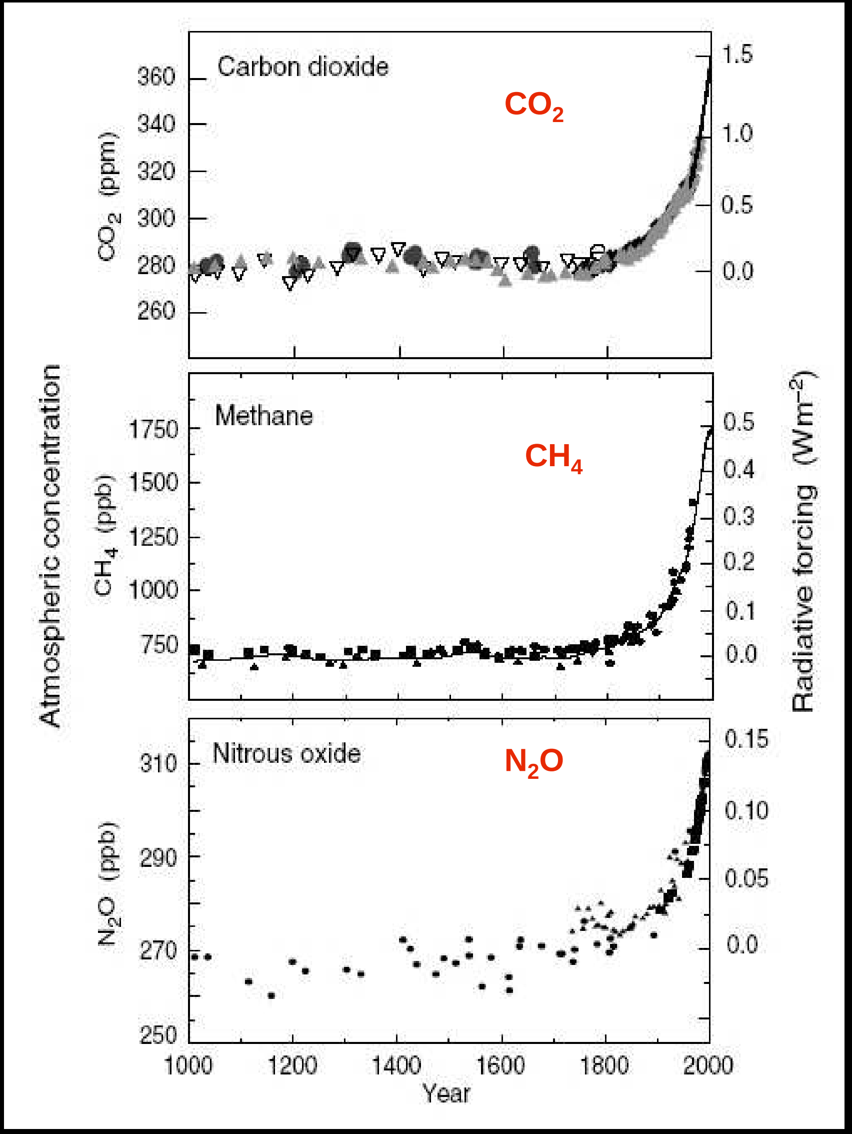
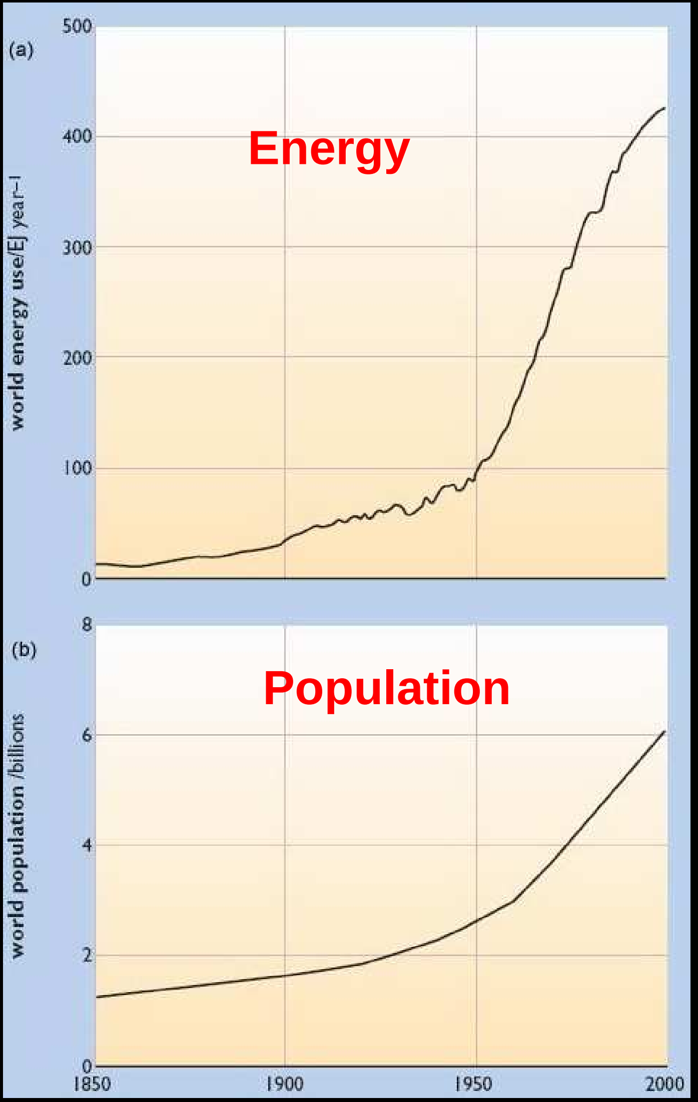
Impatti Mitigazione ed Adattamento :sfide per il futuro

Riccardo Valentini
Università della Tuscia
CMCC

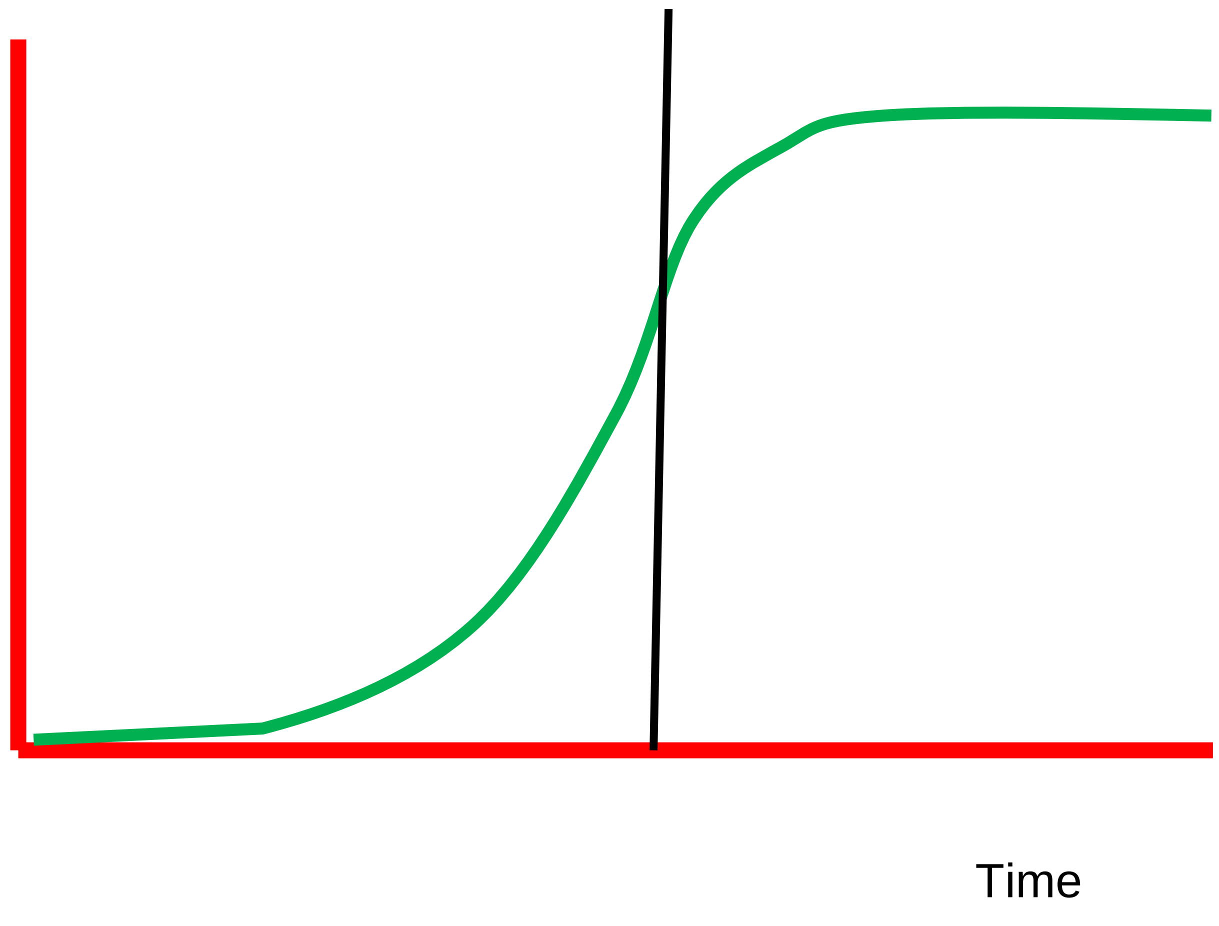
Gas serra

Energia - popolazione



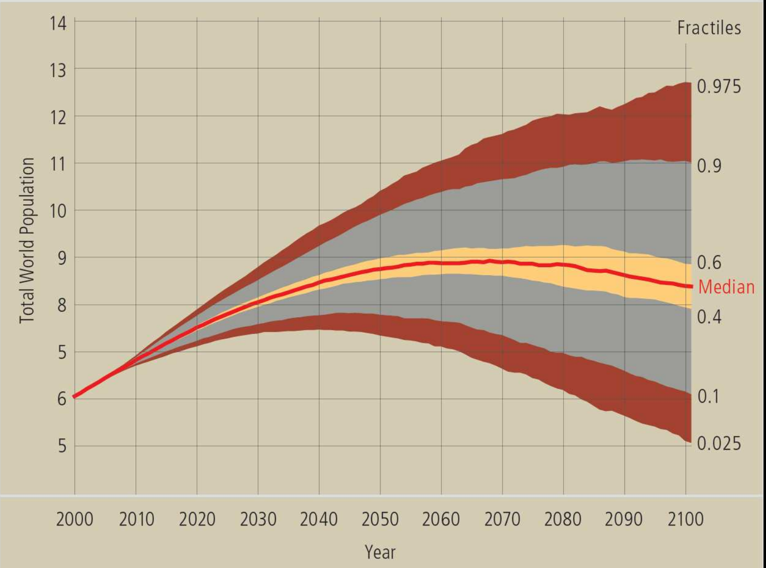


The future ?

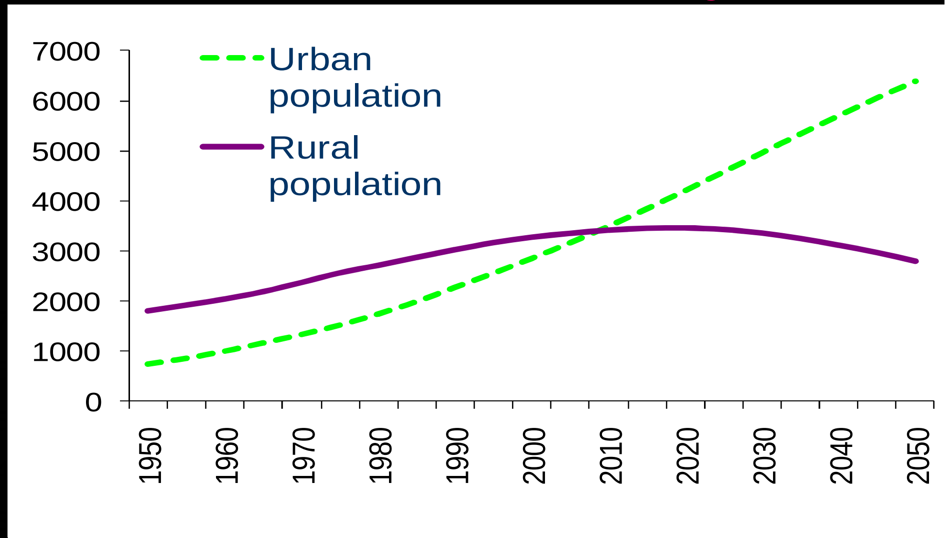


Rising global population

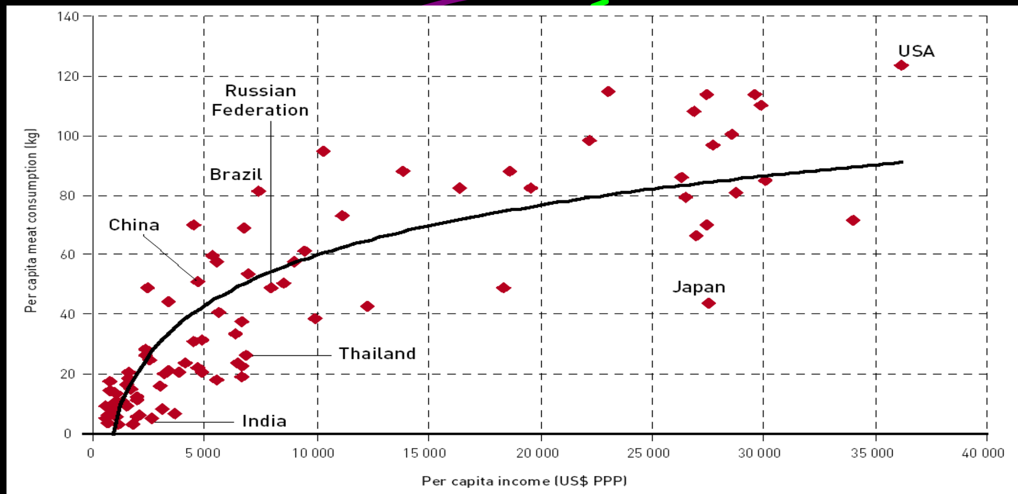
From 6 to 9 billion by 2050 …



… more people now live in towns and cities than in the countryside



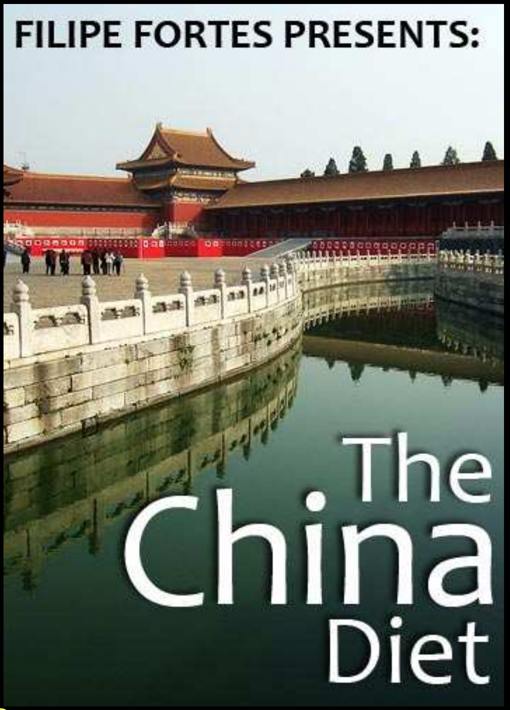
… more meat and GHG emissions



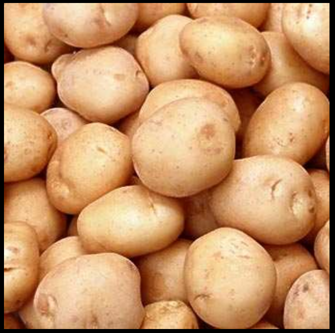
Note: National per capita based on purchasing power parity (PPP).
Source: World Bank (2006) and FAO (2006b).

Table 1—food consumption per-capita Taiwan, 1940-92

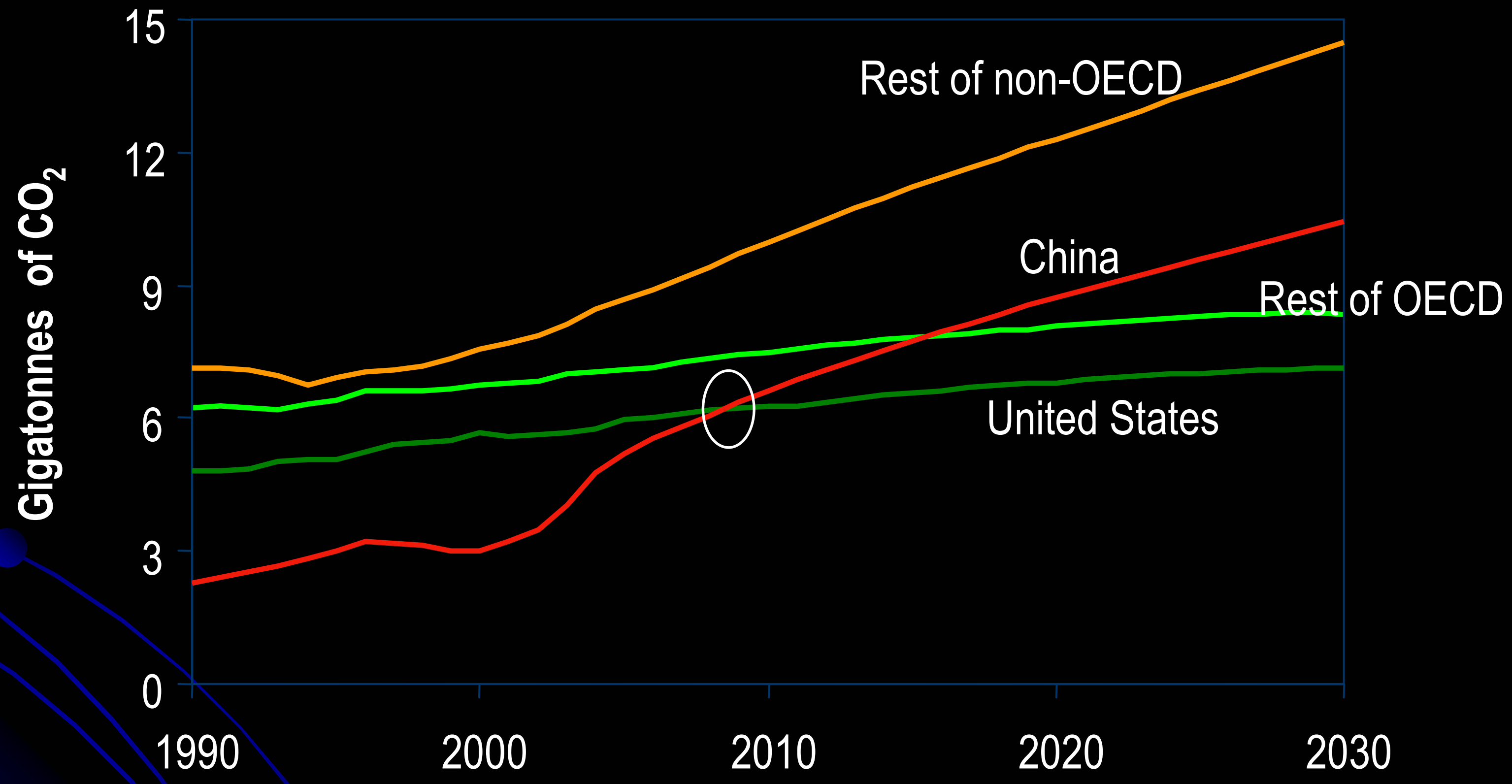
Period	Rice	Wheat	Potato	Meat
		(kilograms per capita per year)		
1940-44	109	0	91	11
1949-51	133	7	66	13
1959-61	137	22	62	16
1969-71	136	25	24	25
1979-81	105	24	4	40
1989-91	68	29	2	62
1992	64	29	2	66



Source: Taiwan, Council for Agricultural Planning and Development, various years

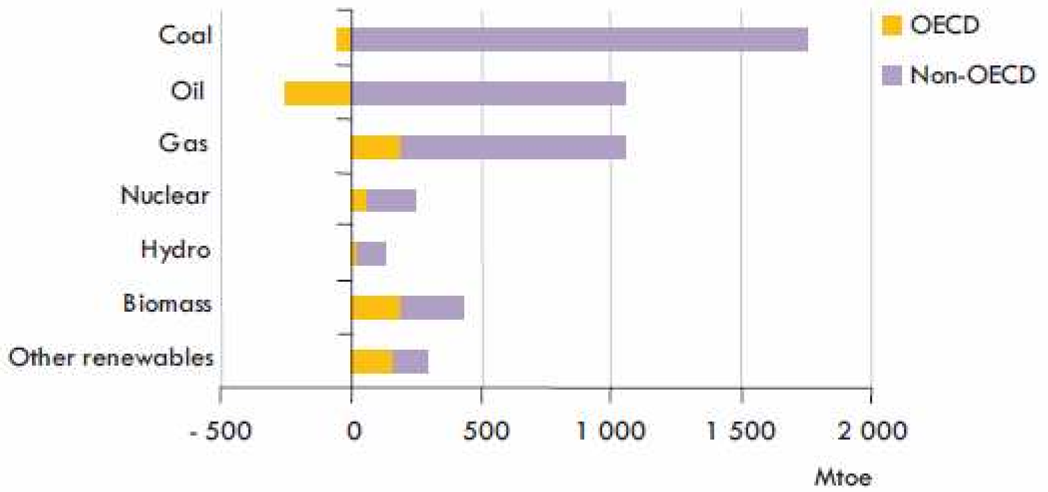


ENERGY-RELATED CO_2 EMISSIONS
(Reference Scenario WEO 2007)



Source: Reference Scenario WEO, IEA 2006

Change in primary energy demand in the Reference Scenario, 2007-2030

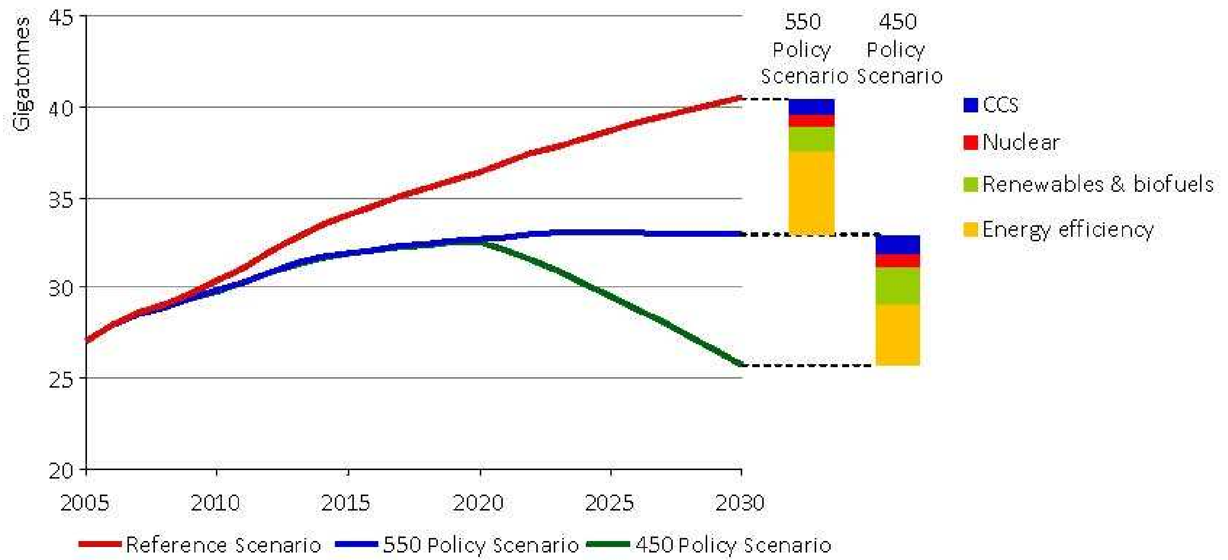


Fossil fuels account for 77% of the increase in world primary energy demand in 2007-2030, with oil demand rising from 85 mb/d in 2008 to 88 mb/d in 2015 & 105 mb/d in 2030

Rank	Country	Annual CO_2 emissions (in thousands of metric tons)	Percentage of total emissions[8]	Emission per capita (t CO2 eq/cap year)
-	*World*	28,431,741	100.0 %	
1	China	6,103,493	**21.5 %**	5.5
2	United States[9]	5,752,289	**20.2 %**	23.5
-	*European Union*[10]	3,914,359	**13.8 %**	
3	Russia	1,564,669	5.5 %	
4	India	1,510,351	**5.3 %**	1.7
5	Japan	1,293,409	4.6 %	
6	Germany	805,090	2.8 %	
7	United Kingdom	568,520	2.0 %	
8	Canada	544,680	1.9 %	
9	South Korea	475,248	**1.7 %**	
10	Italy[11]	474,148	**1.7 %**	9.7
11	Iran	466,976	**1.6 %**	
12	Mexico	436,150	**1.6 %**	
13	South Africa	414,649	**1.5 %**	
14	France[12]	383,148	1.4 %	
15	Saudi Arabia	381,564	1.3 %	
16	Australia	372,013	1.3 %	
17	Brazil	352,524	1.2 %	
18	Spain	352,235	1.2 %	
19	Indonesia	333,483	1.2 %	
20	Ukraine	319,158	1.1 %	

Reductions in energy-related CO_2 emissions in the climate-policy scenarios

World Energy Outlook 2008



While technological progress is required to achieve some emissions reductions, increased deployment of existing low-carbon technologies accounts for most of the CO_2 savings

Energia rinnovabile
306 miliardi US$

Industria
36 miliardi US$

Efficienza energetica edifici
51 miliardi US$

Trasporti e mobilità
88 miliardi US$

Rifiuti
1 miliardo US$

Agricoltura
35 miliardi US$

Foreste
21 miliardi US$

Ricerca e tecnologie
35 miliardi US$

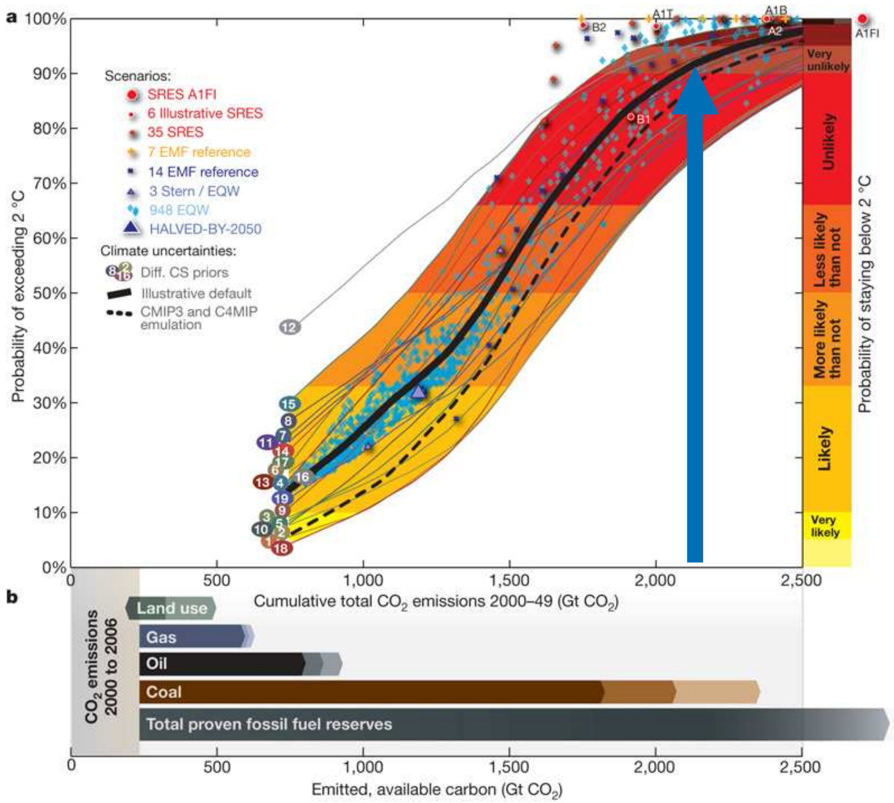
ALCUNI NUMERI DELLA BLUE ECONOMY

Investimento totale per raggiungere nel 2030 la stabilizzazione

1800 miliardi US $ (0.3-0.5 % GDP)

Prezzo del carbonio EU 13.12 € /tCO_2 (29.4.2011)

The probability of exceeding 2 ° C warming versus CO_2 emitted in the first half of the twenty-first century.



M Meinshausen *et al. Nature* **458**, 1158-1162 (2009) doi:10.1038/nature08017

nature

MESSAGGIO :

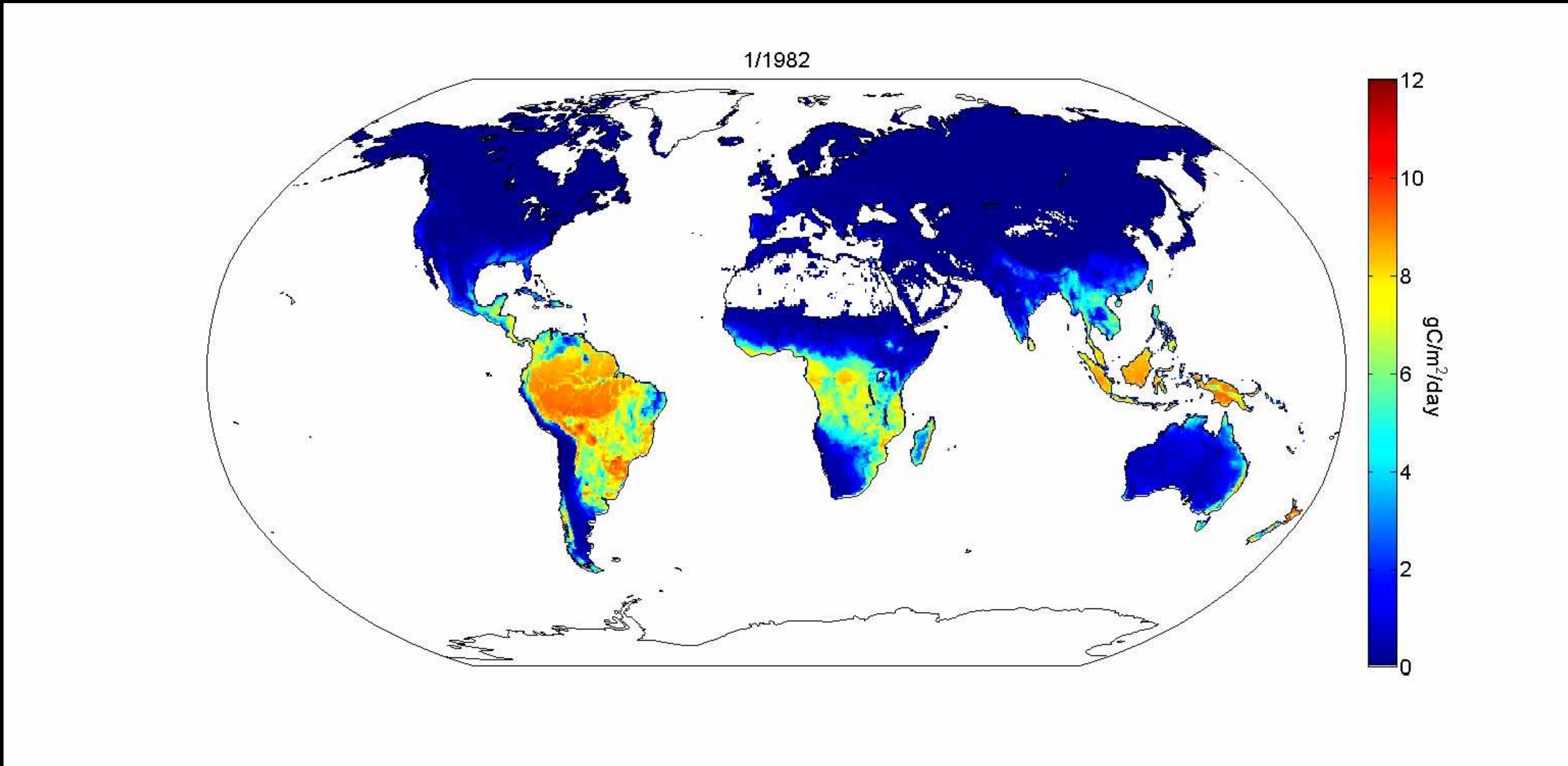
Mitigazione è difficile

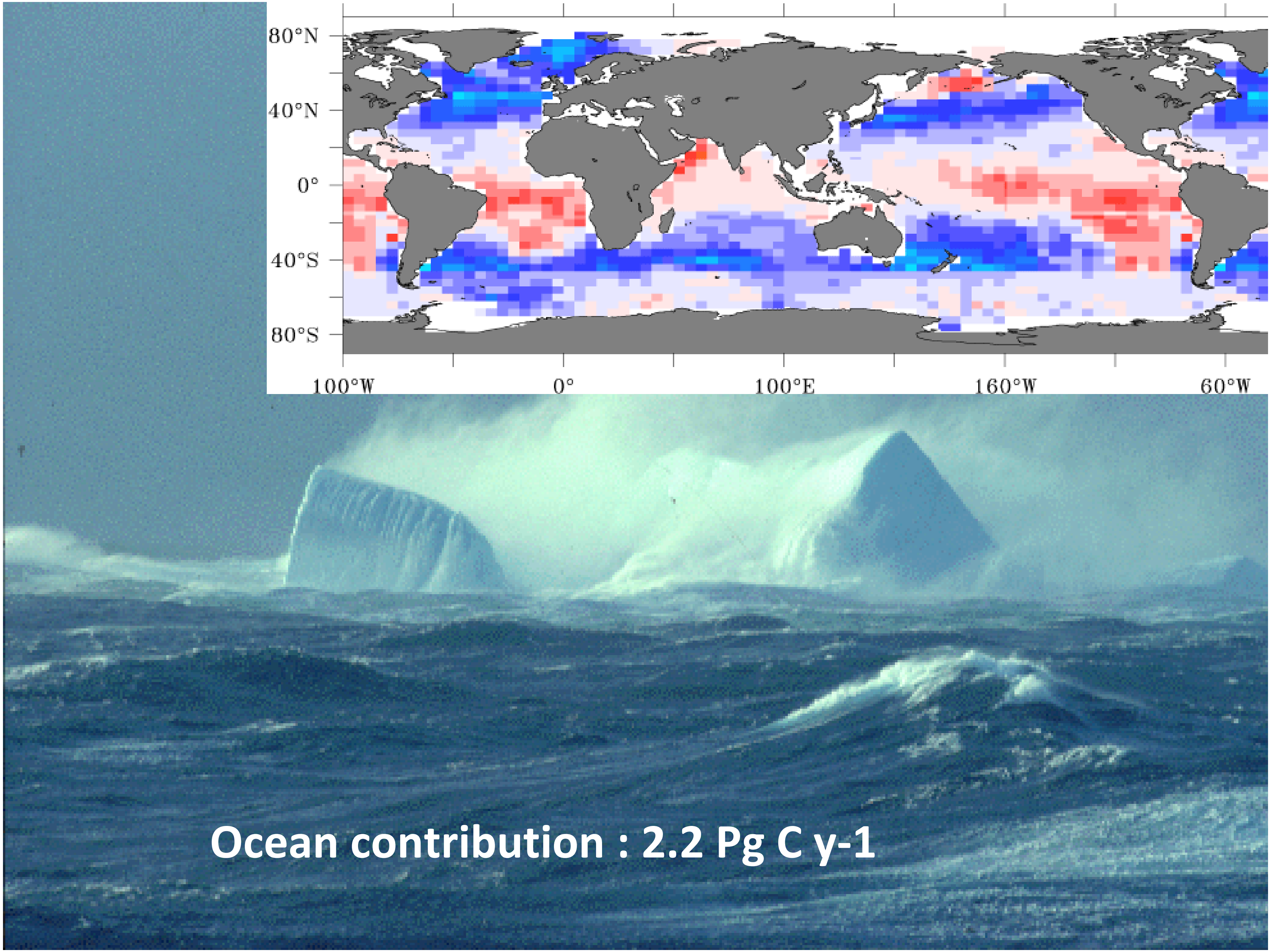
L’Europa non è determinante

Il trasferimento tecnologico nei Paesi emergenti è fondamentale

L’investimento globale sulla mitigazione è urgente

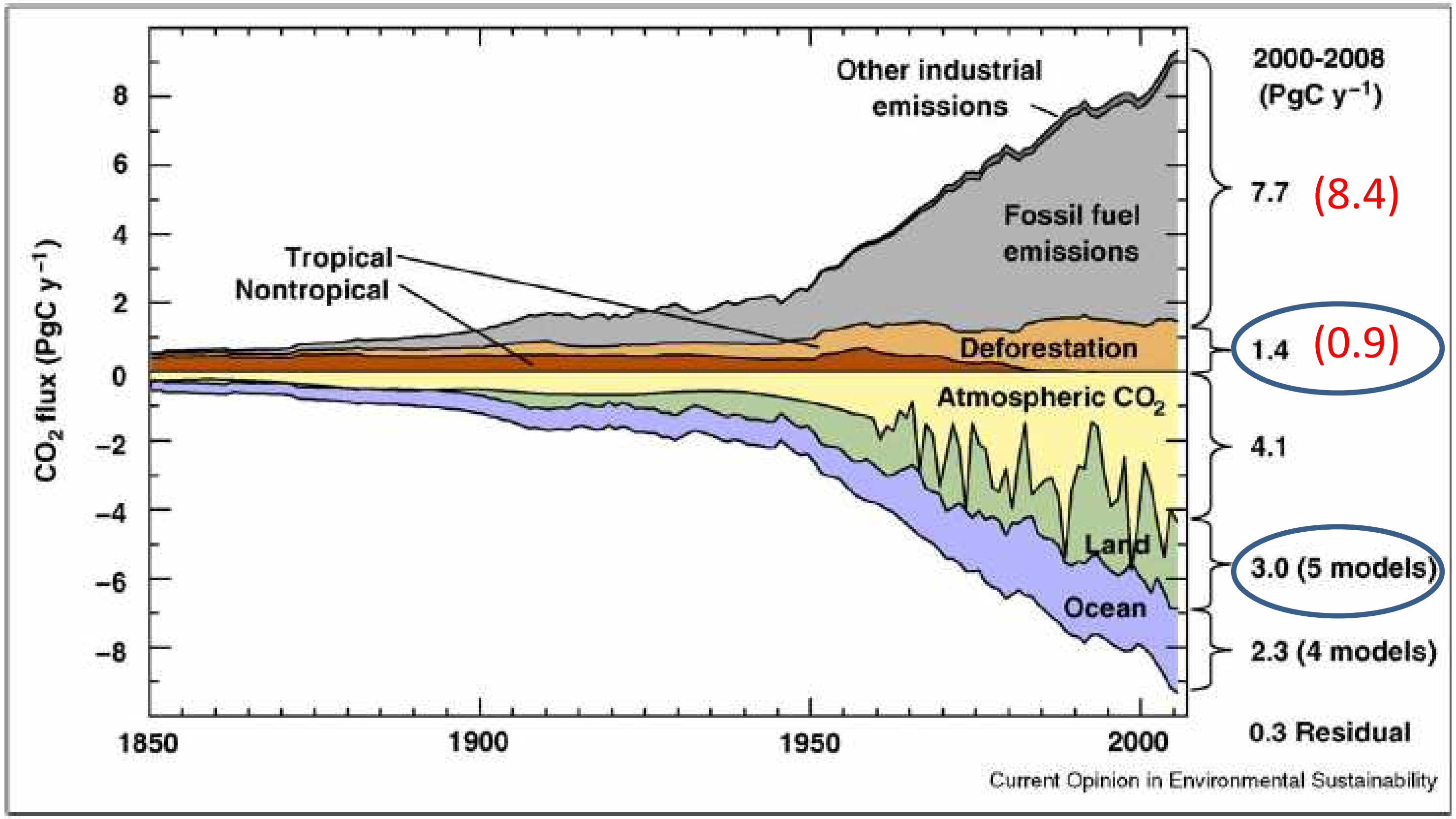
First global GPP estimate by FLUXNET (Beer et al. 2010) (123±8 Pg Cy^{-1})





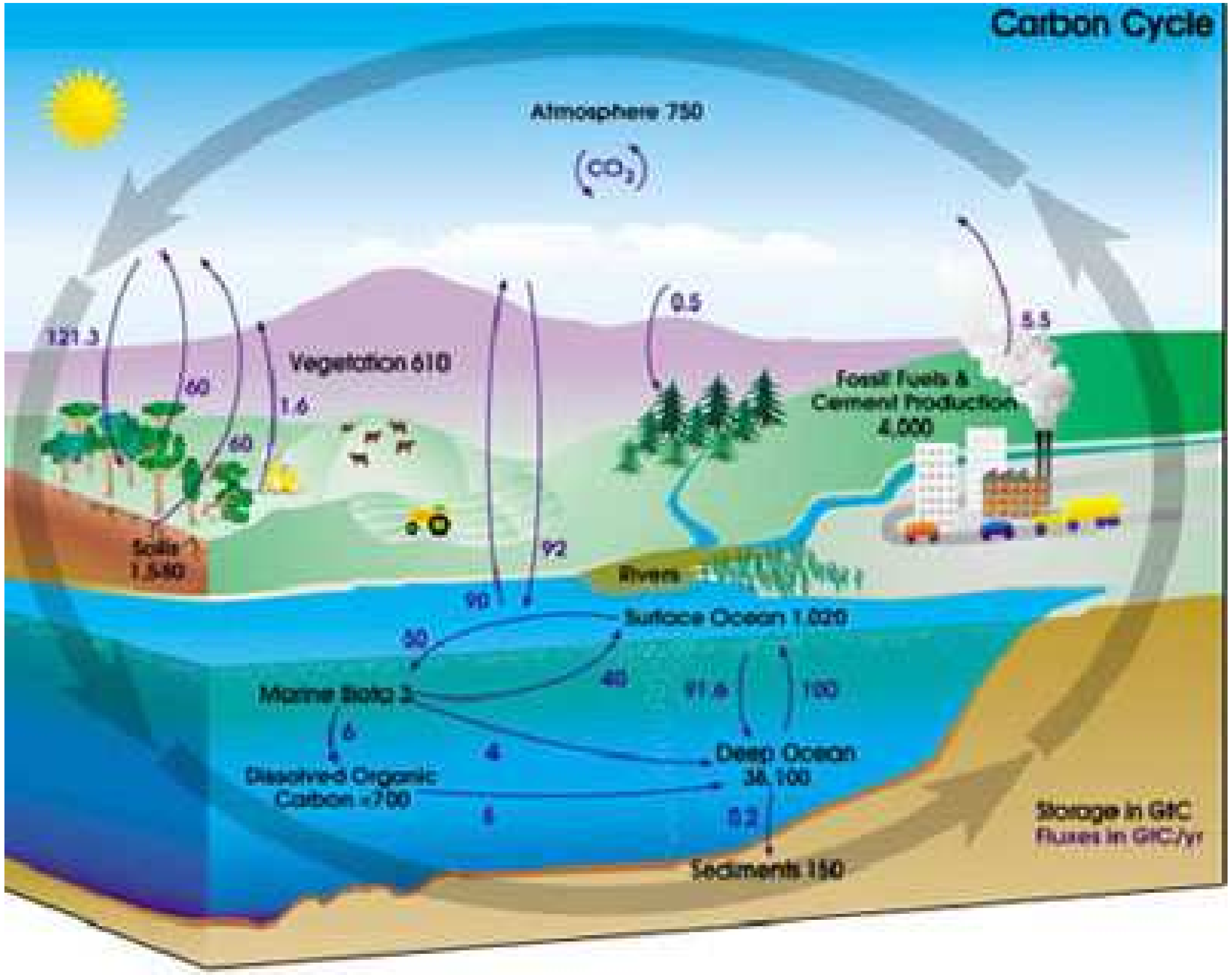
Ocean contribution : 2.2 Pg C y-1

The global carbon budget 2000-2008



I sistemi naturali assorbono 55% di tutte le emissioni di gas serra. Un valore economico di

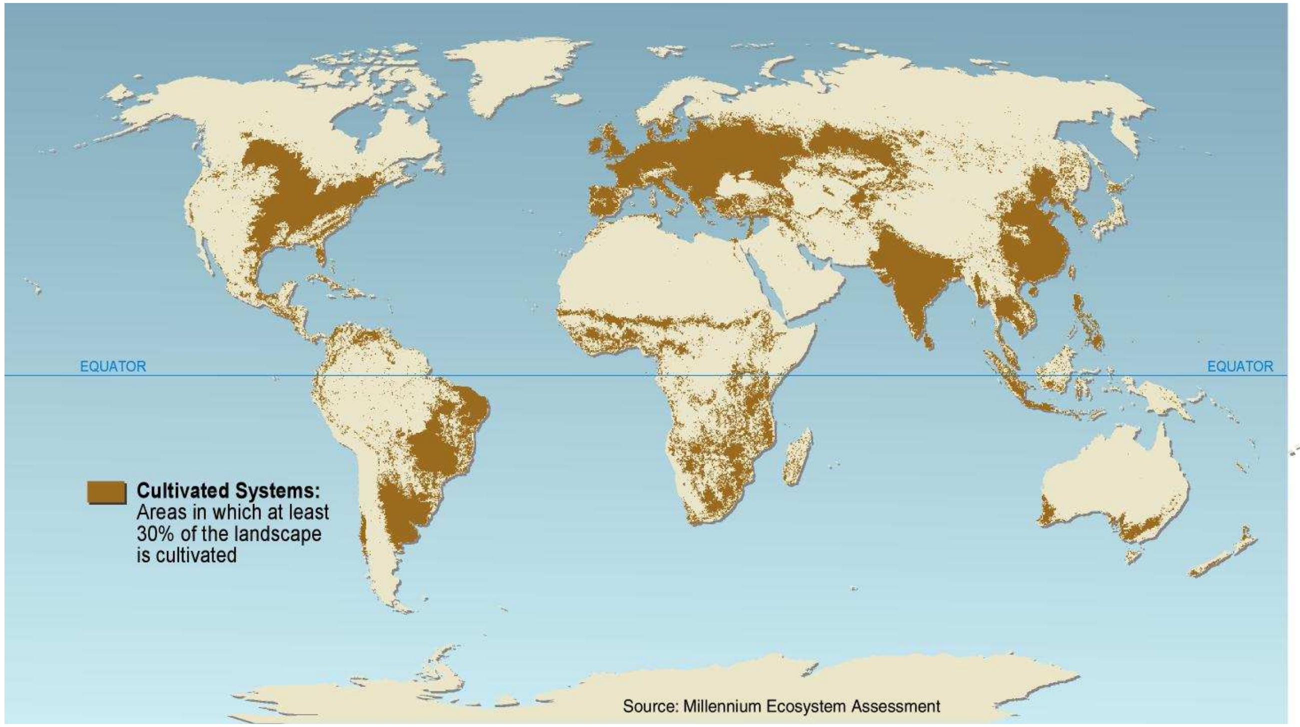
234 miliardi di Euro per anno



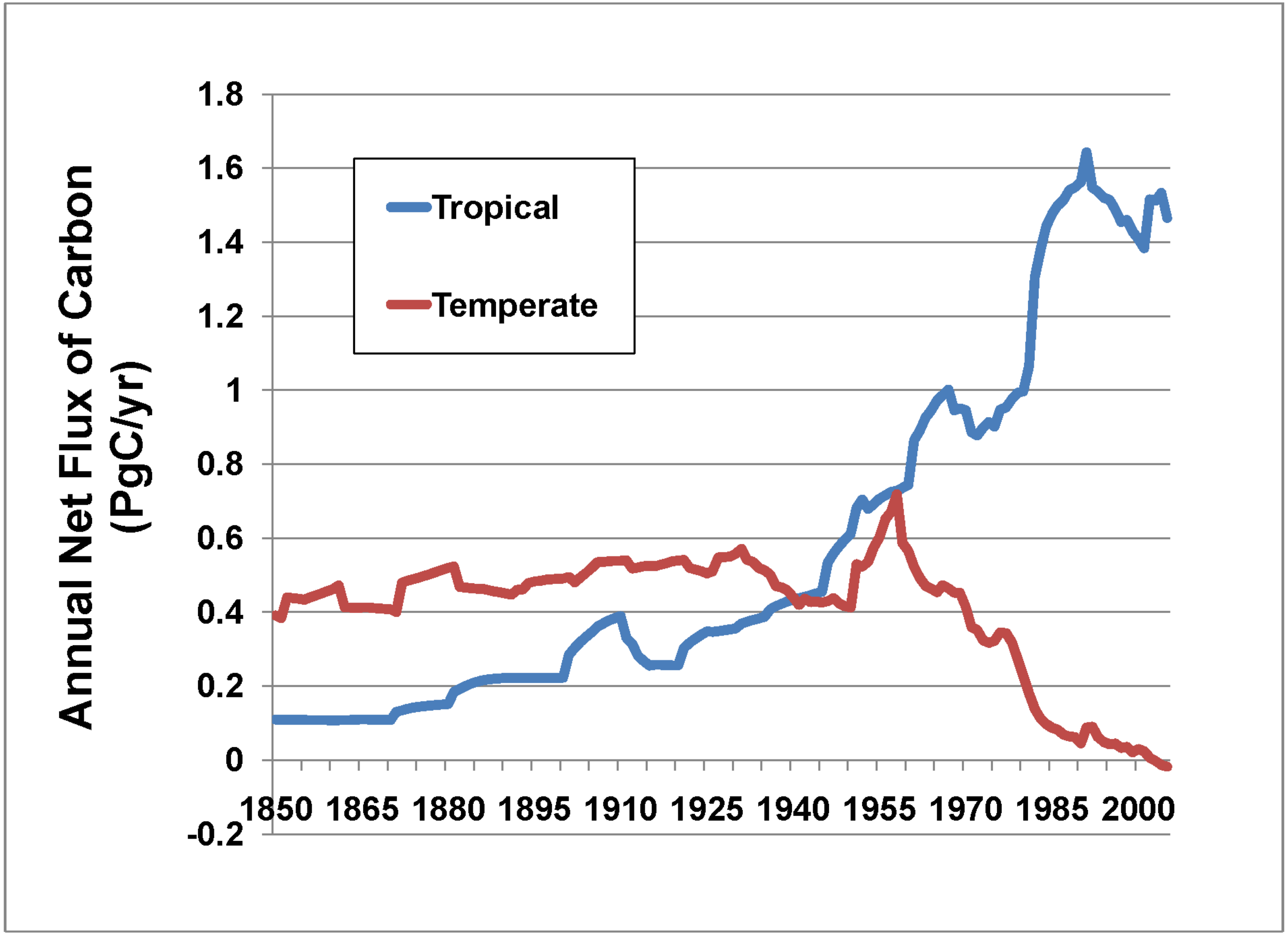
Millennium Ecosystem Assessment

Unprecedented change in structure and function of ecosystems

Più terra è stata convertita in agricoltura tra il 1950 e 1980 che tra il 1700 e 1850.



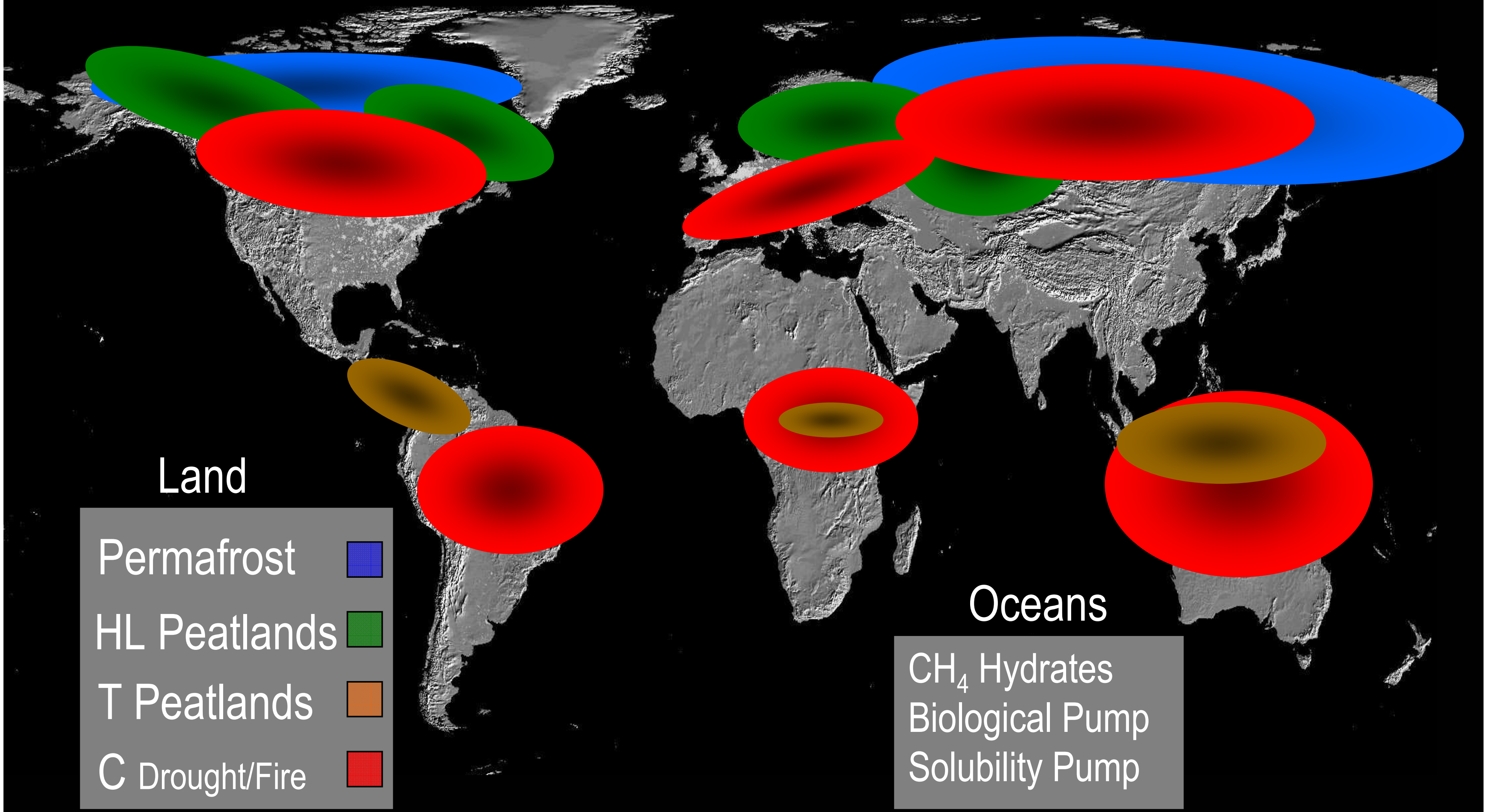
L’agricoltura copre il 25% della superficie terrestre



Annual Net Flux of Carbon (PgC/yr)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
1850 1865 1880 1895 1910 1925 1940 1955 1970 1985 2000
Tropical
Temperate

Vulnerability of Carbon Pools in the 21st Century

Hot Spots of the Carbon-Climate System

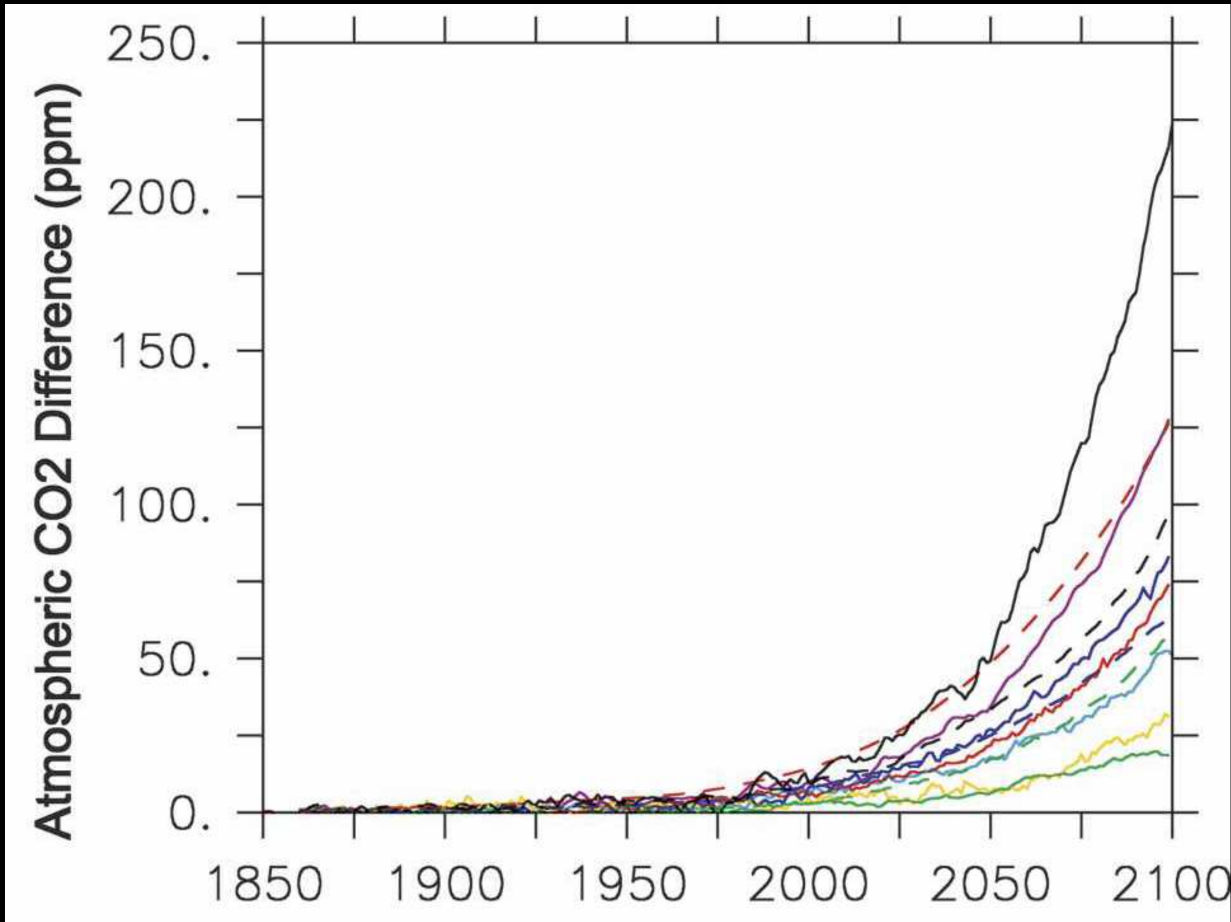


Many of these Pools and Processes are not included in Earth System models

Canadell et al. 2007, Springer
Gruber et al. 2004, Island Press

Carbon-Climate Feedbacks

10 GCMs with coupled carbon cycle C^4MIP

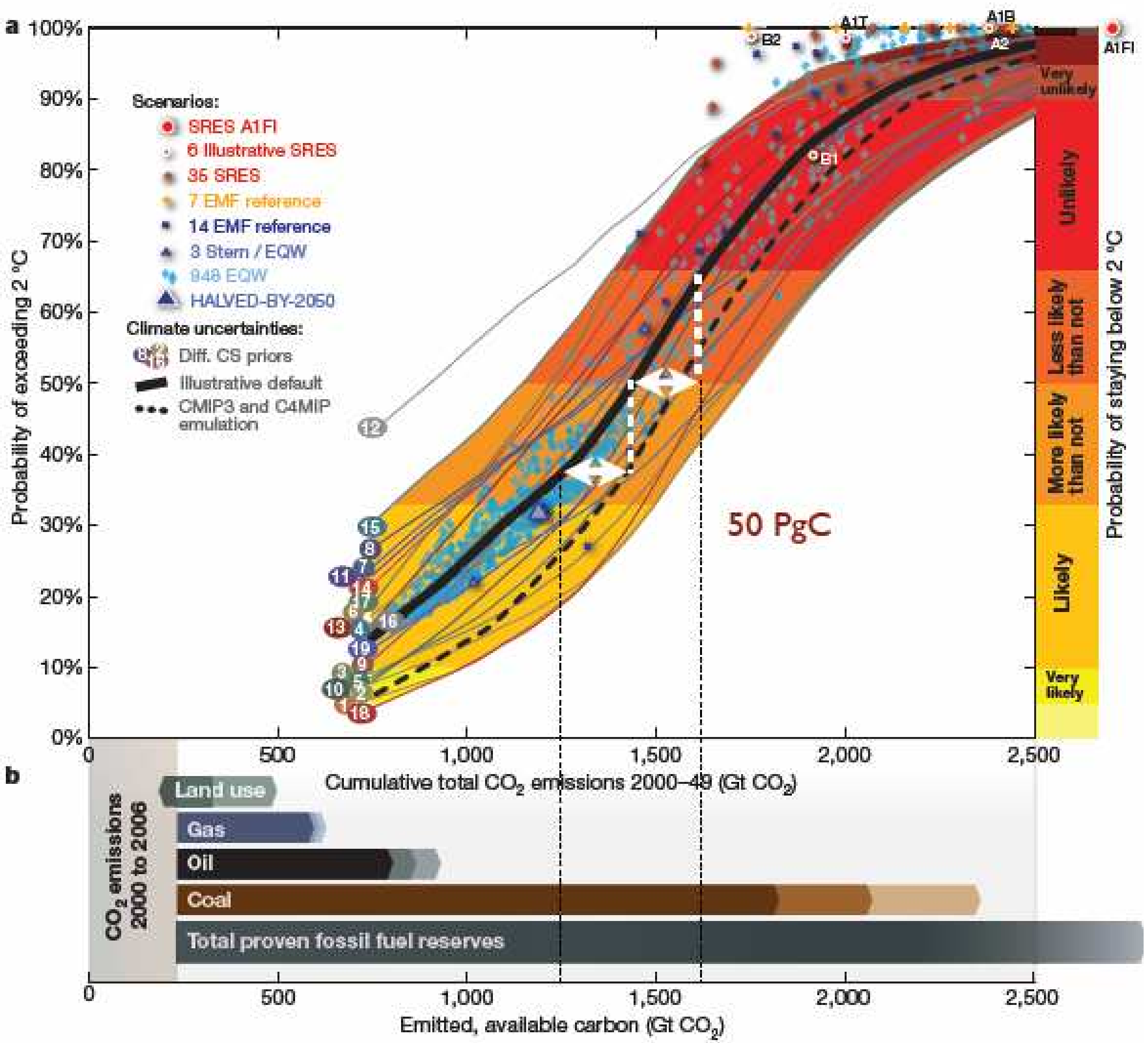


200 ppm 1.5 ° C

20 ppm 0.1 °C

Friedlingstein et al.2006

The context: Probability of exceeding 2°C warming versus CO_2 emitted in 1st half of 21st century



Effect of addition or removal of 50 PgC (=~180 $GtCO_2$) via climate-carbon cycle feedbacks

Meinshausen et al. 2009

MESSAGGIO

La biosfera terrestra e gli oceani possono rallentare o accelerare il global warming

La gestione delle risorse naturali (in particolare terrestri) è importante nella sfida della mitigazione delle emissioni di gas serra

La conservazione delle foreste tropicali ed in generale degli stock di carbonio è assolutamente urgente e necessaria

MAIN ADAPTATION SECTORS FOR ITALY

WATER

AGRICULTURE

TOURISM

INFRASTRUCTURE

ENERGY PRODUCTION

HEALTH

BIODIVERSITY

IMPRONTA USO IDRICO

Table 2 Global average virtual water content of some selected products, per unit of product

Product	Virtual water content (litres)
1 glass of beer (250 ml)	75
1 glass of milk (200 ml)	200
1 cup of coffee (125 ml)	140
1 cup of tea (250 ml)	35
1 slice of bread (30 g)	40
1 slice of bread (30 g) with cheese(10 g)	90
1 potato (100 g)	25
1 apple (100 g)	70
1 cotton T-shirt (250 g)	2000
1 sheet of A4-paper (80 g/m^2)	10
1 glass of wine (125 ml)	120
1 glass of apple juice (200 ml)	190
1 glass of orange juice (200 ml)	170
1 bag of potato crisps (200 g)	185
1 egg (40 g)	135
1 hamburger (150 g)	2400
1 tomato (70 g)	13
1 orange (100 g)	50
1 pair of shoes (bovine leather)	8000
1 microchip (2 g)	32

IMPRONTA USO IDRICO

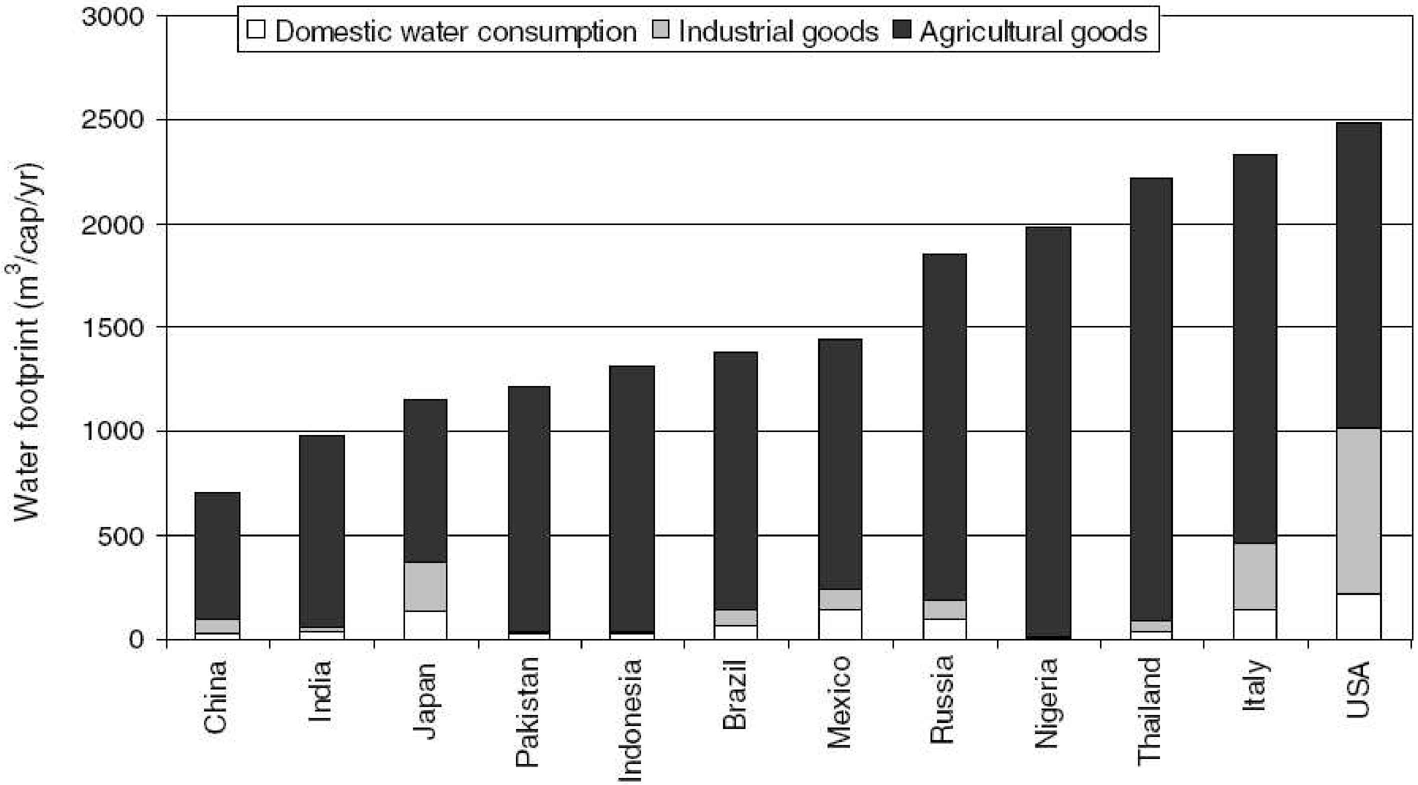
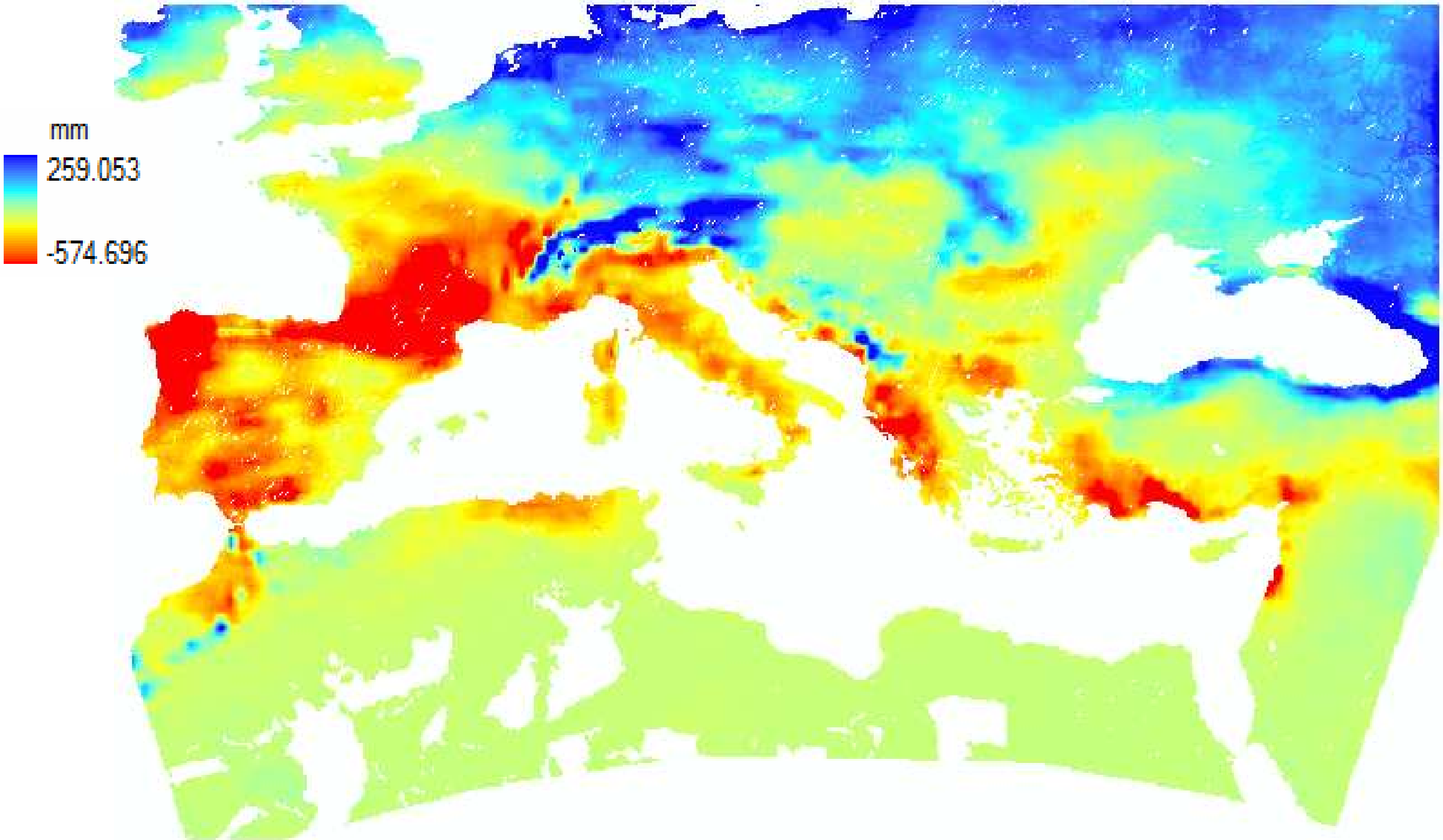


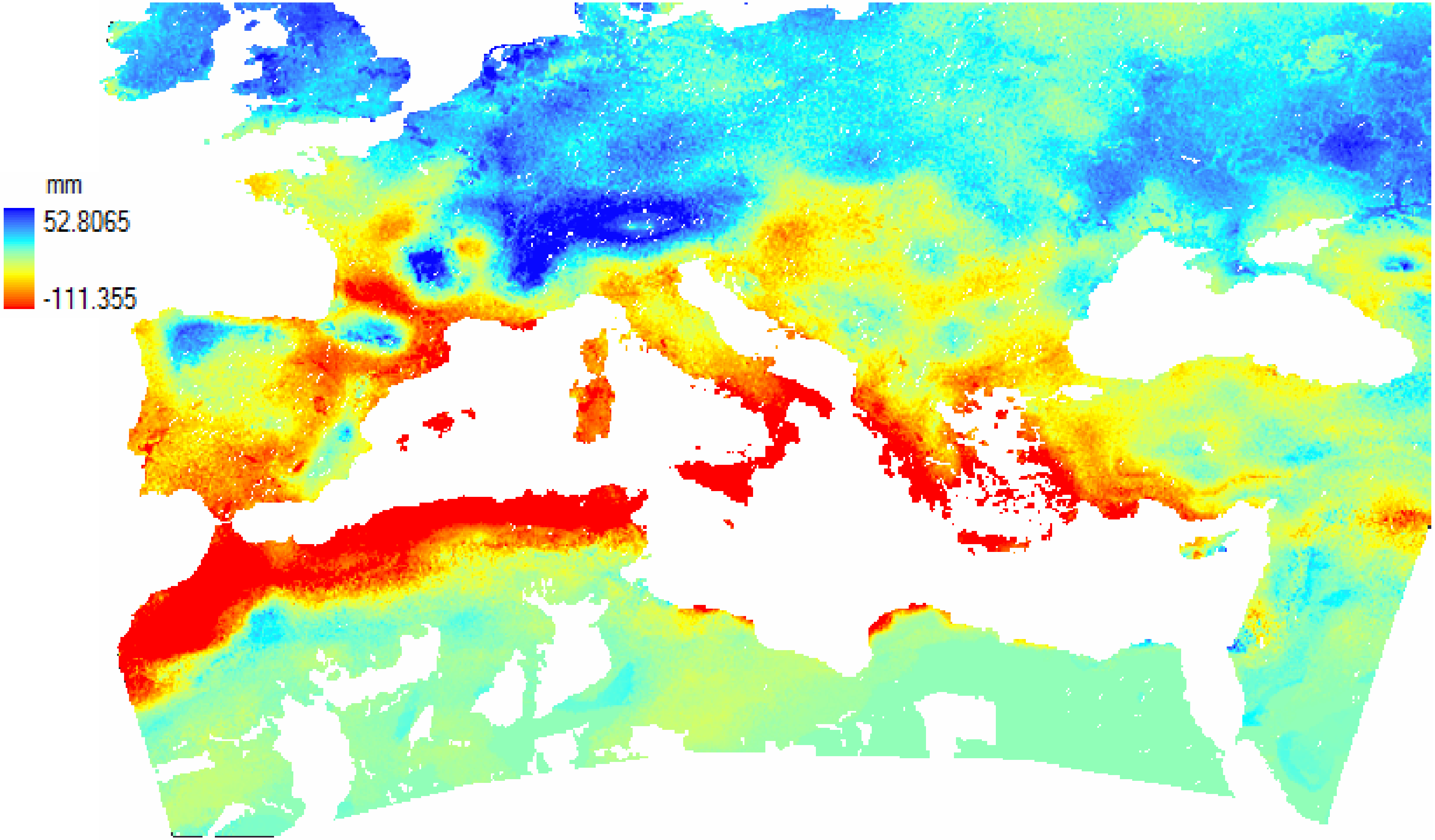
Fig. 5 The national water footprint per capita and the contribution of different consumption categories for some selected countries

Spatial yearly Blue Water anomalies



2021-2050 minus 1971-2000, whole ensemble average

Spatial yearly Green Water anomalies



2021-2050 minus 1971-2000, whole ensemble average

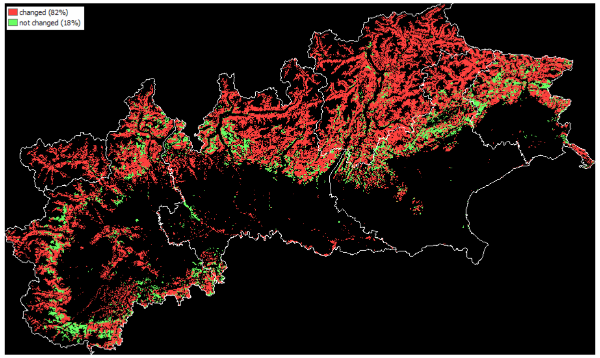
This projects has received European Regional Development Funding through the INTERREG III B Community Initiative

Alpine Space

Interreg III B

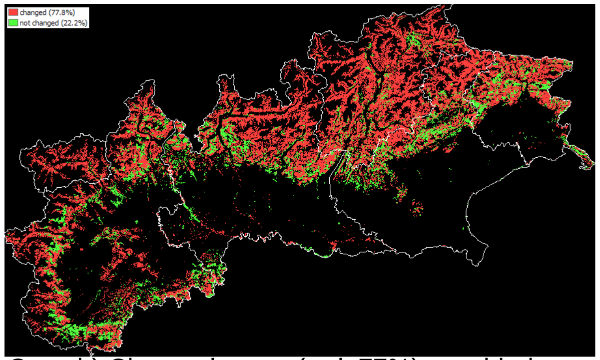
Altitude profiles of forest distribution

Forest classes
00 - Woody plantation in agricultural areas
01 - Oaks and other evergreen broadleaf forests
09 - Oro-Mediterranean and mountain pine dominant forests
10 - *Abies alba* and *Picea* dominant forests
11 - Larch and cembrus pine dominant forests
12 - Exotic needleleaf dominant forests
13 - Mixed needleleaf and broadleaf forests with prevalent beech
14 - Mixed needleleaf and broadleaf forests with prevalent oro-mediterranean and mountain pine



	FOREST 1990			FOREST 2100		
VALUE	COUNT	AREA (Ha)	PERCENT	COUNT	AREA (Ha)	PERCENT
0	4748	29675	1.09	0	0	0
1	131	819	0.03	0	0	0
2	14015	87594	3.20	30045	187781.25	6.87
3	34436	215225	7.87	22561	141006.25	5.16
4	43344	270900	9.91	226552	1415950	51.79
5	3282	20513	0.75	637	3981.25	0.15
6	76158	475988	17.41	41913	261956.25	9.58
7	16935	105844	3.87	224	1400	0.05
8	336	2100	0.08	122	762.5	0.03
9	15443	96519	3.53	92	575	0.02
10	97168	607300	22.21	0	0	0.00
11	39358	245988	9.00	0	0	0.00
12	73	456	0.02	0	0	0.00
13	21729	135806	4.97	0	0	0.00
14	13877	86731	3.17	2265	14156.25	0.52
15	23322	145763	5.33	105680	660500	24.16
16	33055	206594	7.56	7319	45743.75	1.67

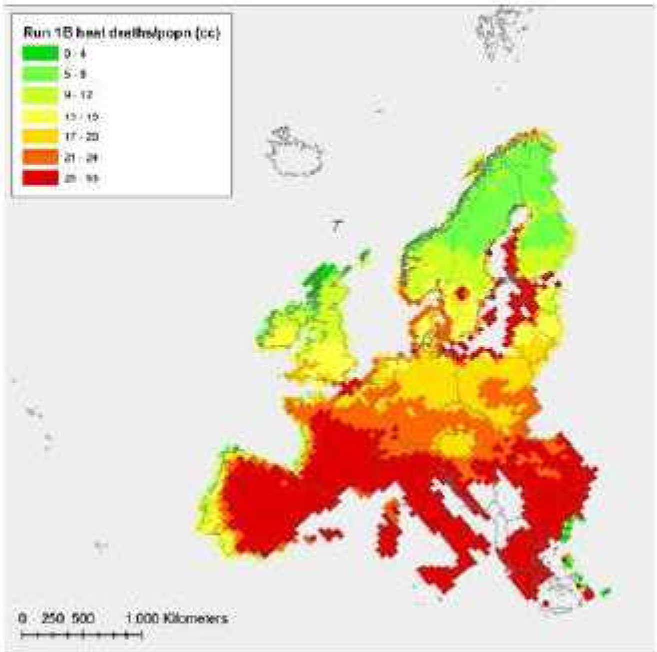
Case a) Changed areas (red, 82%) considering only statistical analysis



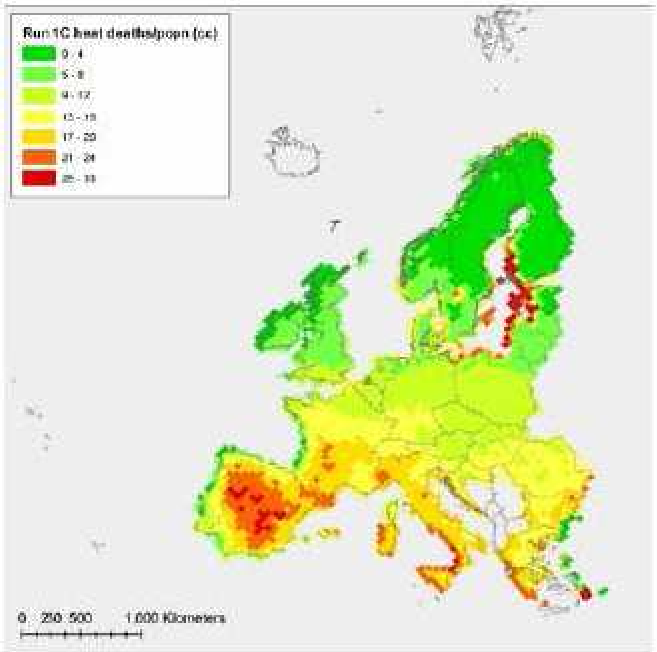
	FOREST 1990			FOREST 2100_v		
VALUE	COUNT	AREA (Ha)	PERCENT	COUNT	AREA (Ha)	PERCENT
0	4748	29675	1.09	566	3537.5	0.13
1	131	819	0.03	0	0	0.00
2	14015	87594	3.20	28159	175993.75	6.44
3	34436	215225	7.87	13444	84025	3.07
4	43344	270900	9.91	213609	1335056.3	48.83
5	3282	20513	0.75	804	5025	0.18
6	76158	475988	17.41	52810	330062.5	12.07
7	16935	105844	3.87	3279	20493.75	0.75
8	336	2100	0.08	234	1462.5	0.05
9	15443	96519	3.53	955	5968.75	0.22
10	97168	607300	22.21	1892	11825	0.43
11	39358	245988	9.00	0	0	0.00
12	73	456	0.02	0	0	0.00
13	21729	135806	4.97	0	0	0.00
14	13877	86731	3.17	1914	11962.5	0.44
15	23322	145763	5.33	110242	689012.5	25.20
16	33055	206594	7.56	9502	59387.5	2.17

Case b) Changed areas (red, 77%) considering statistical analysis and neighborhood criteria

IMPACTS ON HEALTH
(death/100000 pop)



Heat related - Climate Dependent function A2



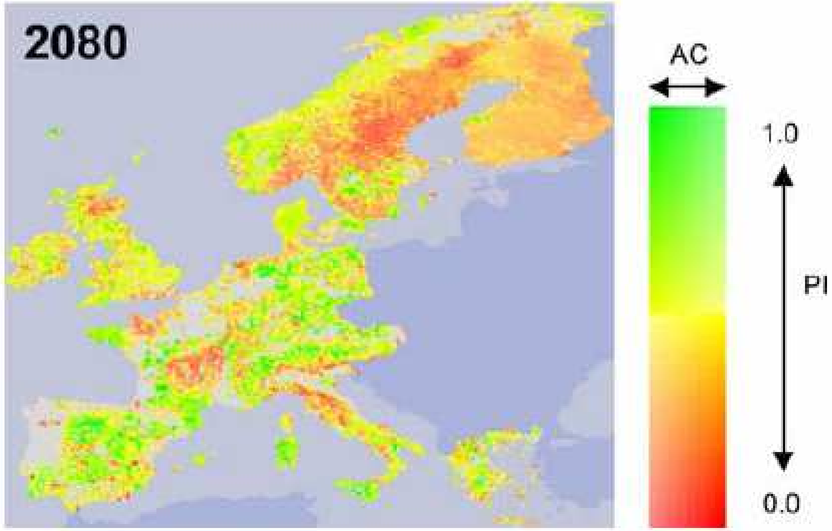
Heat related – Climate Dependent function B2

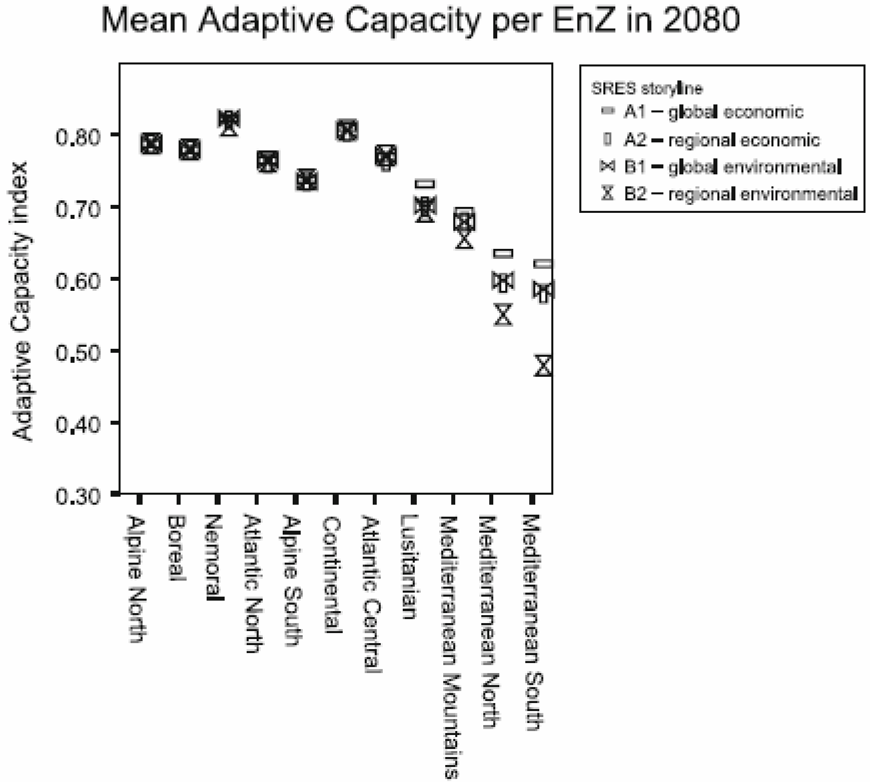
IMPATTO = ESPOSIZIONE x SENSIBILITA’

VULNERABILITA’ = IMPATTO x CAPACITA’ ADATTATIVA

Vulnerability (V)

Ecosystem service	net carbon storage
Ecosystem model	LPJ
GCM	HadCM3
Scenario	A1 – global economic





for a living planet®

Per un piano di adattamento al Cambiamento Climatico in Italia

CONCLUSIONI (1/2)

1. La mitigazione delle emissioni di gas serra è un impegno urgente e necessario ma difficile da raggiungere.

2. I maggiori sforzi vanno indirizzati nelle economie emergenti

3. L’adattamento ai cambiamenti climatici diventa inevitabile

Conclusioni (2/2)

4. In Italia non esiste un piano nazionale di adattamento

5. Non vi sono elementi di analisi di impatto dei cambiamenti climatici nella programmazione territoriale (es. rischio idrogeologico,piani assestamento forestale, rischi salute etc.)

6. La capacità di adattamento in Italia,a causa di barriere istituzionali e specificità geografiche, più difficile che in altri Paesi europei.