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Protection goals in environmental risk assessment

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Challenging boundaries in risk assessment
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Outline

- Background
- Protection goals in legislation
- Methodology - Ecosystems Services approach and Steps

- Specific protection goals – example Honeybees
- Relevance to other Environmental Risk Assessment

Background

EFSA's Plant Protection Products and their Residues Panel (PPR) was asked to revise EC Guidance Documents on RA

- Aquatic ecotoxicology
- Terrestrial ecotoxicology

Directive 91/414/EC replaced by Regulation (EC) No 1107/2009 in June 2011

To develop robust, efficient ERA procedures required, must define protection goals more precisely in order to quantify

- What to protect?
- Where to protect it?
- Over what time period?

Protection goals in legislation

European Food Safety Authority

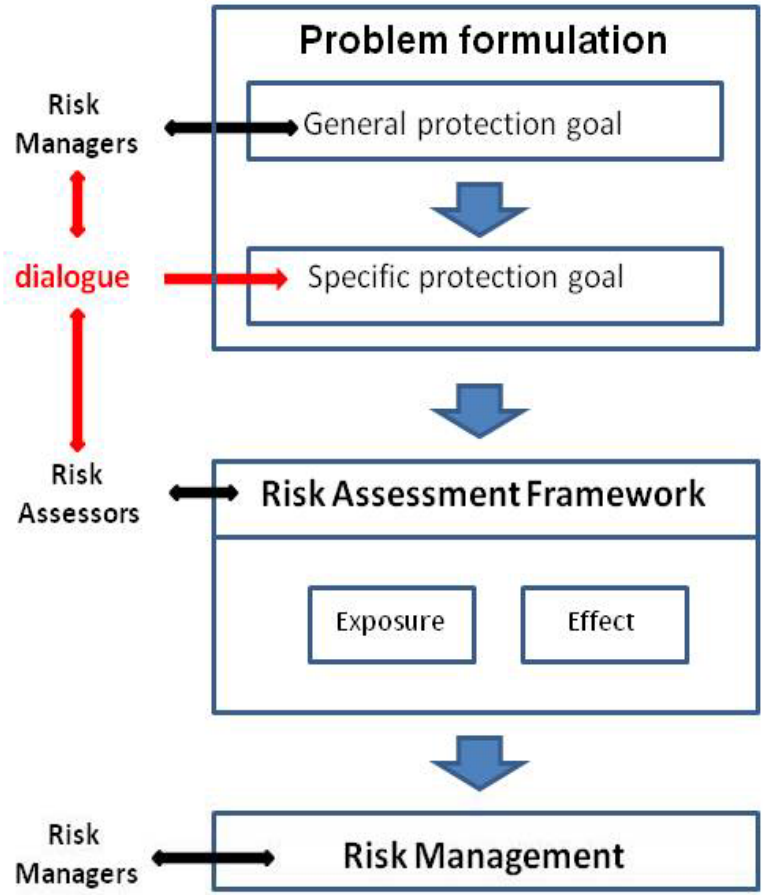
• Protection goals are defined in relevant EU legislation at a general level

• PPP Regulation (1107/2009) Requires high level of protection
" *no unacceptable effects on the environment*" for ppps
" *no serious risk to the environment*" for treated seeds

Translation into precise goals for RA methodology is difficult

- Directive on Biocides
- REACH Regulation
- Habitats Directive
- Water Framework Directive

Specific Protection Goals (SPG)



SPGs needed to clarify ecological, temporal, spatial scales, In-crop vs off-crop, multiple stress and uncertainties

Ecosystem services concept

ES defined as benefits that humans receive from ecosystems including

- Production of goods (provisioning services e.g. food production)
- Life support processes (regulating and supporting services e.g. water and climate regulation)
- Life fulfilling conditions (cultural services e.g. aesthetic value and recreation)

1. List Ecosystem Services

MEA category	Ecosystem service
Provisioning service	Food, Fibre, Genetic Resources, Biochemicals , natural medicines, pharmaceuticals, Ornamental resources, Fresh water
Regulatory services	Air quality, Climate, Water, Erosion, Disease, Pest, Natural hazard - Regulation Water purification and treatment, Pollination

from Millennium Ecosystem Assessment 2005

2. Identify ES potentially affected

ES category	In-crop area	Off-crop area
Provisioning	Food, Fibre & fuel	Food, Genetic resources, Fresh water
Regulating	Pollination, Pest & disease regulation	Pollination, Pest & disease regulation, Water & Erosion regulation, water purification
Cultural	Education & inspiration Recreation & ecotourism Cultural heritage	Education & inspiration, Recreation & ecotourism, Cultural heritage, Aesthetic value
Supporting	Primary production Photosynthesis	+ Habitat provision, Soil formation & retention, Nutrient cycling, Water cycling

3. Identify key drivers

- Key drivers for a given ES are major taxonomic or functional groups that support the ES

- Large number of key drivers for aquatic and terrestrial ecosystems were identified

- Inclusion of taxa for which data are requested under Regulation (EC) 1107/2009 was checked

4. Develop SPG

Define 6 dimensions for each key driver/ES combination

Ecological entity: individual – (meta)population – functional group – ecosystem

Attribute: behaviour – survival/growth – abundance/biomass – process – biodiversity

Magnitude: negligible effect – small effect – medium effect – large effect

Temporal scale: days – weeks – months – seasons – > 1 year

Spatial scale: in crop – edge of field – nearby off-crop – watershed/landscape

Degree of certainty: low – medium – high *

* Legal requirement

SPGs

After deriving SPG for each key driver/ES combination, those combinations leading to similar SPG were pooled to give seven main categories:

- Microbes
- Algae
- Non-target plants (aquatic and terrestrial)
- Aquatic invertebrates
- Terrestrial non-target arthropods (including honeybees)
- Terrestrial non-target invertebrates (e.g. worms, snails)
- Vertebrates (fish, amphibia, reptiles, birds, mammals)

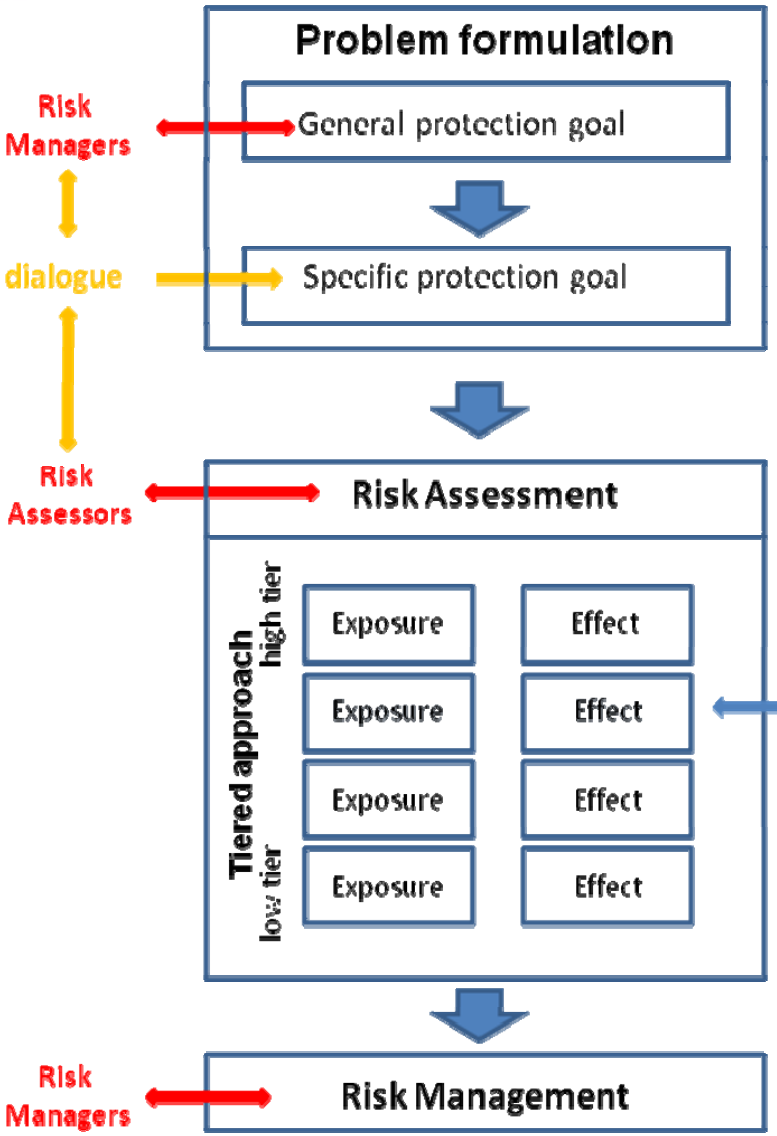
Identify vulnerable species

Honeybees

- Relevant ES – pollination, hive products, biodiversity
- Attributes
  - colony survival & development (in Regulation)
  - effects on larvae & bee behaviour (in Regulation)
  - (abundance/biomass, reproduction) long-term
- Colony viability – depends on colony strength = colony size
- Effects

Effect	Magnitude (reduction in colony size)
Large	>35%
Medium	15% to 35%
Small	7% to 15%
Negligible	3.5% to 7%

Tiered Risk Assessment



Identification of vulnerable species for each key driver and SPG option

"reference tier"

Considerations

- For majority of Key Drivers, SPGs defined at population level or higher
- Recovery rate is important issue
- Population models are needed for RA
- Spatio-temporal scale of effects & exposure require same Ecotoxicologically relevant concentration
- Define ‘statistical population’ and percentiles
- Mixture toxicity & multiple stress (pesticides in different crops) can be included in methodology

Conclusions

- ES enables systematic and transparent assessment of all SPG options, useful communication tool with RMs, stakeholders and public

- Trade-offs are visible (environmental impact vs benefit)

- Decision is for Risk Managers

- Dialogue important – PPR experience - workshops, consultations with RMs

Published References

Scientific Opinion of the PPR Panel in EFSA Journal, 2010 (vol 8: 1821)

Paper in Science of the Total Environment, 2012 (vol 415: 31-38)

Grazie per la Vostra attenzione