Mountains and climate change: adaptation and mitigation strategies

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cmcc Centro Euro-Mediterraneo sui Cambiamenti Climatici


LANGOUE 1
Profile 1
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50

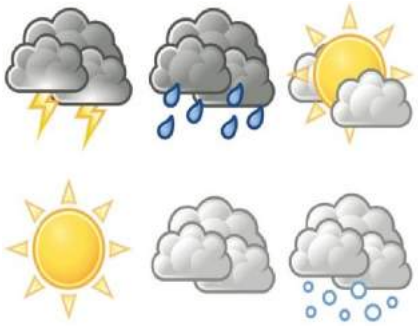
OUTLINE

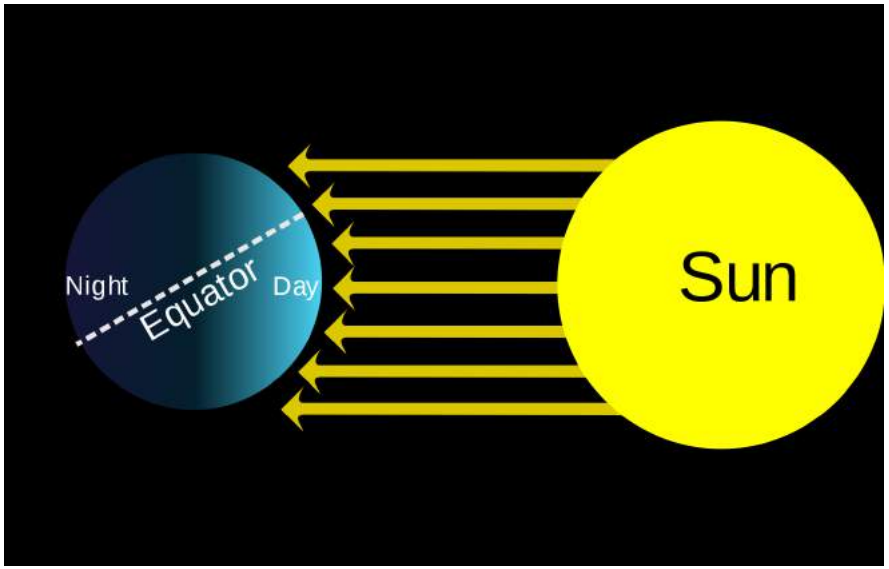
- A) Climate change
- B) Role of forests (AFOLU sector)
- C) International policies
- D) Mitigation and Adaptation strategies
- E) Case studies

The difference between weather and climate is a measure of <u>time</u>.

WEATHER

Weather is what conditions of the atmosphere are over a short period of time



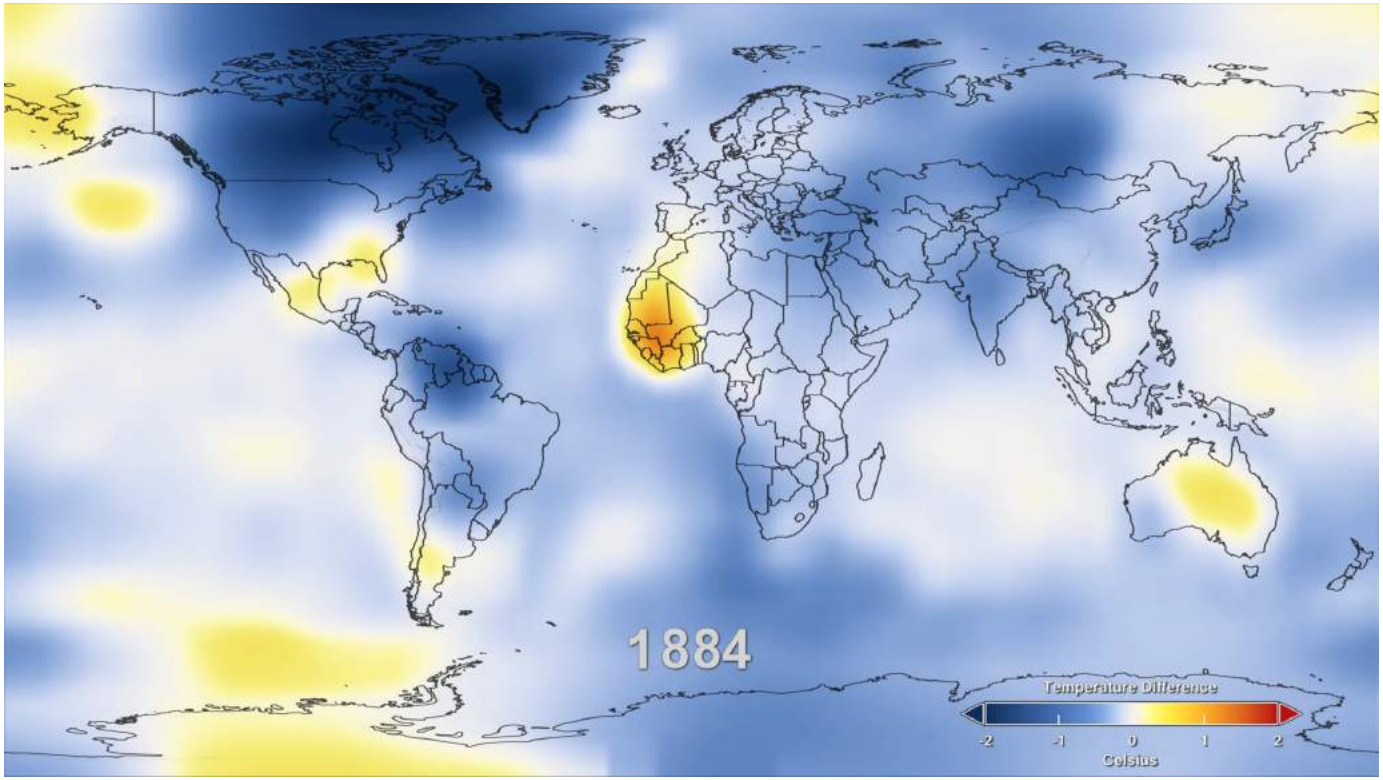


CLIMATE

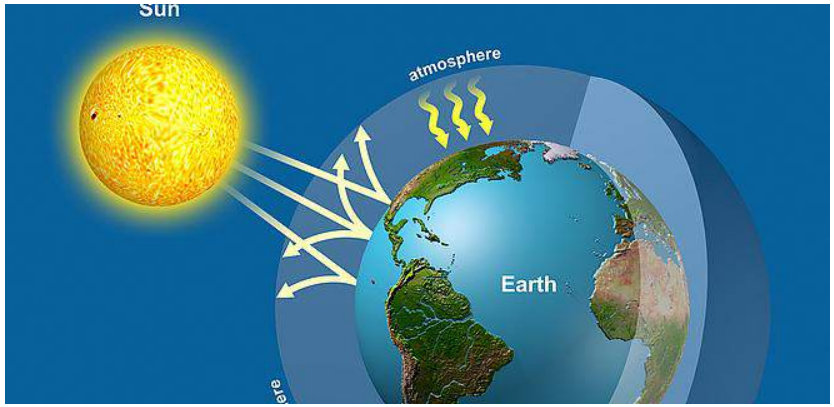
Climate is how the atmosphere "behaves" over relatively long periods of time (10-30 years)

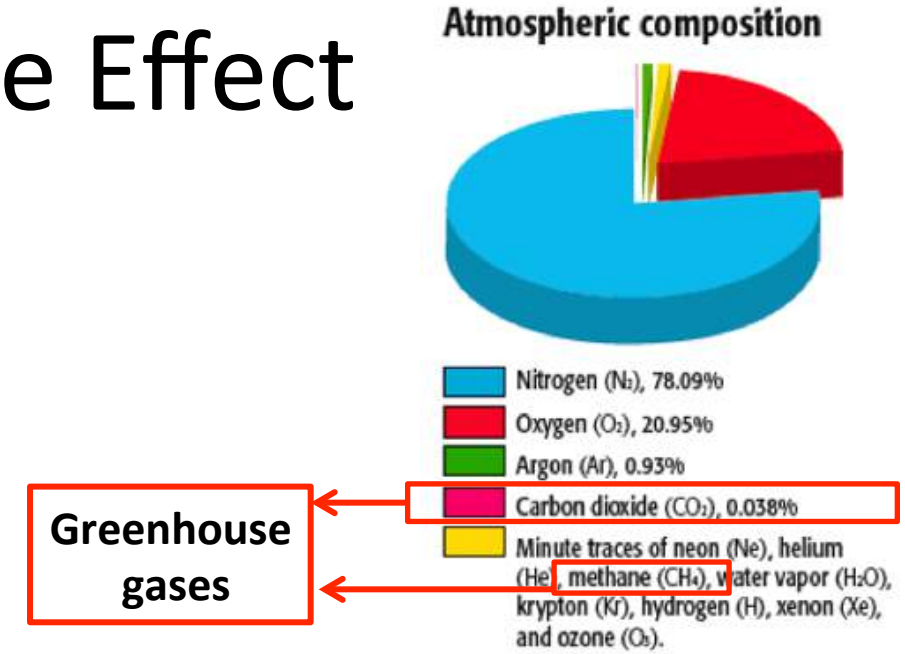
CLIMATE vs WEATHER

Temperature rise



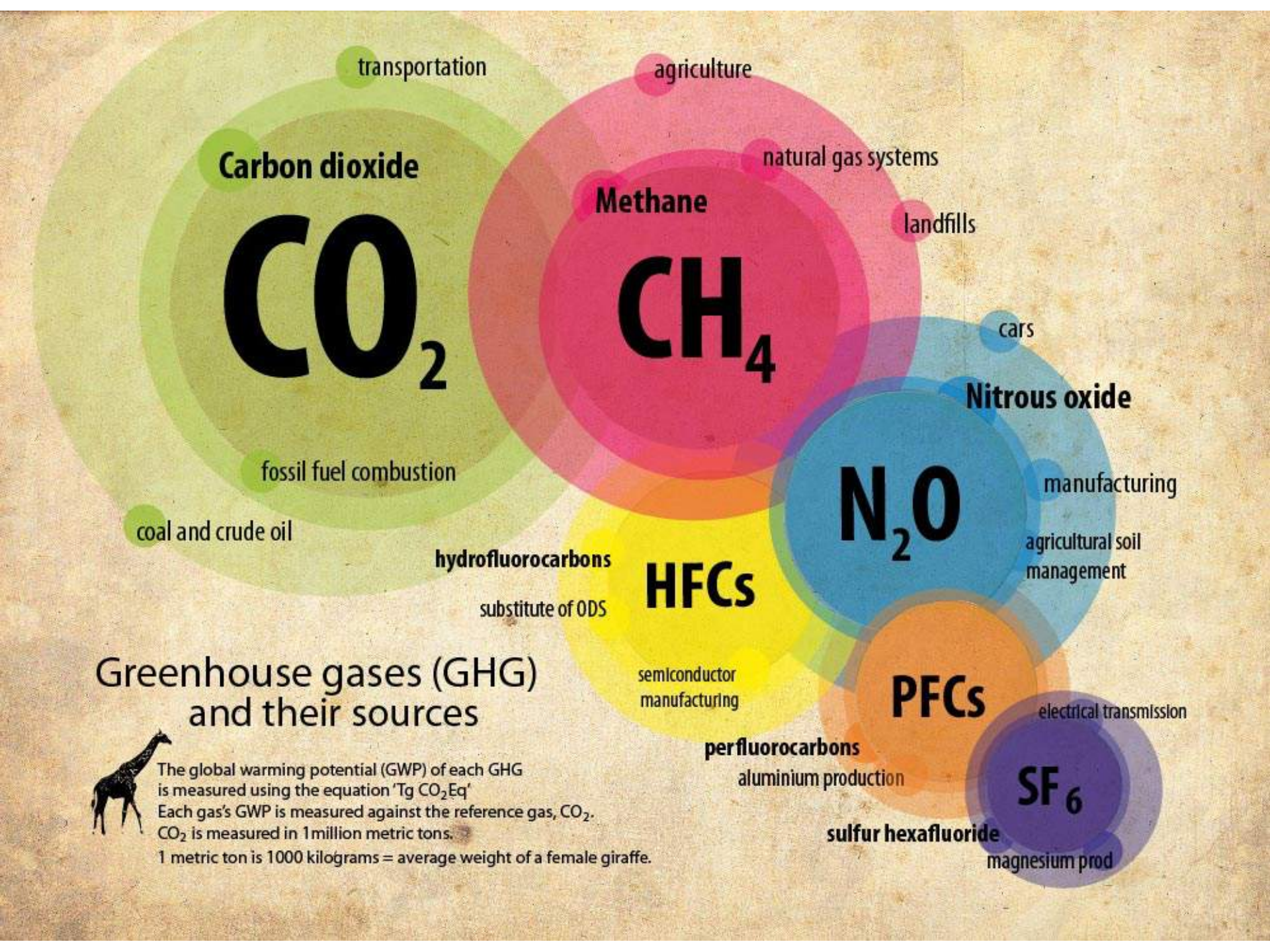
Greenhouse Effect

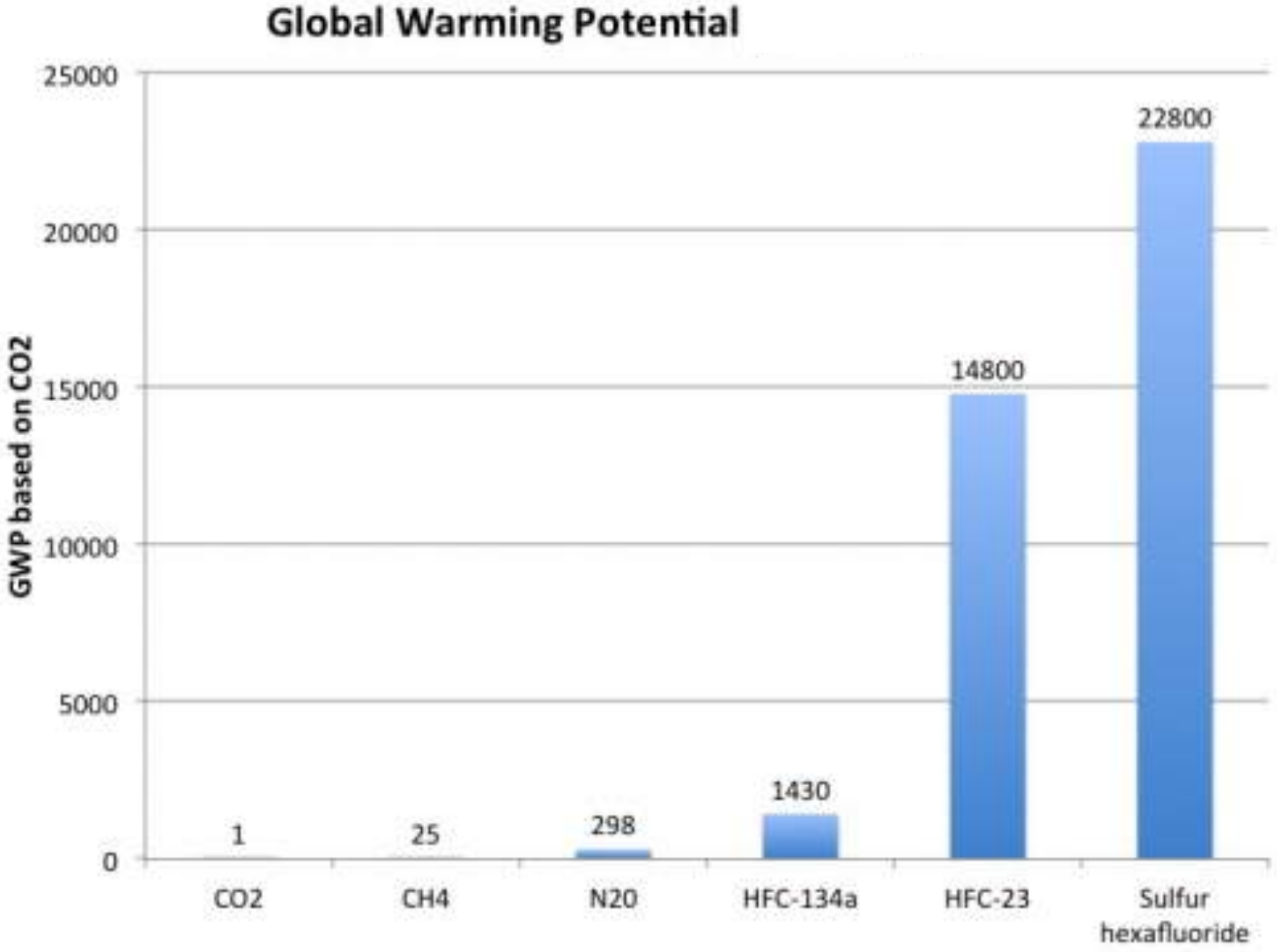




Without the atmosphere the Earth's temperature would be of -19°C on average

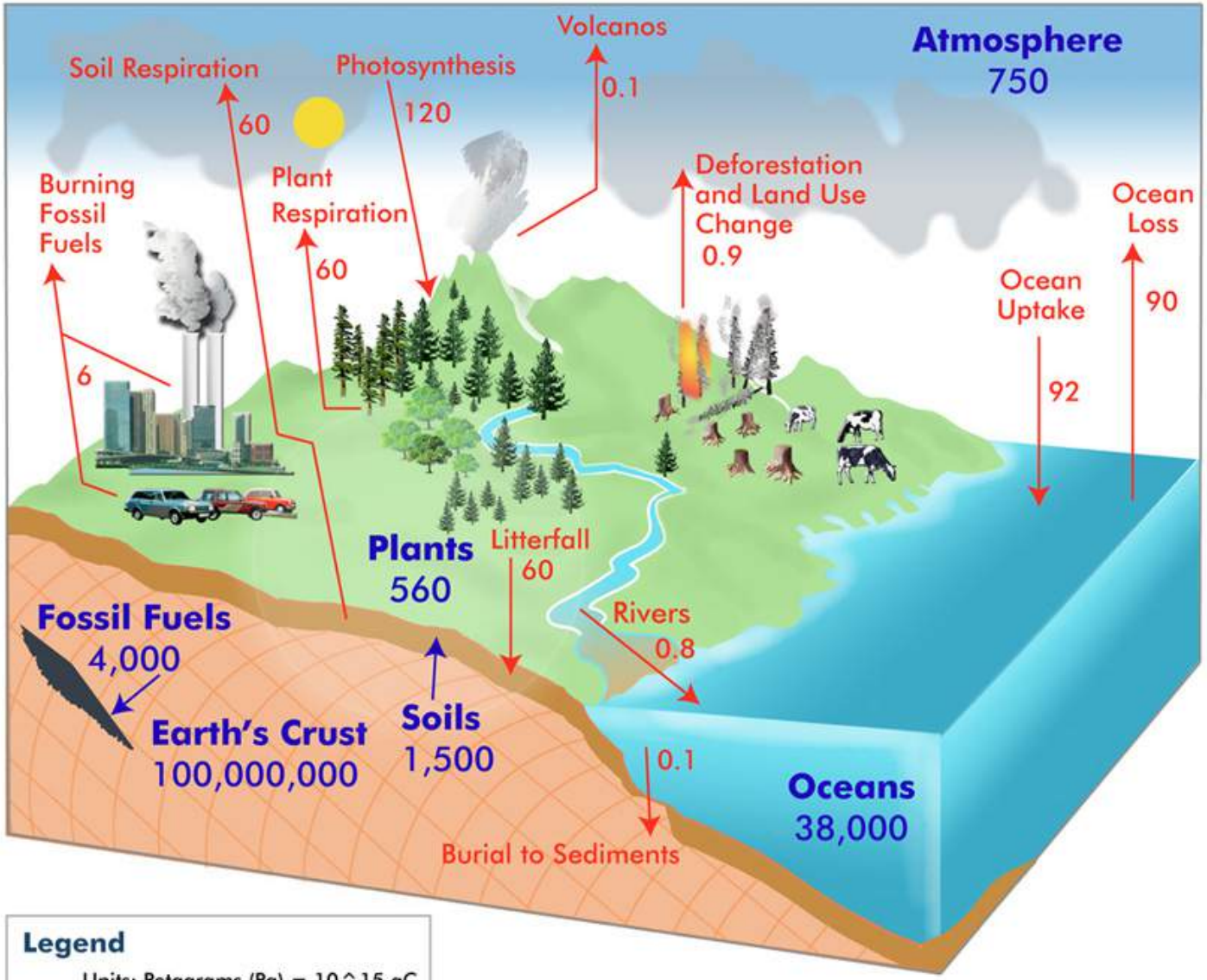
The greenhouse effect makes the Earth with an average temperature of 14°C


transportation
agriculture
Carbon dioxide
CO_2
natural gas systems
Methane
CH_4
landfills
cars
Nitrous oxide
N_2O
manufacturing
agricultural soil management
fossil fuel combustion
coal and crude oil
hydrofluorocarbons
substitute of ODS
HFCs
semiconductor manufacturing
PFCs
perfluorocarbons
aluminium production
electrical transmission
SF_6
sulfur hexafluoride
magnesium prod
Greenhouse gases (GHG) and their sources
The global warming potential (GWP) of each GHG is measured using the equation 'Tg CO_2Eq'
Each gas's GWP is measured against the reference gas, CO_2.
CO_2 is measured in 1million metric tons.
1 metric ton is 1000 kilograms = average weight of a female giraffe.

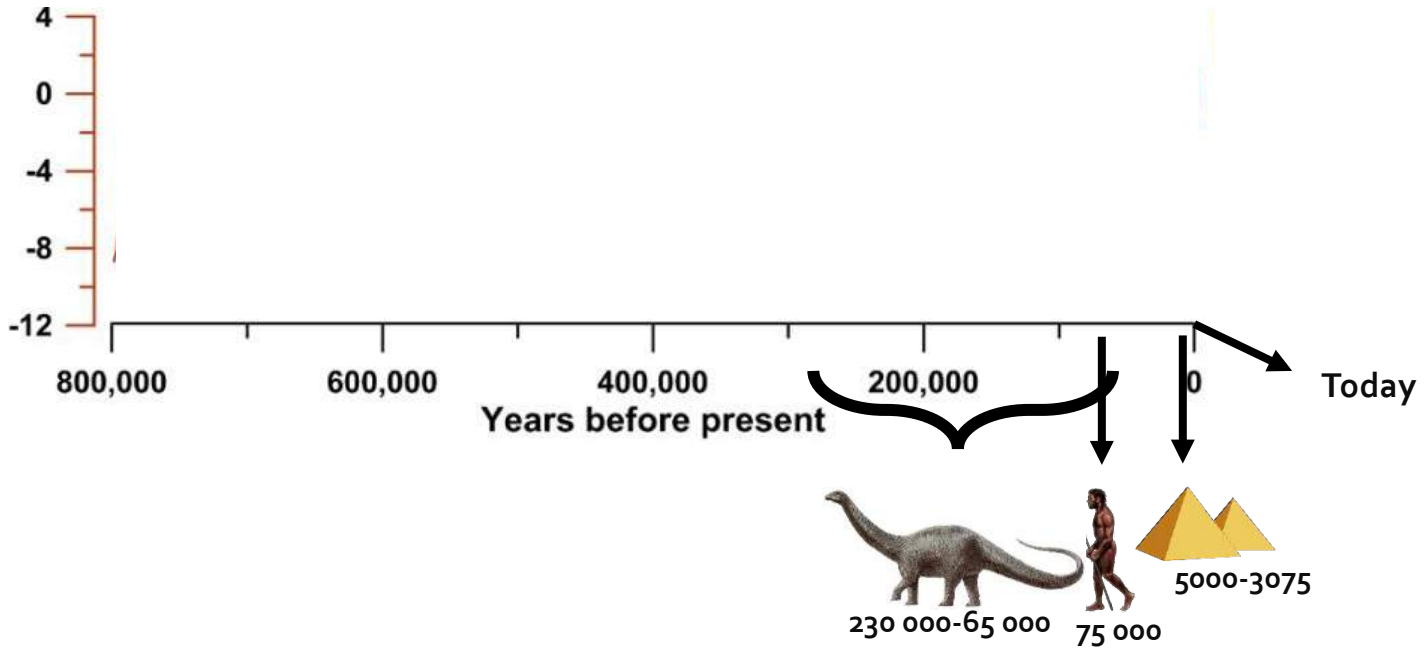

Global Warming Potential
GWP based on CO2
25000
20000
15000
10000
5000
0
1
25
298
1430
14800
22800
CO2
CH4
N20
HFC-134a
HFC-23
Sulfur hexafluoride

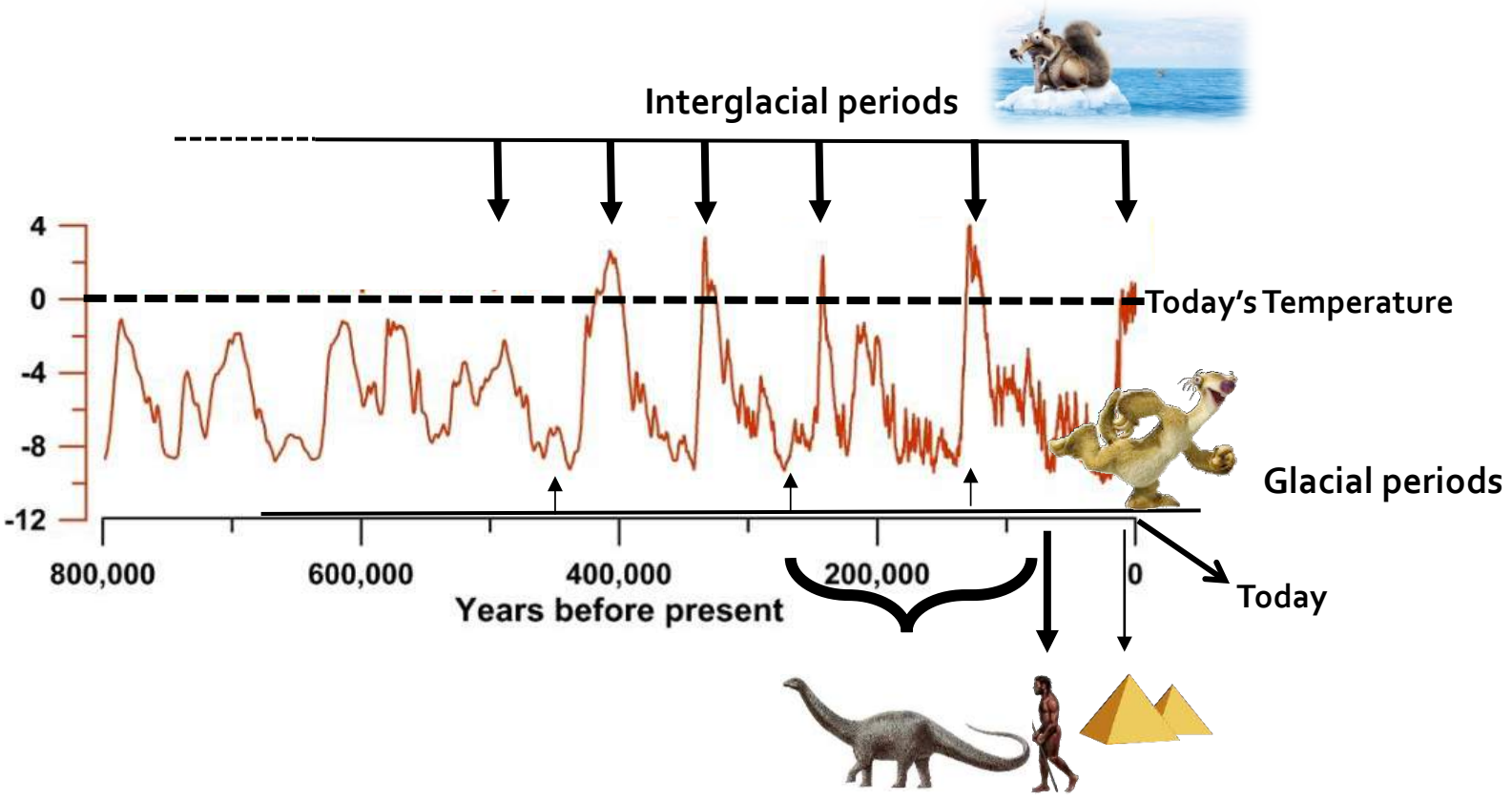

Take action for our future
– reduce your CO_2-emissions
This is the size of
ONE TONNE CO_2
up the challenge
every way YOU can.
Now!

Global Carbon Cycle

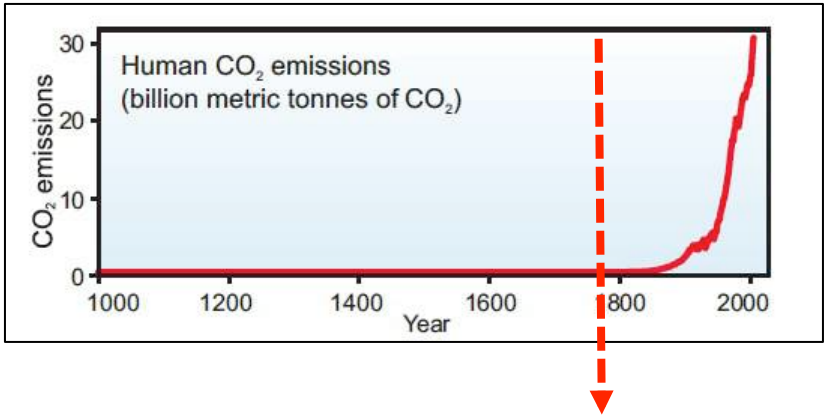


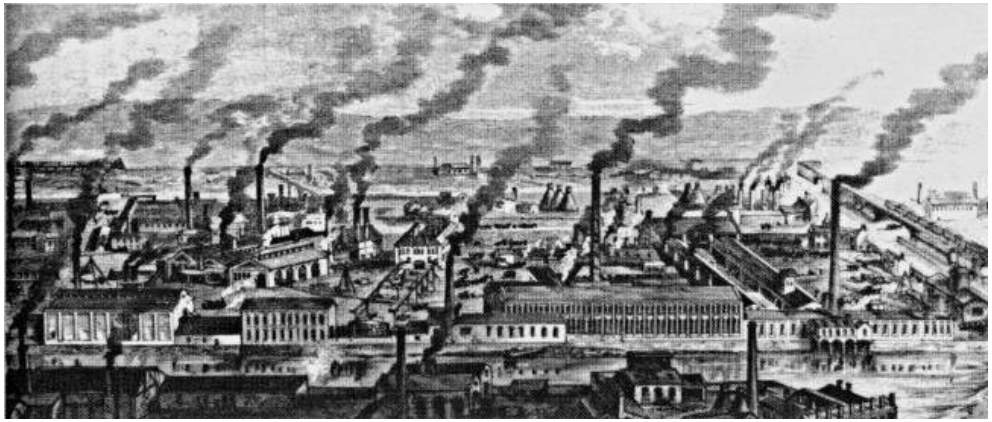
Has Earth climate been always the same?




Interglacial periods
4
0
-4
-8
-12
Today's Temperature
Glacial periods
800,000
600,000
400,000
200,000
0
Years before present
Today

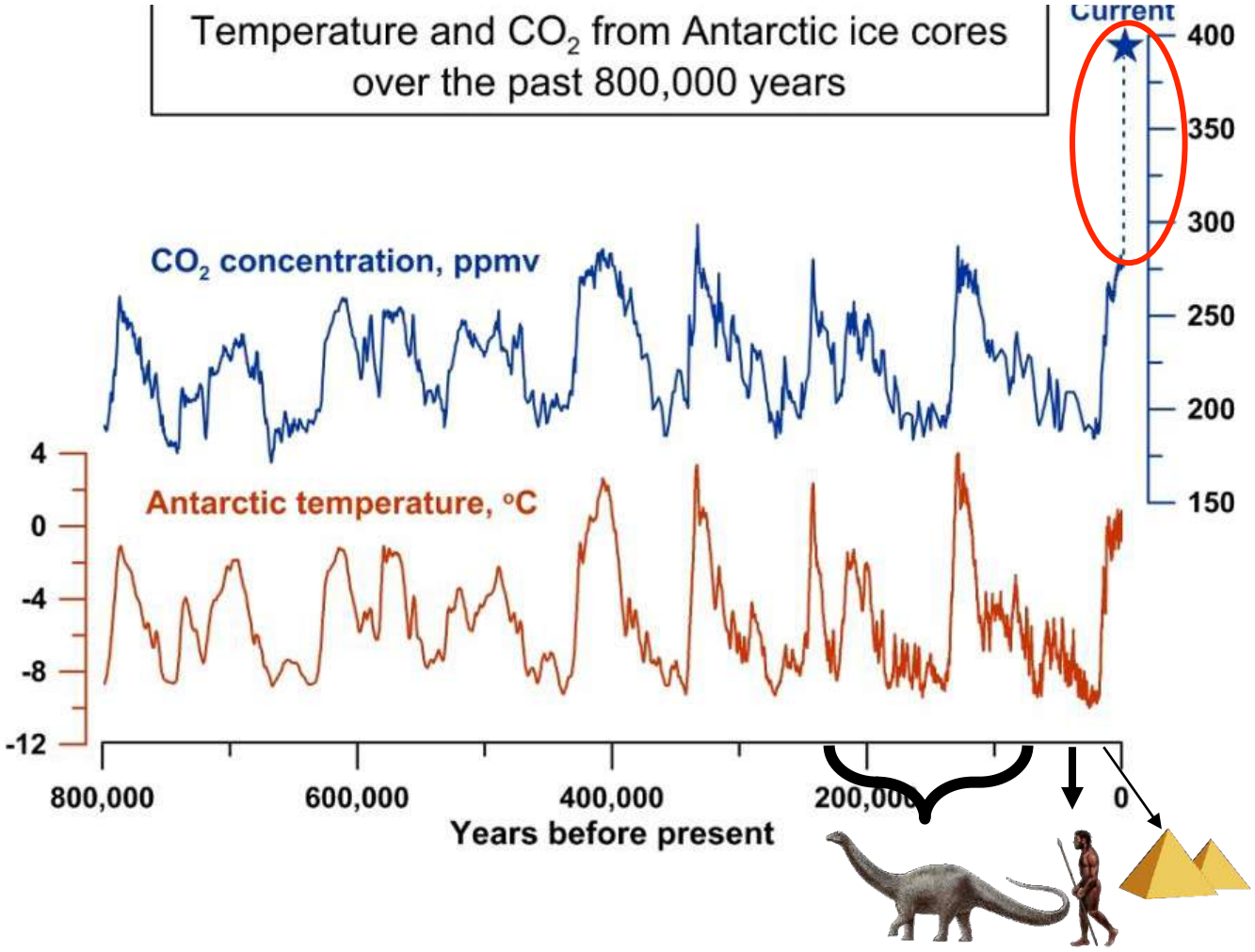
Historical trends





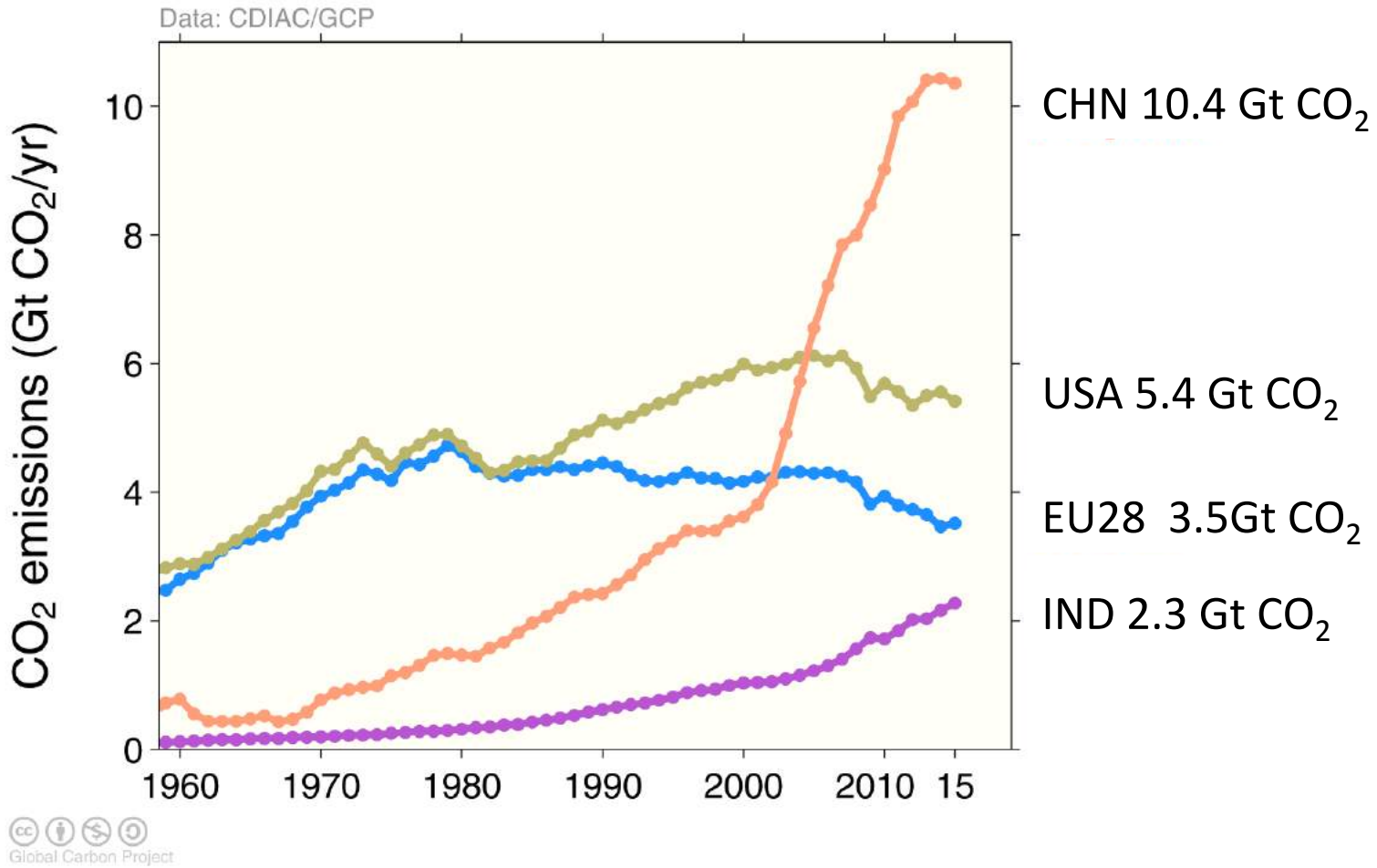
Industrial revolution in England from 1750…..

Historical changes of T



Top emitters: fossil fuels and industry (absolute)

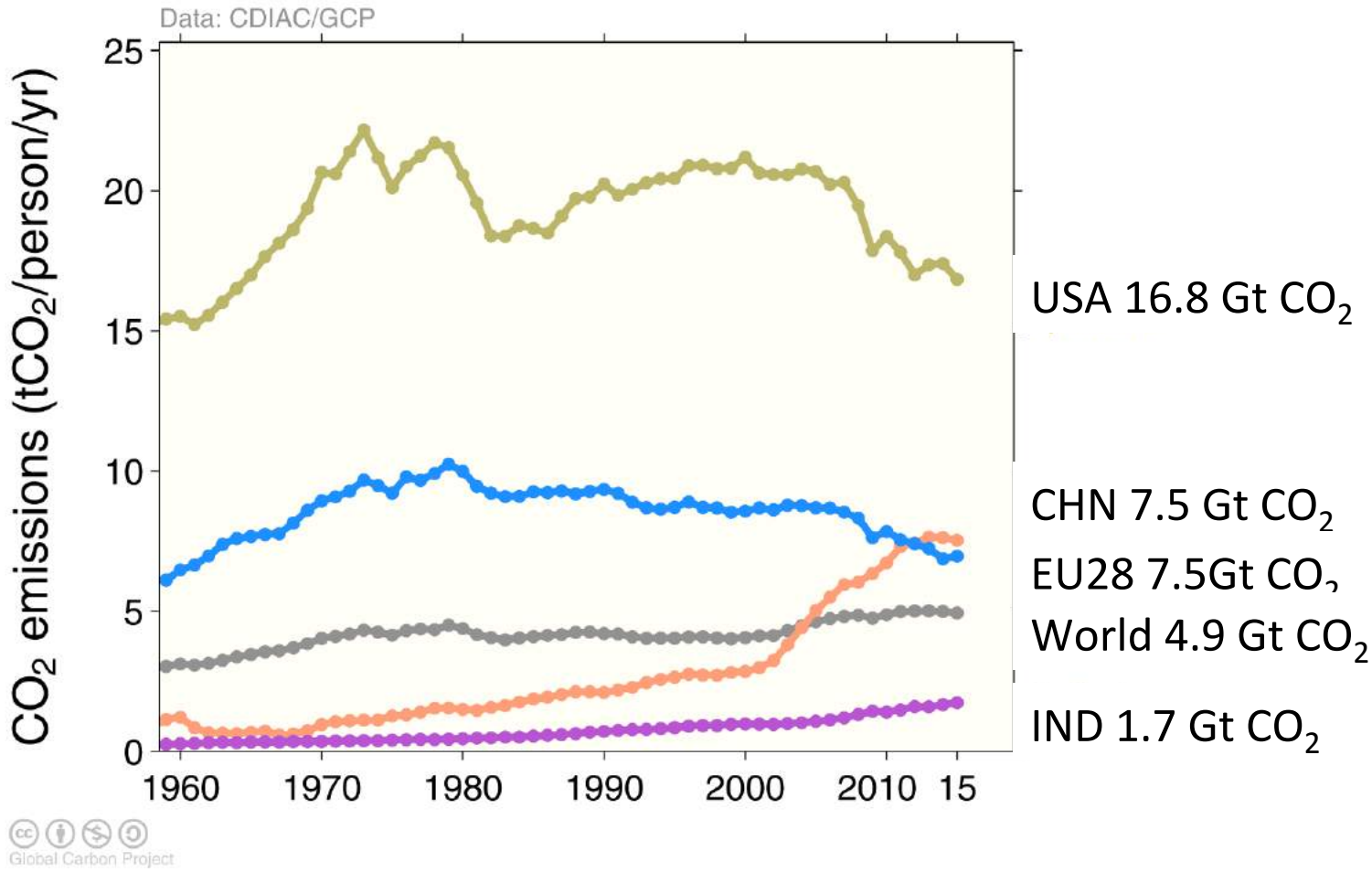
The top four emitters in 2015 covered 59% of global emissions
China (29%), United States (15%), EU28 (10%), India (6%)



Bunker fuels are used for international transport is 3.1% of global emissions.
Statistical differences between the global estimates and sum of national totals are 1.2% of global emissions.
Source: CDIAC; Le Quéré et al 2016; Global Carbon Budget 2016

Top emitters: fossil fuels and industry (per capita)

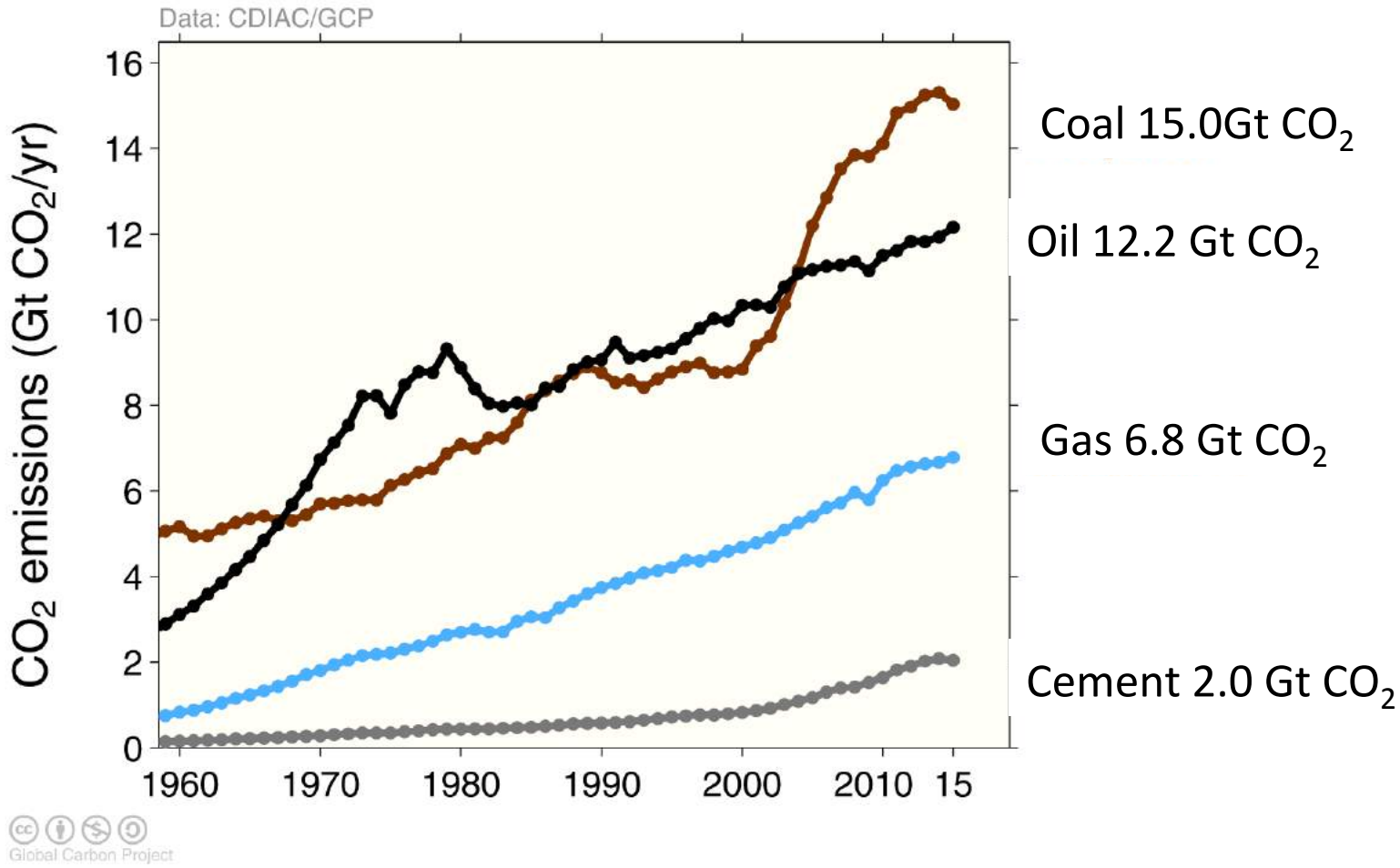
Countries have a broad range of per capita emissions reflecting their national circumstances



Source: CDIAC; Le Quéré et al 2016; Global Carbon Budget 2016

Emissions from coal, oil, gas, cement

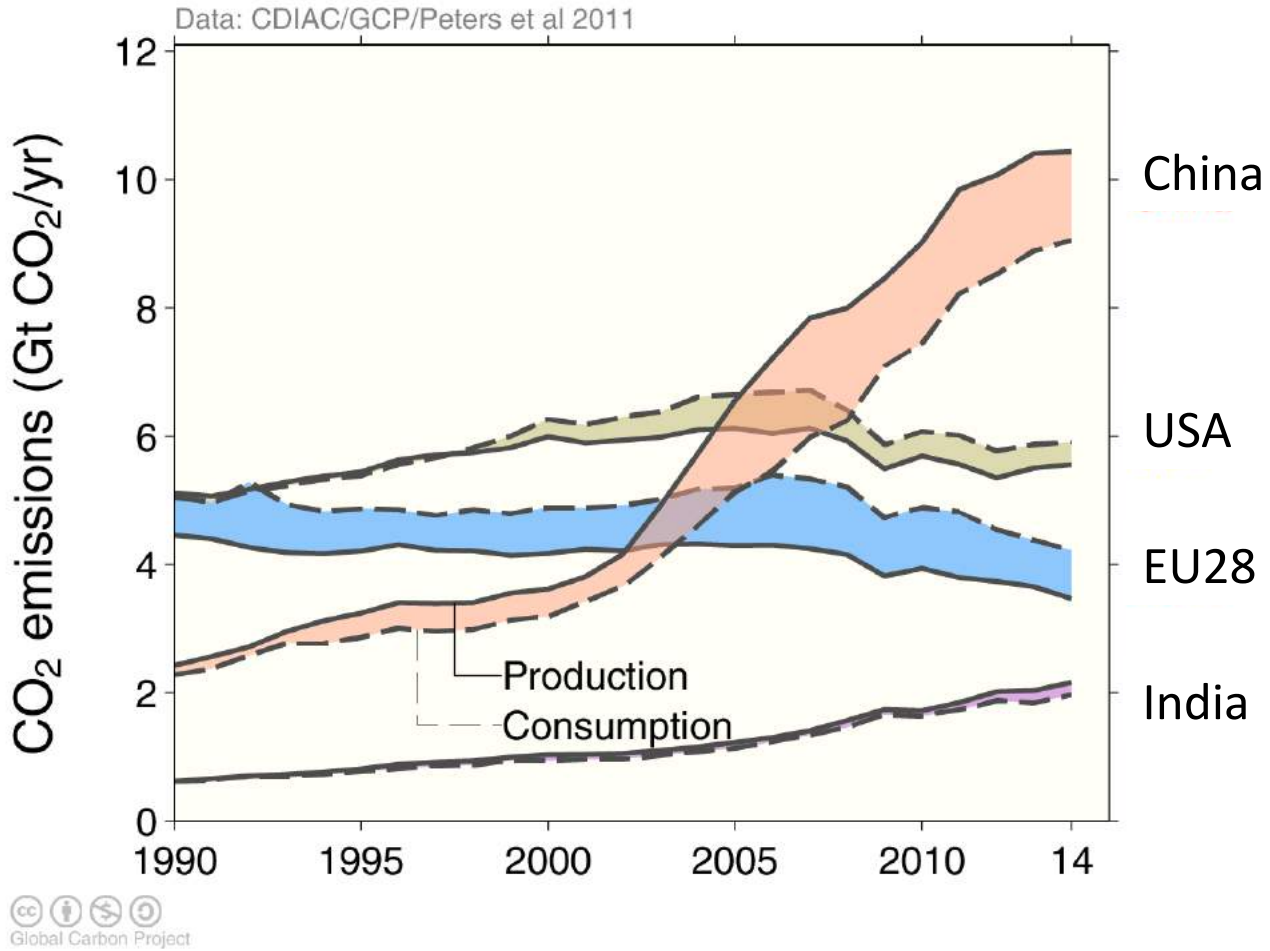
Share of global emissions in 2015:
coal (41%), oil (34%), gas (19%), cement (6%), flaring (1%, not shown)



Source: CDIAC; Le Quéré et al 2016; Global Carbon Budget 2016

Consumption-based emissions (carbon footprint)

Allocating emissions to the consumption of products provides an alternative perspective
USA and EU28 are net importers of embodied emissions, China and India are net exporters



Consumption-based emissions are calculated by adjusting the standard production-based emissions to account for international trade

Source: Peters et al 2011; Le Quéré et al 2016; Global Carbon Project 2016

GLOBAL CARBON BUDGET

Sources

34.1 $GtCO_2/yr$

91%

9%

3.5 $GtCO_2/yr$

Sinks

16.4 $GtCO_2/yr$

44%

31%

11.6 $GtCO_2/yr$

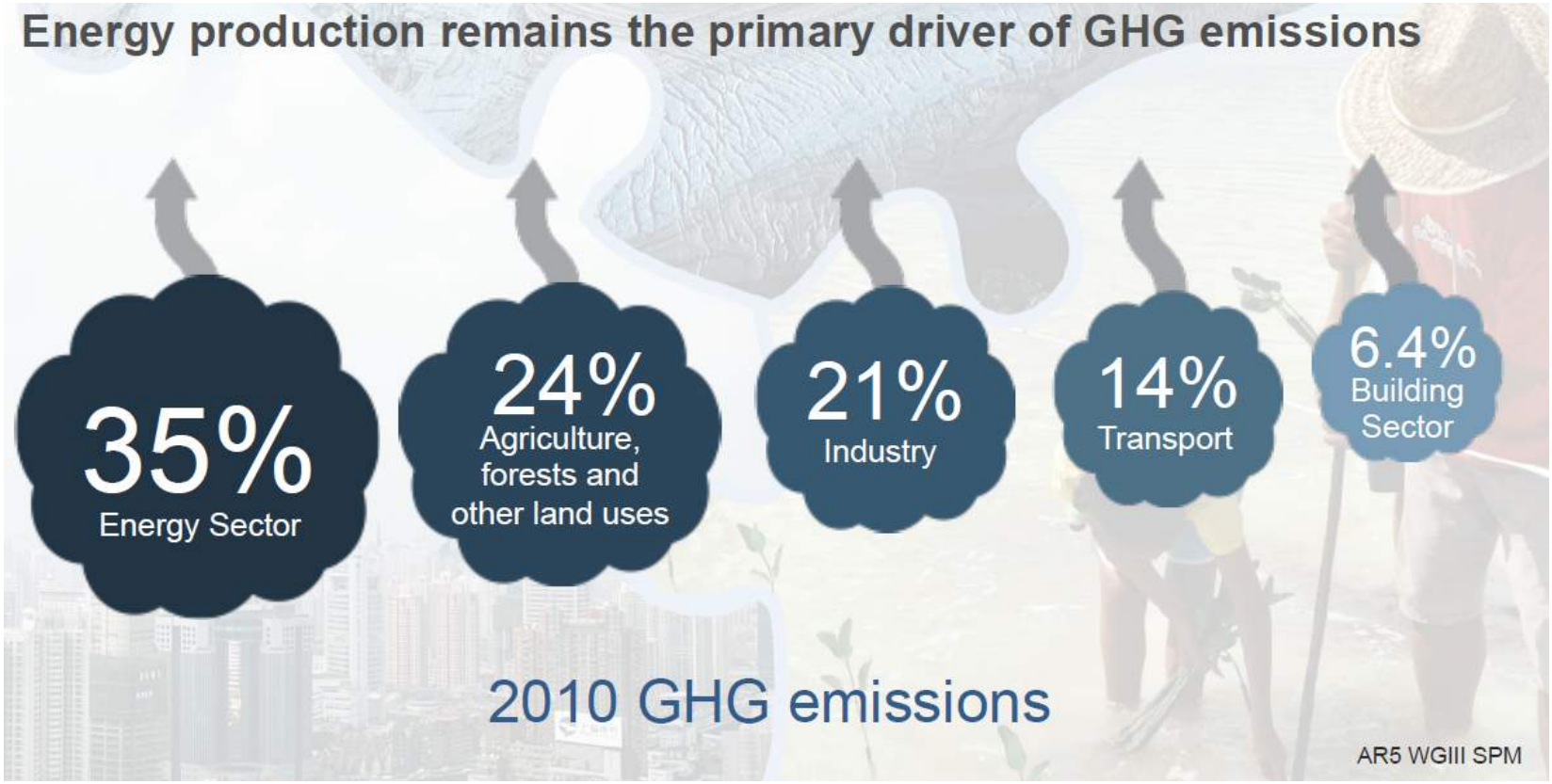
26%

9.7 $GtCO_2/yr$

Forest are part of the problem and part of the solution…

Source: CDIAC; NOAA-ESRL; Houghton et al 2012; Giglio et al 2013; Le Quéré et al 2016; Global Carbon Budget 2016

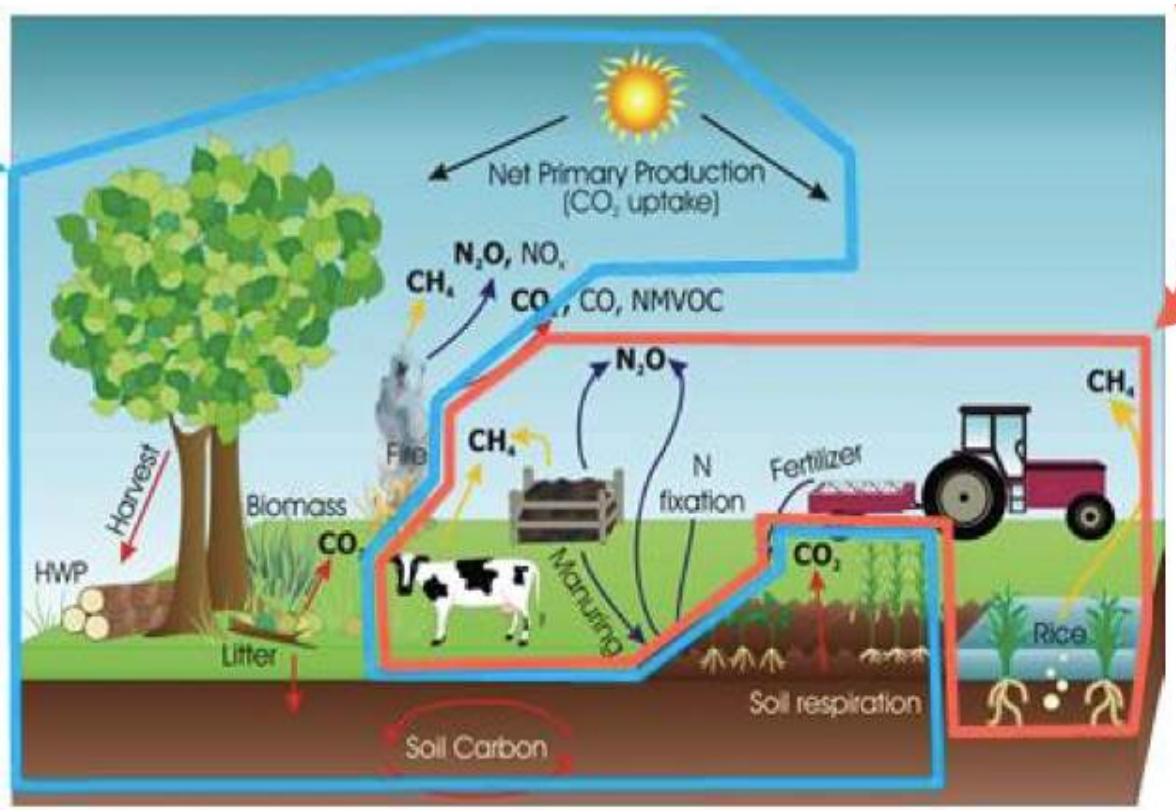
Causes of the increase of GHG concentrations in the atmosphere



AFOLU sector

Land Use, Land Use Change and Forestry (**LULUCF**): CO_2

AGRICULTURE *non-*CO_2 (CH_4, N_2O)



Partly human induced (strongly linked to global natural carbon cycle)

Uncertainties?
Additionality?
Permanence?
Leakage?

Mainly human-induced

=> More readily quantifiable

AFOLU SECTOR

Importance of the AFOLU sector

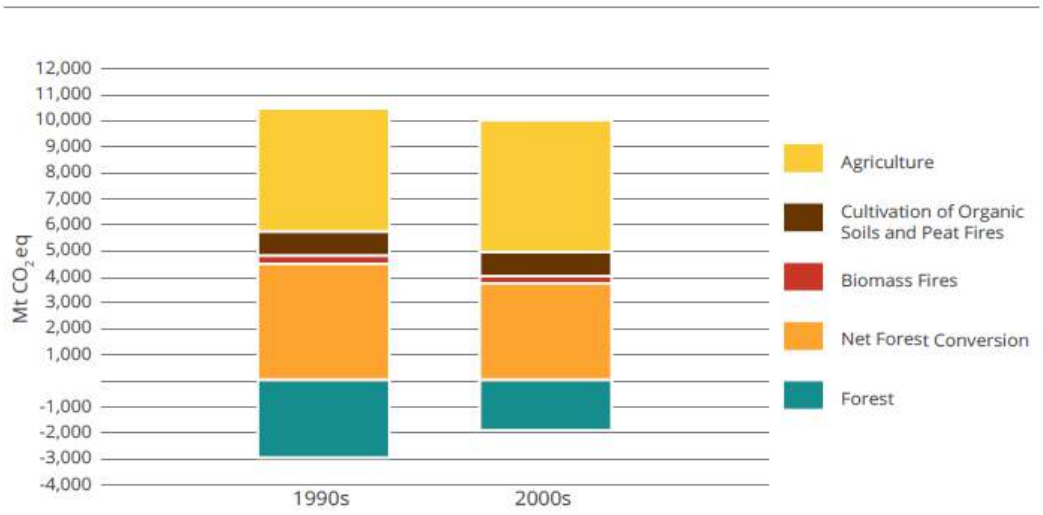
- Land use sector is responsable of 4 Gt **CO2 /yr emissions - LULUCF**
- Agriculture (non-CO2 emissions from fertilizers, enteric fermentation and manure management is of around **4 GtCO2 per year.**

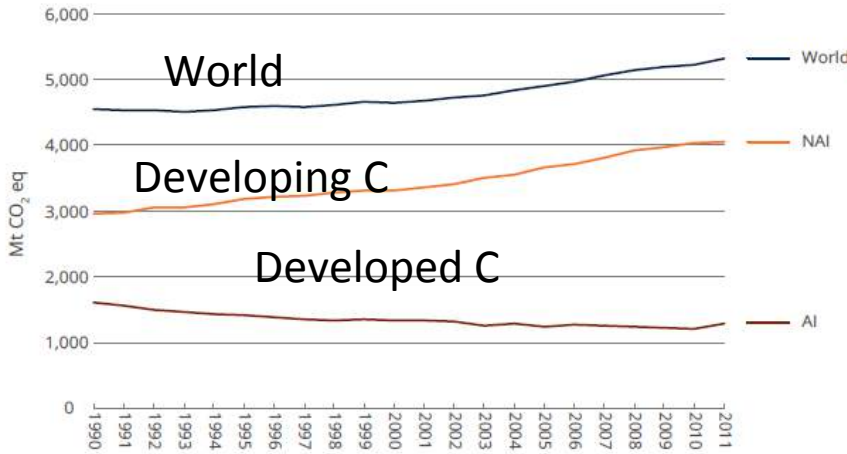
The AFOLU sector (LULUCF+ Agriculture) contributes of about 24% of the global emissions.

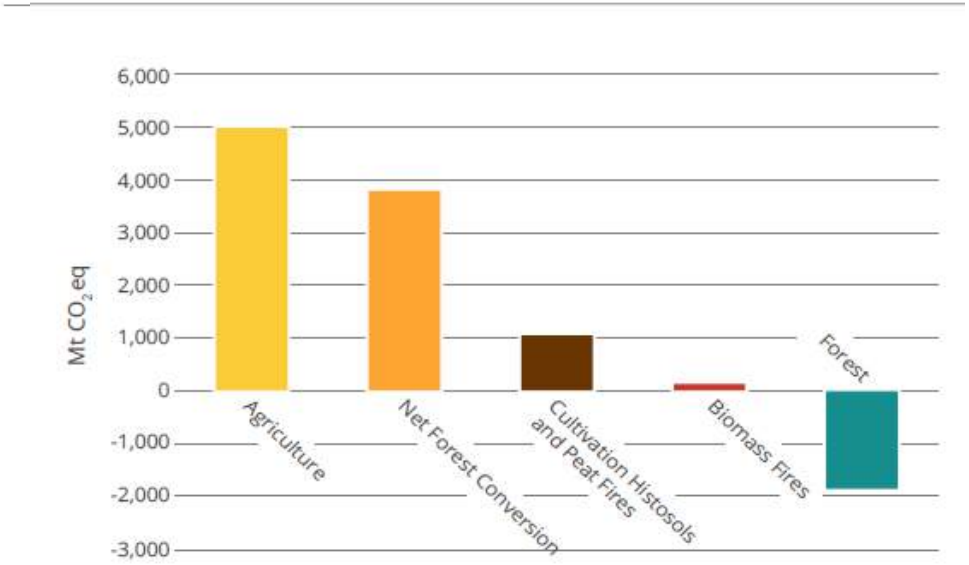
Emissions will remain high and increasing following the increasing demand of food, biofuel, fibers linked with the population increase

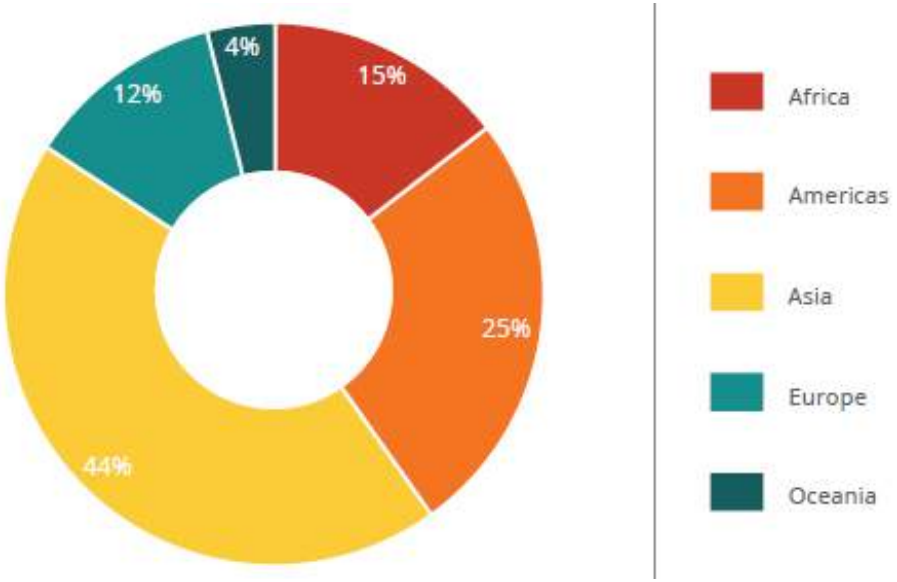


Emissions in the AFOLU sector









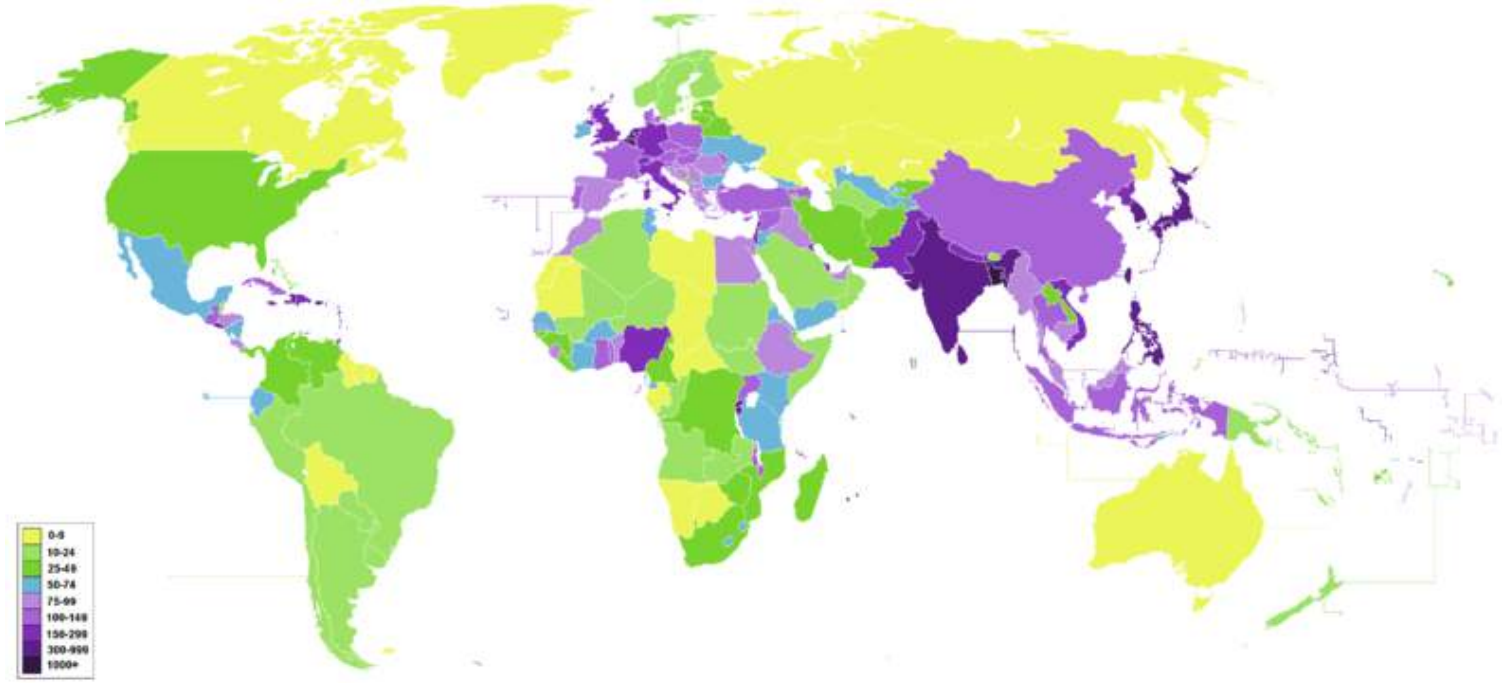
Source: FAO 2014

Food security

Importance of the sector as % of GDP (World Bank, 2013):

- Africa **23%**
- Asia **22%**
- Latin America **10%**
- Industrialized countries **3-4%**

Current population 7.5 bilion
->~9 bilion in 2050



RISKS OF CLIMATE CHANGE

Climate change impacts

- Increase of mean temperature
- Sea level rising
- Increase of the number of extrem precipitation events
- Increase of dry periods (Mediterranean area)

ADAPTATION vs. MITIGATION

- **Climate adaptation** refers to the ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damage, to take advantage of opportunities, or to cope with the consequences.

- The **IPCC** defines adaptation as the, "adjustment in natural or human systems to a new or changing environment. Adaptation to climate change refers **to adjustment in natural or human systems in response to actual or expected climatic stimuli** or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation."

ADAPTATION vs. MITIGATION

- **Climate mitigation** is any action taken to permanently eliminate or reduce the long-term risk and hazards of climate change to human life, property.

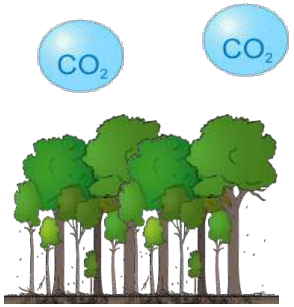
- The International Panel on Climate Change (**IPCC**) defines mitigation as: “An anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases.”

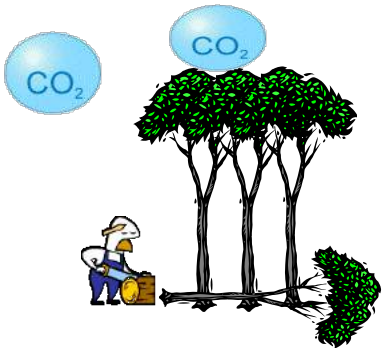
The CLIMATE MITIGATION options in forestry include:

1. **Enhancement of C sink** (new forests, increased C stocks in existing forests)
2. **Reduction of C sources** (reduce deforestation and forest degradation)
3. **C substitution** (wood replacing fossil fuels or other products)

Forests offer synergies between mitigation (at low cost), adaptation, biodiversity ...

forests are a key element in climate policy debate





The CLIMATE ADAPTATION include:

a) Stability of mountainside;
b) Water management;
c) Costal protection (Mangroves)

REDD+ scope (Dec. 1/CP.16 par. 70)

*Encourages **developing country Parties** to contribute to mitigation actions in the forest sector by undertaking the following activities[…]:*

RED

*Reducing emissions from **deforestation***

D

*Reducing emissions from forest **degradation***

+

***Conservation of forest** carbon stocks;*

Sustainable management of forests;

***Enhancement of forest** carbon stocks;*

Afforestation/reforestation Activities

SCALE: National (sub-national ad interim)

Peculiarities of the Forestry sector

LULUCF sector is the only sink (oceans as well but they are not considered as economic sector)

- **Factoring out**: On the same unit of land net carbon stock changes are the result of a number of factors including various human activities, natural variables and associated disturbances, and the lagged effect of previous activities and disturbances. Need to factor out natural processes in the GHG balance.

- **Long time scales** of the effect of forestry-related activities (long growth/harvesting cycles) -> emissions/removals in a particular year may reflect the choices taken long time ago, not related to particular choices during the commitment period.

- **Saturation** which limits biological sequestration potential but not necessarily provision of renewable energy or wood products

- **Non-permanence** of removed carbon

- **Uncertainity**: estimates are affected by high uncertainty level (e.g. UE uncertainties for land sector ~30% other sectors <5%)

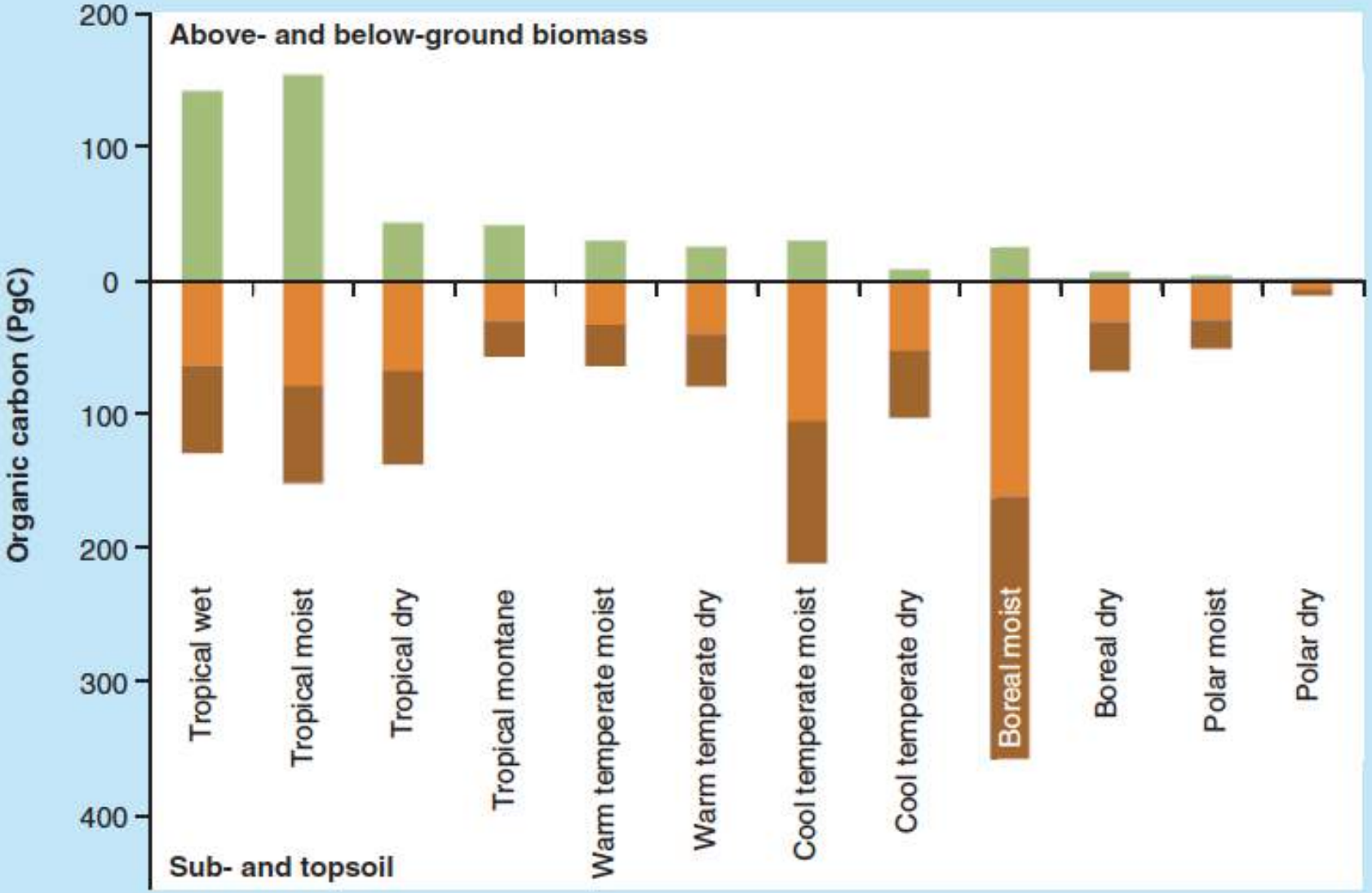
Fonte: FA

FORESTS

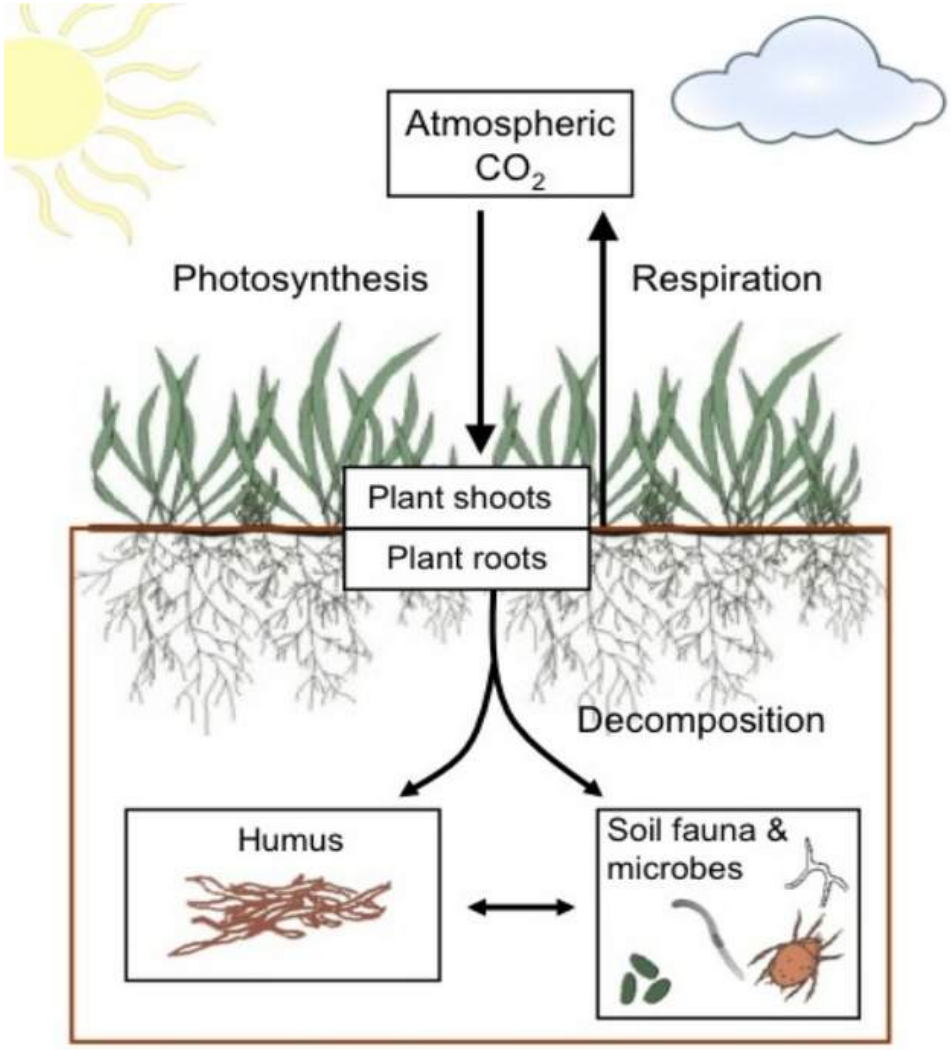
- **Forests contain 90% global biodiversity**
- Water regime and soil protection against erosion

- **More than 1 billion people depend directly from forest resources**

- Wood is the primary energetic source for cooking and heating for more than 2 billion people covering the 70% of the dayly energetic needs of the population in Africa and south east Asia.


Above- and below-ground biomass
Sub- and topsoil
Organic carbon (PgC)
200
100
0
100
200
300
400
Tropical wet
Tropical moist
Tropical dry
Tropical montane
Warm temperate moist
Warm temperate dry
Cool temperate moist
Cool temperate dry
Boreal moist
Boreal dry
Polar moist
Polar dry

Atmospheric C is a primary source of C for soil



The amount of biomass arriving to soil varies according to climatic conditions

Above ground Biomass

1.0 – 4.0 Mg C ha^{-1} yr^{-1} Artic and Alpine Tundra

3.0 – 7.5 Mg C ha^{-1} yr^{-1} Broaleaves Boreal Forest

5.0 – 11.0 Mg C ha^{-1} yr^{-1} Broadleaves Temperate forests

3.0 – 6.0 Mg C ha^{-1} yr^{-1} Temperate Grasslands

Root production

- 2.3 – 10 Mg C ha^{-1} yr^{-1} Temperate forests
- 5.0 Mg C ha^{-1} yr^{-1} Temperate Grasslands

Forest disturbances due to……

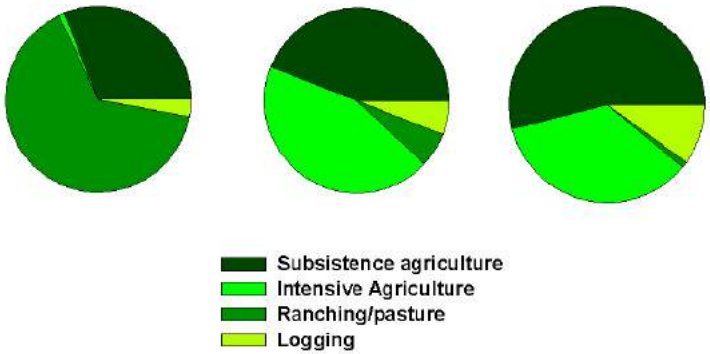
- Land use change
- Change in management
- Forest degradation

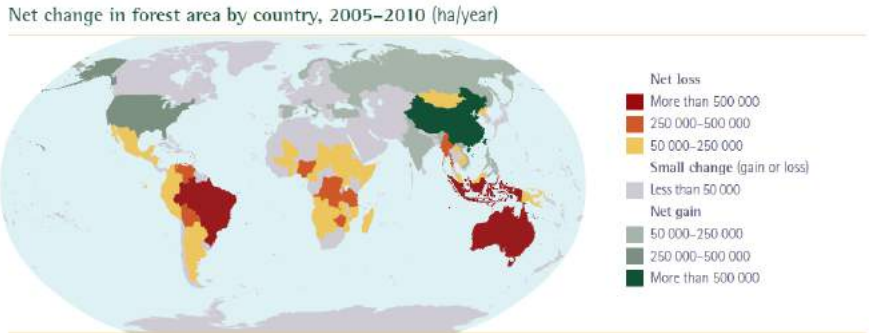
As a results ***Biomass*** and ***SOM*** dynamics ***change***

- Change in the amount of C inputs to soil
- Change in vegetation type
- Change in the quality of C inputs to soil

DEFORESTATION

Latin America Southeast Asia Africa

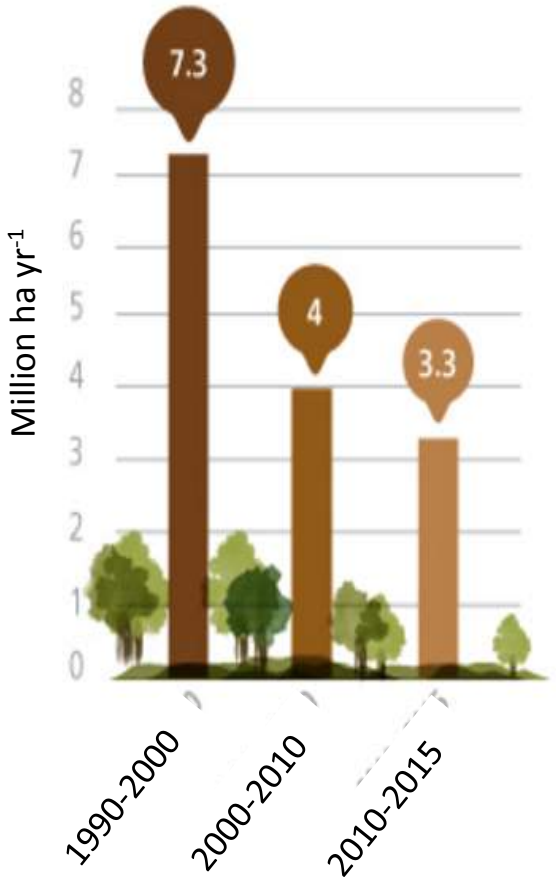




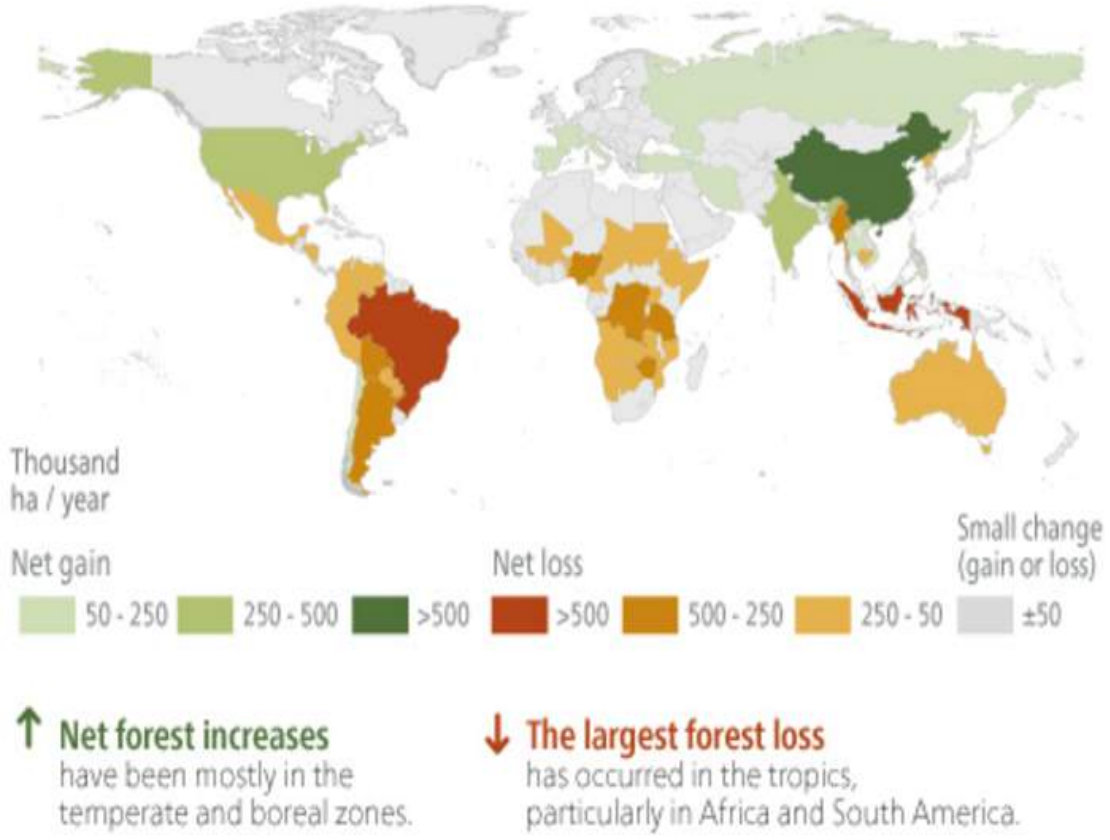
How are the world's forests changing?*

Forest areas have decreased since 1990 but the rate of net forest loss has been cut by 50%

World forests annual net loss



Forest area annual net change 1990-2015



FOREST DEGRADATION EMISSIONS

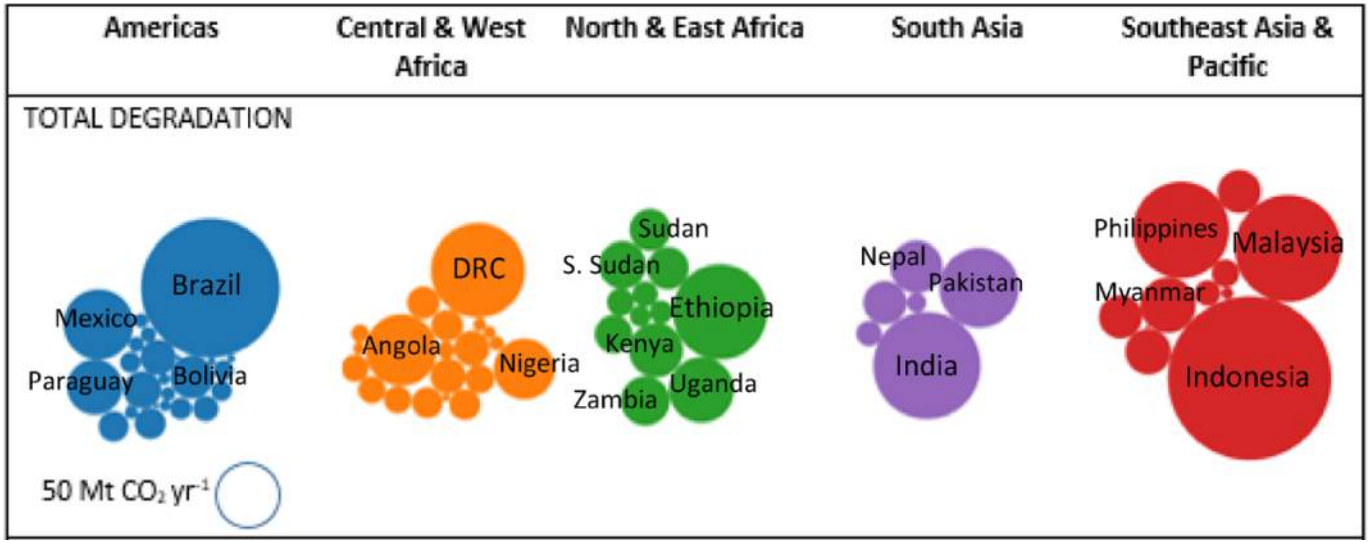
53% timber harvest

30% woodfuel harvest

17% forest fires

Forest degradation emissions = 2.2 Gt CO_2 $year^{-1}$

25% of the summed emissions from deforestation and forest degradation (8.28 Gt CO_2 $year^{-1}$)



Pearson et al. Carbon Balance Manage (2017) 12:3

AGRICULTURE

1 Kg

14-20 Kg

GHG emissions

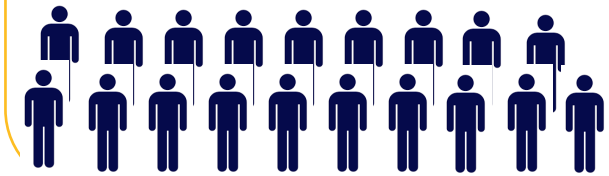
Enteric fermentation

Fertilizers

Manure management

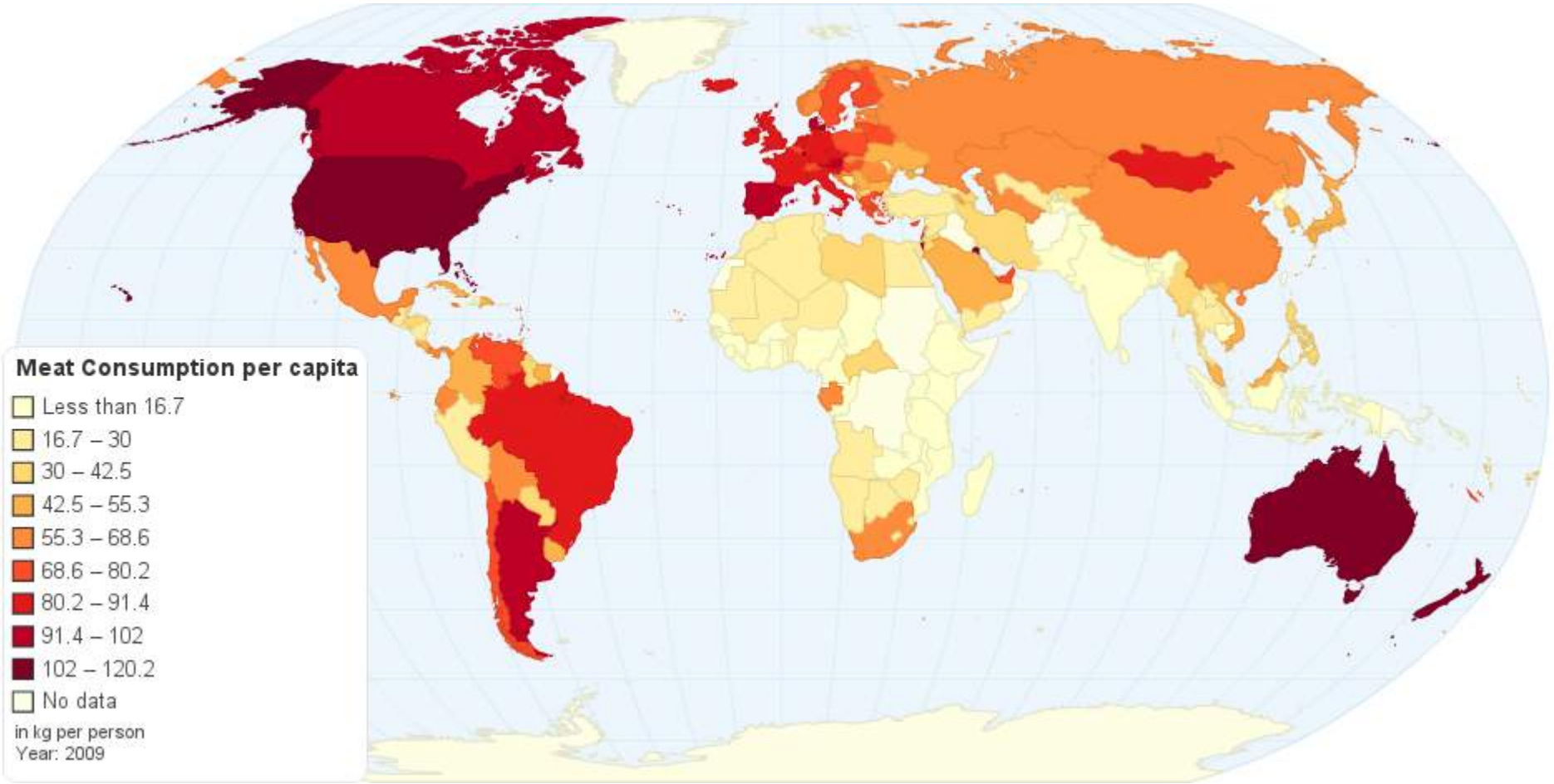
1 ha rice production

1 ha Cow grazing

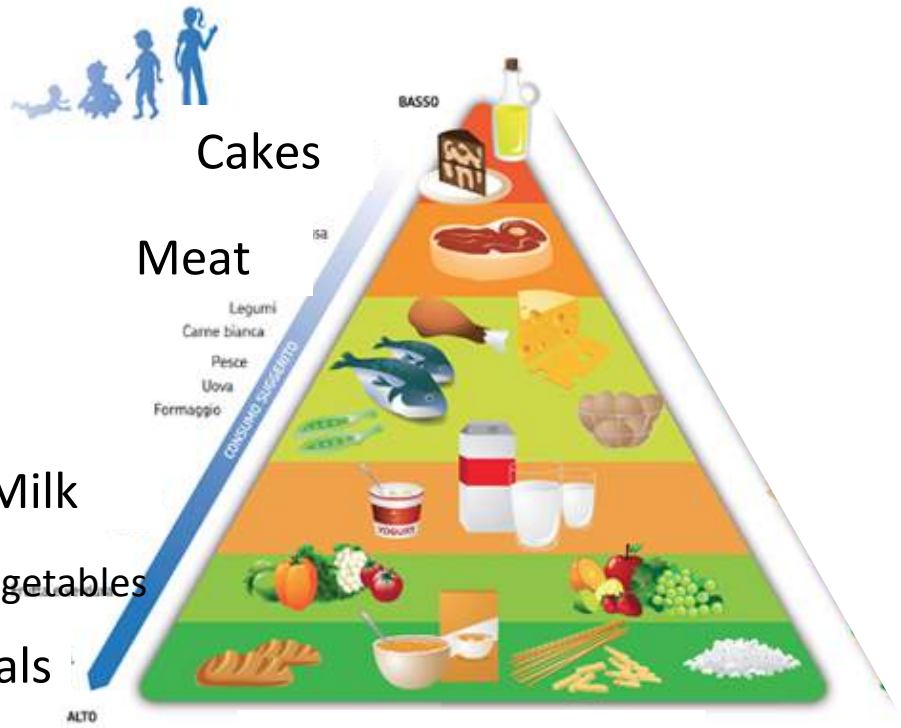


In US and Europe, half of cereal production is for animal consumption

Meat per capita consumption



FOOD PYRAMID



Cakes

Meat

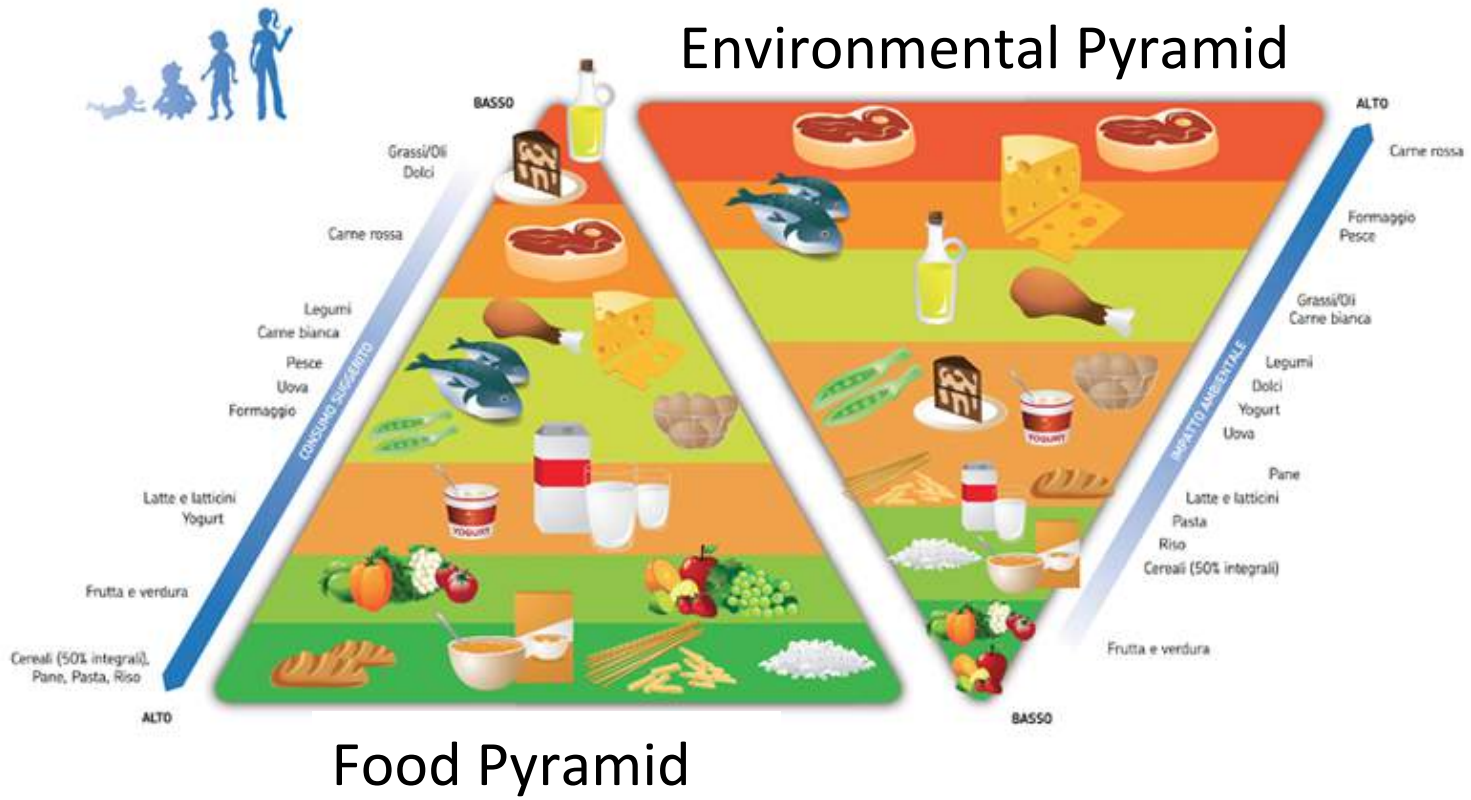
Milk

Fruit and vegetables

Cereals

Food Pyramid

ENVIRONMENTAL PYRAMID



MILESTONE	YEAR	IMPORTANCE
First World Climate Conference	1979	Lays the foundation for some international climate programmes including the Intergovernmental Panel on Climate Change (IPCC)
IPCC's First assessment report	1990	Provides the first estimates of confidence about the extent of global climate change and the human influences behind it
UN Framework Convention on Climate Change (UNFCCC) signed	1992	A major international climate change treaty representing worldwide agreement that action is needed against climate change
UNFCCC enters into force	1994	Countries signing the UNFCCC are now bound by its rules.
First Conference of the Parties (COP) of the UNFCCC	1995	The first of the (generally annual) international negotiations on climate change stipulated by the UNFCCC, leading to the Kyoto Protocol
Kyoto Protocol signed	1997	Thirty-seven developed nations and economies in transition commit to reducing their emissions by at least five per cent below 1990 levels from 2008-2012
Kyoto Protocol enters into force	2005	Countries with greenhouse gas reduction targets are now committed to them
IPCC's Fifth assessment report	2013-2014	Follows reports in 1995, 2001 and 2007. Makes strong statements about the high likelihood of human influence on the global climate and the consequent impacts
Twenty-first UNFCCC COP in Paris	2015	The meeting is aiming for an agreement to succeed the Kyoto Protocol

1990

SO, THIS CLIMATE CHANGE THING COULD BE A PROBLEM...

1995

CLIMATE CHANGE: DEFINITELY A PROBLEM.

2001

YEP, WE SHOULD REALLY BE GETTING ON WITH SORTING THIS OUT PRETTY SOON...

2007

LOOK, SORRY TO SOUND LIKE A BROKEN RECORD HERE...

2013

WE REALLY HAVE CHECKED AND WE'RE NOT MAKING THIS UP.

2019

IS THIS THING ON?

TAP TAP TAP

KUDLA. 28/9/13

PARIS AGREEMENT

153 Parties have ratified of 197 Parties to the Convention

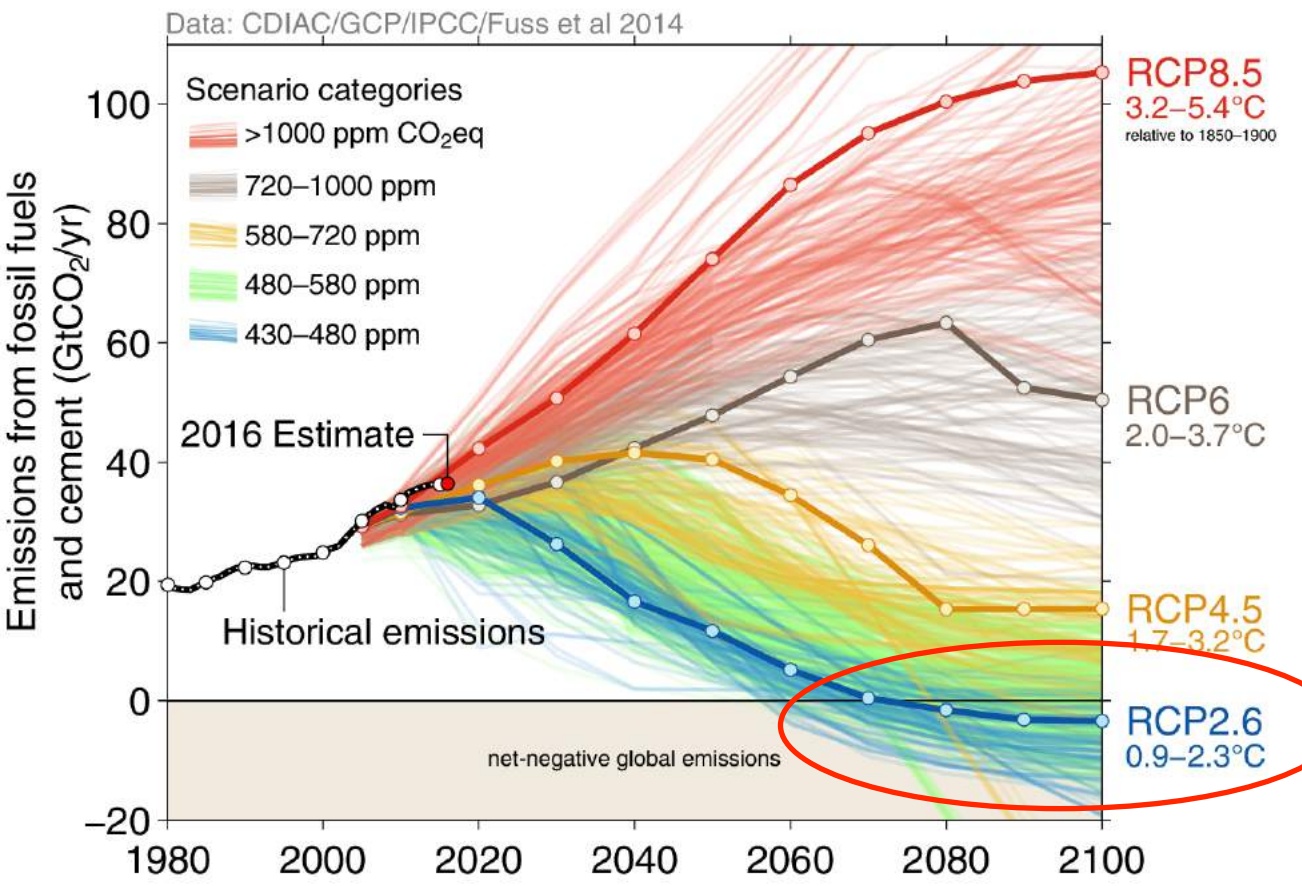
On 5 October 2016, the threshold for entry into force of the Paris Agreement was achieved. The Paris Agreement entered into force on 4 November 2016. The first session of the Conference of the Parties serving as the Meeting of the Parties to the Paris Agreement (CMA 1) took place in Marrakech, Morocco from 15-18 November 2016.
More information

PARIS AGREEMENT

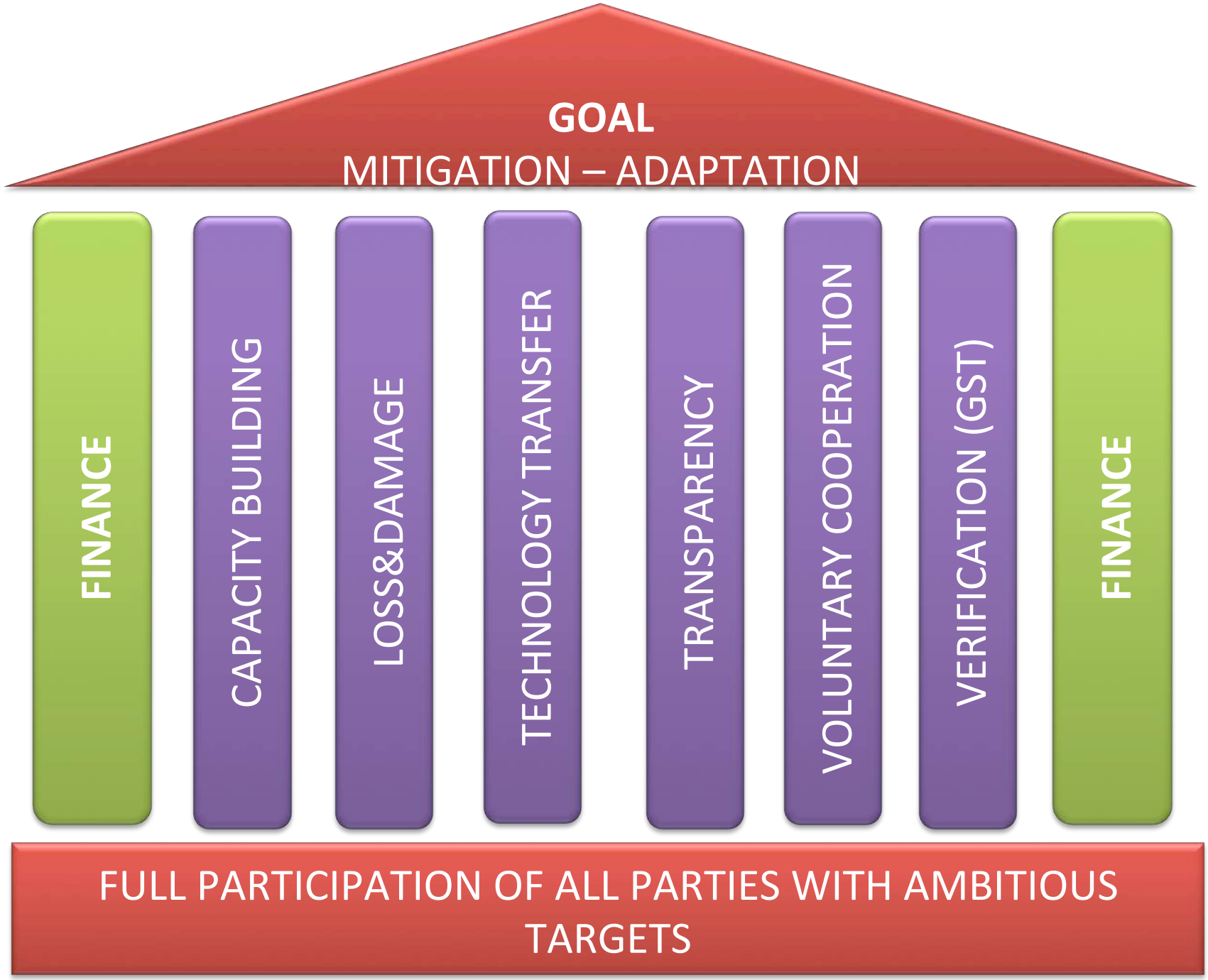
PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

PARIS AGREEMENT

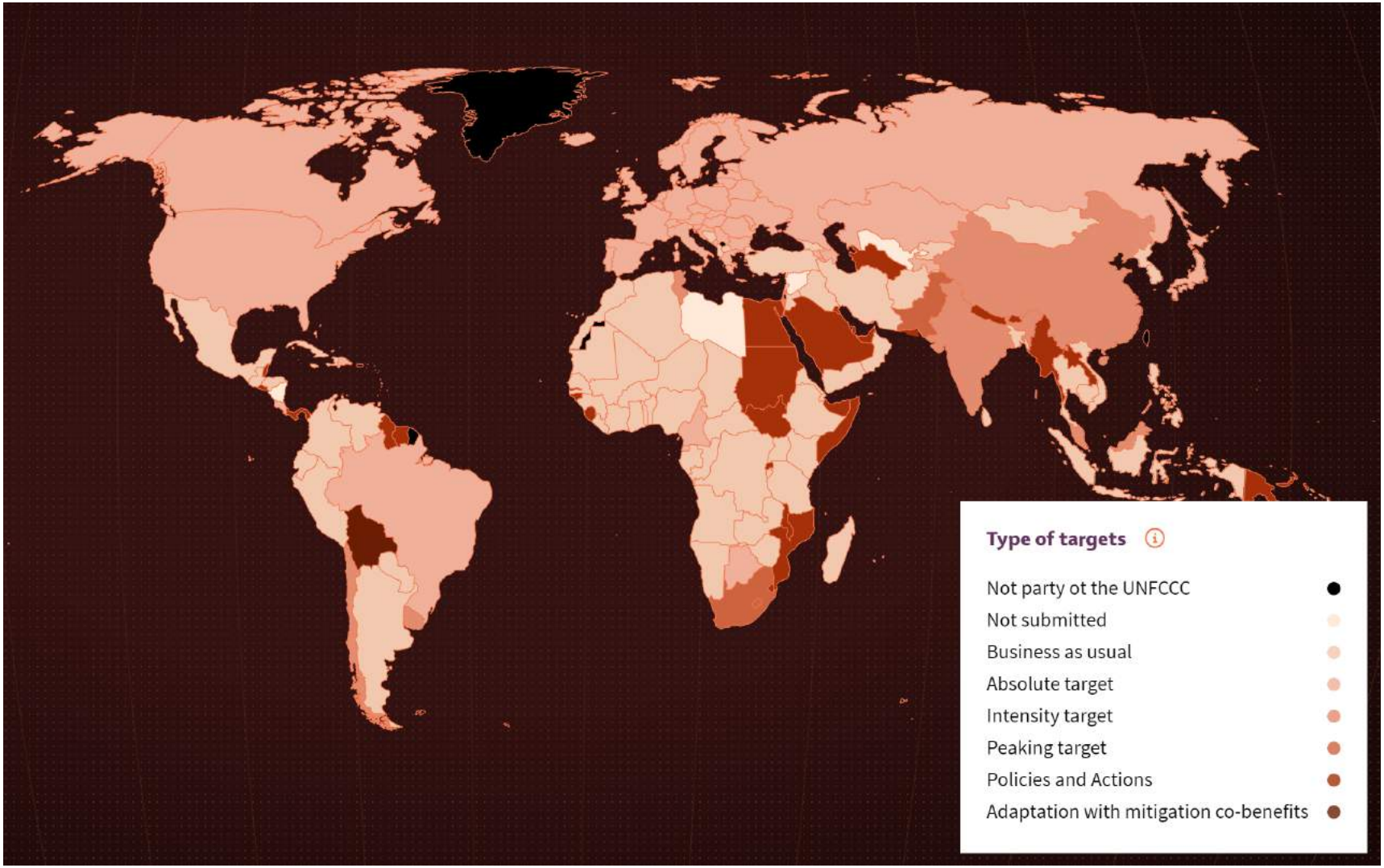
Mitigation – long term objective:
hold the increase in T below 2°C [1.5°C]
Adaptation – Increase the adapting capacity to climate change
Finance - ensure funds in line with the pathway towards a low carbon and resilient development



«BOTTOM UP» agreement based on National Determined Contribution (NDC) with a long term ambition


GOAL
MITIGATION – ADAPTATION
FINANCE
CAPACITY BUILDING
LOSS&DAMAGE
TECHNOLOGY TRANSFER
TRANSPARENCY
VOLUNTARY COOPERATION
VERIFICATION (GST)
FINANCE
FULL PARTICIPATION OF ALL PARTIES WITH AMBITIOUS TARGETS

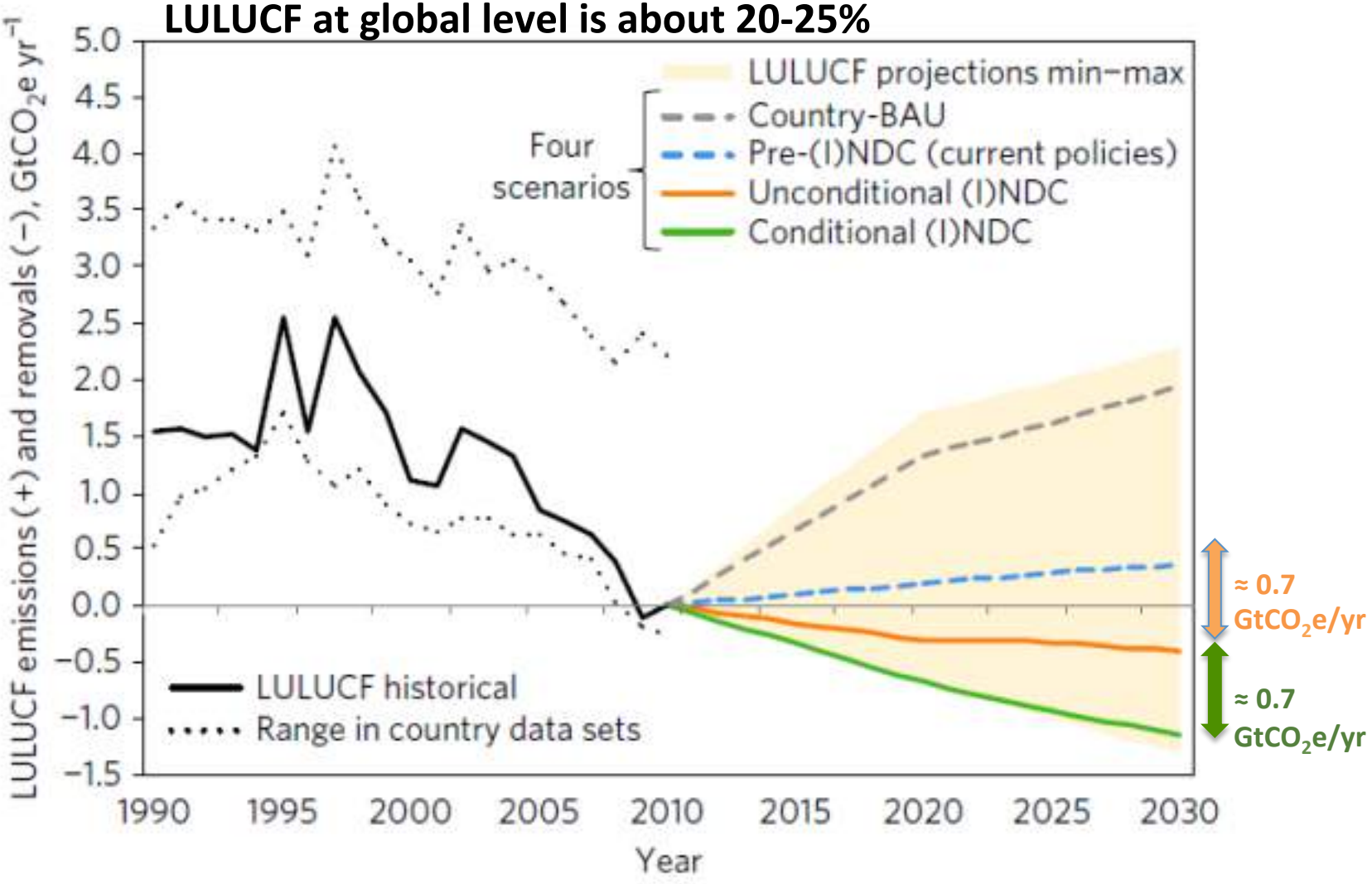
Types of NDC (136 submitted so far)



http://datadrivenjournalism.net/resources/ndc_explorer

LAND USE SECTOR CONTRIBUTION

Relative to the emissions from all sectors, the estimated contribution from LULUCF at global level is about 20-25%



Grassi et al. Nature Climate Change (2017)

Donald J. Trump
@realDonaldTrump

Following

Give me clean, beautiful and healthy air - not the same old climate change (global warming) bullshit! I am tired of hearing this nonsense.

Donald J. Trump
@realDonaldTrump

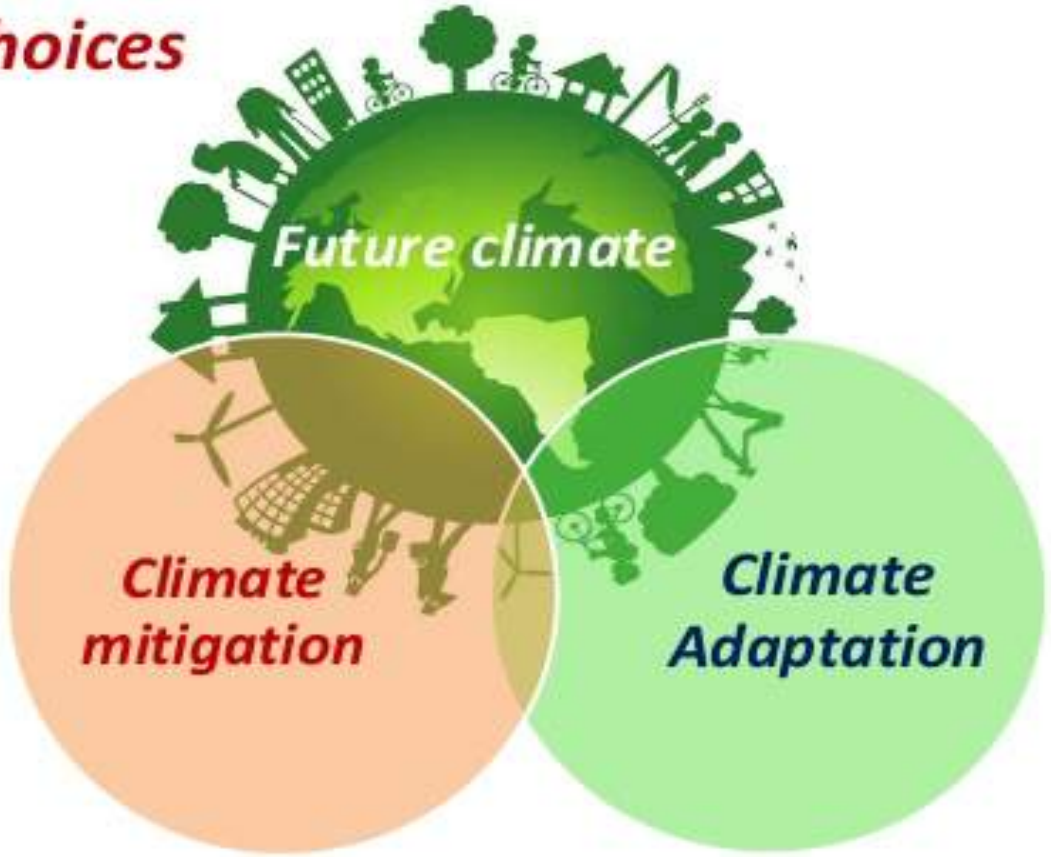
Follow

The concept of global warming was created by and for the Chinese in order to make U.S. manufacturing non-competitive.

RETWEETS	FAVORITES
7,276	2,800

11:15 AM - 6 Nov 2012

Climate Choices



"Avoiding the unmanageable, and managing the unavoidable"

WOODY ENCROACHMENT OVER ABANDONED PASTURE ALONG THE ITALIAN PENINSULA

The effect of the process on soil and ecosystem carbon stocks

Guido Pellis and Tommaso Chiti

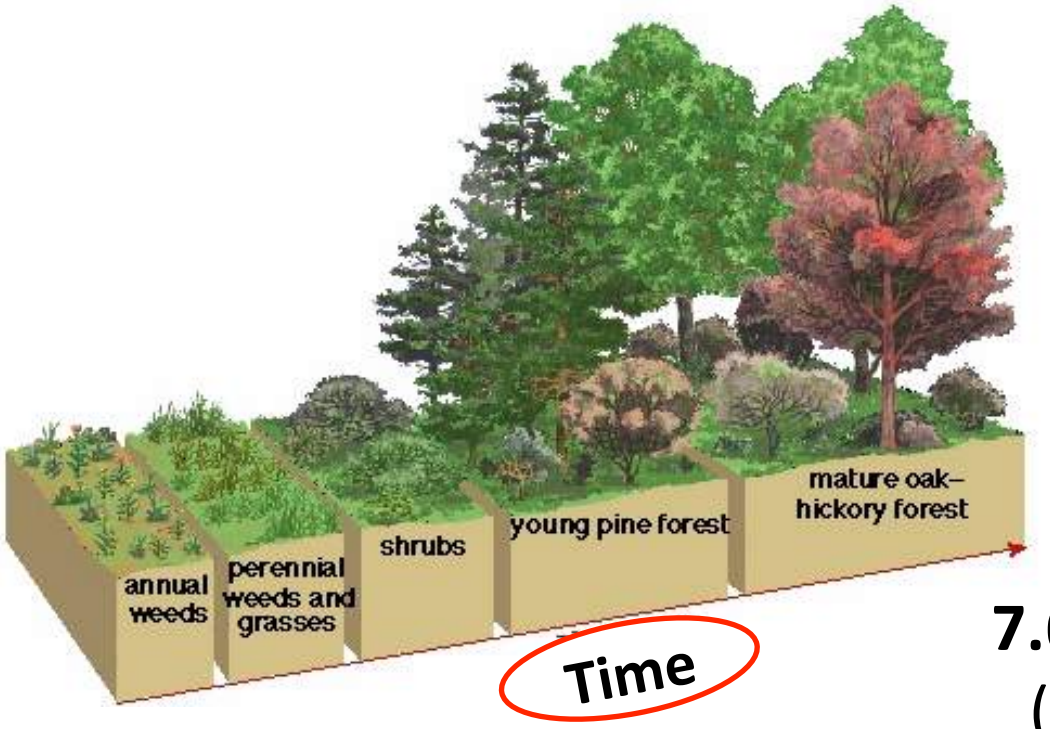
DIBAF Dept. for Innovation in Biological, Agro-food and Forest systems-University of Tuscia

UNIVERSITÀ DEGLI STUDI DELLA Tuscia

Woody encroachment over pastures and grasslands

- Secondary succession
- Woody vegetation expansion
- Land Use Change (LUC)

Release/absorption of GHGs (IPCC, 2014)



Mountain and rural territories after WWII

7.6% S Europe (1950-2010)

1.1% Italy (1990-2008)

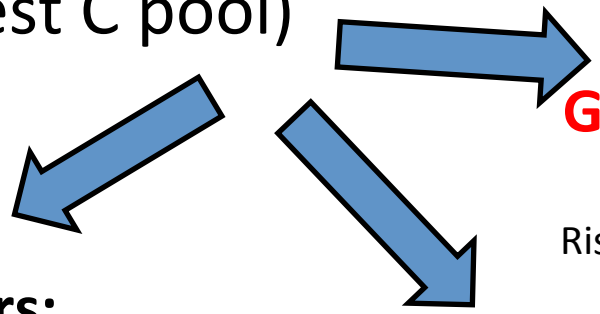
SVIZZERA
AUSTRIA
UNGHERIA
ALPI CENTRALI
ALPI ORIENTALI
ALPI OCCIDENTALI
Alpi Carniche
Alpi Giulie
SLOVENIA
Pizzo Bernina
Alpi Orobie
Adamello
Dolomiti
M. Bianco
M. Rosa
Gran Paradiso
Lago Maggiore
L. di Como
Brianza
L. di Garda
Ticino
Adda
Adige
Piave
Pianura Veneta
Pianura Padana
Po
Polesine
Monferrato
Langhe
Carso
G. di Trieste
Golfo di Venezia
Istria
CROAZIA
BOSNIA HERZEGOVINA
Valli di Comacchio
Appennino Settentrionale
Reno
Romagna
Golfo di Genova
M. Cimone
M. Falterona
M. Fumaiolo
Arno
Chiana
MAR LIGURE
MARE ADRIATICO
L. Trasimeno
Appennino Centrale
Capraia
I. d'Elba
Pianosa
Arcip. Toscano
Montecristo
Giglio
Maremma
M. Amiata
M. Vettore
L. di Bolsena
Tevere
Gran Sasso d'Italia
L. di Bracciano
Corsica (Francia)
C. Linaro
Agro Romano
Ciociaria
La Maiella
La Meta
Isole Tremiti
Testa del Gargano
G. di Manfredonia
Tavoliere
Bocche di Bonifacio
La Maddalena
Caprera
Asinara
M. Limbara
G. di Gaeta
Isole Ponziane
Volturno
Vesuvio
Arcip. Campano
Ischia
G. di Napoli
Capri
G. di Salerno
Cilento
Le Murge
Bradano
Pen. Salentina
Golfo di Taranto
Appennino Meridionale
C. Caccia
C. Comino
Barbagia
G. di Orosei
Monti del Gennargentu
Tirso
Campidano
G. di Oristano
Sardegna
MAR TIRRENO
C. Palinuro
M. Pollino
C.S. Maria di Leuca
C. Pecora
M. Linas
I. di S. Pietro
I. di S. Antioco
G. di Cagliari
C. Carbonara
C. Teulada
C. Spartivento
Punta Alice
La Sila
C. Colonna
G. di Squillace
Punta Stilo
Ustica
Isole Eolie o Lipari
Salina
Lipari
Vulcano
C. S. Vito
C. Gallo
Sicilia
Aspromonte
Str. di Messina
C. Spartivento
MAR IONIO
Isole Egadi
Marettimo
Favignana
C. Boeo o Lilibeo
Le Madonie
Etna
Canale di Sicilia
MAR MEDITERRANEO
Salso
Piana di Catania
G. di Catania
Piana di Gela
G. di Gela
Pantelleria
C. Passero
C. I. d. Correnti
Canale di Malta
AFRICA
Linosa
MALTA
Isole Pelagie
Lampione
Lampedusa
0 100 200 km
Long. Est 15° da Greenwich

Carta forestale del Regno d'Italia, realizzata nel 1936 dall'allora Milizia Forestale. (Ferretti at al., 2016 modificata)

Formazioni Forestali in base al Corine Land Cover 2012 (CLC, 2012)

Background

- Increment in biomass and necromass C stocks
- Discordant results for Soil organic C stocks (largest C pool)



Limitations:

Generally topsoil (0-30 cm) only

(Thuille & Schulze, 2006; Alberti *et al.*, 2008; Risch *et al.*, 2008; Fonseca *et al.*, 2011; La Mantia *et al., 2013;* Guidi *et al.*, 2014)

Pair plot (pasture vs. forest)

Drivers:

Climate (MAP)

Time from abandonment

Plant species

Aspect or exposure

Soil properties

…

Italian case studies:

(Jackson *et al.*, 2002; Guo & Gifford ,2002; Alberti *et al.*, 2011)

Alps → decrease / no changes

(Thuille & Schulze, 2006; Alberti *et al.*, 2008; Risch *et al.*, 2008; Guidi *et al.*, 2014)

Sicily → increase / decrease / no changes

(La Mantia *et al.,* 2013)

Apennines → no data

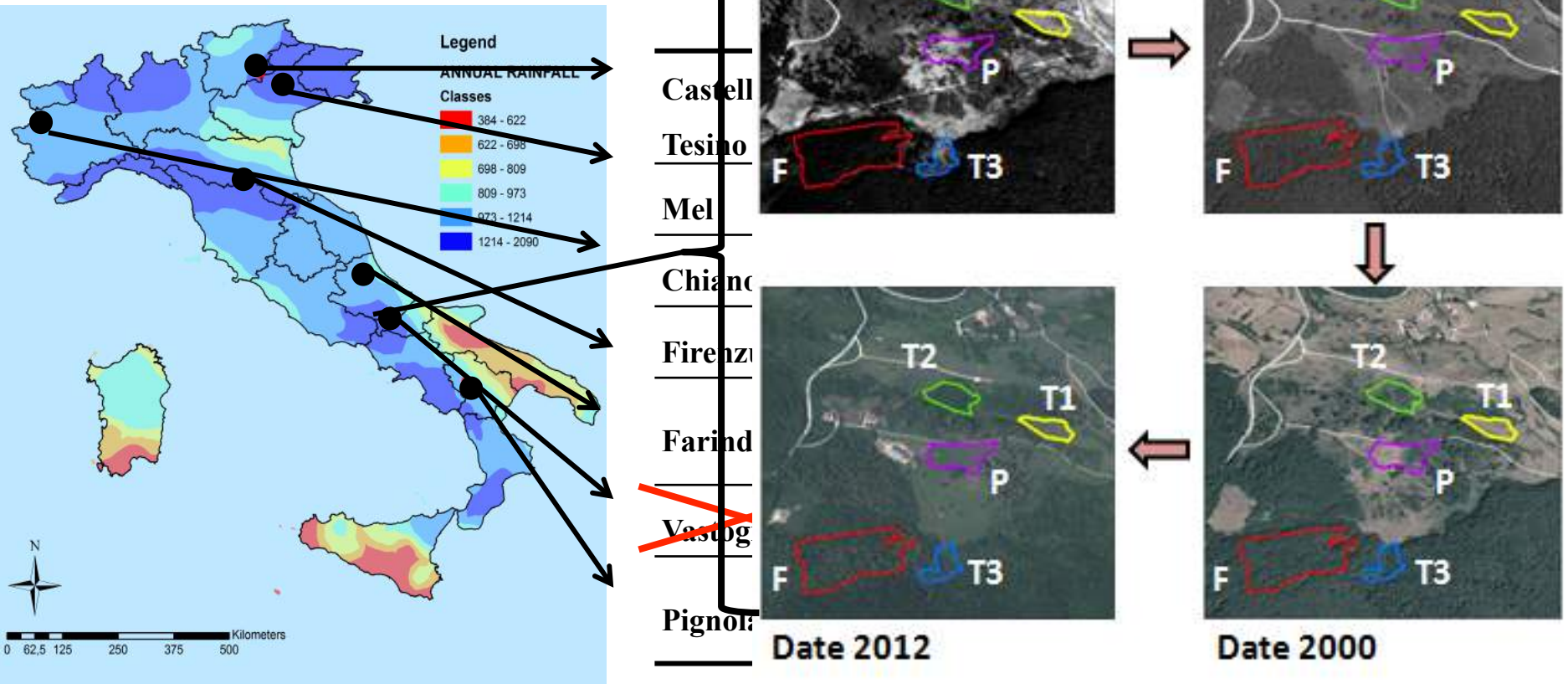
Objectives

1. Estimate **SOC stock changes** along woody encroachments (WEs) in some Italian sites
2. Investigate the role of **subsoil**
3. Test the **MAP** key role in SOC stock changes along Italian peninsula
4. Evaluate the WE effect on **ecosystem C stocks** (i.e. sum of above and belowground biomass, litter, dead wood, soil pools)

Sites selection

Seven sites with different climatic conditions

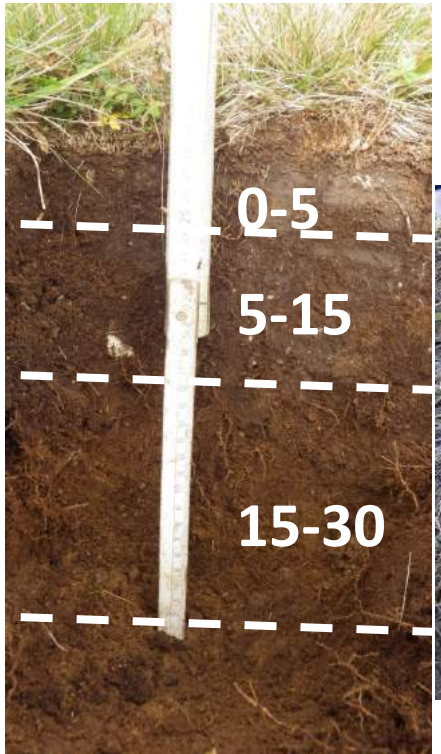
Chronosequence approach



SOC stocks

- Sampling protocol: suggested by JRC for EC (Stolbovoy et al., 2007)
- Depth intervals: 0-5, 5-15, 15-30, 30-50, 50-70 cm
- Composite samples
- $SOC_{stock} = C_{conc} * BD * depth * [1-(\%rock\ volume/100)]$

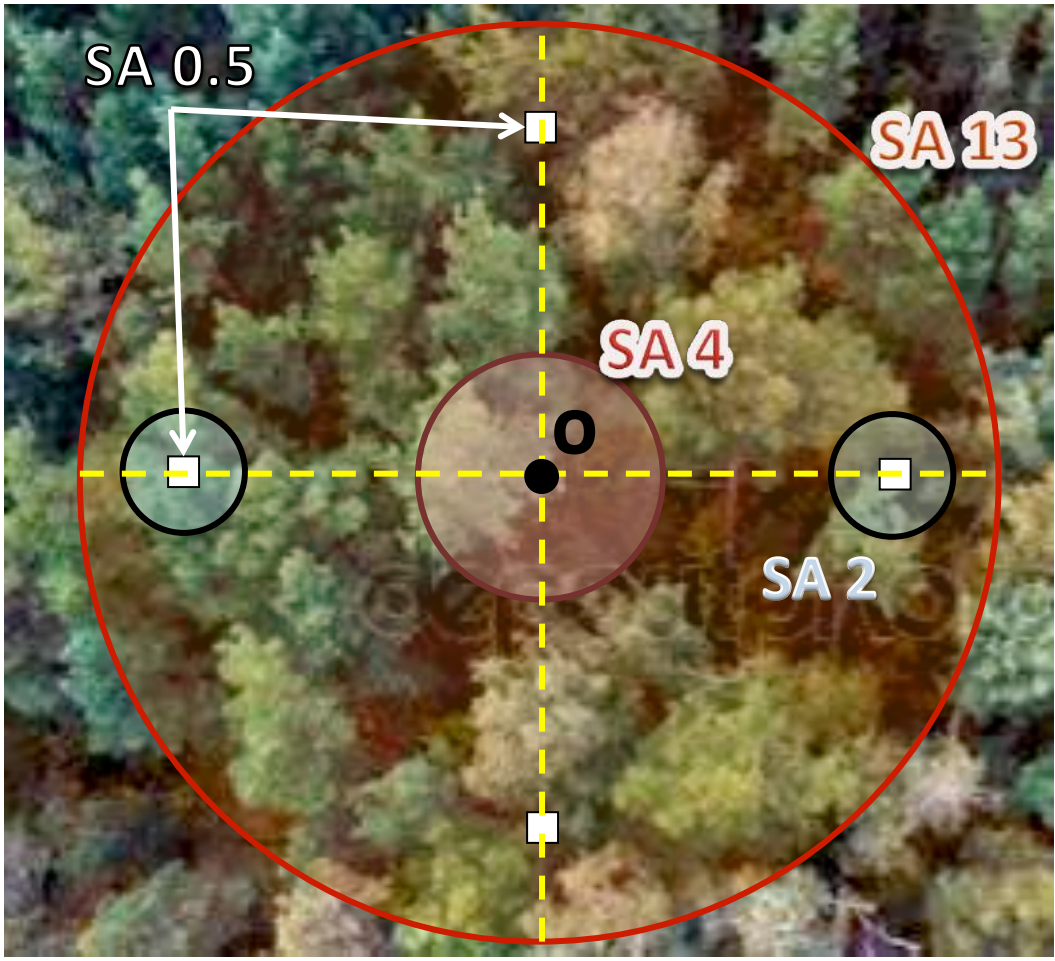
Subsoil



Biomass and necromass

In *Pasture* (P), *Intermediate* (T2), *Forest* (F) stages

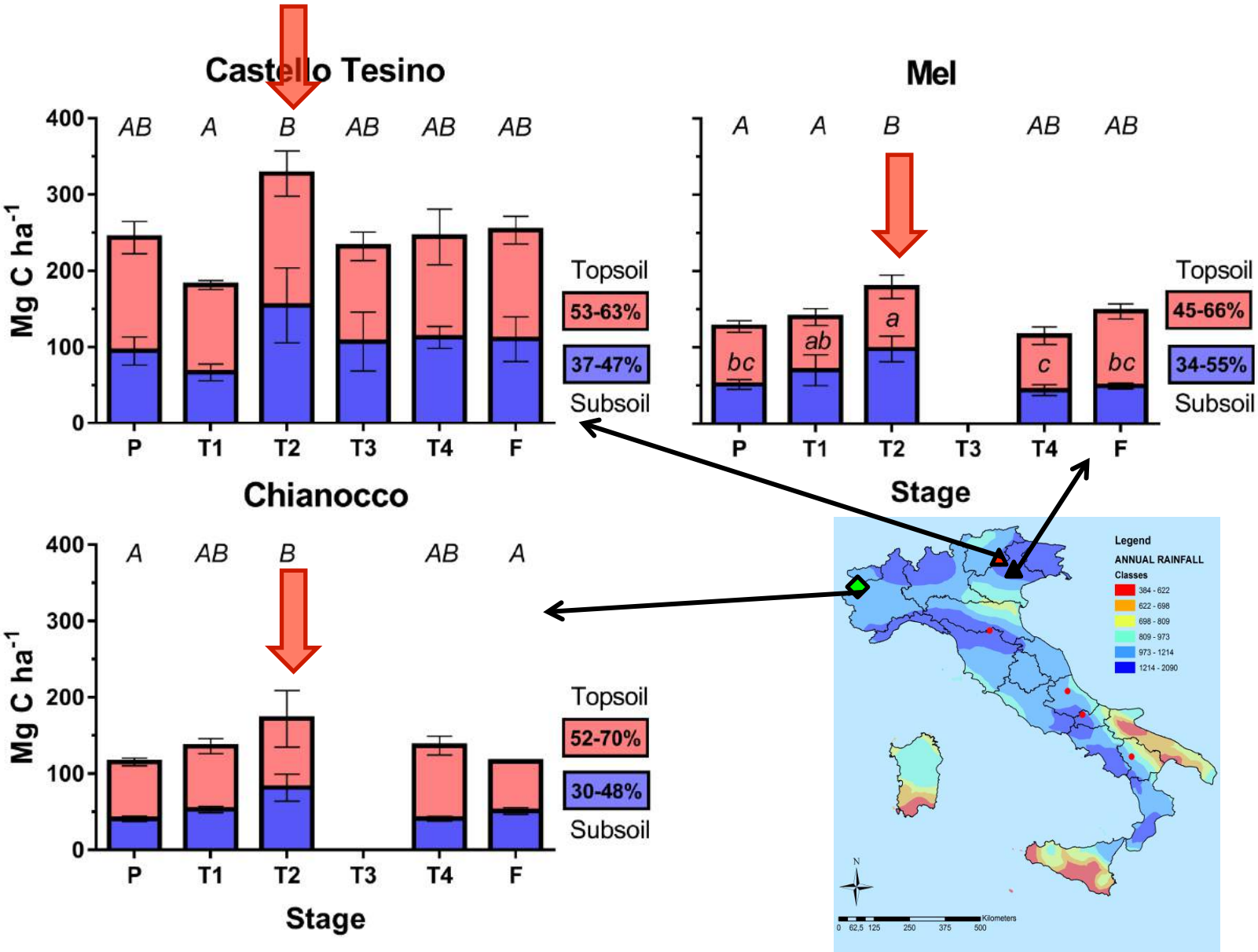
Graphic element	Pool
Central point **O**	Litter – mass
SA 0.5	Grasses and Fine Woody Debris (FWD) – mass
SA 2	Shrubs – mass
SA 4	Trees, 9.5 < DBH < 2.5 cm – mass
SA 13	Trees, 9.5 < DBH – mass
Dotted diameters	Coarse woody debris (CWD) – volume Density decay classes



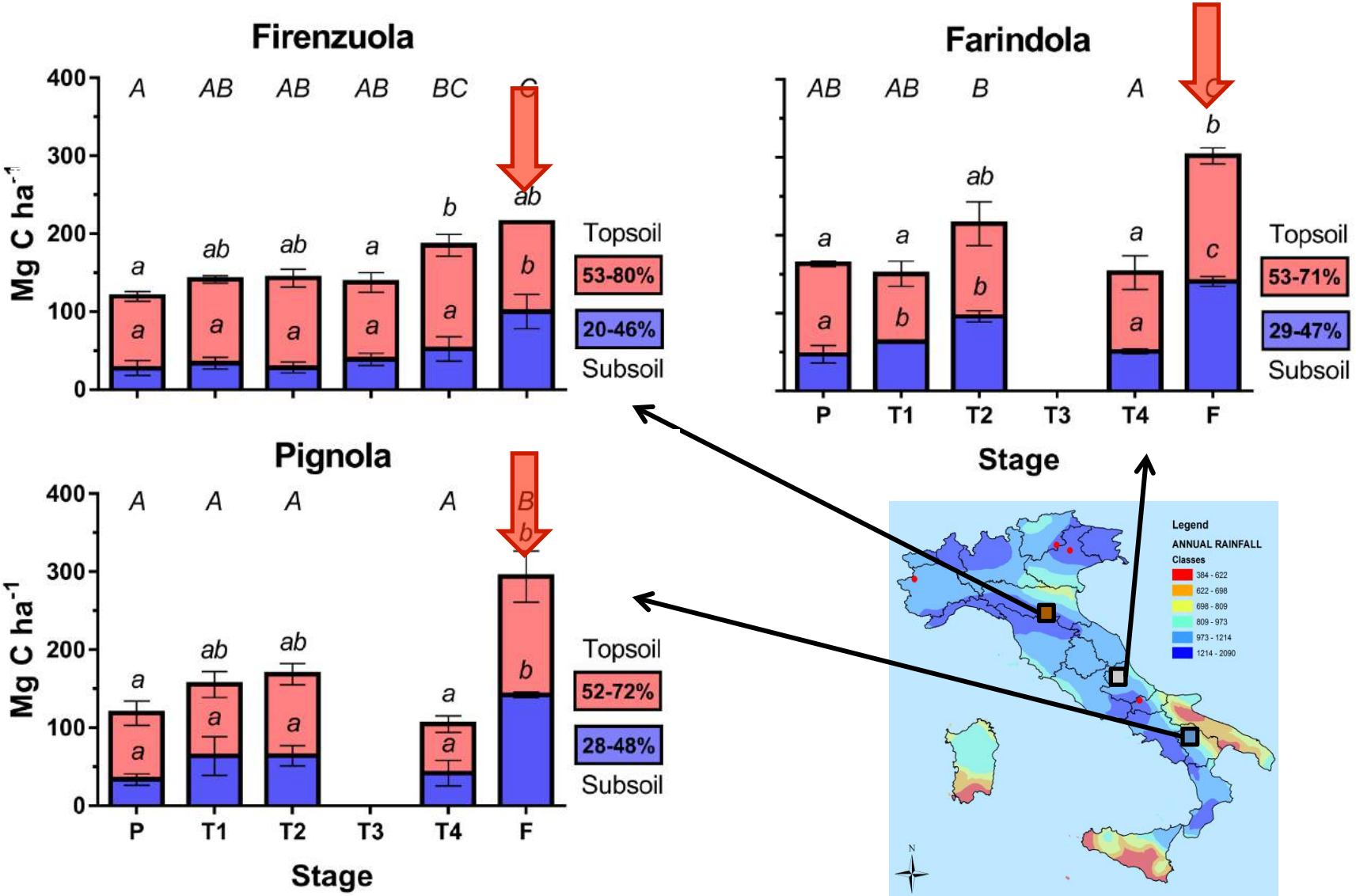
Belowground biomass:
Root-to-Shoot ratio

Inspiderd by MPAF (2006), Bovio *et al.* (2014)

SOC stock Alps changes

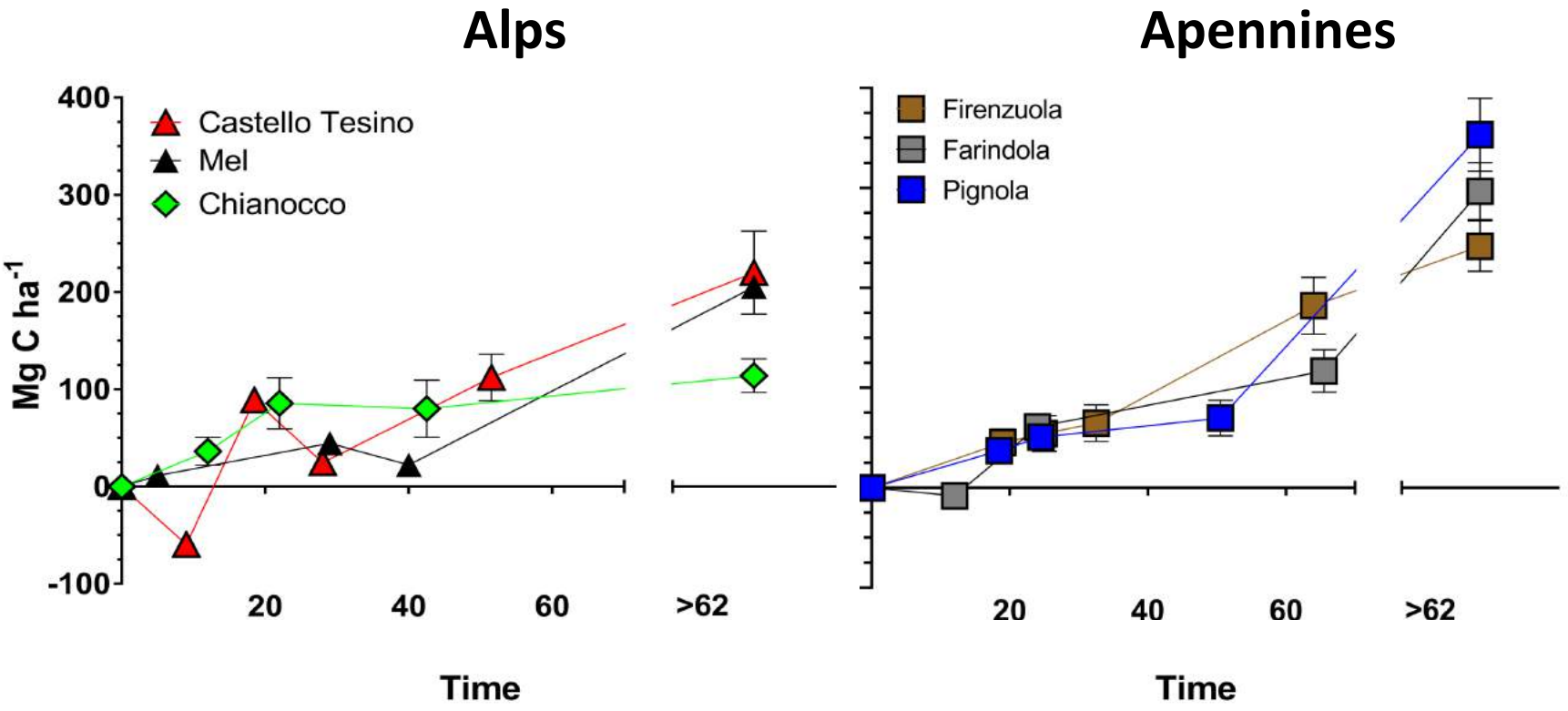


SOC stock Apennines changes



Ecosystem C stocks changes

Soil + aboveground biomass + belowground biomass + litter + dead wood



CONSIDERATIONS

1. **SOC stock changes vary among sites** – Alps and **Apennines** very different
2. The **subsoil is a large pool** (30-40%)
3. **Temperature** (not precipitation) is the best climatic predictor for SOC changes
4. The **woody encroachment acts as a C sink at ecosystem level**
5. **Importance of the intermediate stages**
6. **Aboveground diversity** could explain the **microbial enzyme activity**

Adaptaion measures

The UNFCCC refers to adaptation in several of its articles: Article 4.1(f):

"All Parties shall "Take climate change considerations into account, to the extent feasible, in their relevant social, economic and environmental policies and actions, and employ appropriate methods, for example ***impact assessments****, formulated and determined nationally, with a view to minimizing adverse effects on the* ***economy****, on* ***public health*** *and on the* ***quality of the environmen****t, of projects or measures undertaken by them to mitigate or adapt to climate change*."

Consiglio Nazionale delle Ricerche

Local Adaptation plans in a Mediterranean Mountain Environment - PALMO

Objectives

Context and law

Reference context

① Framework EU → COM (2013) 216 ruolo e funzione per gli SM;

② Network EU → Promozione piattaforma Climate-Adapt

③ CMCC-MATTM SNAC Definition - Alps and Appennins

④ PAL → Consultazione Conferenza Stato Regioni

⑤ MATTM → decreto del 16 Giugno 2015

MINISTERO DELL'AMBIENTE
E DELLA TUTELA DEL TERRITORIO E DEL MARE

Strategia Nazionale adattamenti climatici

Objectives

Verify the applicability of adaptation measured at local scale in a Montane Mediterranean climate.

Help the decision making to define a planning scheme multi level at local scale.

Expected results

vulnerability – risk perception

Outputs

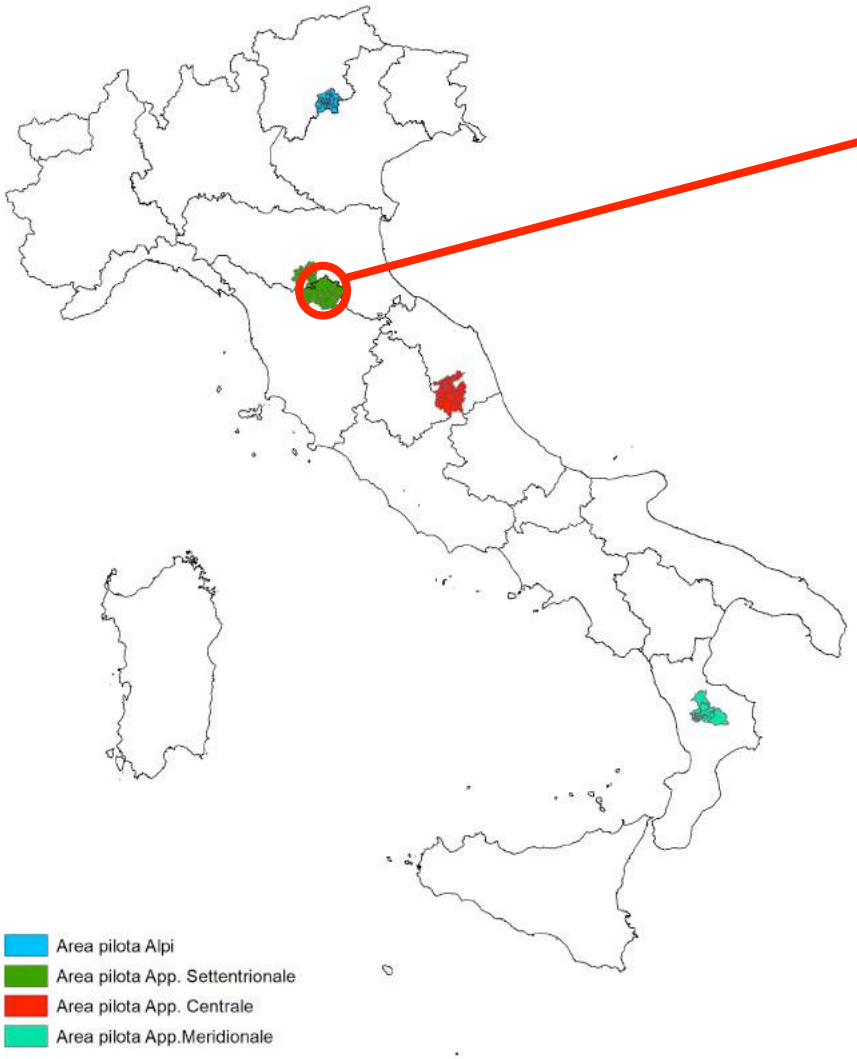
- Methodology to investigate risk perception related to CC in a mountain community

- Criteria for harmonizing politics and strategy of intervention at local scale

Application

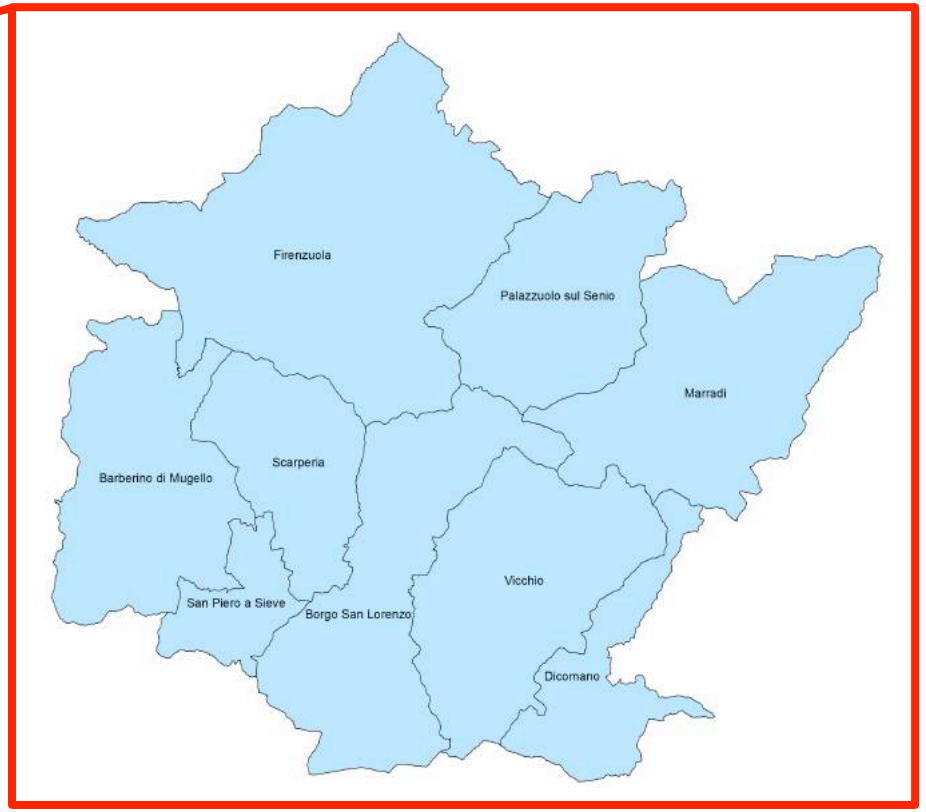
Guidelines in which are identified both methodological aspects and tools useful to produce a “Local Adaptation Plan” in a montane context, to be used by local administration, local entity civil society.

Case studies



Administrative boundaries

Unione Montana dei Comuni del Mugello



20th September 2014

Palazzuolo, Firenzuola e Marradi: ten landslides, interrupted roads, isolated villages.

Rainfall in 24 hours: 144 mm

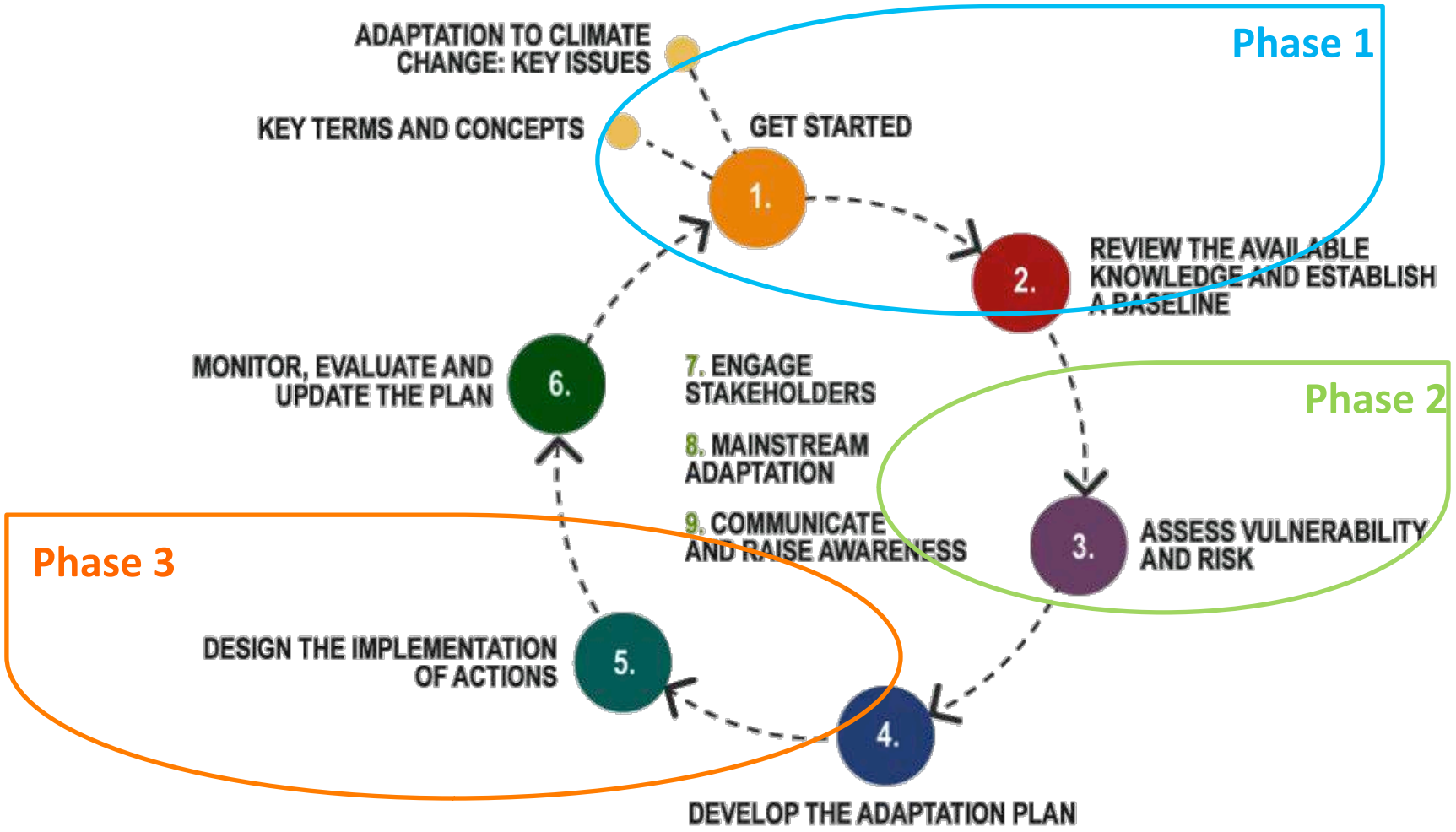
19th March 2013 - landslide and flood in the Mugello valley

14th February 2014 – landslides and floods

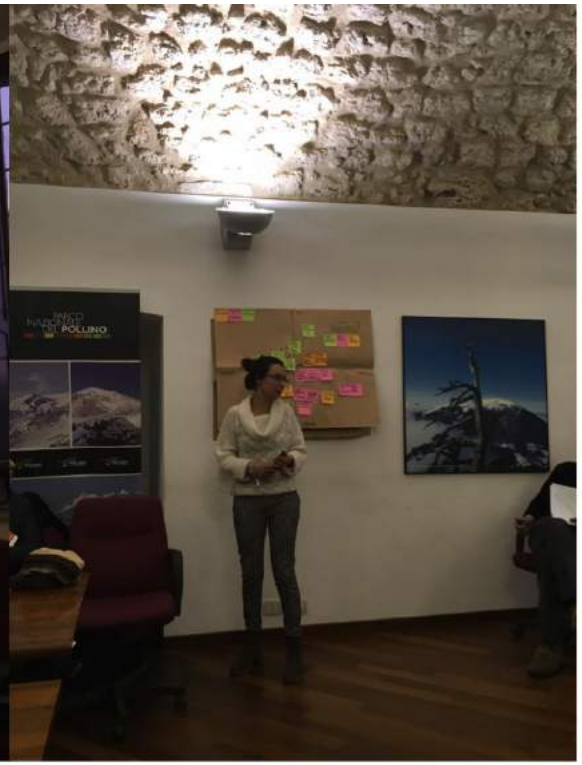
National street 107

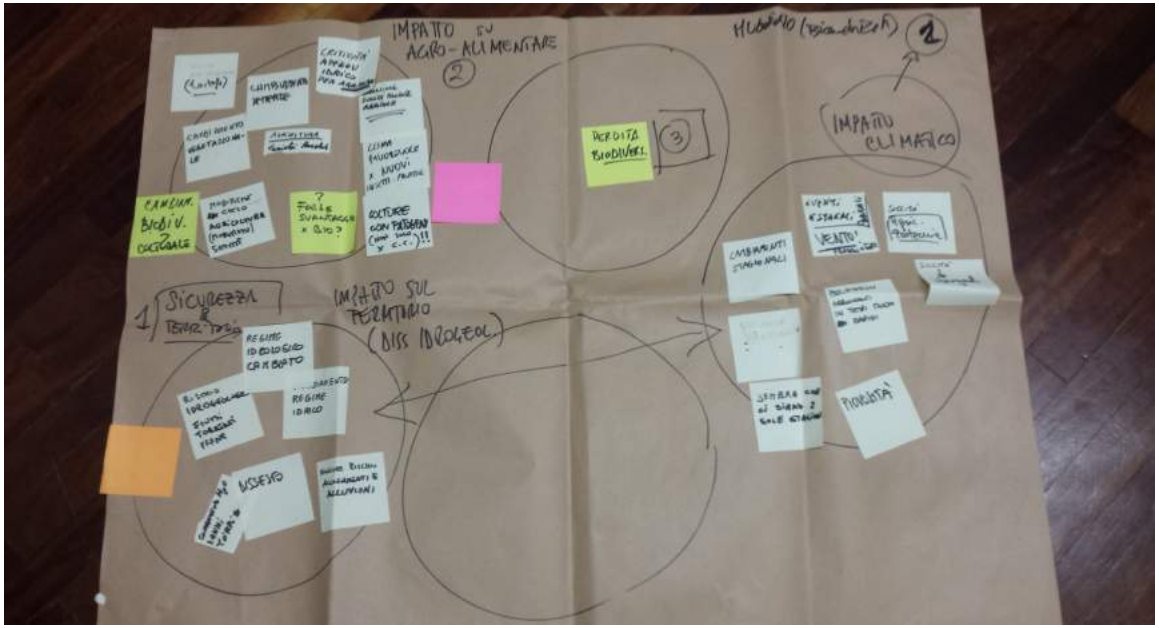
21st October 2013

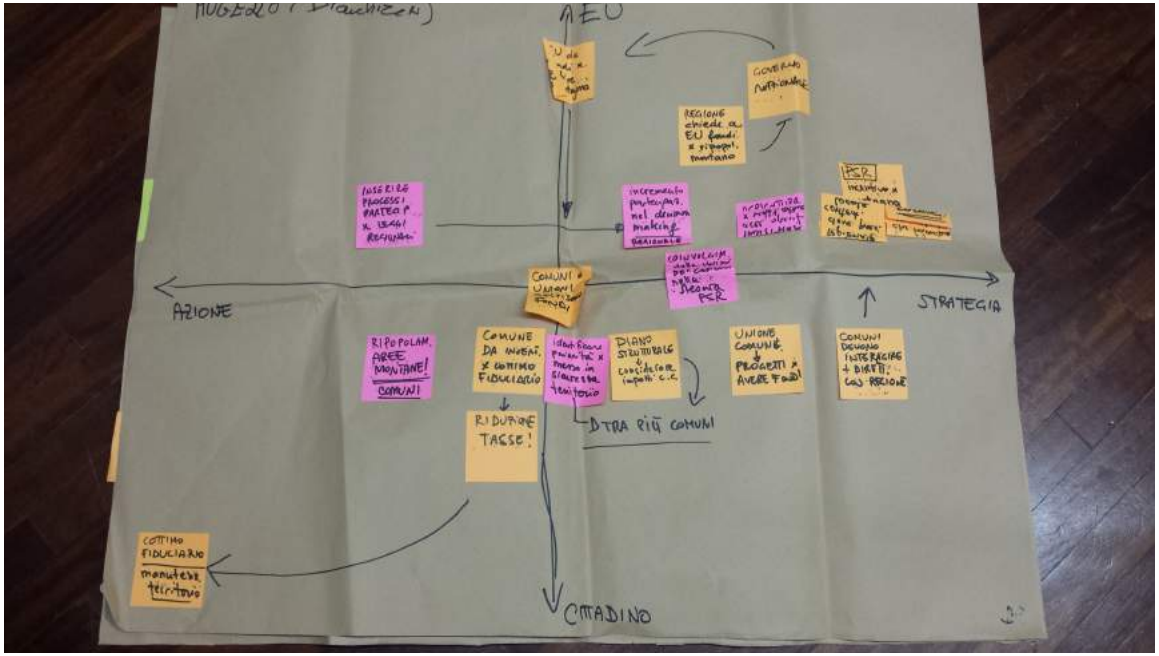
Activities and methodology




PALMO
IL PROGETTO
Obiettivi e Risultati attesi
CURSA




IMPATTO SU AGRO-ALIMENTARE
2
PERDITA BIODIVERS.
3
IMPATTO CLIMATICO
1
SICUREZZA & TERRITORIO
IMPATTO SUL TERRITORIO (DISS IDROGEOL.)
REGIME IDROLOGICO CRITICATO
REGIME IDRICO
DISSESTO


UE
GOVERNO NAZIONALE
REGIONE chiede a UE fondi x sviluppo territorio
INSERIRE PROGETTI PARTECIPATI x LOTTA AI RISCHI NATURALI
AZIONE
STRATEGIA
COMUNI
RIPOPOLAM. AREE MONTANE! COMUNI
COMUNE DA SOLI: x CONTRIBUTO FIDUCIARIO
PIANO STRUTTURALE o CONSIDERAZIONI impatto c.c.
UNIONE COMUNI → PROGETTI x AVERE FONDI
COMUNI DEVONO INTERAGIRE + DIRETTI CON REGIONE
RIDURRE TASSE!
TRA PIÙ COMUNI
CONTRIBUTO FIDUCIARIO
CITTADINO

Climate and Territory

Collecting data for the specific case study

Evidences of CC	Data collected	Source	Reference period
Temperatures	Trend of Temperatures (Mean, Max, Min)	CMCC - Centro Euro Mediterraneo sui Cambiamenti Climatici	1950-2014
Precipitations - Rain	Monthly mean rainfall	CMCC - Centro Euro Mediterraneo sui Cambiamenti Climatici	1950-2014
Precipitations - Snow			
Frozen soils			

Climate and Territory

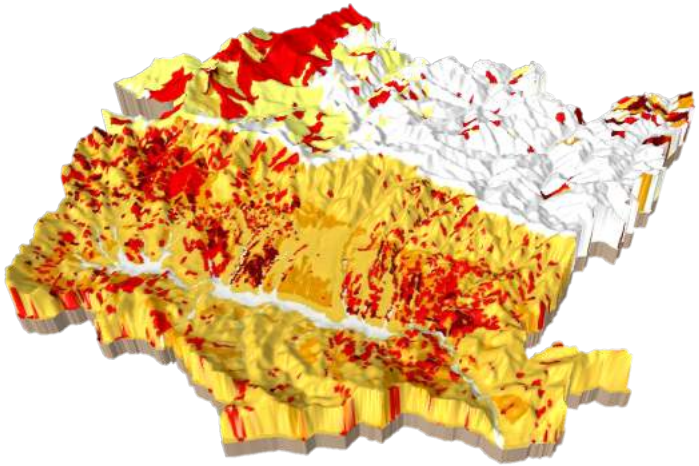
Useful data to describe the territory

Influence of CC on different sectors	Data collected	Source	Reference period
Water resources	Water available for municipalities	Istat - Censimento popolazione e abitazioni	2012
	Volume of water used in agriculture	Istat - Censimento agricoltura	2010
Protected areas	Surfaces EUA	MATTM	2010
	Aree Natura 2000	MATTM	2015
Natural hazards	Landslides risks	Ispra	2015
	Hydraulik risks	Ispra	2015
Soil Degradation	Soil consumption	Ispra	2012
	Not consumed soil	Ispra	2012
Air	**pollutant**		
Tourism	Number of hosting structure	Istat - Censimento popolazione e abitazioni	2009-2014
Healt	**allergies**		
Agriculture/Forests	Employed in agriculture	Istat - Censimento agricoltura	2010
	Numbers of farms	Istat - Censimento agricoltura	1982-1990-2000-2010
	Total agric. Surface (SAT)	Istat - Censimento agricoltura	1982-1990-2000-2010
Energy	pro-capite gas consumption	Istat - Censimento popolazione e abitazioni	2000-2005-2011
	Electricity for domestic use	Istat - Censimento popolazione e abitazioni	2000-2005-2011

Climate and Territory

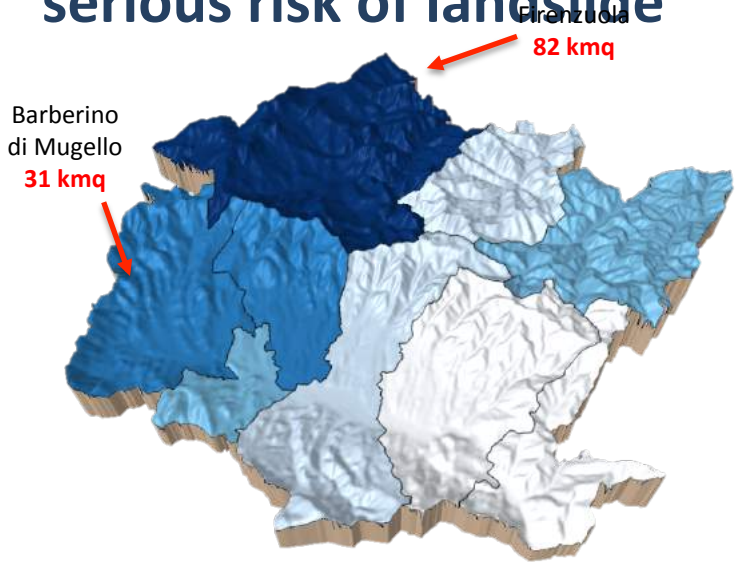
Landslide risks

Landslide risk



Molto elevata
Elevata
Media
Moderata
Aree di attenzione

Area of the municipality interested by serious risk of landslide



3,3 – 3,6 kmq
3,6 – 4,4 kmq
4,4 – 11,3 kmq
11,3 – 31,3 kmq
31,3 – 82,0 kmq

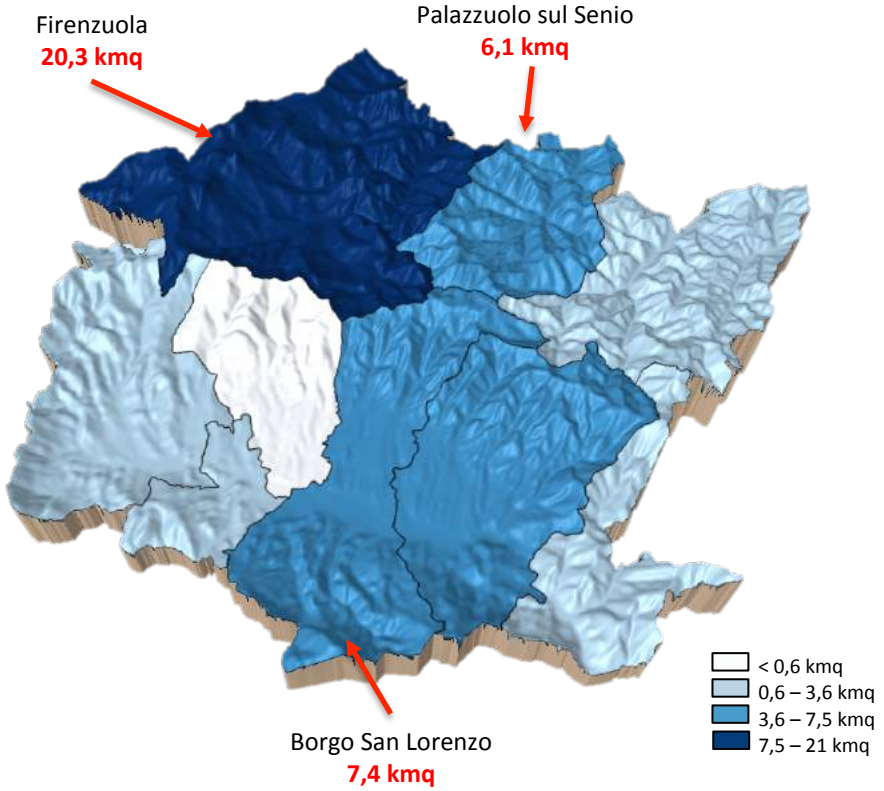
Ns. elaborazione su dati Rapporto ISPRA 2015- «Dissesto idrogeologico in Italia: pericolosità ed indicatori di rischio»

Climate and Territory

Hydraulic risk

Idrography

Areas with an high hydraulic risk



Ns. elaborazione su dati Rapporto ISPRA 2015- «Dissesto idrogeologico in Italia: pericolosità ed indicatori di rischio»

Climate and Territory

Trends- temperature - Precipitation

Data and statistics

Data refer to 2014

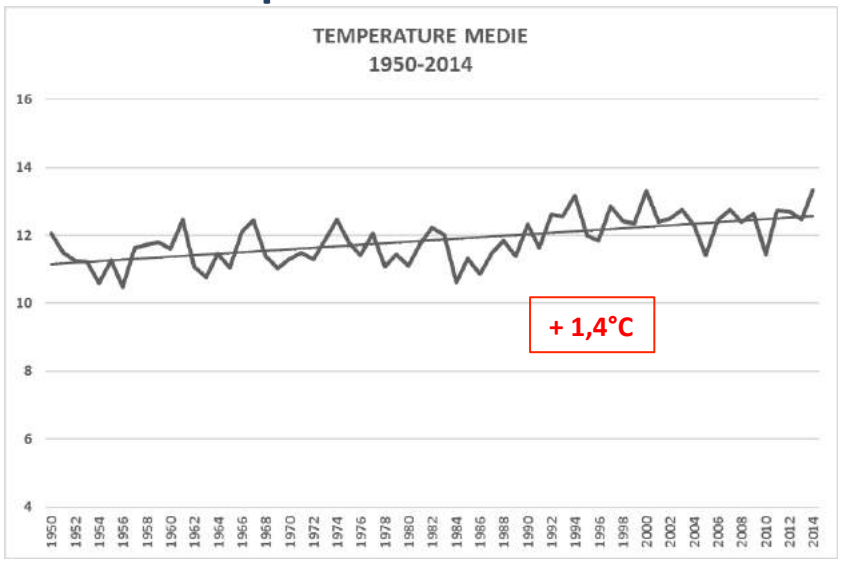
Mean annual T	T max annual mean	T min annual mean	Annual rainfall
13,3°C	17,4°C	8,9°C	988 mm

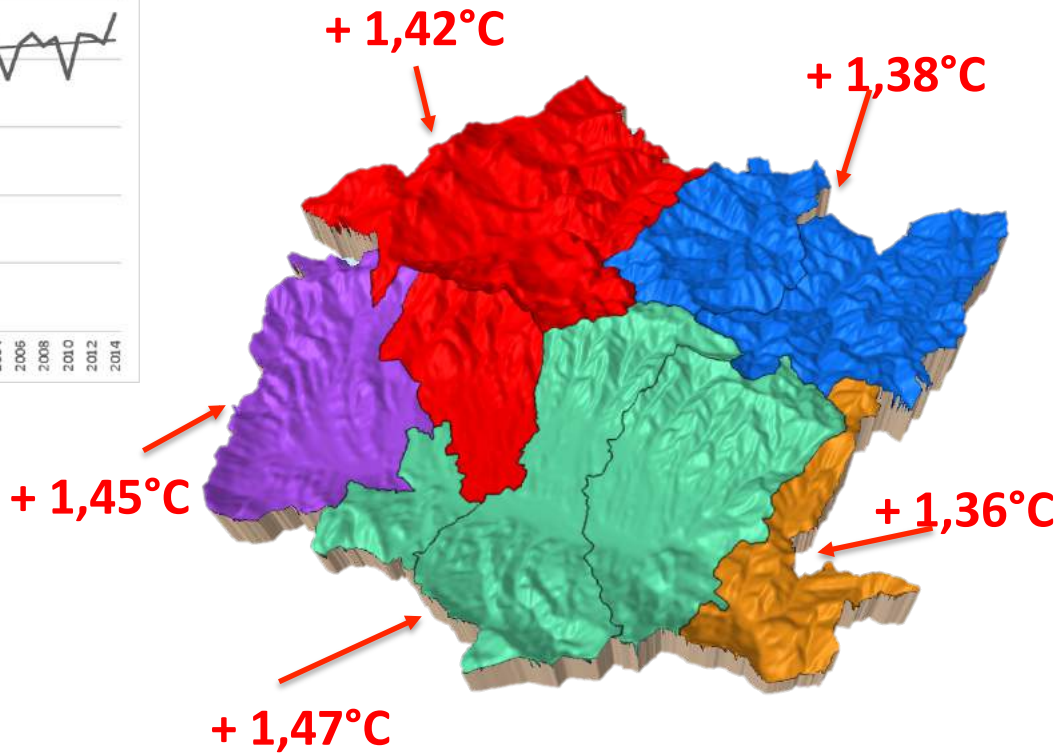
Ns. data elaboration CMCC - Centro Euro-Mediterraneo sui Cambiamenti Climatici

Climate and Territory

Trends- temperature

Mean Temperature 1950-2014

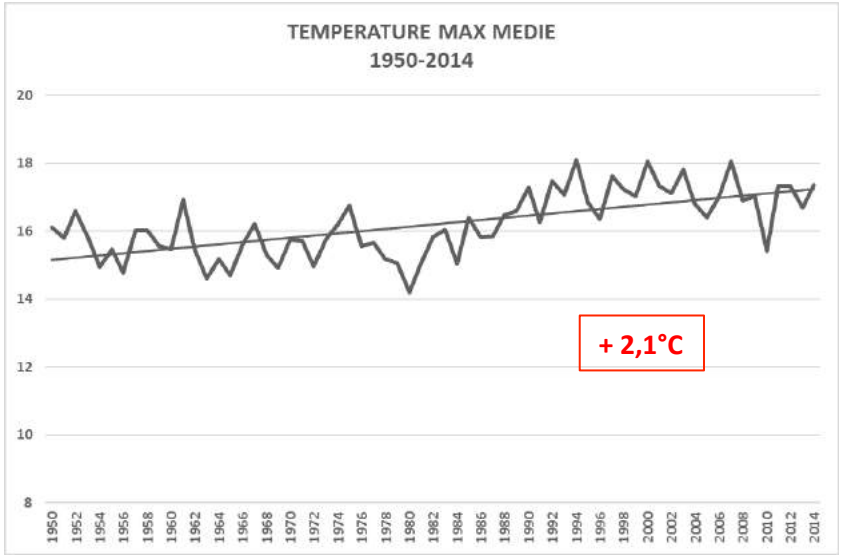


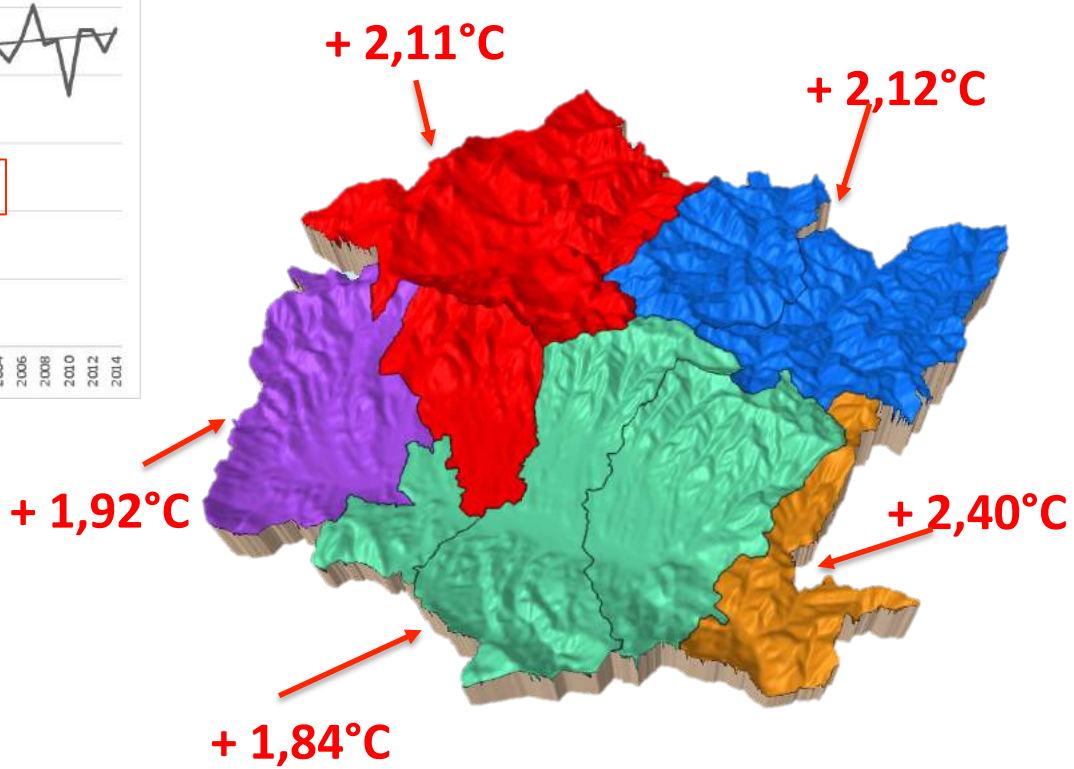


Climate and Territory

Trends- temperature

MAX Temperature average 1950-2014

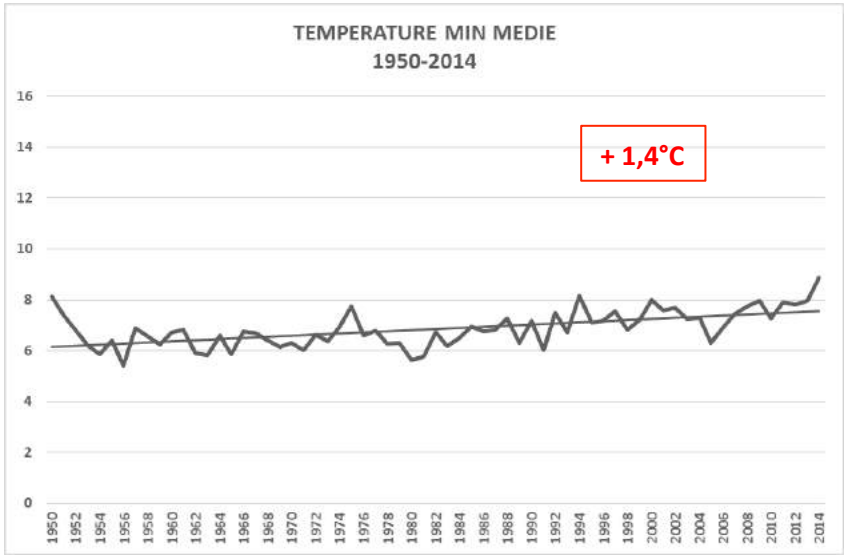


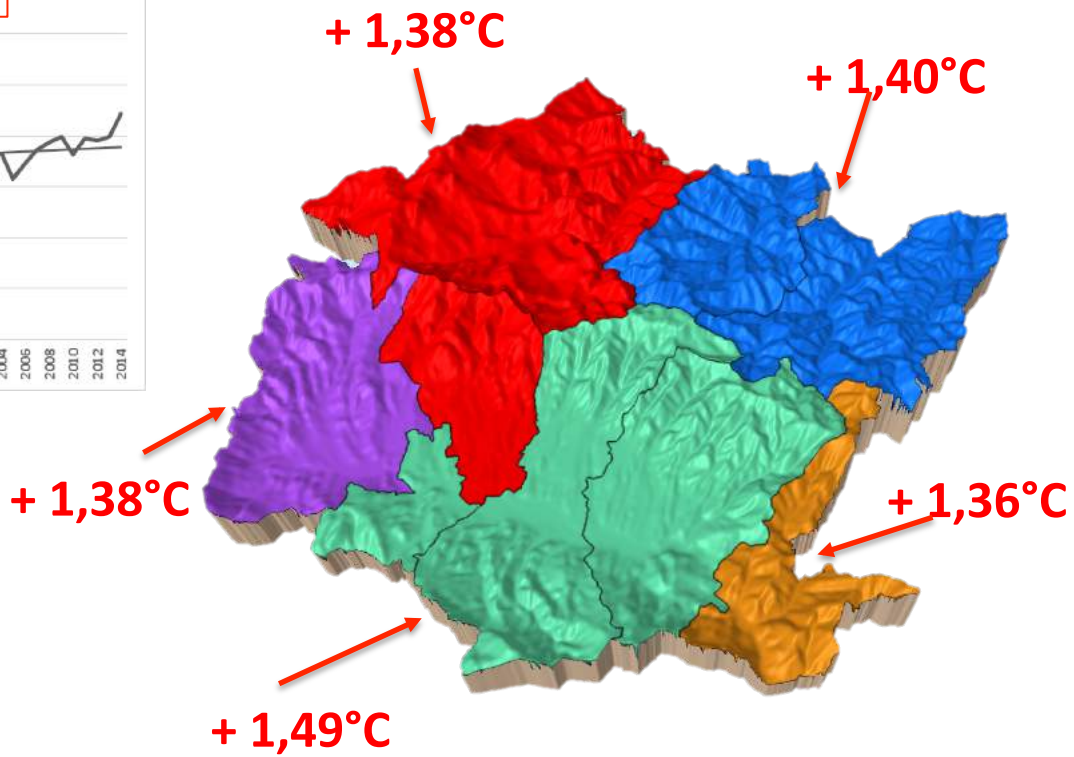


Climate and Territory

Trends- temperature

MIN Temperature average 1950-2014

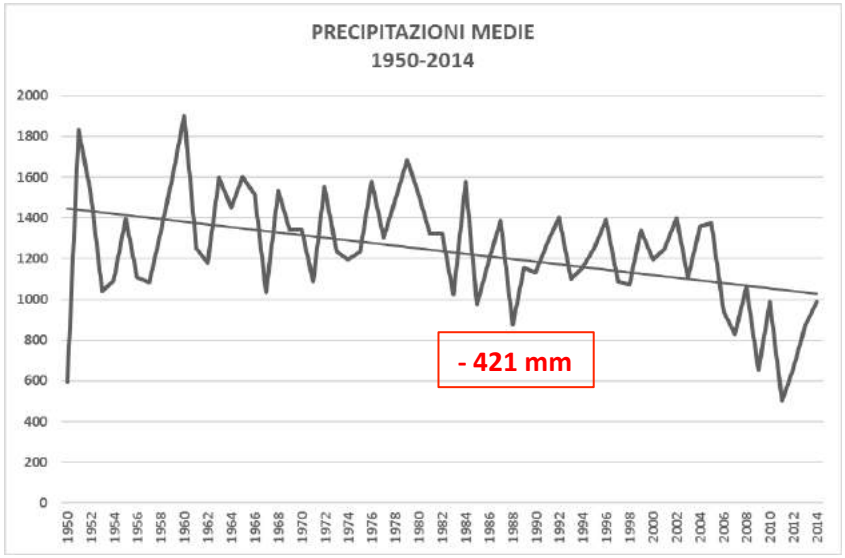


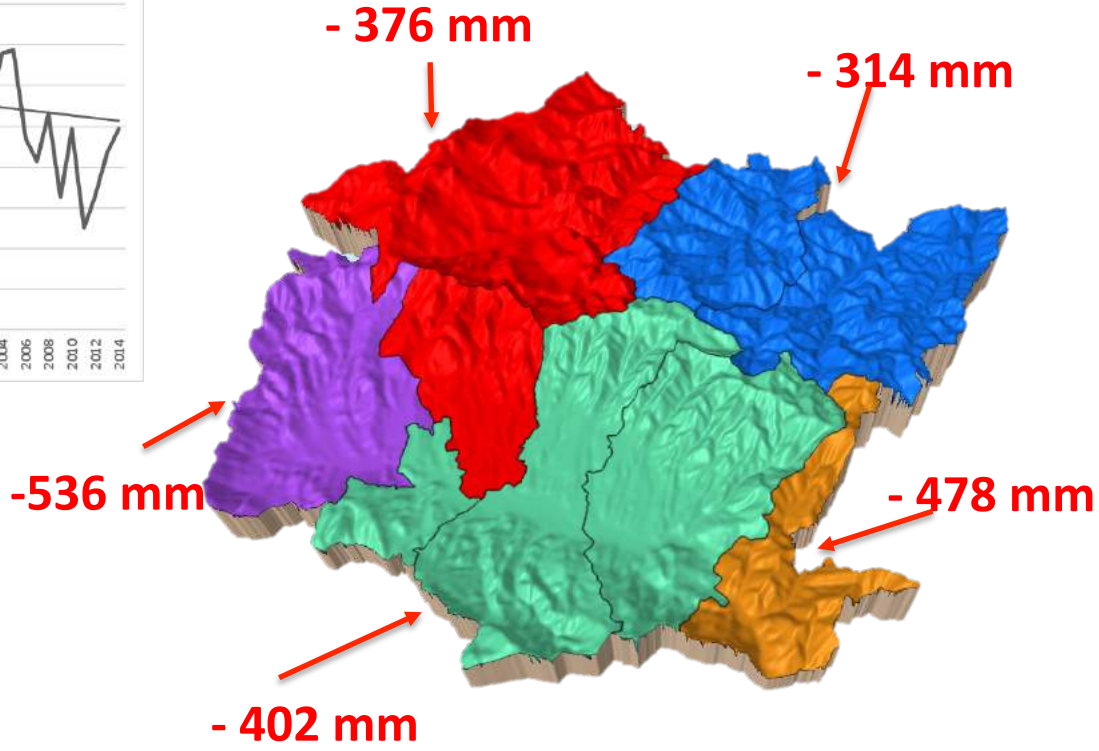


Climate and Territory

Trend - Precipitations

Mean Precipitation 1950-2014

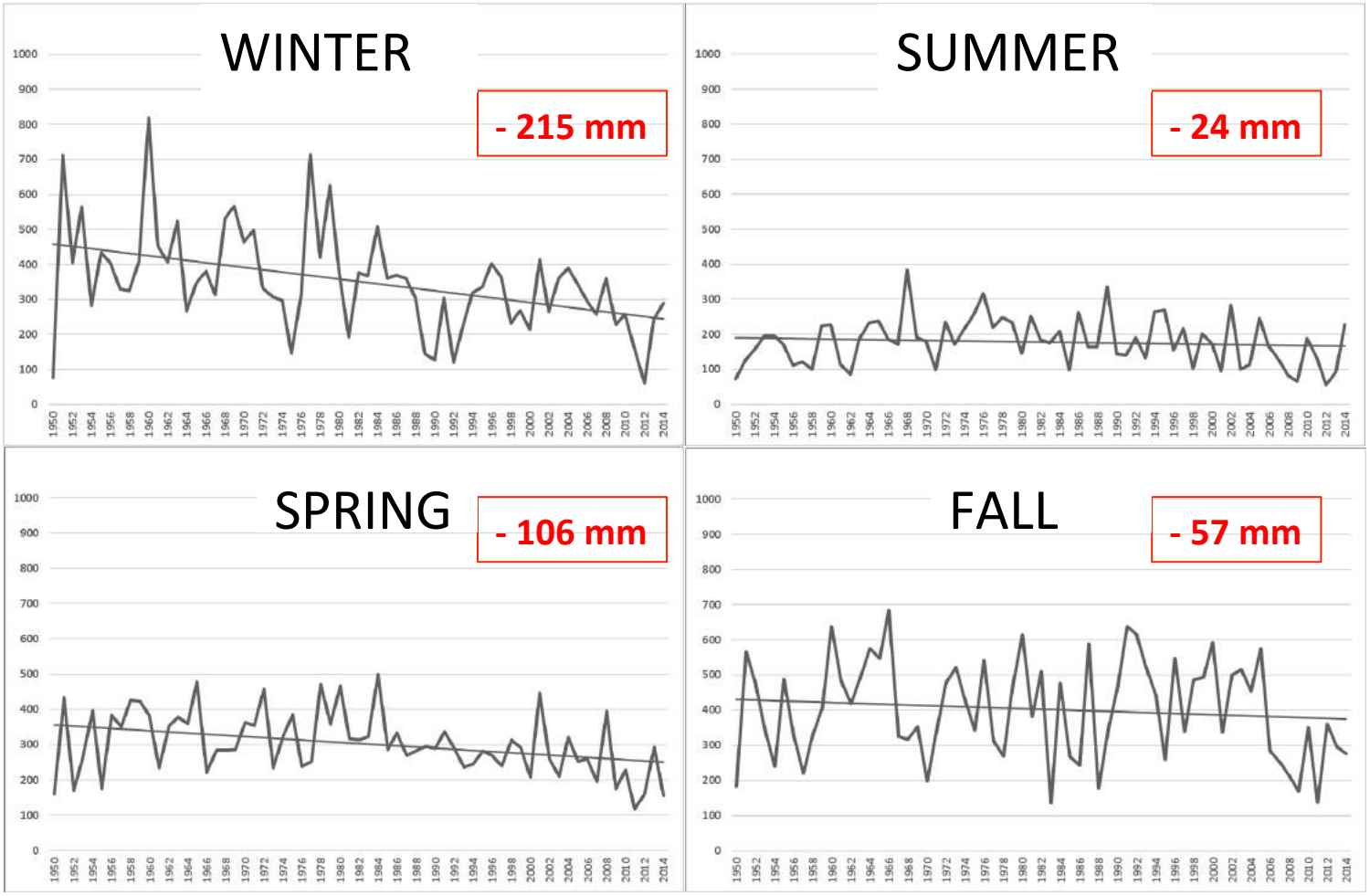




Climate and Territory

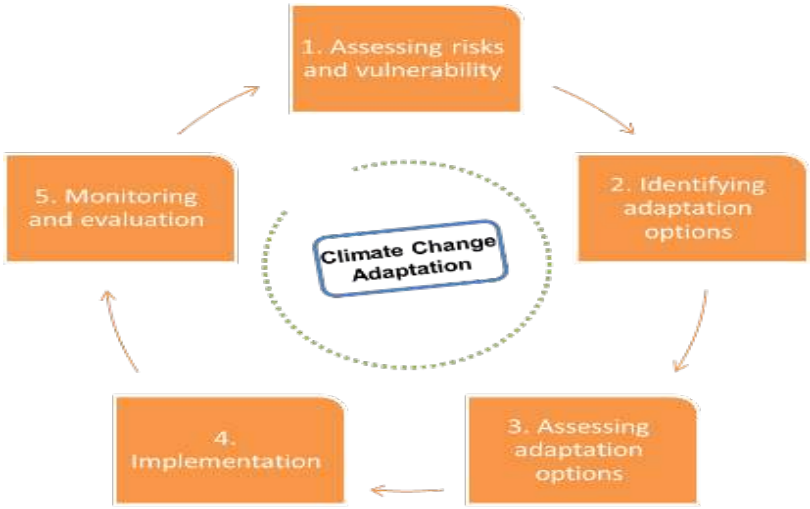
Trend - Precipitation

Mean Precipitation 1950-2014 - seasons



FINAL ADAPTATION PLAN

- Adaptation plan with the measures to be adopted to combat CC
- Individuation of specific areas/sectors where the effect of CC will be more severe
- Indication about where to find the resources
- Timetable about the time of the different interventions



Working groups

- Identify the main problems related to climate change in your area
- Mitigation and Adaptation measures possibly to be adopted in the study area
- How these measures can contribute to decrease the effect of climate change and be sustainable with the time

THANKS FOR YOUR ATTENTION

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