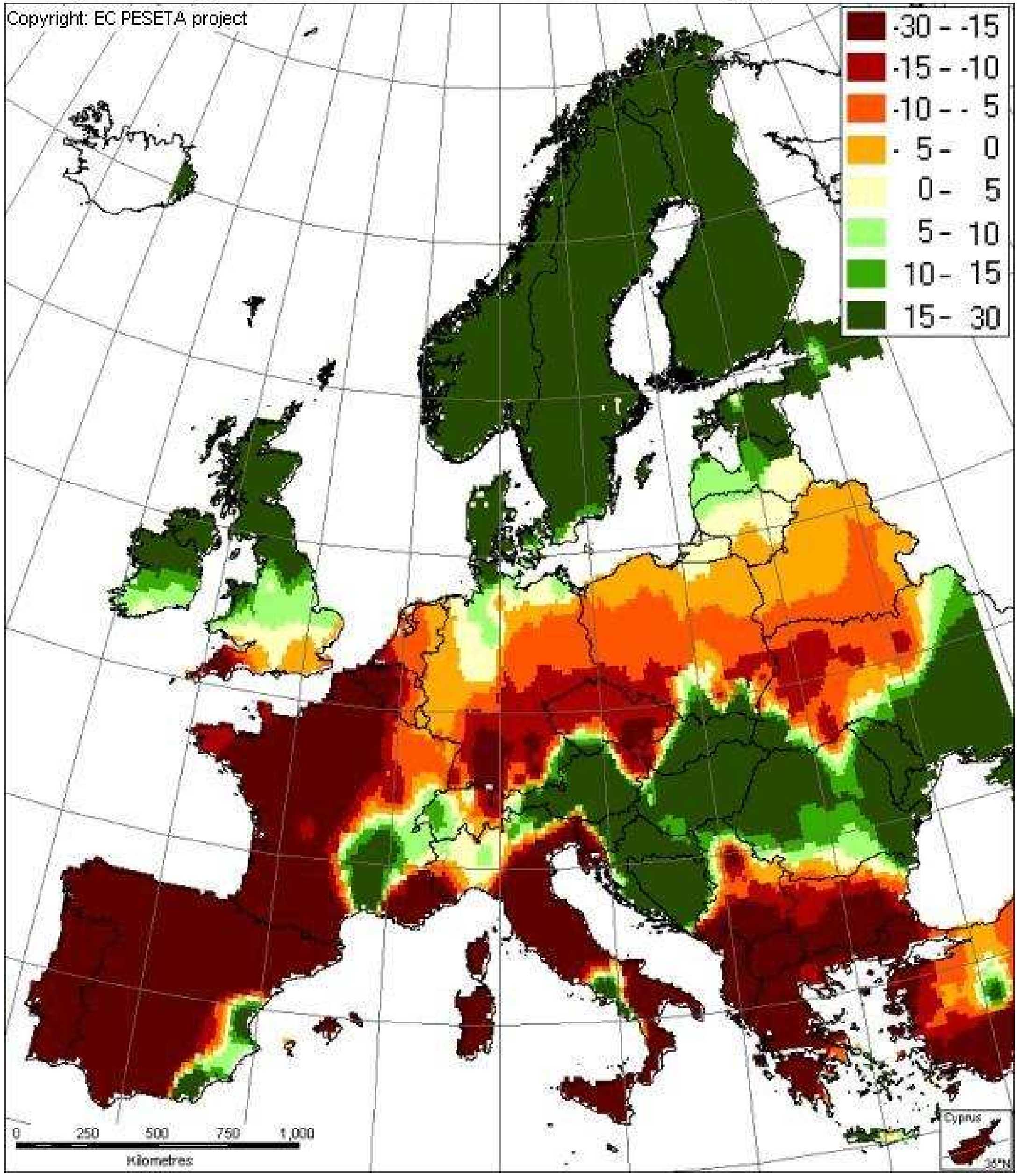
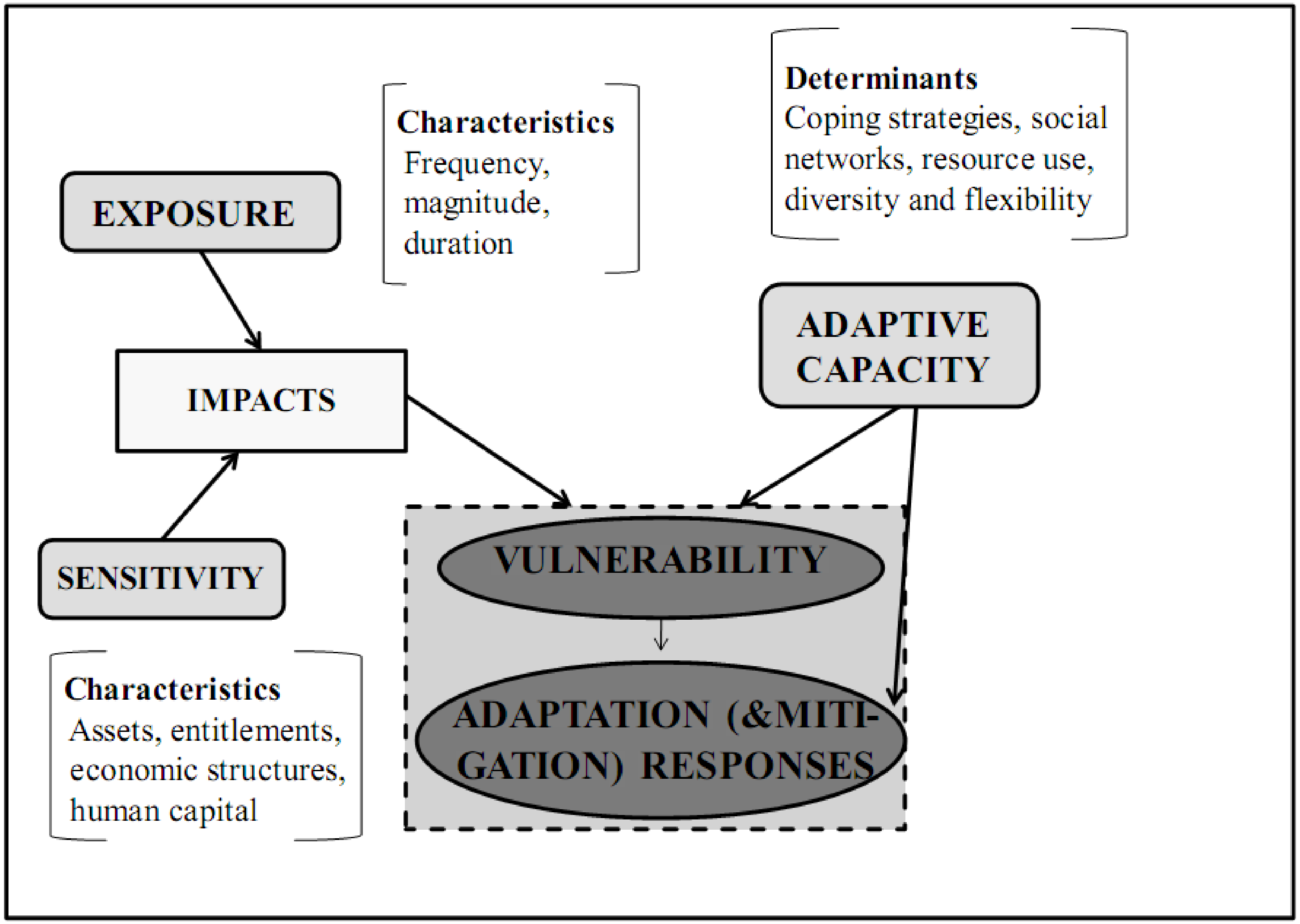


**Figure 1. Vulnerability framework**




**Fonte: International Food Policy Research Institute, 2009**

## Vulnerability

Vulnerability is the degree to which a *system* is susceptible to, and unable to cope with, adverse effects of *climate change*, including *climate variability* and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its *sensitivity*, and its *adaptive capacity*.

## Sensitivity

Sensitivity is the degree to which a system is affected, either adversely or beneficially, by *climate variability* or change. The effect may be direct (e.g., a change in crop yield in response to a change in the mean, range or variability of temperature) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to *sea-level rise*).

## Adaptive capacity (in relation to climate change impacts)

The ability of a system to adjust to *climate change* (including *climate variability* and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

## Adaptive capacity

The whole of capabilities, resources and institutions of a country or *region* to implement effective *adaptation* measures.

***Exposure***

Exposure relates to the degree of climate stress upon a particular unit of analysis.

In this work, exposure is represented by:

1. Frequency of climate extreme events (droughts and floods, episodes of high relative humidity, frost, and hail can also affect yield and quality of fruits and vegetables) and climate-related biotic and abiotic stresses (forest fire, etc.).
2. Predicted change in temperature and precipitation by 2050

***Sensitivity***

1. Irrigation rate
2. Land degradation index
3. Crop diversification index:
4. Percent small-scale holdings
5. Rural population density

***Adaptive capacity***

1. Inherent biological adaptive capacity of crops (annual crops better than perennial, gamic better than agamic)
2. Farm organization
3. Technical skills (percentage of agriculturalist living in the study area)
4. Access to credit
5. Farm income
6. Farm holding size
7. Share of agriculture GDP
8. Farm assets
9. Infrastructure index

Vulnerability of a given agricultural or sylvicultural system depends on its **exposure** and **sensitivity**, which combined provides the potential impact and the potential for effectively coping with the impacts and associated risks.

Vulnerability may be formulated mathematically as follows:

**V = f (I – AC)**

where **V** is vulnerability, **I** is potential impact, and **AC** is adaptive capacity.

A higher adaptive capacity is associated with a lower vulnerability, while a higher impact is associated with a higher vulnerability.

Having considered the theoretical determinants of local farming sector vulnerability and selected appropriate indicators, we must now carry out a form of **standardization** to ensure that all the **indicators are comparable**.

Based on the method in the UNDP's Human Development Index, all of the variables in the vulnerability indices are normalized to a range of 0 to 100.

The values of each variable are normalized to the range of values in the data set by applying the following **general formula**:

$$\text{Index value} = \frac{(\text{Actual value} - \text{minimum value}) * 100}{(\text{Maximum value} - \text{minimum value})}$$

To ensure that high index values indicate high vulnerability in all cases, we reverse the index values by using [100 – index value] for indicators hypothesized to decrease vulnerability.

After standardizing the data, we next attach weights to the vulnerability indicators.

A review of the literature indicates that **three methods are used to assign weights to indicators**:

1. expert judgment
2. arbitrary choice of equal weight and
3. statistical methods such as principal component analysis or factor analysis.

CONCLUSIONS

- Need to adapt to a changing climate (temperatures increases, changing amount of available water, increased frequency and intensity of extreme weather events and rises in sea level and saline intrusion in the coastal zones of the peninsula and islands)
- autonomous (ex.: reaction of a farmer) and planned adaptation (conscious policy options or response strategies
- adaptation is a risk-management strategy that has costs and is not fail-safe
- adaptation measures that are able to incorporate biodiversity conservation and mitigation planning, to obtain 'win-win-win' strategies
- Assessment of vulnerability is key (exposure, sensitivity, and adaptive capacity).
- The environmental and socio-economic indicators to be identified have to reflect these three components of vulnerability.
- The approach to be followed should combine exposure with sensitivity to give the potential impact, which is then compared with the adaptive capacity to yield an overall measure of vulnerability
- Principal component analysis has to be used to generate weights for the different indicators, and an overall vulnerability index has to be proposed.

Foto di Paolo Orlandi