Addressing Climate Change: Challenges and Opportunities

Louis C.P.M. Stuyt, M.Sc, Ph.D.

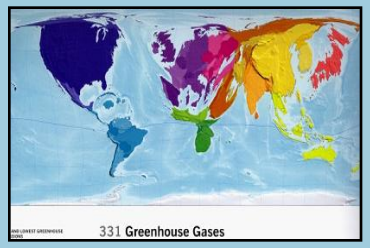
provincie limburg

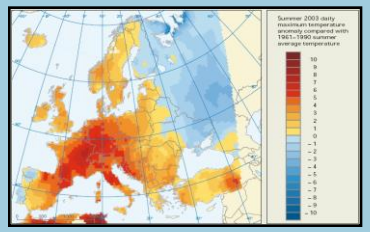
Climate Change

Why?

Challenges?

Opportunities?





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Climate Change

Why?

Challenges?

Opportunities?

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ST AND SMALLEST LAND AREAS

erritory	Hectares
ussia	1,689,000,000
hina	933,000,000
anada	922,000,000
nited States	916,000,000
razil	846,000,000
ustralia	768,000,000
ndia	297,000,000
rgentina	274,000,000
azakhstan	270,000,000
lgeria	238,000,000
t Kitts-Nevis	36,000
ru	26,000
ook Islands	23,800
arshall Islands	18,000
iechtenstein	16,000
an Marino	6,000
uvalu	3,000
auru	2,000
onaco	200
atican City	40

001 Land Area

The size of each territory represents exactly its land area in proportion to that of the others, giving a strikingly different perspective from the Mercator projection most commonly used.

Maps based on the Mercator projection enormously distort the size of land masses at the poles, making Greenland and Antarctica disproportionately large by comparison with Africa and South America. This map uses land area data for each of the 200 territories shown throughout the atlas, scaled to represent accurately in two dimensions the actual relative sizes of the territories.

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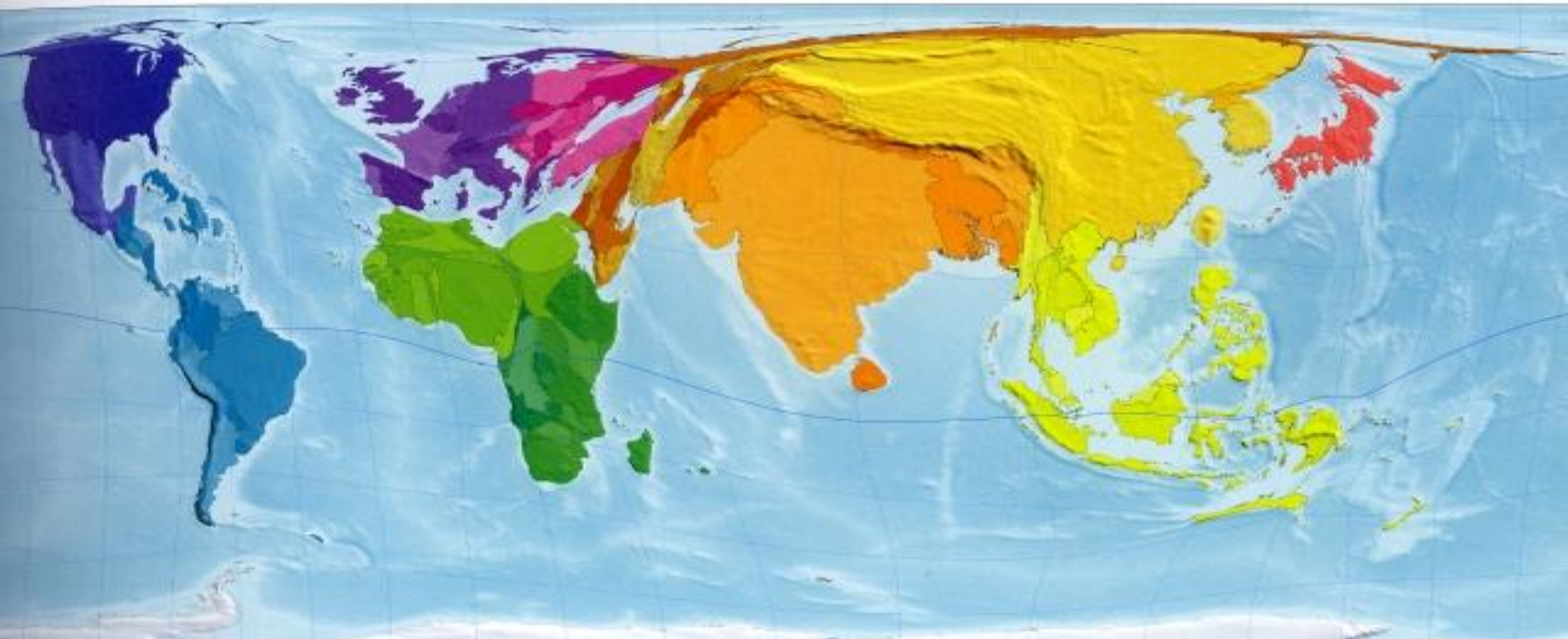
'Secure access to land remains essential for diverse land-based livelihoods and is a precondition for sustainable agriculture, economic growth and poverty reduction.' Oxfam, 2006



AND SMALLEST POPULATIONS

	Population
	1,295,000,000
	1,050,000,000
d States	291,000,000
esia	217,000,000
	175,000,000
tan	150,000,000
adesh	144,000,000
	144,000,000
	128,000,000
	121,000,000
ts–Nevis	42,000
co	34,000
tenstein	33,000
Marino	27,000
	20,000
Islands	18,000
	13,000
	10,000
	2,000
n City	1,000

MOST AND LEAST LAND AREA PER PERSON

Rank	Territory	Hectares per person
1	Greenland	1,821
2	Western Sahara	97
3	Mongolia	60
4	Namibia	41
5	Australia	39
6	Suriname	39
7	Mauritania	37
8	Iceland	33
9	St Vincent and the Grenadines	33
10	Botswana	31
191	Nauru	0.154
192	Barbados	0.143
193	Bahrain	0.101
194	Maldives	0.100
195	Bangladesh	0.091
196	Malta	0.080
197	Vatican City	0.044
198	Singapore	0.016
199	Hong Kong (China)	0.015
200	Monaco	0.006

002 Total Population

The size of each territory indicates the proportion of the world's population living there, showing how the Earth's population is distributed over the planet's surface.

In the spring of 2000, the population of the world passed 6 billion people for the first time. On this map, India, China and Japan appear large because they have large populations; Panama, Namibia and Guinea-Bissau have small populations and so are barely visible.

Population is only weakly related to la area. Sudan, for example, is the largest country in Africa in terms of land area b has a smaller population than many oth African countries, including Nigeria, Eg Ethiopia, the Democratic Republic of Congo, South Africa and Tanzania.

'Out of every 100 persons added to the population in coming decade, 97 will live in developing countri

Hania Zlotnik, UNFPA,

AND LOWEST GREENHOUSE SSIONS

tory	Tonnes'
ar	86
oica	46
ssia	37
ait	27
embourg	27
tralia	27
ael	26
guay	25
ted Arab Emirates	25
ted States	23
ambique	0.18
ra	0.18
dagascar	0.18
ndia	0.18
ria	0.16
ra Leone	0.12

331 Greenhouse Gases

Greenhouse gases trap heat in the earth's atmosphere, causing it to warm up. The size of each territory indicates its greenhouse gas emissions.

This map shows emissions of the three leading greenhouse gases – carbon dioxide, methane and nitrous oxide – which between them account for 98% of the greenhouse effect. Other greenhouse gases, not shown here, include various fluorocarbons and sulphur hexafluoride. Quantities of gases are weighted according to their global warming potential because some have a stronger effect than others.

The territories emitting the largest amounts of greenhouse gases are the United States, China, Russia and Japan. The highest emissions per person are from Qatar, which emits the equivalent of 86 tonnes of carbon dioxide per person per year. Qatar has significant oil and gas reserves but a population of less than a million people.

GREENHOUSE GA
equivalent tonnes of carbon dioxide, pe

EEA Report | No 4/2008
JRC Reference Report | No JRC47756

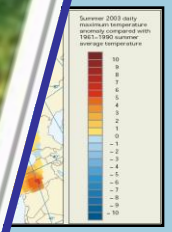
Impacts of Europe's changing climate — 2008 indicator-based assessment

Joint EEA-JRC-WHO report

WORLD HEALTH ORGANIZATION EUROPE

JRC EUROPEAN COMMISSION

European Environment Agency



ECRN

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Challenges for Chemical Industry in EU

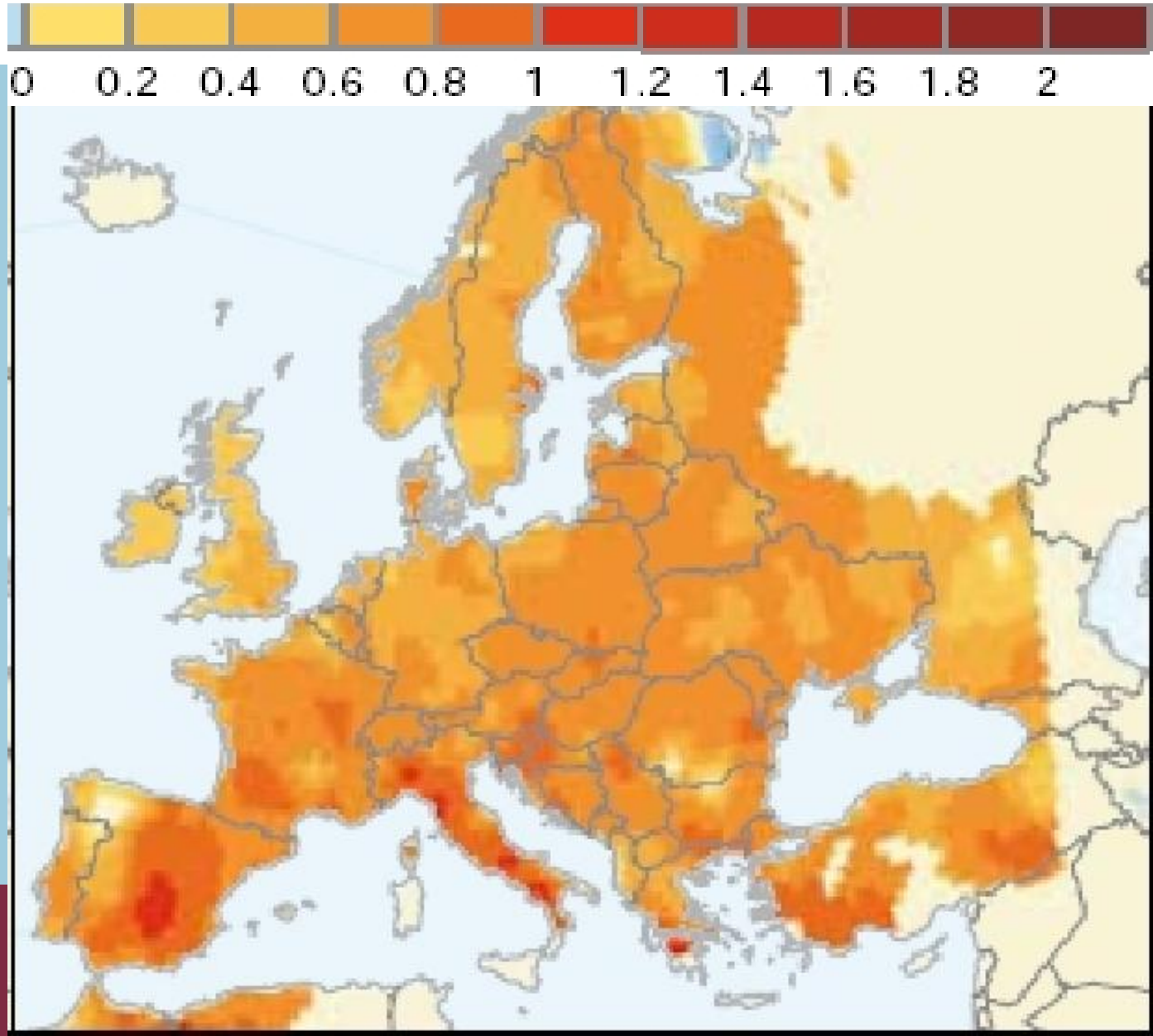
2 indicators:

temperature
water

Challenges for Chemical Industry in EU

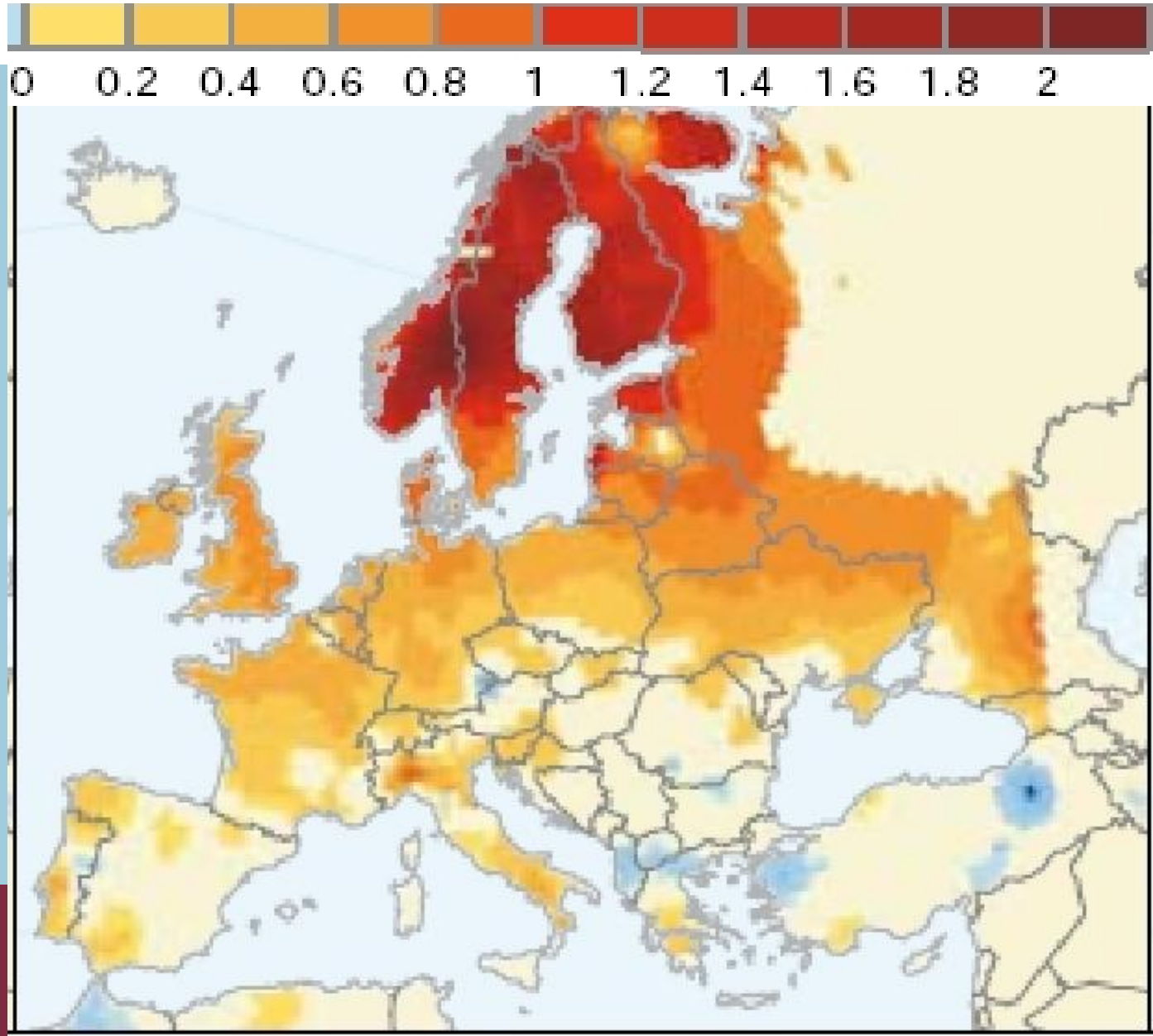
Temperature

European summers are getting warmer



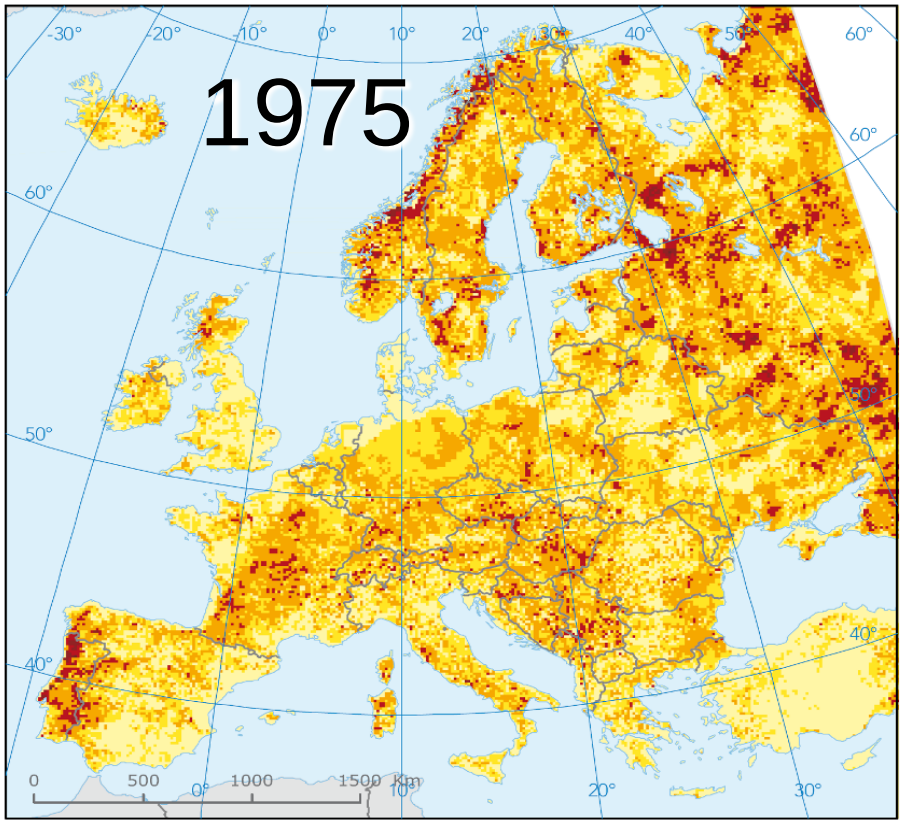
recorded
1976-2006

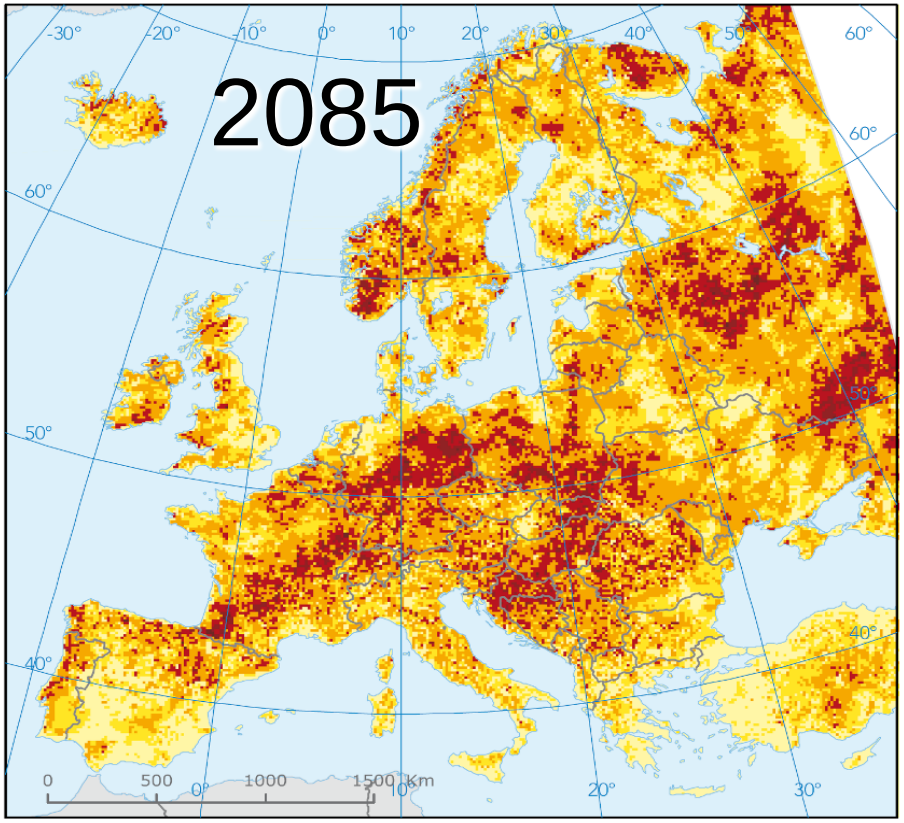
European winters are getting warmer also



recorded
1976-2006

More heat waves >7 days





Heat wave frequency for the periods 1961–1990 (left) and 2071–2100 (right)
Based on the IPCC-SRES A2 emission scenario and the DMI climate model

Source: EEA, 2007

< 1 | 1 | 2–3 | 4–5 | 6–7 | 8–9 | ≥ 10 | Outside report coverage

Note: The A2 baseline scenario in combination with the Danish regional climate model.

Source: Indicator elaboration: R. Hiederer, European Commission DG Joint Research Centre, Institute for Environment and Sustainability, 2007. Data: PRUDENCE Project 12km HIRHAM4, Danish Climate Centre, 2006.

Challenge for Cl

Water: growing

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'Secure access to land remains essential for diverse land-based livelihoods and is a precondition for sustainable agriculture, economic growth and poverty reduction.' Oxfam, 2006

AND LOWEST RATES
TRIAL WATER USE

ory	cubic metres
aria	1,303
o and Montenegro	1,061
da	1,009
d States	723
ria	520
baijan	497
ova	453
ce	389
ary	388
nia	383
ongo	1.25
	1.22
	1.11
pia	0.96
	0.87
nia	0.66
mbique	0.65
da	0.64
	0.48
oodia	0.36

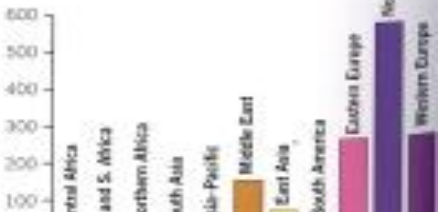
349 Industrial Water Use

The size of each territory indicates the annual industrial water use in cubic metres. Industrial use worldwide far outstrips domestic use.

Between 1987 and 2003 roughly twice as much water was used each year for industry as for domestic purposes: worldwide, industries used 665 billion cubic metres per year on average. Just under a 3rd of this total was used in the United States, and just under a 30th in all 19 territories of East and Southern Africa combined. Central Africa, East and Southern Africa, South Asia, Northern Africa and the Asia–Pacific and Australasia all have low industrial water use per person.

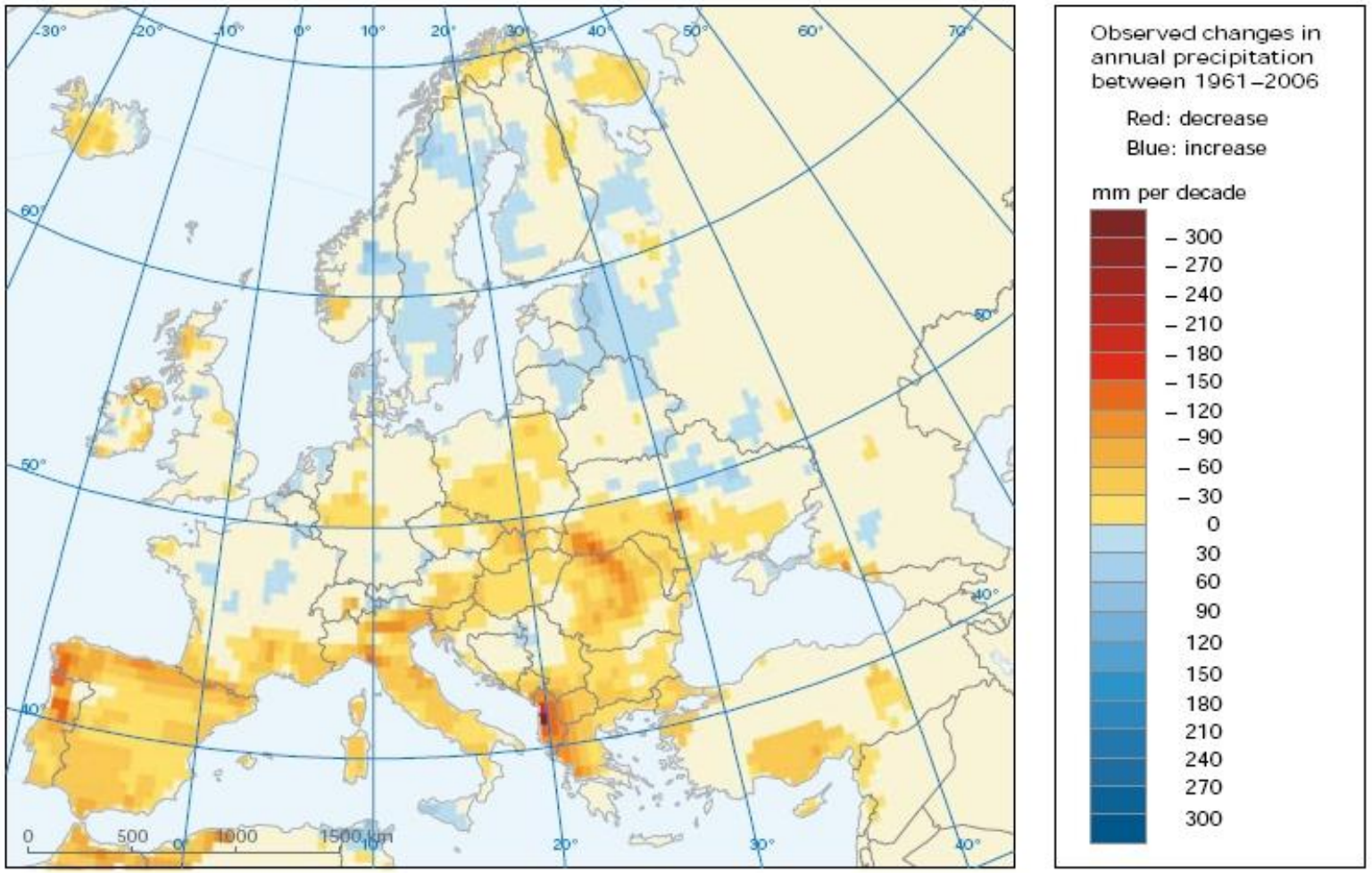
'More than one-half of the world's major rivers are being seriously depleted and polluted, degrading and poisoning the surrounding ecosystems, thus threatening the health and livelihood of people...'

INDUSTRIAL WATER
cubic metres per person per year, 1987–



more or less annual rainfall

Map 5.4 **Observed changes in annual precipitation 1961–2006**



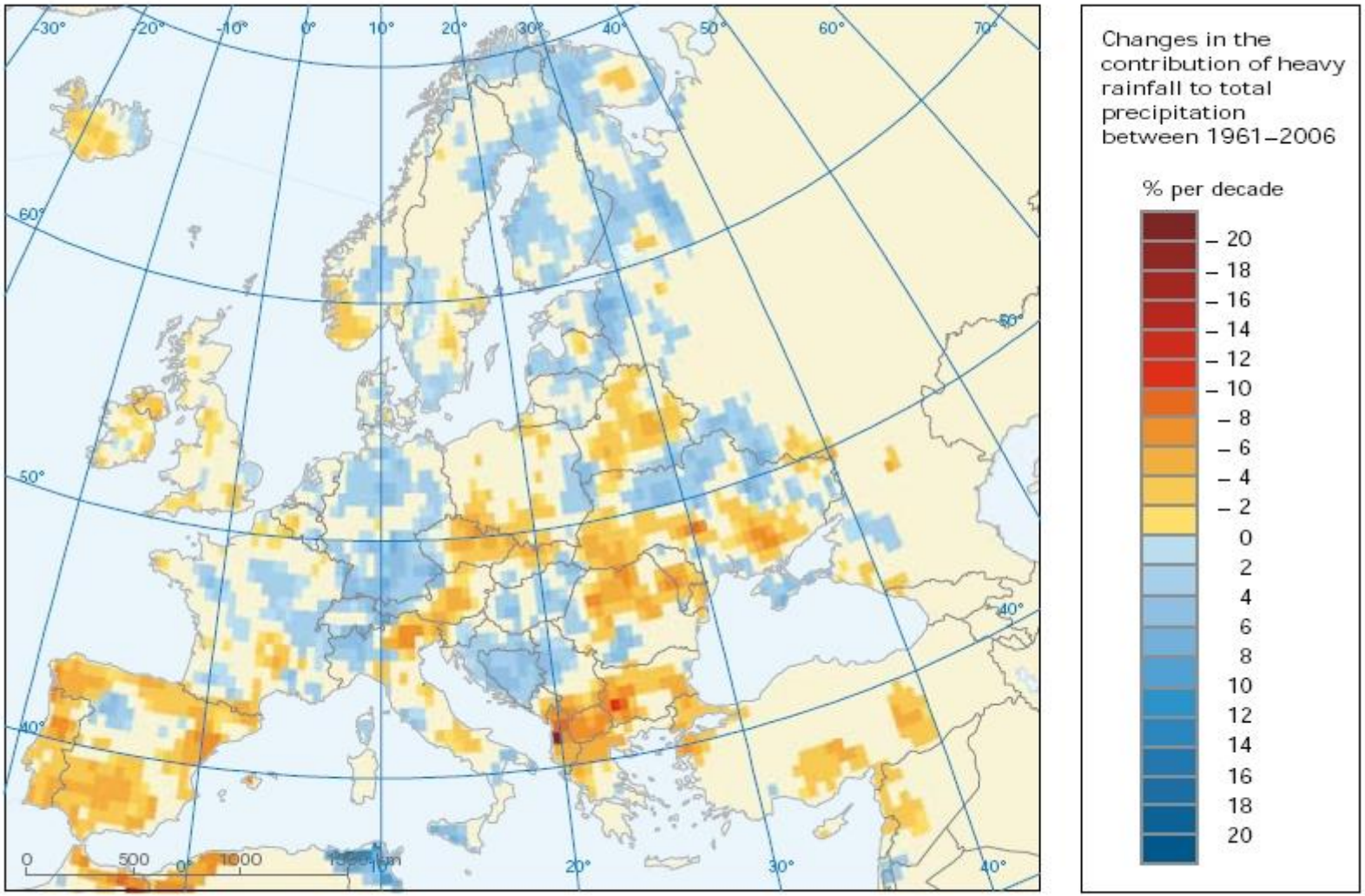
recorded 1961-2006

Note: Data are in mm per decade, blue means an increase, red a decrease. The observations indicate that large decadal scale variability in precipitation amount is superposed on the long time scale trends described above. This variability is partly related to the decadal scale variability in atmospheric circulation anomalies (see Box 5.1). Calculating trends over shorter time periods may therefore lead to different results.

Source: The climate dataset is from the EU-FP6 project ENSEMBLES (http://www.ensembles-eu.org) and the data providers in the ECA&D project (http://eca.knmi.nl).

more or less heavy showers

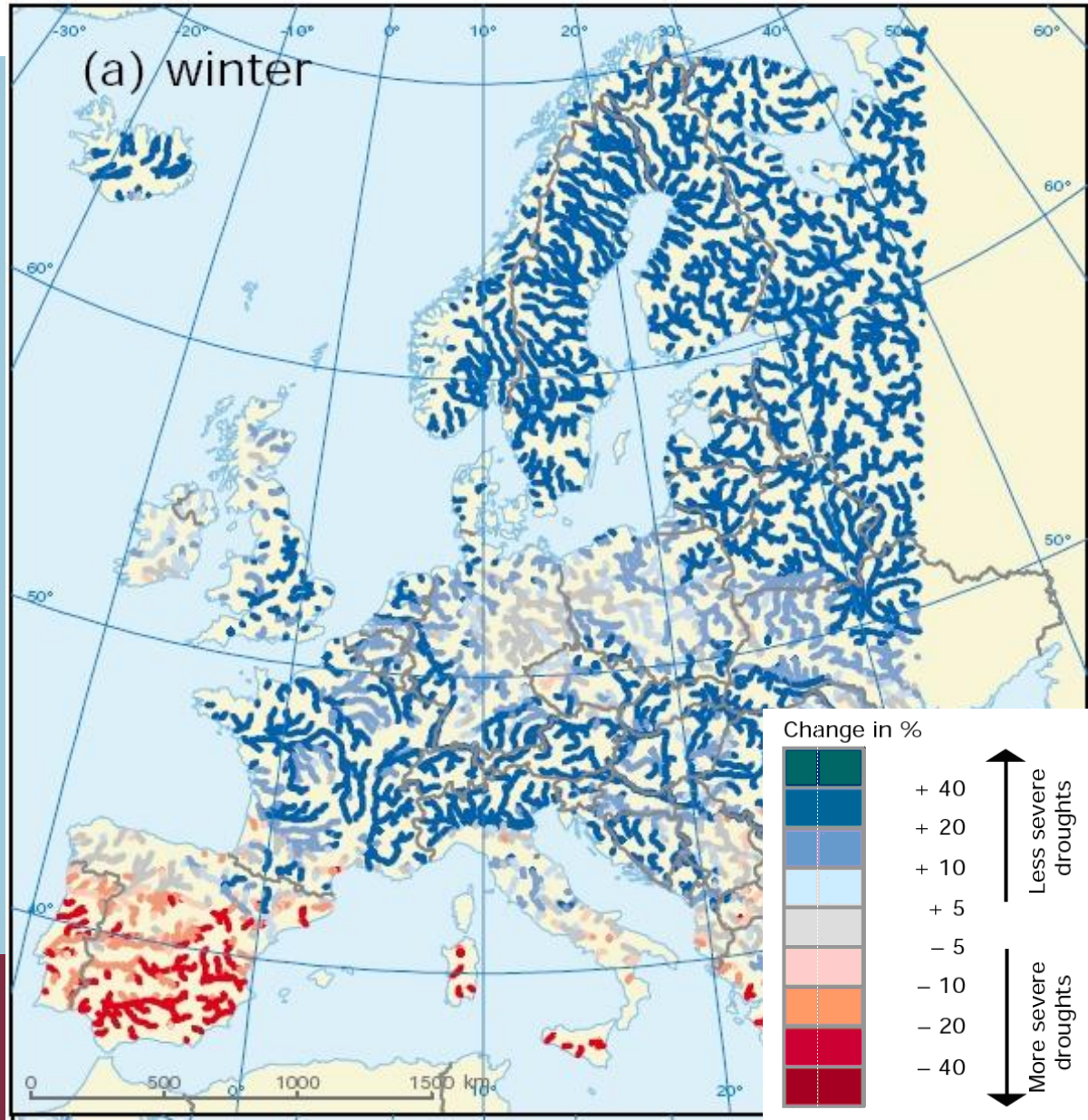
Map 5.9 Changes in the contribution of heavy rainfall to total precipitation 1961–2006



recorded 1961-2006

Source: The climate dataset is from the EU-FP6 project ENSEMBLES (http://www.ensembles-eu.org) and the data providers in the ECA&D project (http://eca.knmi.nl).

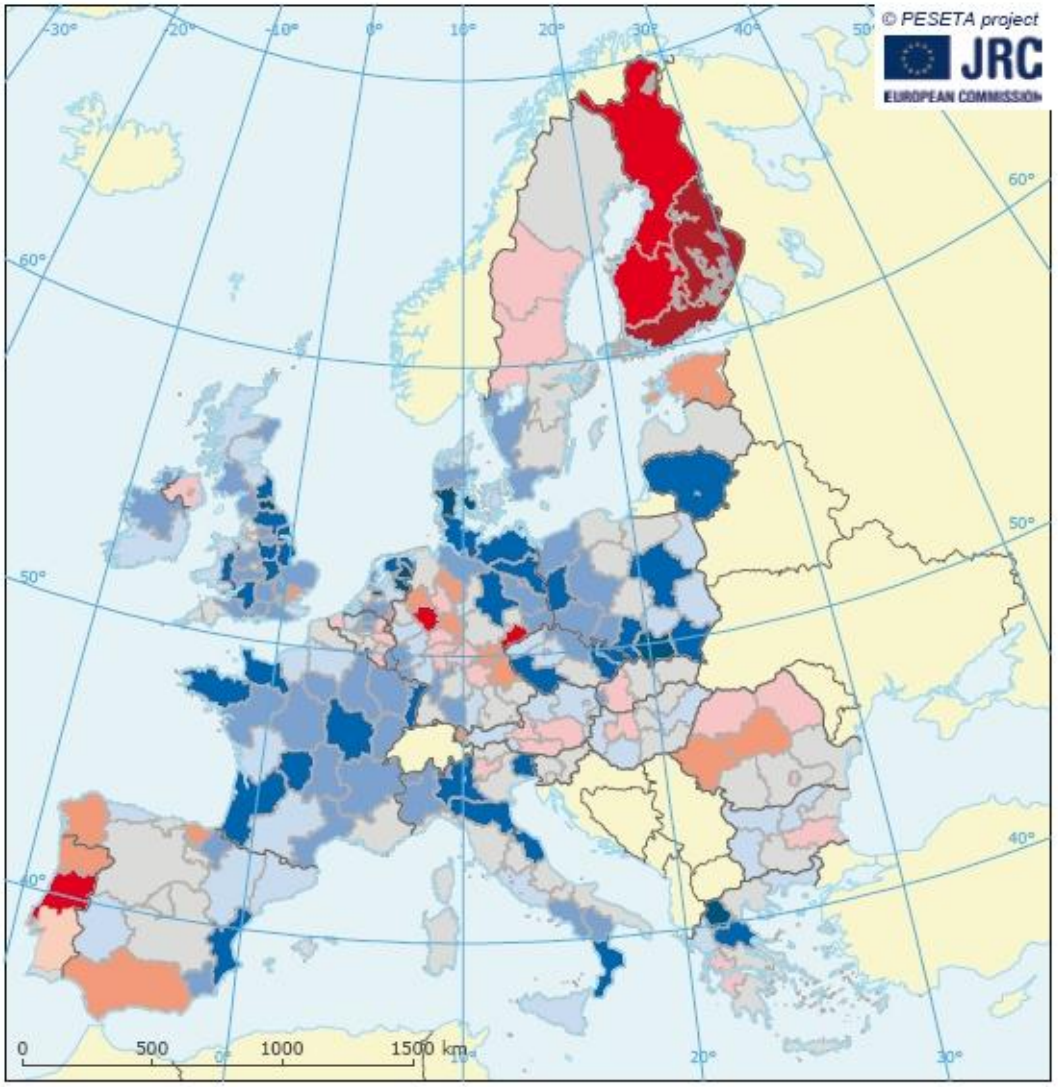
higher river flows in winter: flooding



forecast
2071-2100

flood damage in winter more likely

Map 7.2 Projected change in damage of river floods with a 100-year return period between 2071–2100 and 1961–1990



Change in 100-year flood damage for IPCC SRES A2 scenario between 2071–2100 and 1961–1990

Change in %

+ 40
+ 20
+ 10
+ 5
– 5
– 10
– 20
– 40

Increase

Decrease

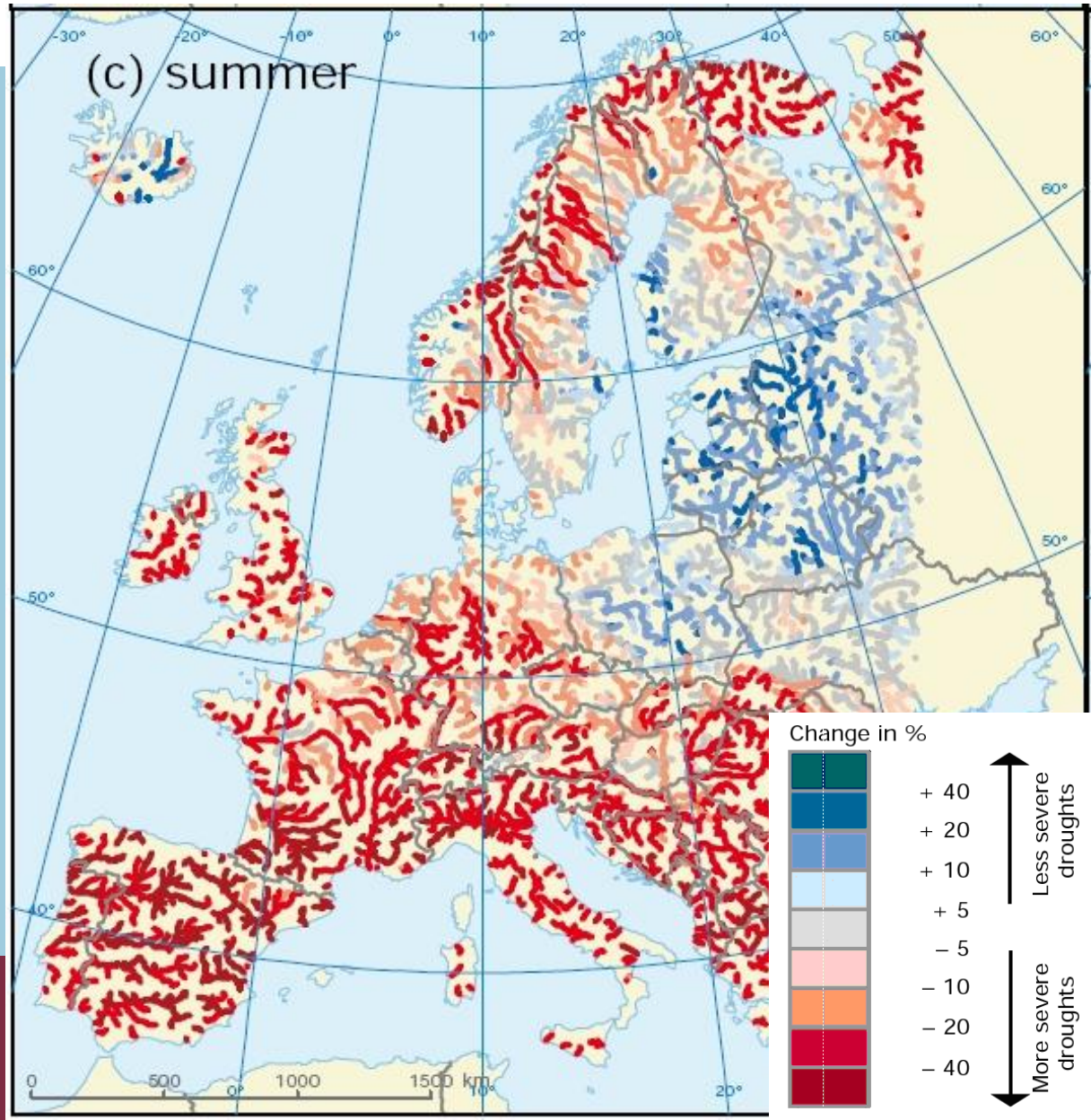
Note: Model calculation using the IPCC SRES scenario A2 and NUTS2 level.

Source: JRC PESETA project (http://peseta.jrc.ec.europa.eu/docs/Riverfloods.html).

forecast
2071-2100

ECRN

lower river flows in summer: water availability

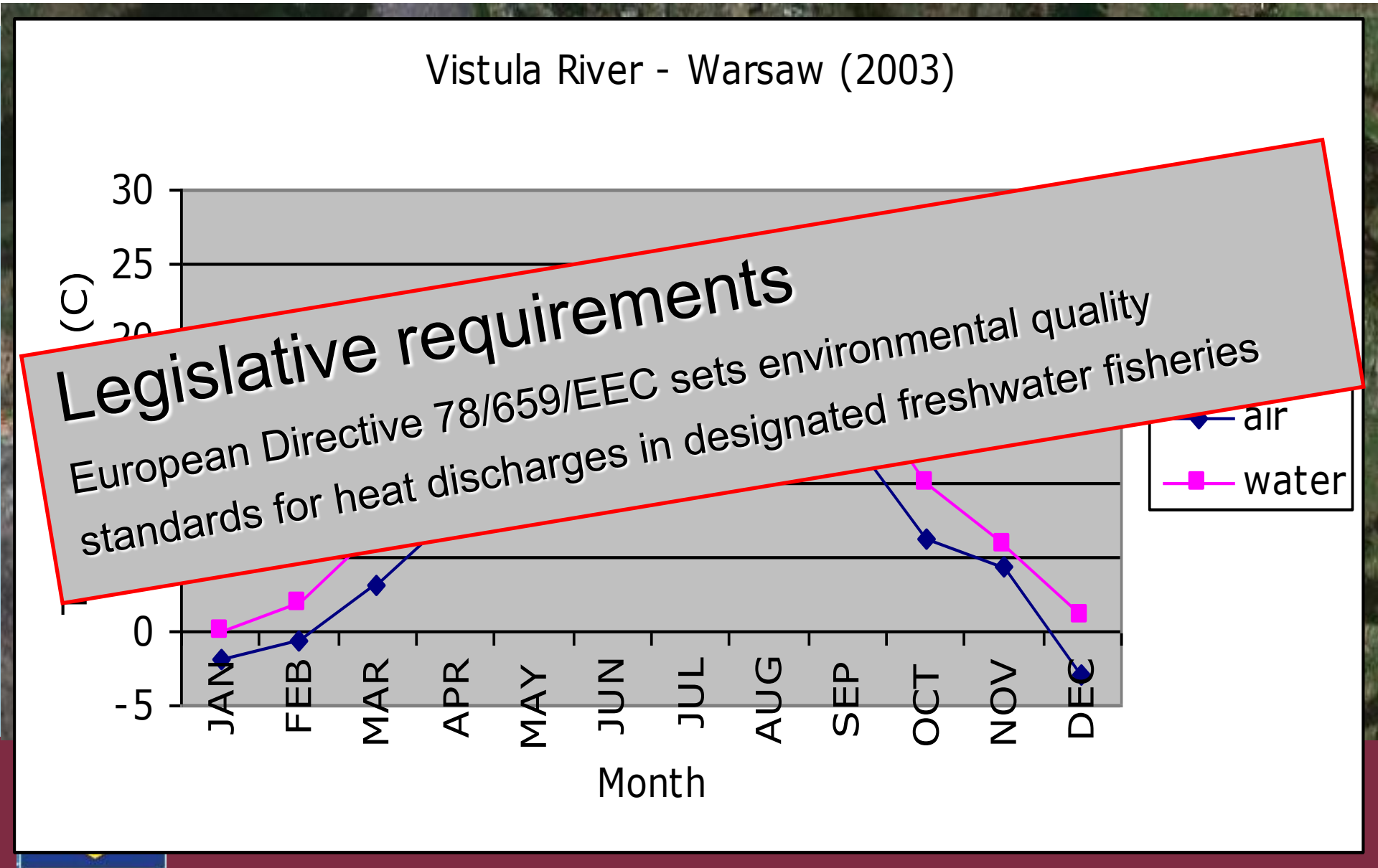


forecast
2071-2100

lower river flows in summer: logistics

lower river flows in summer: logistics

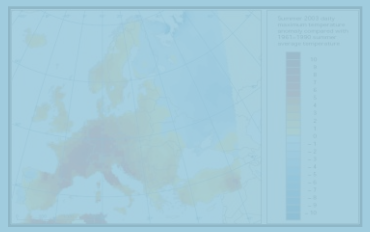
lower river flows in summer: cooling capacity



Climate Change

Why?

Challenges?



Opportunities?

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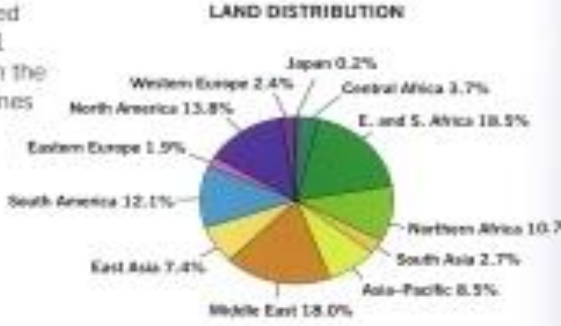

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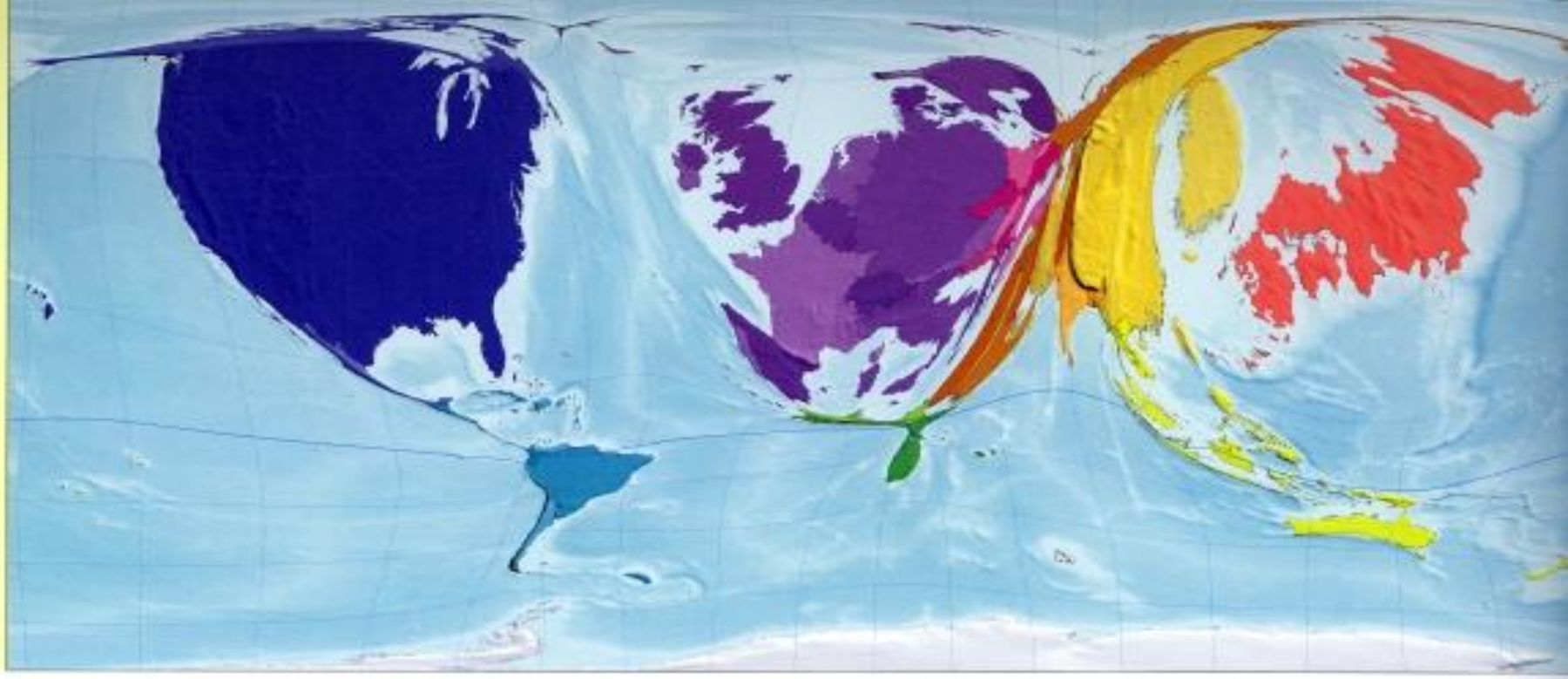


HIGHEST AND LOWEST EXPENDITURE ON RESEARCH AND DEVELOPMENT

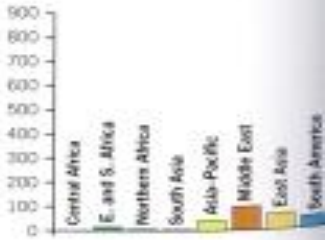
Rank	Territory	PPP US$*
1	Luxembourg	1,510
2	Sweden	1,202
3	Israel	1,017
4	United States	992
5	Finland	890
6	Iceland	840
7	Japan	833
8	Switzerland	790
9	Germany	678
10	Denmark	647
181	Nepal	2.7
182	Nigeria	2.6
183	Nicaragua	2.5
184	Mali	2.3
185	Niger	2.1
186	Burkina Faso	2.1
187	Guinea-Bissau	1.9
188	Sierra Leone	1.5
189	Madagascar	0.7
190–200	11 countries	<0.1

* expenditure per person, 2002

141 Research and Development Expenditure

The size of each territory reflects its spending on research and development – an area of both high costs and high potential rewards.

Research and development is undertaken by governments, manufacturers, and scientific, technological and medical companies to find new techniques and products. This can be an expensive pursuit, given the costs of materials, machines and skilled specialists, but it can also bring substantial financial rewards. In 2002, US$289 billion was spent on research and development in the United States; in the same year there was practically no research and development spending in Angola. It is therefore not surprising that the number of patents granted, and the value of royalty and licence fees received (see Maps 137 and 139), are also vastly different in these countries.



'If we don't alleviate poverty and grow our economies, there will be no one left to do basic research. Once African economies grow, there will be enough time and money to go off and think deep thoughts.'

Asifa Nanyaro, director general of the Tanzania Industrial Research and Development Organization, 2004

The CHEMaterial Industry helps to protect the climate through its:

- production processes
- products
- contribution to innovative technologies

What is Chemelot?

- One of the largest chematerial communities in Europe (> 800 ha)
- Industrial Park + Research & Business Campus
- Number of companies on site > 70; 33 new companies since 2005
- Many of them global leaders in their product market combination
- Concept of open chemical innovation is applied

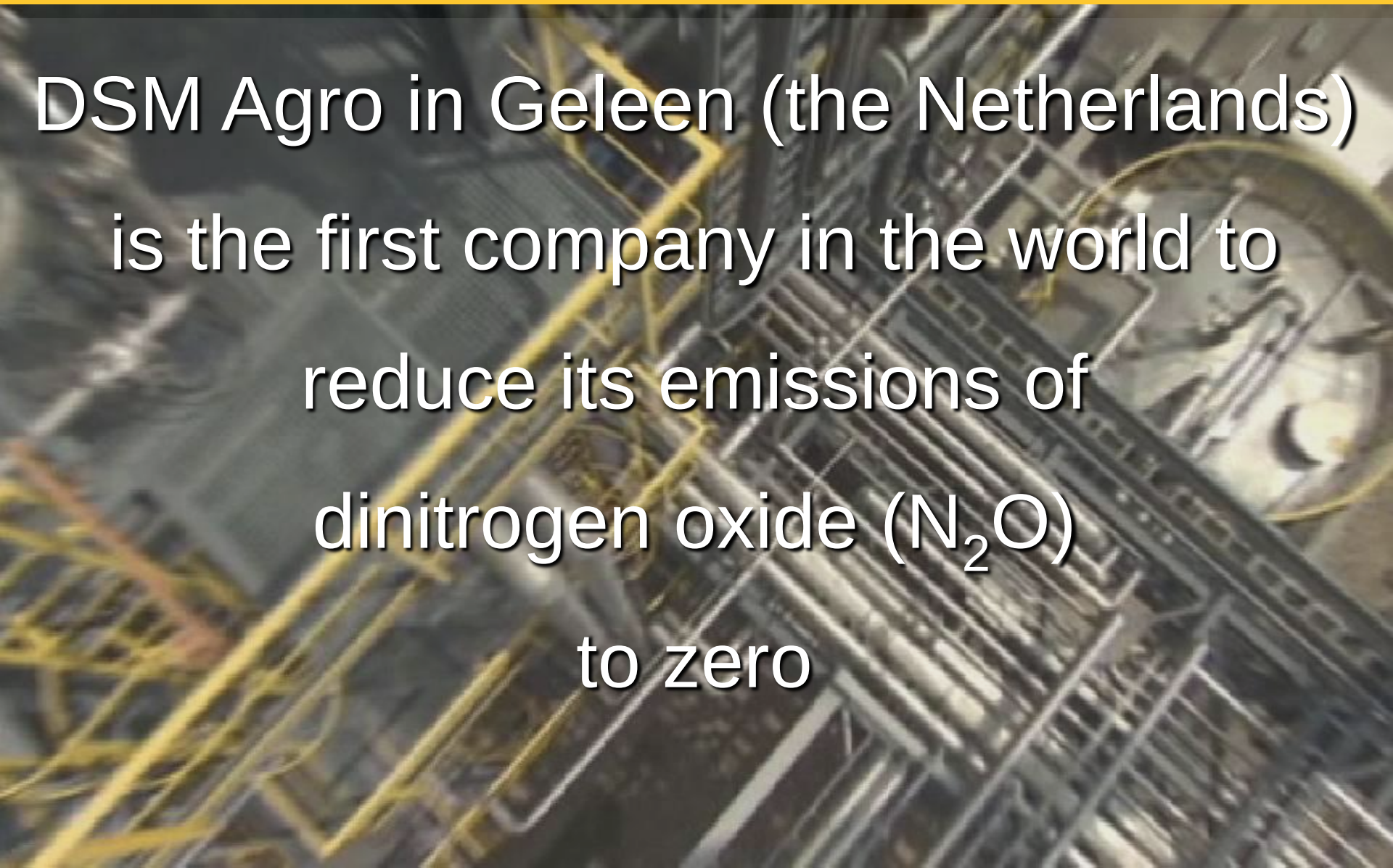
Industrial Park

sharing infrastructure and costs

Research & Business Campus

sharing knowledge; global networks

Its production processes



DSM Agro in Geleen (the Netherlands) is the first company in the world to reduce its emissions of dinitrogen oxide (N_2O) to zero

Its products:

Benefits of Stanyl gears compared to metal gears

- Significant weight reductions possible, to less than one third that of the metal gear
- Cost reductions of 30-50%, productivity increased and supply chain shortened
- Lower elastic modulus reduces transmission error
- Lower perceived noise during running

Astonishing Stanyl®

Its contribution to innovative technologies:

TSM

Solland

Silicium | Wafer | Zonnecel | Module | Systeem

T CHEMICALS EXPORTS

	US$
ttary	
and	4,562
gapore	1,186
gium	821
herlands	645
tzerland	629
an	426
many	344
ada	337
idad and Tobago	299
alu	183
el	178
amas	144

107 Chemicals Exports

The size of each territory indicates the dollar value of its net exports of chemicals and chemical products, such as paint, perfume, fertilizer, pesticides and soap.

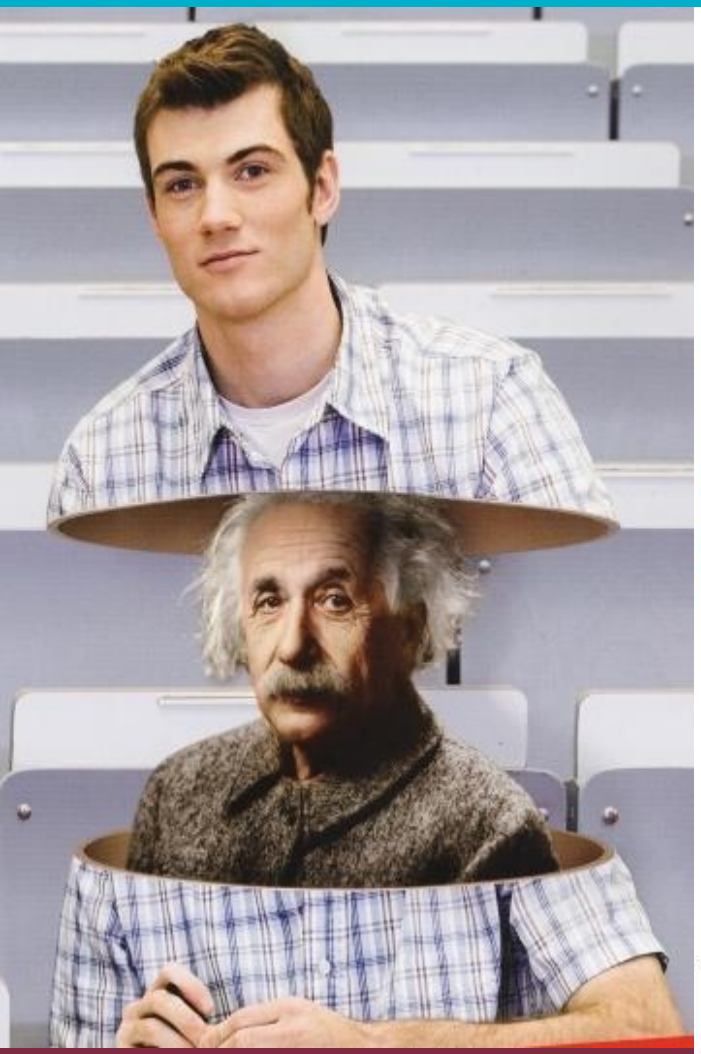
This category includes many items not used directly by most of us but nonetheless very much in evidence in our daily lives: the paint on our walls, for example, or the chemicals used to grow our food. Thus it should be no surprise that chemicals make up a substantial fraction of all exports, about 8% in total. Only 3 of the 12 regions, however, make profits from the net export of chemicals, with Western Europe the leader by far, earning over 6 times as much in net US dollar terms as second-placed Japan.

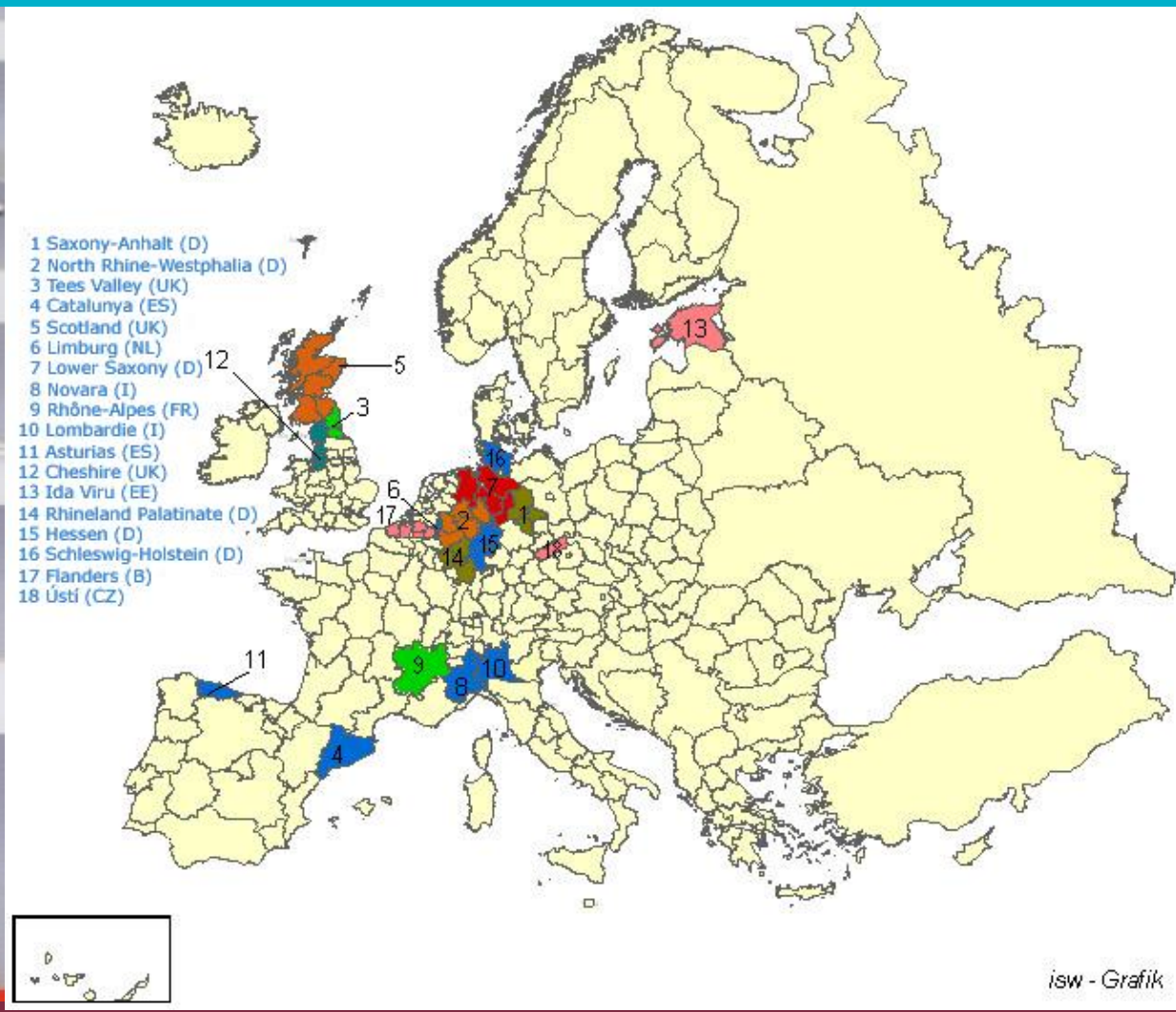
NET CHEMIC
annual surp

70
60
50

Recommendations

- be worried, yet in positive sense
- climate change: business opportunities!
- public & private sectors: join forces
- Working Group ECRN: Position Paper
- share stakeholders, knowledge and costs




1 Saxony-Anhalt (D)
2 North Rhine-Westphalia (D)
3 Tees Valley (UK)
4 Catalunya (ES)
5 Scotland (UK)
6 Limburg (NL)
7 Lower Saxony (D)
8 Novara (I)
9 Rhône-Alpes (FR)
10 Lombardie (I)
11 Asturias (ES)
12 Cheshire (UK)
13 Ida Viru (EE)
14 Rhineland Palatinate (D)
15 Hessen (D)
16 Schleswig-Holstein (D)
17 Flanders (B)
18 Ústí (CZ)
isw - Grafik

Thank You