



Senter for vitenskapsteori

Science, lobbies and the environment: marking the 60th anniversary of Rachel Carson's *Silent Spring*  
6 October Brussels – University of Bergen BeeCaution project & Corporate Europe Observatory

# Regulatory science & precaution

## lessons from the neonicotinoids case



*Prof. Dr. Jeroen P. van der Sluijs*

Twitter: @Jeroen\_vdSluijs



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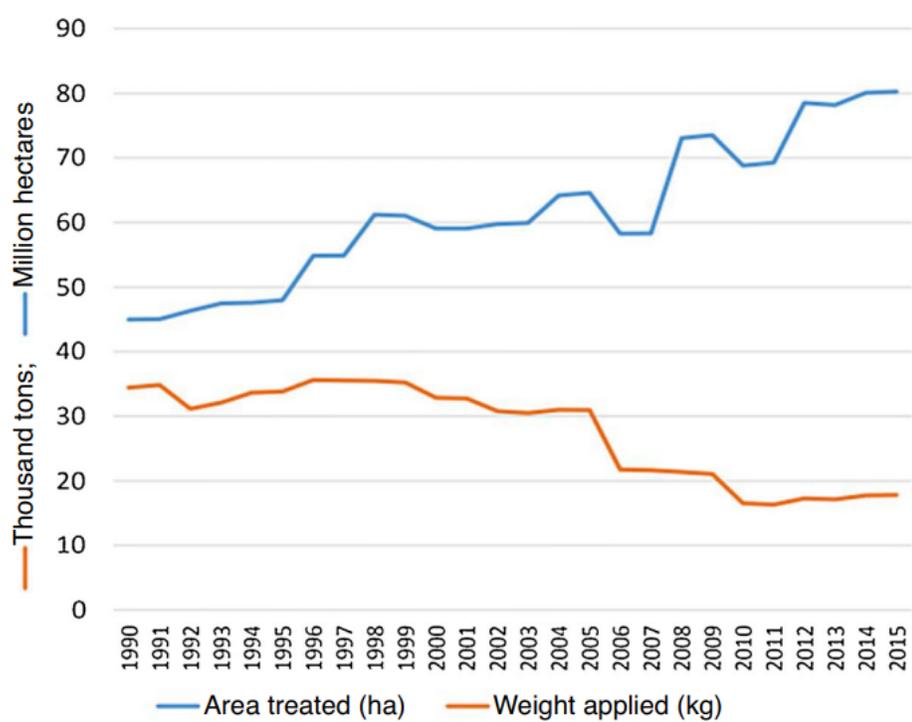


# 60 years of regrettable substitution

## Can we stop the pesticide merry-go-round?

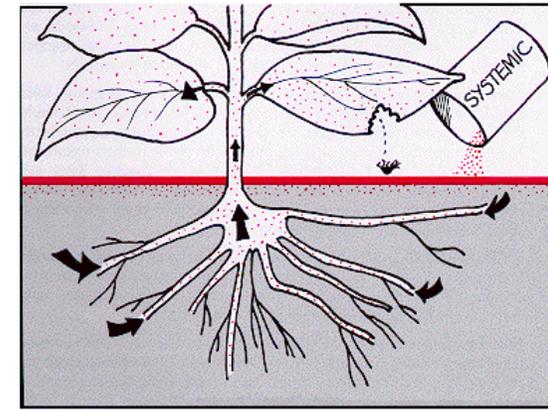
### Insecticides:

- **DDT** (banned by many countries in 70s/80s, worldwide ban 2001)
- **Drins** (Aldrin, Dieldrin, Endrin) (Banned in EU in 1991, worldwide 2004)
- **Organophosphates** (replaced DDT)  
(some banned recently in EU: 2002 omethoate; 2020 Chlorpyrifos)
- **Neonicotinoids** (replaced Drins and Organophosphates)  
(4 partly banned in EU in 2018 / 2019)
- **Sulfoximines** (sulfoxaflor, authorized in EU in 2015, banned in 2022)
- **Butenolides** (flupyradifurone)



# Systemic pesticides (neonics)

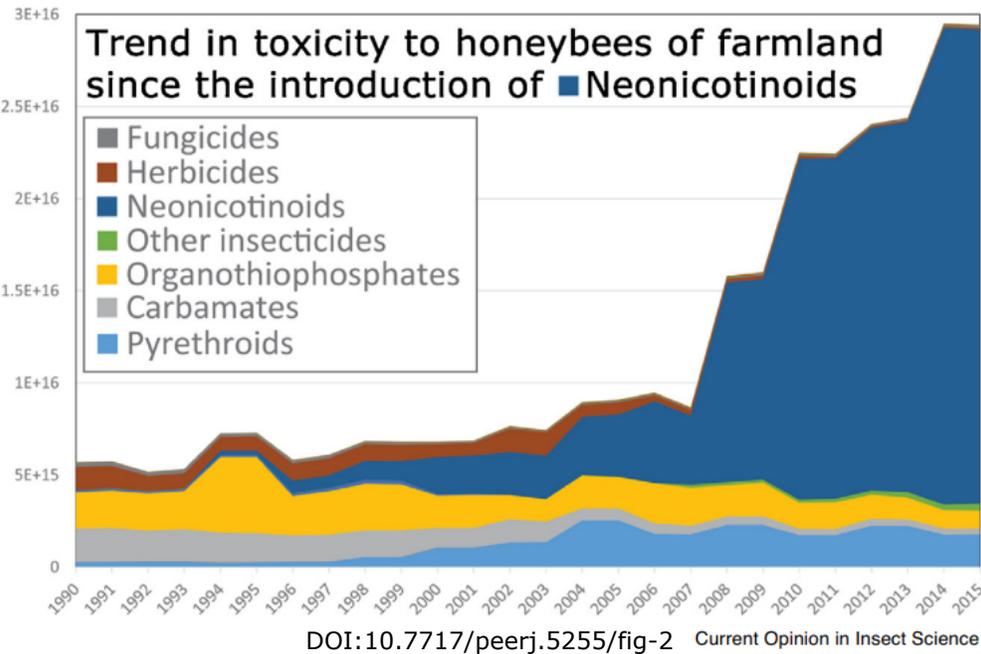
- Used prophylactically



*Systemic = crop takes it up into its plantsap: chemical makes plant toxic from inside*

- Convenience pesticides = antithesis of IPM (preemptive strike, not last resort)

- Pollutants with no emission ceiling... !!!



# of honeybee lethal doses (LD<sub>50</sub>) in pesticides applied to UK farmland 1990-2015

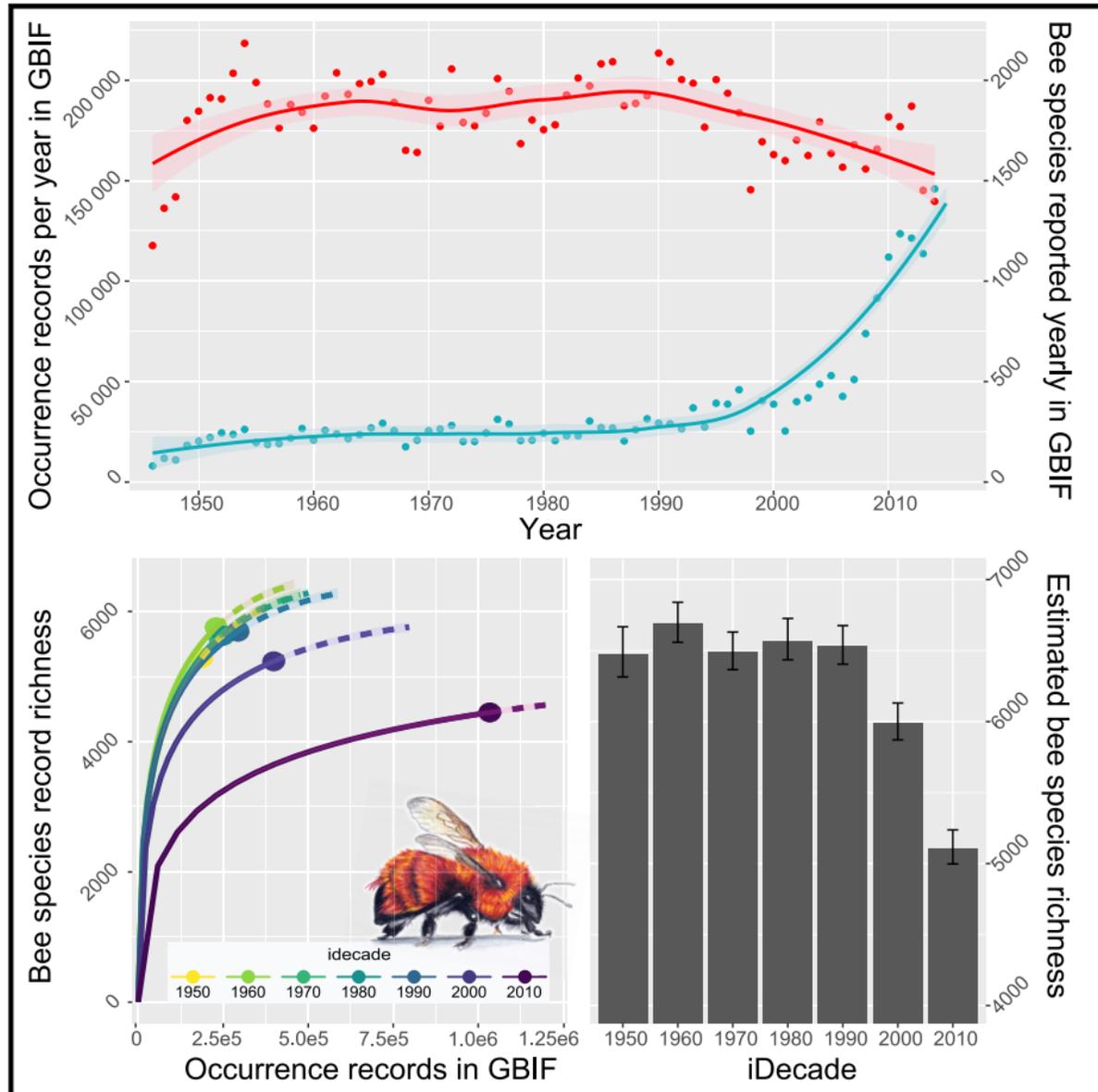
## Toxicity of neonicotinoids

Pesticide	®	Use	LD50 (ng/honeybee)	Toxicity index relative to DDT
DDT	Dinocide	insecticide	27000	1
Amitraz	Apivar	insecticide / acaricide	12000	2
Coumaphos	Perizin	insecticide / acaricide	3000	9
Tau-fluvalinate	Apistan	insecticide / acaricide	2000	13.5
Methiocarb	Mesurool	insecticide	230	117
Carbofuran	Curater	insecticide	160	169
λ-cyhalothrin	Karate	insecticide	38	711
Deltamethrine	Decis	insecticide	10	2700
Thiamethoxam	Cruise	insecticide	5	5400
Fipronil	Regent	Insecticide	4.2	6475
Clothianidine	Poncho	Insecticide	4.0	6750
Imidacloprid	Gaucho	Insecticide	3.7	7297

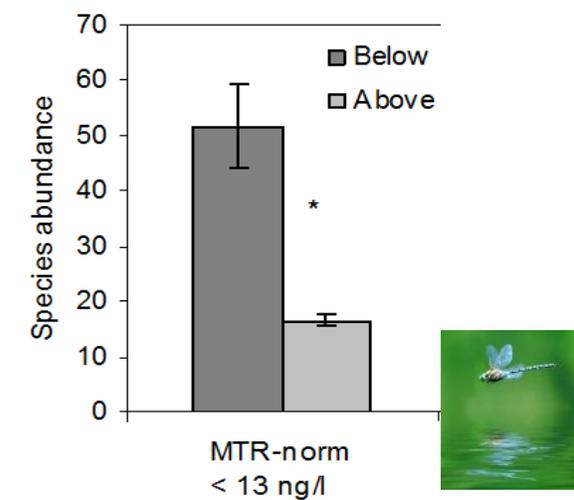
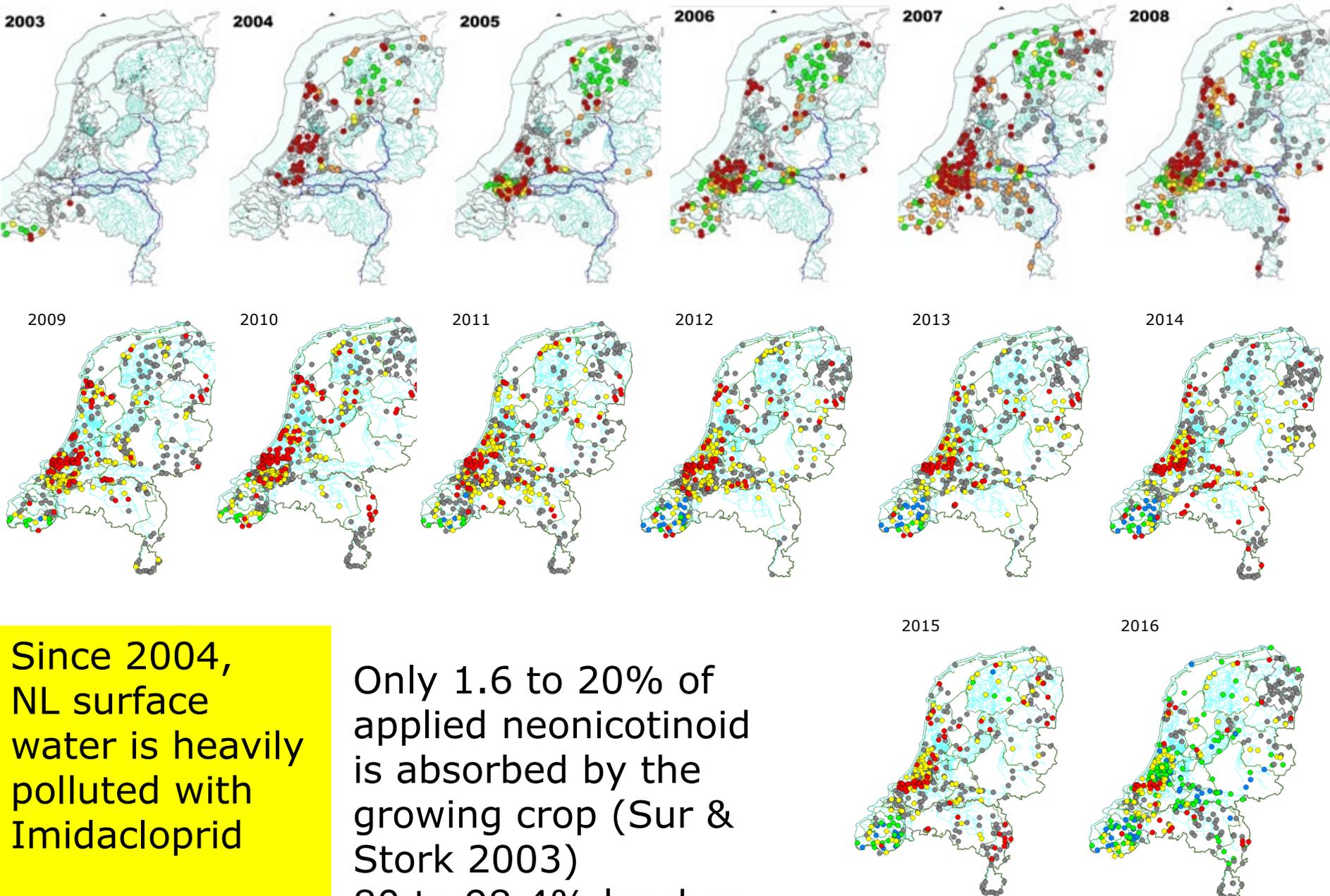
Toxicity of insecticides to honeybees compared to DDT. The final column expresses the toxicity relative to DDT. (Source: Bonmatin, 2009)

# Number of worldwide recorded bee species is sharply decreasing

*Despite increasing number of observations in Global Biodiversity Information Facility,*



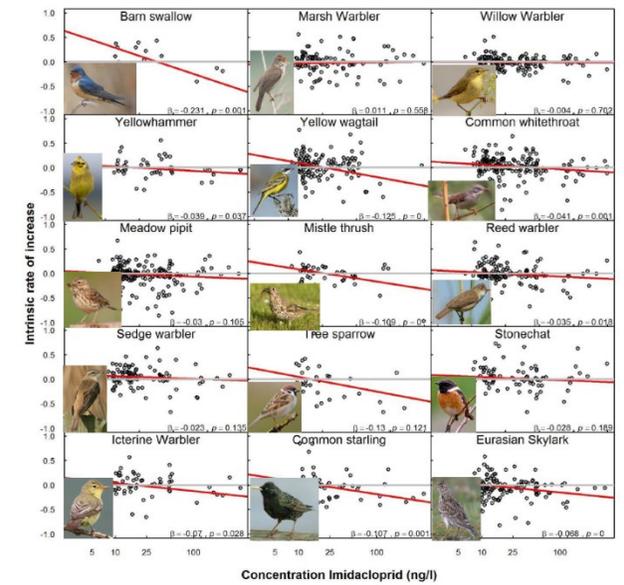
between 2006 and 2015,  
**25% fewer** species of  
**wild bees** were seen than  
was the case before 1990



70% decline in macrofauna abundance in polluted water  
<https://doi.org/10.1371/journal.pone.0062374>

Since 2004, NL surface water is heavily polluted with Imidacloprid  
[www.bestrijdingsmiddelenatlas.nl](http://www.bestrijdingsmiddelenatlas.nl)

Only 1.6 to 20% of applied neonicotinoid is absorbed by the growing crop (Sur & Stork 2003)  
 80 to 98.4% leaches to soil & water!



Insectivorous birds decline  
<https://doi.org/10.1038/nature13531>

# Timeline neonic case

- 1991 Market introduction imidacloprid
- 1994 Early warnings France
- 1999 First ban in France (sunflowers)
- 2002 EFSA established
- 2003 CST report France  $PEC \gg PNEC$ 
  - <https://controverses.sciences-po.fr/archive/pesticides/rapportfin.pdf>
- 2004 Ban in France (corn)
- 2013 EU ban 3 neonics on crops attractive to bees
- 2018 EU ban on outdoor use in crops
- 2019 EU ban thiacloprid

# (historic) errors in risk assessment of neonics

Industry & regulatory science	Proven wrong by academic research	Issue
Does not translocate to flowers	Detected in pollen and nectar at ppb level.	Limit of detection
Key risk indicator is Acute Toxicity (+some times 10d chronic)	Sublethal effects are crucial	2003 CST PEC>>PNEC = No Go!
Honeybee is representative	Wild bees more sensitive and ecologically more key	Resilience of honeybee colony >> wild bees
Field tests can overrule lab tests	Field tests used are flawed by design & lack statistical power	Reproducibility
<b>Assess single applications of single substances, assume 1 time exposure</b>	Holistic, all applications together, all neonics together, year round exposure	<b>&gt; 1000 allowed applications of 6 neonics in 200 products in EU (2015)</b>
Allow for recovery of hive after single exposure	Year round exposure makes recovery irrelevant	Recovery unrealistic
What is field realistic: what industry reports based on models and standard experiments	What we measure in the field.	Invalid assumptions
Emissions based on models with assumptions	Measured levels of pollution proofs models wrong	Invalid assumptions

# Loopholes

## *Neonics continue to pollute our environment*

- “Emergency” authorisations
- Use as biocide continues
  - Bayt spray (imidacloprid) to kill flies in cattle breeding (stables, trucks, etc.)
  - Wood conservation (thiacloprid)
- Use as veterinary medicine continues
  - On pets and cattle (fleas and flies)
- Use outside EU on food (for humans and cattle) continues
  - Neonic residues in food are not fully metabolised, ends up in urine and manure.
  - Found in effluent of household waste-water treatment plants.
- Regrettable substitution Neonics:
  - Thiacloprid (replaced the 3 neonics banned in 2013/2018)
  - Sulfoxaflor [2015] & Flupyradifurone [2015]: same mode of action, *early warnings date from before authorisation decisions*
- New markets:
  - Lice treatment in Salmon farming authorised in 2021 in Norway (imidacloprid)

# Challenges neonicotinoids

## Too little

- Large scale use and pollution continues (see previous slide)
- How to fix the loopholes?

## Too late

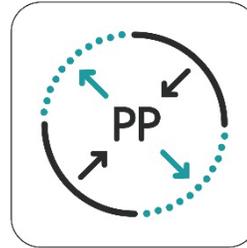
- How to reduce delays between early warning and action?
- How to improve the social organisation of expertise to timely inform decisions

## Partial ban only in Europe

- World wide use Neonics still growing
- Europe produces and exports the banned neonics
- Human exposure still high and probably rising (residues in imported food)
- **Pollutant of emerging concern** in Marine and Arctic environments

# Guidance for the Application of the Precautionary Principle (2022)

3 parts:



- Scope of application



- Organisation of expertise



- Participation



## Precaution for Responsible Innovation

Guidance on the application  
of the precautionary principle in the EU

<https://recipes-project.eu/results/guidance-future-application-precautionary-principle>

# Risk assessment must be open to 'non-standard' knowledge

RECIPES cases showed:

- Blind spots in **overly reductionist** risk assessment protocols.
- Knowledge that do not fit in such protocols (e.g. end-points not covered by the protocols) is often downplayed, marginalised or ignored.
- Too often, coalitions of concerned scientists and societal actors need to **step in and 'break the script'** of routinised assessment and management processes to recognise key uncertainties and potential harm.

# Lessons learned

- **Stop pesticide use** in stead of endlessly replacing them by new, less-studied ones
- **Post-authorisation feedbacks missing** (extreme violation of norms has no consequences)
- **Strengthen** the role of the **precautionary principle** (safeguard & compass)
- **Epistemic diversity of the knowledge base not accounted for:**
  - Important knowledge systematically silenced, downplayed and ignored.
  - Make use of **information of non-scientific sources** (local knowledge)
- Make thorough **Knowledge Quality Assessment the key task in the science policy interface** and communicate uncertainty clearly and transparently
- **Clarify values, stakes and vested interests** that play a role in research and in the political and socioeconomic context within which the research is embedded.
- Address **Power asymmetries** that bias weighting of evidence

# Further reading

- RECIPES Guidance on the application of the precautionary principle:  
<https://recipes-project.eu/results/guidance-future-application-precautionary-principle>
- EU Ban on Neonics: Too Little, Too Late  
<https://www.greeneuropeanjournal.eu/eu-ban-on-neonics-too-little-too-late/>
- Report EU Parliament PEST committee on the Union's authorisation procedure for pesticides:  
[https://www.europarl.europa.eu/doceo/document/A-8-2018-0475\\_EN.pdf](https://www.europarl.europa.eu/doceo/document/A-8-2018-0475_EN.pdf)
- Pollinator conservation requires a stronger and broader application of the precautionary principle  
<https://doi.org/10.1016/j.cois.2021.04.005>
- Halting the pollinator crisis requires entomologists to step up and assume their societal responsibilities  
<https://doi.org/10.1016/j.cois.2021.08.004>
- Insect decline, an emerging global environmental risk  
<https://doi.org/10.1016/j.cosust.2020.08.012>