Pesticide Environmental Risk Assessment: Environment unprotected?

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Pesticides

Deliberately made to be toxic to living organisms

- Cellular sites in target species similar to other organisms

Pesticides are toxic to non-target species

Species population

Impact ecosystems biodiversity

Low water solubility + Repeated use → Contamination of ecosystems
Pesticides, not just for crops

- Detected in: biota (flora and fauna), air, soil, sediments, rivers & streams, even in humans.
- About 38% of EU’s total land area is treated with pesticides

- Only a tiny fraction reaches the target pest
Pesticide sales in EU

EU: 300,000,000 kg/year – world’s highest consumer

Eurostats 2003-2013
Anthropogenic pressures

Pesticides not the only ones

- Population expansion
- Consumption of resources
  - Marine
  - Freshwater
  - Terrestrial
- Habitat and biodiversity loss (extinction)
- Ecosystem services loss
- Invasive species

- Land exploitation
- Deforestation
- Degradation of land and habitat loss
- Livestock production
- Intensive agricultural production

- Industrialization
- Urbanization
- Freshwater exploitation
- Pollution
  - Freshwater
  - Marine
  - Air
  - Land
- Ecosystem degradation
Anthropogenic pressures

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- Marine
- Air
- Land
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Pesticides are intentionally released to open fields
Legal requirements - pesticides

PPPR (EC) 1107/2009:
Rec 8:
“The purpose of this Regulation is to ensure **a high level of protection** of both human and animal health and the environment.... **The precautionary principle should be applied.**”

Art 2(b,e):”**Residues/products shall not have any unacceptable effect on the environment.**” (non-target species, biodiversity and ecosystems)

Annex II 3.8.: no unacceptable effects on bees, no endocrine disruptors

But are these objectives fulfilled?
Accelerating global biodiversity loss

2002 Convention on Biological Diversity: reduction targets by 2010

Study period: 1970s-2010

Indicators

- Declines in population trends
- Increasing pressures
- Policy and management responses are increasing but are not effective

EU freshwater ecosystems unprotected

Study - Outline

- 2006-2010 EEA data
- 4000 EU sites; 91 EU rivers
- 223 Organic pollutants
- Fish, invertebrates, algae

EU freshwater ecosystems unprotected

Acute Toxicity

- Acute Risk at 14% sites

Chronic Toxicity

- Chronic Risk 42% sites

Pesticides- the underlying cause

Fish: 81% insecticides
Invertebrates: 87% insecticides
Algae: 96% herbicides

Chemical risk
- Agricultural land
- Natural vegetation

Pesticide effects on biodiversity

**Study**

- 8 EU countries, 9 sites:
  - 30 x 30 up to 50 x 50 km²
  - 30 arable farms/site (cereals)

**Indicators:**
- Wild plants, carabids & birds
- Biological control (aphids survival)
- Farmers’ practises, landscape

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### Results

**Wild plants**

<table>
<thead>
<tr>
<th>Explanatory variable</th>
<th>Standardized effect</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean field size</td>
<td>-0.094</td>
<td>0.014</td>
</tr>
<tr>
<td>% of land under AES</td>
<td>0.149</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Frequency of herbicide application</td>
<td>-0.1061</td>
<td>0.003</td>
</tr>
<tr>
<td>Frequency of insecticide application</td>
<td>-0.105</td>
<td>0.013</td>
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<tr>
<td>Applied amounts of a.i. of fungicides</td>
<td>-0.262</td>
<td>&lt;0.001</td>
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</tbody>
</table>

**Carabids**

<table>
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<tr>
<th>Explanatory variable</th>
<th>Standardized effect</th>
<th>p-value</th>
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</thead>
<tbody>
<tr>
<td>% of land under AES</td>
<td>0.062</td>
<td>0.012</td>
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<tr>
<td>Applied amounts of a.i. of insecticides</td>
<td>-0.061</td>
<td>0.001</td>
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**Birds**

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<th>Standardized effect</th>
<th>p-value</th>
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</thead>
<tbody>
<tr>
<td>Frequency of fungicide application</td>
<td>-0.127</td>
<td>0.017</td>
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**Biological control**

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</thead>
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<tr>
<td>% of land under AES</td>
<td>-0.144</td>
<td>0.002</td>
</tr>
<tr>
<td>Applied amounts of a.i. of insecticides</td>
<td>0.114</td>
<td>0.001</td>
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</table>

Impact of neonicotinoids on wild bees

**Study**

- 62 wild bee species in UK
- Oilseed rape treated crops

**Data from 1994-2011:**
- 31,818 surveys
- 4,056 Km²

- Other pollinators affected:
  - Butterflies
  - Bumble bees

Bees unprotected from herbicides

Study

- Pesticides in bee matrices:
  - Bees (13)
  - Beebread (61)
  - Wax (71)
- Hazard Quotient
- Colony Survival

Bee mortality

Insecticides

Regulatory Acceptable Concentration (RAC) sw/sed

Vs

Measured Insecticide Concentrations (MICs) n=23

44.7% MICs>RACs

55% of sites (n=1566)

- Limited monitoring data
- > Environmental Quality Standards (WFD)
- 90% with mixtures

Insecticide are the main drivers of biodiversity loss

ERA – Underestimation of harm?

**Fungicides**

- Predicted Environmental Concentrations (PECs) *FOCUS scenarios*
- Measured Fungicide Concentration (MFC) sw/sed
- Are PECs worst case scenarios? *No, it's an underestimation*

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<thead>
<tr>
<th></th>
<th>Seawater</th>
<th>Sediment</th>
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</thead>
<tbody>
<tr>
<td>Step 3</td>
<td>15% PECsw &lt; MFCsw</td>
<td>67% PECsed &lt; MFCsed</td>
</tr>
<tr>
<td>Step 4</td>
<td>28% PECsw &lt; MFCsw</td>
<td>76% PECsed &lt; MFCsed</td>
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*Herbicide permitted levels unsafe*

Environment Unprotected - Recapitulate

- Pressures are increasing steadily
- Biodiversity loss and ecosystem degradation is increasing
- Real-time monitoring is missing
- Scenarios fail to predict worst-case and the environment remains unprotected
- Long term, chronic effects of ERA are underestimated
Final remarks

- Urgent need to reduce pesticide environmental exposure
- Europe has to adopt non toxic alternatives for agriculture
- Environmental Risk Assessment must have a truly conservative, ecological-based approach
- Abandon the concept that ecosystems always recover
- EU models should consider low dose, long term effects. Reproduction impairment, endocrine disruption and chronic effects on species should be identified
- EU should ban completely the use of dangerous and already banned pesticides (MS derogations) and prohibit exports
Thank you!