LuWQ 2015

International Interdisciplinary Conference on
Land Use and Water Quality
Agricultural Production and the Environment
Vienna, Austria, 21-24 September 2015

National Institute for Public Health and the Environment
Ministry of Health, Welfare and Sport

Farming within environmental boundary conditions

Developments and challenges

Dico Fraters, Karel Kovar, Brian Kronvang, Roland Stenger

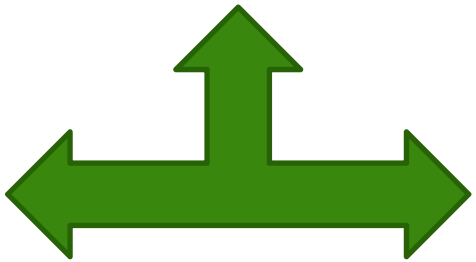
AARHUS UNIVERSITY
DEPARTMENT OF BIOSCIENCE

LINCOLN AGRITECH LTD

The common challenges for agriculture

Green energy

High quality food



Clean water

LuWQ 2015

International Interdisciplinary Conference on
Land Use and Water Quality
Agricultural Production and the Environment
Vienna, Austria, 21-24 September 2015

National Institute for Public Health and the Environment
Ministry of Health, Welfare and Sport

Outline

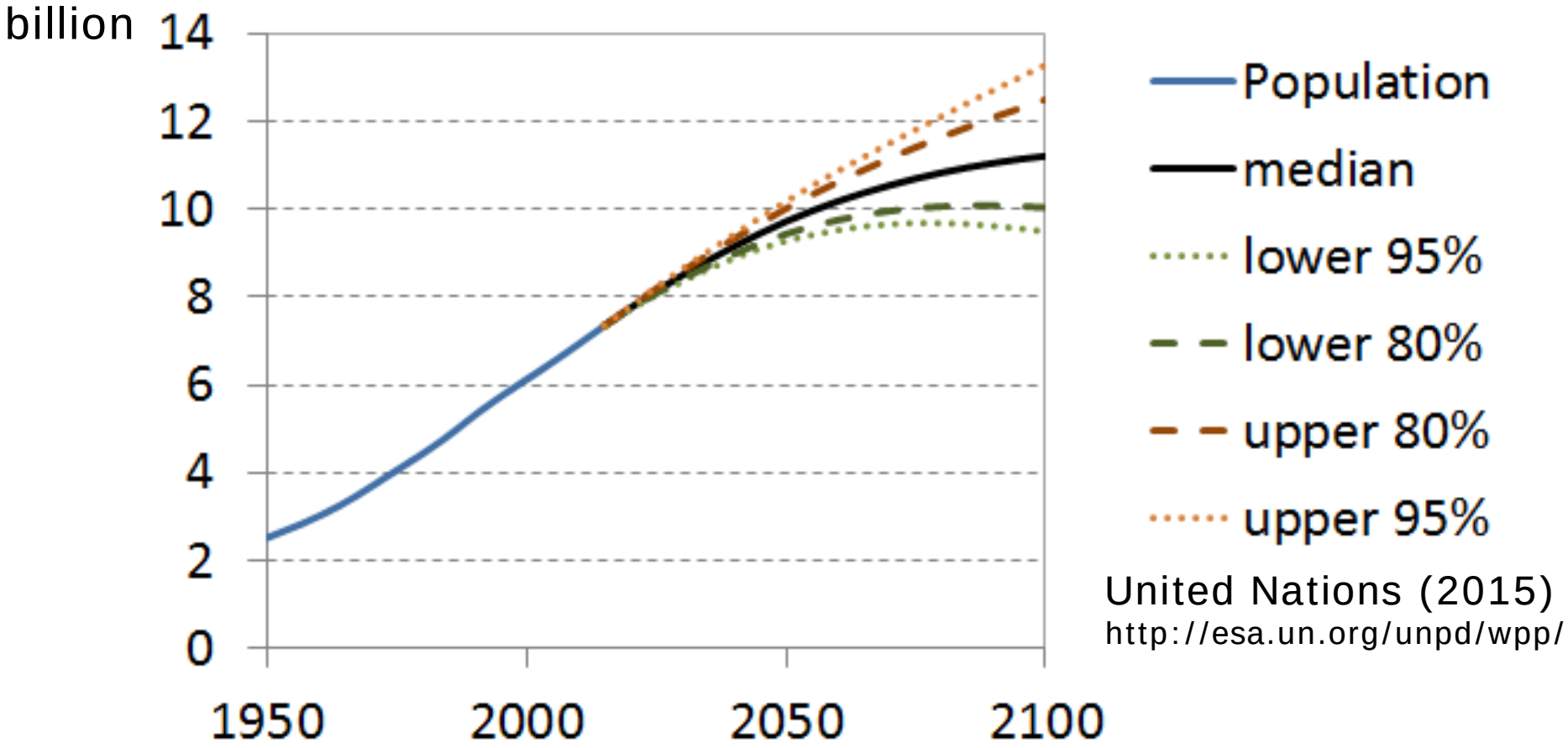
1. The common challenges for agriculture - details
2. Examples of successes, failures, and challenges
3. Dealing with the challenges
4. LuWQ2015 conference

AARHUS UNIVERSITY
DEPARTMENT OF BIOSCIENCE

LINCOLN AGRITECH LTD

Development of world population

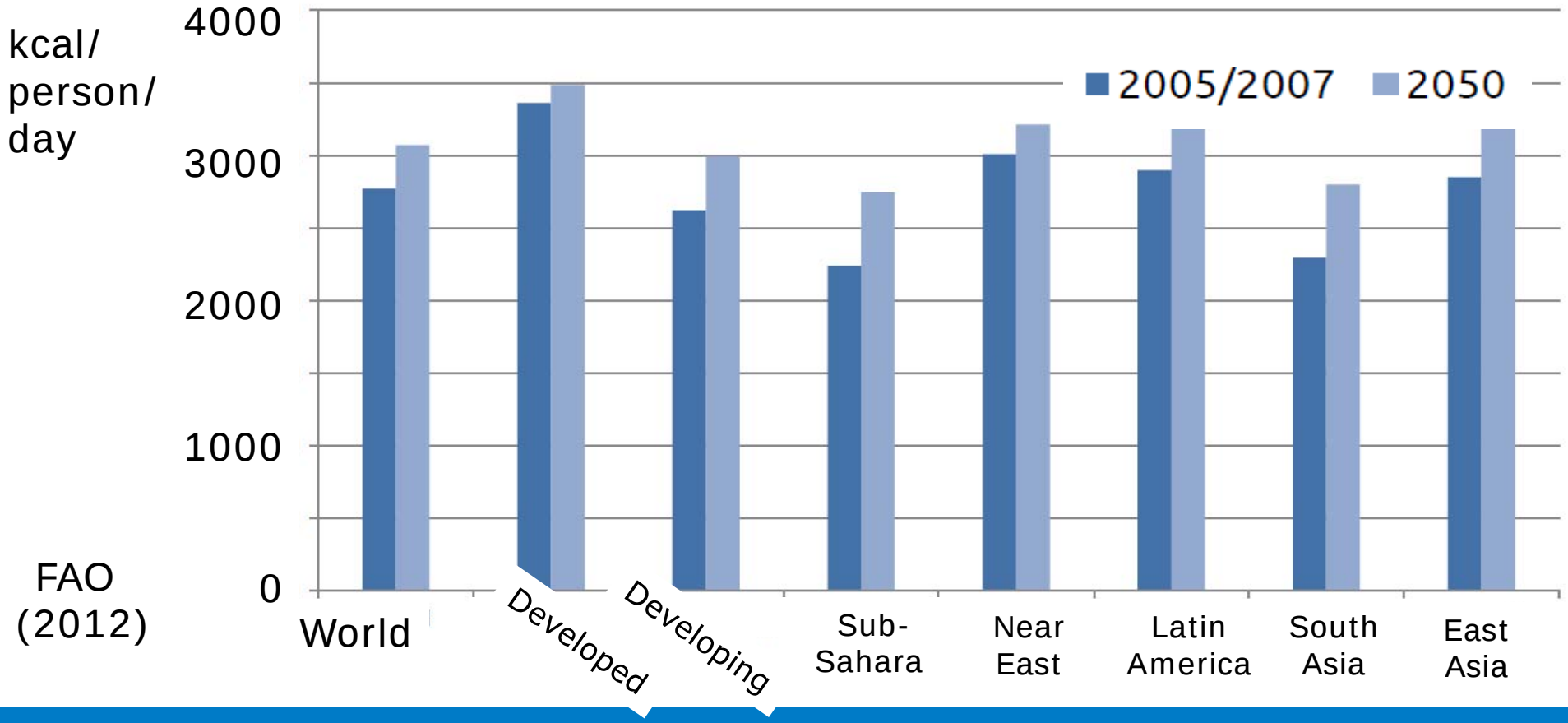
About 40% increase in population between 2005 and 2050



United Nations (2015)
http://esa.un.org/unpd/wpp/

Per capita food consumption

About 10% increase in consumption per person between 2005 and 2050

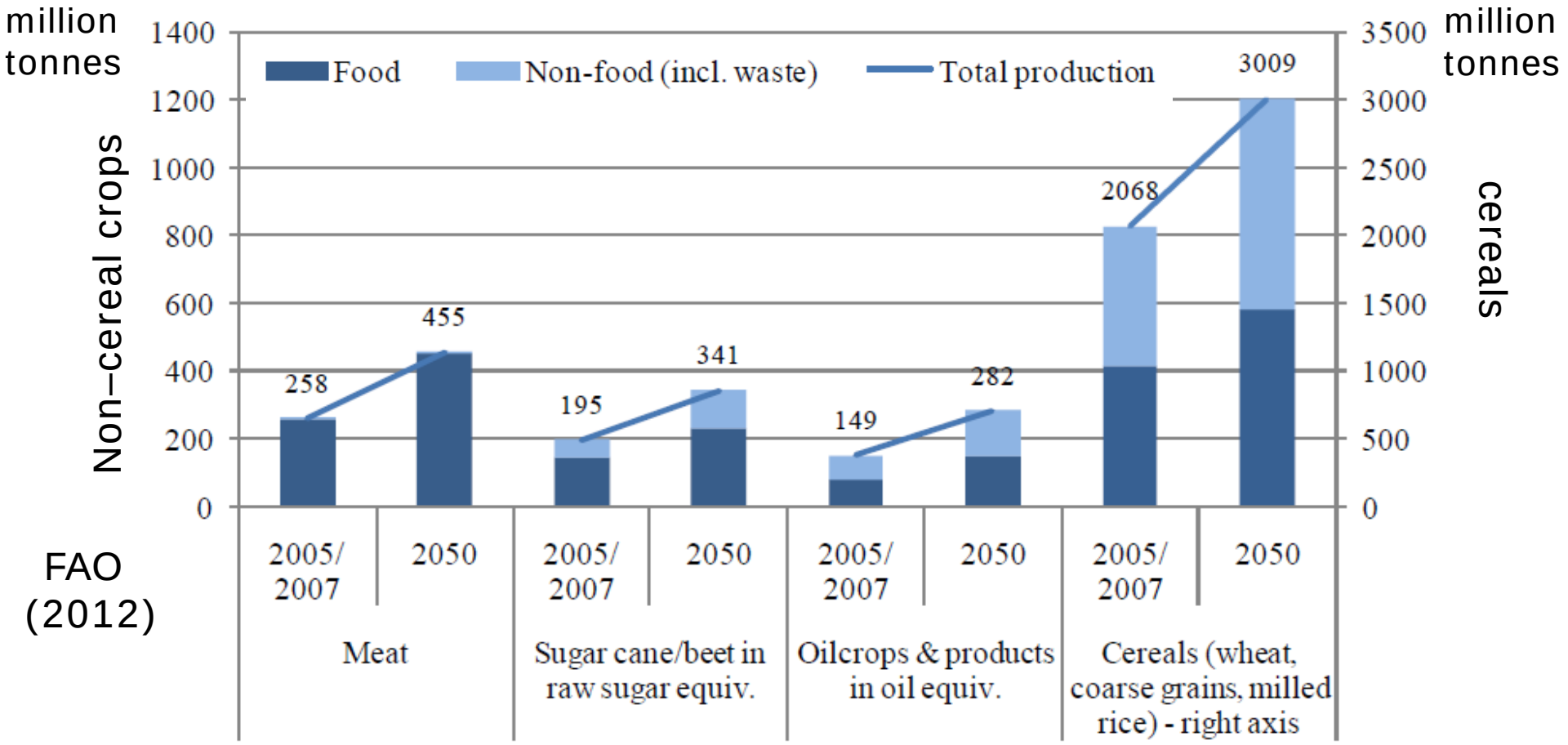


FAO (2012)

http://www.fao.org/docrep/016/ap106e/ap106e.pdf

World production and use, major products

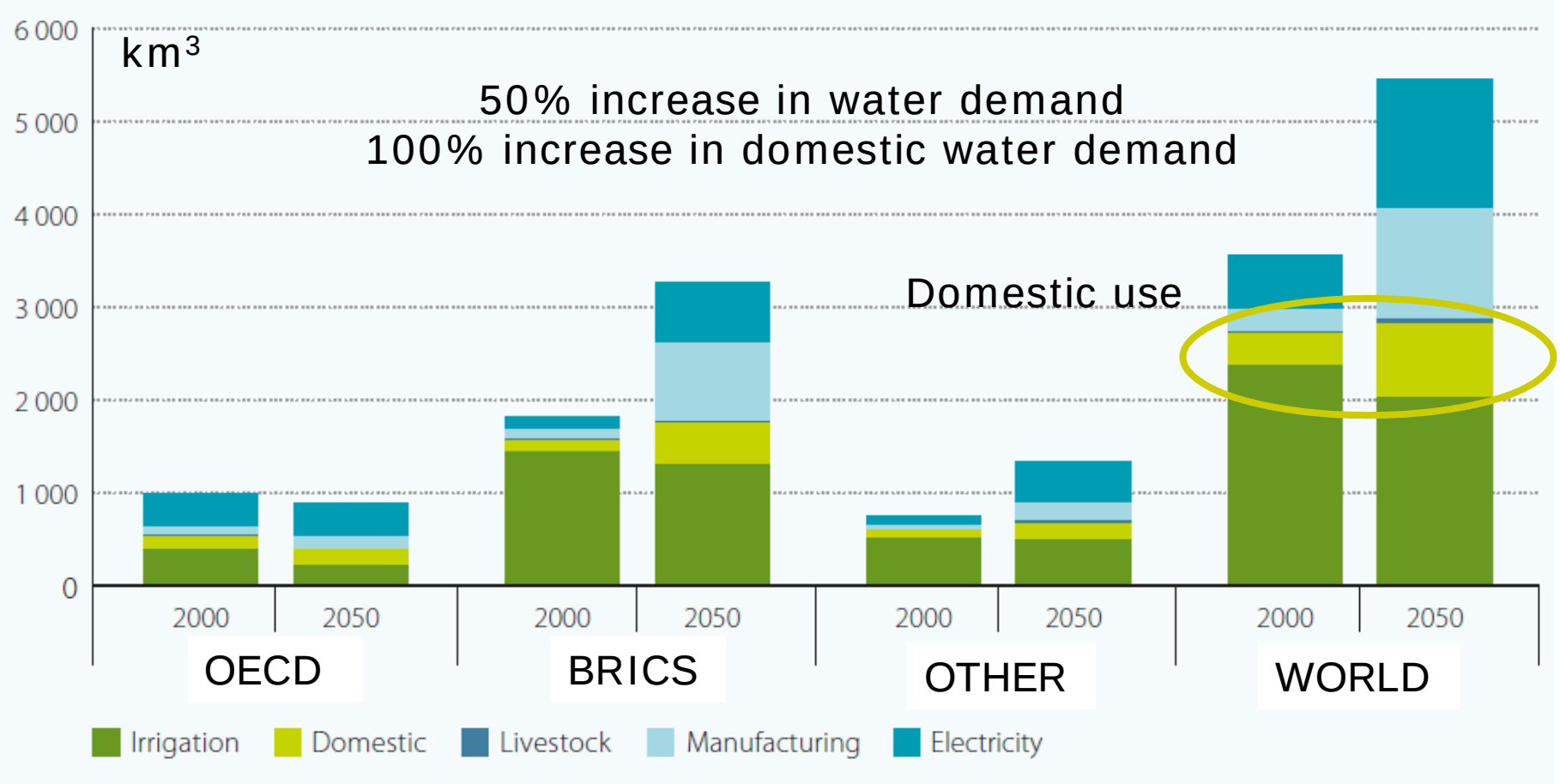
60% increase in agricultural production between 2005 and 2050



FAO (2012)

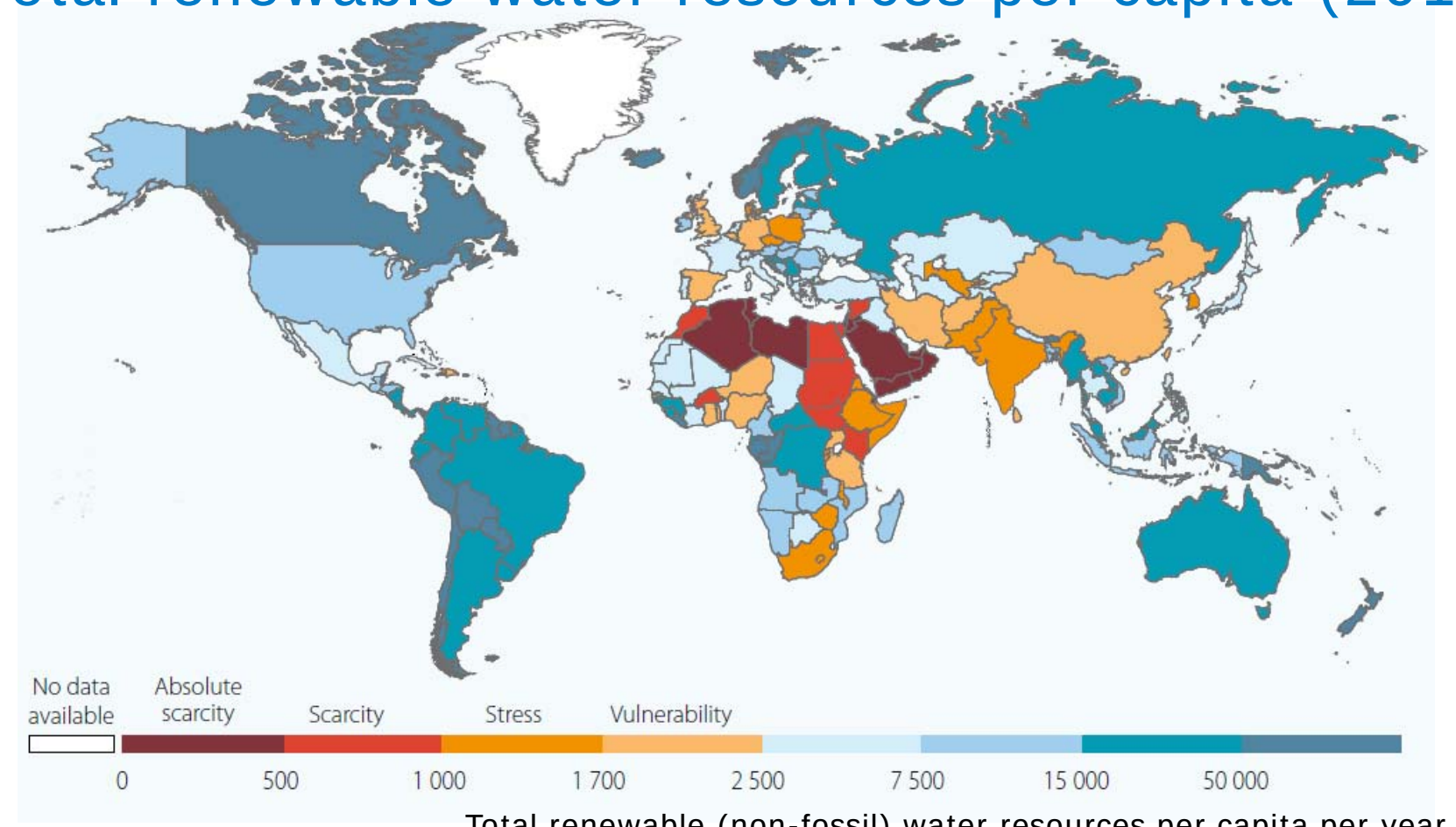
http://www.fao.org/docrep/016/ap106e/ap106e.pdf

Total water demand (baseline scenario 2000 and 2050)



Unesco(2015) http://unesdoc.unesco.org/images/0023/002321/232179E.pdf

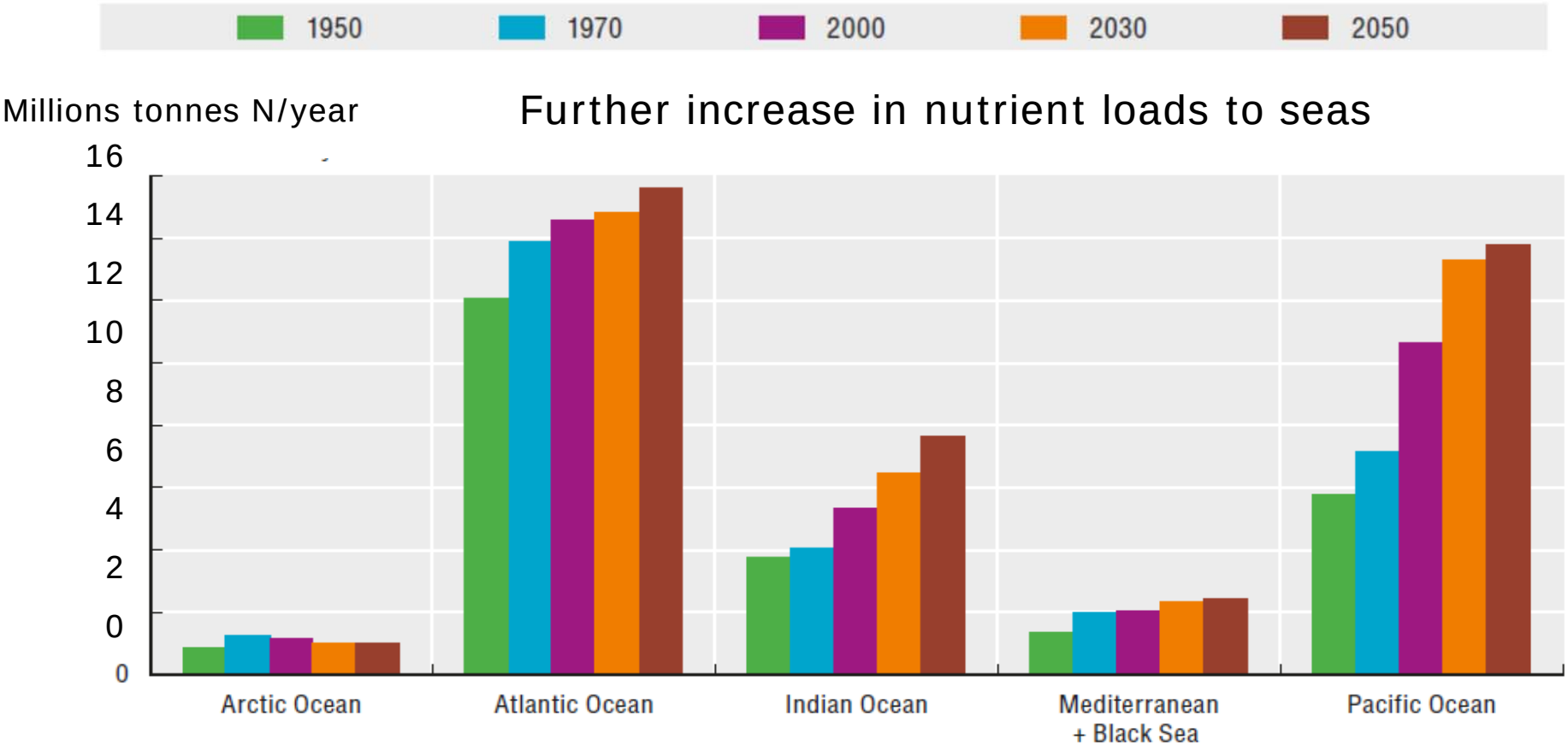
Total renewable water resources per capita (2013)



Total renewable (non-fossil) water resources per capita per year in m^3

Unesco(2015) http://unesdoc.unesco.org/images/0023/002321/232179E.pdf

River discharges of nitrogen into the sea

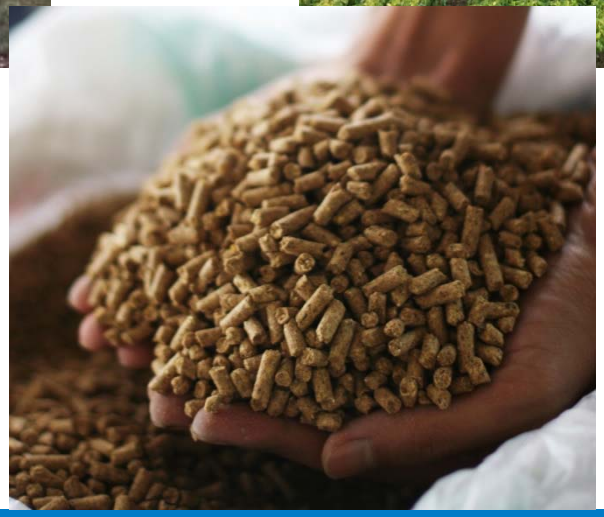


OECD (2012) Environmental Outlook to 2050

Not only nutrients, but also …

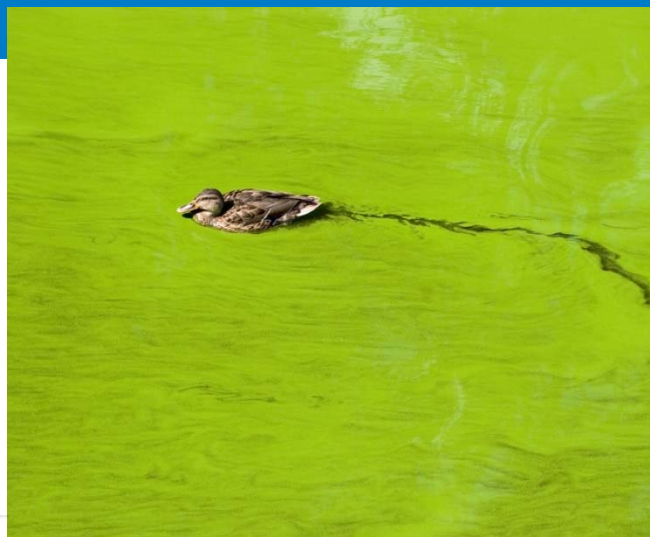
natural hormones

pesticides

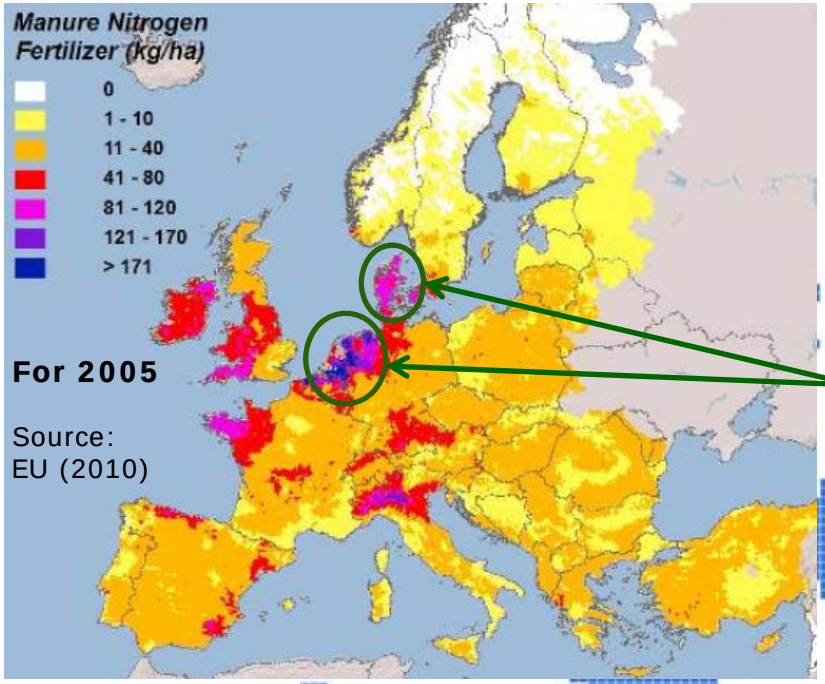


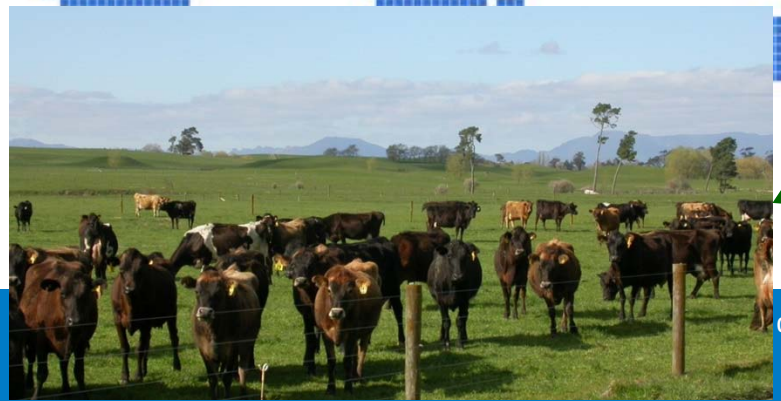
heavy metals

What can we do to prevent this?

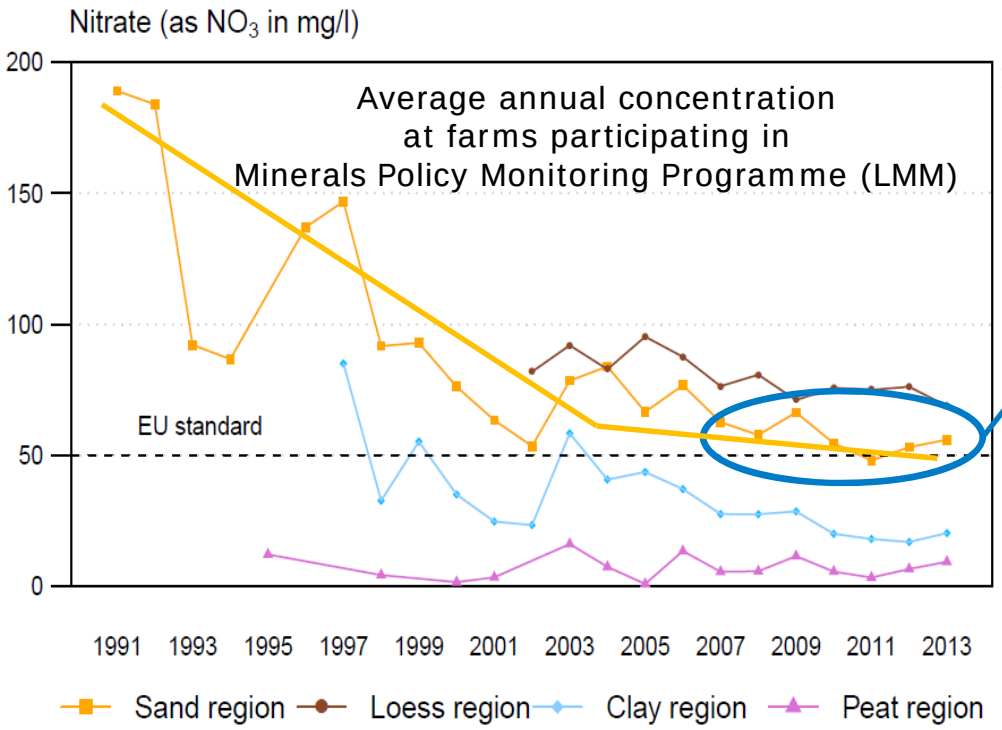


2. Examples of successes, failures and challenges

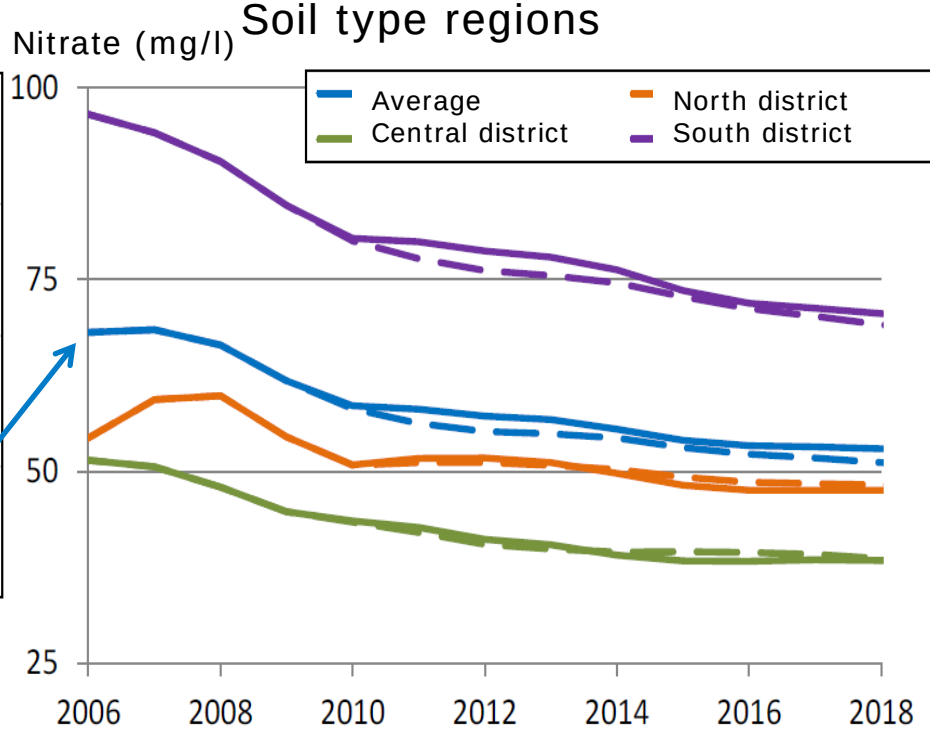




The Netherlands – results of actions



Source: www.rivm.nl/lmm

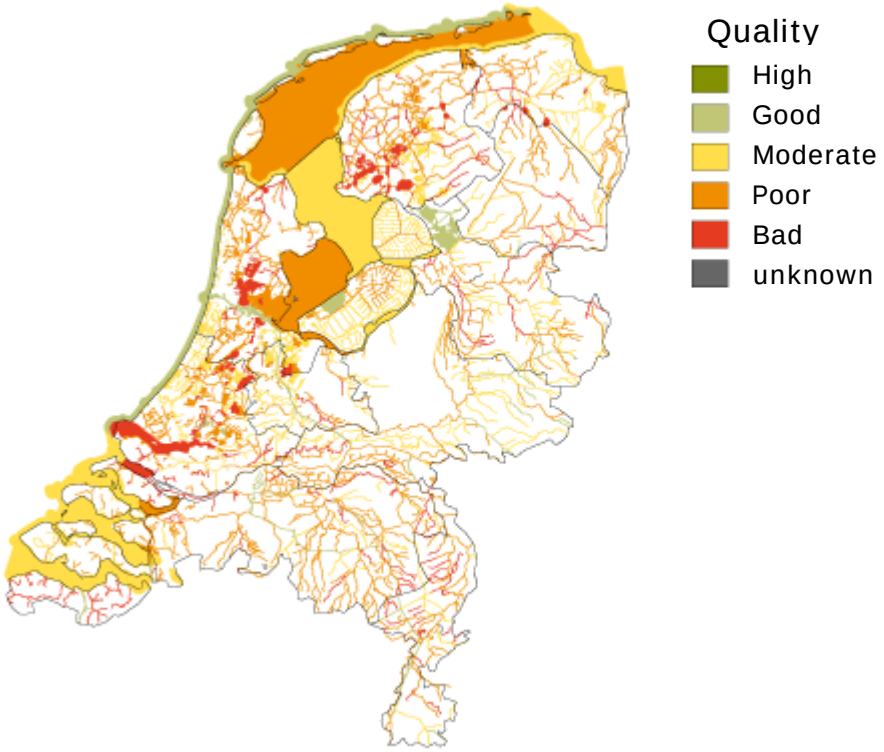


Source: Alterra (http://edepot.wur.nl/343644)

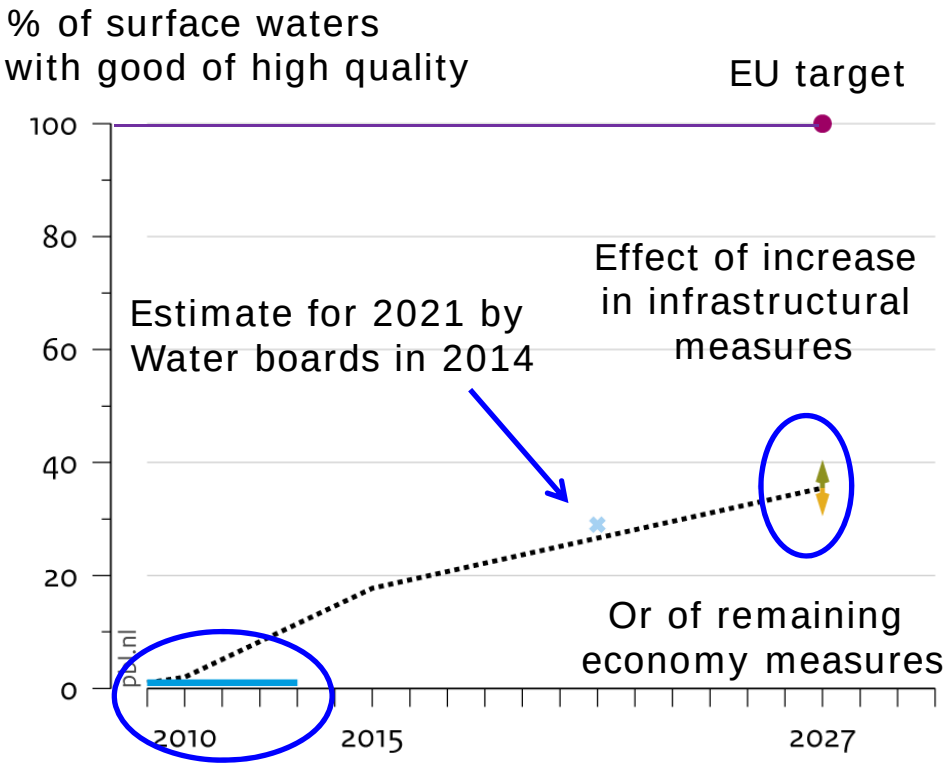
Broers et al., #208, session E.ii; Groenendijk et al., #167, session C.i

The Netherlands – prospects surface waters

Ecological quality of surface water (2013)



Bron: IHW, bewerkt door PBL.

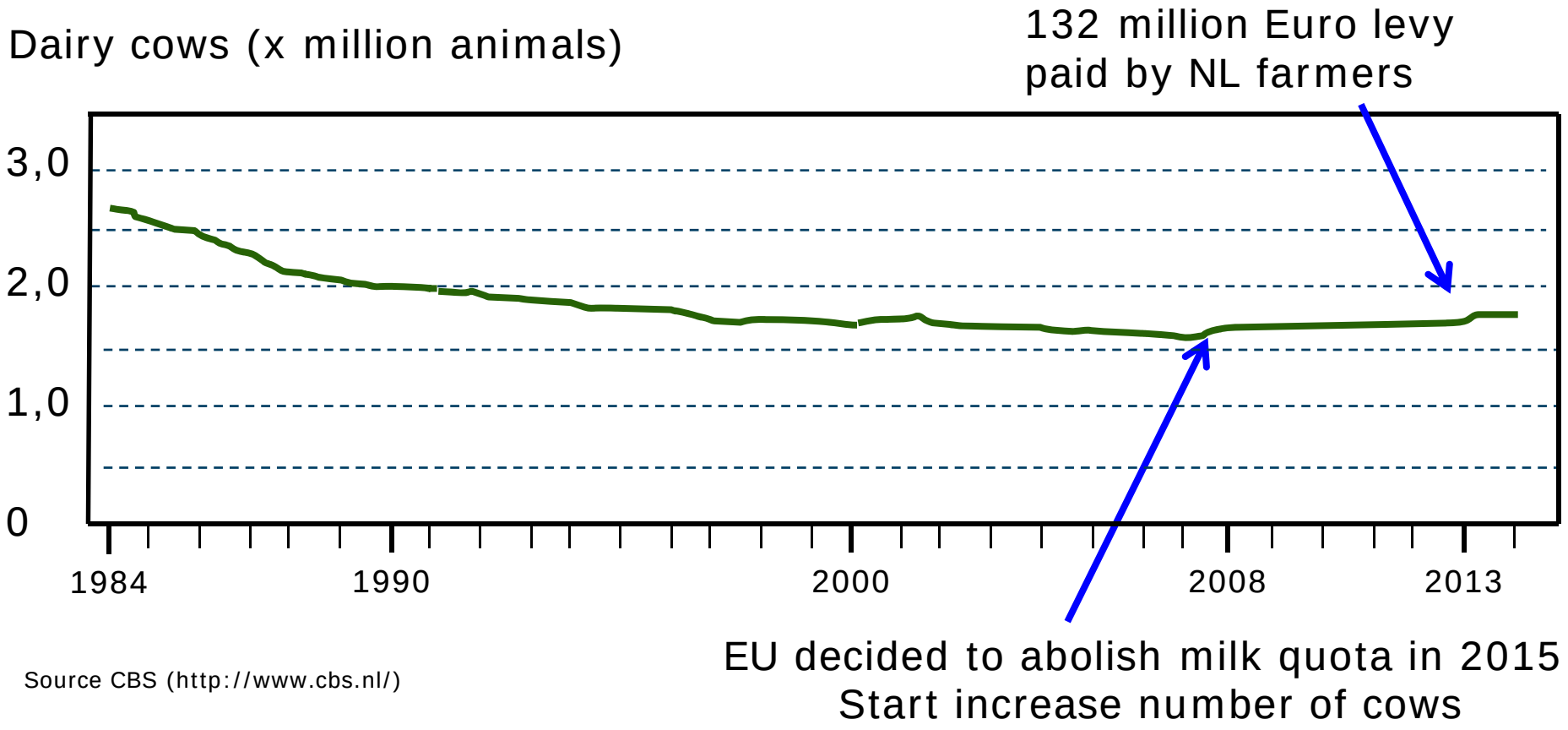


Source: www.pbl.nl

Policy planning
Monitoring

Schipper et al., #185, session C.v

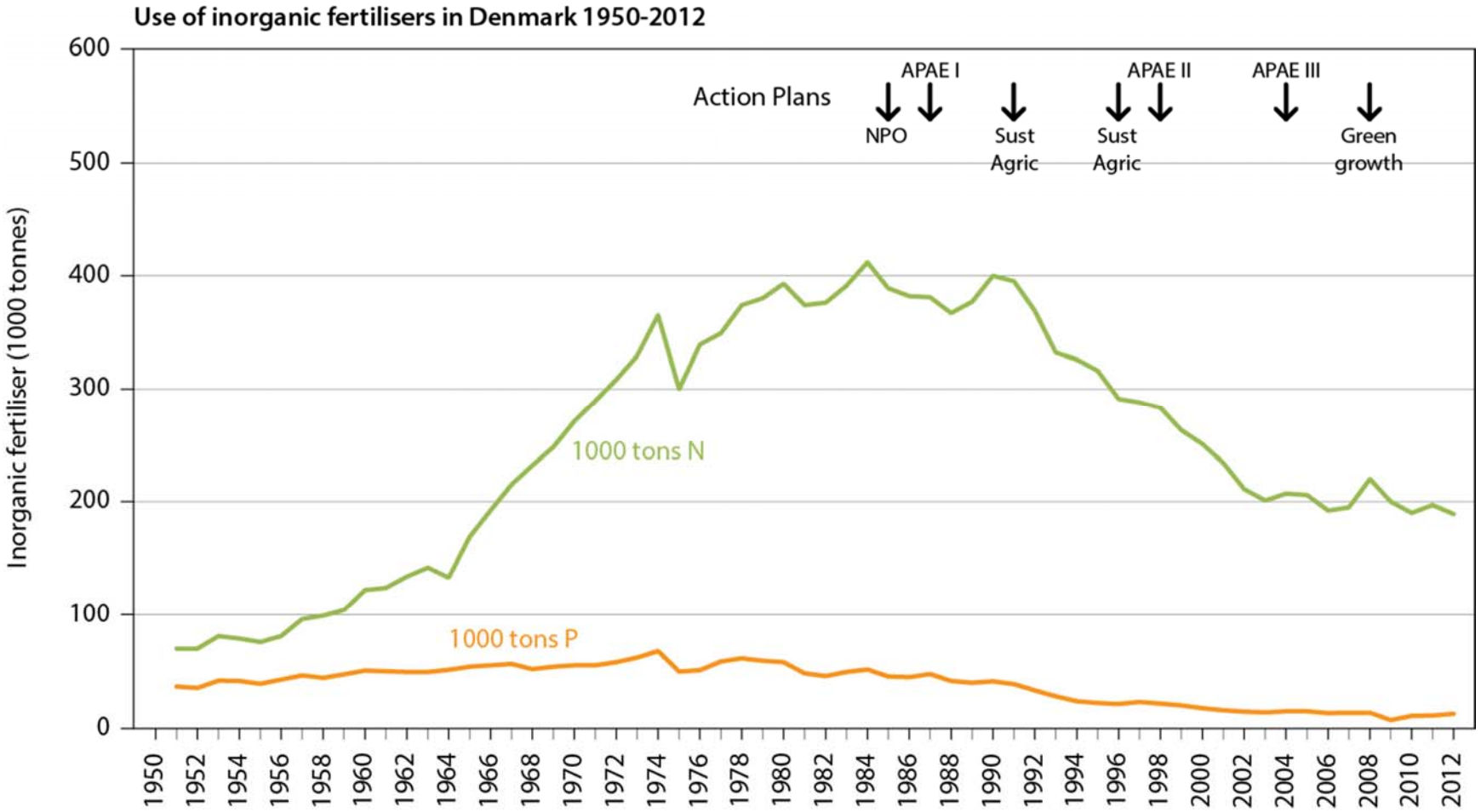
The Netherlands - challenges



Source CBS (http://www.cbs.nl/)

Luesink et al., #116, poster session P.i

Use of inorganic fertilisers in Denmark, 1950-2012

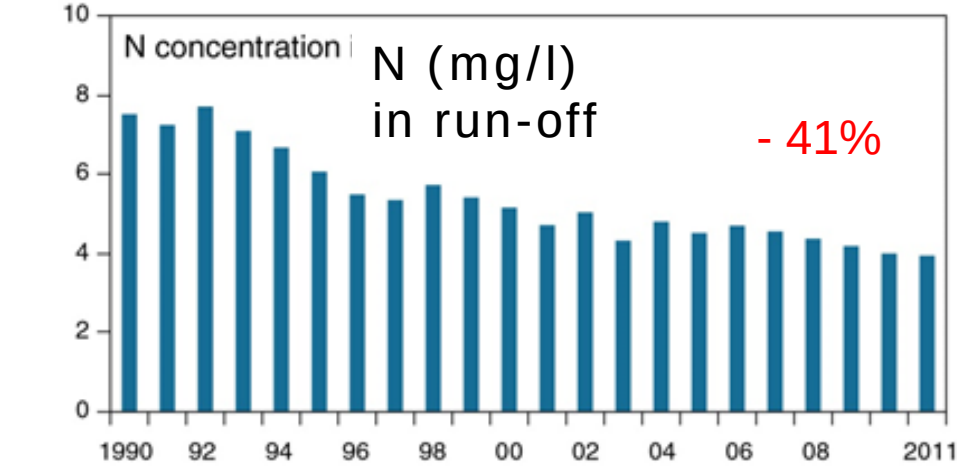


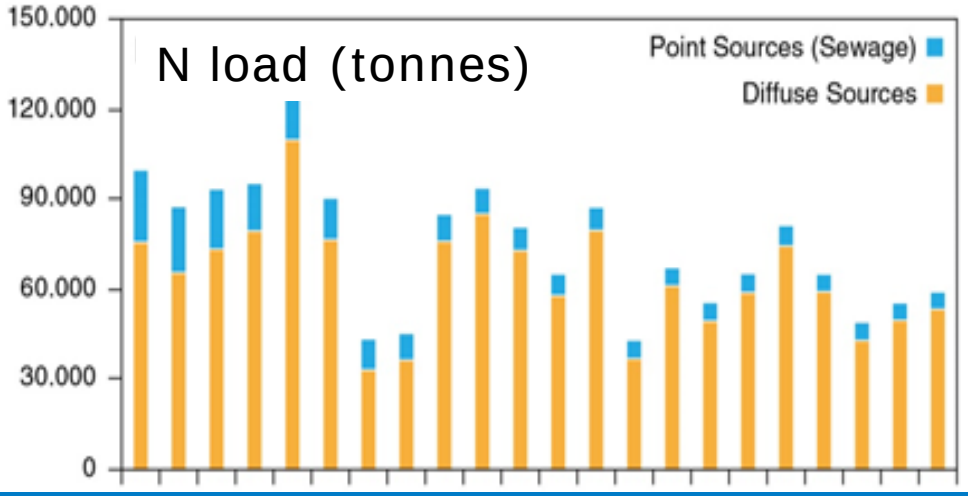
Improvement of water quality

Water quality has improved,

However:
- WFD targets not realised yet
- New reduction requirements needed
- Low hanging fruit has been picked

A general additional restriction of use
- Too strict for non-sensitive areas
- Not strict enough for sensitive areas





Denmark: More targeted regulation a new era?

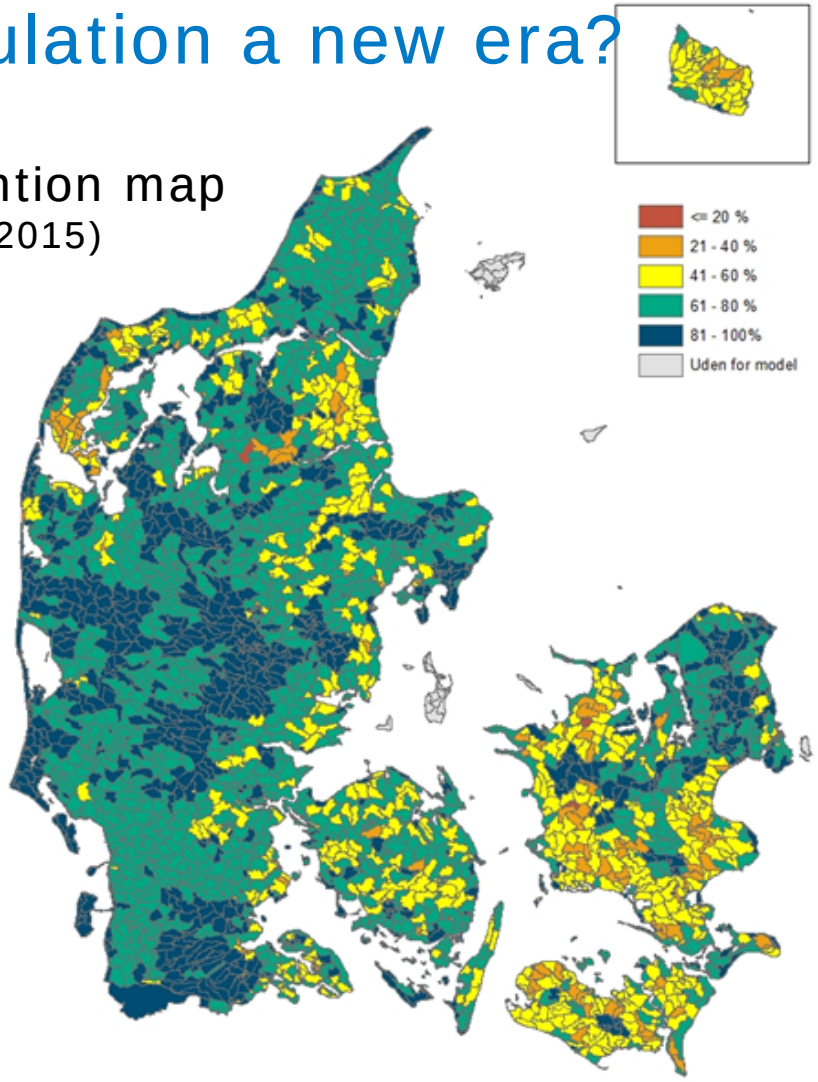
Goal: more targeted regulation of agricultural production

Approach: account for natural attenuation

Realisation: a new and more fine scale (ca. 1500 ha) mapping of nitrogen retention has been conducted in Denmark during the last two years

Højbjerg et al., #187, session C.1
Tornbjerg et al., #168, poster session P.i

Nitrate retention map
(August 2015)

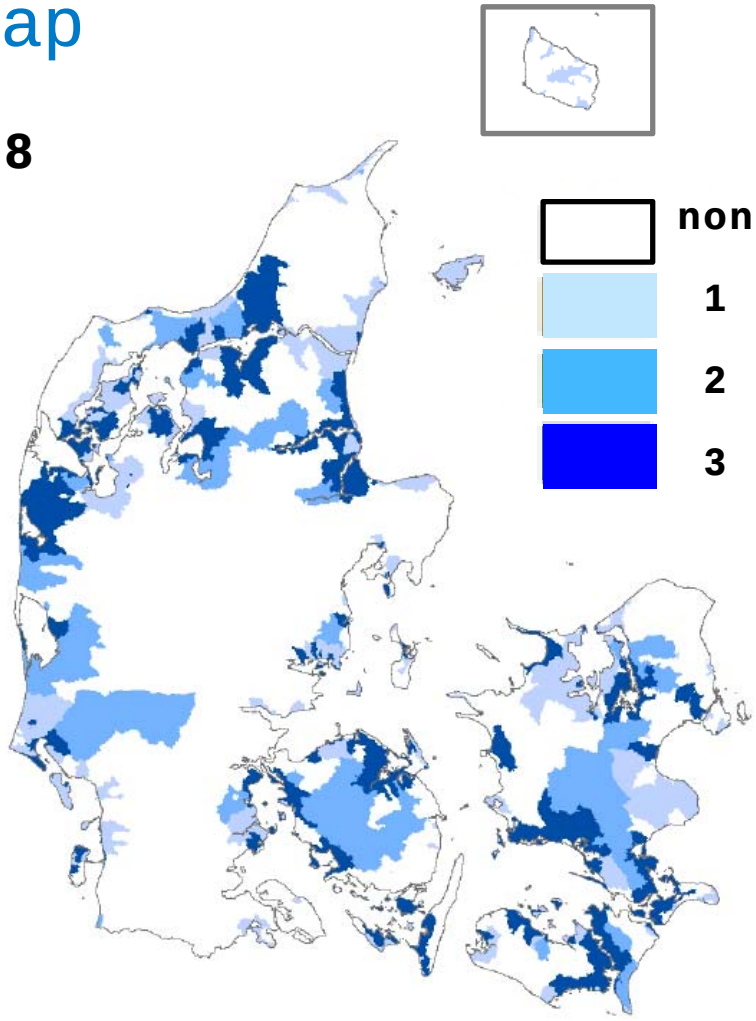


Denmark – the Nitrate Class Map

Designated area with restrictions in 2008
total: 16,666 km²; farmed: 10,731 km²

General Livestock Harmony rules (GLH):
pigs 1.4 LU/ha, other: 1.7 LU/ha

Nitrate classes	% GLR allowed	Farmed area (% of UAA)
1	85 %	12%
2	65%	13%
3	50%	16%
Total		41%

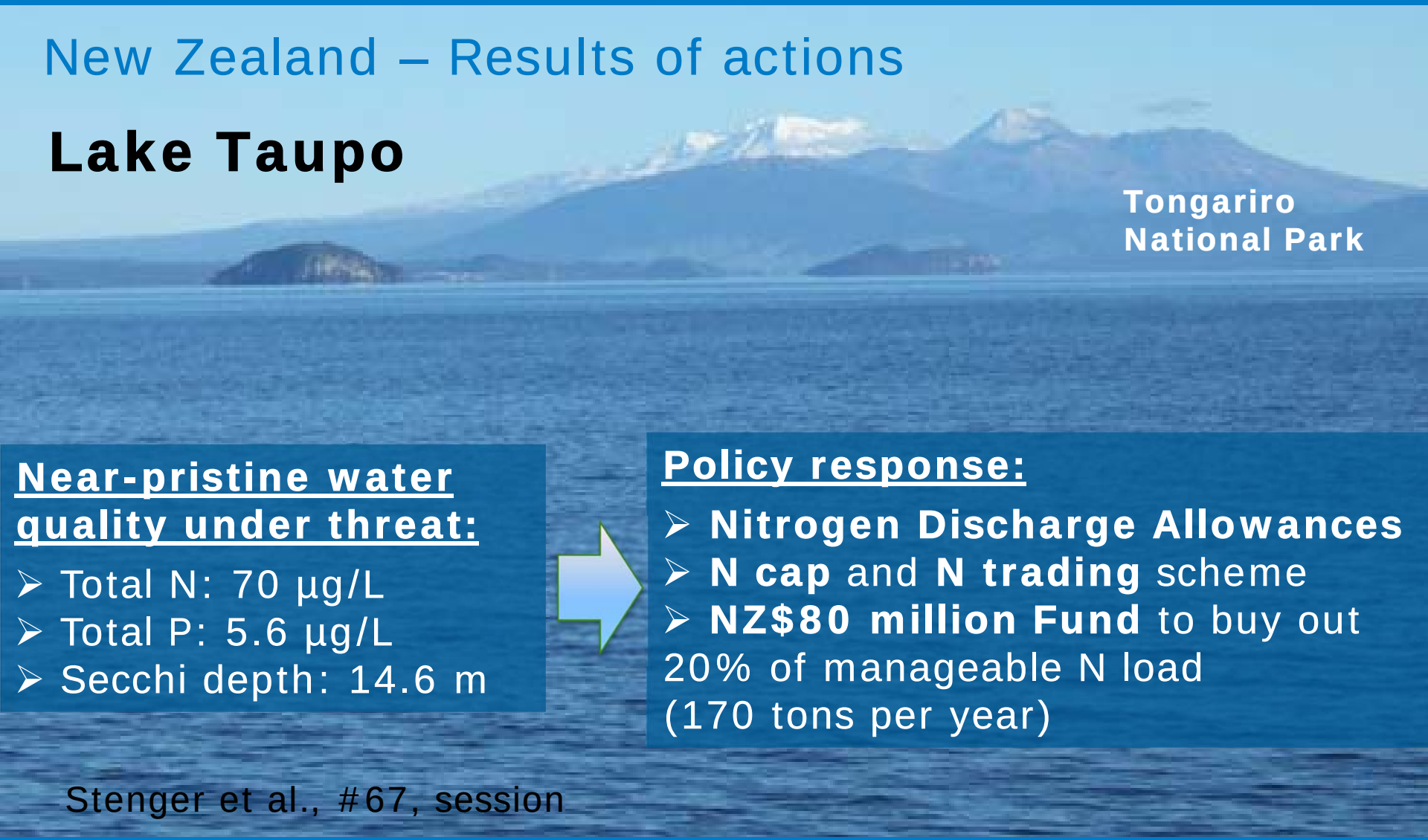


Højbjerg et al., #187, session C.1
Tornbjerg et al., #168, poster session P.i

http://eng.mst.dk/topics/agriculture/environmental-approvals-for-livestock-holdings/map-for-nitrate-classes/

New Zealand – Results of actions

Lake Taupo



Near-pristine water quality under threat:

- Total N: 70 µg/L
- Total P: 5.6 µg/L
- Secchi depth: 14.6 m

Policy response:

- **Nitrogen Discharge Allowances**
- **N cap** and **N trading** scheme
- **NZ$80 million Fund** to buy out 20% of manageable N load (170 tons per year)

Stenger et al., #67, session

New Zealand – results of actions

Lake Taupo

Tongariro NP

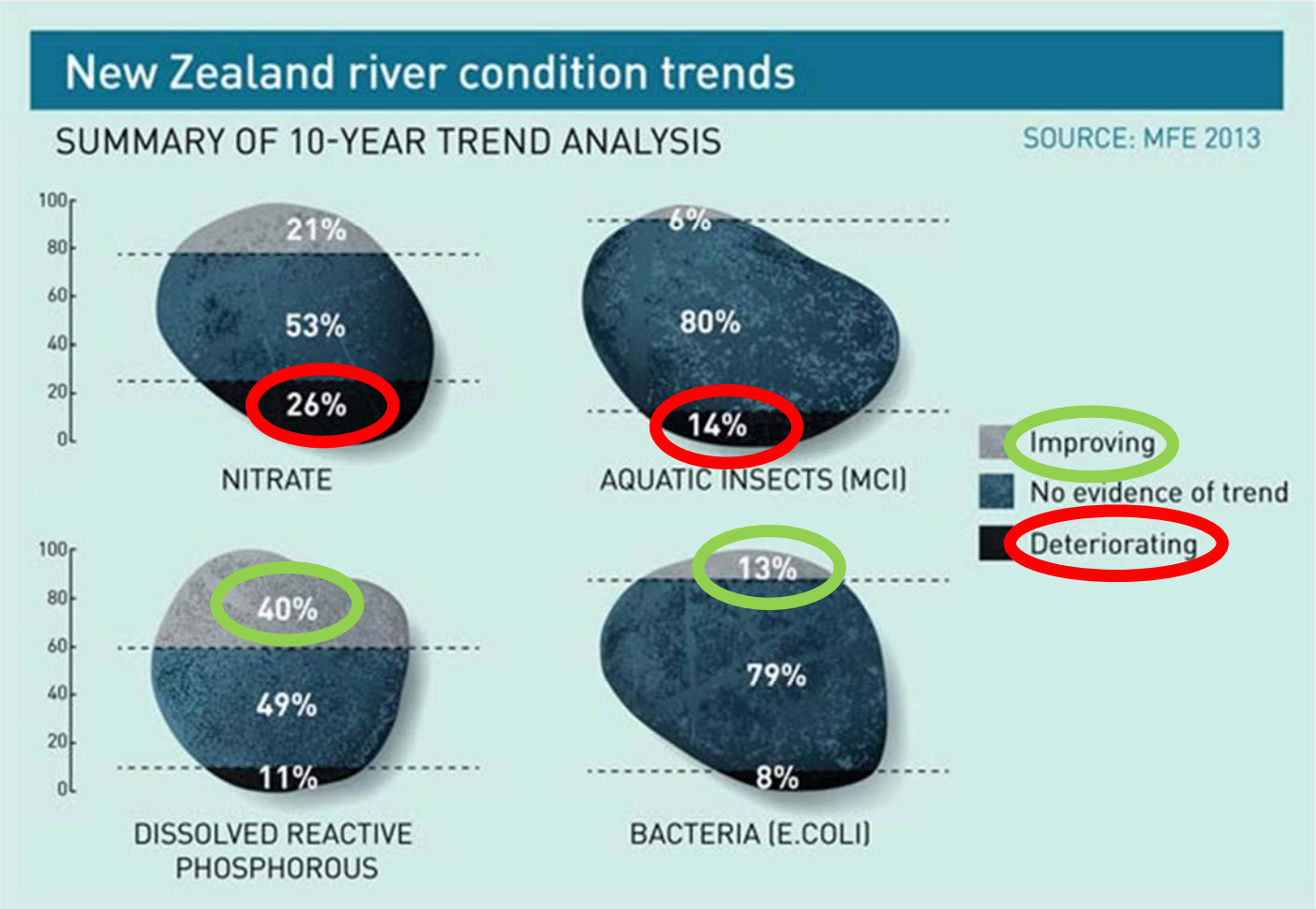
Near-pristine water quality under threat:

- Total N: 70 µg/L
- Total P: 5.6 µg/L
- Secchi depth: 14.6 m

Time line:

- Late 1990s: Early deterioration
- 2001: Start of policy development
- 2005: Policy proposed
- 2011: Policy operative
- 2015: 20% load reduction ‘contracted’ with land owners
- By 2080: Return to near-pristine water quality (long lag times)

New Zealand – failure/partial success



New Zealand – challenges

NZ Government's twin challenge:

'doubling export earnings from primary production, <u>while</u> maintaining or improving water quality'.

<u>2025:</u>

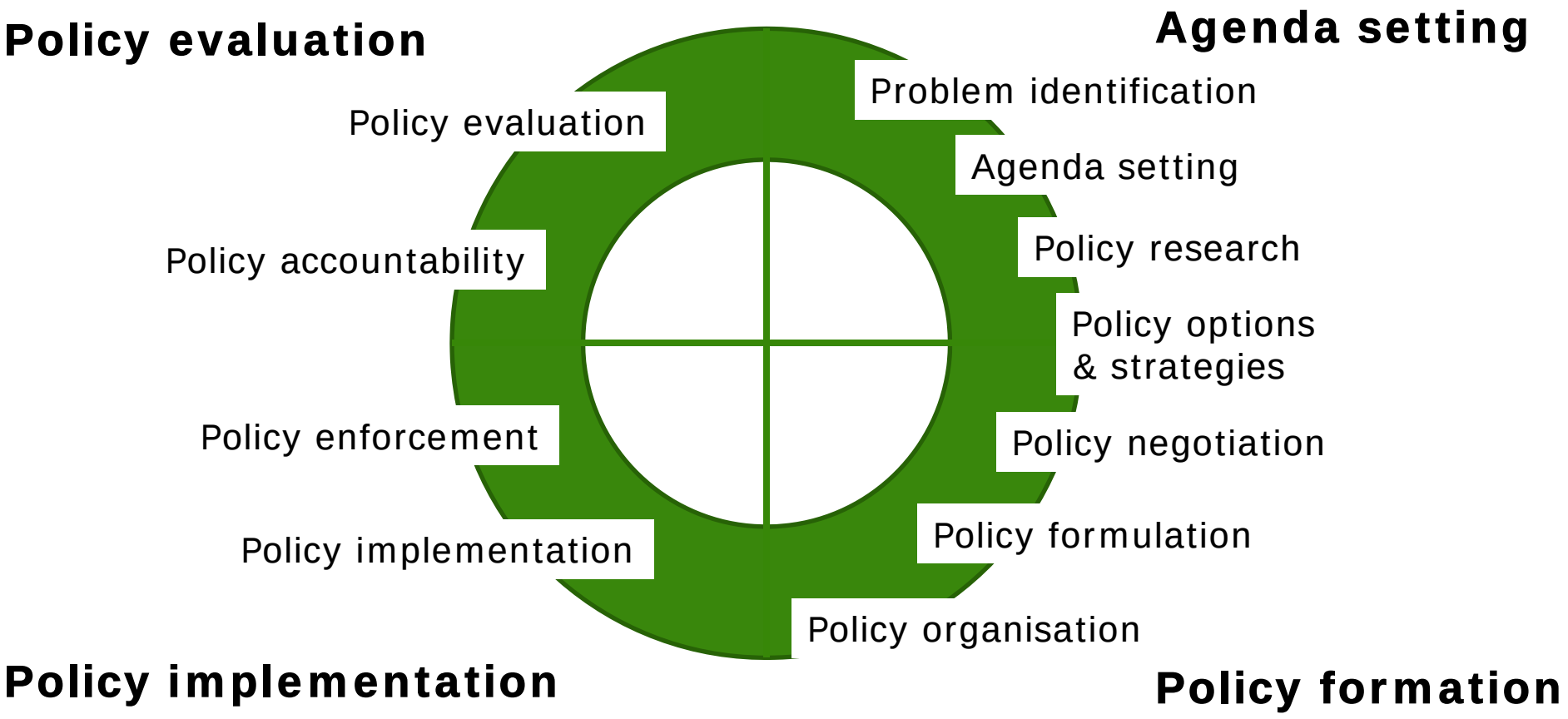
Economy  **Environment**

Joint up-lift rather than re-balancing

<u>Now:</u>

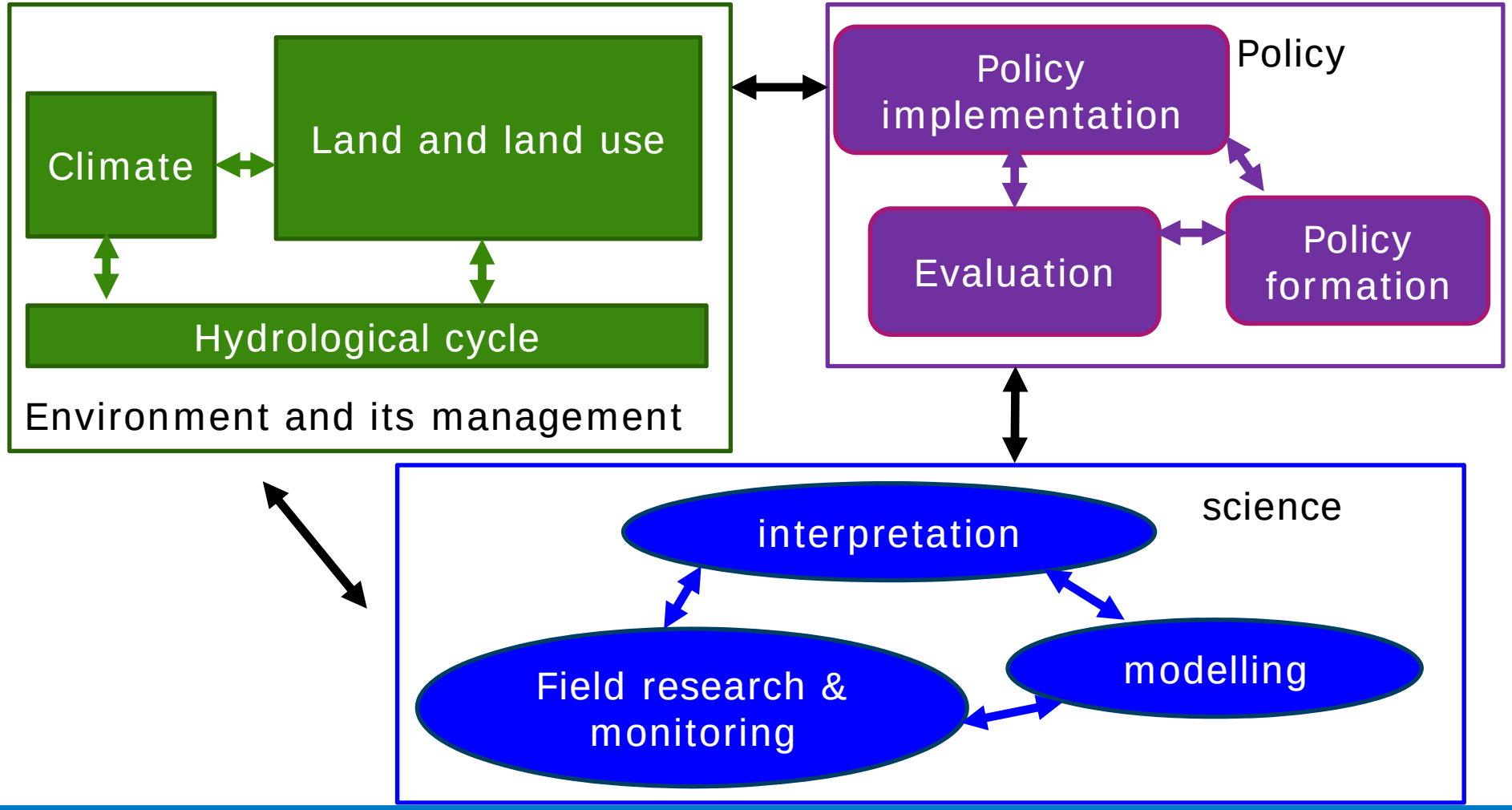
Economy  **Environment**

3. Dealing with the challenge is a cyclic process

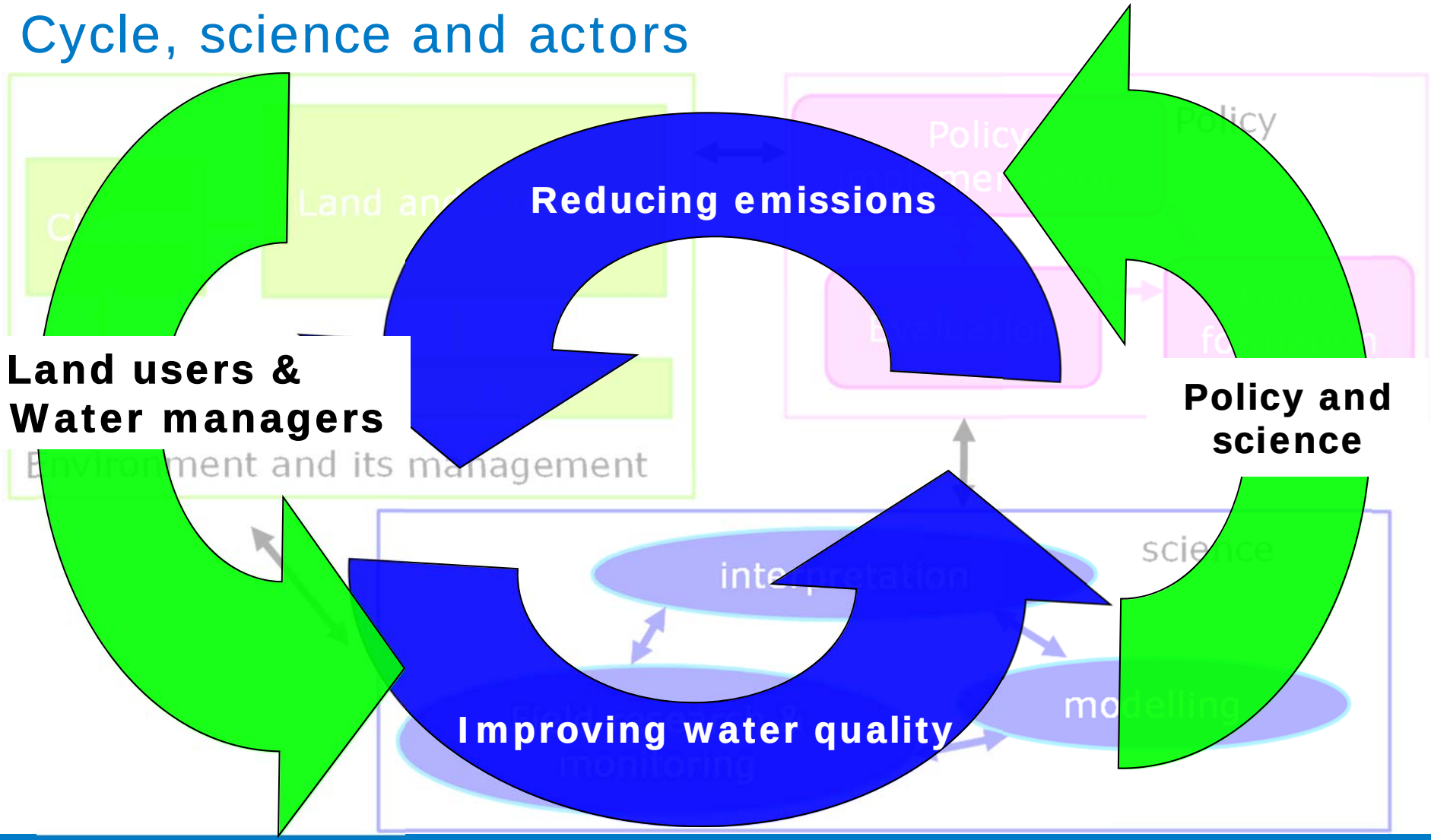


Source: http://www.geostrategis.com/

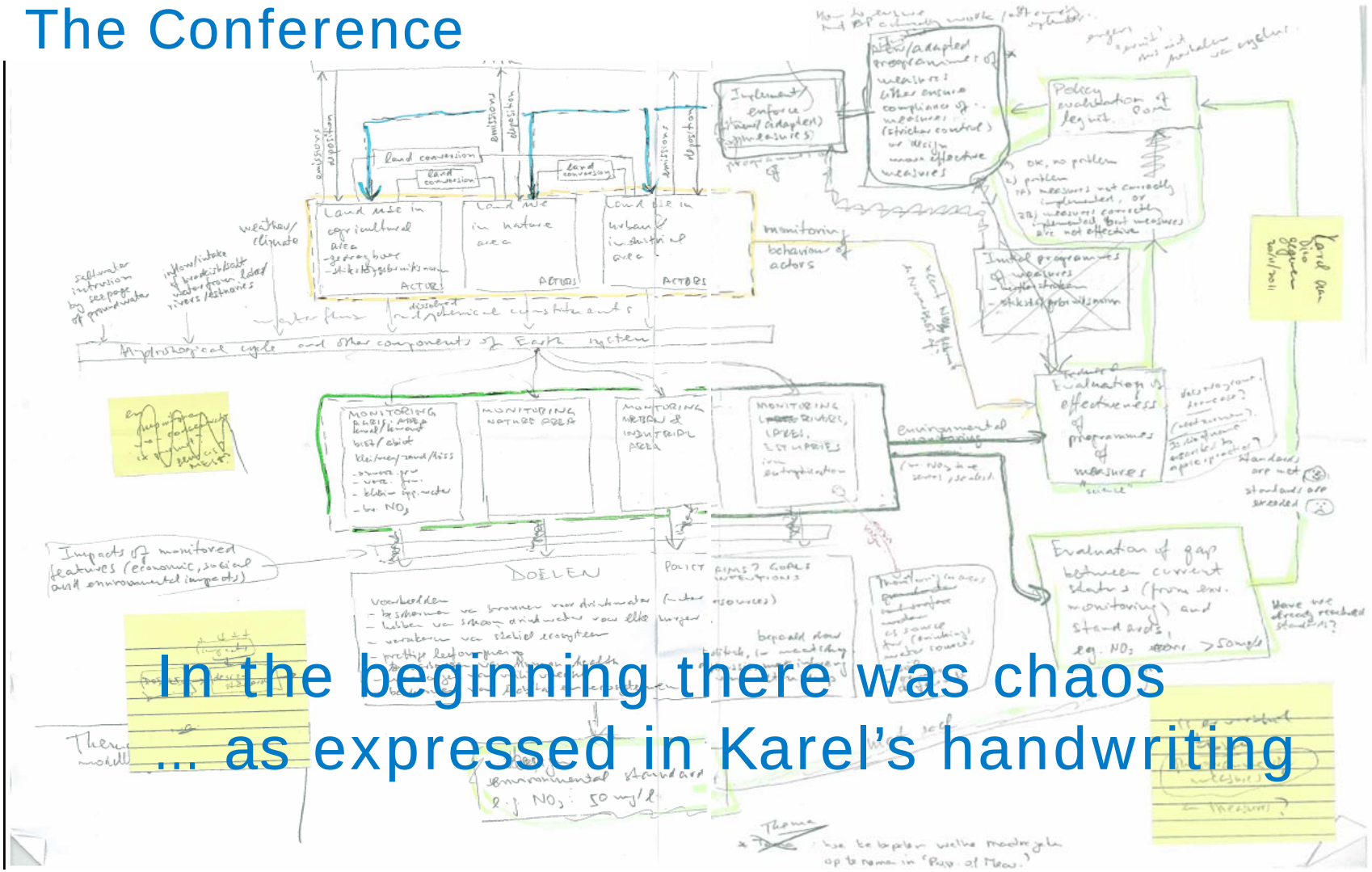
Environment, science, policy and management



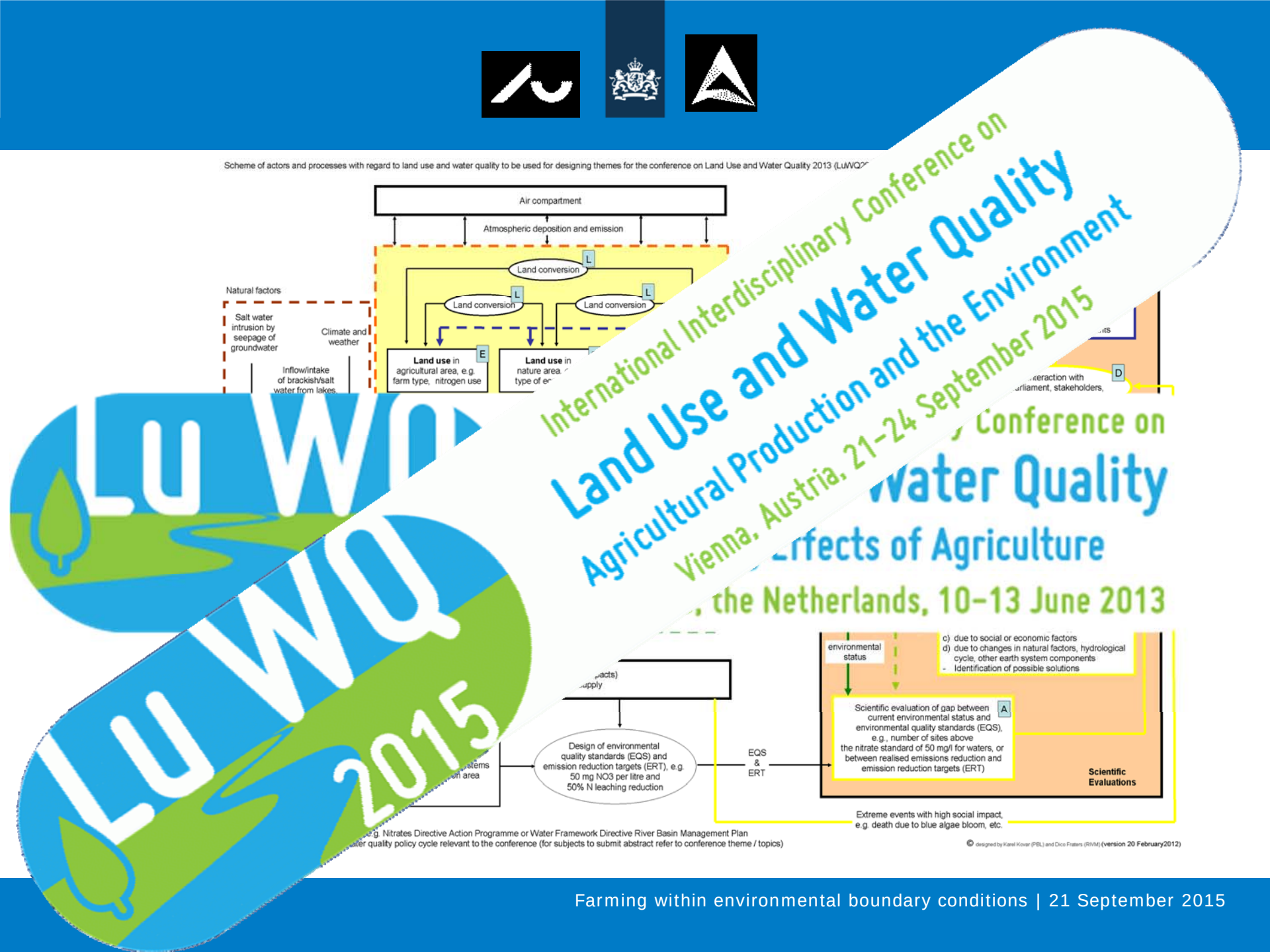
Cycle, science and actors



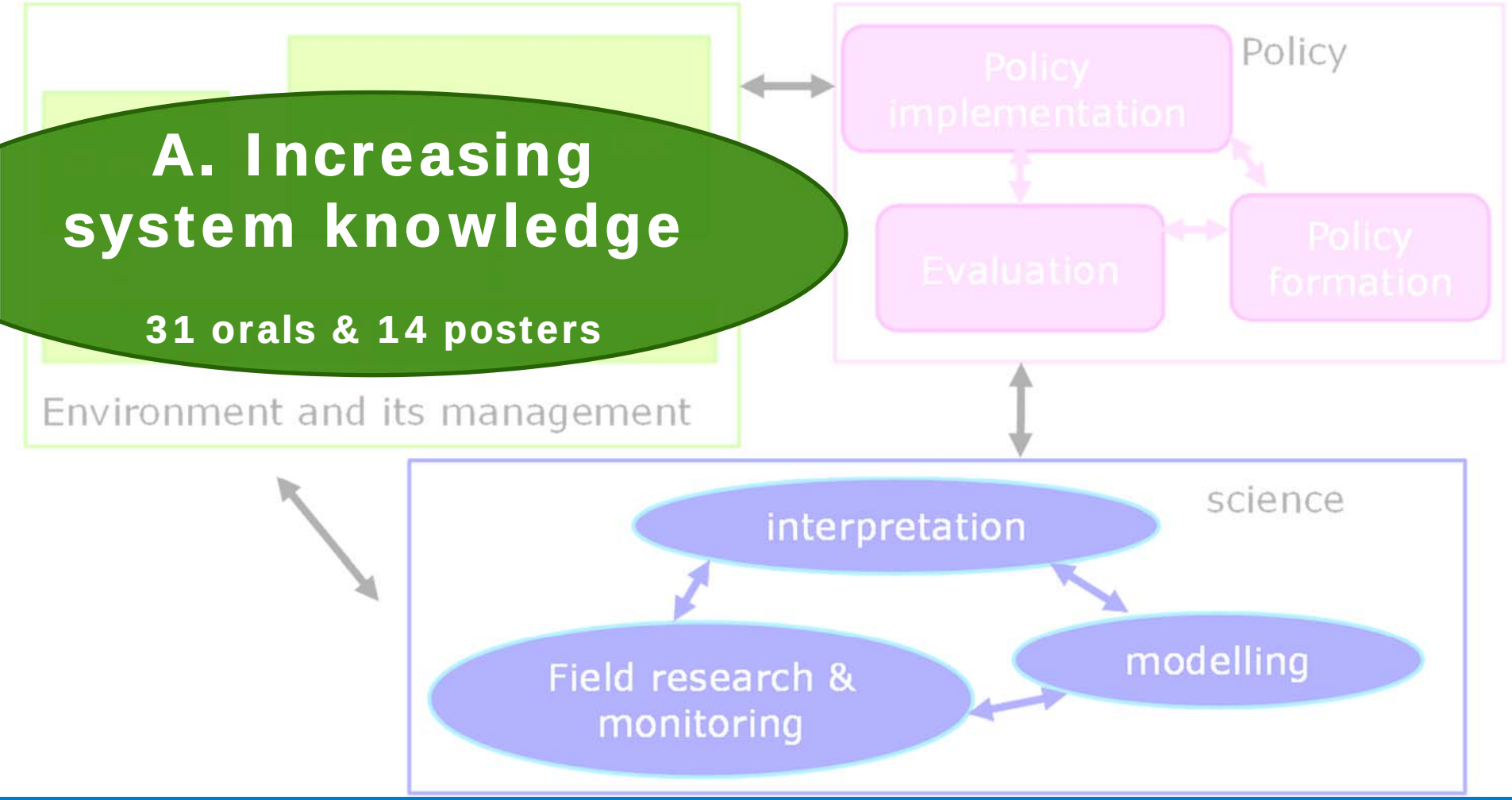
4. The Conference



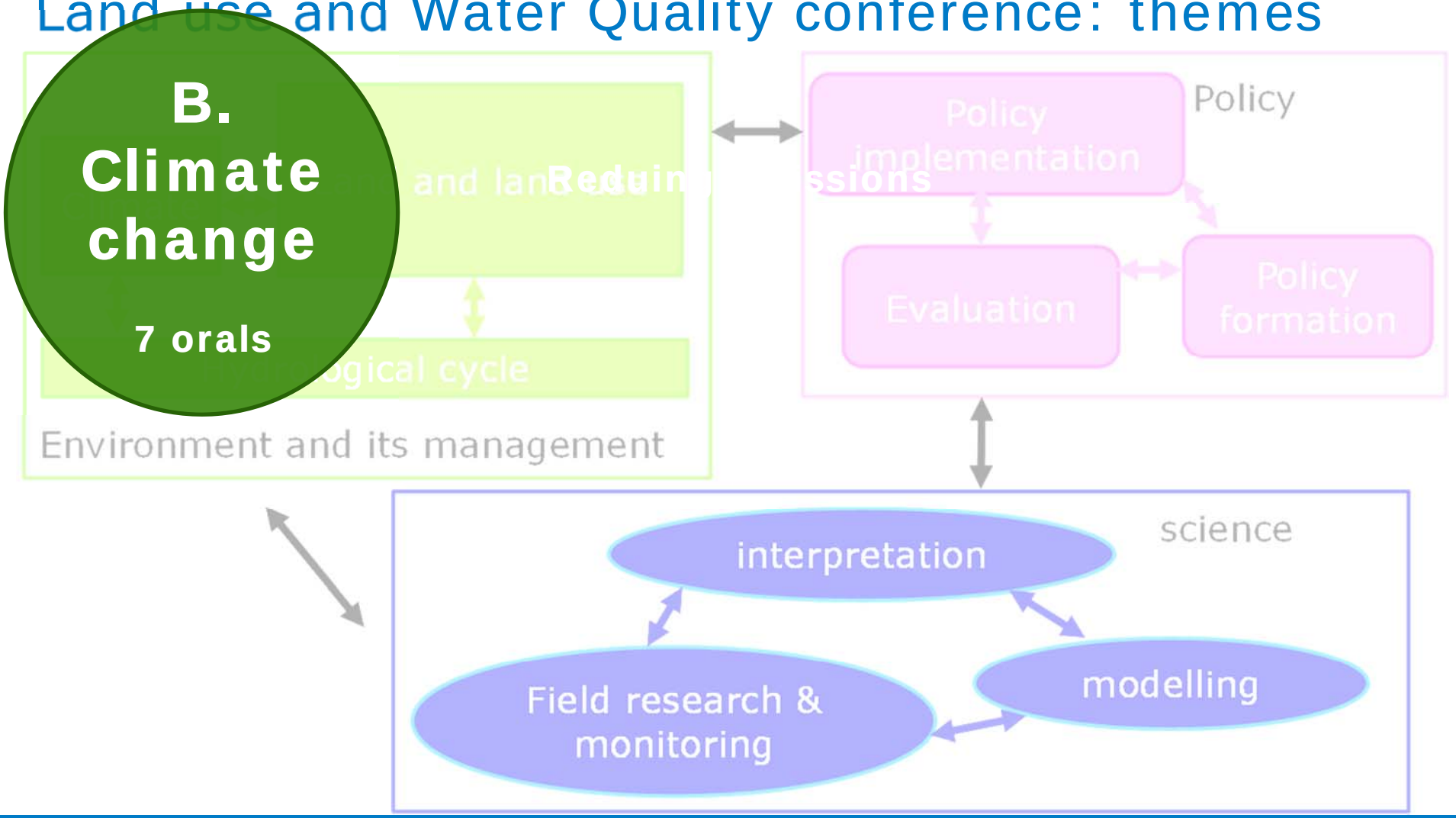
In the beginning there was chaos
... as expressed in Karel's handwriting


International Interdisciplinary Conference on
Land Use and Water Quality
Agricultural Production and the Environment
Vienna, Austria, 21-24 September 2015
Conference on
Water Quality
Effects of Agriculture
the Netherlands, 10-13 June 2013
LU WQ
2015
Scheme of actors and processes with regard to land use and water quality to be used for designing themes for the conference on Land Use and Water Quality 2013 (LuWQ2
Air compartment
Atmospheric deposition and emission
Land conversion
Land conversion
Land conversion
Natural factors
Salt water intrusion by seepage of groundwater
Climate and weather
Inflow/intake of brackish/salt water from lakes
Land use in agricultural area, e.g. farm type, nitrogen use
Land use in nature area
type of
Design of environmental quality standards (EQS) and emission reduction targets (ERT), e.g. 50 mg NO3 per litre and 50% N leaching reduction
EQS & ERT
environmental status
c) due to social or economic factors
d) due to changes in natural factors, hydrological cycle, other earth system components
- Identification of possible solutions
Scientific evaluation of gap between current environmental status and environmental quality standards (EQS), e.g., number of sites above the nitrate standard of 50 mg/l for waters, or between realised emissions reduction and emission reduction targets (ERT)
Scientific Evaluations
Extreme events with high social impact, e.g. death due to blue algae bloom, etc.
e.g. Nitrates Directive Action Programme or Water Framework Directive River Basin Management Plan
ater quality policy cycle relevant to the conference (for subjects to submit abstract refer to conference theme / topics)
designed by Karel Kovar (PBL) and Dico Fraters (RIVM) (version 20 February2012)

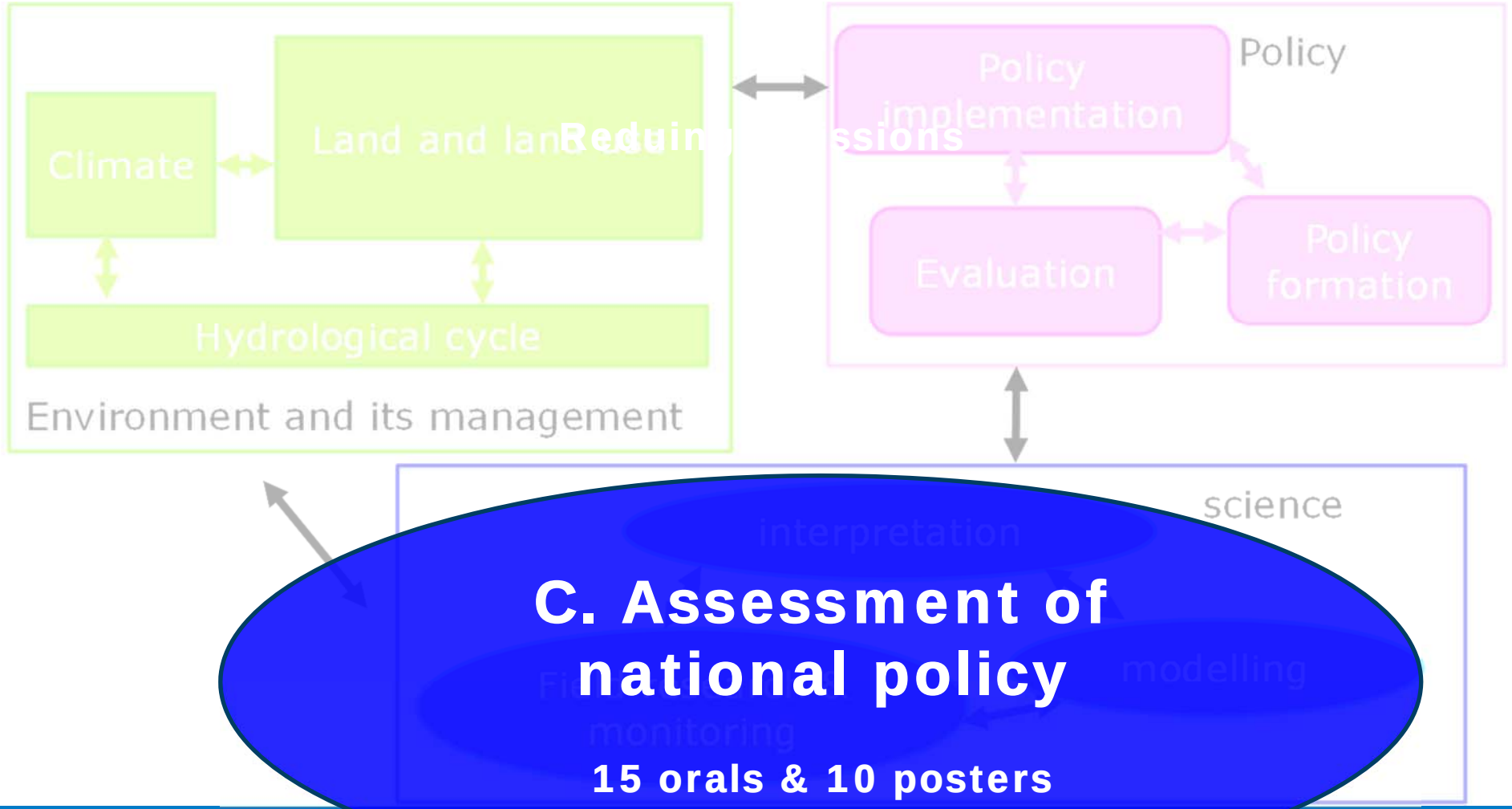
Land use and Water Quality conference: themes



Land use and Water Quality conference: themes



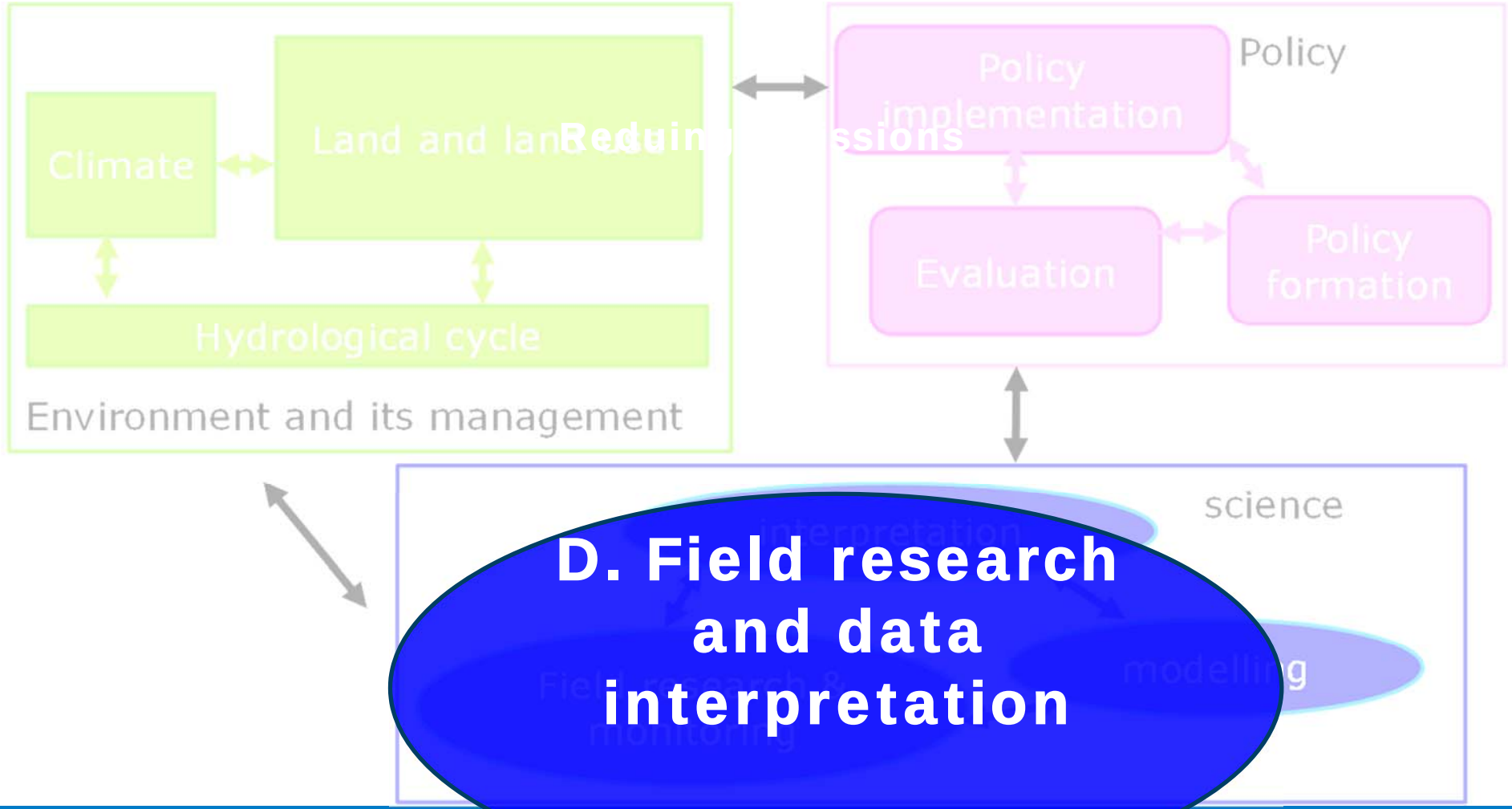
Land use and Water Quality conference: themes



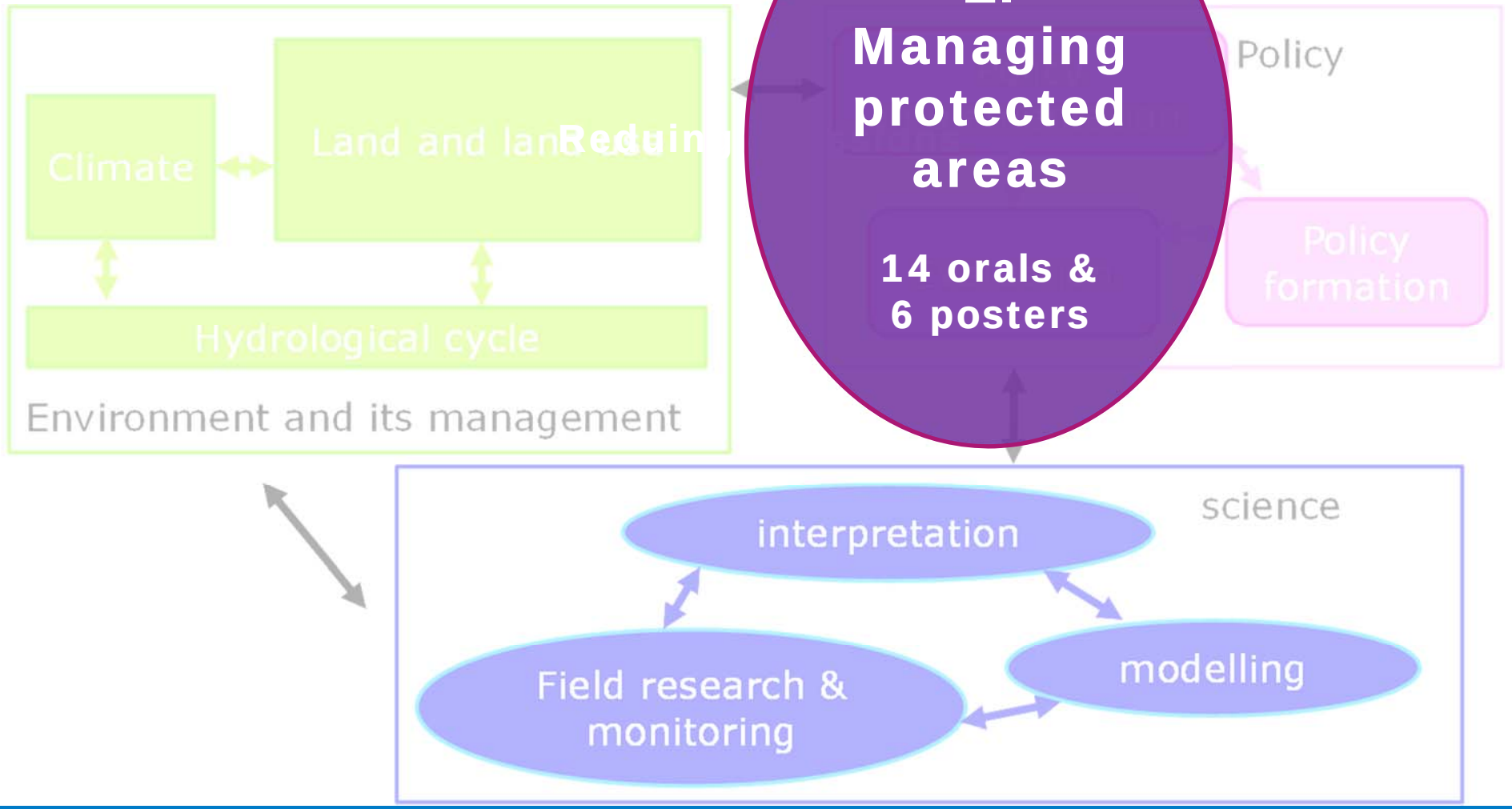
C. Assessment of national policy

15 orals & 10 posters

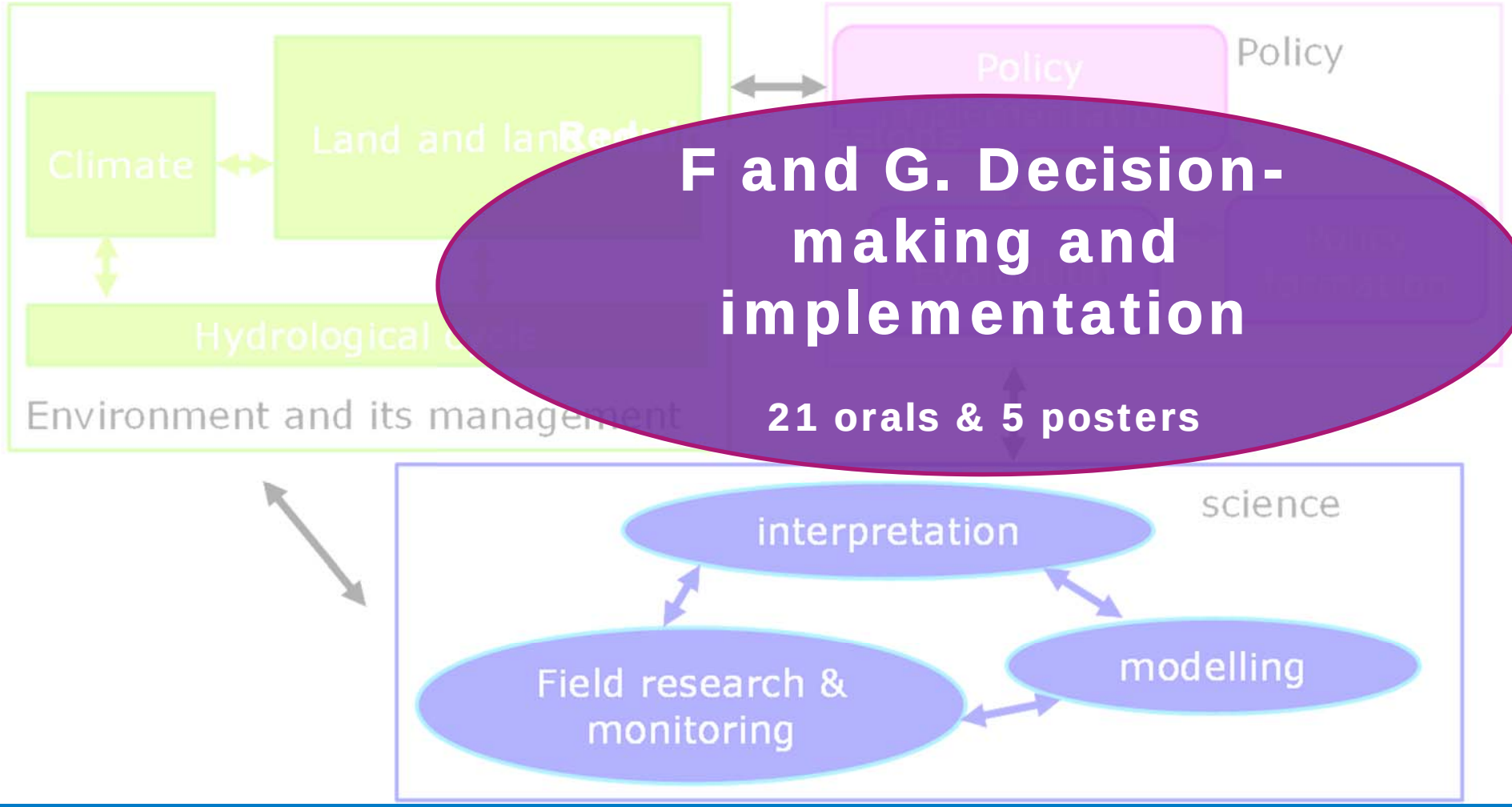
Land use and Water Quality conference: themes



Land use and Water Quality conference: themes



Land use and Water Quality conference: themes




LuWQ 2015
International Interdisciplinary Conference on
Land Use and Water Quality
Agricultural Production and the Environment
Vienna, Austria, 21-24 September 2015
170 participants
from 31 countries
from all (habitable) continents


Enjoy this conference
and thank you for your attention