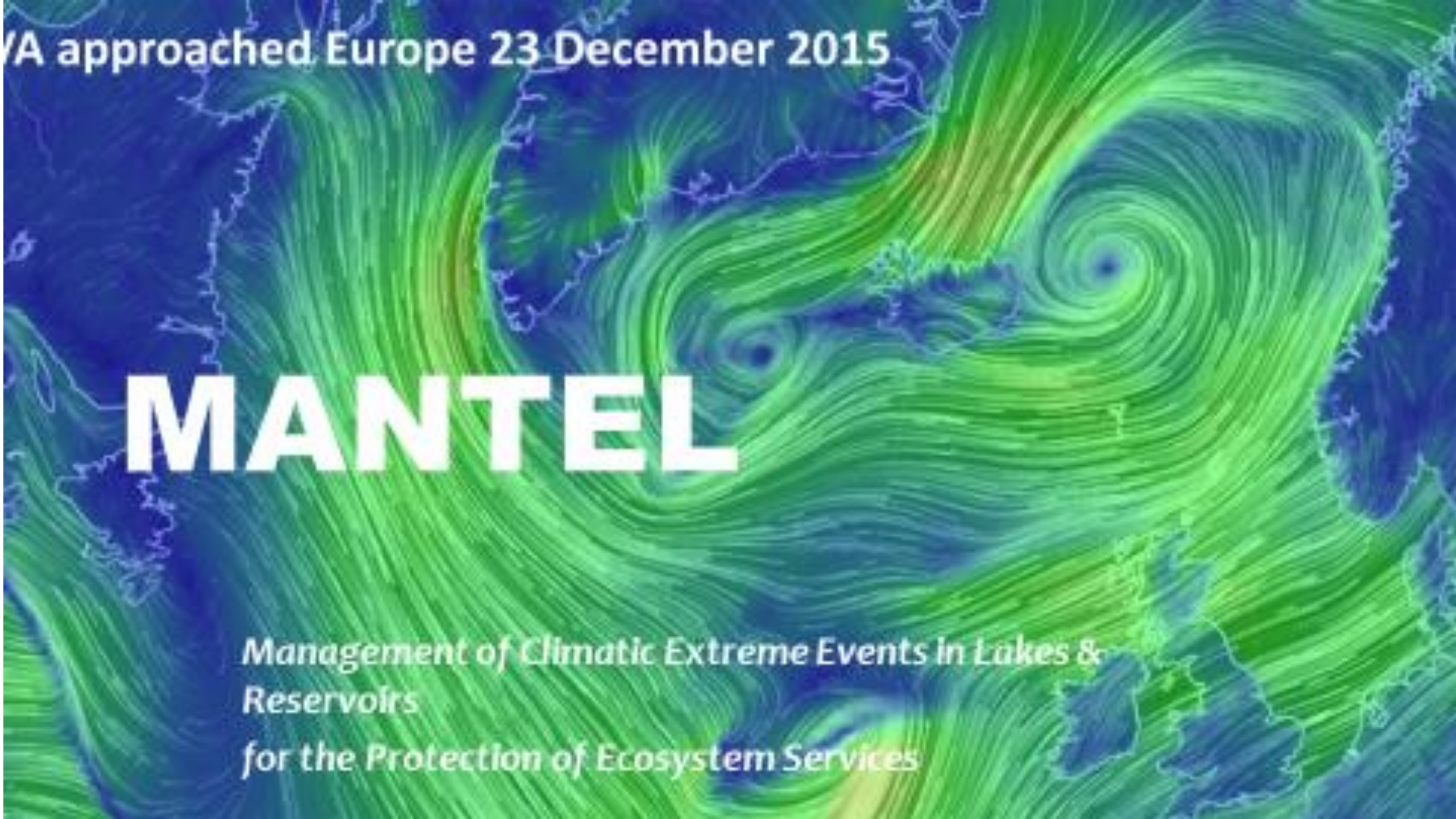
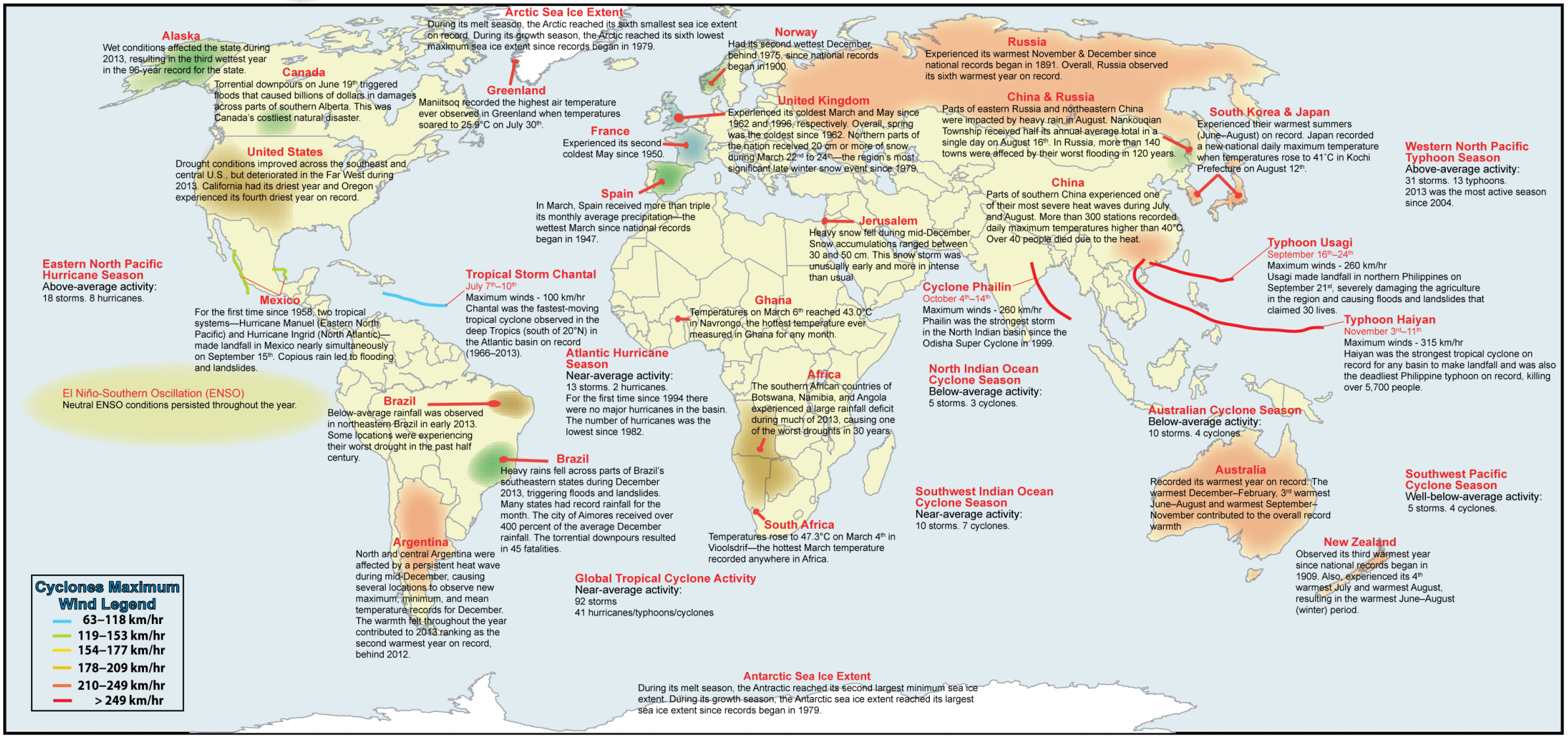


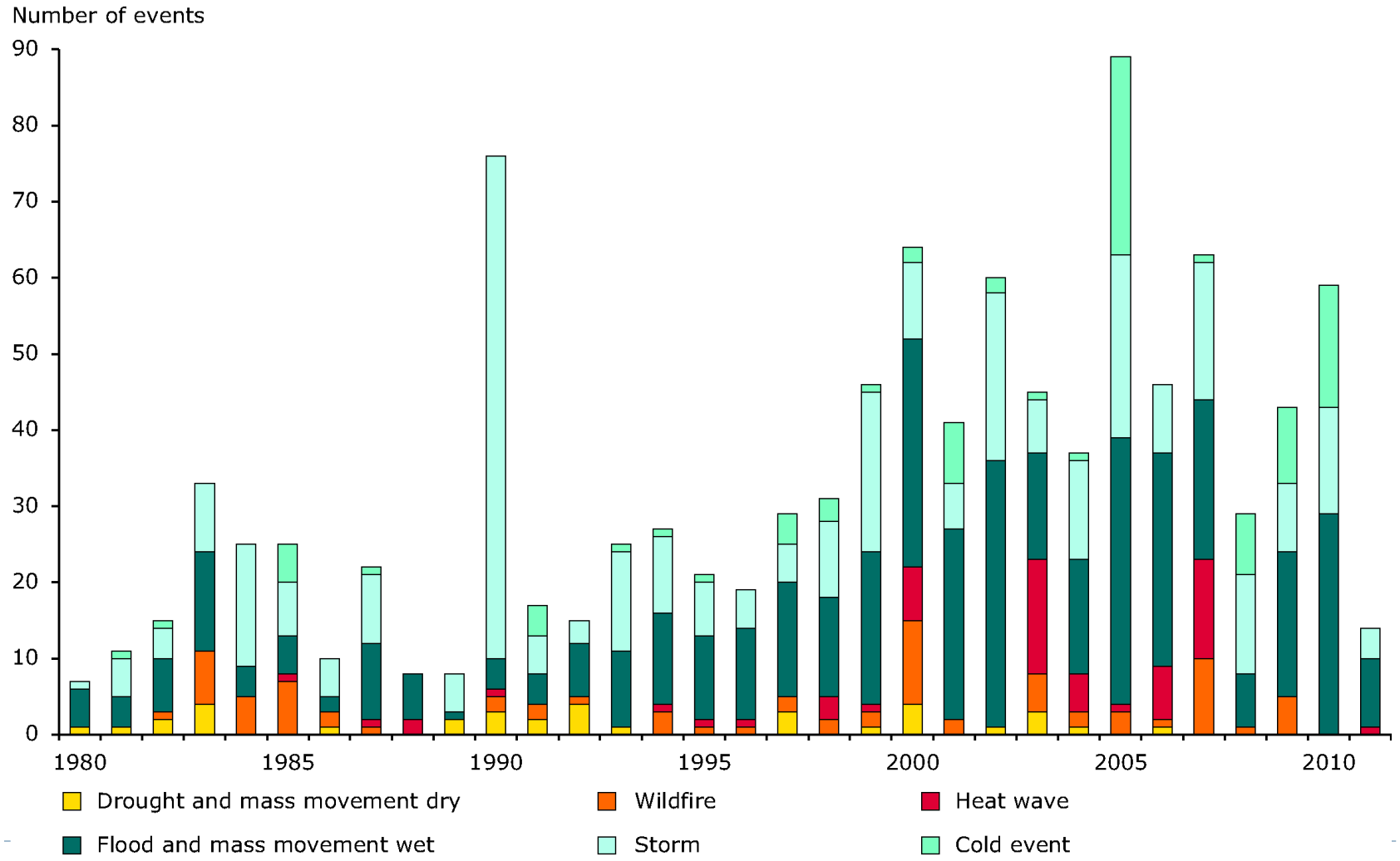

# MANTEL

*Management of Climatic Extreme Events In Lakes & Reservoirs for the Protection of Ecosystem Services*

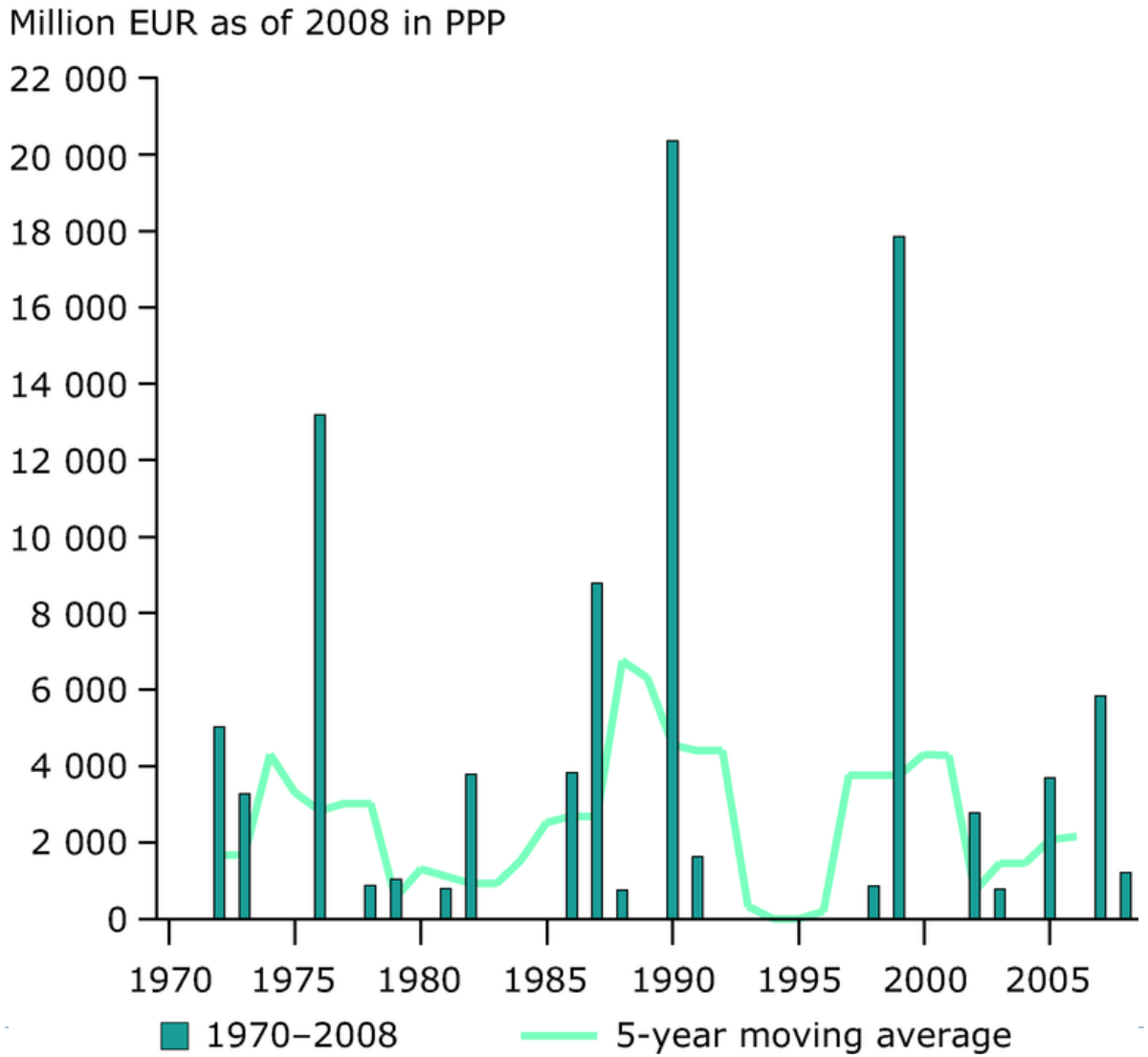
# 2013 Significant Climate Anomalies and Events



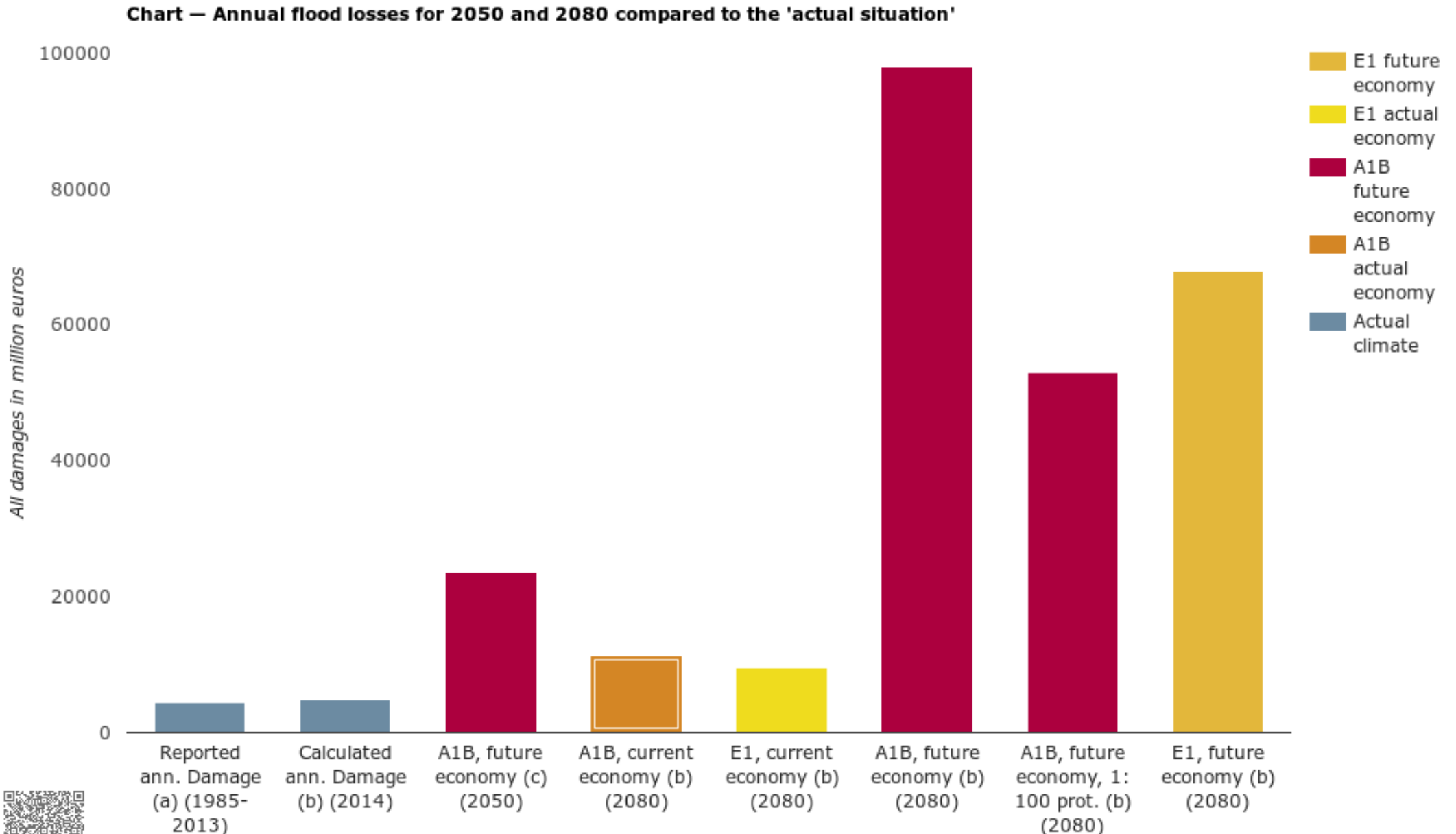
# Europe


Number of events
90
80
70
60
50
40
30
20
10
0
1980
1985
1990
1995
2000
2005
2010
Drought and mass movement dry
Wildfire
Heat wave
Flood and mass movement wet
Storm
Cold event

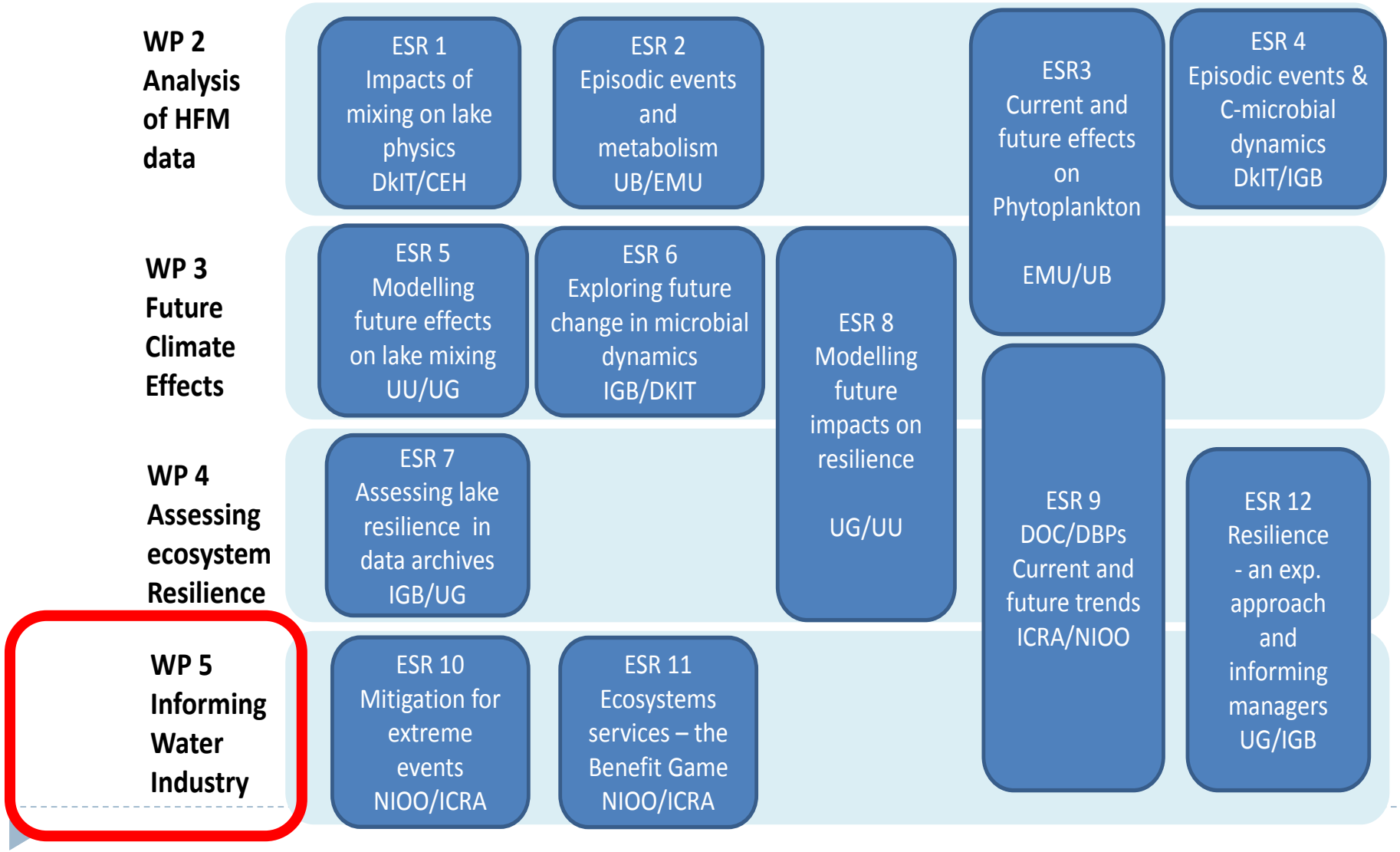
# Losses due to storms



# Losses due to floods

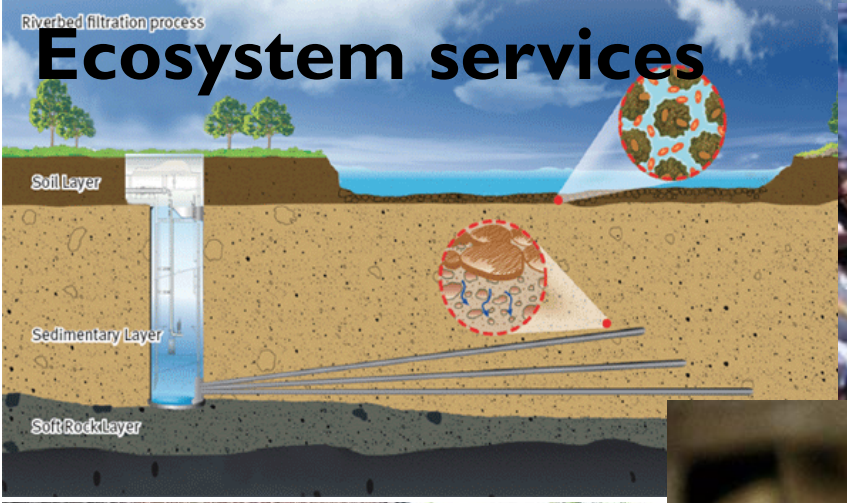


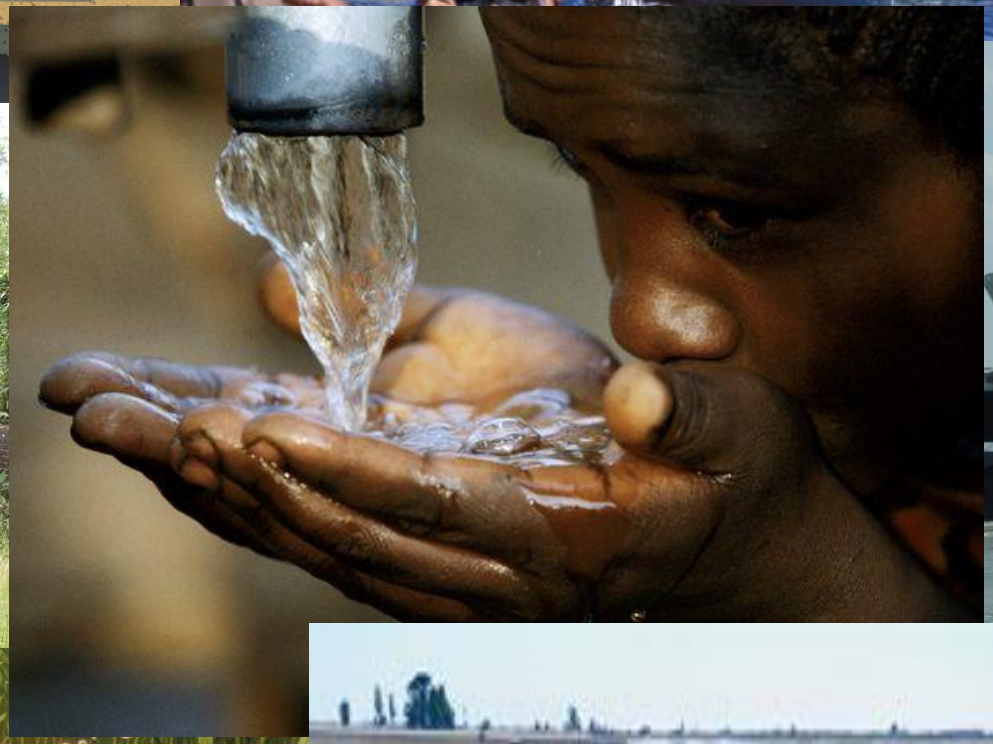
# 12 PhDs divided over 5 workpackages



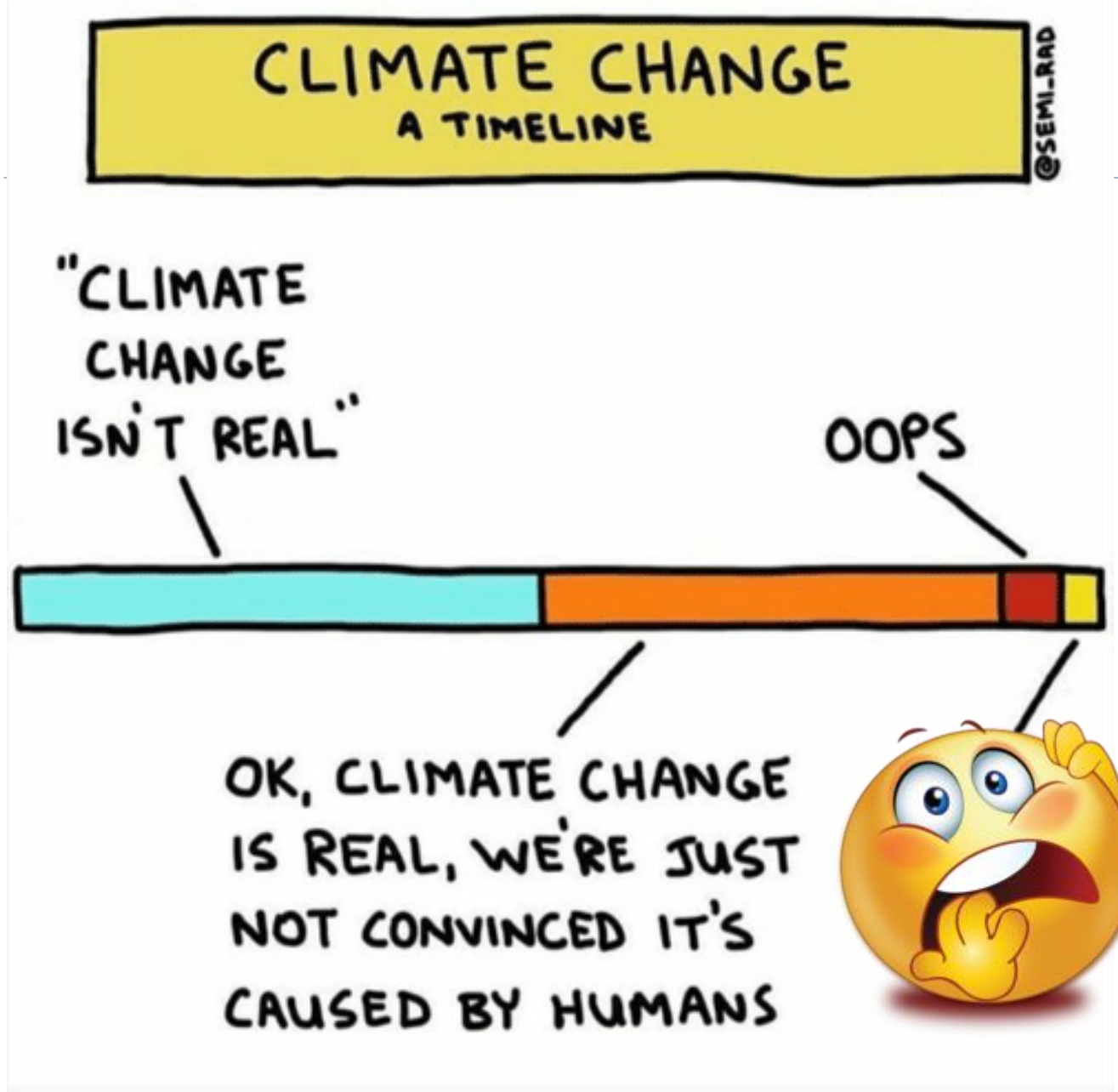
# Human-water interactions: lessons for ecology and management

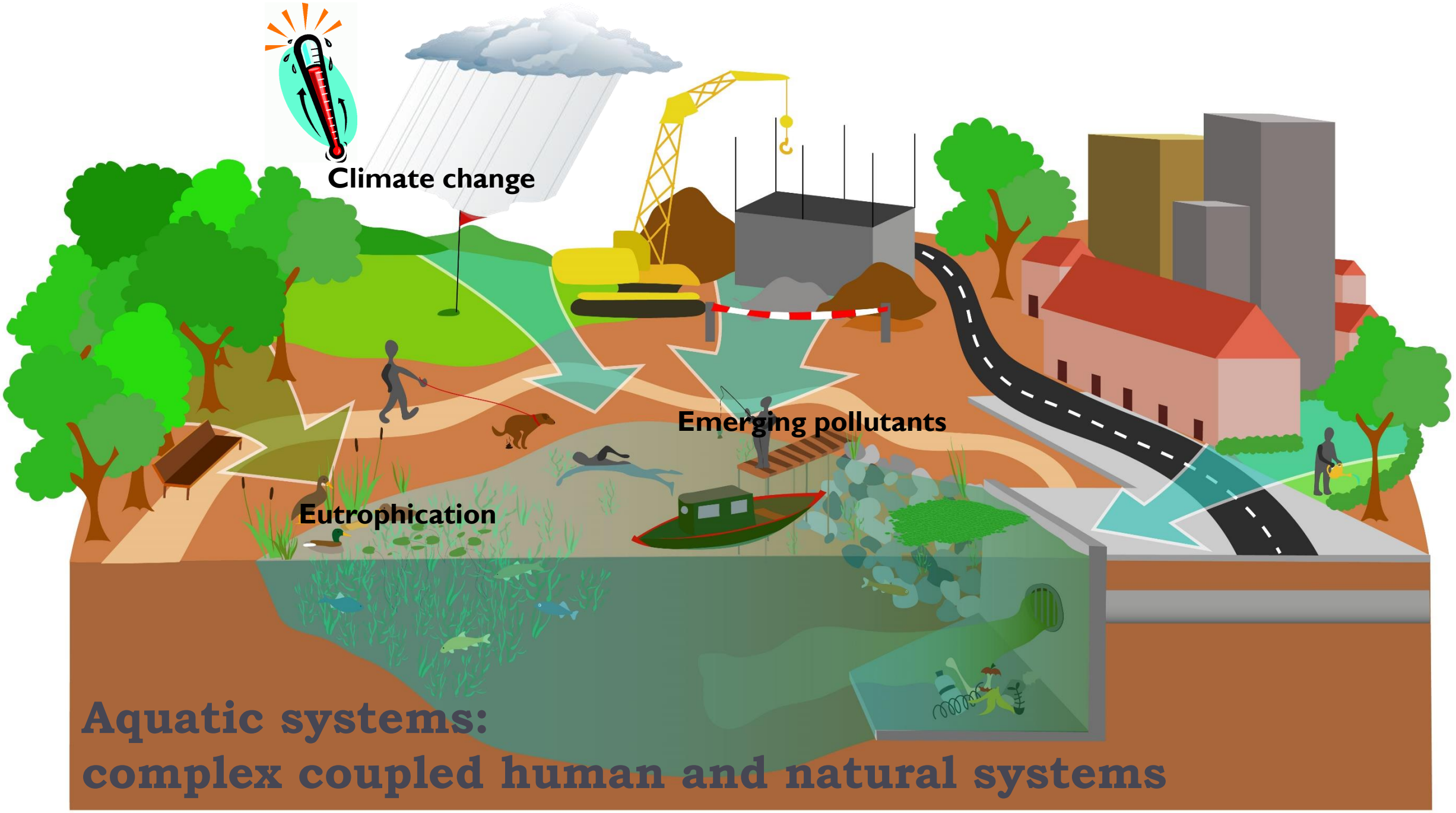
# Ecosystem services




ANTHROPOCENE

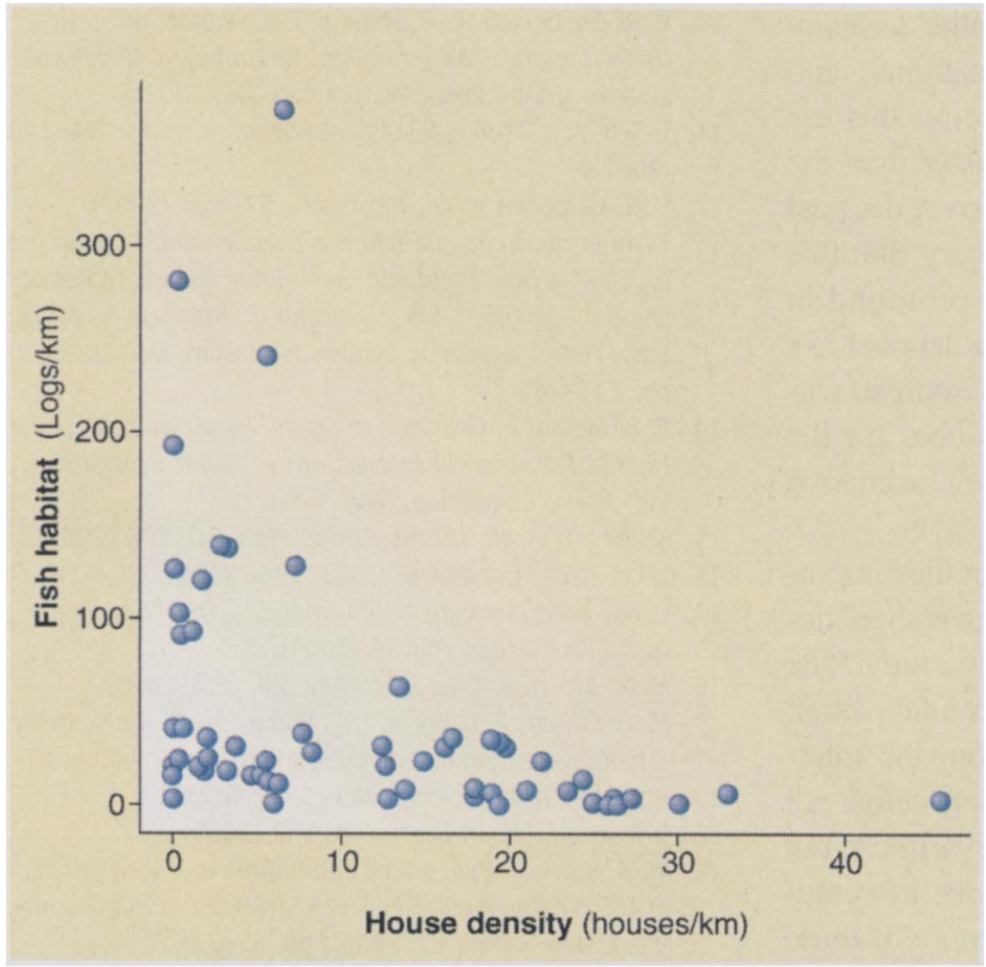

CLIMATE CHANGE
A TIMELINE
@SEMI_RAD
"CLIMATE CHANGE ISN'T REAL"
OOPS
OK, CLIMATE CHANGE IS REAL, WE'RE JUST NOT CONVINCED IT'S CAUSED BY HUMANS




*Adapted from Teurlincx et al., COSUST, 2018*

# Complexity of coupled human-water systems

- Complex feedback loops
- Non linearity and tresholds
- Surprises
- Legacy effects and time lags
- Heterogeneity (context dependence)
- Resilience




*Liu et al., Science, 2007*

# Complexity of coupled human-environmental systems

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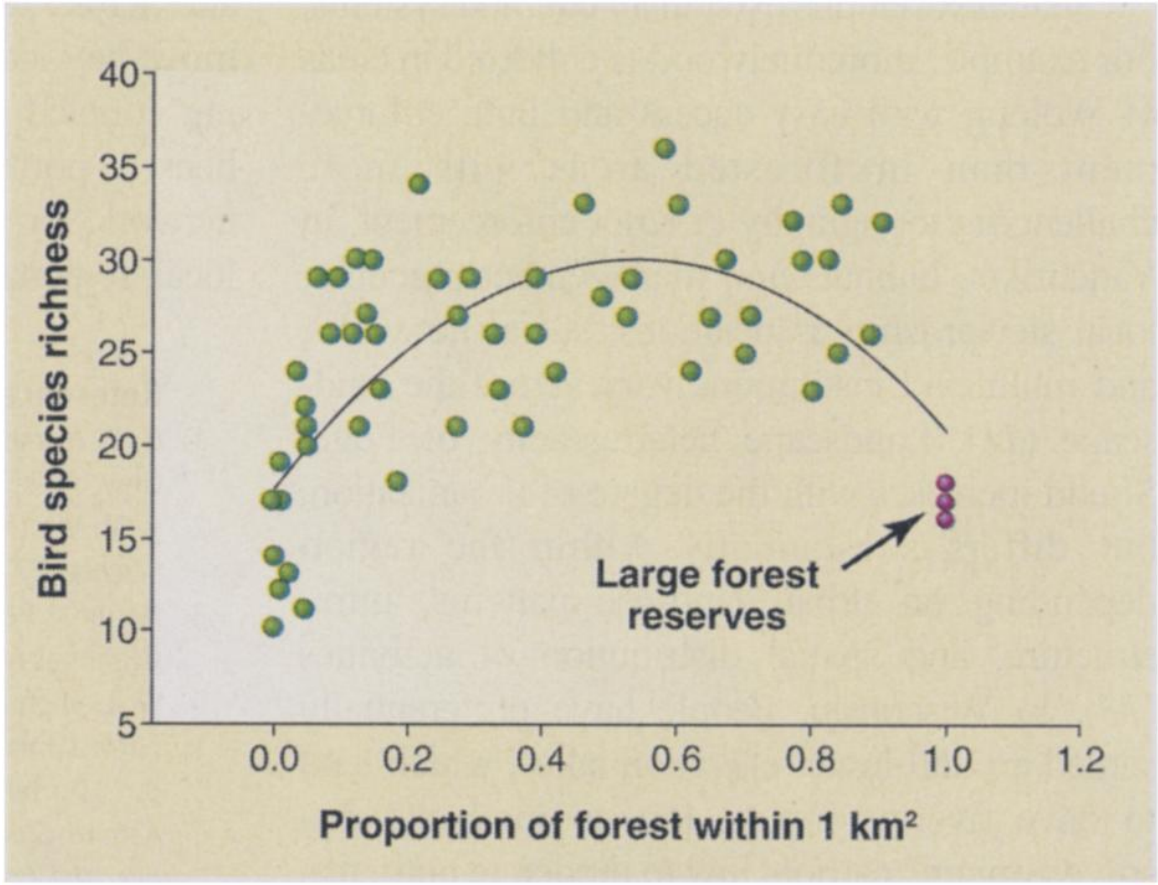
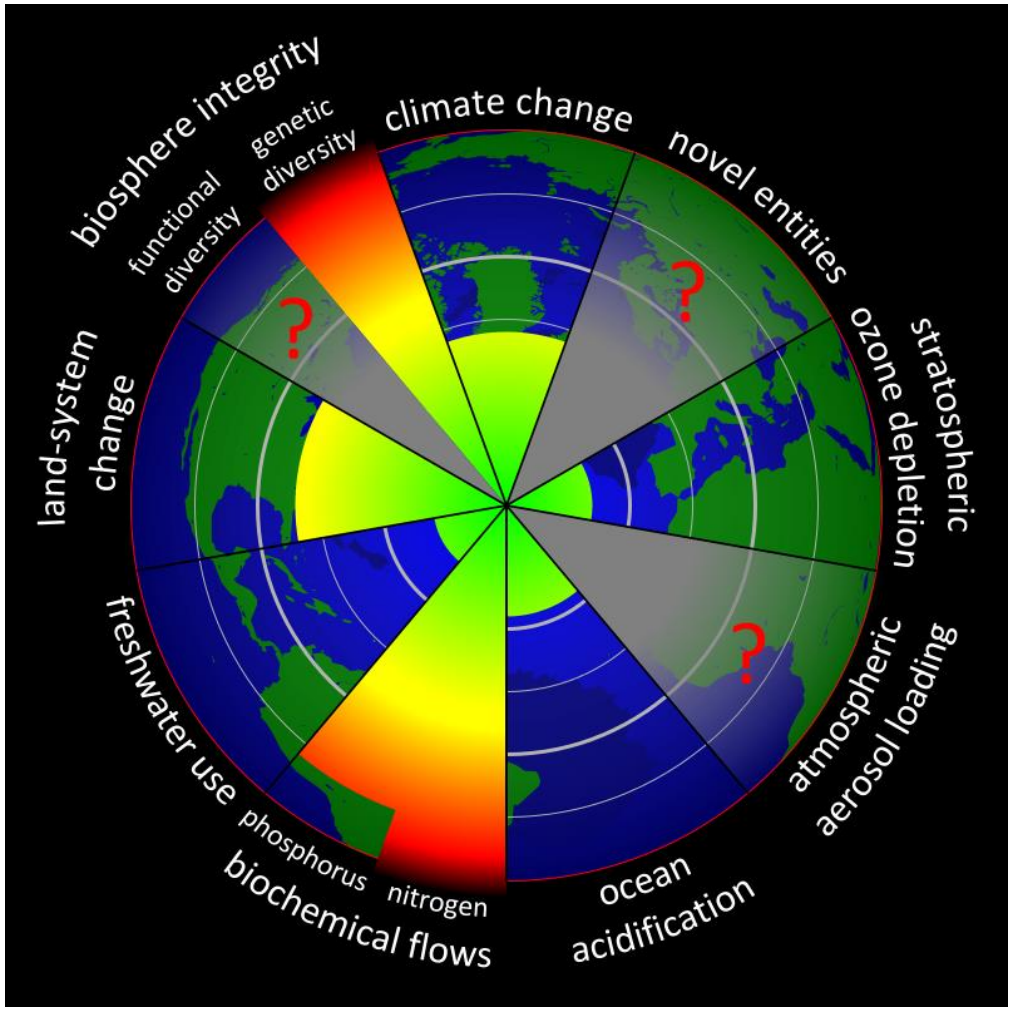


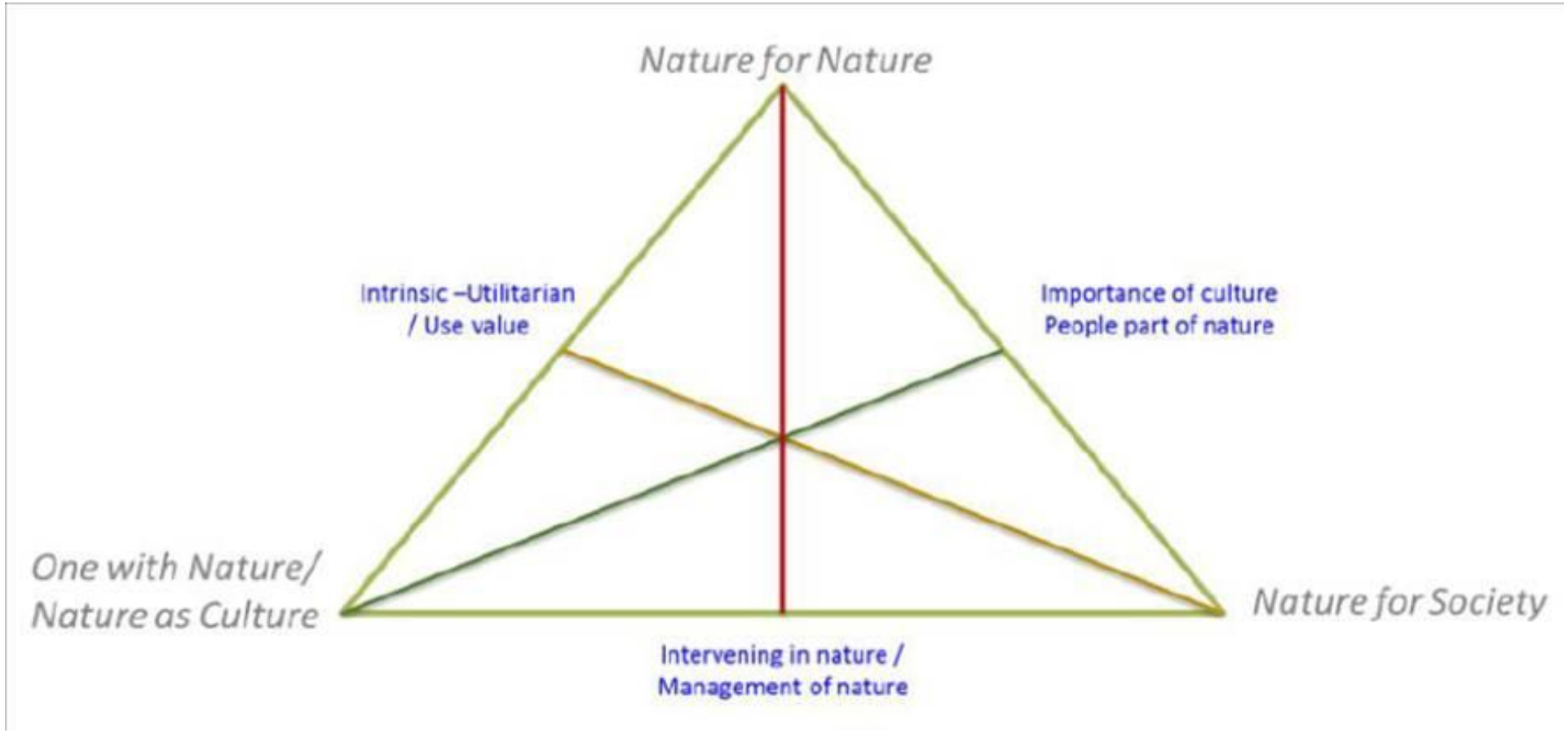

*Liu et al., Science, 2007*

# From reaping benefits to recognizing that humans are part of ecosystems

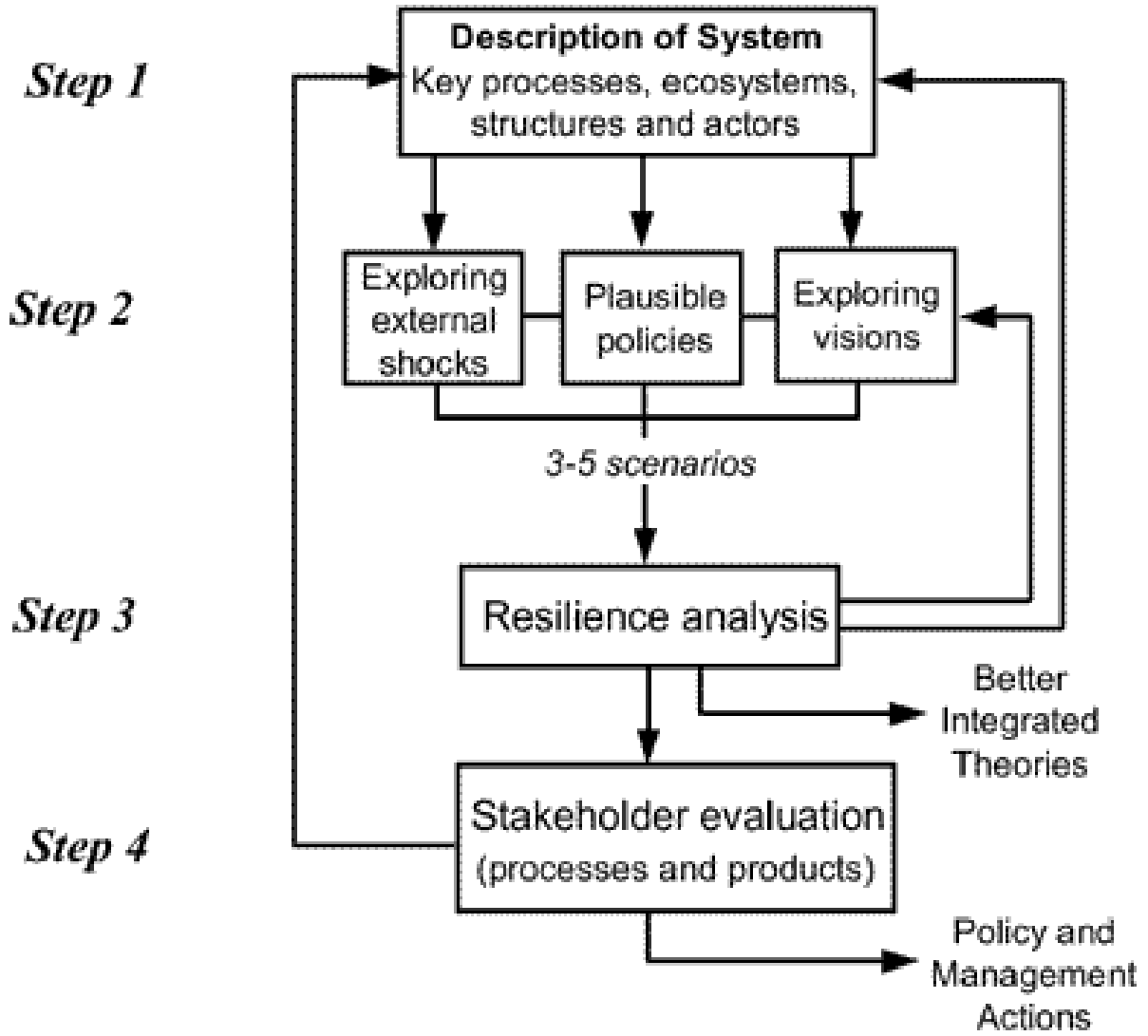




**Benefits**

**Planetary boundaries**




*Courtesy of Jan Kuiper, Stockholm Resilience*




*Walker et al., Ecology and Society, 2002*

# Water: a finite resource in a fast changing world… how do we better manage these resources?

# Program morning

- 09.30 - 10.00 Opening
- 10.00 - 10:30 Goals and measures for the Water Framework Directive: how do we make the right choices? (Elisabeth Ruijgrok, Witteveen+Bos)
- 10.30 - 11.00 Ecosystem services in river basins (Didac Jordà, Catalan Institute for Water Research)
- 11.00 - 11.30 Coffee break
- 11.30 - 12.00 Ecological Key factor context: A diagnostic tool for understanding ecosystem services (Alexander van Oudenhoven, Institute of Environmental Sciences of Leiden University)
- 12.00 - 12.30 Interactive recap of the morning, KAHOOT
- 12.30 - 13.30 Lunch break with optional tour around the NIOO building

# Program afternoon

- 13:30 - 14.30 Workshop session 1:
  - (a) Dutch workshop on usability tools such as key factor Context (Tessa van der Wijngaart (STOWA)
  - (b) Introduction to the ecological key factor concept (Marloes van der Kamp, Witteveen+Bos/STOWA)
- 14.30 - 15.00 Break and switch to sessions
- 15.00 - 16:00 Workshop session 2:
  - (a) The Markermeer (Dutch casus), by Marcel van den Berg, Rijkswaterstaat)
  - (b) Spanish casus, by Didac Jordà, Catalan Institute for Water Research)
  - (c) Survey of Maggie Armstrong (PhD student) with practitioners
- 16.00 - 17.00 Closure and Drinks