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Training Seminar on Auditing  
Environmental Impacts of Agriculture

# Environmental impacts of agriculture



# The European Environment Agency

The European Environment Agency (EEA) is an agency of the European Union. The EEA aims to support sustainable development and to help achieve significant and measurable improvement in Europe's environment, through the provision of timely, targeted, relevant and reliable information to policymaking agents and the public.

# Plan of presentation

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- Degradation of biodiversity due to extensive land use
- Degradation of biodiversity due to use of chemicals
- Irrigation demand
- Air emissions
- Food safety
- Information sources and trends

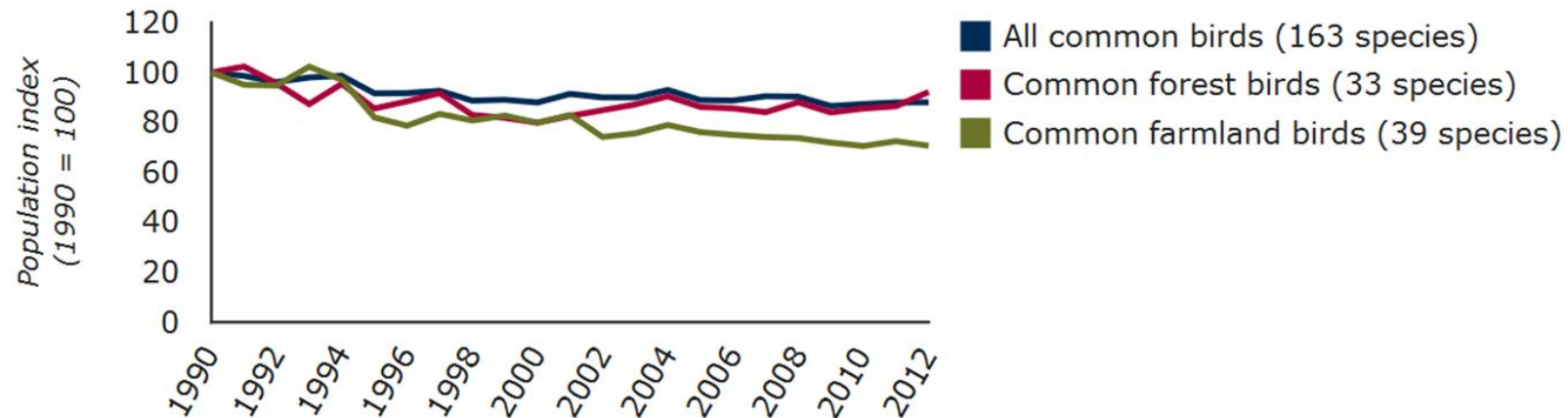
# European agriculture

- European agriculture — 40 % of the land — serves societal demands for food production, pollination and energy.
- Long-observed environmental impacts are mixed: decreasing GHG emissions, less pesticide use but exceedance of nutrients, diffuse pollution to water and dramatic loss of grassland biodiversity.
- There are fewer farmers and less arable land but demand for food is growing. Europe faces a continuous challenge to reconcile low environmental impact, food security and the viability of rural societies.



# Degradation of biodiversity due to excessive land use

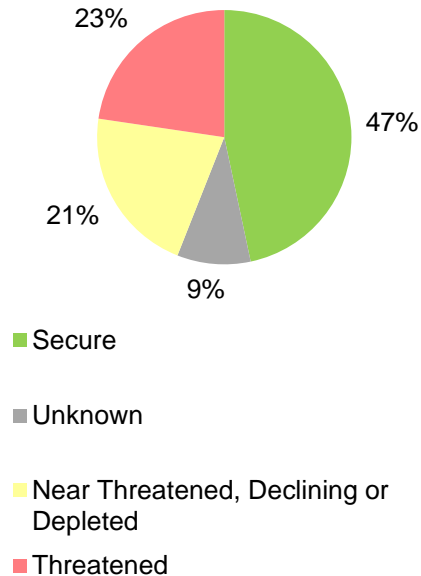
## Common birds in Europe – population index:



Data sources: EBCC. Common Birds in Europe, population index; Birdlife International; Royal Society for the Protection of Birds; Statistics Netherlands; EEA – Indicator SEBI001

# Population status and trends in birds species

## Grassland: population status



Results confirm Common farmland index – 30% declining in 1990-2012

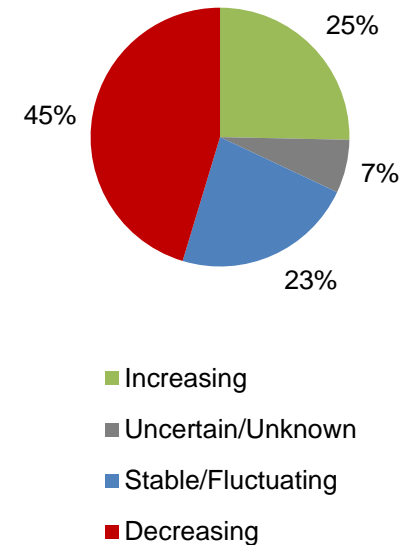
### Declining trends:

- ortolan bunting (*Emberiza hortulana*)
  - crested lark (*Galerida cristata*)
  - grey partridge (*Perdix perdix*)
- respectively: 88%, 90%, 90% in long-term trend (1980-2012).

### Increasing trends:

- common whitethroat (*Sylvia communis*)
- white stork (*Ciconia ciconia*)
- lesser kestrel (*Falco naumanni*)
- eastern imperial eagle (*Aquila heliaca*)

## Grassland: short-term trends



Source: State of nature in the EU, EEA, May 2015



# Degradation of biodiversity due to excessive land use

## Grassland butterfly indicator for Europe:

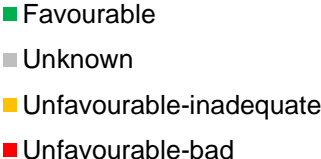
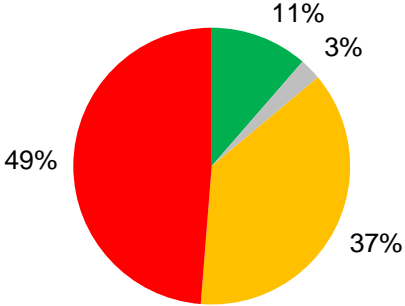


Data sources: BCE. European Grassland Butterfly Indicator; Statistics Netherlands; EEA – Indicator SEBI001

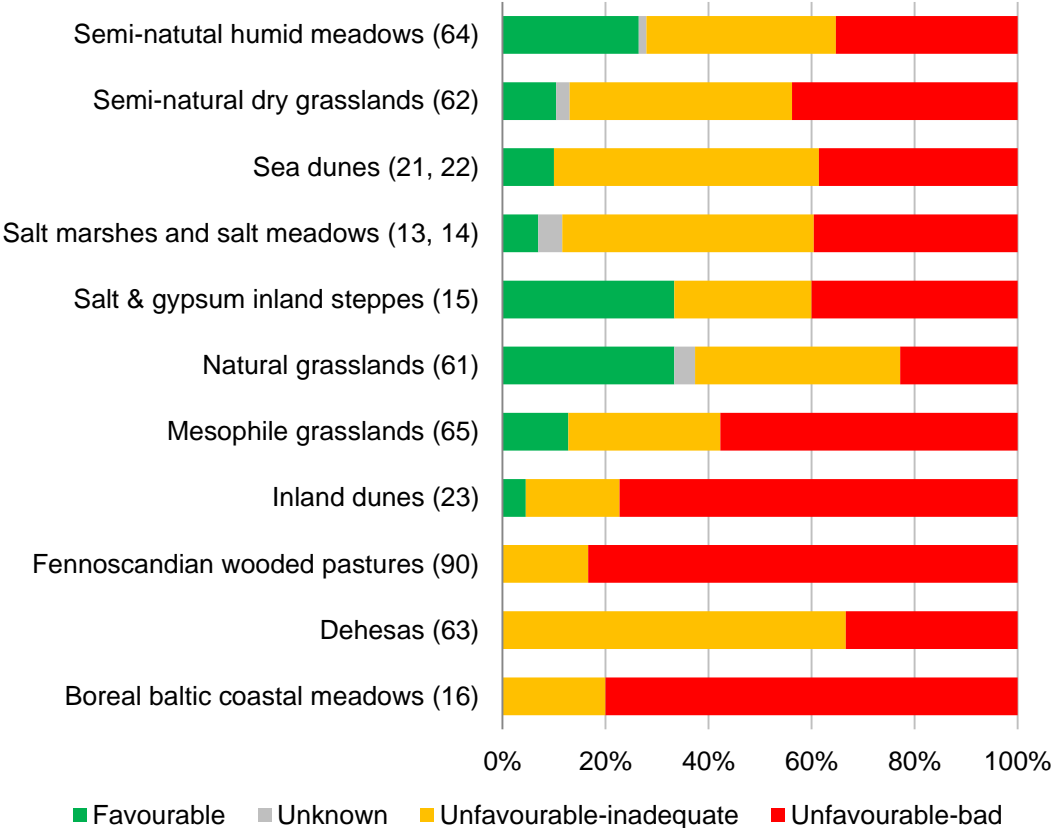


# Degradation of biodiversity due to excessive land use

## Conservation status of habitats associated with grassland ecosystems at Member State level:



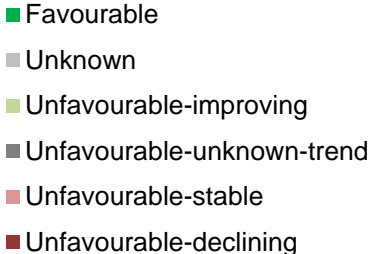
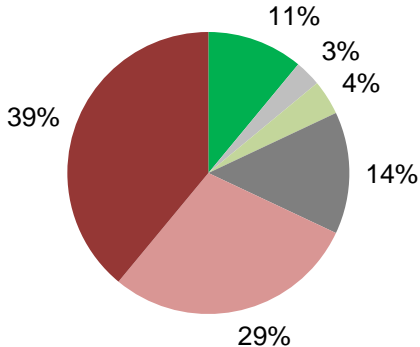
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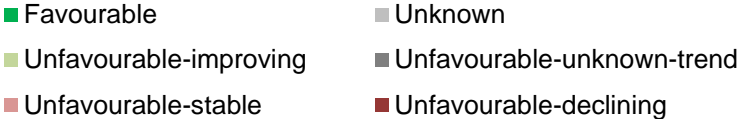
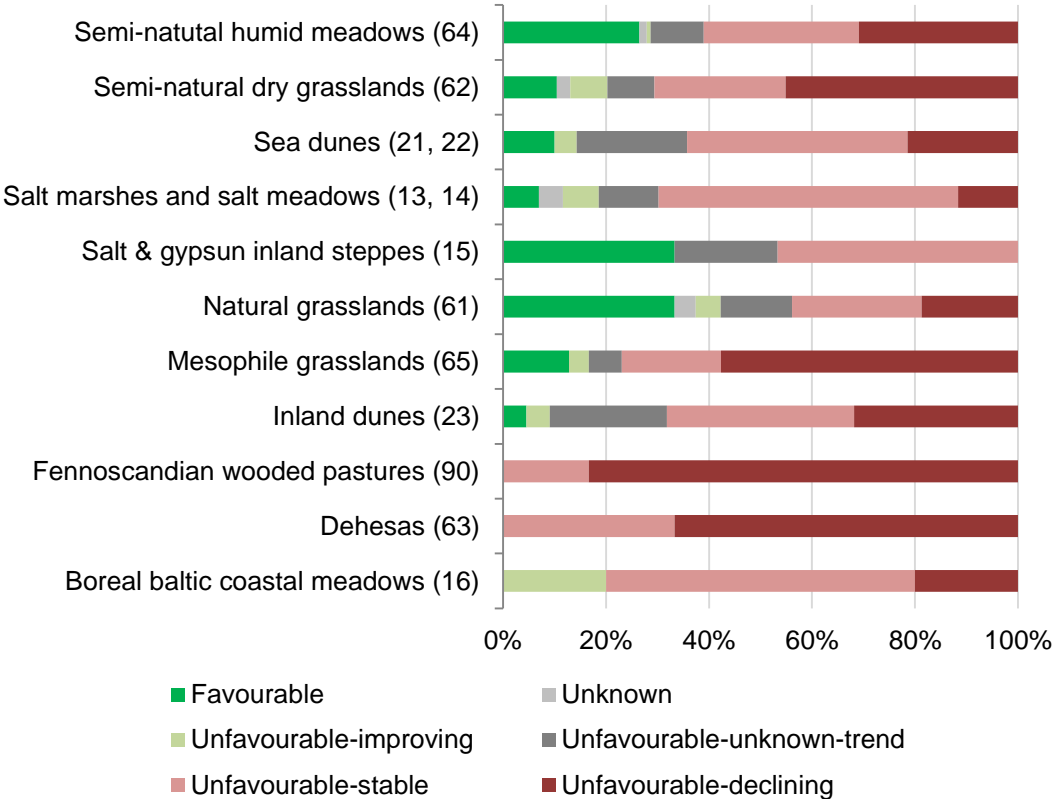
Source: State of nature in the EU, EEA, May 2015

# Degradation of biodiversity due to excessive land use

## Conservation trends of habitats associated with grassland ecosystem at Member State level (overview):



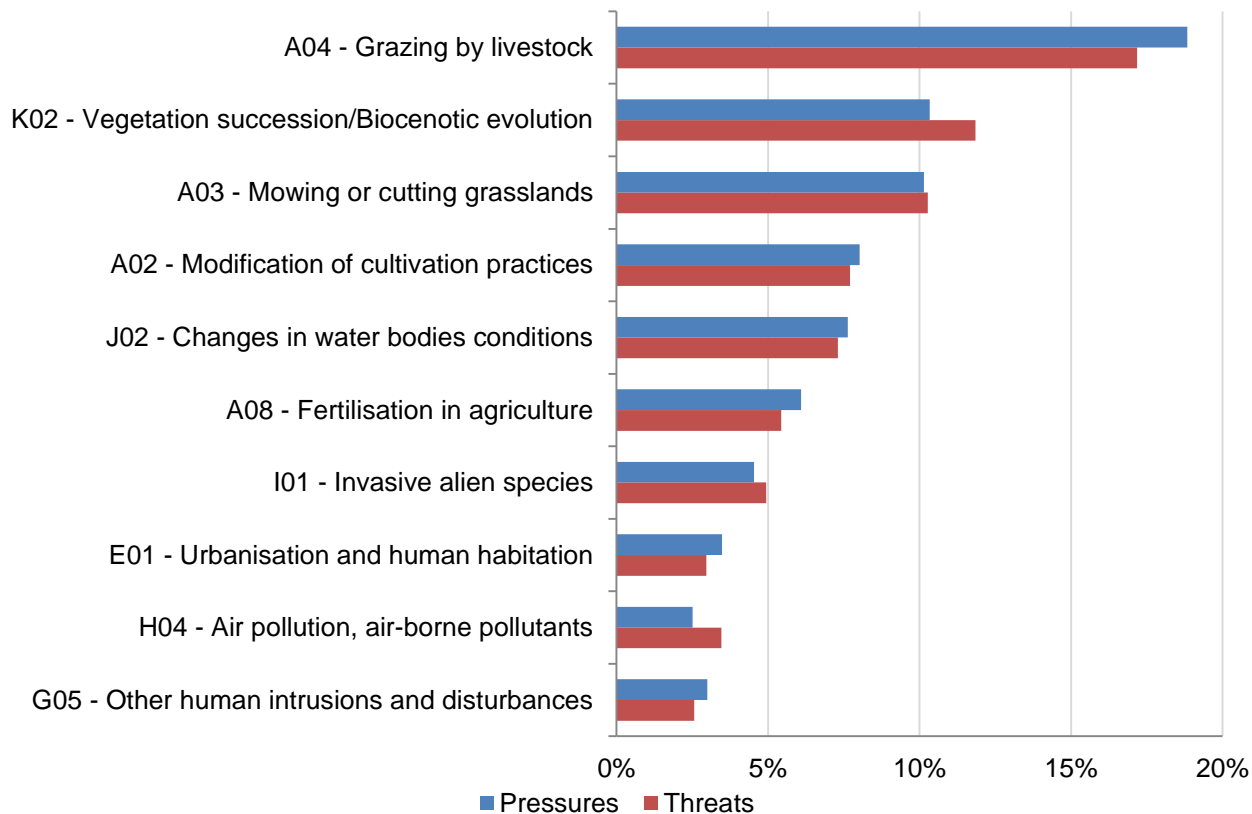
## Conservation trends of habitats associated with grassland ecosystem at Member State level:



Source: State of nature in the EU, EEA

# Degradation of biodiversity due to excessive land use

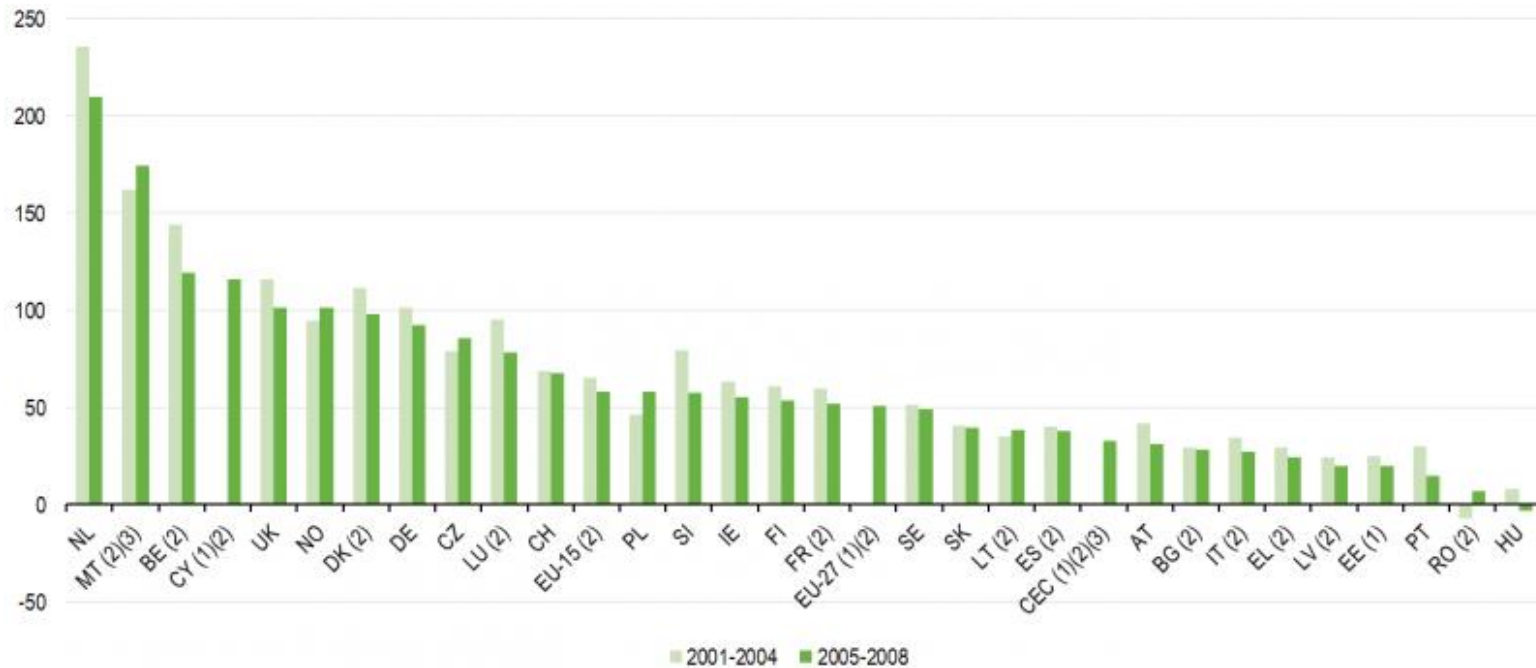
## Pressures on grassland ecosystems reported by Member States:



Source: State of nature in the EU, EEA

# Degradation of biodiversity due to use of chemicals

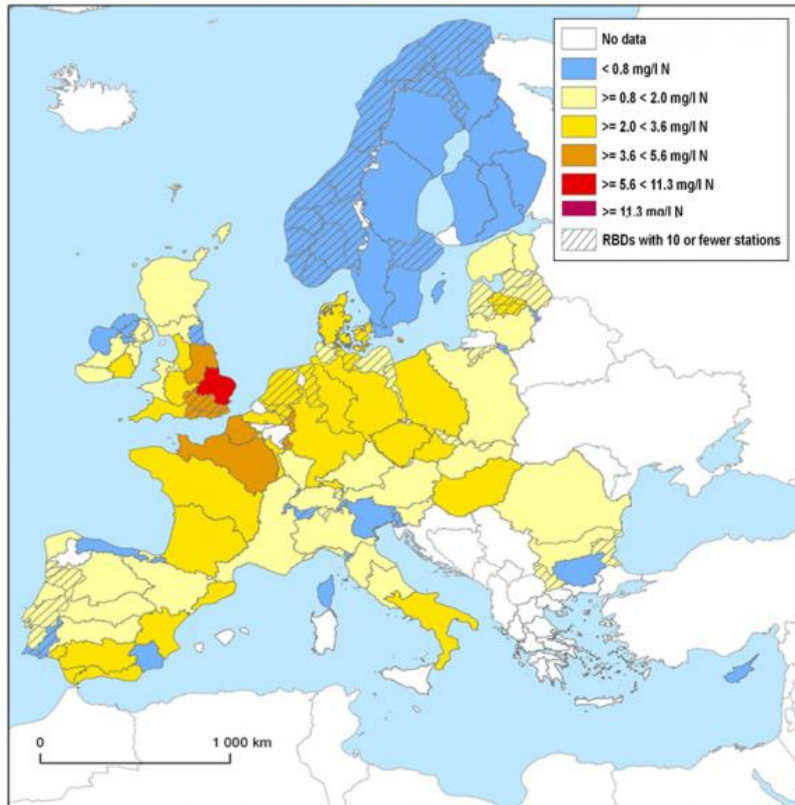
Nitrogen surplus (kg N per ha), average 2001-2004 vs 2005-2008, EU-27, CH and NO:



- (1) Data not available for 2001-2004
- (2) Eurostat estimations
- (3) PL, RO, BG, CZ, HU, LV, LT, EE, SI, SK
- (4) Average 2002-2004

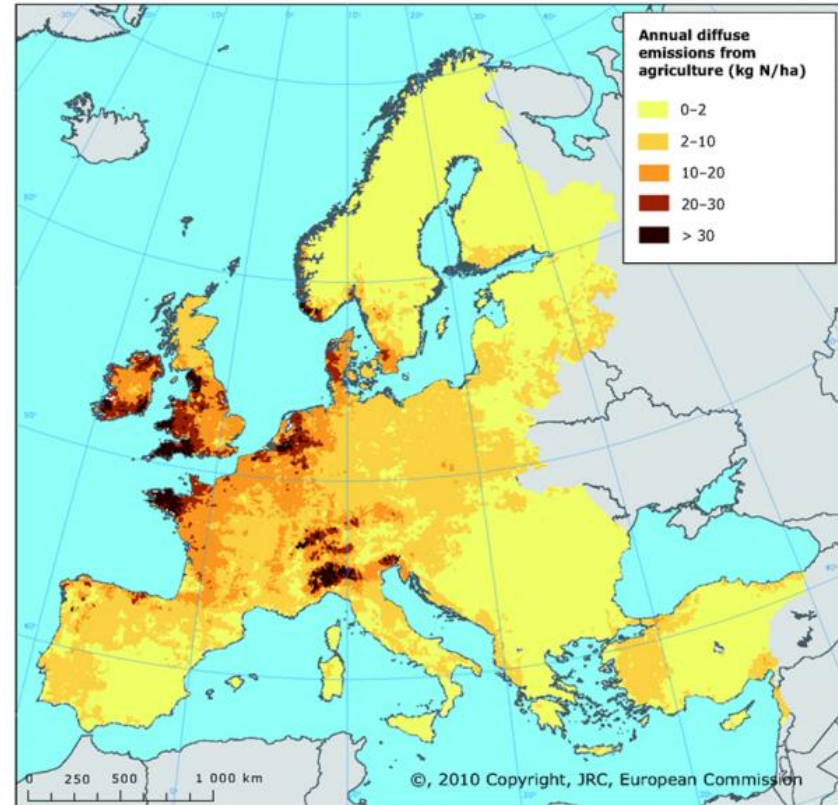
# Degradation of biodiversity due to use of chemicals

Annual average river nitrate concentration averaged by National River Basin Districts (mg N/l), (2009), EU-27 and EFTA:



Source: European Environment Agency

Annual diffuse agricultural emissions of nitrogen to freshwater (kg N/ha of total land area), (2009):



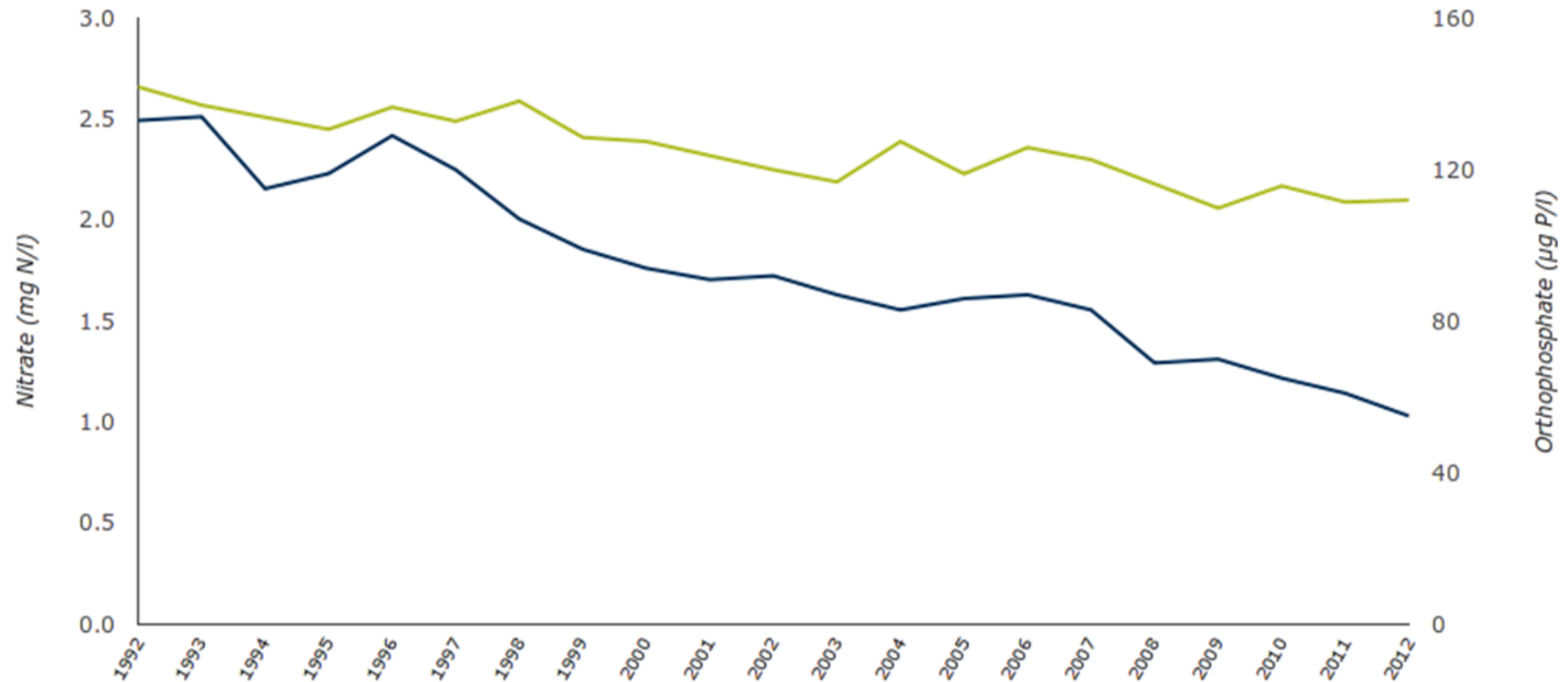
Source: Joint Research Centre, European Commission

European Environment Agency



# Degradation of biodiversity due to use of chemicals

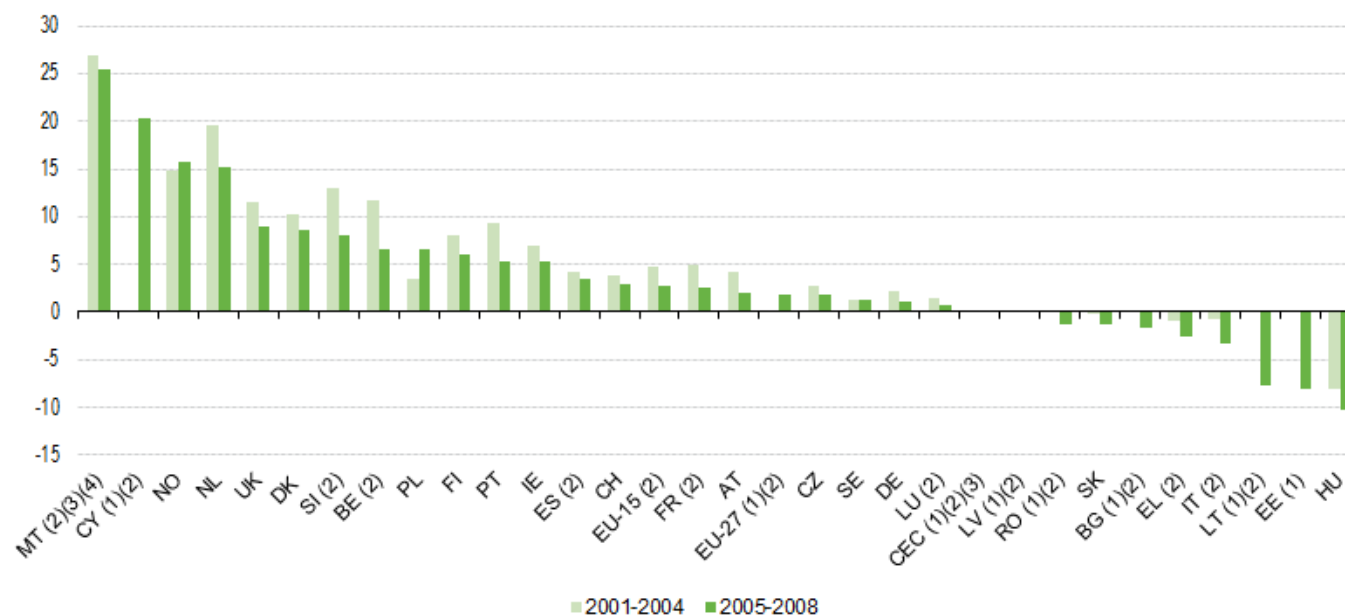
## Changes in water quality variables during the last two decades:



Source: Waterbase - Rivers provided by European Environment Agency (EEA)

# Degradation of biodiversity due to use of chemicals

## Phosphorus surplus (kg P per ha), average 2001-2004 vs 2005-2008, EU-27, CH and NO:



- (1) Data not available for 2001-2004
- (2) Eurostat estimations
- (3) PL, RO, BG, CZ, HU, LV, LT, EE, SI, SK
- (4) Average 2002-2004

Source: Eurostat

# Degradation of biodiversity due to use of chemicals

## Ecological consequences of unsustainable use of N and P:

- Runoff – groundwater and drinking water pollution
- Eutrophication (proliferation of blue-green algae, reduced light penetration, depletion of oxygen in surface water, disappearance of benthic invertebrates, and production of toxins)
- Cumulative P balance of the past – soil erosion and water contamination



<http://archive.cosmosmagazine.com>



<http://www.buzzle.com>

# Degradation of biodiversity due to use of chemicals

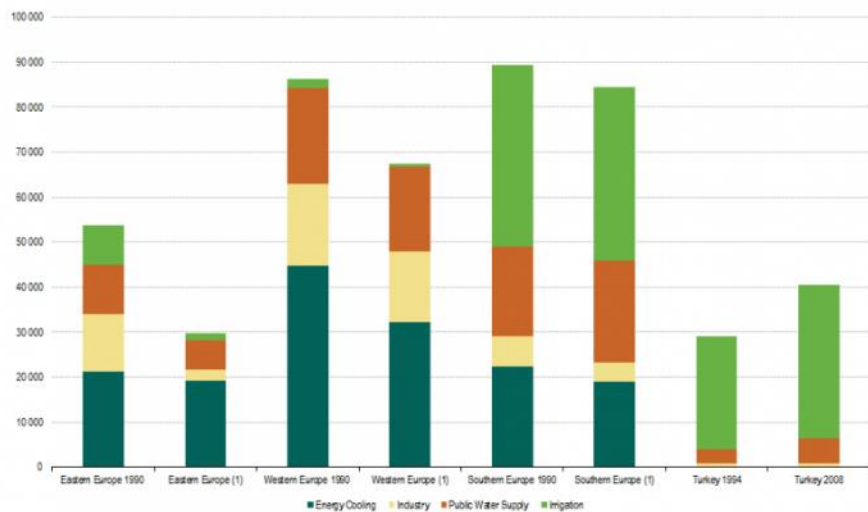
- The effects of pesticides on ecosystems have been characterized using toxicological properties of the chemicals for indicator species.
- Chemical substances on the market tend to be less and less harmful.
- The persistence of pesticides in the environment
- Pesticides represent one of the main pressures from agriculture on ecosystems.
- Impact on air quality, water, soil and soil biodiversity, birds, amphibians, pollinators



Source of the photos: [https://en.wikipedia.org/wiki/Environmental\\_impact\\_of\\_pesticides](https://en.wikipedia.org/wiki/Environmental_impact_of_pesticides)

# Irrigation demand

## Annual water abstraction by sector (million m3 per year), 1990-2009, EU-28, IS, NO, CH and MK:

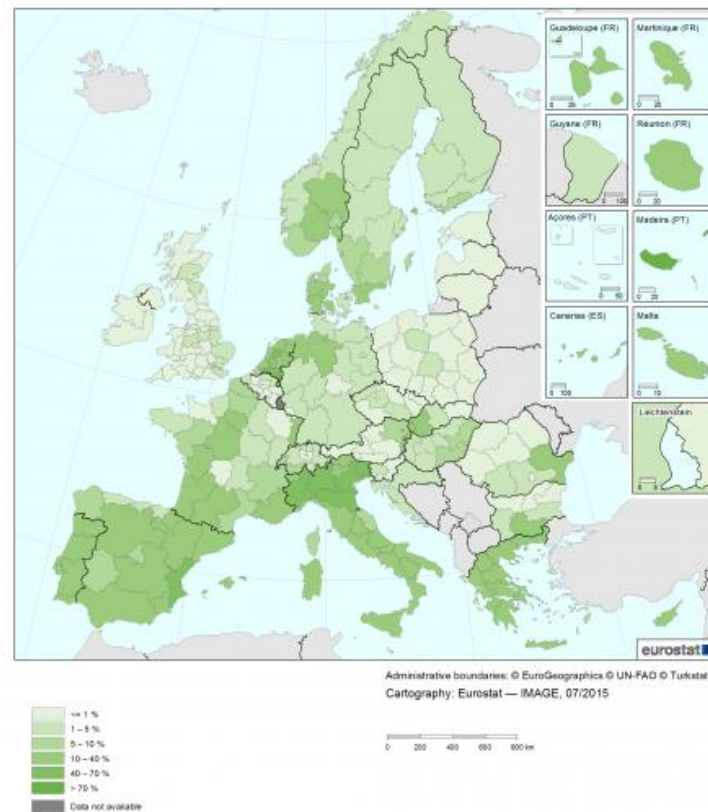


(1) Latest year for which data are available (1997-2009)

Eastern Europe: BG, CZ, EE, HR, LV, HU, PL, RO, SI, SK  
 Western Europe: BE, DK, DE, IE, NL, AT, FI, SE, UK, IS, NO, CH  
 Southern Europe: EL, ES, FR, IT, CY, MT, PT, MK

Source: European Environment Agency-European Topic Centre on Water (ETC/WTR) based on data from Eurostat

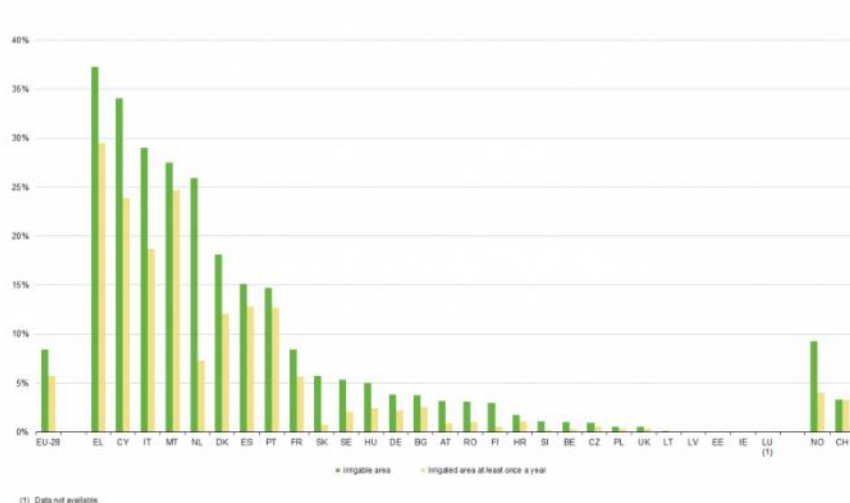
## Share of irrigable areas in UAA by NUTS 2 regions, EU-28, NO and CH, 2010, (%)



Source: Eurostat

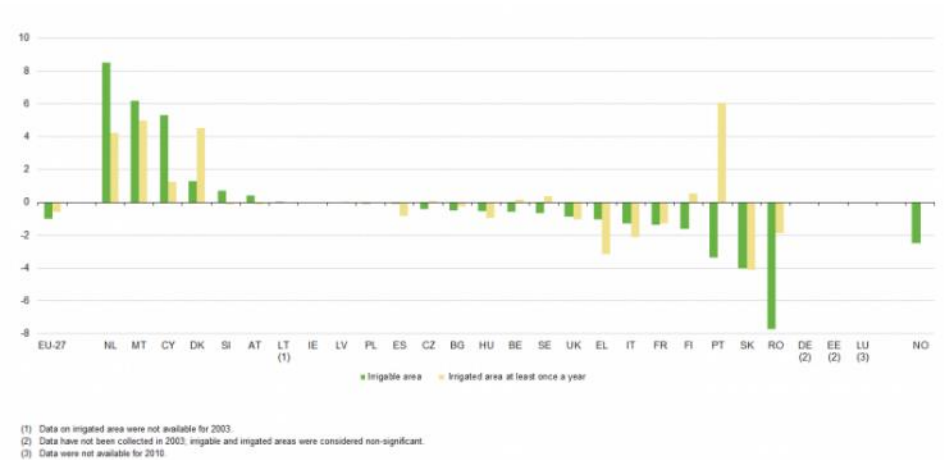
# Irrigation demand

Share of irrigable and irrigated areas in UAA, EU-28, NO and CH 2010, (%):



Source: Eurostat

Change in share of irrigable and irrigated areas in UAA, EU-27 and NO, 2010-2003, (percentage points):



Source: Eurostat

# Irrigation demand

## Agri-environmental context of irrigation:

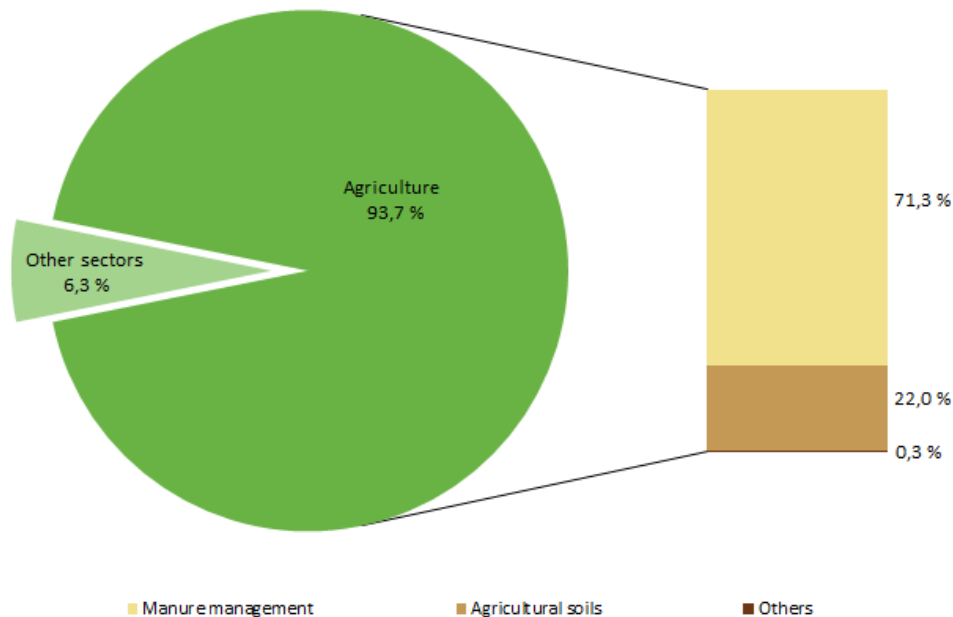
- Climate and climate change
- Over-abstraction of groundwater supplies, salinisation and water pollution
- Soil erosion
- Wetlands and HNV habitats degradation (arable dry land, low density pastures and sensitive aquatic environments)
  
- Diverse cultural landscape
- Shelter for some wintering bird species
- Opportunity for nature conservation



Source: [www.flickr.com](http://www.flickr.com)

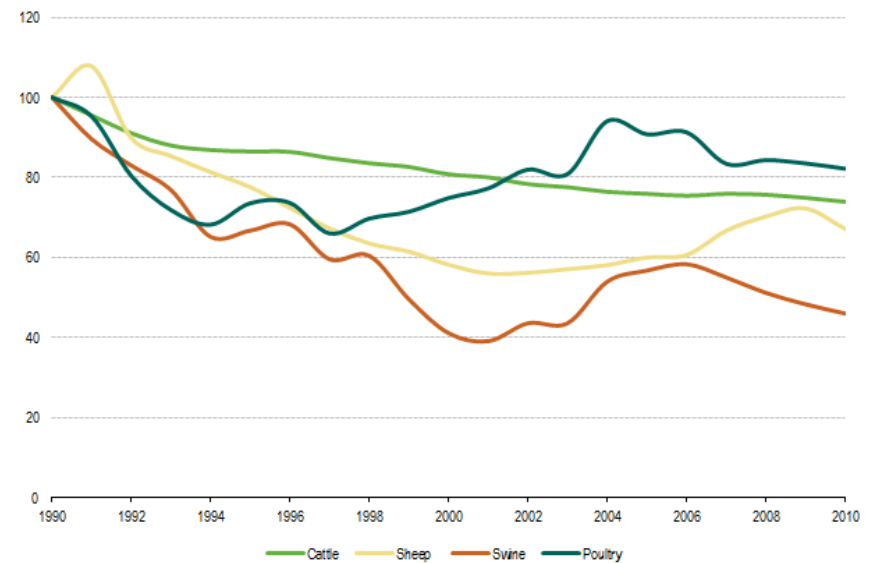
# Air emissions

## Share of agriculture to total ammonia emissions (%), 2010, EU-27:



Source: European Environment Agency

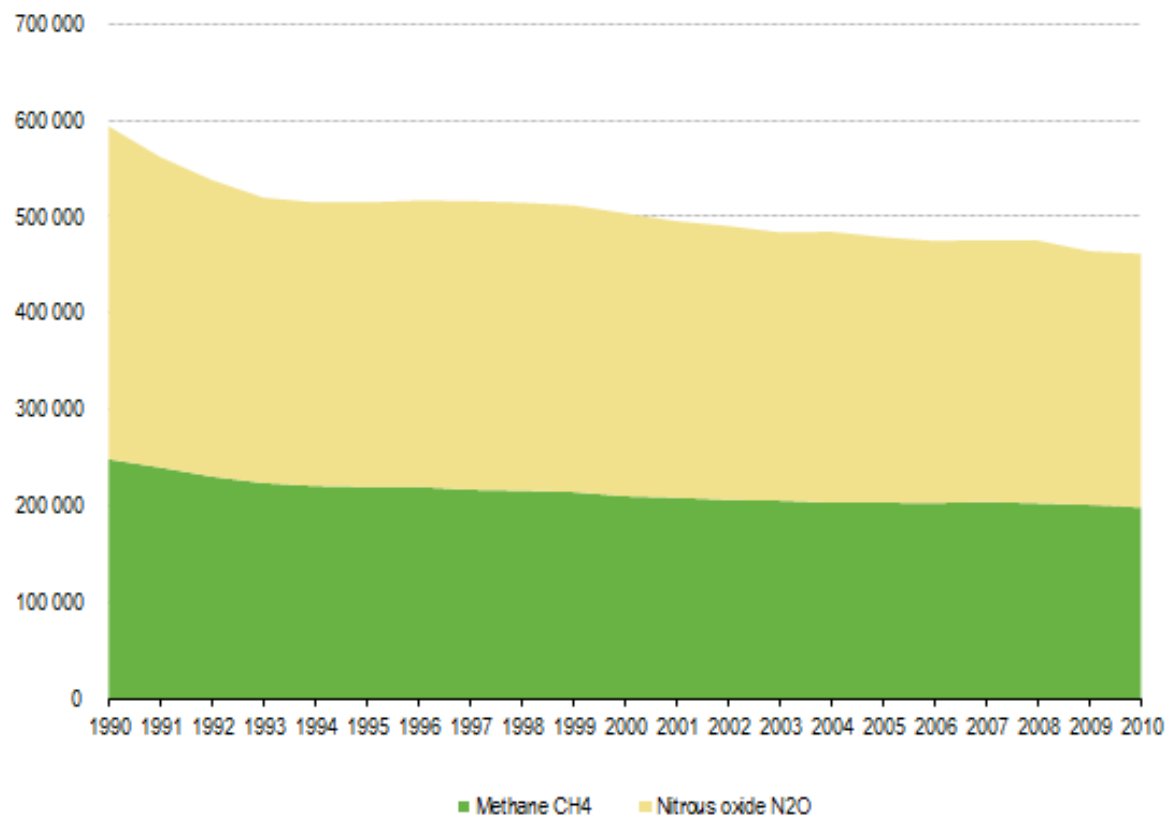
## Change in numbers of livestock (index 1990 = 100), 1990-2010, EU-27:



Source: European Environment Agency

# Air emissions

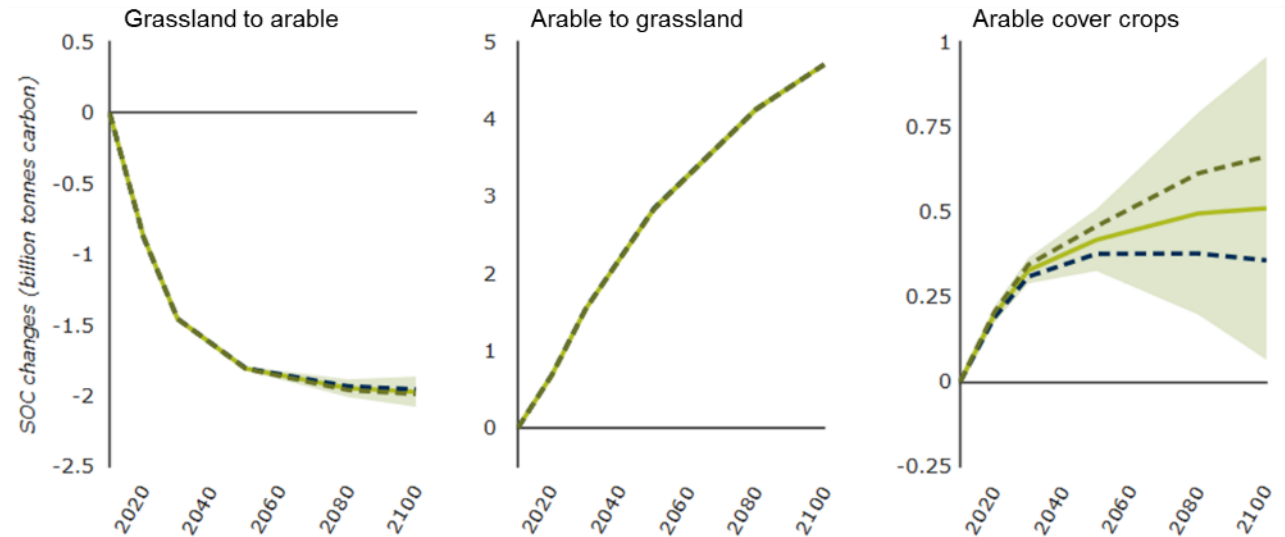
## Methane and nitrous oxide emissions from agriculture sector (kilotonnes of CO2 equivalents), 1990-2010, EU-27:



Source: European Environment Agency

# Air emissions

## Soil organic carbon change at pan-European level under different land use change and soil management scenarios:



Note: Values are projected to 2100 using two climatic scenarios. The blue and dark green interrupted lines correspond to the HADCM3\_A1FI (HAD) ('world markets-fossil fuel intensive') and PCM\_B1 (PCM) ('global sustainability') scenarios respectively, the former is more extreme, the latter more conservative. The bright green line is the average, while the light green region delimits the 2σ confidence interval/variability. Scenarios were calculated using the CENTURY agroecosystem model. Source: CAPRESE project. Lugato E., Panagos, P., Bampa, F., Jones A. and Montanarella, L. (2014); Lugato, E., Bampa, F., Panagos, P., Montanarella, L. and Jones, A. (2014)

### Agri-environmental context:

- Soil management and land use
- Manure management
- Climate change
- Mitigation practices

# Food safety

- Labelling and nutrition (allergens, fresh meat, engineered nanomaterials, vegetable origin, defrosted products, nutrition information of processed foods)
- Food supplements
- Biological safety (food hygiene, animal by-products, food-borne diseases, microbiological criteria)
- Genetically modified organisms
- Chemical safety (contaminants, residues, pesticides, food contact materials, hormones in meat)
- Food improvement agents (food additives, enzymes, flavourings)
- Animal nutrition (feed labelling, hygiene, additives, medicated feed, undesirable substances)
- Food waste

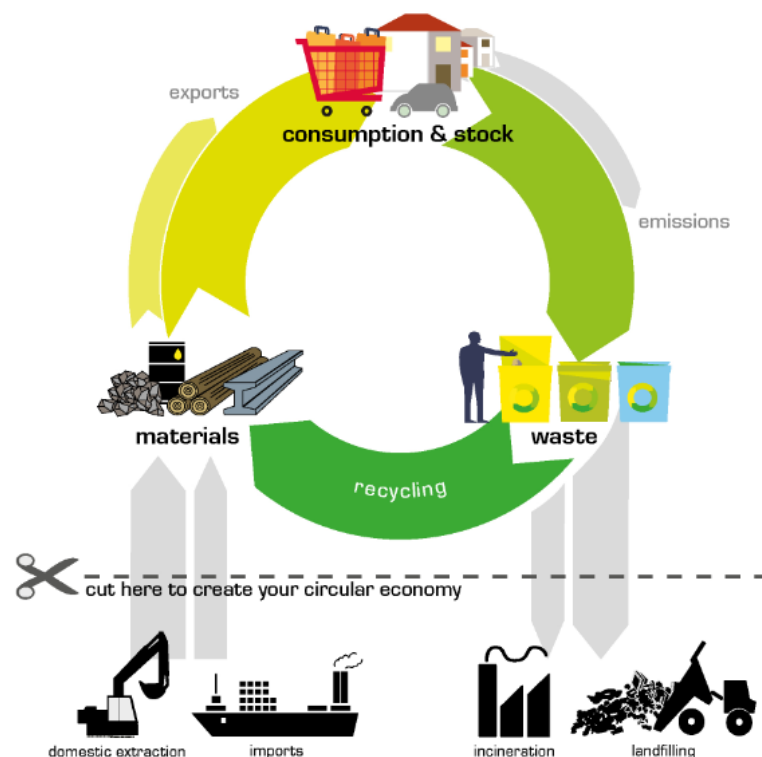


# Food safety

- **Nearly 100 million tonnes of food are wasted annually** in the EU (2012). If nothing is done, food waste could rise to over 120 million tonnes by 2020.
- About a **third of all food produced globally for human consumption is lost or wasted** - around 1.3 billion tonnes per year, according to the FAO.
- Food loss and waste in **industrialised countries are as high as in developing countries, but their distribution is different:**
  - In developing countries, over 40% of food losses happen after harvest and during processing;
  - In industrialised countries, over 40% occurs at retail and consumer level.

Source: European Commission

## Circular economy and resource efficiency:



Source: EEA Signals 2014



# Information sources and trends

| Institution                                     | Contact   |
|---|---|
| European Environment Agency                     | <a href="http://www.eea.europa.eu/">http://www.eea.europa.eu/</a>   |
| European Topic Centre/Biological Diversity      | <a href="http://bd.eionet.europa.eu/">http://bd.eionet.europa.eu/</a>   |
| European Commission – DG Environment            | <a href="http://ec.europa.eu/dgs/environment/index_en.htm">http://ec.europa.eu/dgs/environment/index_en.htm</a>                             |
| Joint Research Centre                           | <a href="https://ec.europa.eu/jrc/">https://ec.europa.eu/jrc/</a>   |
| Eurostat (Agri-environmental indicators)        | <a href="http://ec.europa.eu/eurostat/web/agri-environmental-indicators">http://ec.europa.eu/eurostat/web/agri-environmental-indicators</a> |
| European Commission – DG Health and Food Safety | <a href="http://ec.europa.eu/food/index_en.htm">http://ec.europa.eu/food/index_en.htm</a>   |
| European Food Safety Authority                  | <a href="http://www.efsa.europa.eu/">http://www.efsa.europa.eu/</a>   |



# Information sources and trends



## Biodiversity decline and ecosystem degradation reduce resilience

### Terrestrial and freshwater biodiversity

#### 5-10 year trends:

High proportion of protected species and habitats in unfavourable conditions.

#### 20+ year outlook:

Underlying drivers of biodiversity loss are not changing favourably.

Full implementation of policy is needed to deliver improvements.

#### Progress to policy targets:

Not on track to halting overall biodiversity loss (Biodiversity Strategy), but some more specific targets are being met.

Source: EEA. SOER 2015 Synthesis report.



## Land-use change and intensification threaten soil ecosystem services and drive biodiversity loss

### Land use and soil functions

#### 5-10 year trends:

Loss of soil functions due to (urban) land take and land degradation (e.g. as a consequence of soil erosion or land intensification) is continuing; nearly a third of Europe's landscape is highly fragmented.

#### 20+ year outlook:

Land use and management, and their associated environmental and socio-economic drivers, are not expected to change favourably.

#### Progress to policy targets:

No target

The only non-binding explicit objective is to arrive at 'no net land take by 2050', and to restore at least 15 % of degraded ecosystems by 2020.

Source: EEA. SOER 2015 Synthesis report.

## Europe is far from meeting water policy objectives and having healthy aquatic ecosystems

### Ecological status of freshwater bodies

#### 5-10 year trends:

Mixed progress; more than half of rivers and lakes are in less than good ecological status.

#### 20+ year outlook:

Continuous progress is expected as implementation of the Water Framework Directive continues.



#### Progress to policy targets:

Only half of surface water bodies meet the 2015 target to achieve good status.

Source: EEA. SOER 2015 Synthesis report.

## Reducing water stress requires enhanced efficiency and water demand management

Water use and water quantity stress

### 5-10 year trends:

Water use is decreasing for most sectors and in most regions but agricultural water use, in particular in southern Europe, remains a problem.

### 20+ year outlook:

Water stress remains a concern in some regions, and efficiency improvements may not offset all impacts of climate change.

### Progress to policy targets:



Water scarcity and droughts continue to affect some European regions, impacting both economic sectors and freshwater ecosystems.

Source: EEA. SOER 2015 Synthesis report.

## Water quality has improved but the nutrient load of water bodies remains a problem

### Water quality and nutrient loading

#### 5-10 year trends:

Water quality has improved, although concentrations of nutrients in many places are still high and affect the status of waters.

#### 20+ year outlook:

In regions with intensive agriculture production, diffuse nitrogen pollution will still be high, resulting in continued eutrophication problems.

#### Progress to policy targets:

Although the Urban Waste Water Treatment Directive and the Nitrates Directive continue to deliver pollution control, diffuse nitrogen pollution remains problematic.

Source: EEA. SOER 2015 Synthesis report.



## Despite cuts in air emissions, ecosystems still suffer from eutrophication, acidification and ozone

### Air pollution and its ecosystem impacts

#### 5-10 year trends:

Lower emissions of air pollutants have contributed to fewer exceedances of acidification and eutrophication limits.

#### 20+ year outlook:

Long-term problems from eutrophication are forecast to persist in some areas, although adverse impacts caused by acidification will be greatly improved.

#### Progress to policy targets:

There has been mixed progress in meeting the EU's 2010 interim environmental objectives for eutrophication and acidification.

Source: EEA. SOER 2015 Synthesis report.

**Thank you for your attention**

