# Climate change: facts with impacts on the Mediterranean

## Setting the framework of the meeting

**Regional Workshop**

**for Members of Parliaments, Media and Stakeholders**

on Climate Change Adaptation in the Mediterranean Coastal Area

**Prof. Michael Scoullos**

# Setting the framework of the meeting

*Our vision is for a more "water-energy -food-ecosystem" secure Mediterranean for all its inhabitants in the present and future generations*

To approach that, in this session, we will examine the following issues:

-The concept of "nexus"
-The Climate Change (CC) evidences, globally with some highlights concerning the Mediterranean
-The evolution of the CC negotiations in view of the COP 21 in Paris

• It is very important to understand that CC is not only about energy (mostly associated with mitigation), but also with water (usually associated with adaptation) .

• Mitigation and adaptation are the two sides of the same coin.

# The water energy nexus is directly linked to the issue of climate change

Energy use is at the source of the problem

Water availability is reduced as a consequence of the problem

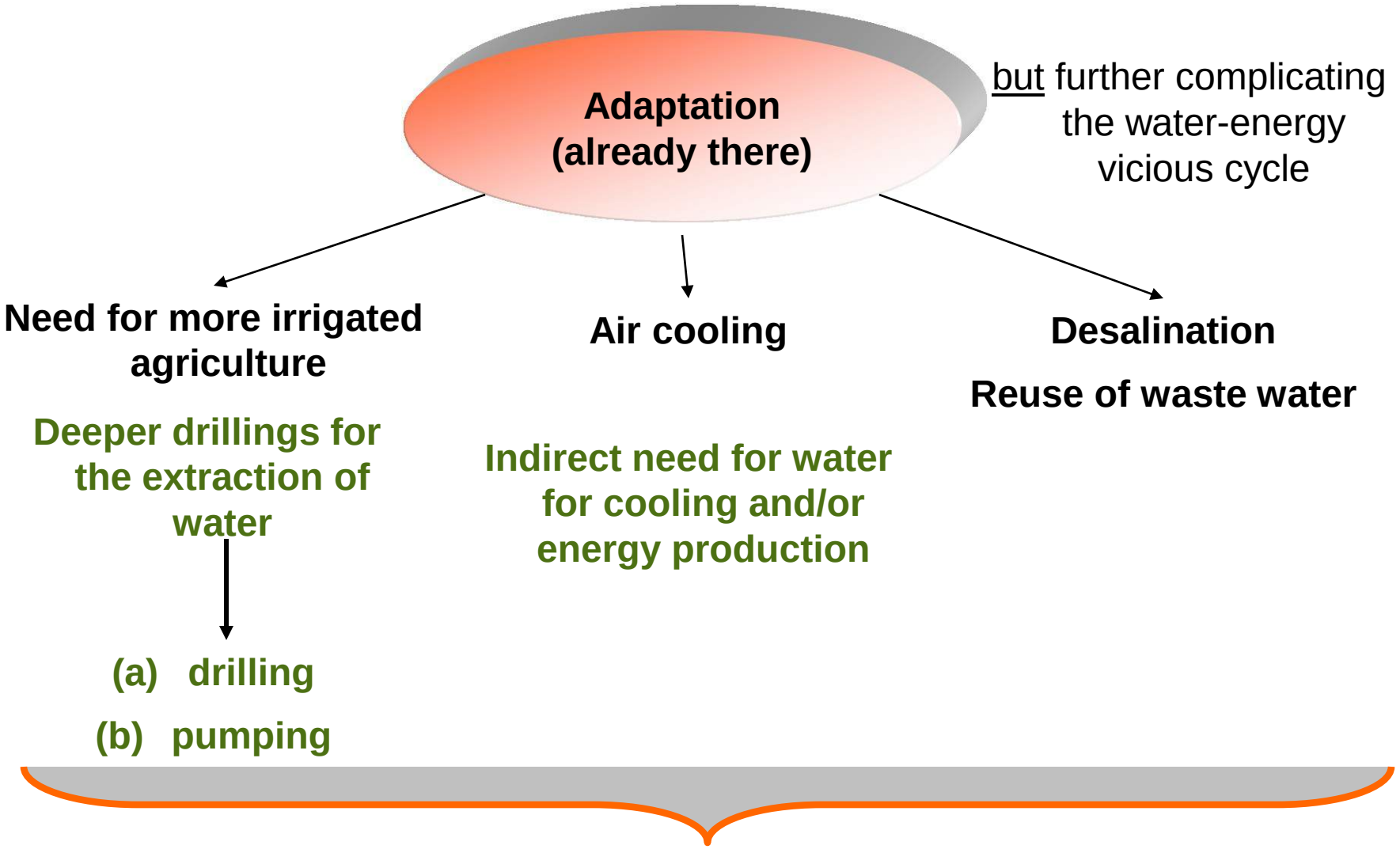

**Energy is Required to Make Use of Water:**

For humans to take advantage of water resources, energy from some source is needed to lift, move, process and treat the substance at every phase of its extraction, distribution and use.

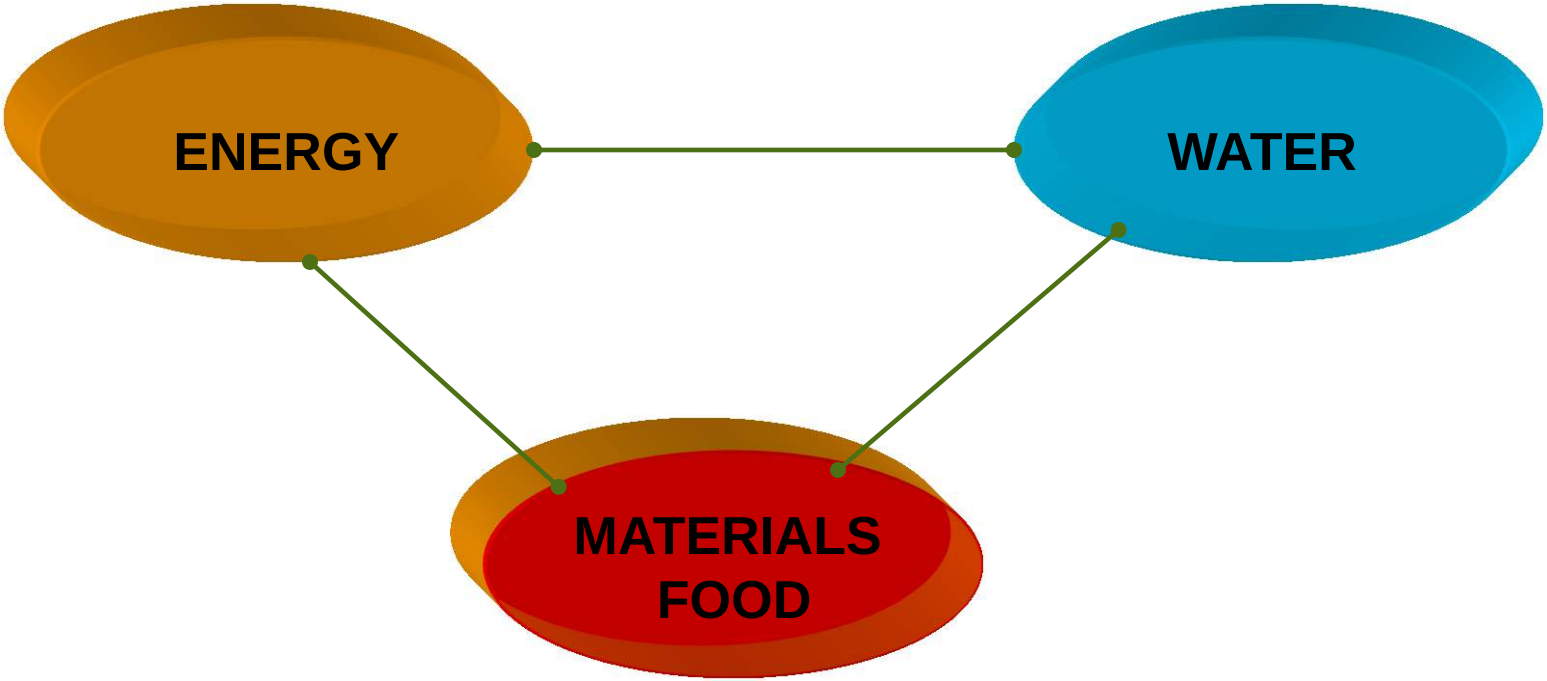
**Water is Needed to Make Use of Energy:**

Water is also used in the generation of most forms of traditional turbine-produced electricity. Sometimes water is a direct input to the energy generation process, for example in the case of hydropower or geothermal energy. Much more often it plays a role at various intermediate phases of electricity generation (cooling, etc).

# *Ad hoc* Adaptation to CC is already taking place affecting the water energy nexus

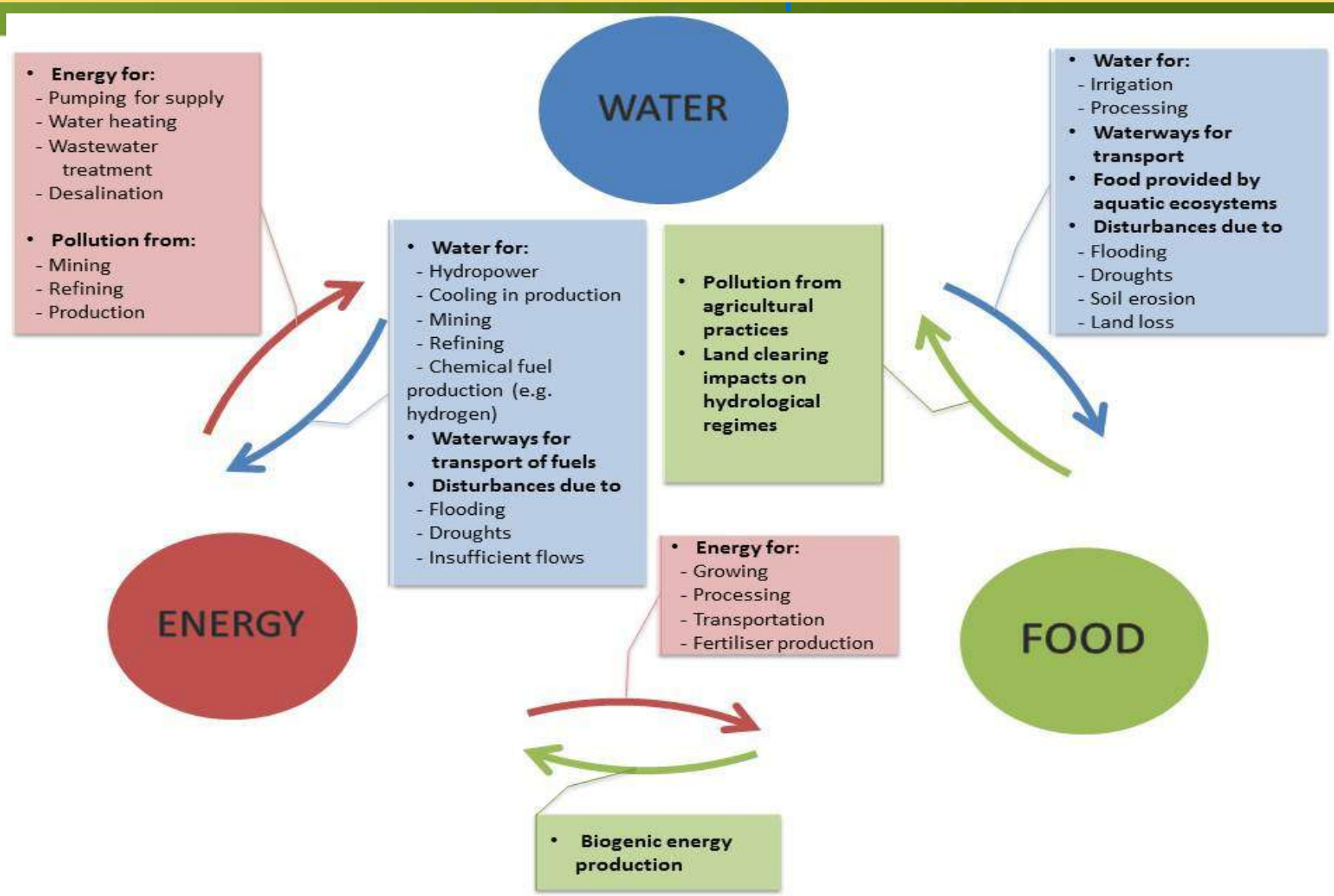


# The water energy nexus is extended…
# CC is threatening security of all its aspects




This is even more visible in coastal areas where impacts affect fresh and brakish surface and ground waters and ecosystems

# The entire 'nexus' of energy, water, material/food and ecosystem security is threatened by CC




Ecosystems security

GWP-Med, 2013

# Root causes of “nexus” insecurity

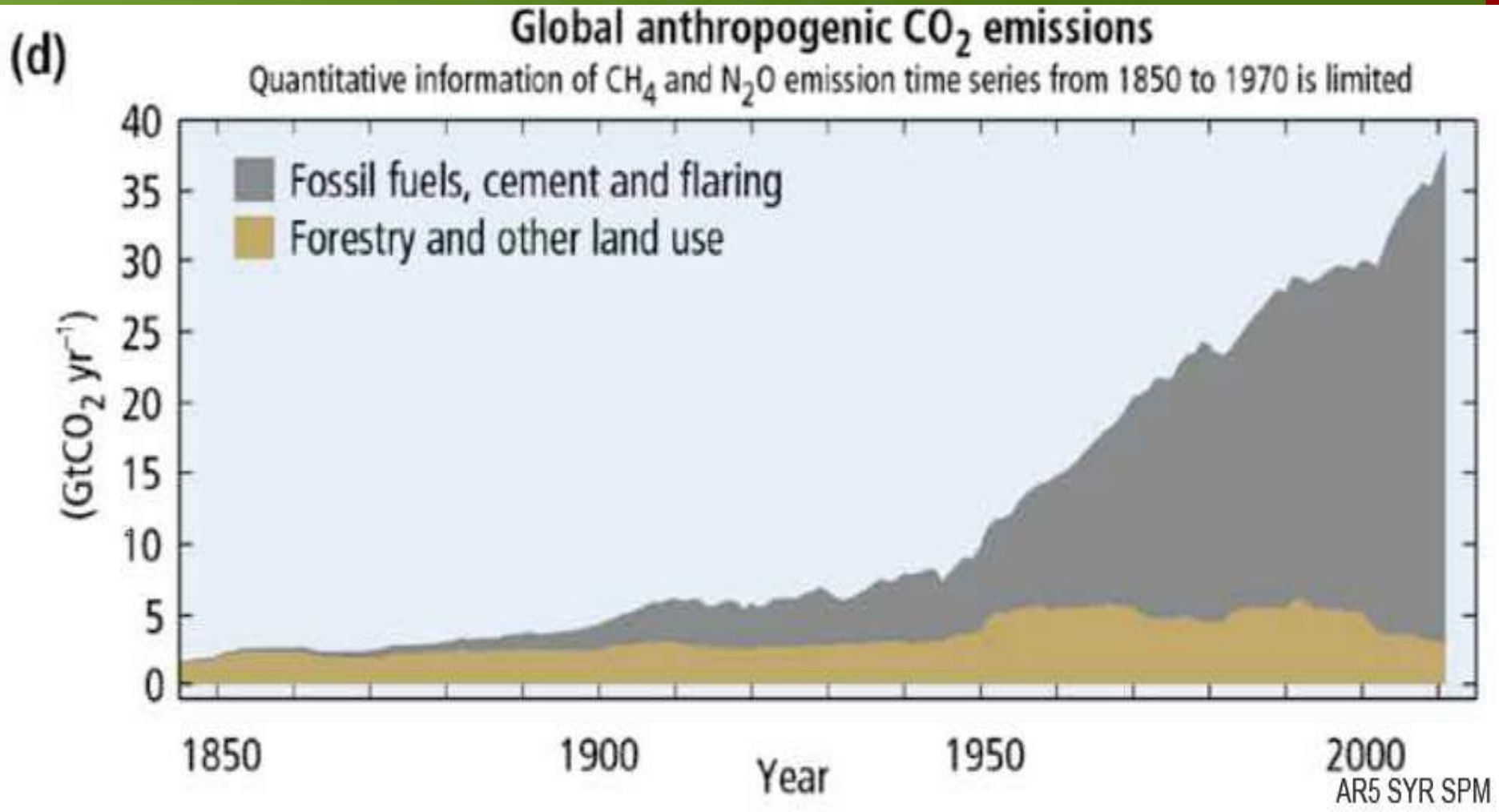
**Water-energy-material/food-ecosystem insecurity** and **risks** are increasing rapidly particularly in deltaic systems an coastal areas, due to:

– Increasing climate variability and global warming from natural and anthropogenic causes

But also:

– Population growth
– Economic growth in many countries and stagnation in others
– Rapid changes in lifestyle
– Uneven distribution of availability of water & energy resources

# The “nexus” of food, energy, water and ecosystem security is exacerbated by climate change



# Potential Impacts of Climate Change

Food and water shortages

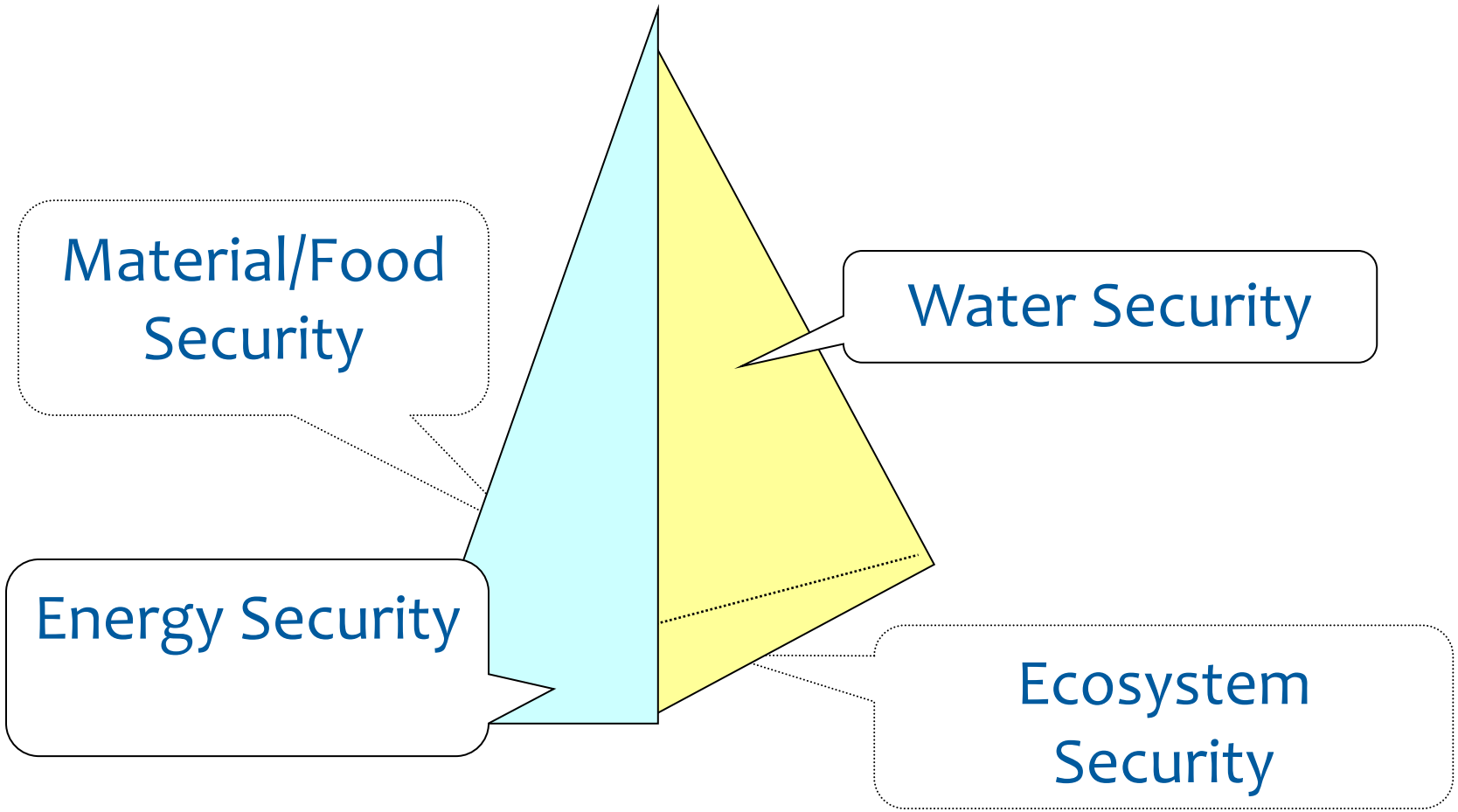
Increased displacement of people

Increased poverty

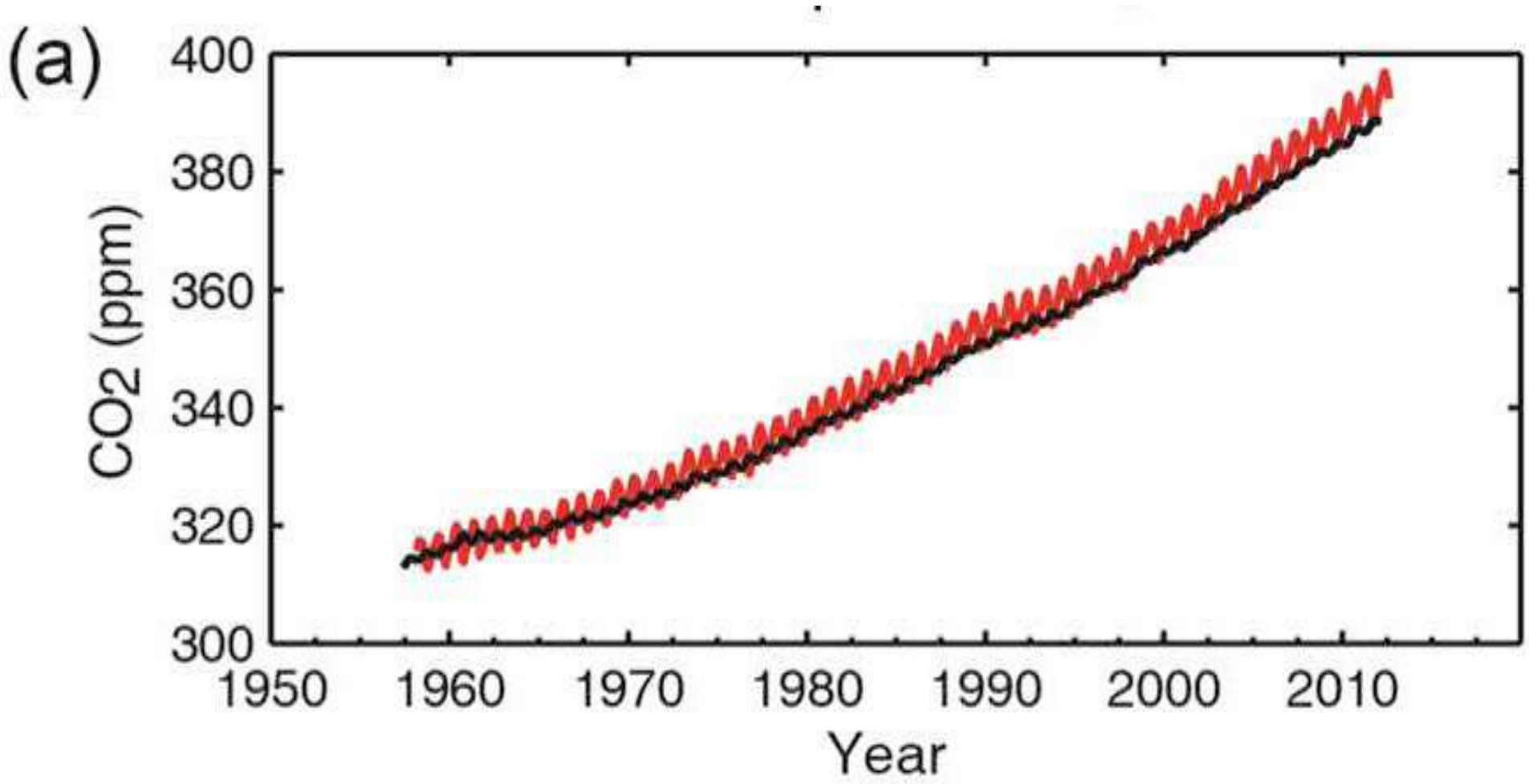
Coastal flooding

AR5 WGII SPM

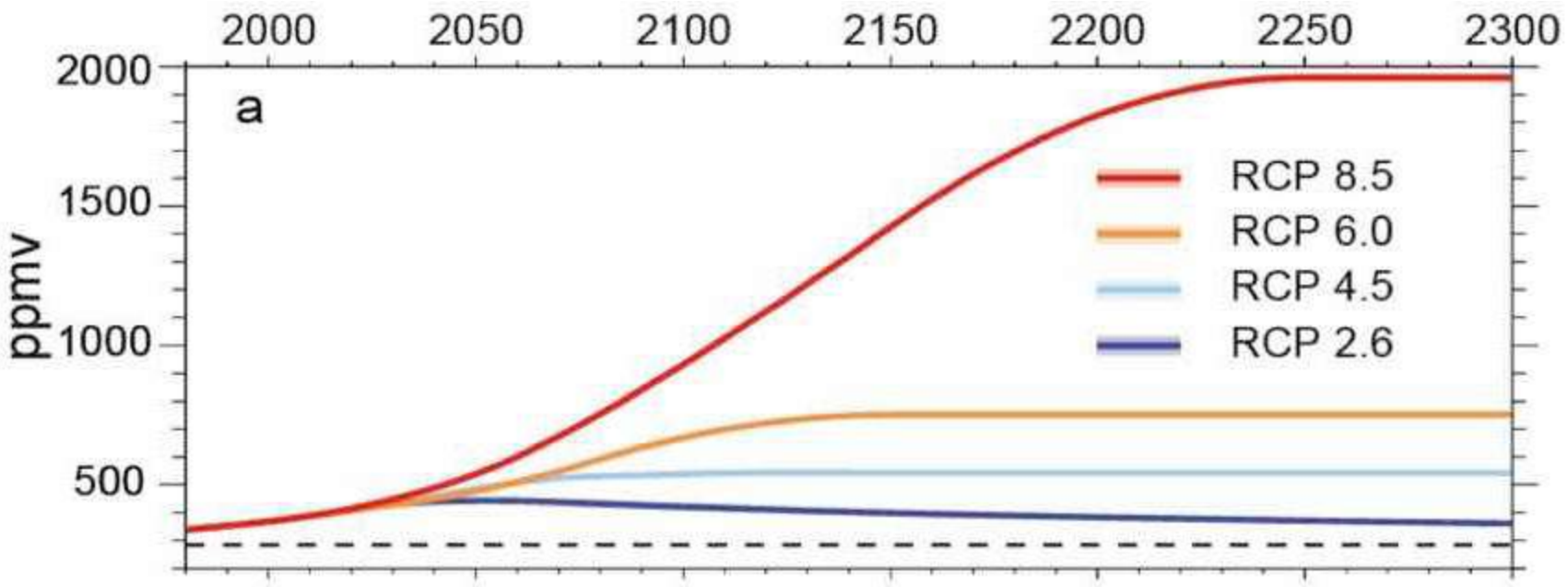
# The ‘nexus’ of food, energy, water and ecosystem security is affected by climate change: the risks increase in all cases (differentiated according to the mitigation scenaria)



# Evolution of the $CO_2$ content in the atmosphere

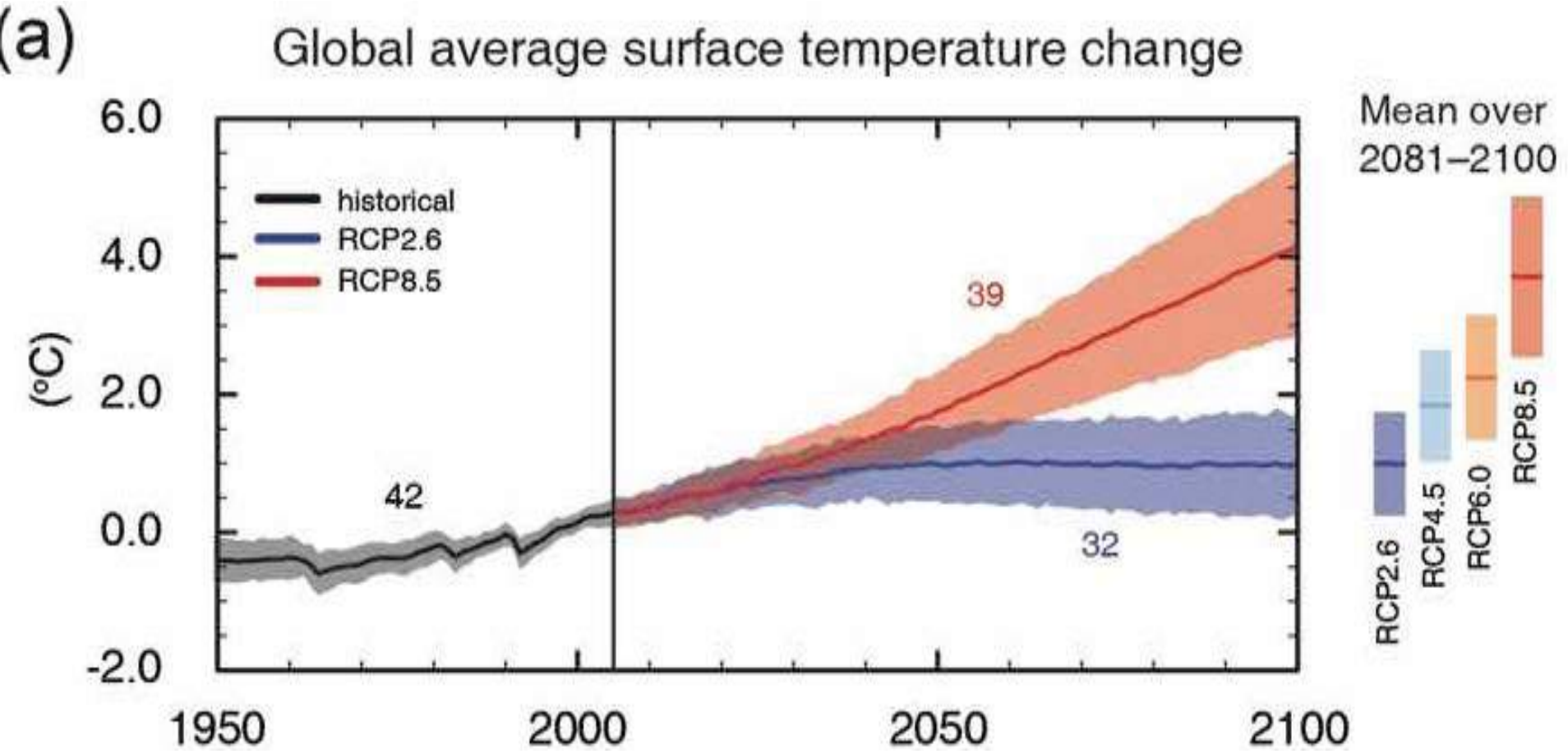


# RCP Scenarios: Atmospheric CO2 concentration! AR5, chapter




Three stabilisation scenarios: RCP 2.6 to 6
One Business-as-usual scenario: RCP 8.5

# Only the lowest (RCP2.6) scenario maintains the global surface temperature increase above the pre-industrial level to less than 2°C with at least 66% probability



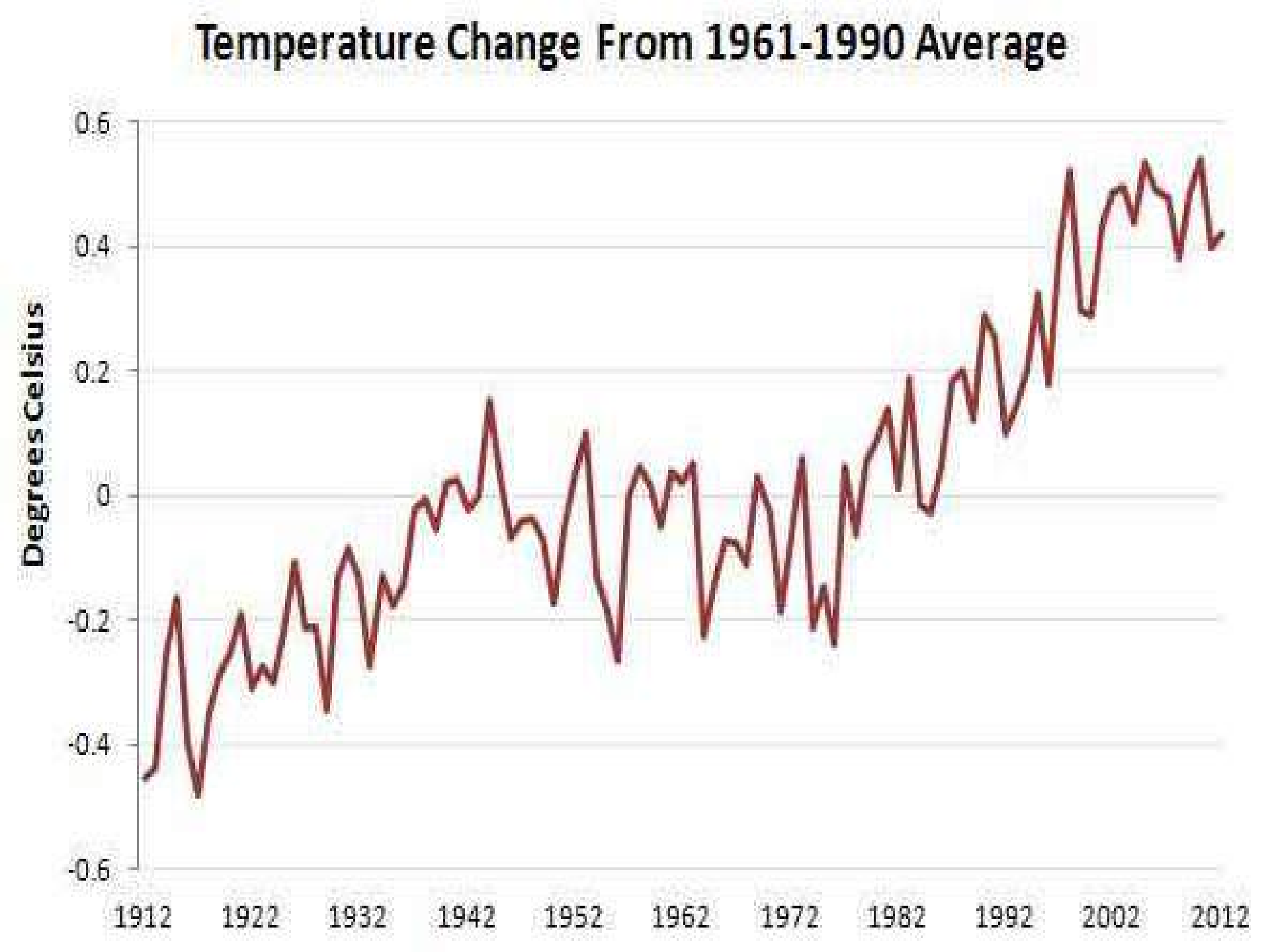
# Impacts are already underway

- Since 1950, extreme hot days and heavy precipitation have become more common.
- Severe floods in coastal areas have increased
- There is evidence that anthropogenic influences, including increasing atmospheric greenhouse gas concentrations, have changed these extremes

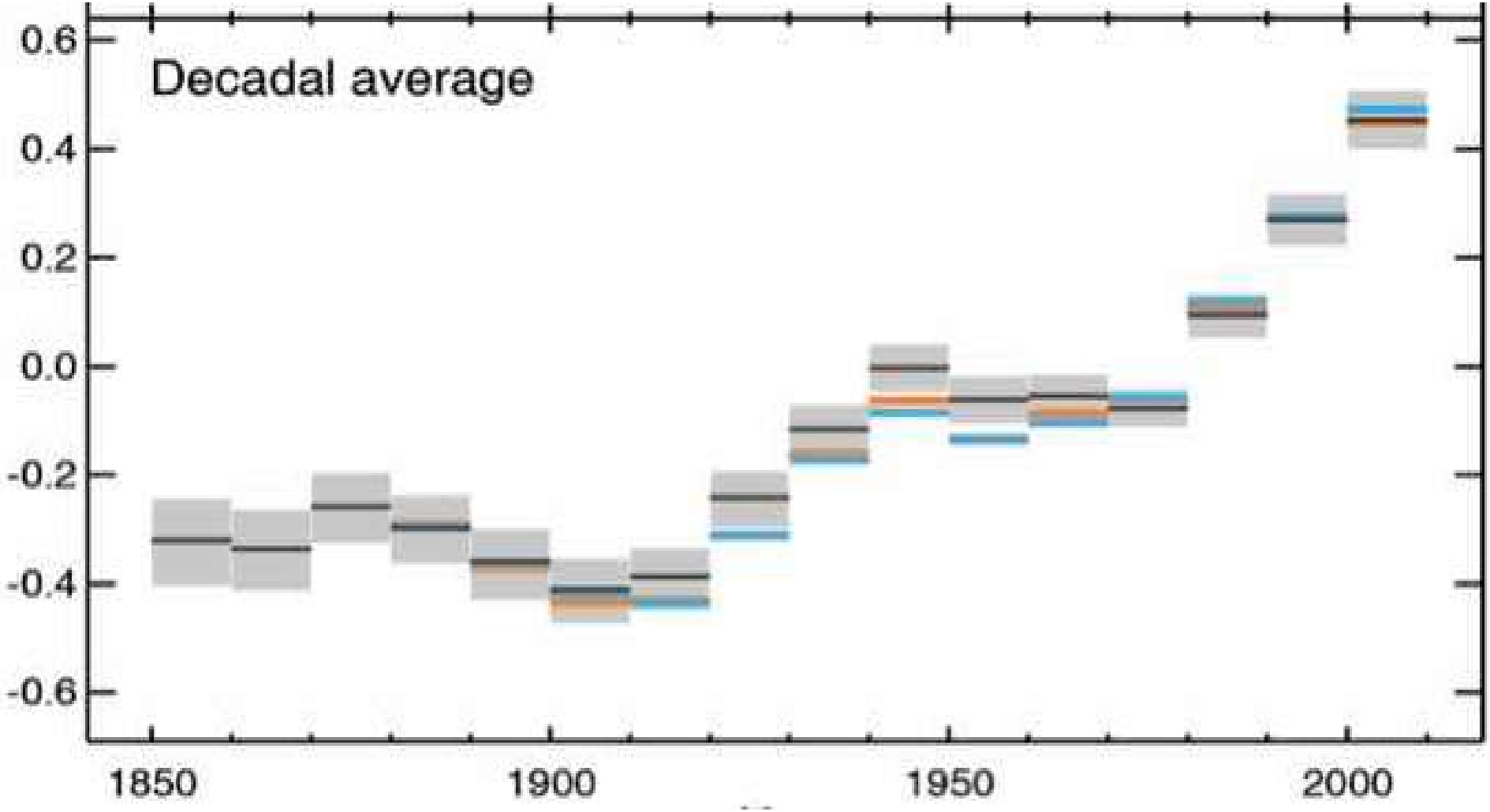
- Impacts are already underway, from the Tropics to the Poles, on all continents and in the ocean, affecting rich and poor countries (the poor being more vulnerable)

# Key messages from IPCC AR5

- Human influence on the climate system is clear
- Continued emissions of greenhouse gases will increase the likelihood of severe, pervasive and irreversible impacts for people and ecosystems
- While climate change is a threat to sustainable development, there are many opportunities to integrate mitigation, adaptation, and the pursuit of other societal objectives
- Humanity has the means to limit climate change and build a more sustainable and resilient future


Temperature Change From 1961-1990 Average
Degrees Celsius
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
1912
1922
1932
1942
1952
1962
1972
1982
1992
2002
2012

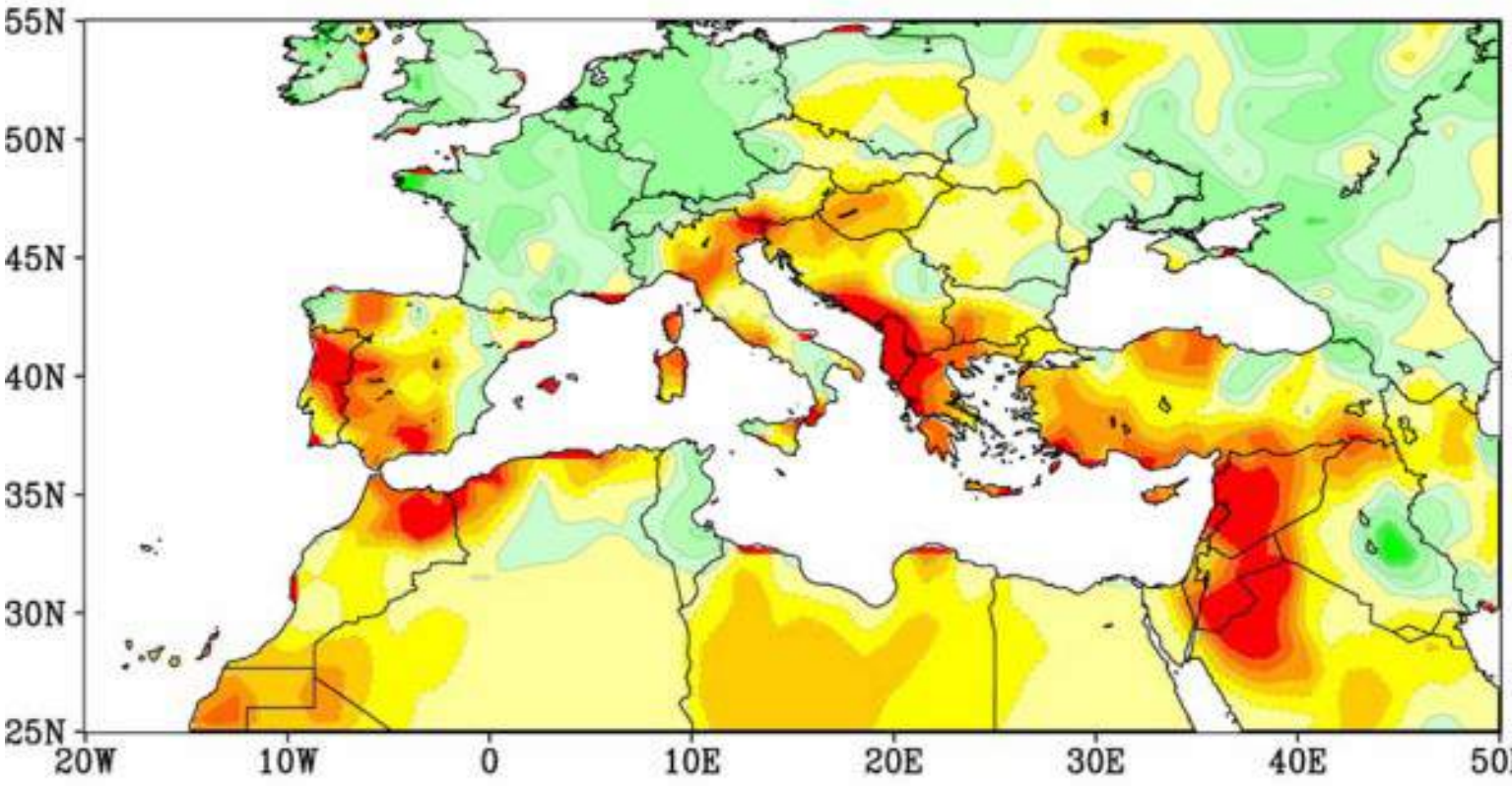
# The last three decades had the highest temperatures since 1850.



# Climate Change evidence from the Mediterranean

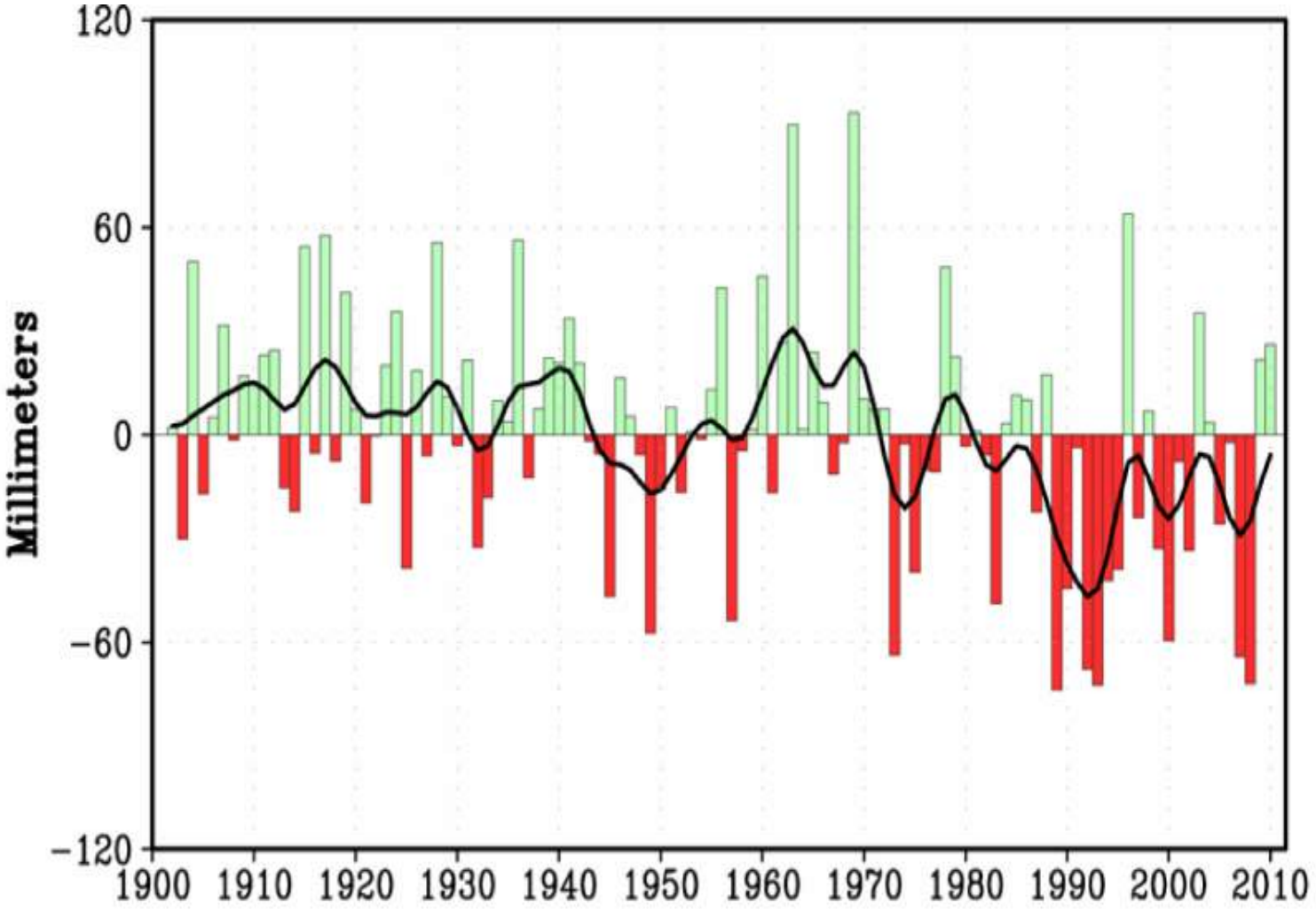
Reds and oranges highlight lands around the Mediterranean that experienced **significantly drier winters** during 1971-2010 than the comparison period of 1902-2010.

*Source: NOAA, November 2011*



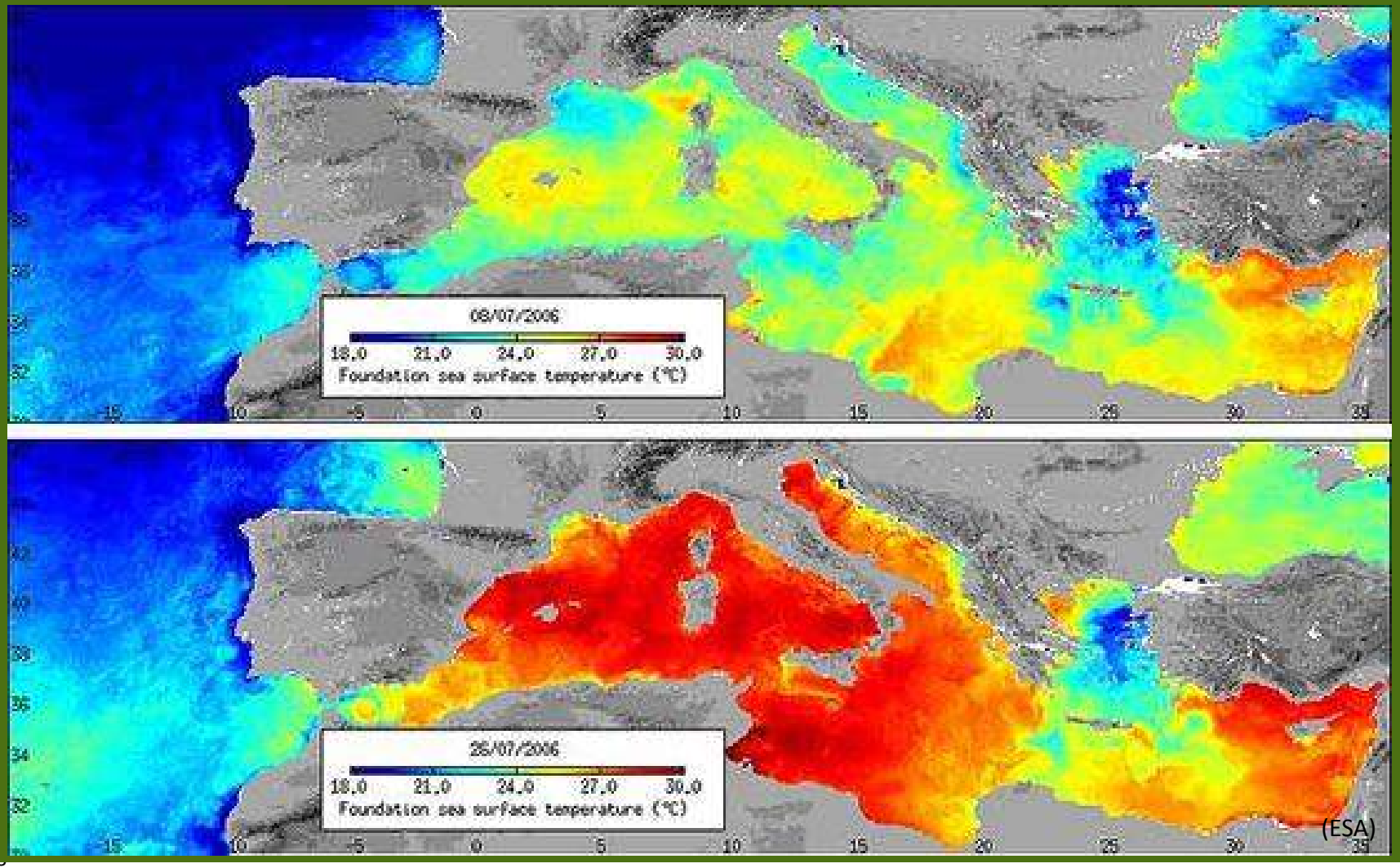
**Wintertime droughts are increasingly common in the Mediterranean region, and human-caused climate change is partly responsible. In the last 20 years, 10 of the driest 12 winters have taken place in the lands surrounding the Mediterranean Sea.**

***Source: NOAA, November 2011***



# Thermal shocks in the Mediterranean Sea and their consequences

**In summer 2006, in only 14 days (from July 8 to 26), surface waters in the Balearic region warmed from 22º to 30ºC**




(ESA)

# Which are the consequences of such events?

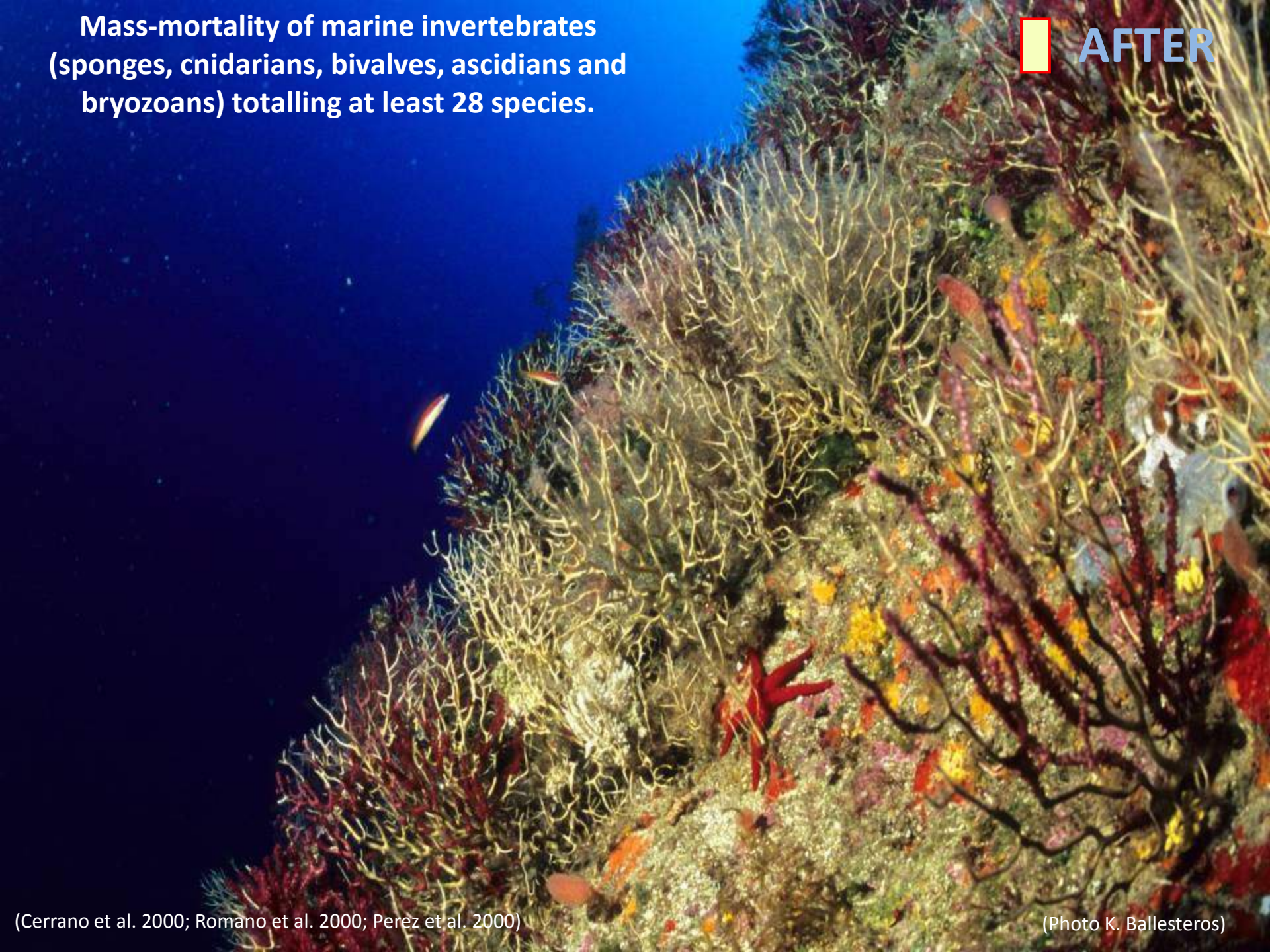
BEFORE

Sponges and cnidarians as most affected with mortality rates up to 75% and 90%, respectively.

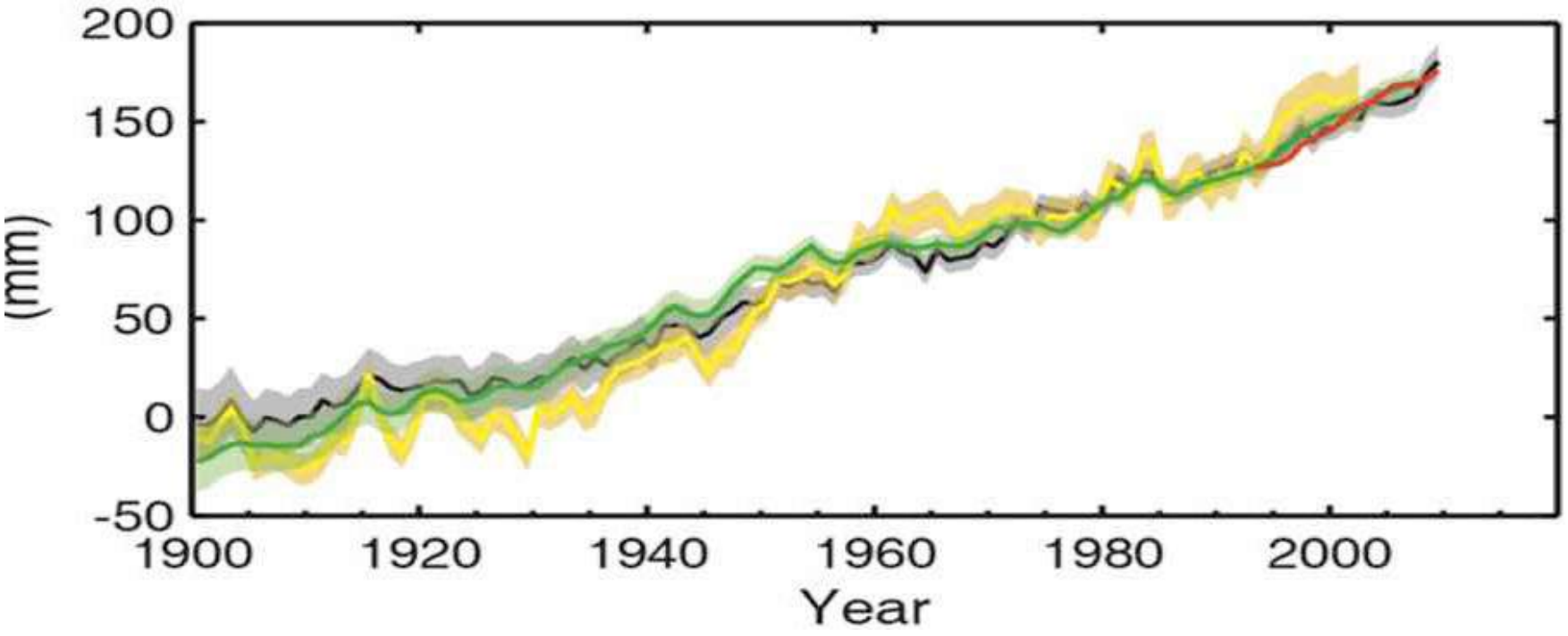
Amongst cnidarians, the gorgonians suffered spectacular and extensive damages.

*Paramuricea clavata* and *Eunicella singularis* as most affected gorgonian species.

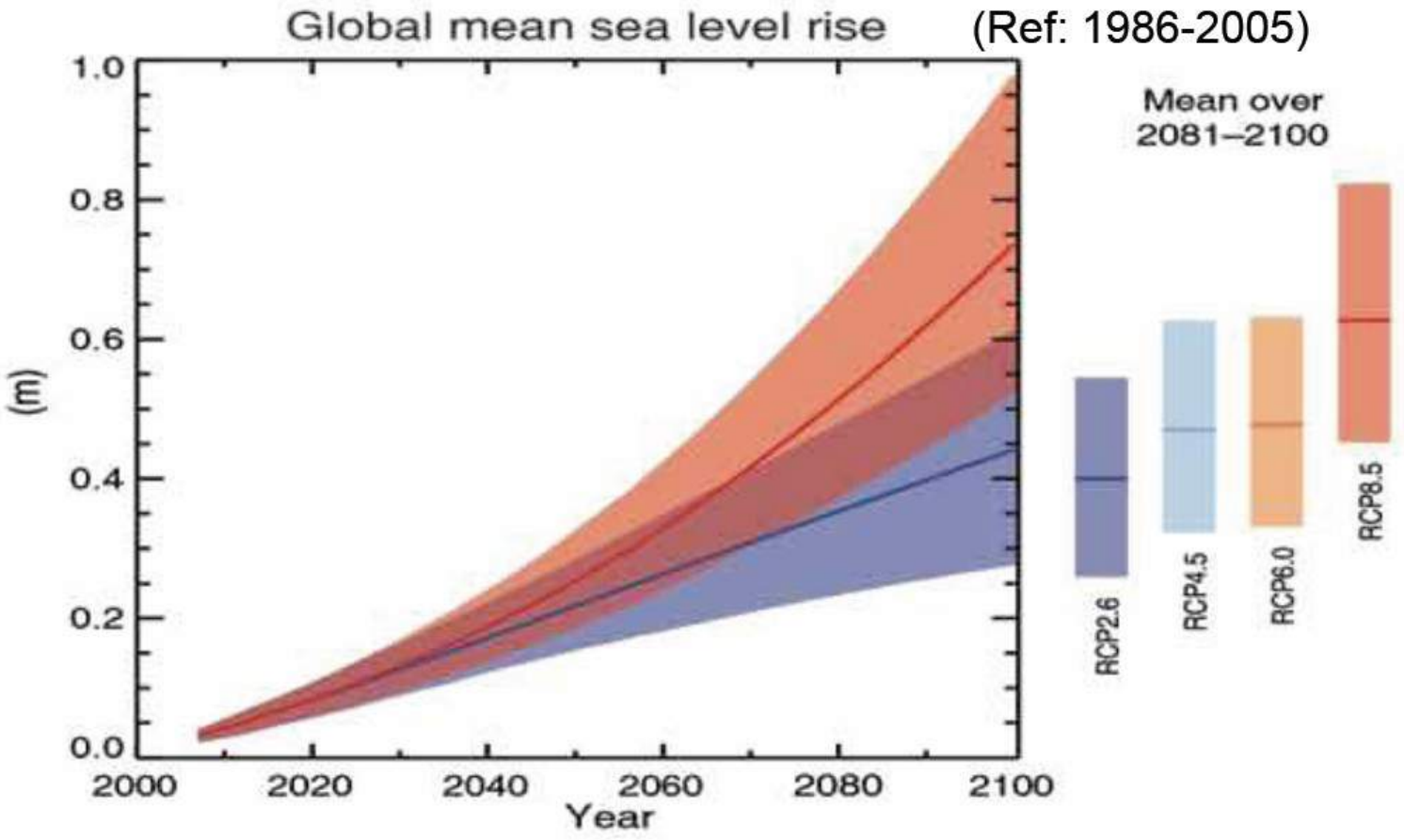
(Photo K. Ballesteros)


Mass-mortality of marine invertebrates (sponges, cnidarians, bivalves, ascidians and bryozoans) totalling at least 28 species.
AFTER
(Cerrano et al. 2000; Romano et al. 2000; Perez et al. 2000)
(Photo K. Ballesteros)

# Evolution of the sea level rise in various oceans



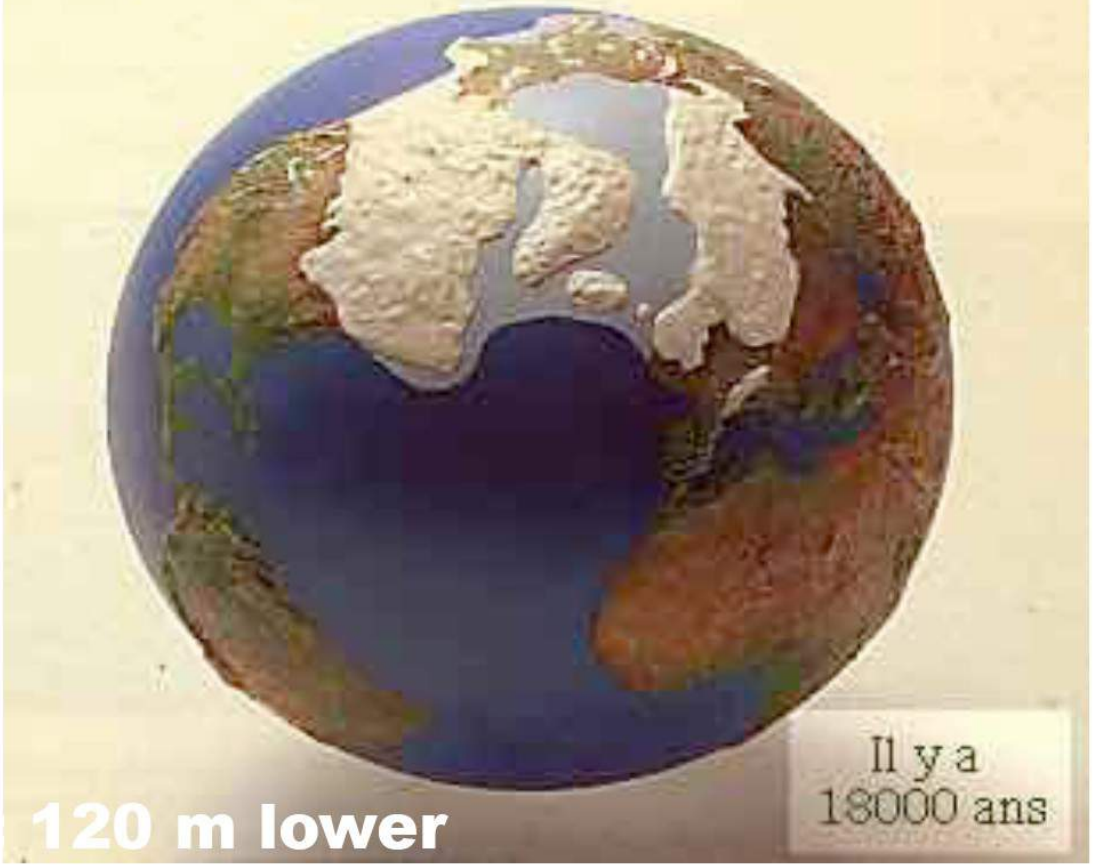
# Sea level will continue to increase



# 18-20000 years ago (Last Glacial Maximum)

J- P van Ypersele

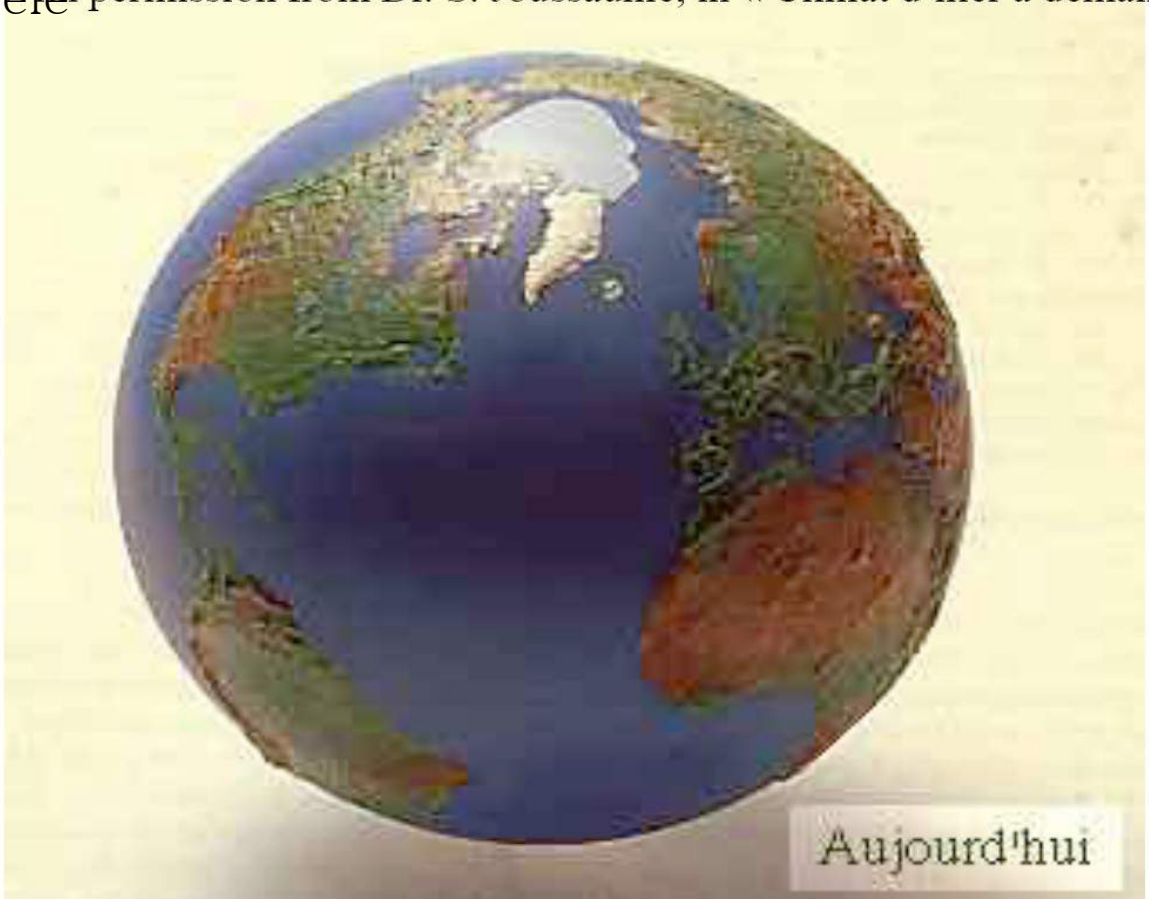
With permission from Dr. S. Joussaume, in « Climat d'hier à demain », CNRS éditions.



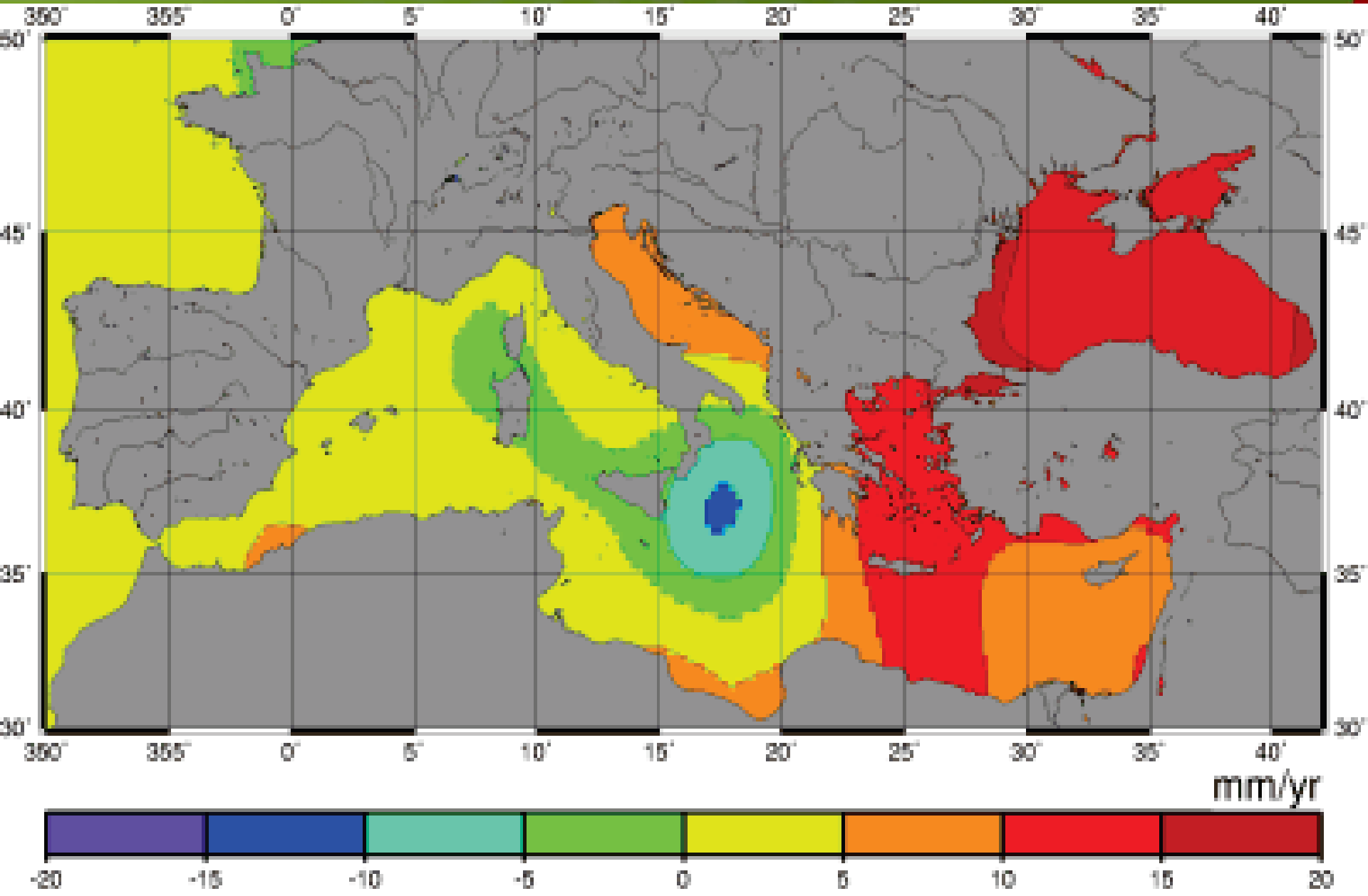
# Today, with +4-5°C globally

J- P van Ypersele

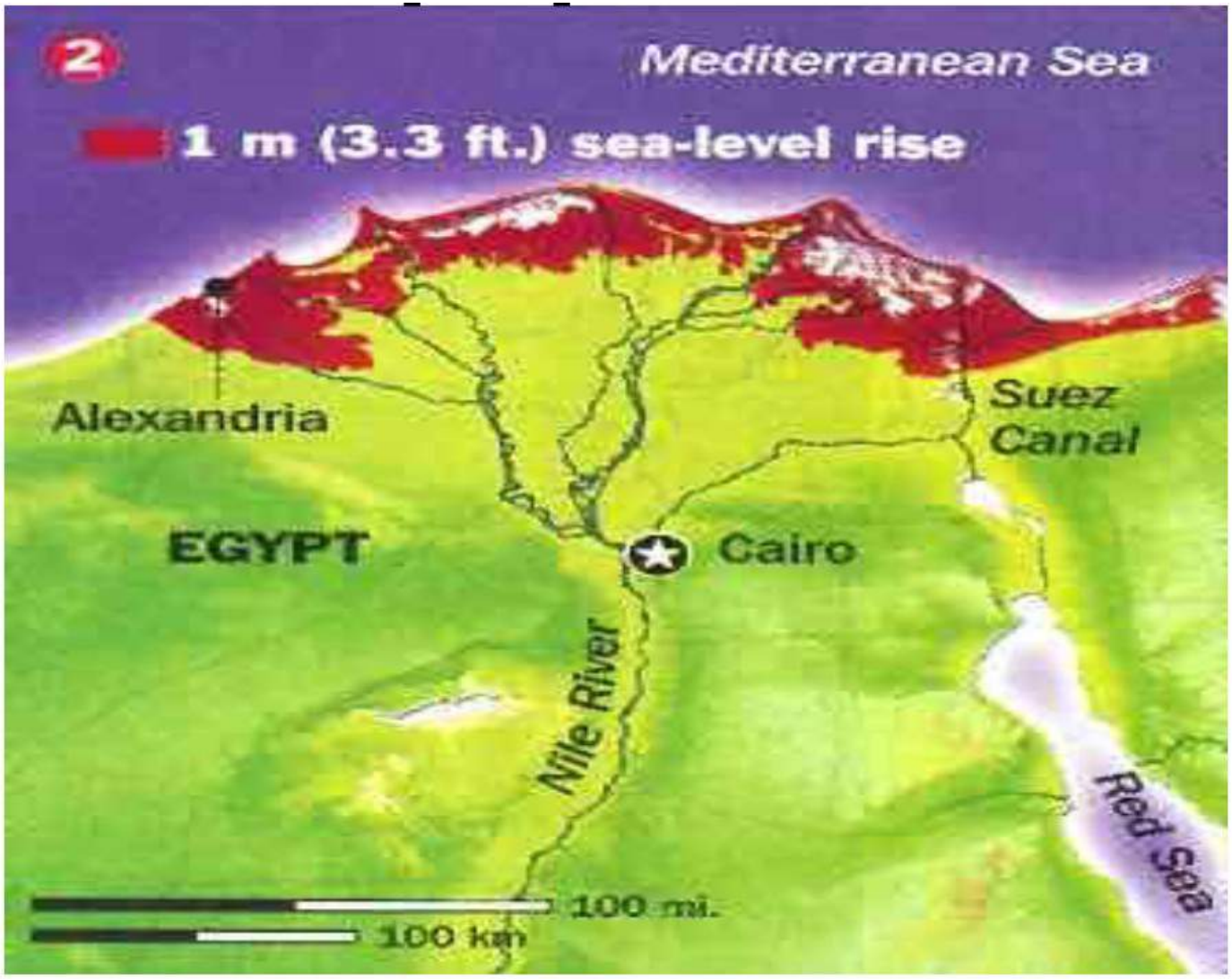
With permission from Dr. S. Joussaume, in « Climat d'hier à demain », CNRS éditions.



# Variations of sea-level rise observed between 1999 and 2006 by the TOPEX/Poseidon project, mm/year

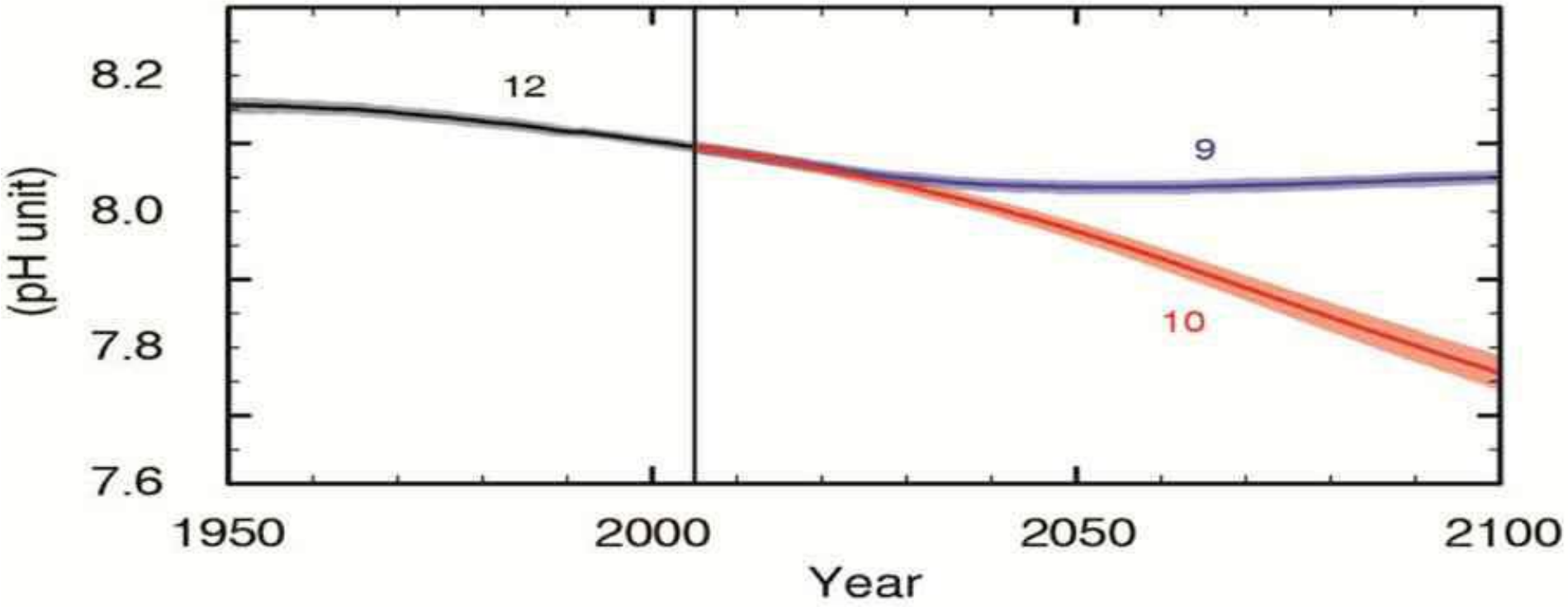


# Nile Delta: red zone = less than 1 m above sea level, 10 M people in 2000

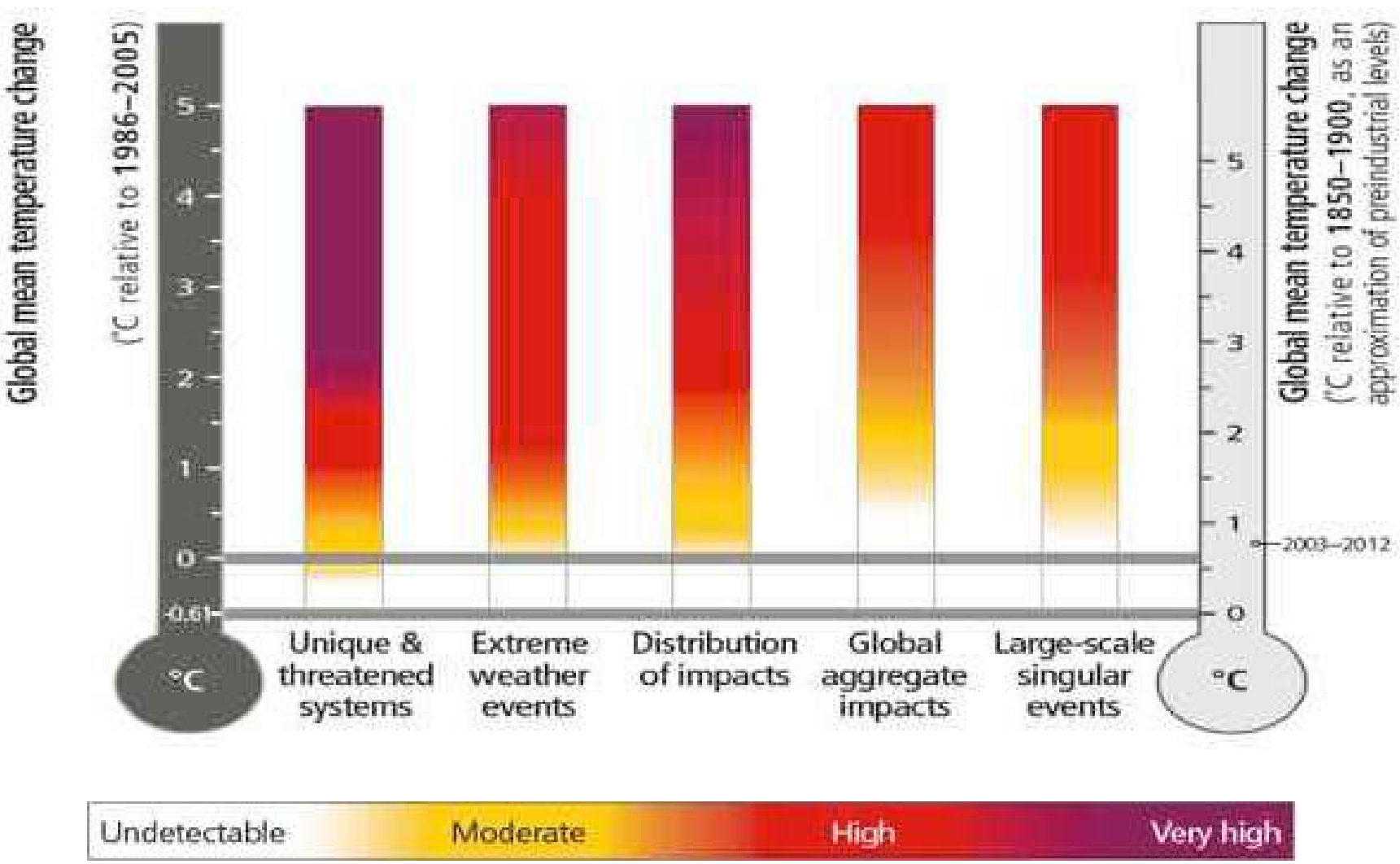


# Global ocean surface pH (projections)

**Ocean Acidification, for RCP 8.5 (orange) & RCP2.6 (blue)**



# Level of additional risk due to climate change



# Can temperature rise but still be kept below 1.5 or 2°C (over the 21st century) compared to pre-industrial ?

Many scenaria confirm that it is technically and economically feasible to keep the warming below 2°C, (with more than 66% probability/ “likely chance”). This would imply limiting atmospheric concentrations to 450 ppm CO2-eq by 2100.

Such scenaria imply reducing by 40 to 70% global GHG emissions compared to 2010 by mid-century (60% by 2050), and reach zero or negative emissions by 2100 .

These scenaria are characterized by rapid improvements of energy efficiency and a near quadrupling of the share of low-carbon energy supply (renewables, nuclear, and bioenergy), so that this share reaches 60% by 2050.

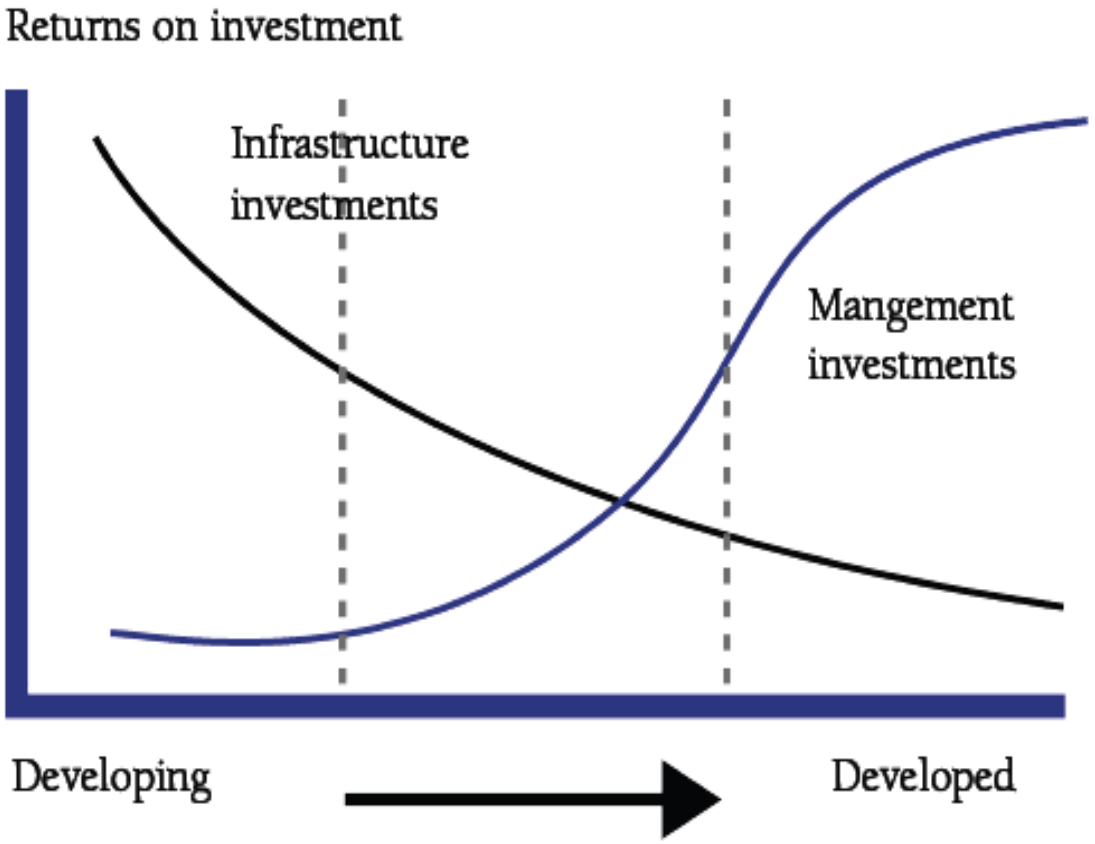
# “Nexus”/water security & investment

To achieve water security, **investments** will be needed in **infrastructure** to store and transport water, treat and reuse waste water as well as for **management**, in robust institutions and the information and capacity to predict, plan for and cope with climate variability. Such investments will help societies, also, to **adapt** to long-term climate change and manage current climate variability and shocks- thus offering water security to the world’s poorest people and countries.

GWP TEC Bachground Papers: No 14, 2009

# Returns on investment

*Balancing and sequencing investments in water infrastructure and management*




*Source: World Bank, 'China Country Water Resources Assistance Strategy,' 2002.*

# Mitigation Measures re

## More efficient use of energy

**Greater use of low-carbon and no-carbon/renewable energy sources**

(Many of these technologies exist today)

## Improved carbon sink

- Reduced deforestation and improved forest management and planting of new forests
- Bio-energy with carbon capture and storage

## Lifestyle and behavioural changes

# Since AR4, there has been an increased focus on policies designed to integrate multiple objectives, increase cobenefits and reduce adverse side-effects.

- **Sector-specific policies** have been more widely used than economy-wide policies.
- **Regulatory approaches and information** measures are widely used, and often environmentally effective.
- **Cap and Trade** systems for GHGs have been established in a number of countries and regions.
- **Tax-based policies** specifically aimed at reducing GHG emissions–alongside technology and other policies–have helped countries to decouple GHG emissions from GDP.
- **Reduction of subsidies** for GHG-related activities in various sectors may achieve emission reductions.
- **Policies on equity, justice, and fairness** are increasingly considered with respect to mitigation and adaptation.

# Needed changes in the flow of investment

There will be a need for important changes in the flow of investment between the years 2010-2029 (the figures reffer to billions of $ according to IPCC AR5 WGIII Fig SPM 9

- energy efficiency: +330
- renewables: + 90
- electricity with Carbon Caprure and Storage (CCS): + 40
- neclear: + 40
- electricity without CCS: - 60
- extaction of fossil fuels: - 120

# 1. Green Climate Fund (GCF)

GCF was decided in Copenhagen in 2009 and established in 2010

- Finances projects and programmes that drive low-emission and climate-resilient development pathways
- 50.50 balance between mitigation and adaptation
- Submit funding proposal through National Designated Authorities (135 NDAs as of October)
- Direct access through accredited sub-national, national and regional implementing entities; Access through multilateral implementing entities
- Readiness support programme focused on preparing countries to mobilize GCF funding
- Funding Proposal Template available – Water Security as one of the results areas (http://www.gcfund.org/operations/resource-guide.html)
- http://news.gcfund.org/

# 2. Global Environmental Facilities (GEF)

- Established in 1991 to provide grants for projects adressing biodiversity, climate change, international waters, land degradation, etc.
- GEF administers the LDCF and SCCF
- Funding proposals for LDCF and SCCF have to be submitted through a selected GEF Agency (ADB, AFDB, EBRD, FAO, IDB, IFAD, UNDP, UNEP, UNIDO, World Bank)
- Three new Integrated Programmes launched:
  - Sustainable Cities;
  - Taking Deforestation out of Global Commodity Supply Chains;
  - Sustainability and Resilience for Food Security in Sub-Saharan Africa.
- https://www.thegef.org/gef/

# 3. Special Climate Change Fund (SCCF)

- SCCF was established in 2001 (COP 7) under UNFCCC
- Supports adaptation and technology transfer projects and programmes that:
  - are country-driven, cost-effective and integrated into national sustainable development and poverty-reduction strategies; and,
  - take into account national communications or NAPAs/NAPs and other relevant studies and information.
- Thematic areas are, *inter alia:*

  **Water resources management**; Agriculture; Infrastructure, Ecosystems, Climatic disaster risk management.

- https://www.thegef.org/gef/SCCF

# 4. Least Developed Countries Fund (LDCF)

- LDCF was established in 2001 (COP 7) under UNFCCC
- Supports the preparation and the implementation of the NAPAs/ NAPs, which are country-driven strategies that identify the immediate needs of LDCs/ non-LDCs in order to adapt to climate change.
- Thematic areas are, *inter alia:*

  **Water resources management**, agriculture and food security, health, disaster risk management, infrastructure and fragile ecosystems

- https://www.thegef.org/gef/LDCF

# 5. Adaptation Fund

- Established in 2007 to support concrete adaptation activities that reduce the adverse effects of climate change facing communities, countries and sectors.
- Thematic areas are, *inter alia:*

  Water resources management, agriculture, infrastructure development, ecosystems, early-warning systems, capacity building
- Direct access for developing countries to resources →nominate domestic institutions for accreditation as NIEs

- https://www.adaptation-fund.org/

# Factors reducing “nexus” security, e.g on water

**are not only emerging:**

- Natural **(mostly linked with climate variability)**:
  - Increase of temperature, evaporation and aridity
  - Water scarcity
  - Floods, droughts & more intense and frequent storms
  - Glacier and snow melting

**But also the already existing:**

- Anthropogenic:
  - Reduction of water quality / pollution
  - Increase of groundwater abstraction & change of groundwater recharge patterns
  - Reduction of storage, retention and detention capacity of systems

# The “nexus” security & resilience under Climate Change

Addressing security of the system requires both:

– **Reducing the conditions, pressures and root causes of its vulnerability**

– **Enhancing its resilience** (*the ability of a system to return to equilibrium after a perturbation or disturbance)*

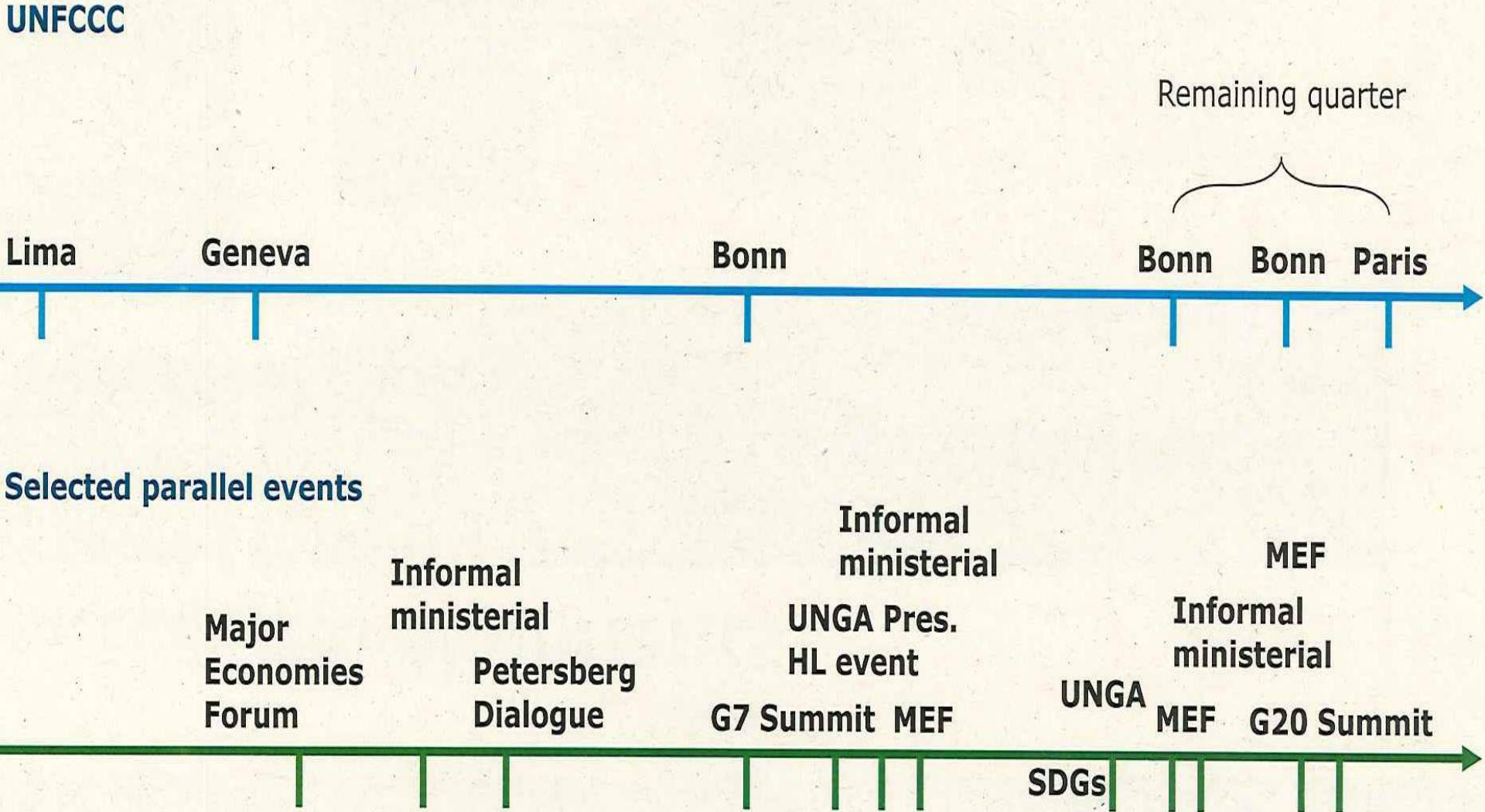
To implement the above, measures are needed for all 3 aspects of Sustainable Development, employing technological, institutional and information/educational/cultural tools and enhancement of the **adaptability** of management

# What was the outcome of COP20 in Lima?

In 2014, COP20 held in Lima attracted over 15,000 official delegates, and negotiators concluded talks with the ‘Lima Call For Climate Action’, a draft document that lays the foundations for a new global climate deal.

Alongside COP20, there were more than 400 conferences in which new research projects and initiatives were presented. The Sustainable Innovation Forum 2014 was the largest commercially-focused event during COP20, attracting high profile speakers, celebrities and over 500 pre-approved delegates representing private sector, government, NGO, UN agencies and civil society. During the two weeks of COP20, over 140 press conferences were held and more than 900 journalists from around the world covered the international event.

# Parallel textual negotiations and political engagement throughout 2015



# Major upcoming meetings

| | |
|---|---|
| By 1 Nov | Publication of UNFCCC report on aggregate effect of INDCs |
| 8-11 Nov | Pre-COP |
| 9–10 Nov | Major Economies Forum, tbd (probably in conjunction with a Pre-COP in Paris) |
| 10 Nov | ECOFIN Council |
| 15–16 Nov | G20 Summit, Antalya |
| 30 Nov–11 Dec | COP21, Paris |

# Overview of negotiating landscape

Emissions reductions

Adaptation, Loss and Damage

Finance, technology and capacity building

INDCs (intended nationally determined contributions)

Differentiation between countries

Transparency, accountability and dynamism

Legal form and force of the Agreement

Enhancing pre-2020 action

Technical work under the two subsidiary bodies

European Commission

# The Paris Package

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

*Formal COP deliverable*

**Agreement**

**INDCs**

**Decisions**

*Broad stakeholder engagement*

**Lima-Paris Action Agenda**

| | | | |
|---|---|---|---|
| FOREST | RESILIENCE | TRANSPORT | PRIVATE FINANCE |
| AGRICULTURE | BUILDING | SHORT-LIVED CLIMATE POLLUTANTS | RENEWABLE ENERGY |
| CITIES & SUBNATIONALS | ENERGY EFFICIENCY & ACCESS | INNOVATION | BUSINESS |

**Other announcements declarations**

*Climate Action*

- Constructive discussions on concepts, although without clear outcome yet

| | |
|---|---|
| **Pre-2020, building trust by showing finance is scaled up** | ▪ $100bn annually by 2020 from a variety of sources: now agreed methodology for tracking private finance<br>▪ Report on progress due 9 October |
| **Differentiation essential question – need to enlarge the donor base** | |
| **Scale and sources of finance** | ▪ Reorient investments or insist on public finance |
| **Enabling environments** | ▪ Recipient countries now open to discuss and starting to understand that not a condition for finance |
| **Dynamism** | ▪ EU and US proposal for dynamic elements for all<br>▪ Developing countries want commitment to scaling up |

# Other forms of support

| | |
|---|---|
| **Technology development and transfer** | • Important for mitigation and adaptation<br>• No agreement on transfer, funding, intellectual property |
| **Capacity-building** | ▪ Calls for a new mechanism, but no clear justification<br>▪ Workshop in the margins of the October ADP session<br>▪ Capacity-building for transparency framework will be critical |

# Intended nationally determined contributions

**More than 130 Parties' INDCs submitted, covering more than 78% of global emissions**

- Unprecedented coverage – clear momentum
- Collective ambition not yet sufficient for pathway to 2° C
- Underlines the need for a dynamic reviewing and strengthening process

# What must Paris deliver?

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

- **Fair, ambitious and legally binding agreement** with targets for all Parties
- **Transparency and accountability** through robust common rules
- **Dynamism** - 5 yearly reviews to increase ambition towards a **long term goal**
- **International support** for low carbon, climate resilient sustainable development

**...And accelerated action pre-2020**

*Climate Action*

# Five key aspects of “nexus” security beyond Paris

“Nexus” security:

- **goes beyond physical availability** due to complex interactions between natural and socioeconomic systems
- **demands addressing variability and risk**
- **should focus on the needs of individuals**, especially the poor and vulnerable
- **should meet environmental/ecosystem needs**, over time, in terms of quantity and quality
- **requires management of competition and/or conflict between users & uses**, preferably through rules-based systems

# How Members of Parliaments could contribute

By reducing the vulnerability of their countries and the Mediterranean region in dealing with natural resources by avoiding “monoculture” / dependence on a single management approach by employing combinations including some of the following:

- **Water:**
  - Diversity of water supply options
  - Flexibility in water use options
  - Recycling
  - Water demand management
  - Water storage and risk reducing (retention and detention) systems
- **Energy:**
  - Concrete climate mitigation measures
  - Reduction of energy consumption and promotion of energy efficiency systems
  - Reduction of energy losses in buildings
  - Biogas (energy from waste water treatment)
  - Rapid shift to carbon free energy production/promotion of renewables: solar and wind energy
- **Material:**
  - Resource efficiency
  - “Cradle to cradle” approach
  - Total recycling of nutrients, biomass, etc.

# How Members of Parliaments could contribute

by promoting in their countries the appropriate mix of instruments

**Socioeconomic**

Institutional Frameworks Regulations

e.g. Financial and other incentives (Green Taxes, levies, charges, etc), indication on products about their energy, water and material footprint, etc.

**Technological**

Appropriate, clean technology (building insulation, sunheaters, water saving systems, modern rainwater harvesting systems, material recycling, etc).

**Cultural**

Awareness raising and education about clean consumption and production

# How Members of Parliaments could contribute

Encourage the Governments and other stakeholders in their countries to act in a coherent and rapid way to:

1. Introduce and apply the appropriate international, regional and national frameworks, laws and management plans to address effectively climate change and its impact on coastal areas and water resources by implementing the ICZM Protocol and IWRM Plans. This could be facilitated by the recently published, Integrative Methodological Framework (IMF).

2. To promote investment in green technologies, which will be beneficial not only form the environmental and social point of view but also from the economic point of view very soon.

3. To promote education for sustainable development , public awareness and capacity building on all aspects of CC and the nexus.

# Thank you!

Prof. Michael SCOULLOS
www.mio-ecsde.org
www.gwpmed.org,