



EUROPE

Protecting health in Europe from climate change

*The health effects of
climate change*

Cyprus, 2009



Protecting HEALTH in Europe from climate change
Protéger la SANTÉ en Europe face au changement climatique
Schutz der GESUNDHEIT vor den Folgen des Klimawandels in der Europäischen Region
Защита здоровья населения Европы от последствий изменения климата



Why climate change and health?

Critical in the years to come will be the capacity of health systems to develop and implement adaptation and mitigation strategies and to strengthen a range of key areas of work – from disease surveillance and control and research, to disaster risk reduction – that are essential elements of the capacity for rapid detection of and action to protect health from climate change.



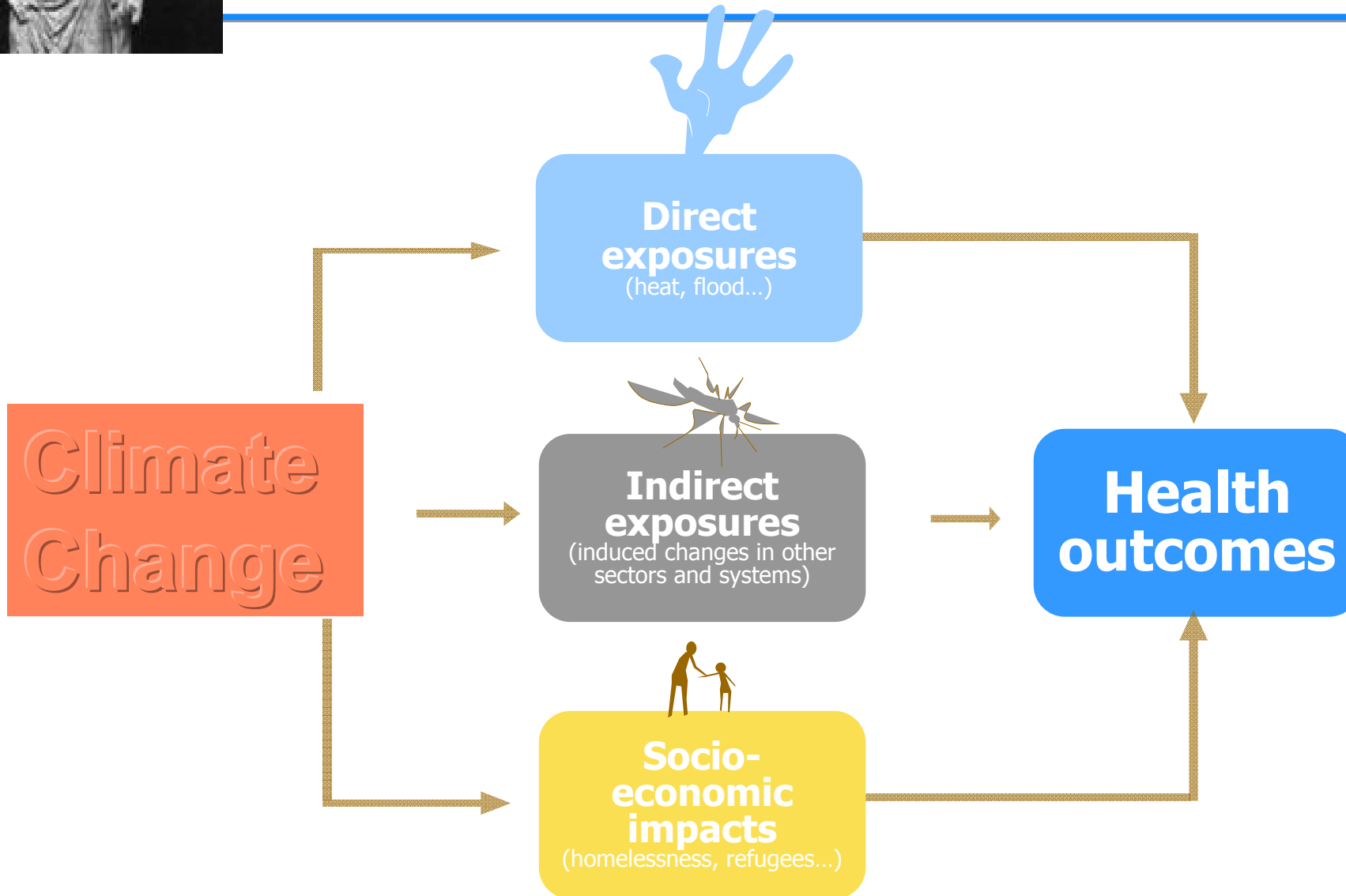
Marc Danzon

Dr Marc Danzon, WHO Regional Director for Europe



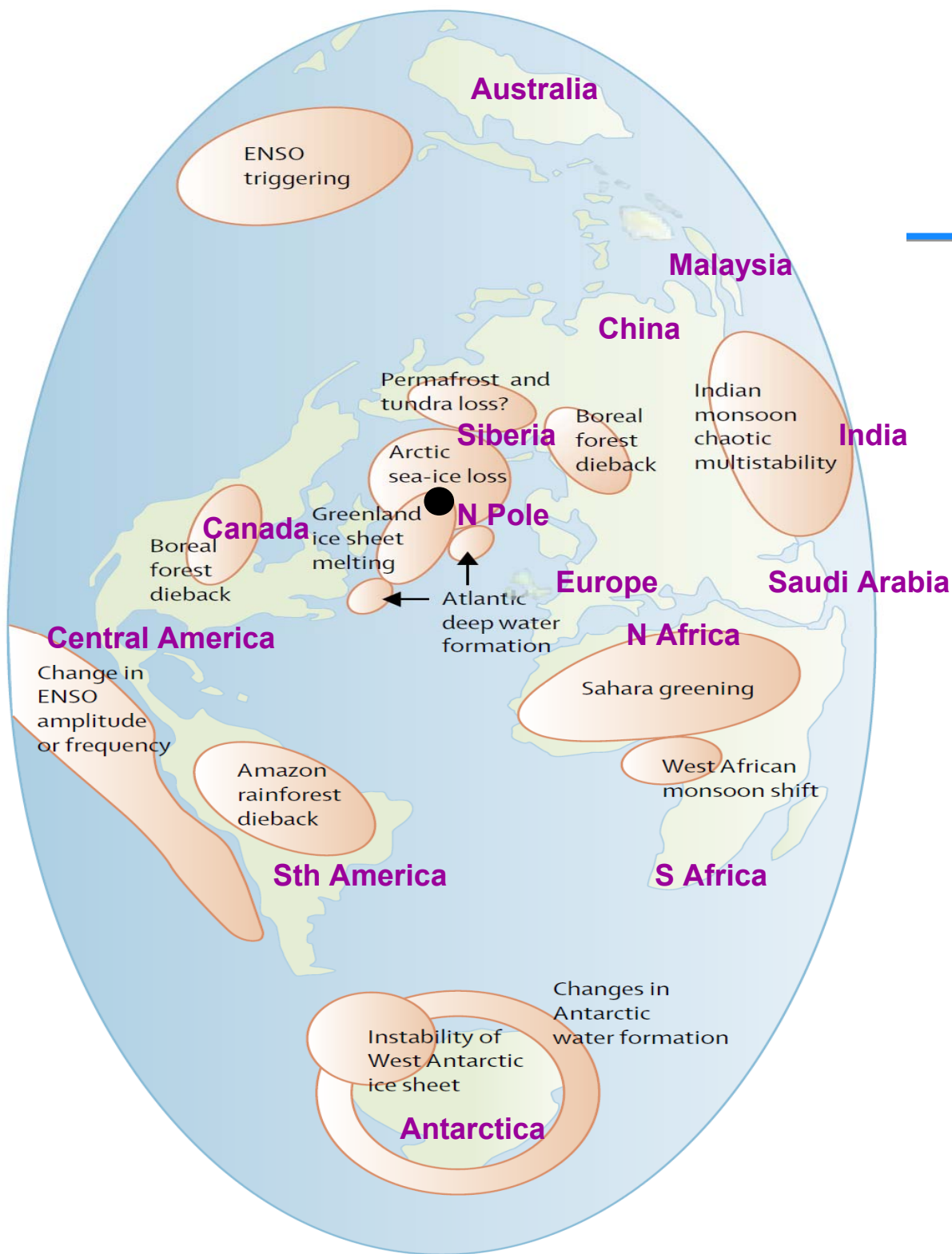


Pathways





“The picture's pretty bleak, gentlemen. The world's climates are changing, the mammals are taking over, and we all have a brain about the size of a walnut”



**Major shifts
(‘tipping
points’?)
observed or
expected under
climate change
(Maslin, 2008)**



Five climate change concerns

Cyprus, 2009

Five climate change concerns for human health

1. GHG emissions have increased by 70% over the last four decades (IPCC 2007). In Europe energy and transport are the biggest emitters.
2. Transport emissions projected to increase of about 50% by 2030 compared to 2000. Transport kills (EEA 2007).
3. The projected temperature increase for Europe by the end of 21st century is 2.3 - 6 °C (IPCC 2007).



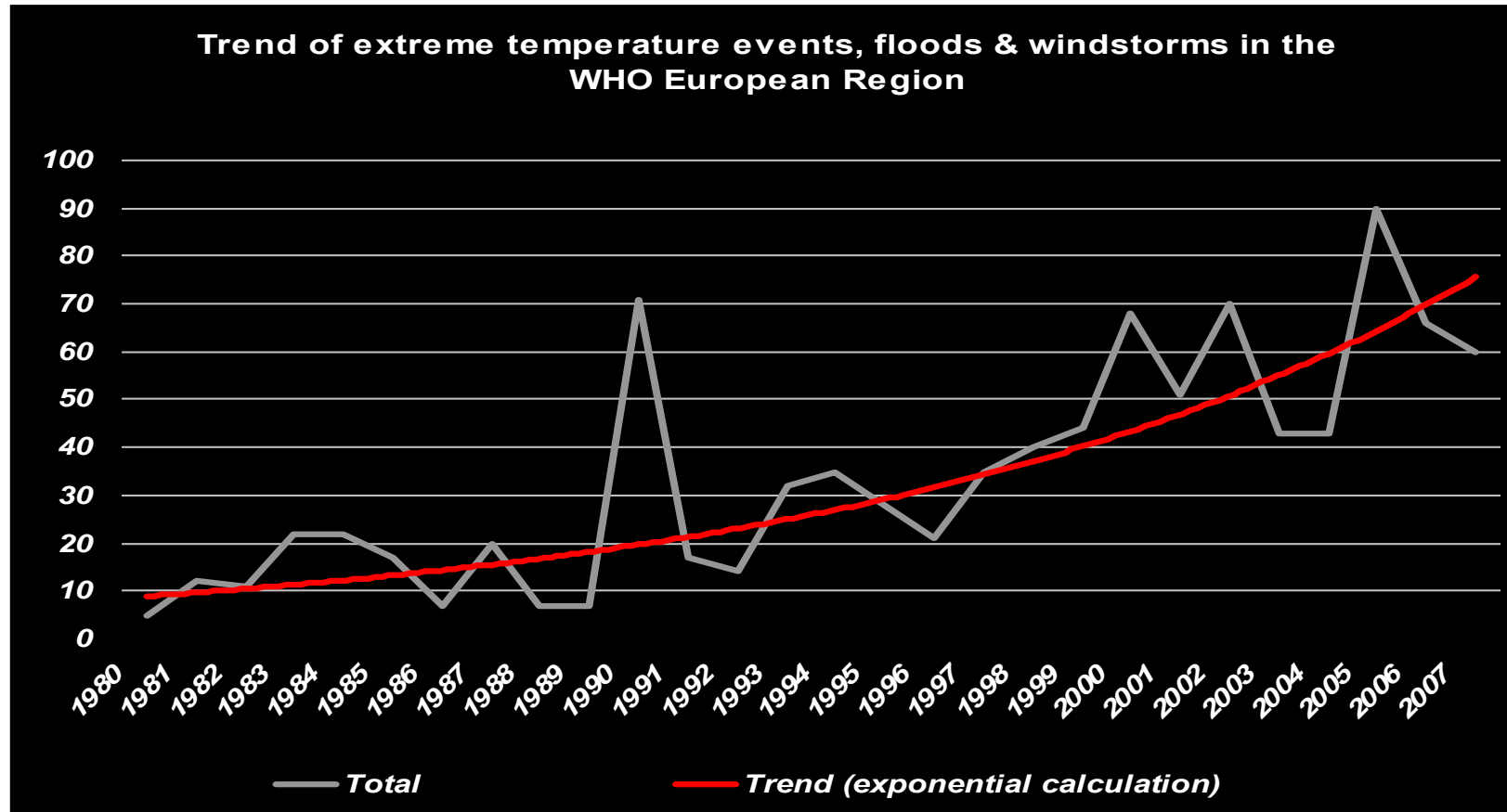
Photo: iStockphoto

Five climate change concerns for human health

4. The Mediterranean: important exposures relevant to human health
 - reduced water availability
 - increased drought
 - increased forest fires
 - increased energy demand in summer
 - increased salinity and eutrophication of coastal waters
 - Air pollution episodes

Photo: Istockphoto

Increase in heat-waves frequency and intensity



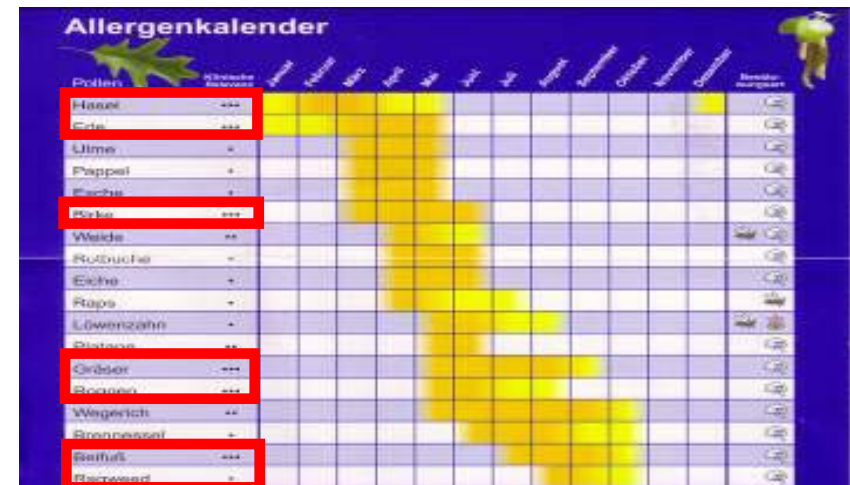
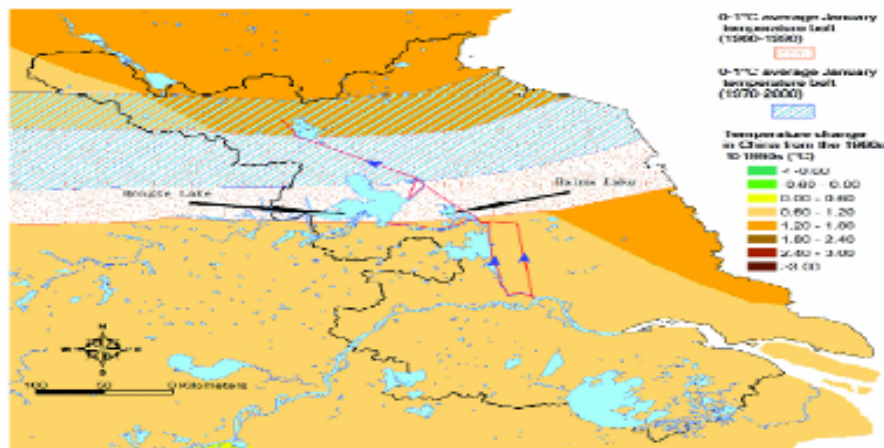
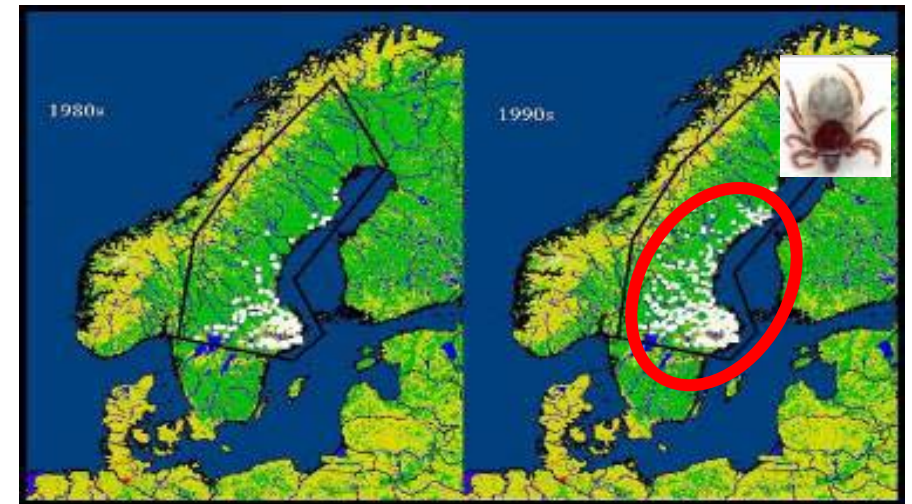
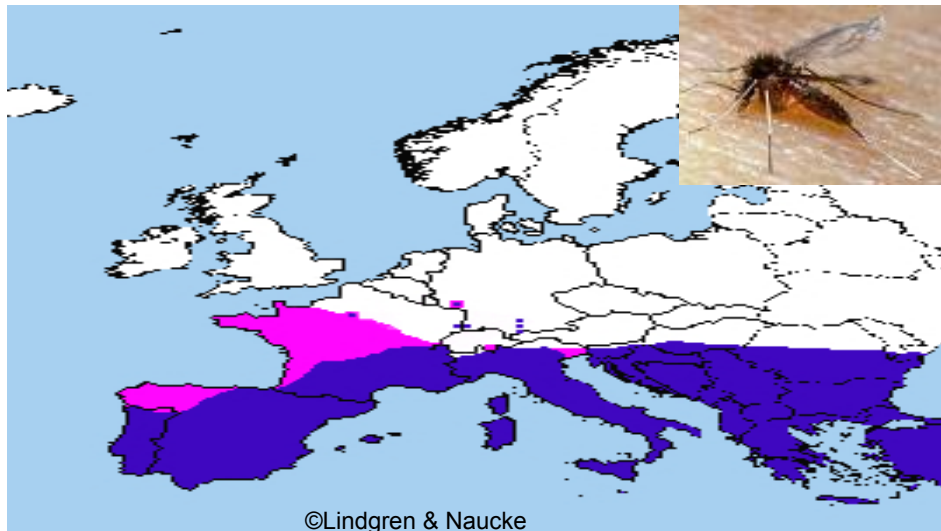
**Over 1,000 climate-related events hit Europe
in the last three decades**



Health effects of climate change

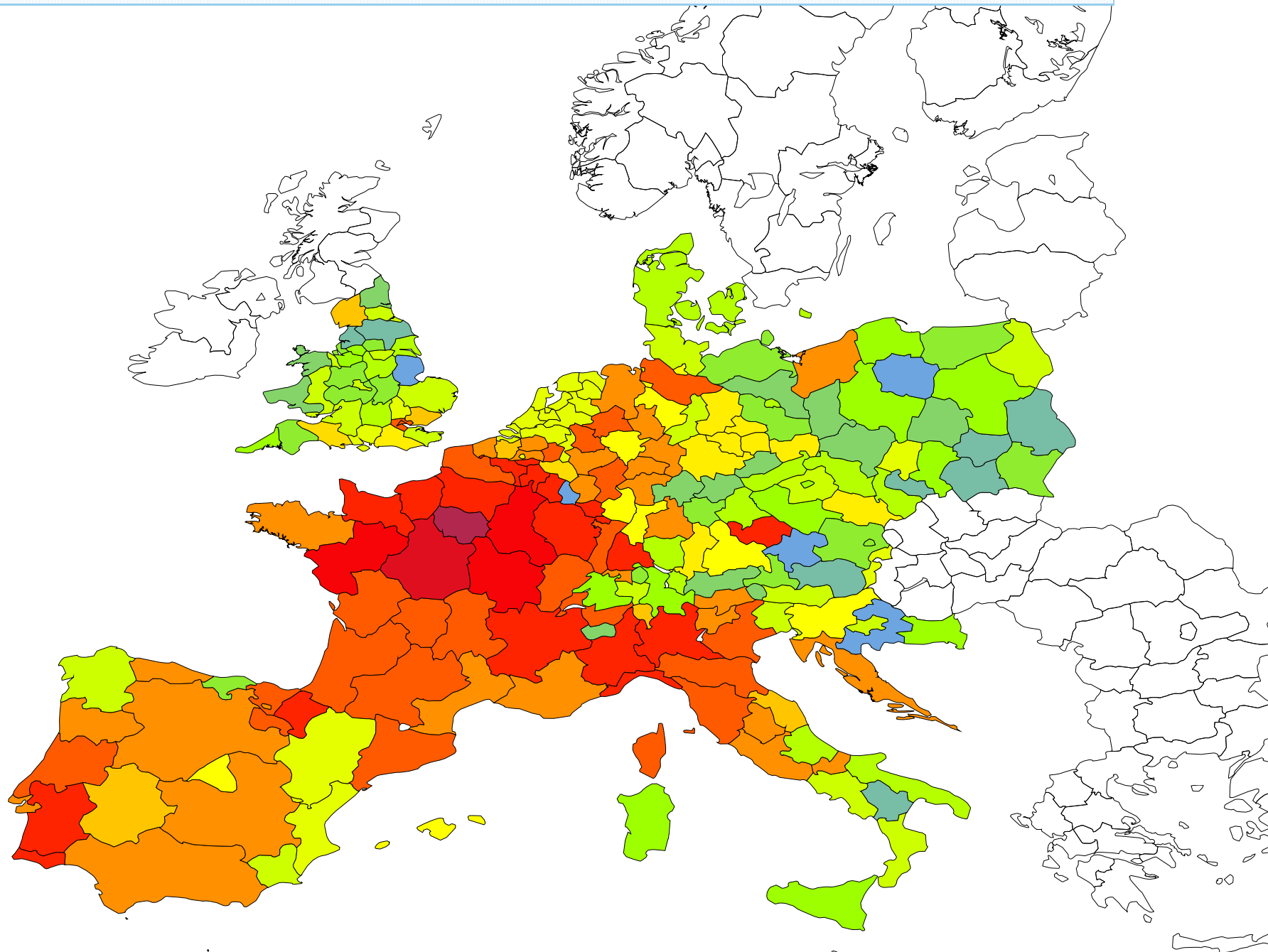
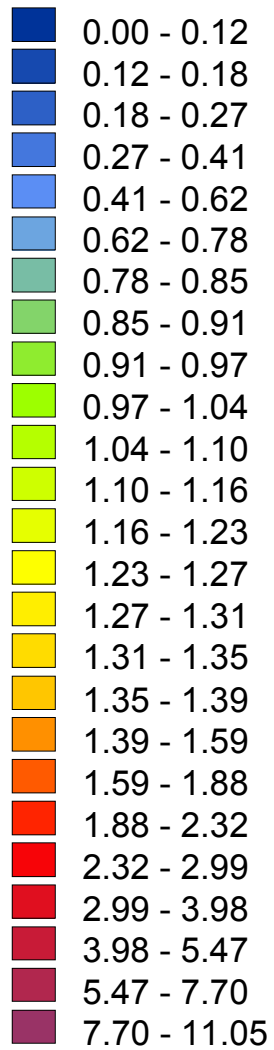
Cyprus, 2009

Health effects of CC are already observed



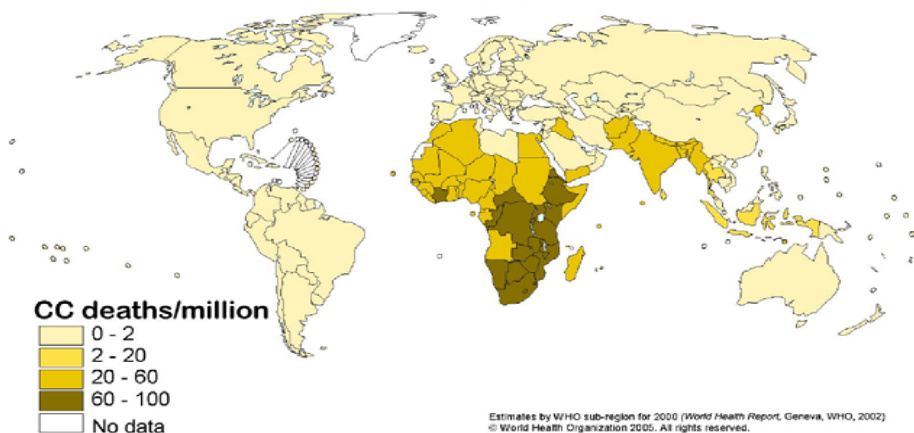
August the 12th 2003 (Inserm, 2007)

Percentage
Mortality exceedance

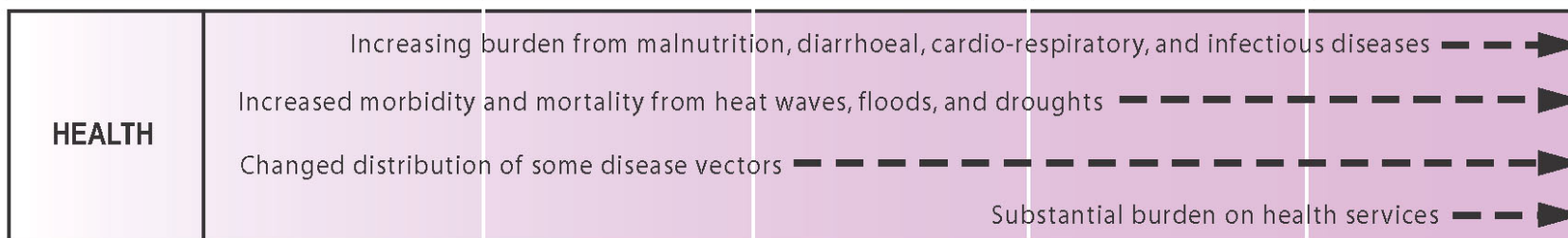


Climate change affected BOD in 2000

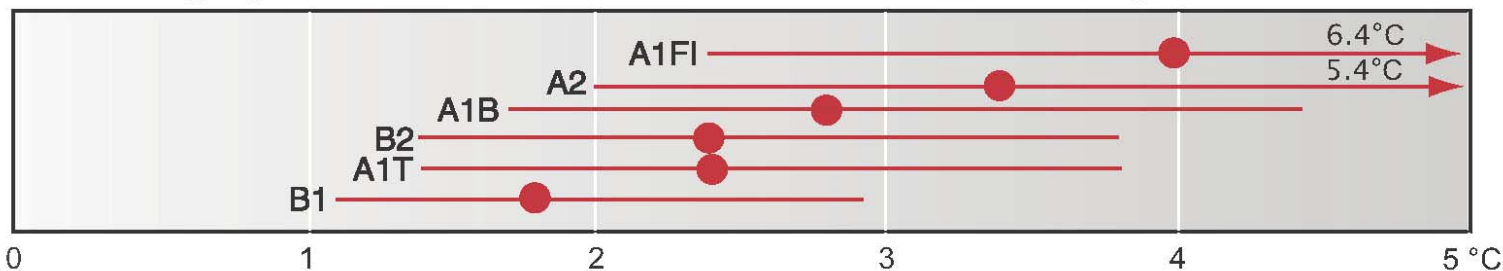
Deaths from climate change












❖ Health impacts of climate change presented 0.4% of the global burden of disease in 2000 (150,000 deaths) with only an increase of 0.4 degree of temperature



Warming by 2090-2099 relative to 1980-1999 for non-mitigation scenarios



Direction and Magnitude of Climate Change Health Impacts

	Negative Impact	Positive Impact
Very High Confidence <i>Malaria: Contraction and expansion, changes in transmission season</i>		
High Confidence <i>Increase in malnutrition</i>		
<i>Increase in the number of people suffering from deaths, disease and injuries from extreme weather events</i>		
<i>Increase in the frequency of cardio-respiratory diseases from changes in air quality</i>		
<i>Change in the range of infectious disease vectors</i>		
<i>Reduction of cold-related deaths</i>		
Medium Confidence <i>Increase in the burden of diarrheal diseases</i>		



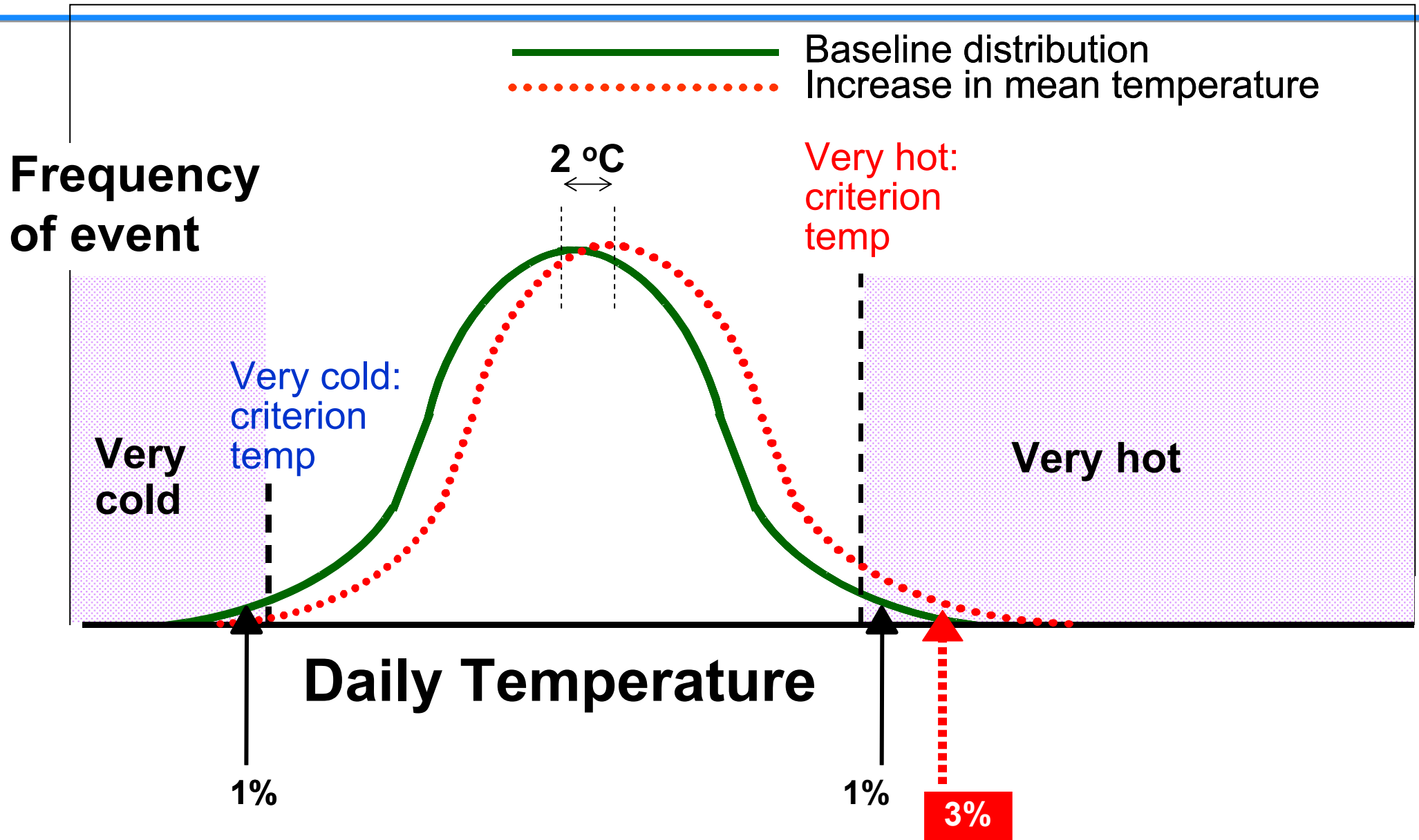
Are we prepared?

Cyprus, 2009

Few examples

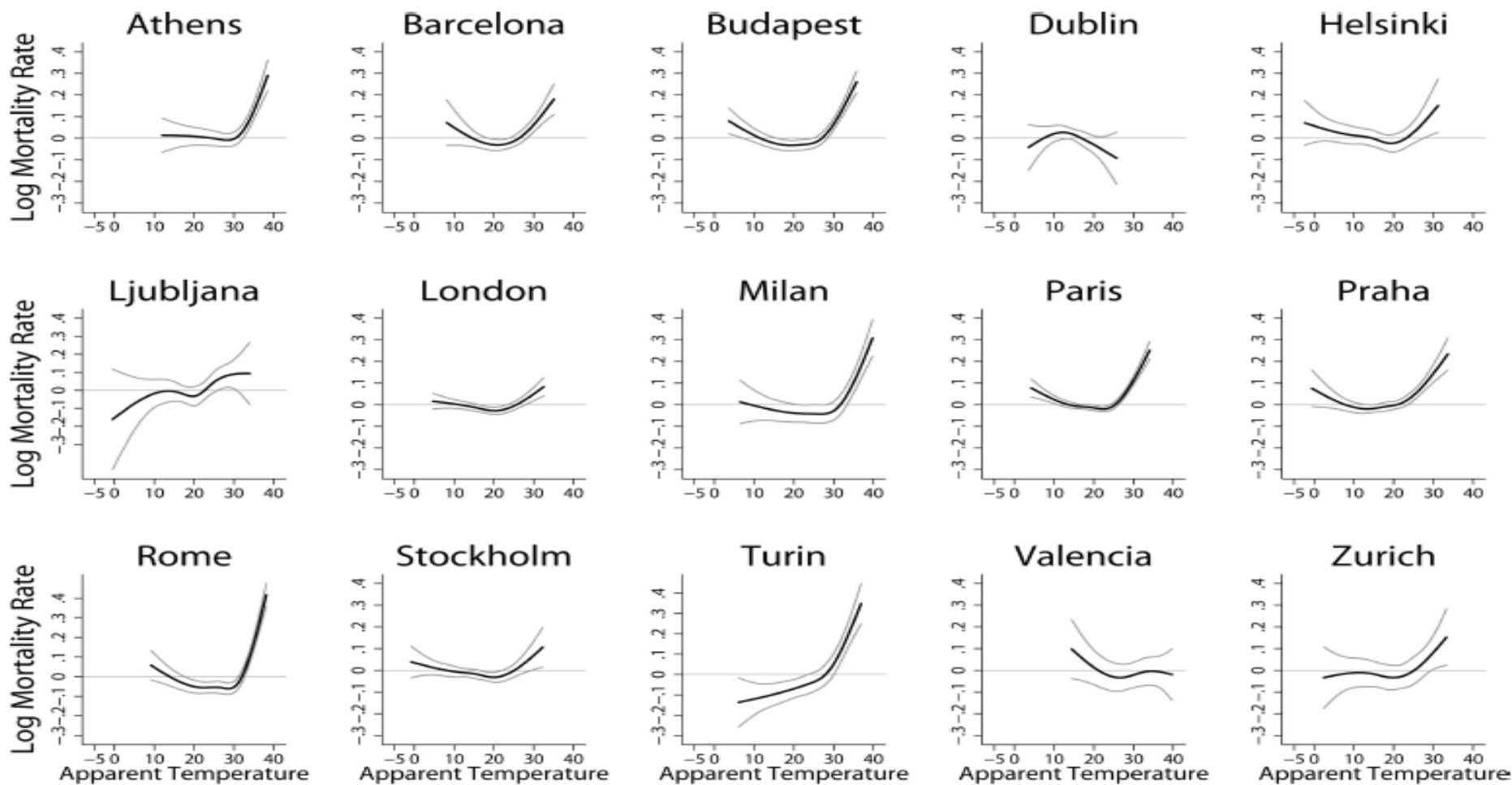
- Heat and heat-waves
- Respiratory diseases
- Infectious diseases

Attribution: Inference based on Shift in Probability of Event





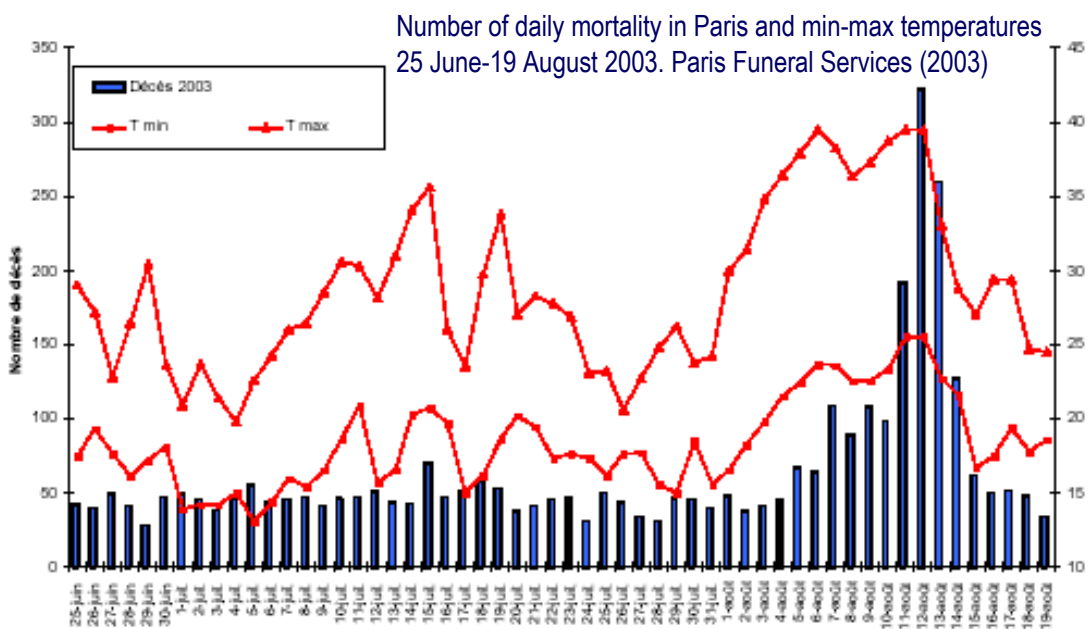
A stronger effect in the Mediterranean



Increase in heat-waves is one of the most certain consequences of climate change

Mortality increases between 1 and 4% for each degree of temperature raise (KOVATS 2006)

- Over 70,000 extra deaths reported in Europe in summer 2003 (ROBINE 2008).
- 86,000 extra deaths estimated per year with a global mean temperature increase of 3°C in 2071-2100 in the EU (PESETA 2008).



HOW TO REDUCE HEALTH EFFECTS

Implement heat-health action plans by

- ensuring health systems' preparedness and ability to respond
- reducing community exposure to heat
- providing timely weather-related health alerts and advice to citizens

Exceptional heat-waves stronger effect in cities where normally exposure is low

City	2003			
	heat-wave days	increase in daily mortality		
		%	90 CI	
Athens	11	23.0	13.6	- 33.1
Barcelona	43	35.7	28.3	- 43.5
Budapest	16	8.8	1.3	- 32.0
London	14	43.8	37.6	- 50.3
Milan	45	48.0	37.2	- 59.5
Munich	30	5.9	-1.7	- 14.2
Paris	18	105.5	93.2	- 118.7
Rome	30	34.5	27.4	- 41.9
Valencia	32	21.4	9.2	- 34.9

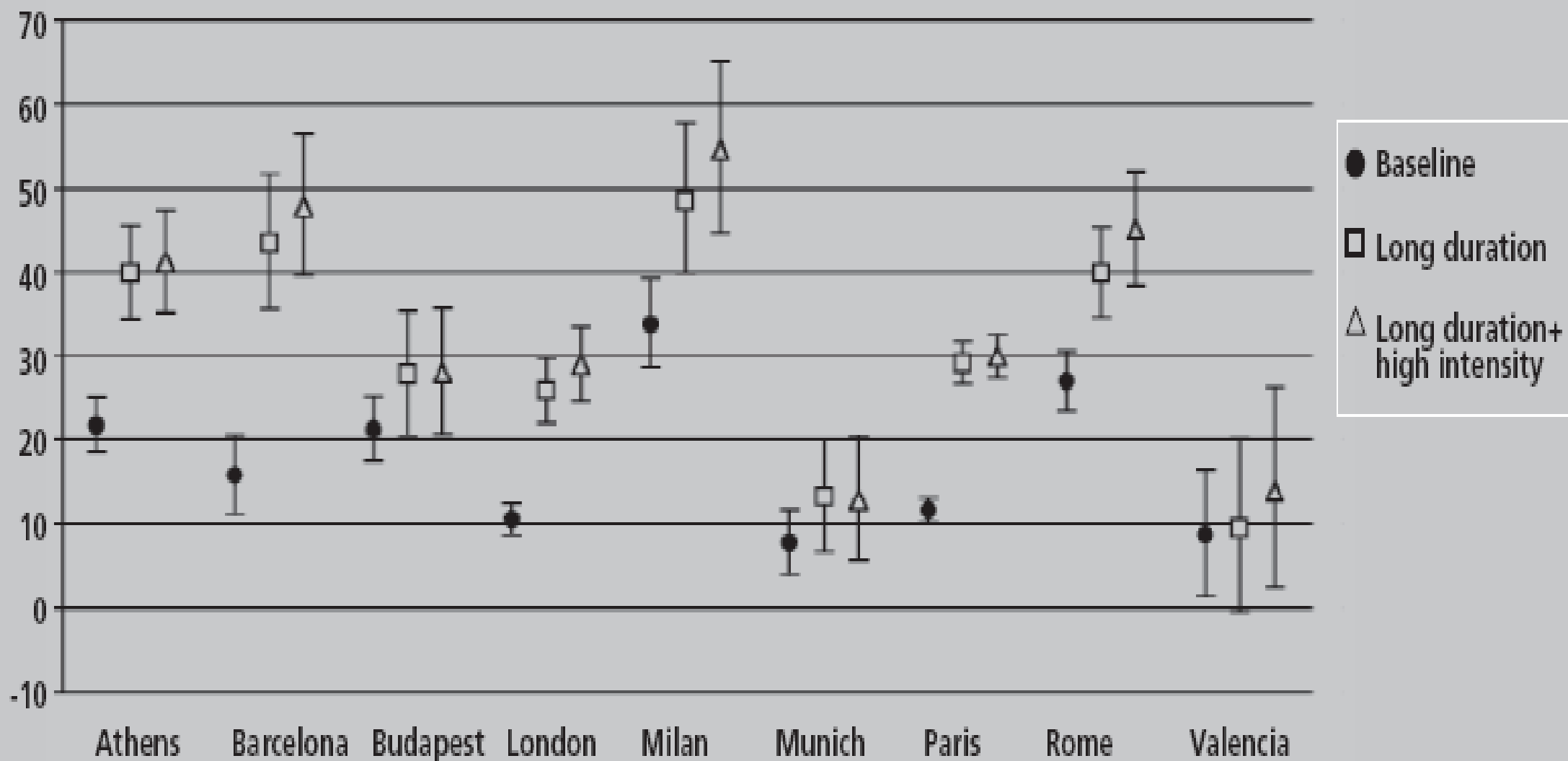
City	1990-2002, 2004			
	heat-wave days	increase in daily mortality		
		range	%	90 CI
Athens	4 - 21	21.5	18.2	- 25.0
Barcelona	5 - 10	7.1	1.4	- 13.0
Budapest	3 - 18	24.7	21.0	- 25.2
London	3 - 27	7.9	6.1	- 9.8
Milan	3 - 14	31.0	25.0	- 37.2
Munich	3 - 15	8.2	4.0	- 12.5
Paris	3 - 15	5.5	3.9	- 7.2
Rome	3 - 15	27.5	23.5	- 31.6
Valencia	4 - 13	5.0	-5.6	- 16.7



www.euro.who.int



Fig. 1. Effect of heat-waves with different characteristics on total mortality among people aged 65+ (% increase and 90% CI)



Source: Michelozzi et al., in press.

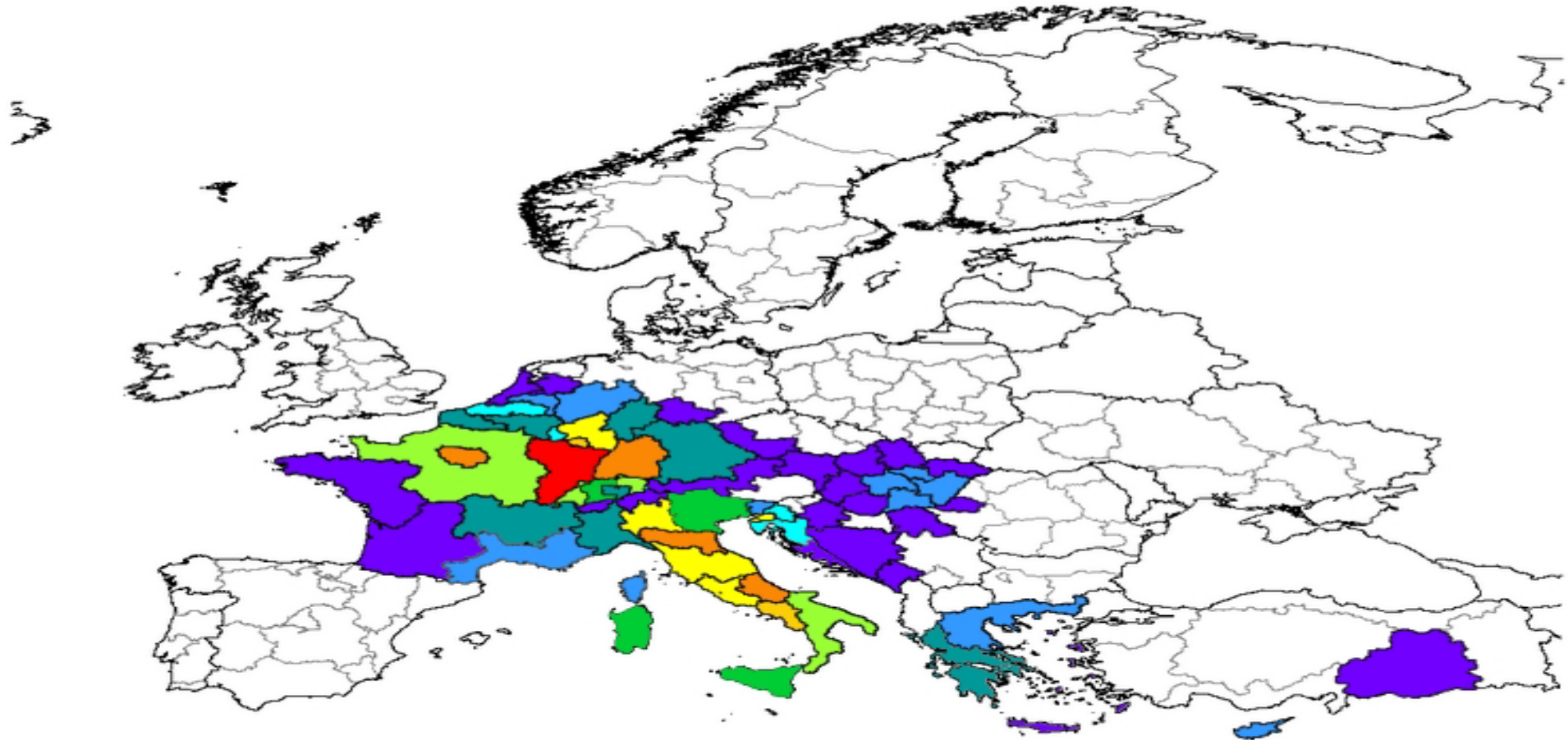
Who is most at risk

- Elderly
- Pre-existing chronic diseases
- Confined to bed
- Alone
- Being heavily exposed: Living directly below roof of a building

Seasonal forecasting and early warning is available

Issued: 25.05.2009

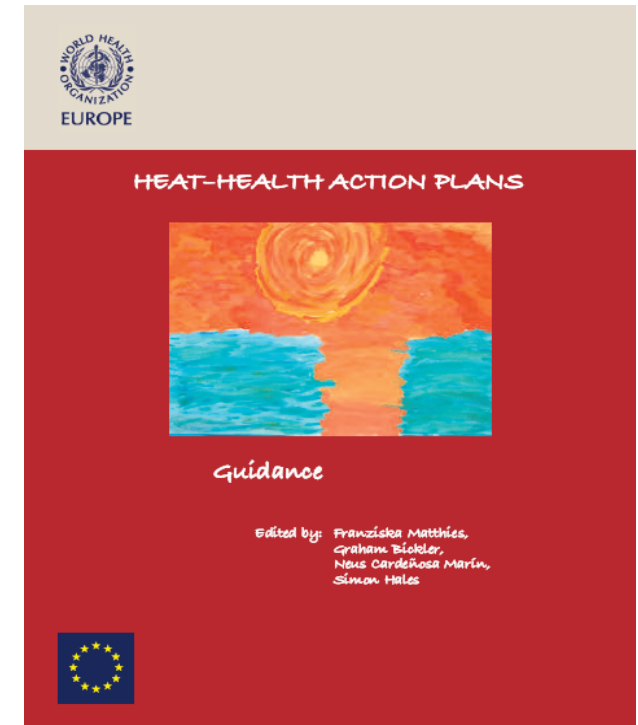
For: 25.05.2009



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Are we prepared??

- Collaborative mechanisms between institutions and a lead body to coordinate emergency responses;
- Accurate and timely meteorological forecasts;
- Reduction of exposure to heat;
- Particular care for vulnerable populations;
- Provision of health care, social services and infrastructure;
- Risk communication mechanisms;
- Urban planning, energy and transport policies;
- Monitoring and evaluation.



Respiratory health

- During heat periods
- Associated with energy and transport choices
- As a result of fires
- As a result of long range transboundary air pollution
- As a result of ecosystem changes and allergen changes

Percent increase in the total daily number of deaths in days with a heat-wave and a “low” or “high” level of ozone (random effects models)

Age group	Low* ozone % increase (95% CI)	High** ozone % increase (95% CI)
All ages	10.0 (3.0, 17.4)	13.2 (8.1, 18.6)
0-64 yrs	5.3 (-1.2, 12.23)	8.6 (4.7, 12.7)
65-74 yrs	7.7 (-1.4, 17.6)	9.8 (4.8, 15.1)
75-84 yrs ⁺	11.8 (4.8, 19.21)	16.9 (10.7, 23.5)
85+ yrs	21.3 (11.6, 31.9)	22.7 (13.1, 33.0)

*: at the 25th percentile of the city-specific distribution of ozone
 **: at the 75th percentile of the city-specific distribution of ozone
 +: significant interaction at P<0.05

Percent increase in the total daily number of deaths in days with a heat-wave and a “low” or “high” level of PM10 (random effects models)

Age group	Low* PM ₁₀ % increase (95% CI)	High** PM ₁₀ % increase (95% CI)
All ages ⁺	11.1 (6.3, 16.0)	12.6 (8.7, 16.8)
0-64 yrs	7.6 (2.3, 13.2)	7.7 (4.3, 11.2)
65-74 yrs	8.8 (3.6, 14.3)	9.3 (4.8, 14.0)
75-84 yrs ⁺	11.2 (4.2, 18.6)	13.6 (8.6, 18.9)
85+ yrs ⁺	12.6 (5.5, 20.1)	19.4 (8.1, 31.9)
<p>*: at the 25th percentile of the city-specific distribution of ozone **: at the 75th percentile of the city-specific distribution of ozone +: significant interaction at P<0.05</p>		



Temperature-related heat mortality in hospitals

Acute conditions (ICD-9 code)	%	OR (95% CI)* (age-adjusted)
Cardiovascular diseases		
Acute myocardial infarction (ICD-9: 410)	3.9	1.19 (0.90 to 1.56)
Diseases of pulmonary circulation (ICD-9: 415–417)	0.9	2.07 (1.04 to 4.12)
Cardiac dysrhythmias (ICD-9: 427)	3.1	1.18 (0.86 to 1.61)
Heart failure (ICD-9: 428)	5.9	1.69 (1.34 to 2.14)
Cerebrovascular diseases (ICD-9: 430–438)	12.9	1.59 (1.37 to 1.84)
Respiratory diseases		
Pneumonia (ICD-9: 480–486)	4.2	1.48 (1.14 to 1.91)
Chronic pulmonary diseases (ICD-9: 490–505)	1.7	2.48 (1.50 to 4.09)
Other diseases		
Acute and chronic liver diseases (ICD-9: 570–572)	2.2	1.21 (0.61 to 2.43)
Renal failure (ICD-9: 584–588)	2.4	0.91 (0.64 to 1.31)

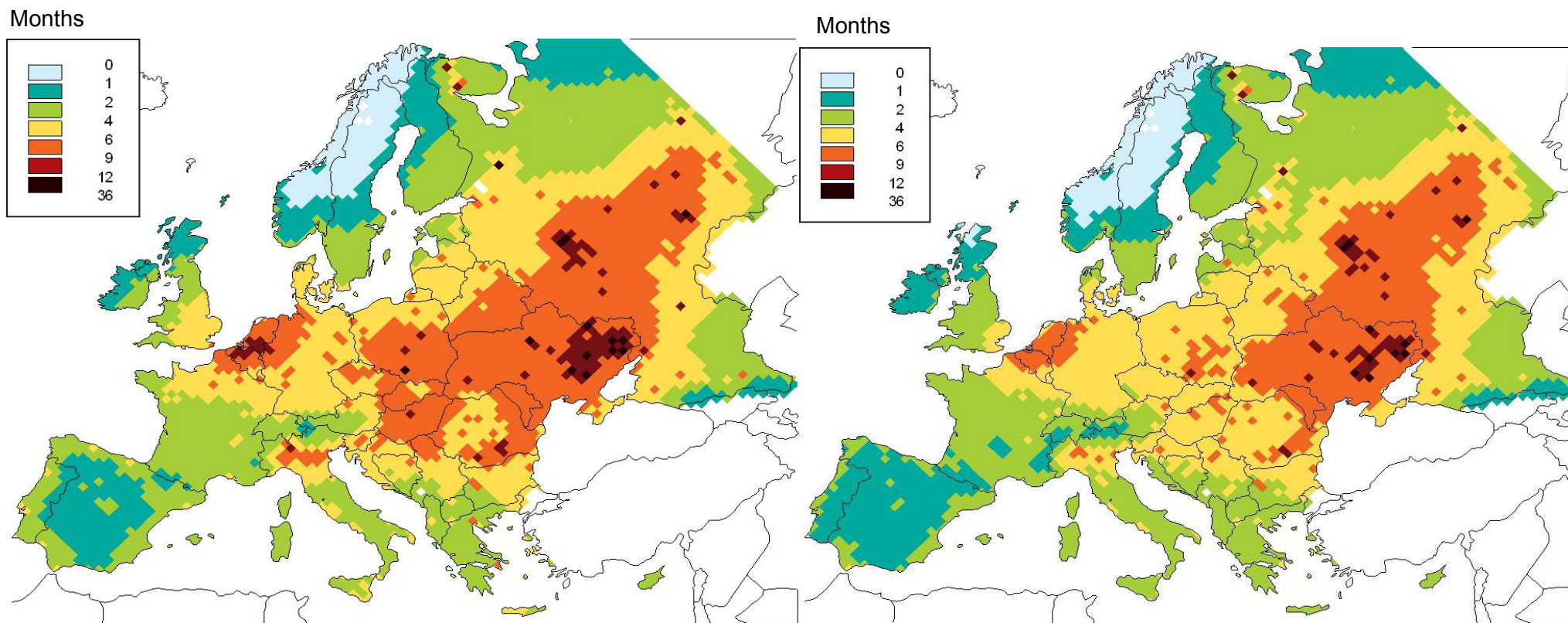
*Odds ratio (OR) and 95% confidence intervals (CI)

Risk of dying in hospitalized people 65+ years in days with 30 C° versus days with 20 C°. Stafoggia et al, JECH, 2008



Estimated loss in statistical life expectancy due to the exposure to anthropogenic PM2.5 in 2020

(Source: IIASA's GAINS model)



Business-as-usual
national energy projections
(+3% CO₂ in 2020)

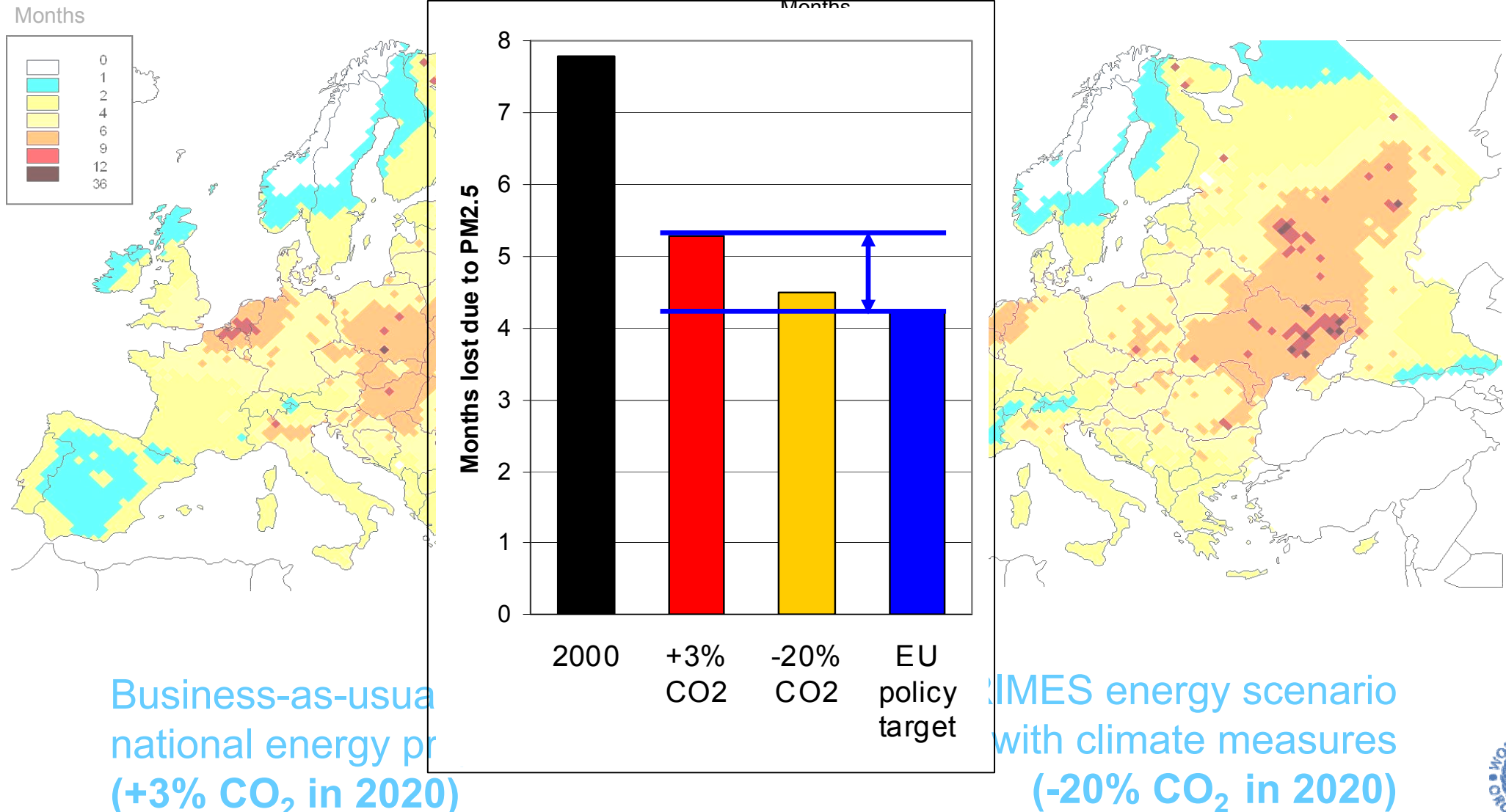
PRIMES energy scenario
with climate measures
(-20% CO₂ in 2020)



EUROPE

Estimated loss in statistical life expectancy (EU-27) due to the exposure to anthropogenic PM2.5 in 2020

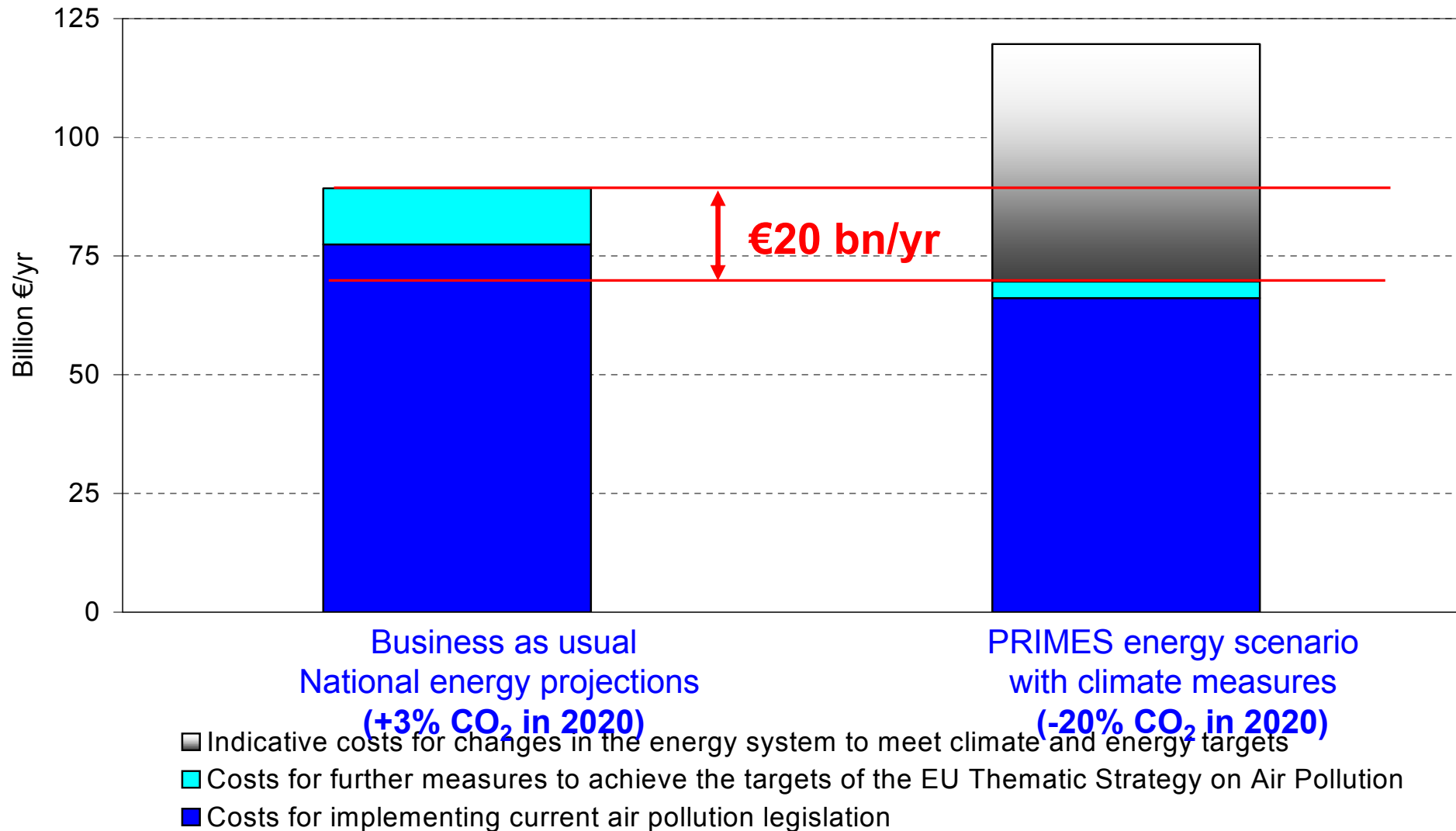
(Source: IIASA's GAIN model)



Emission control costs to meet the EU air quality and climate targets

EU-27, 2020

(Source: IIASA's GAINS model)



Forest Fires



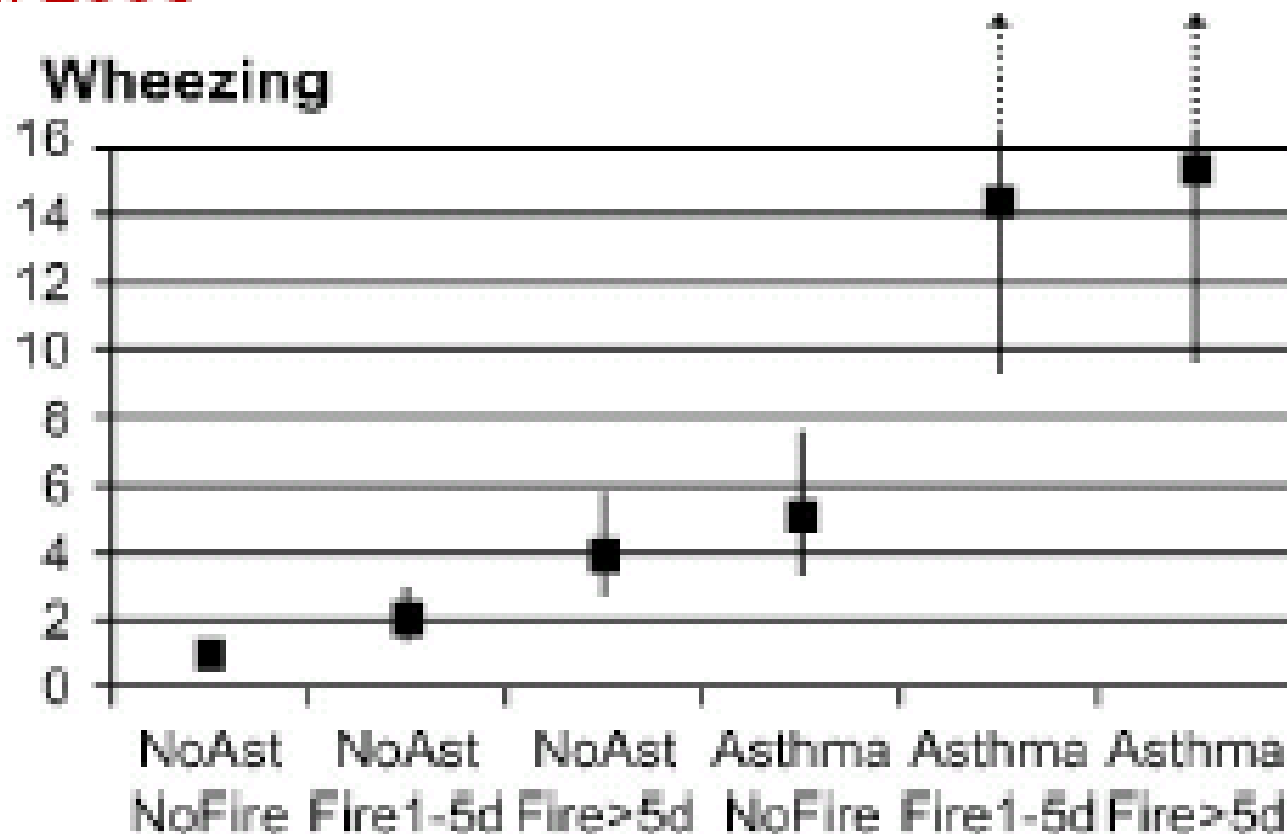
Summer 2007; wildfires in Greece



Health Effects of the 2003 Southern California Wildfires on Children

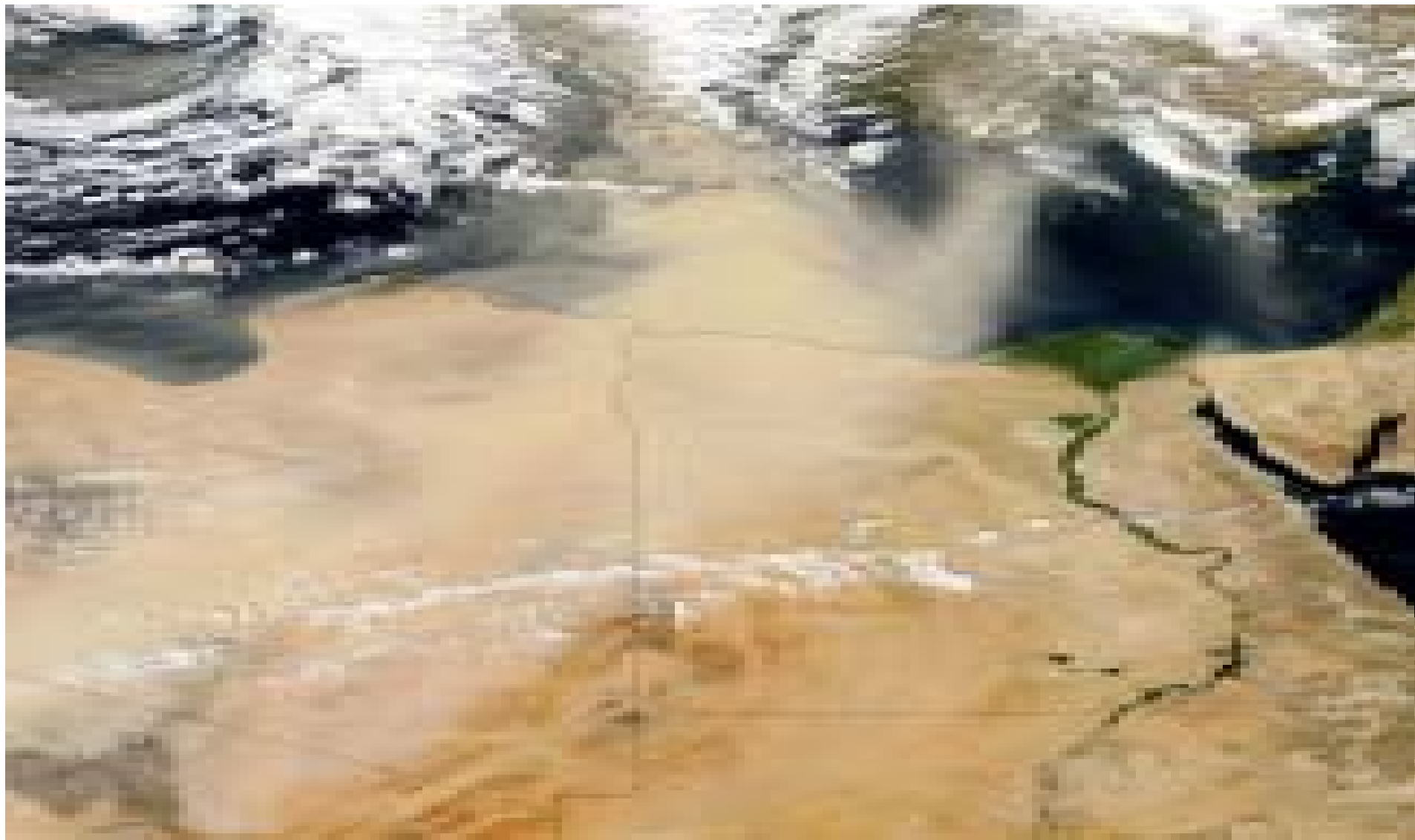
Nico Künzli, Ed Avol, Jun Wu, W. James Gauderman, Ed Rappaport, Joshua Milstein, Jonathan Bernstein, Bob McConnell, Frank D. Gilliland, Kees Berkman, Fred Lurmann, Arthur Wieser, and John M. Peters

AJRCCM 2006



Institute for Risk Assessment Sciences

Sahara Dust storms



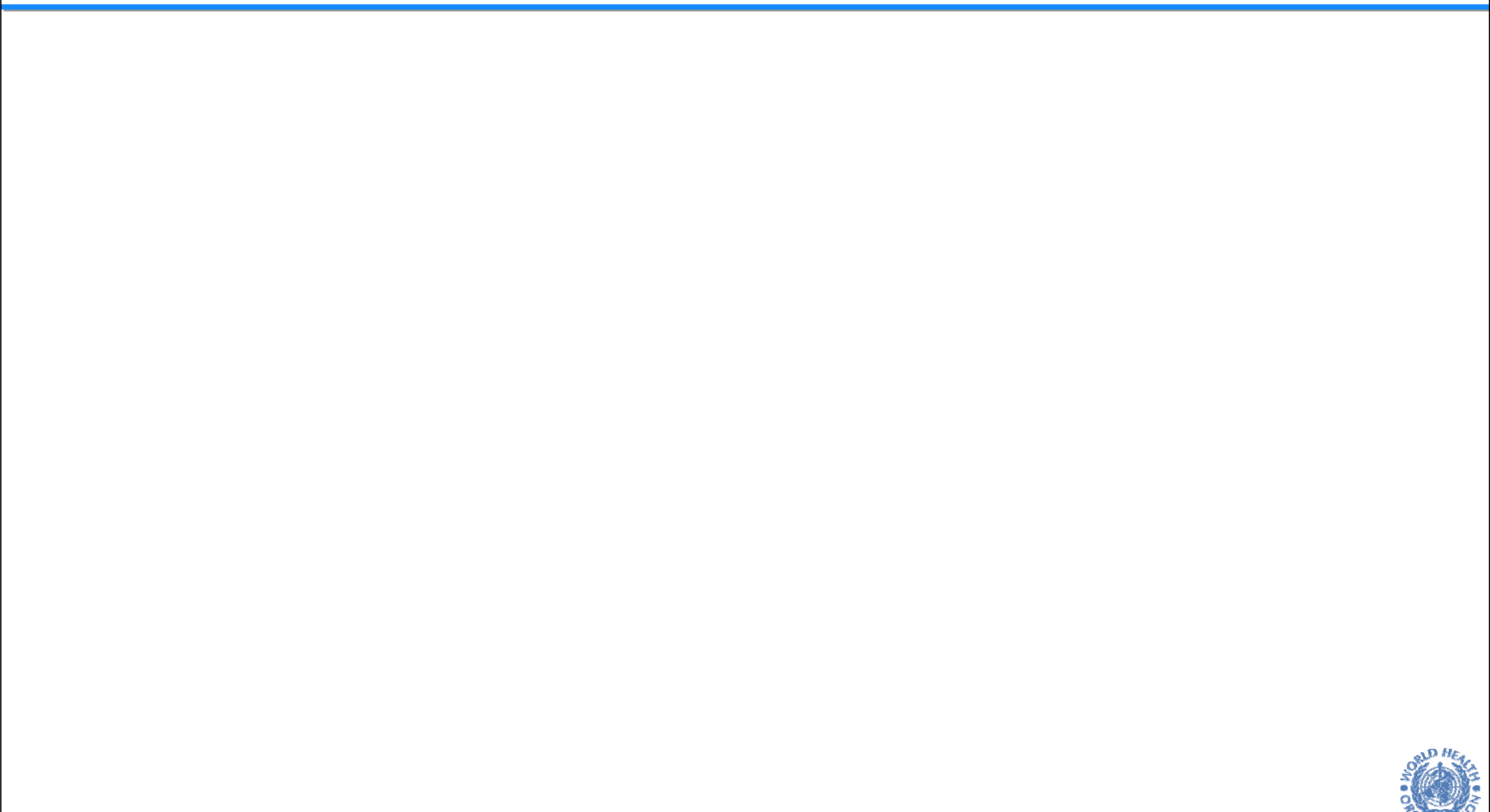
Saharian dust: effect on mortality in one spanish city

Effects of PM_{2.5} and PM(10-2.5) on mortality

Stratified by Saharan dust days

	PM _{2.5}	PM(10-2.5)
	OR per 10 µg/m ³	OR per 10 µg/m ³
Saharan dust days	1.05 (1.005, 1.097)	1.084 (1.015, 1.158)
Non-Saharan dust days	1.035 (1.016, 1.055)	1.013 (0.992, 1.034)

Kuenzli et al, unpublished



Climate is changing infectious disease transmission by altering vectors' geographical distribution

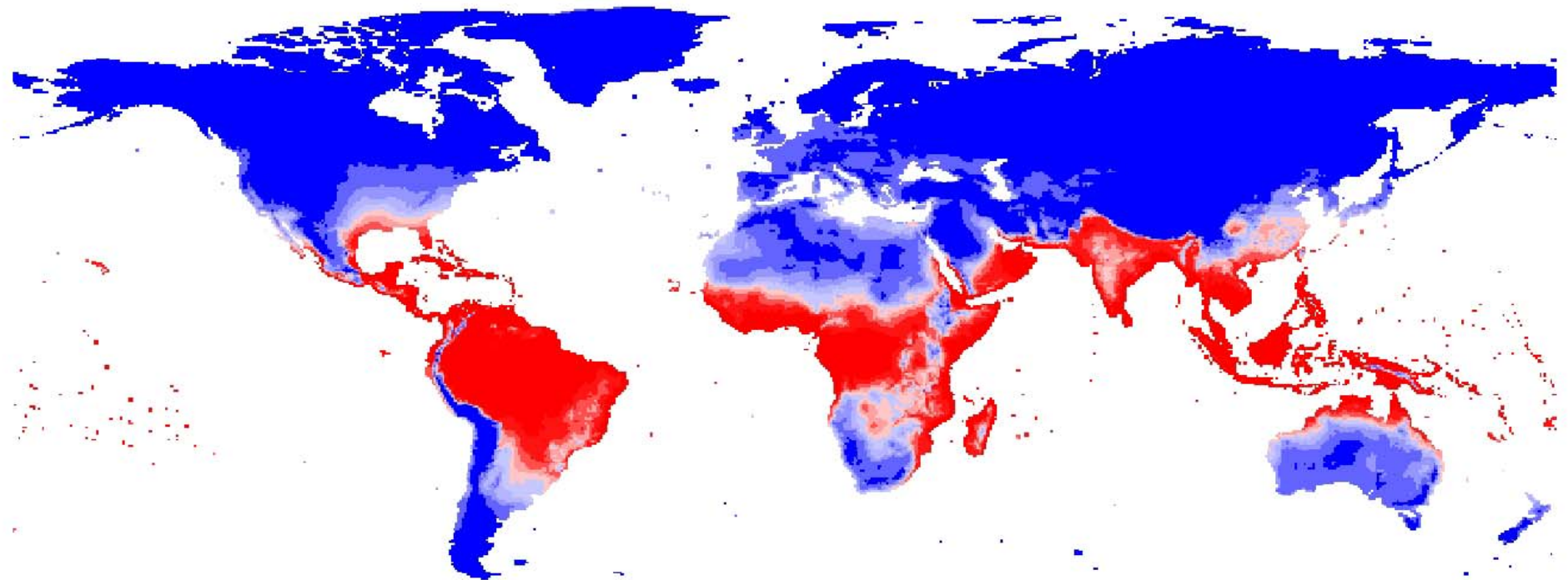
- Climate change will challenge the progress made towards eliminating malaria in Europe and central Asia and increase the risk of local outbreaks (WHO 2004).
- Lyme disease is shifting to higher latitudes and altitudes, following movement of ticks (WHO 2005).
- Leishmaniasis, a skin disease transmitted by sand flies, is travelling north (WHO 2005).
- In the 2007 Chikungunya outbreak in Italy the presence of a suitable vector allowed sustained local transmission (ECDC 2007).

HOW TO REDUCE HEALTH EFFECTS (in collaboration with veterinary services):

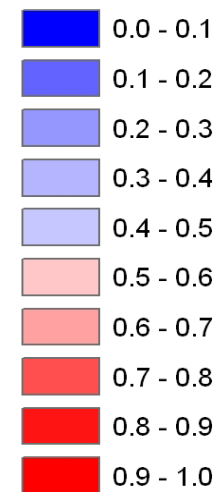
- *Provide vaccination, where needed*
- *Strengthen vector surveillance and control*
- *Ensure rapid diagnostic*
- *Raise awareness on protective behaviour*



Model of future transmission (2080s climate)



Probability



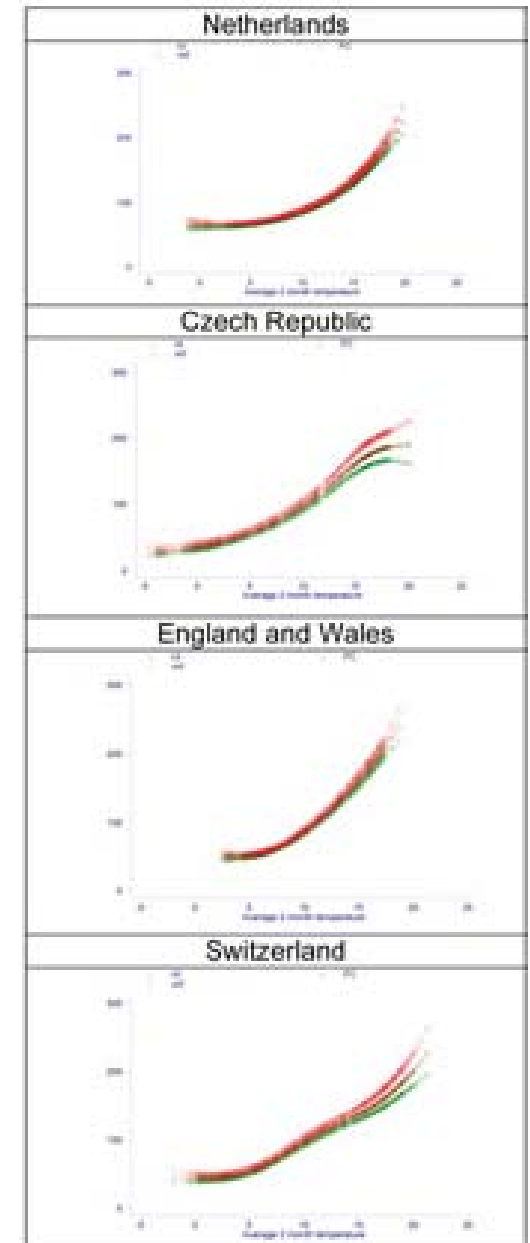
Climate change has an impact on nutrition and food safety

- Food productivity will decrease in the Mediterranean, south-east Europe and central Asia. Crop yields could decrease up to 30% in central Asia by the 21st century (IPCC 2007).
- Higher temperatures favour the growth of bacteria in food, such as *Salmonella* (KOVATS 2006).

HOW TO REDUCE HEALTH EFFECTS

Implement the WHO Food and Nutrition Action Plan by

- strengthening surveillance and monitoring
- detecting changes and analysing trends in foodborne and nutrition-related diseases
- educating and informing consumers on healthy diets and food safety practices



Temperature-salmonellosis relationships by country



Vulnerable groups

Cyprus, 2009

Climate change will affect everybody but not everybody in the same way

Populations differ in vulnerability

- As developing and long-term exposed organisms, children are most at risk from the effects of climate change.
- Heat primarily affects old people: chronic diseases and drugs can decrease their ability to cope with extreme hot weather.
- Emergency services providers and labourers in outdoor environments are especially affected by extreme weather events.



Climate change will have adverse effects on economic growth

More than 60 million people are living in absolute poverty in eastern Europe.

- Climate change can significantly worsen health inequities within and among countries and put additional stress on poorer groups.
- Climate change is estimated to cost up to 5% of the gross domestic product (GDP) globally by the end of this century (IPCC 2007).
- Climate change threatens to undermine progress made towards the Millennium Development Goals (MDGs) (IPCC 2007).





What are the health effects in Cyprus?

Cyprus, 2009



www.euro.who.int/globalchange

Cyprus, 2009



EUROPE



Action by WHO

Cyprus, 2009

Resolution WHA61.19 on climate change and health

Urges Member States:

- to develop health measures and integrate them into plans for adaptation to climate change;
- to strengthen the capacity of health systems;
- to promote effective engagement of the health sector and its collaboration with all related sectors;
- to provide clear directions for planning and investment.

Requests the WHO Director-General:

- to promote research and pilot projects in this area;
- to engage actively in the UNFCCC Nairobi work programme;
- to consult Member States on the preparation of a workplan for scaling up WHO's technical support.

WHO scaling up: The WHO workplan

● Goals:

- support health systems in all countries, in particular low- and middle-income States and small island States, in order to enhance capacity for assessing and monitoring health vulnerability, risks and impacts due to climate change;
- identify strategies and actions to protect human health, particularly of the most vulnerable groups; and
- share knowledge and good practices.

● 4 objectives

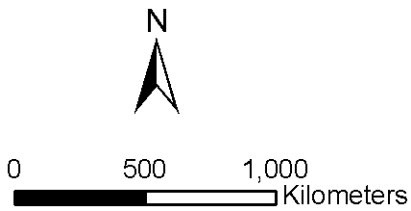
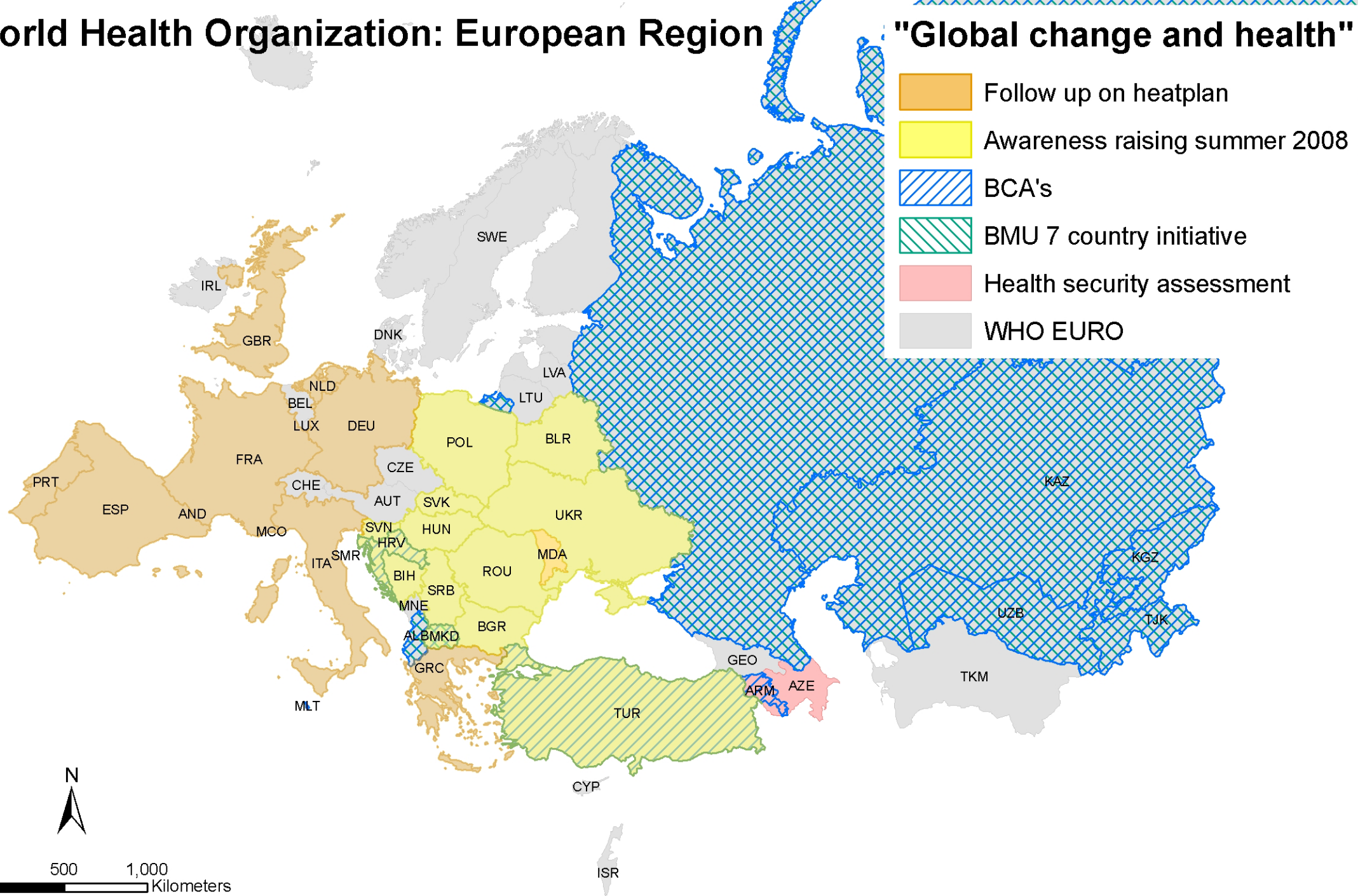
- Awareness raising
- Engage in partnerships with other United Nations organizations and sectors other than the health sector at national, regional and international levels, in order to ensure that health protection and health promotion are central to climate change adaptation and mitigation policies
- Promote and support the generation of scientific evidence
- Strengthen health systems to cope with the health threats posed by climate change, including emergencies related to extreme weather events and sea-level rise

The policy context is strengthening.....

- World Health Day, 2008
- World Health Assembly resolutions:
 - Workplan for scaling up WHO's technical support to Member States for assessing and addressing the implications of climate change for health and health systems
- International collaborations to strengthen health systems response to climate change
 - Seven European countries working together
 - EC White paper on adaptation to climate change
- COP15 – Copenhagen Dec 2009
- Towards a Regional framework for action for protecting health of the WHO European Region citizens to be proposed at the Fifth Ministerial Conference for Health and environment (Parma, Italy, 10-12 March 2010)

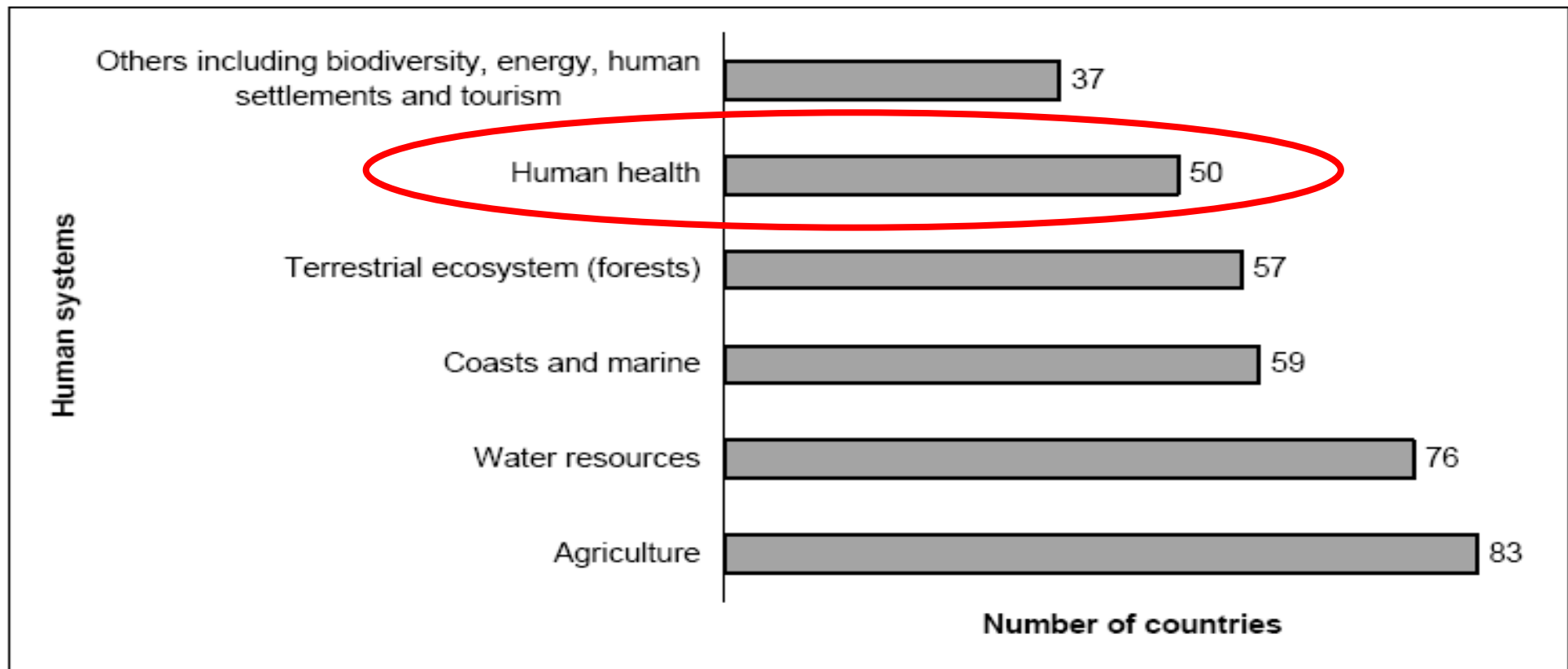
World Health Organization: European Region

"Global change and health"



"The designations employed and the presentation of this material do not imply the expression of any opinion whatsoever on the part of the Secretariat of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers and boundaries."

Many developing and developed countries have identified health as a priority for action.....



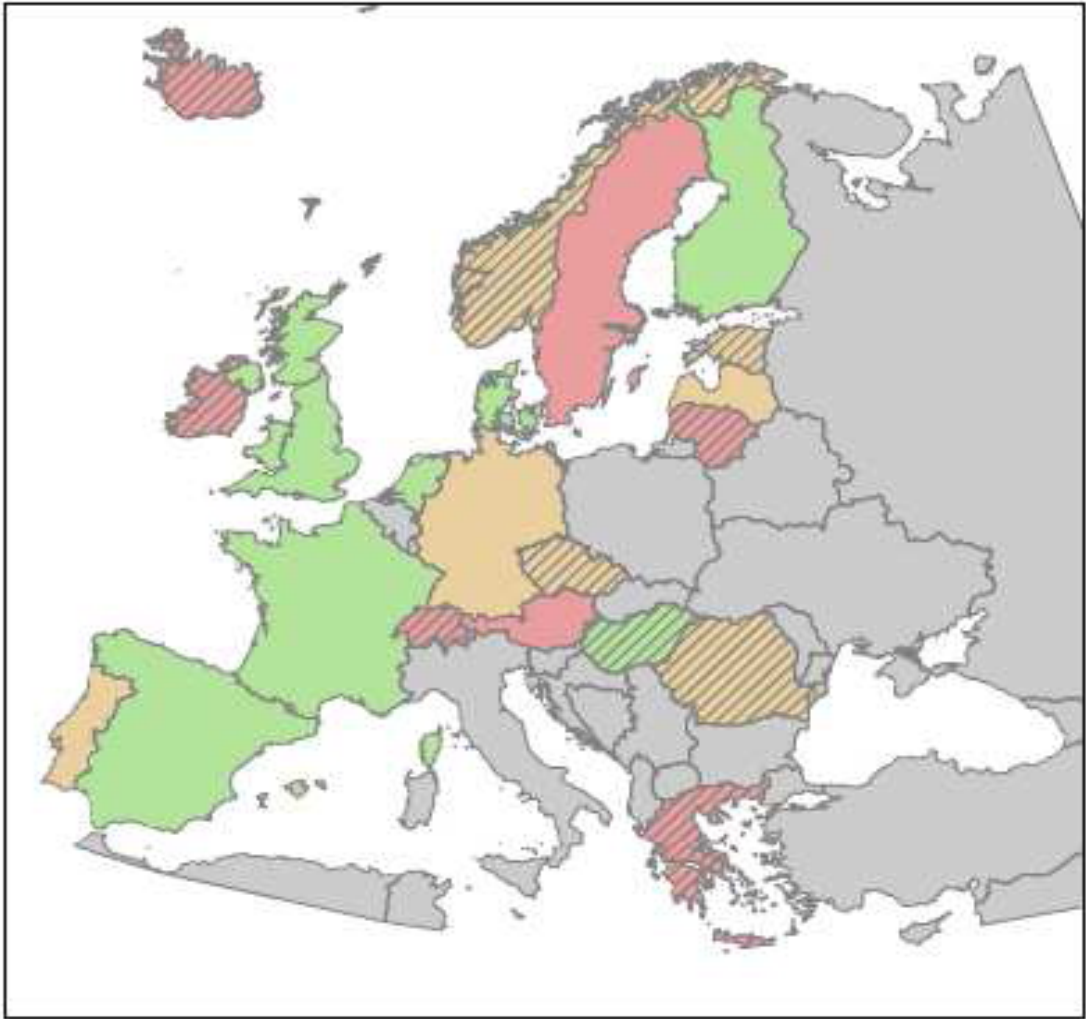
(as reported in the National Communications to the UNFCCC of non-Annex I Parties)

Courtesy of Miwa Kato (UNFCCC)

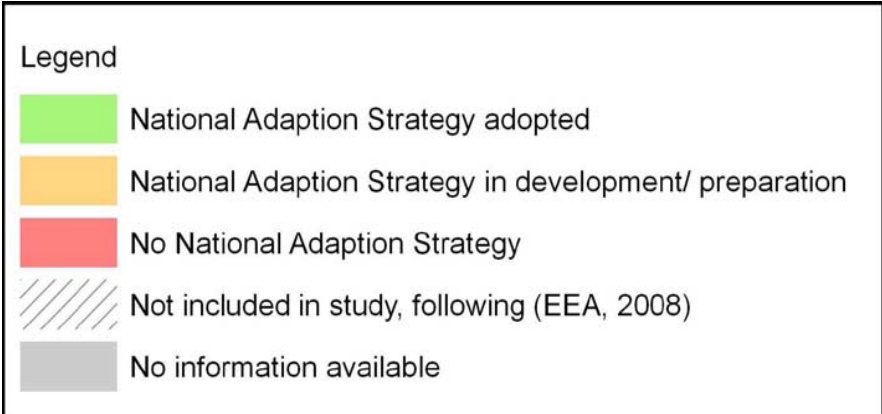
Health is poorly addressed in the international climate change negotiations and funding of adaptation

- Is identified as a priority in 32 out of 38 (84%) UNFCCC National Adaptation Plans of Action (NAPAs) from the least developed countries
- Is the focus of 31 of 430 (7%) projects submitted for NAPA funding
- Has received ~ \$2.5 million of \$1.3 billion (0.2%) of support granted under the UNFCCC
- Is represented by ~20 of the 10,000 participants (0.2%) in the UNFCCC Conference of the Parties

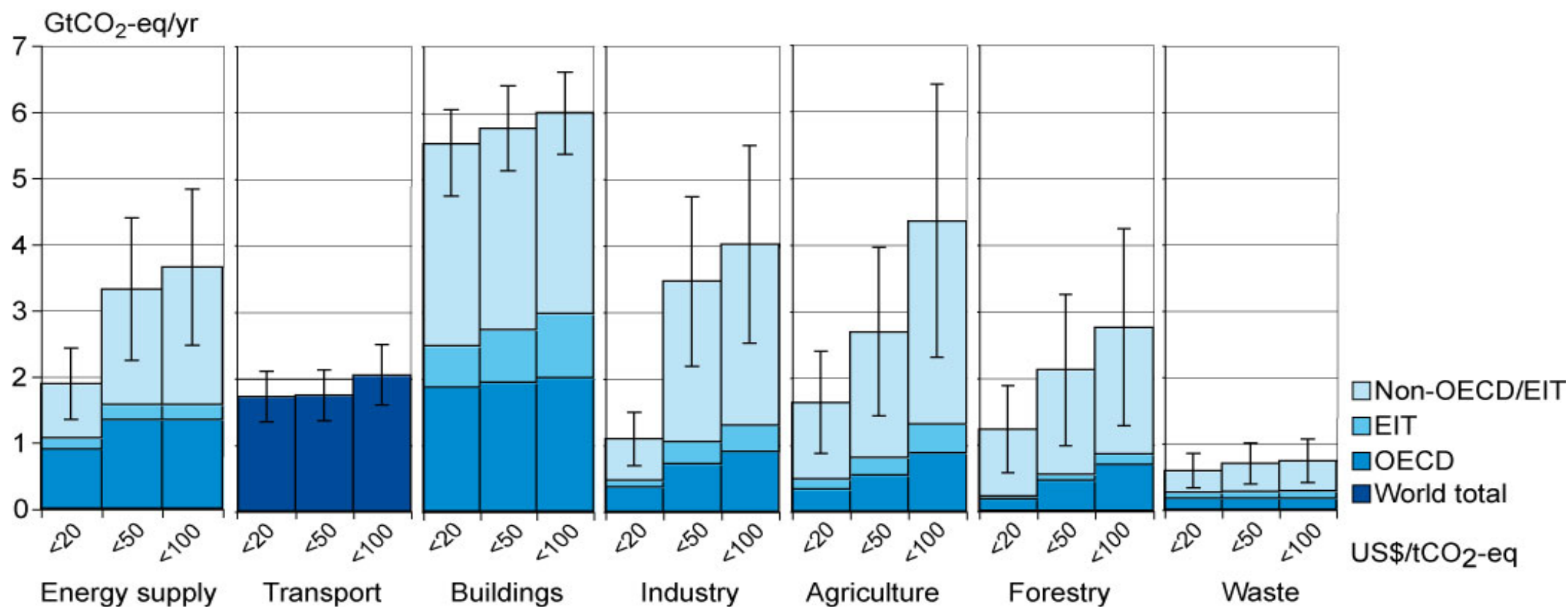
Health in National adaptation strategies (NAS) (courtesy: Swart et al, 2009)



9 out of 11 countries addressed health in the development of their National adaptation strategies; one (France) identified health as the top priority











































































Health benefits of mitigation measures poorly addressed; health damages of mitigation not evaluated



Note: estimates do not include non-technical options, such as lifestyle changes.

TABLE 4.1. EXAMPLES OF TRANSPORT POLICIES AND THEIR SYNERGISTIC EFFECT IN BRINGING ABOUT VARIOUS TRANSPORT-RELATED HEALTH EFFECTS

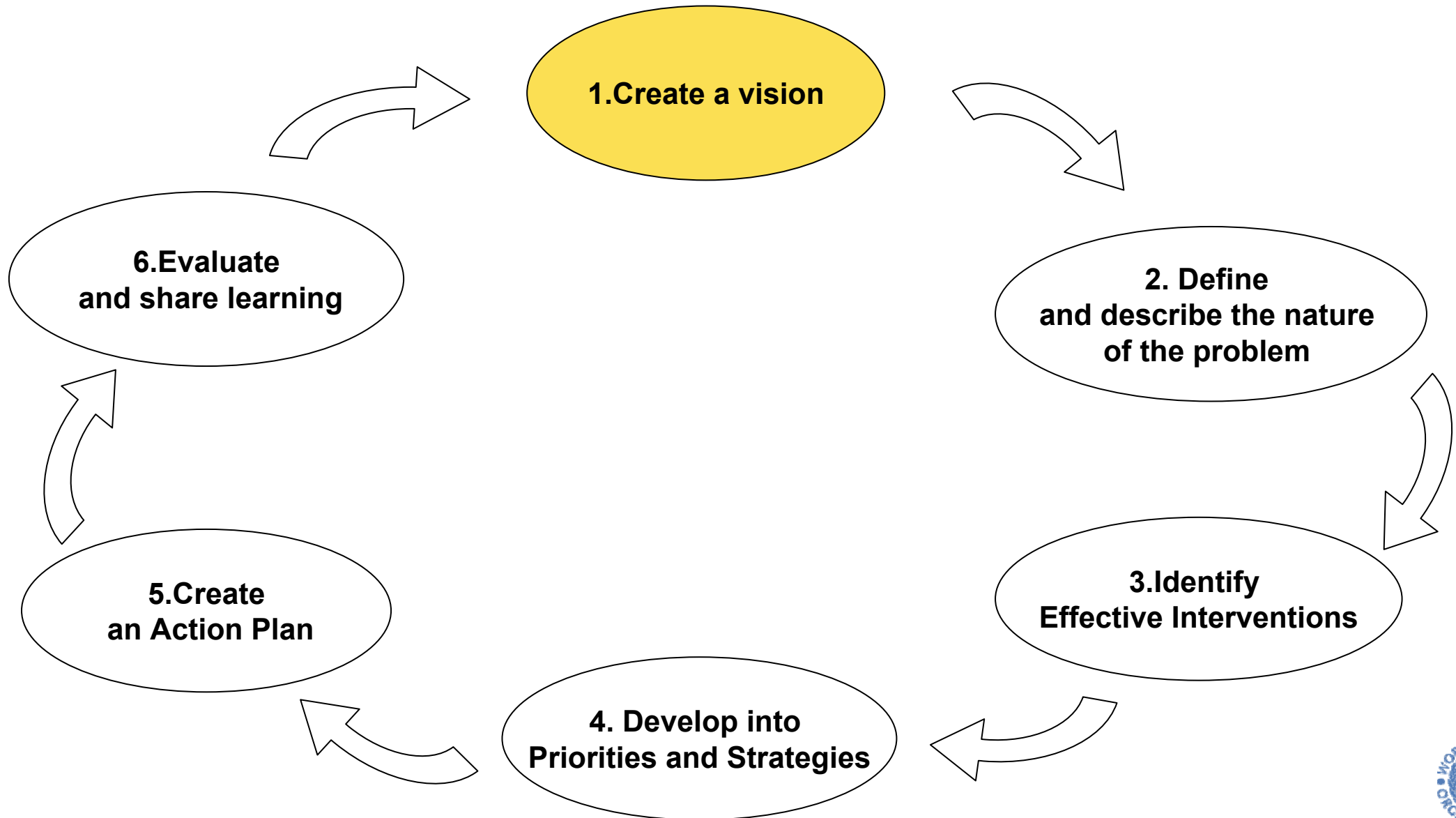
Policy	Reducing crashes	Reducing air pollution	Reducing noise	Mitigating climate change	Promoting physical activity	Promoting community
Speed management						
Traffic calming and speed reduction in residential areas						
Reducing transport demand (such as by telecommunication)						
Road pricing						
Cleaner fuels and more efficient vehicles						
Promotion of safe cycling, walking and public transport						
Safer cars (including fronts protecting pedestrians)						
Implementing noise reduction barriers						
Investment in safe infrastructure for cyclists and pedestrians						
Urban parking management						
Environmentally differentiated fees for motorized transport in urban areas						
Reducing the power of vehicles						



Developing a national strategy

Cyprus, 2009

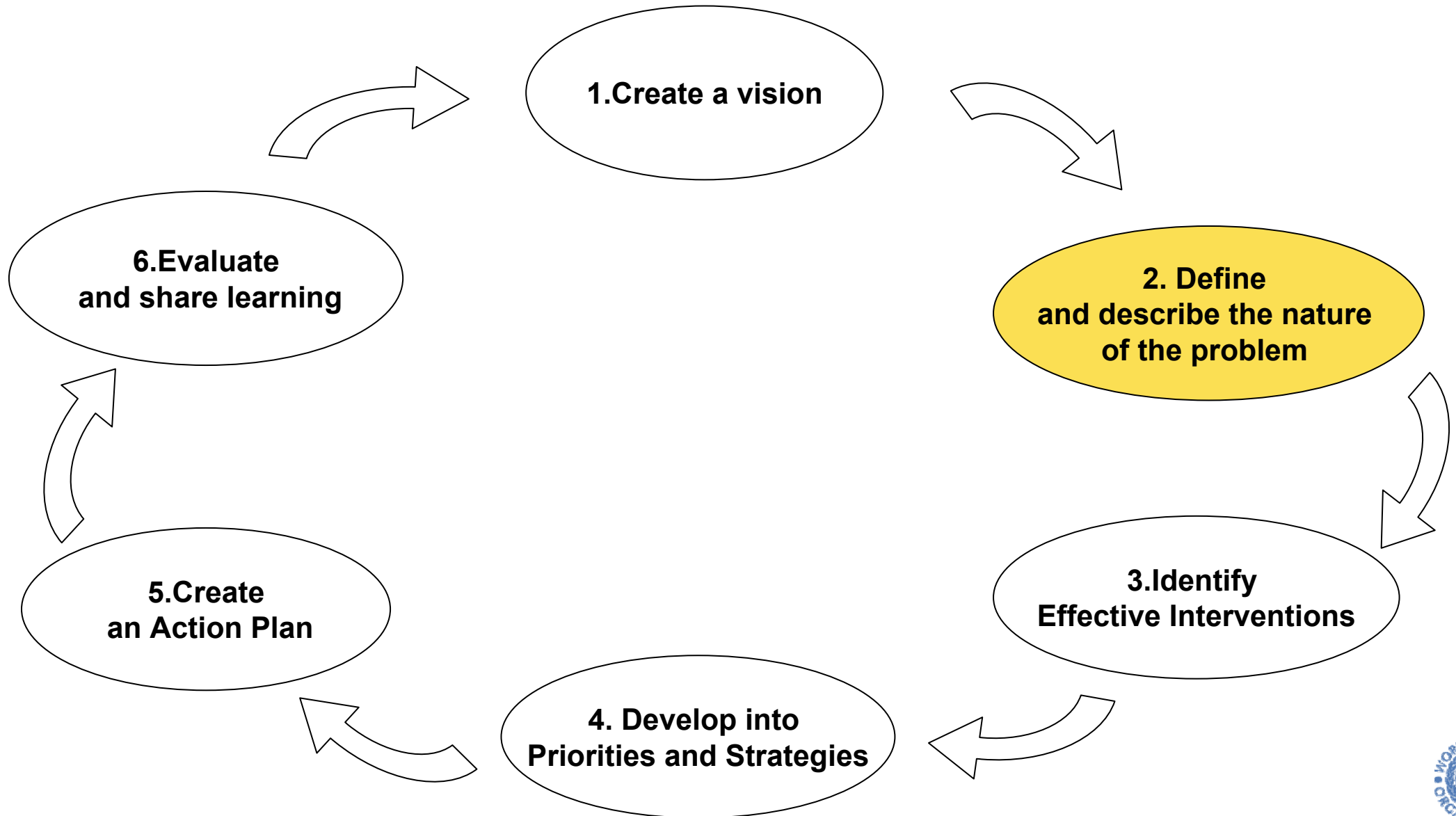
Step One: Create a vision



Purpose of a Vision

- To establish a clear sense of direction
- To enhance ownership of the issue by multiple stakeholders
- To motivate action
- To overcome negative attitudes and pessimism
- To promote opportunities with greater health gains

Step Two: Define and describe the nature of the problem



Step Two: Describe the size & nature of the problem



ARE YOU
PREPARED?

Some basic questions

- What is the current burden of climate-sensitive health outcomes, including which regions and populations are more vulnerable to climate variability and change?
- What factors other than climate determine this vulnerability?
- How is the burden of climate-sensitive health outcomes likely to change over the coming decades, irrespective of climate change?
- What are the likely health impacts of climate change over the next 20 years? Which regions and populations will likely be at highest risk?
- How might planned programs and activities address any additional burden of climate-sensitive health outcomes? What additional public health interventions will likely be needed? What are the estimated costs and benefits?
- What are the potential health risks of adaptation and GHG mitigation measures implemented in other sectors, such as water resources, land use, and transport?

Step Two: Describe the size and nature of the problem

The Size of the Problem today?:

- Size of vulnerable groups
- Size of Geographical impact
- Size of impact if no action taken

The future size of the Problem :

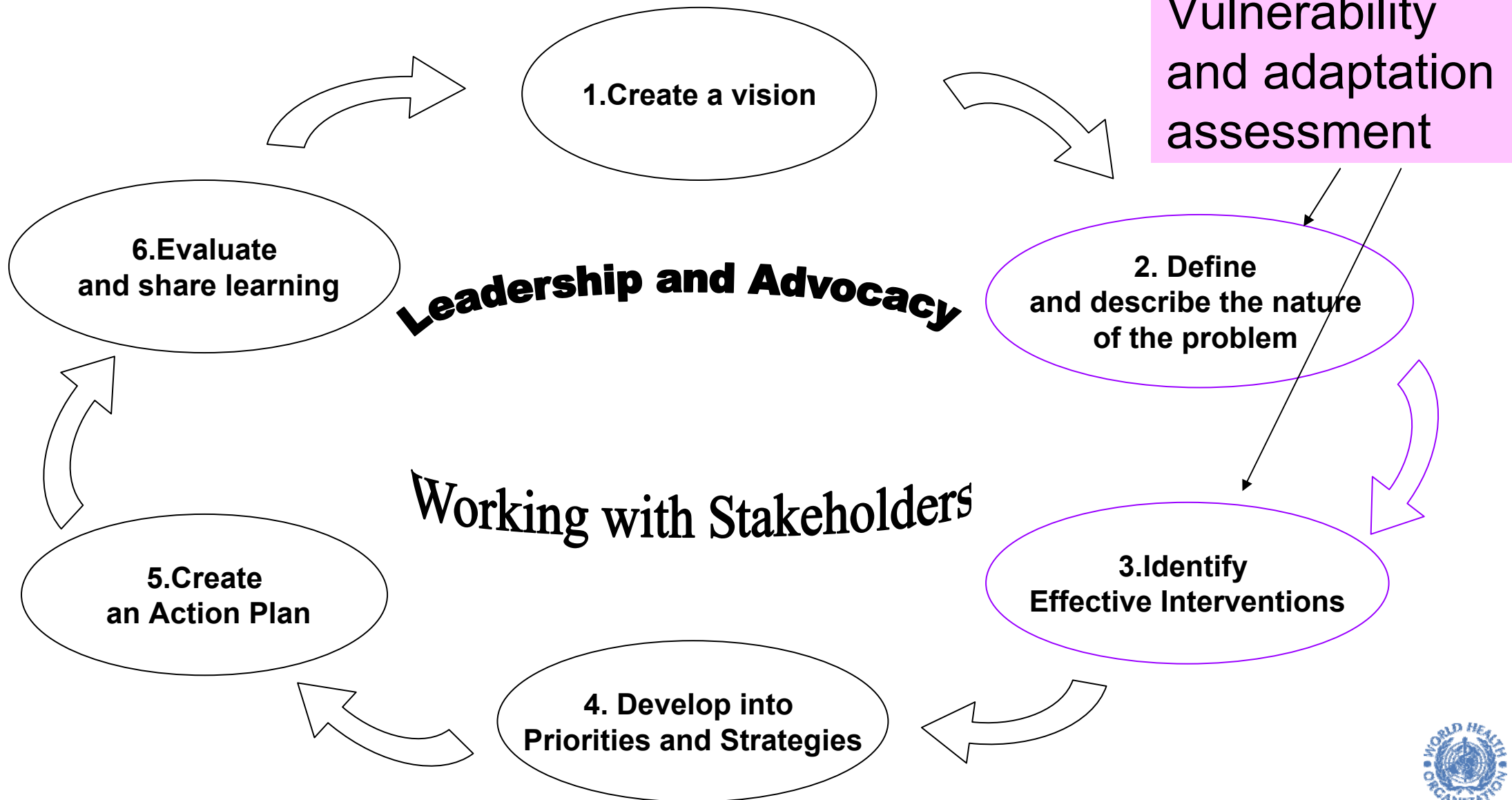
- Size of the problem in 2020 under a changing climate?
- Expected size of the problem in the short, medium and long term

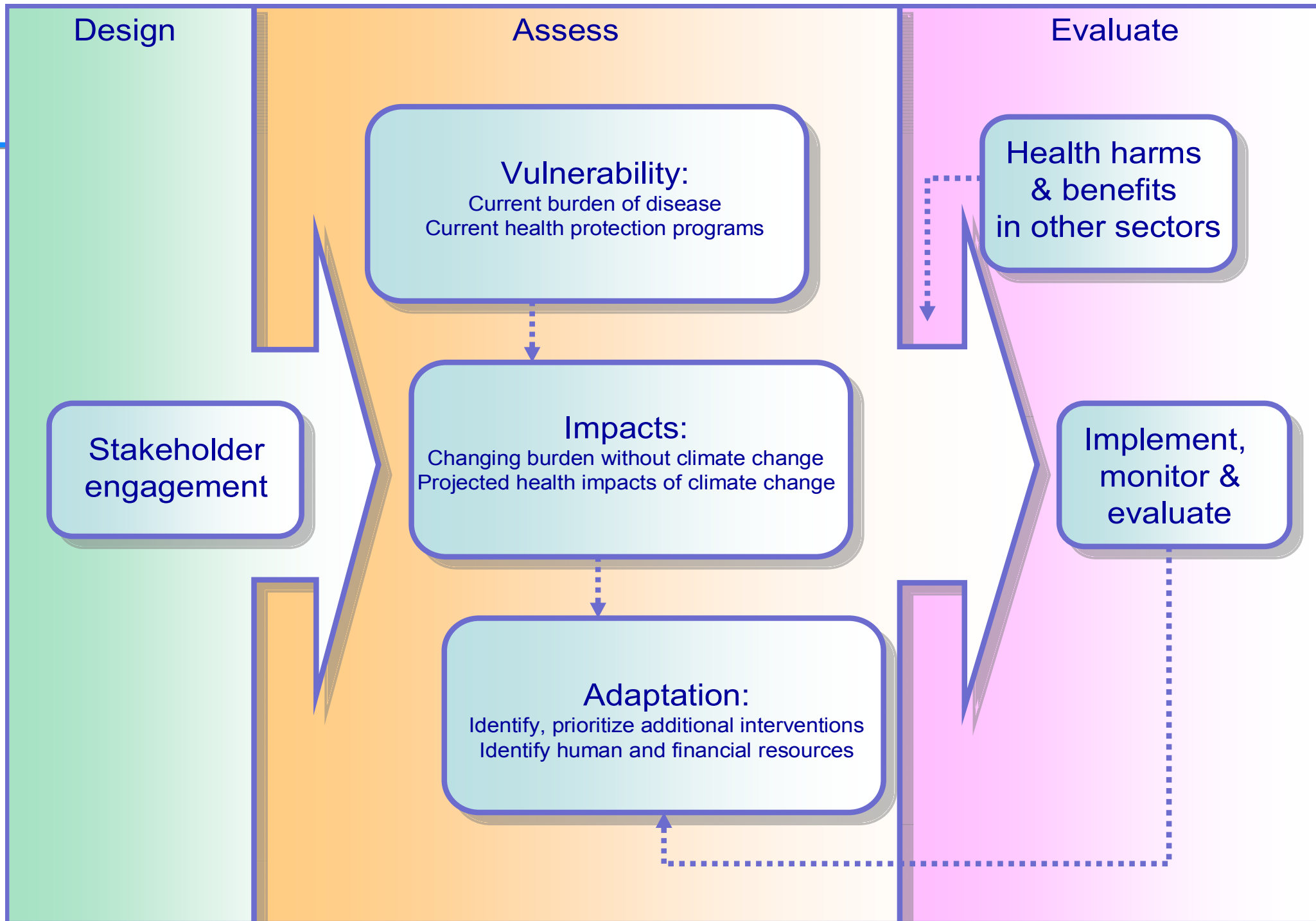
The Nature of the Problem:

- Heatwaves and fires
- Flooding – coastal and inland
- Impact upon food security
- Impact upon migration and provision of health and social care services
- Impact upon Infections diseases – which?
- Air Quality
- Health problems resulting from measures in other sectors (transport, energy, agriculture, etc)

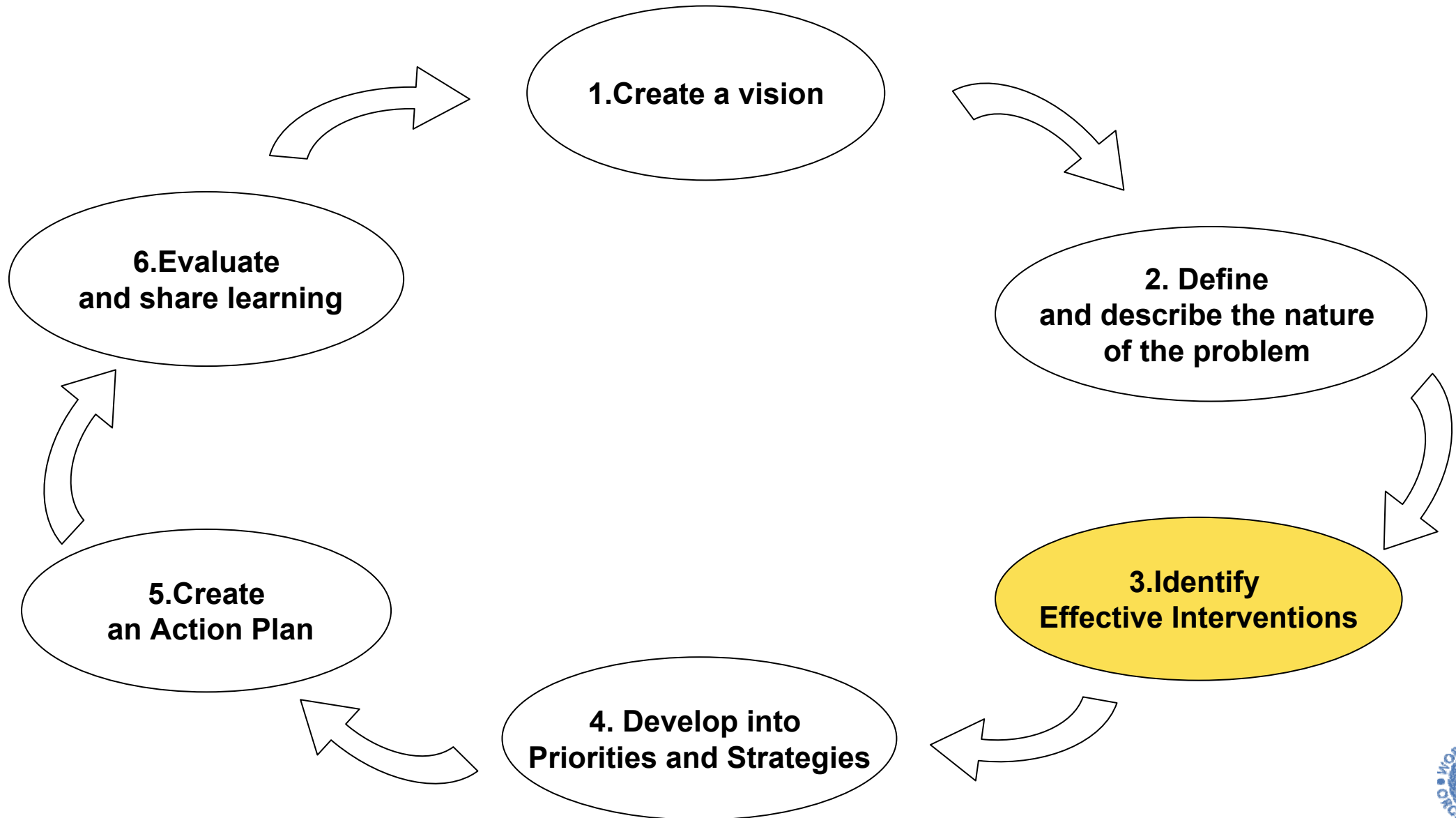
Information can be provided through a vulnerability and adaptation assessment

Public Health Steps to Prevention





Step Three: Identify Effective Interventions



Step Three: Identify effective interventions

Degree of effectiveness:

- Adaptation to what?
- What are the projections for the outcome?
- How good or likely is the adaptation?
- Potential harm?
- Wider benefits?
- For whom and who adapts?
- How does adaptation occur?
- When should interventions be implemented?
- Apply win/win or no-regrets strategies
- Cost of inaction?

Capacity and delivery mechanisms:

- What is currently being done to reduce the burden of disease?
 - How effective and costly are these policies and measures?
 - Size of impact upon reducing harm to
- Do interventions need strengthening or adjustment?
- Are new measures needed?
- How feasible is it to integrate into existing infrastructure
- Are there areas that need to be developed?

Identify gaps in capacity and delivery mechanisms for interventions

Information on health impact

- Scoping studies, health impact /adaptation assessments, climate scenarios, Risk assessment & communication

Data collection for surveillance

- Surveillance & monitoring; early warning systems, forecasting, health indicators, predictive models

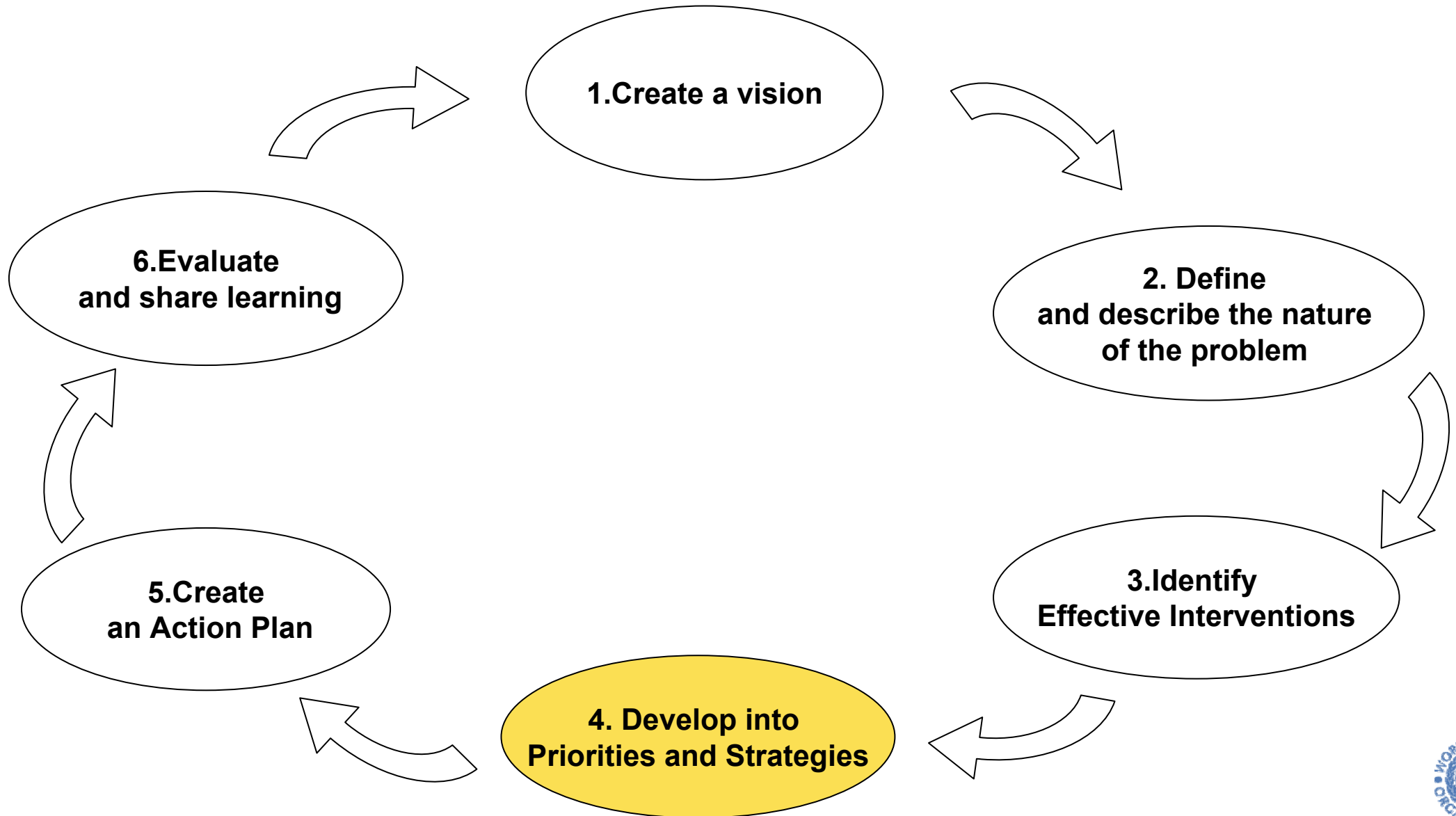
Change standards and developing plans based upon best of current knowledge/ effective interventions:

- Building design, heatwave plan, flood response, public health programmes

Workforce development:

- Training and skills

Step Four: Develop into Priorities and Strategies



Step Four: Develop into policies & strategies (UK example)

Mitigation

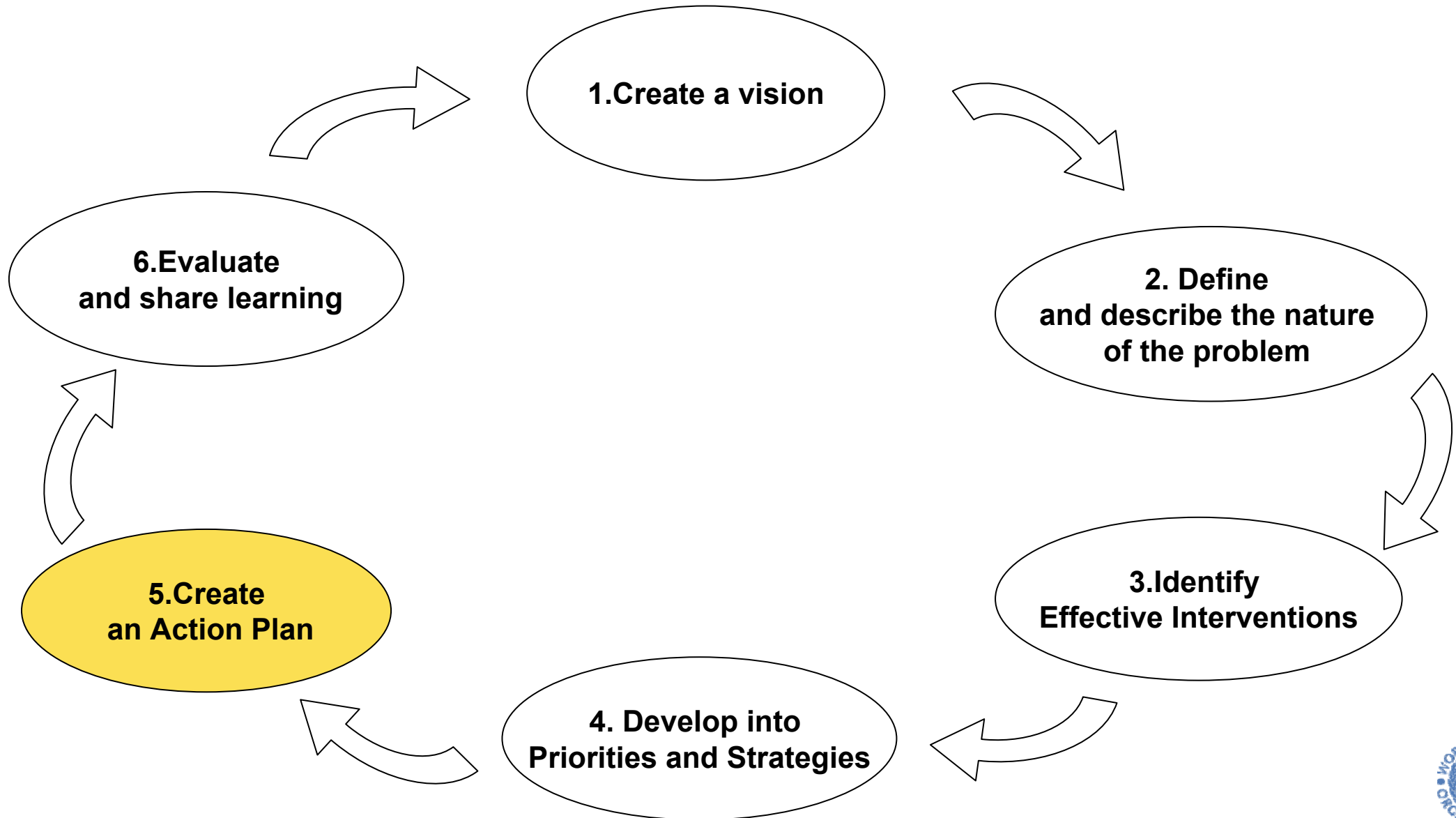
- Legislation on actions to drive mitigation across all country (e.g. Climate Change Bill)
- Links to all relevant Govt. Dept. strategies (e.g. Sustainable Development Strategy)
- Energy Targets for Health & other Govt sectors
- Health Sector Carbon Reduction Strategy

Adaptation

- **Ministerial leads on adaptation established**
- **Set up Cross-Government Official Group ‘Domestic Adaptation Board’**
- **National Risk Assessment (from ‘Climate Change legislation),**
- **Cross-Government ‘Adaptation Policy Framework’**
- **National Heatwave Plan**

• Embed into future commissioning plans, objectives, targets and performance monitoring

Step Five: Create an Action Plan



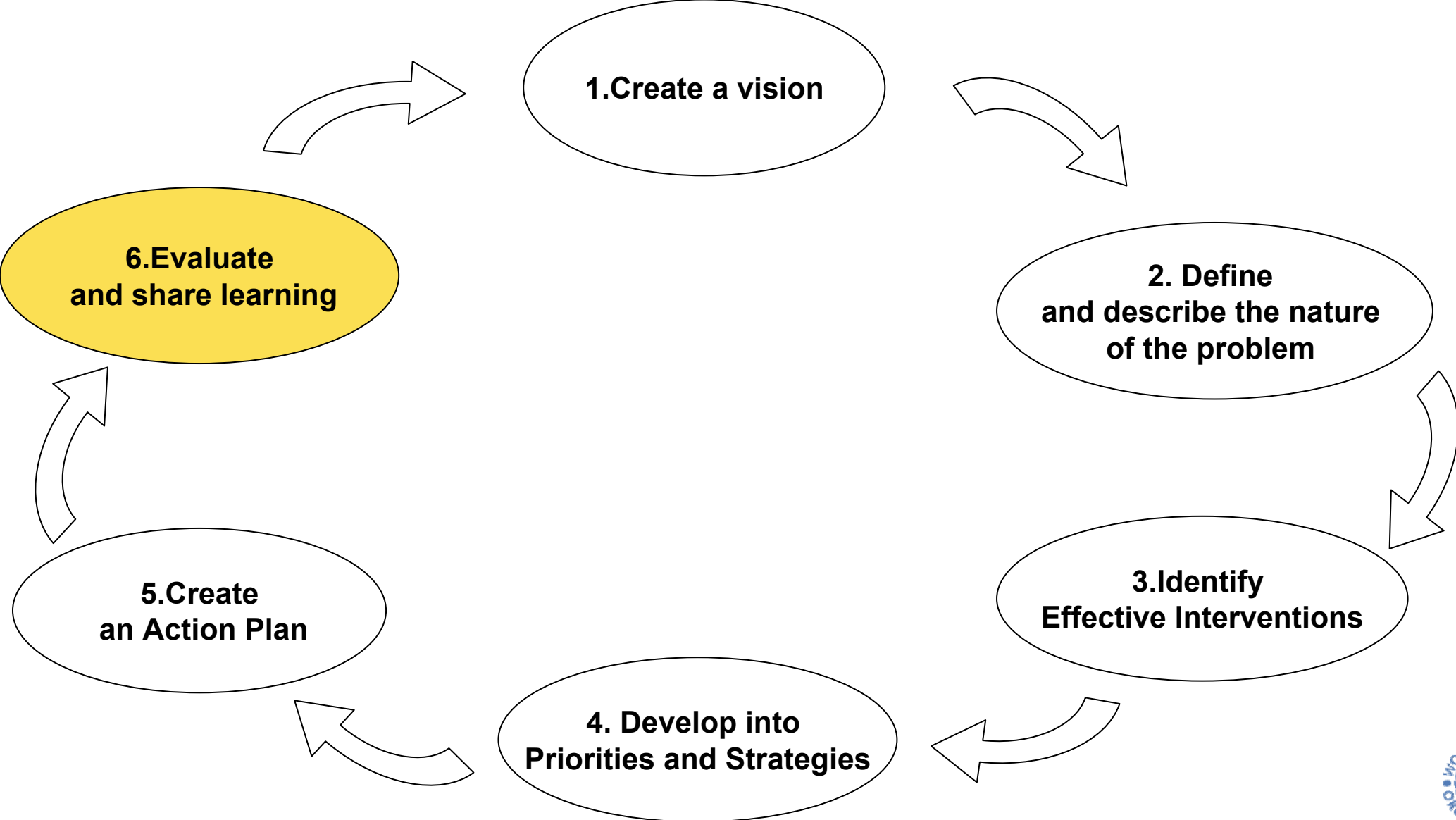
Step Five: Create an Action Plan

- **Establish clear objectives and actions**
- **Describe the process of delivery** for each strategy objective
- **Specify a timetable** to manage the process
- **Identify roles and responsibilities** for delivering each objective
- **Agree a Communication Plan**
- **Identify potential barriers and constraints** and processes to overcome these
- **Establish performance management processes**
- **Ensure Audit and evaluation** of processes and outcomes



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Step Six: Evaluate and share learning



Step Six: Evaluate and share learning

Purpose of Evaluation – to improve future practice:

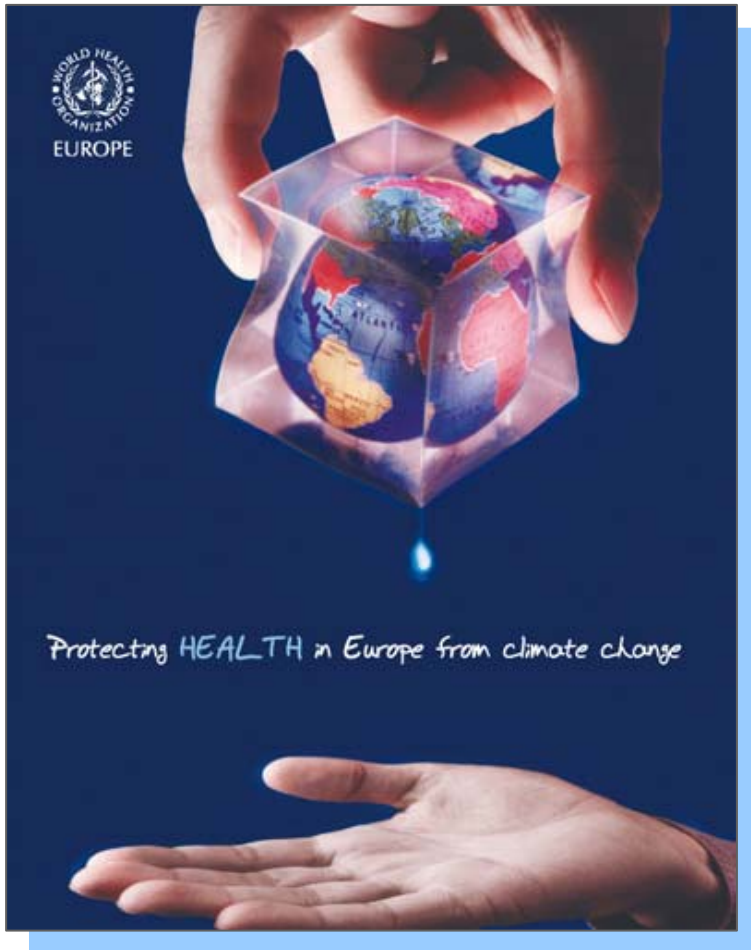
- Establish monitoring systems – to support performance and evaluation
- Process Evaluation – to improve delivery mechanisms
- Outcome Evaluation – to measure health impact
- Economic Evaluations – to ensure best value for money

Share learning:

- To improve motivation and delivery
- To develop workforce skills and knowledge

A WHO tool for European decision-makers on World Health Day 2008

Protecting health in Europe from climate change



presents the current and projected health effects related to climate change and provides practical guidance on specific actions that countries and people can take *now* to protect their health.

There are common actions that all health systems can take to strengthen preparedness and response

1. identify problems; most vulnerable populations; training, communication and supplies needs;
2. reinforce health services to adapt to climate change
(i.e. ensuring clean water and sanitation, safe and adequate food, immunization, disease surveillance and response, vector control, and disaster preparedness);
3. train health professionals on climate-related health issues
(i.e. new transmission patterns of infectious diseases and symptoms and treatments of diseases linked to extreme weather events);



Common actions that all health systems can take (continued...)

4. deliver accurate and timely information and communication

to decision-makers, the general public, other stakeholders for proper action to protect health from climate change;

5. strengthen health security

e.g. facilitate collaboration between countries to respond to climate-related health crises when health security calls to enforce the International Health Regulations;

6. advocate health in other sectors

where reduction of emissions can benefit health (energy, transport, housing, land use, water management);

5. set the example in tackling the root causes of climate change by taking actions to reduce health systems' "carbon footprint".



Photo: iStockphoto

Key objectives of action in Europe

- avoiding additional deaths, disease and injuries from climate-change-related extreme weather events;
- anticipating, early identifying and responding to climate-change-related infectious disease outbreaks and changes in distribution;
- enforcing water safety;
- reducing respiratory diseases from climate change and associated policies; and
- enhancing food security and safety.



www.euro.who.int/globalchange

Cyprus, 2009