



WORKSHOP PART I

Adaptation to Climate Change and Health

*Adaptation of environmental and urban policies:
roles and challenges in mitigating health risks*

Luciana Sinisi, ISPRA, Italy



Life Project ACT - Adapting to Climate change in Time

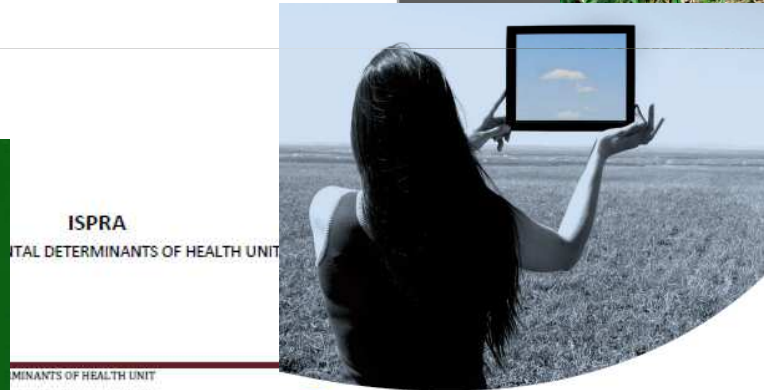
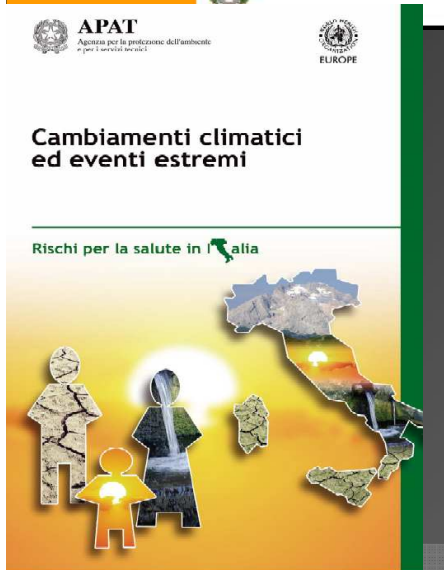
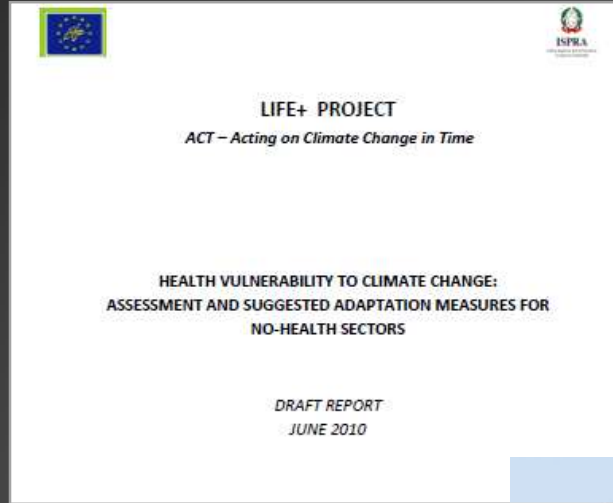
No LIFE08 ENV/IT/000436

ISPRA, Rome, May 12th 2011

With the contribution of the LIFE financial instrument of the European Community



CLIMATE AND HEALTH: ISPRA EXPERIENCE





CLIMATE AND HEALTH: lesson learned

- ① Health risk management **CANNOT BE** fully delegate to public health depts

- ① Environmental and urban policies have their own roles in mitigating health risks from determinant:
 - - Natural environment
 - Built environment

- ① Climate change and variability is an opportunity for (healthy) sustainable development

CLIMATE, ENVIRONMENT AND HEALTH : THE NEXUS and FIELD OF ACTION

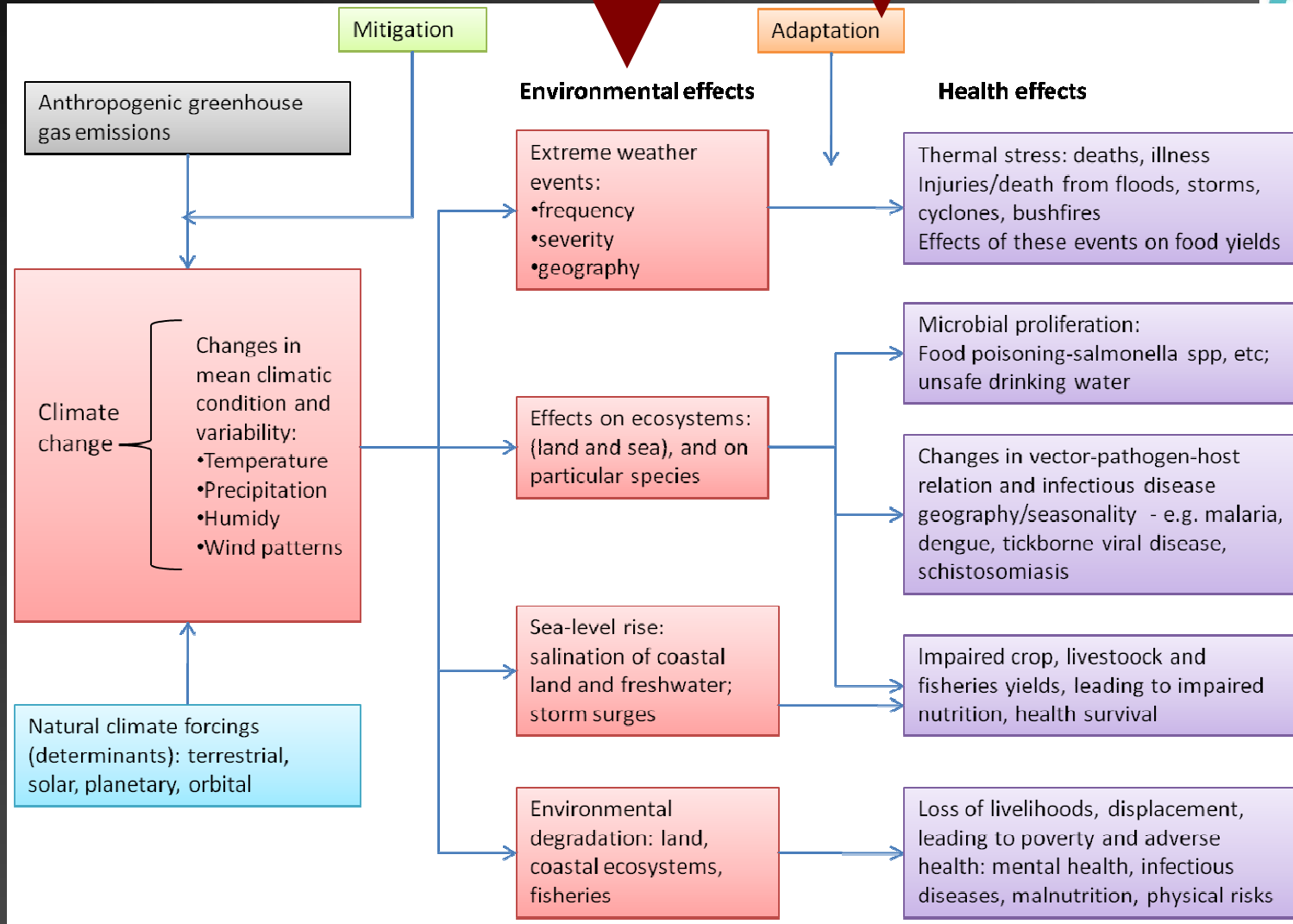


Diagram of pathways by which climate change affects health

(Source: Anthony J McMichael, Rosalie E Woodruff, Simon Hales, 2006 [1] Adapted by [2])

ADAPTATION AND HEALTH RISKS



MAJOR CLIMATE HAZARDS:

THERMAL ANORMALIES & CHANGES IN WEATHER PATTERNS(extremes)

Magnitude of impacts of climate hazards depends upon:

severity of the hazard,
natural & built environmental vulnerabilities
population exposed and
coping capacity of individuals and community.

EFFICIENT Risk management should focus **both** on **risk** (e.g. probability of occurrence) and **vulnerabilities** (environmental, socio-economic)

VULNERABILITY OF URBAN POPULATION



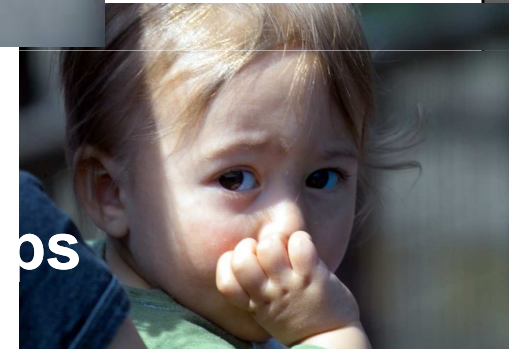
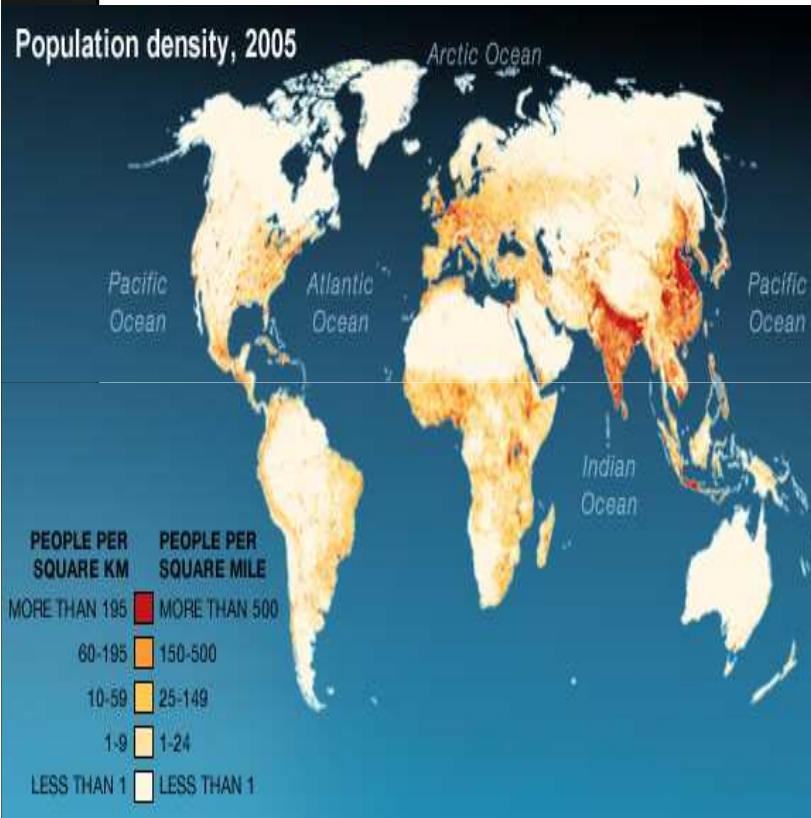
- **Urban areas concentrate people and buildings into a relatively small area,**
 - **HAZARDS INVOLVES LOTS OF PEOPLE**
- **Urban people is highly dependent on WAT/SAN & energy supply, social and health services & infrastructures**
Urban economy may largely rely on touristic resort and economic activities
- **Increased risk of climate-sensitive diseases will result in a heavy social financial burden.**
 - **HAZARDS HITS individual & community COPYING CAPACITIES**
- **Urban built environment vulnerabilities depends upon different policies**
 - **HAZARDS HITS GOVERNANCE CAPACITIES**

Aging and urbanization



act | Adapting to
Climate change
in Time

Population density, 2005



ADAPTATION POLICIES & HEALTH RISK:



TOOLS: Climate & environmental policies

- ⦿ Env & climate information
- ⦿ Water quality
- ⦿ Biodiversity protection
- ⦿ Outdoor air quality

- ⦿ Indoor air quality
- ⦿ Urban heat island
- ⦿ Extreme events management
- ⦿ **ADDRESS VULNERABILITIES**

GOALS : mitigation of health risks

- VECTOR, WATER, FOOD- BORNE DISEASES
- ALLERGY AND RESPIRATORY DISEASES
- EXPOSURE TO CHEMICALS
- MORTALITY/MORBIDITY IN EXTREMES
- SOCIO-ECONOMIC IMPACTS
- IMPROVE EFFICIENCY OF PUBLIC HEALTH ACTIONS & ASSESSMENT

Climate, environment and health: an example of synergies



Influence of temperature on air quality, pollens and allergy risk

- **Respiratory and allergic disorders may be exacerbated by increases in ground-level ozone and photochemical smog**
- **Pollutants interact with pollen enhancing risk of allergic crisis.**
- **Earlier onset and extension of the allergenic pollen season**
- **Alien species**
- **Intense urban windy storm may facilitate “pollen thunderstorm”**

KEY ADAPTATION MEASURES



NATURAL ENVIRONMENT

ENVIRONMENTAL MONITORING

(emerging risks, early warning, recovery)

- EXPOSURE ASSESSMENT (vulnerable pop.)

- VECTOR CONTROL

- GREEN SPACE MANAGEMENT

- Air quality management

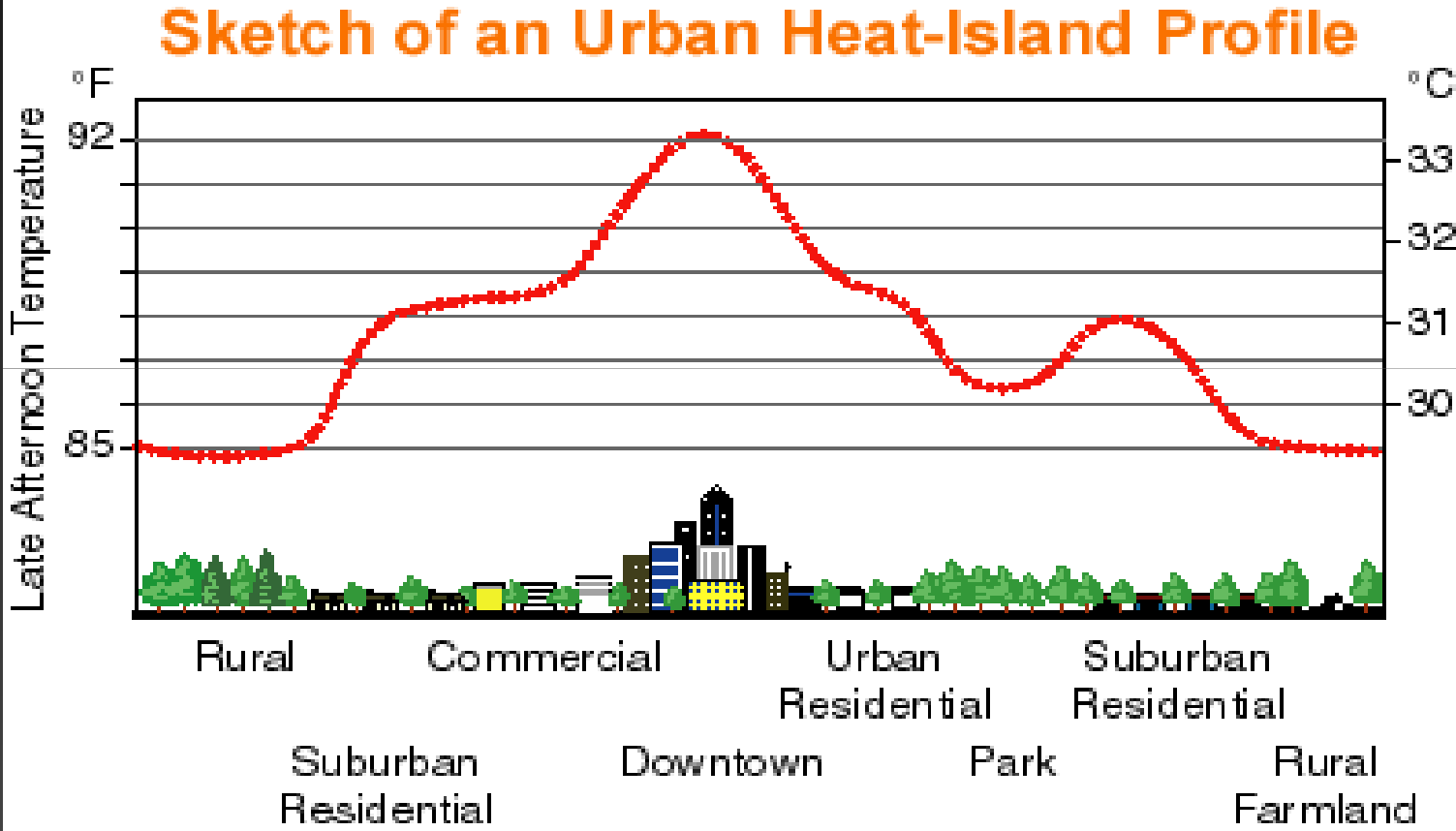
BUILT ENVIRONMENT

URBAN DESIGN

ENERGY SUPPLY / outdoor & indoor air quality

WATER supply and sanitation in extremes

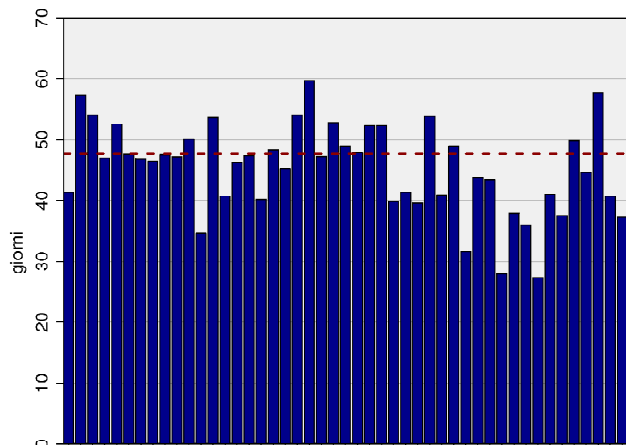
MANAGE HEATH ISLAND



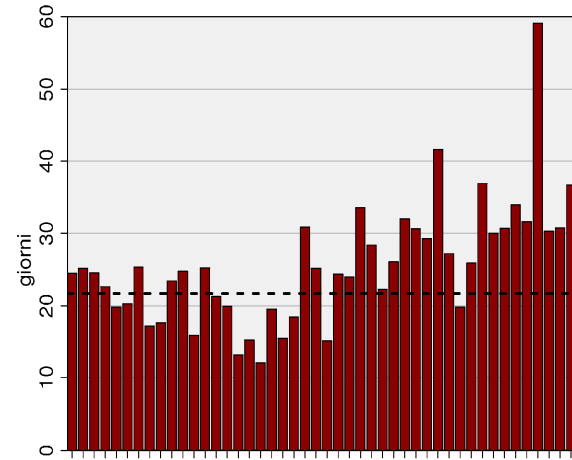
Urban Heat Island Profile [LBNL website <http://eetd.lbl.gov/HeatIsland/>]



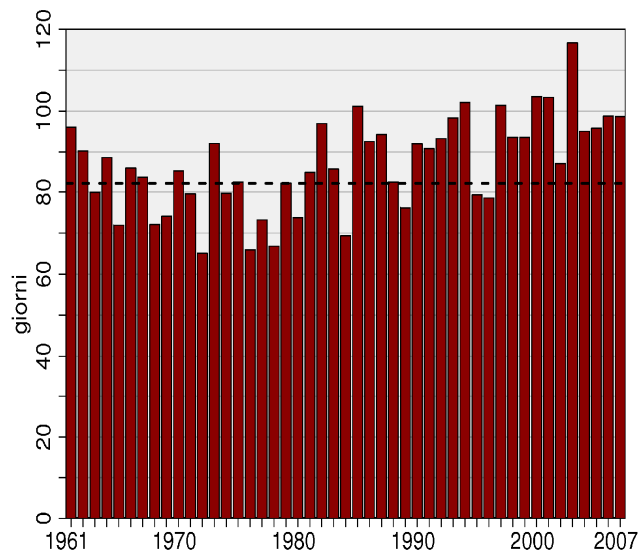
act | Adapting to
Climate change
in Time



N° medio giorni di gelo ($T^{\circ} \leq 0^{\circ}$)



N° medio notti tropicali ($T^{\circ} > 20^{\circ}$)



N° medio giorni estivi ($T^{\circ} > 25^{\circ}$)

- It is not just a question of heat waves
- impact on biodiversity, agriculture practice
- enhanced risk of allergies, VBD & pesticides use

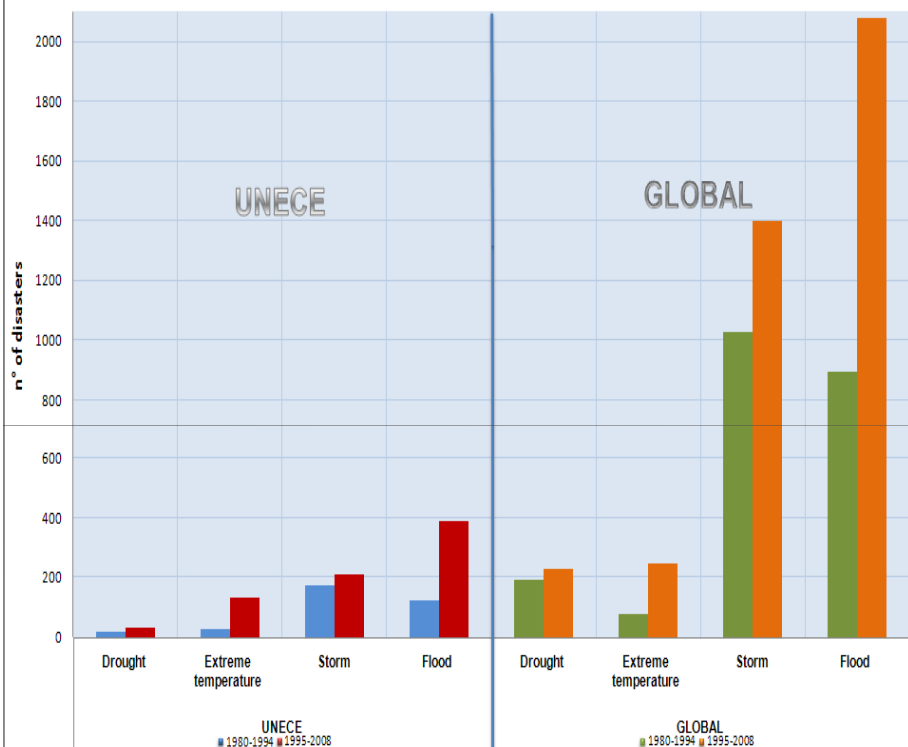
Source: <http://www.scia.sinanet.apat.it/scia.asp#>

temperature pattern in Italy : 1961-2007

Extremes weather events: FACTS & TRENDS

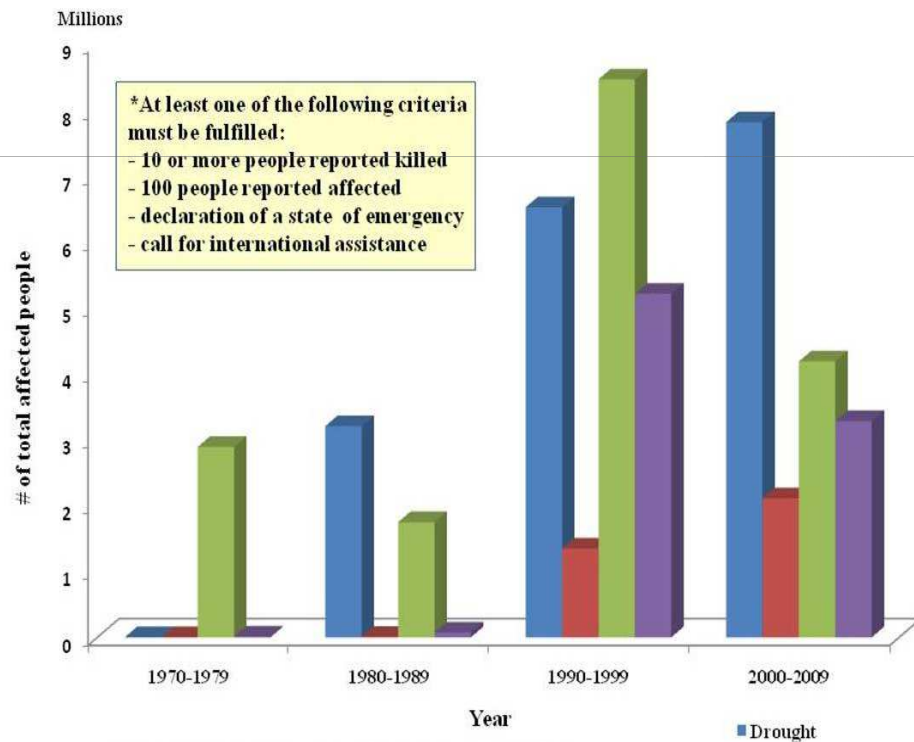


Number of extreme weather disasters 1980-2008
Comparative trends between UNECE and Global Regions



Source: EM-DAT Database by cred*, adapted by ISPRA **
(CRED* = Centre for Research on the Epidemiology of Disasters - Université Catholique de Louvain- ISPRA** = National Institute for Environmental Protection and Research - Italy)

Number of total affected people by drought, extreme temperatures, flood and storm disasters* in UNECE Region (1970-2009)



Source: EM-DAT database by CRED* adapted by ISPRA **
**ISPRA= National Institute for Environmental Protection and Research - Italy
*CRED= Centre for Research on the Epidemiology of Disasters - Université Catholique de Louvain

Water /food safety and extremes

FLOODS

Contaminated discharge in environment and water bodies

Impairment of waste water treatment performance

DROUGHT

Lack of available safe water

Higher pollutants concentrations and/ or overload

Unsafe use of new water sources



▶ Risk for chemical and biological safety of

- Drinking water
- Bathing waters
- Irrigated crops
- Sea food

▶ Increase of vectors and rodents

▶ Increase of Water related diseases

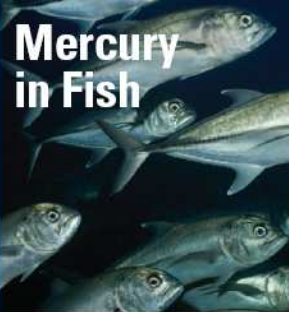
▶ (Costly) impairment of effectiveness of water resources and ecosystem services protection

A Guide to
Protecting
Your Family's
Health



Natural Resources
Defense Council
www.nrdc.org

Mercury in Fish



Eating fish is good for you, right?

It can be. But some fish is high in mercury, a chemical that can cause serious health problems, especially for children and pregnant women.

If you are pregnant or planning to become pregnant, use this guide to see what amount of fish sold in grocery stores and restaurants is safe to eat.

Keep this card with you.

Refer to it when you go to
restaurants or the grocery
store to help you make
healthy choices for you—
and for the ocean.

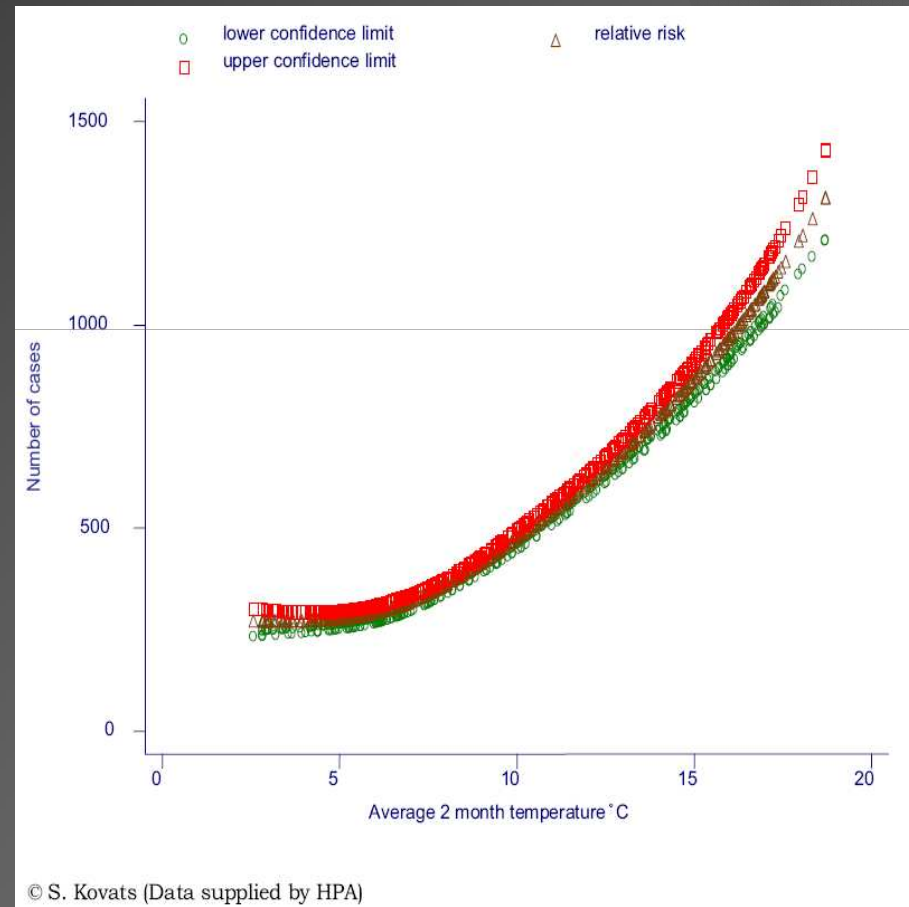


INFO & COMMUNICATION TO MITIGATE INDIVIDUAL RISK



act

Adapting to
Climate change
in Time



Climate Variability and Change in the United States: Potential Impacts on Water- and Foodborne Diseases Caused by Microbiologic Agents

Joan B. Rose,¹ Paul R. Epstein,² Erin K. Lipp,³ Benjamin H. Sherman,⁴ Susan M. Bernard,⁵ and Jonathan A. Patz⁵

Table 5. Examples of some waterborne and foodborne agents and the climate connection.

| Pathogen groups | Pathogenic agent | Foodborne agents | Waterborne agents | Indirect weather effect | Direct weather effect |
|--|---|-----------------------|---------------------------------|---|--|
| Viruses | Enteric viruses (e.g., hepatitis A virus, Coxsackie B virus) | Shellfish | Groundwater | Storms can increase transport from fecal and wastewater sources | Survival increases at reduced temperatures and sunlight (ultraviolet) ^a |
| Bacteria; cyanobacteria; dinoflagellates | <i>Vibrio</i> (e.g., <i>V. vulnificus</i> , <i>V. parahaemolyticus</i> , <i>V. cholerae</i> non-O1; <i>Anabaena</i> spp., <i>Gymnodinium</i> , <i>Pseudonitzschia</i> spp.) | Shellfish | Recreational, wound infections | Enhanced zooplankton blooms | Salinity and temperature associated with growth in marine environment |
| Protozoa | Enteric protozoa (e.g., <i>Cyclospora</i> , <i>Cryptosporidium</i>) | Fruits and vegetables | Recreational and drinking water | Storms can increase transport from fecal and wastewater sources | Temperature associated with maturation and infectivity of <i>Cyclospora</i> |

^aAlso applies to bacteria and protozoa.

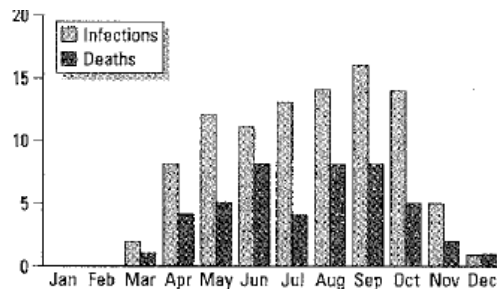


Figure 2. Seasonality of shellfish poisoning in Florida, 1981–1994. Monthly distribution of oyster-associated *V. vulnificus* illness (or shellfish poisoning) and deaths occurring in Florida from 1981 to 1994. Over the 14-year period higher numbers of cases occurred during summer. Monitoring in Florida shows a statistically significant association between concentrations of this pathogen in estuaries and temperature and salinity, the latter being affected by rainfall and runoff. Adapted from Lipp and Rose (77).

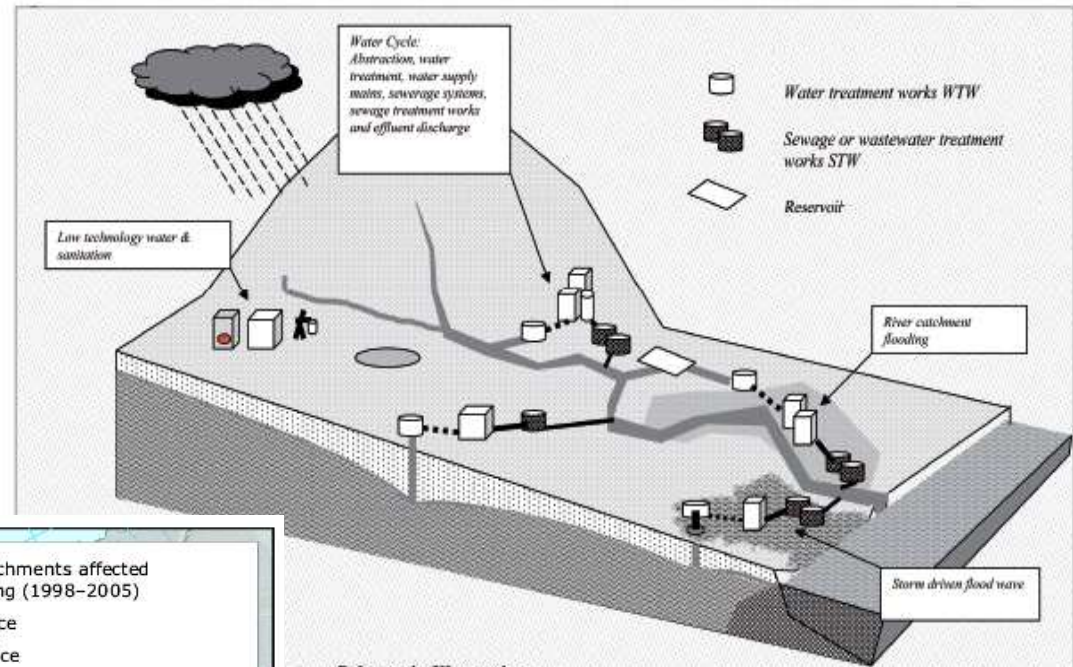
CASE STUDY 7 : UNPRECEDENTED CYANOBACTERIAL BLOOM AND MC PRODUCTION IN A DRINKING-WATER RESERVOIR IN THE SOUTH OF ITALY

Source: Guidance Water Supply and sanitation in extreme weather events , 2010

- References:**
- Luca Lucentini (a), Massimo Ottaviani (a), Sara Bogialli (a), Emanuele Ferretti (a), Enrico Veschetti (a), Rosa Giovanna (b), Concetta Ladalardo (b), Matteo Cannarozzi De Grazia (b), Nicola Ungaro (c), Rosaria Petruzzelli (c), Gianni Tartari (d), Licia Guzzella (d), Marina Mingazzini (d), Diego Copetti (d)
 - (a) Department of Environment and Primary Prevention, Italian National Institute of Health, Rome, Italy.
 - (b) Assessorato alle Politiche della Salute, Regione Puglia, Bari, Italy.
 - (c) Agenzia Regionale per la Prevenzione e la Protezione dell'Ambiente Puglia, Bari, Italy.
 - (d) Water Research Institute, National Research Council, CNR, Brugherio, Monza e Brianza, Italy.

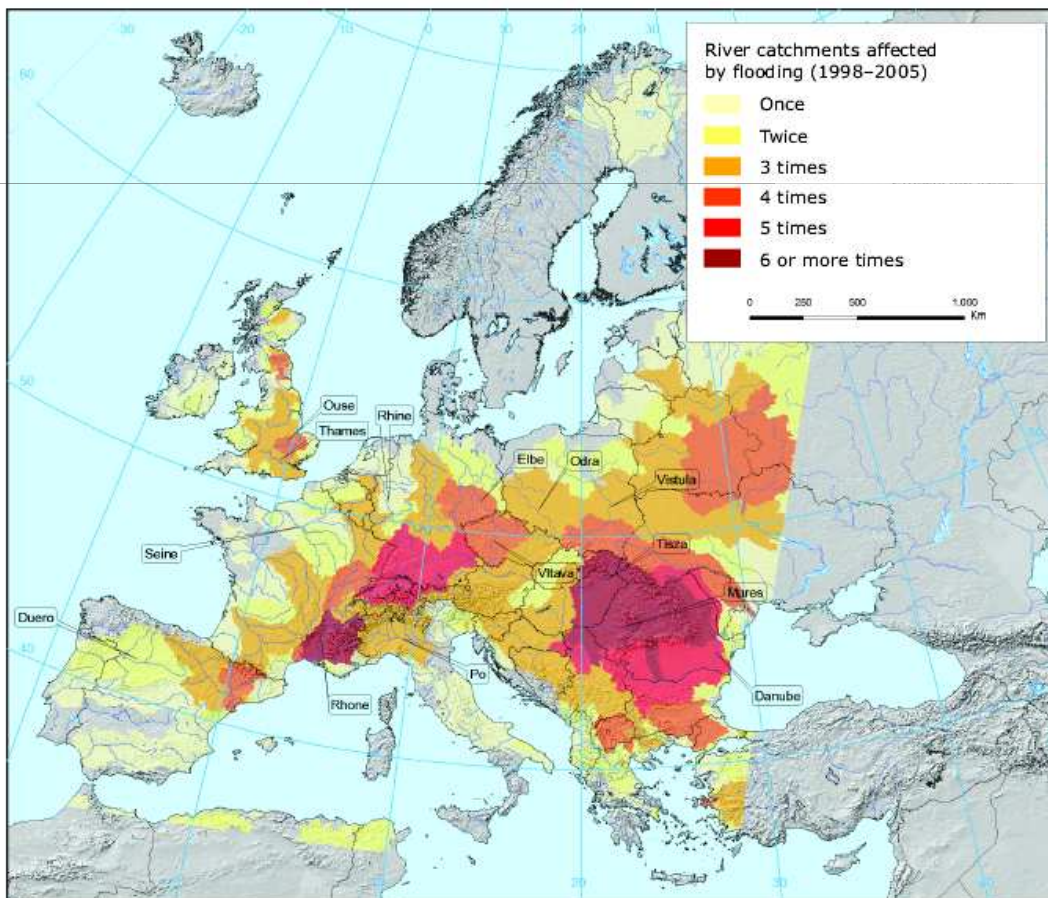
Adaptation challenges

IMPROVE THE LINK BETWEEN IWRM & UTILITIES MANAGEMENT



*Schematic Illustration
River Catchment*

ital Health Engineering, Faculty of Engineering and Physical Sciences, University of Surrey, England.



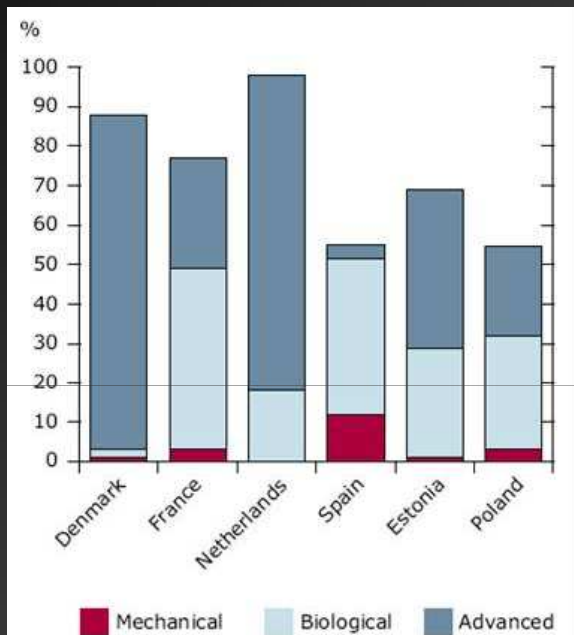
INVOLVE UTILITIES MANAGERS IN RISK MANAGEMENT & ADAPTATION STRATEGIES

WWTP & sewerage: higher vulnerabilities



Adapting to
Climate change
in Time

Courtesy by C.Lasagna, IRIDE aquagas, Italy



Sources: EEA, OECD, Eurostat.

Effectiveness of urban wastewater treatment policies in selected countries: an EEA pilot study “, EEA, 2005



Impact of the storms and heavy rains on the sanitation system



Courtesy by D. Nedvedova, MoE Czech Rep

INDOOR AIR QUALITY, BUILDING ENERGY EFFICIENCY



IMPACTS ON MICROCLIMATE VARIABLES & VENTILATION ?

INCREASED RISK OF TOXIC AND ALLERGENIC SUBSTANCES

SECONDARY POLLUTANTS ?

Table 1. Pollutants considered for inclusion in the WHO indoor air quality guidelines by the WHO working group in October 2006

| Group 1. Development of guidelines recommended | Group 2. Current evidence uncertain or not sufficient for guidelines |
|---|--|
| Benzene | Acetaldehyde |
| Carbon monoxide | Asbestos |
| Formaldehyde | Biocides, pesticides |
| Naphthalene | Flame retardants |
| Nitrogen dioxide | Glycol ethers |
| Particulate matter (PM _{2.5} and PM ₁₀) | Hexane |
| Polycyclic aromatic hydrocarbons, especially benzo-[a]-pyrene | Nitric oxide |
| Radon | Ozone |
| Trichloroethylene | Phthalates |
| Tetrachloroethylene | Styrene |
| | Toluene |
| | Xylenes |

WHO GUIDELINES , 2010

Conclusions

- **Climate change will affect health mostly through environmental determinants.**
- **Environmental and Health determinants are often outside the Health sector domain**
- **Risk and impacts management then requires cooperation of all sectors and responsible stakeholders**
- **Climate change challenges can be an opportunity for SD strategies at global and local level**