



# Making protection goals operational for use in Environmental Risk Assessment

**Dr Reinhilde Schoonjans**  
Scientific risk assessment

Joint EFSA-VKM Symposium  
Oslo, 26 - 27 October 2017

# Abbreviations used

- RA = risk assessment
- RM = risk management
- ERA = environmental risk assessment
- ES = ecosystem service
- SPU = service providing unit
- PG = protection goal
  - GPG = general protection goal
  - SPG = specific protection goal



Why is this needed?



## Protection goals

The objectives of environmental policies, typically defined in law or regulations (Romeis et al., 2011)

- For EFSA mentioned in Food Law
- These are called **general protection goals**
- Example: « **to protect biodiversity** »

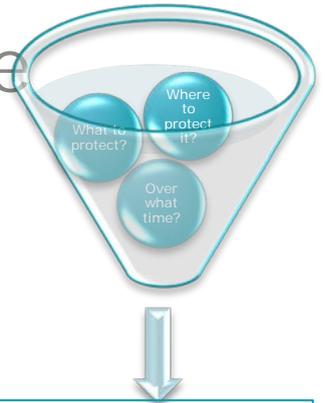


The variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems

- Broad definition (Convention on Biological Diversity)
- Includes structural and functional components

# Specific Protection goals

- Expectations in the food producing context?
- Not further specified and to be made operational for ERA
  - Which aspects of biodiversity?
  - Where to protect biodiversity?
  - To what extent?



Specific Protection Goal

# EFSA Guidance for SPGs

2010

- Method developed by PPR Panel and used for guidance
- Elements of the method in the GMO ERA guidance

2012

- EFSA conference: joint interest from the sectors having biodiversity in their legal framework: GMO, PLH, FA

2016

- Joint work to harmonize the method among sectors
- Guidance adopted by the Scientific Committee

2017

- RA implementation in problem formulation
- RM dialogue



**The method: 3 steps, 5 dimensions**

# STEP 1: Select ecosystem services

The benefits people obtain from ecosystems

That can be affected by  
the stressor to be assessed



## STEP 2: Select service providing unit (SPU)

Structural and functional components of ecosystems necessary to deliver a given ecosystem service

- That can be affected by the stressor to be assessed



# ES MA (2005) categories and SPU examples (1)

## Context in which EFSA works

MA category	Ecosystem services	Examples: service providing units (SPUs)
Provisioning services	Food	Crop species, cattle, pigs, poultry, small game and other consumable vertebrates, fungi, wild fruits (berries), roots, shoots, consumable fish, crayfish, molluscs, algae
	Fibre and fuel	Crop plants (fibres/biofuel), trees (wood/biofuel), emergent macrophytes (thatched roofs), aquatic primary producers and peat (biofuel)
	Genetic resources	All species that potentially provide products to man, e.g. crop species and their wild relatives
	Biochemicals/natural medicines/ pharmaceuticals	Organisms used for medicinal or personal care products
	Ornamental resources	Ornamental species and landscape elements
	Fresh water	Ground and surface water

Provisioning services

# ES MA (2005) categories and SPU examples (2)

Can be in competition with

Regulating services

Pollination	Pollinators: arthropods, such as bees, hoverflies, butterflies and other pollinator species
Seed/propagule dispersal	Insects, birds, mammals, fish and water
Pest/disease regulation	Beneficial arthropods (natural enemies such as ladybirds, ground beetles, true bugs, lacewings, spiders, parasitic wasps), vertebrate predators and fungal species
Climate regulation	Several plant species (wild and domestic)
Air quality regulation	Plants
Water regulation	Plants, microorganisms, soil fauna and beavers (dams)
Erosion regulation	Rooted plants, soil fauna (ecosystem engineers)
Natural hazard regulation	Rooted plants (shrubs and trees), flood plains
Invasion resistance	Autochthonous species with a similar niche than invasive species
Water purification/soil remediation/waste treatment/decomposition	Plants, fauna, macrofauna, bacteria and fungi

Regulating services

# ES MA (2005) categories and SPU examples (3)

Supporting services

Primary production	Algae and vascular plants
Secondary production	Invertebrates and vertebrates
Photosynthesis	Algae and vascular plants
Provision of habitat	Ecosystem engineers (e.g. beavers, earthworms, plants) and larger plants and animals that provide surfaces for periphytic organisms (e.g. shells of mussels), hedgerows
Soil formation and retention	Soil fauna (mainly ecosystem engineers, e.g. earthworms, ants) plants (e.g. organic matter and peat formation)
Nutrient cycling	Microorganisms, macroorganisms (such as annelids, mites, springtails, polychaetes), primary producers, grazers, detritivores, consumers, predators
Water cycling	Plants and terrestrial and aquatic ecosystems

Supporting services

# ES MA (2005) categories and SPU examples (4)

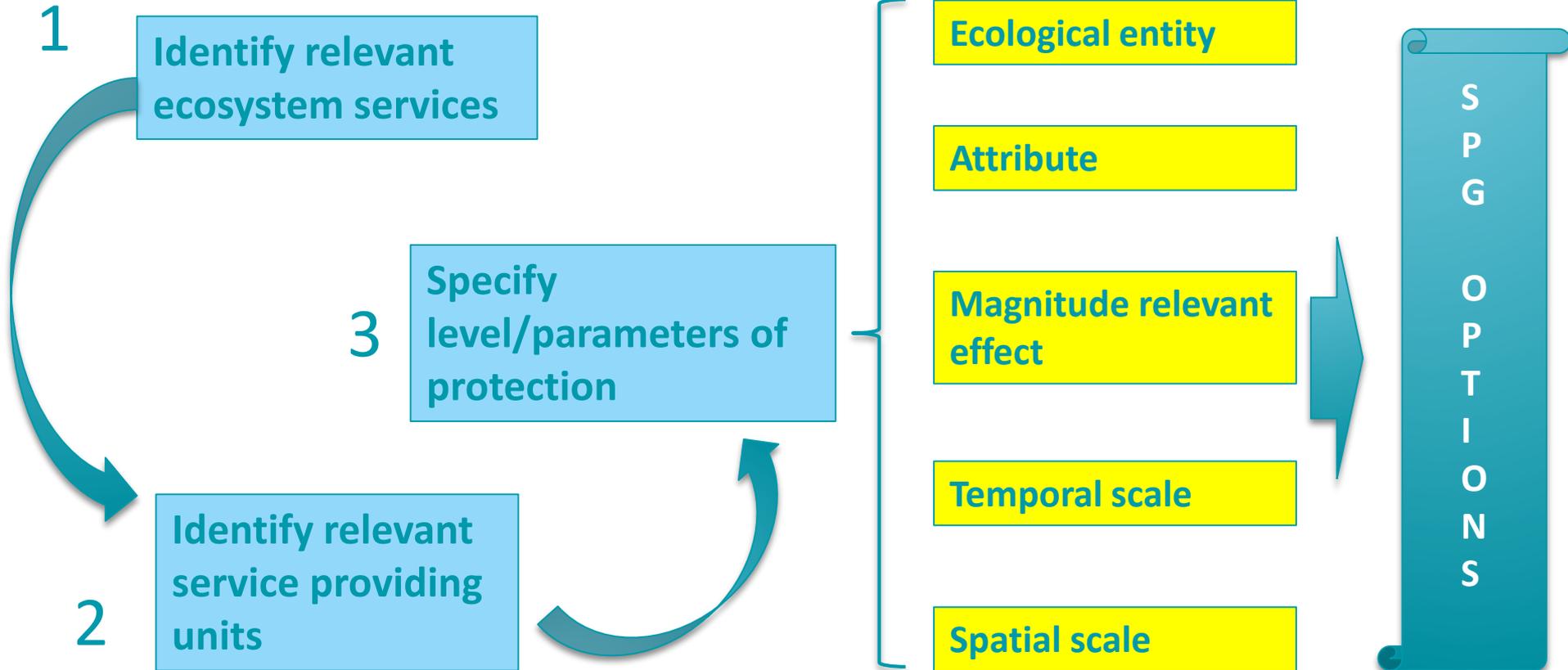
Cultural services

Spiritual and religious values	Particular species
Education and inspiration	Particular species
Recreation and ecotourism	Fish (sport fishing), attractive plants and vegetation, vertebrates (bird watching, hunting) and attractive invertebrates
Cultural heritage	Structures constructed and/or modified by man and their typical biota
Aesthetic values	Particular species, such as flowering plants, attractive invertebrates and vertebrates
Sense of place	Trees, patches of vegetation and ecosystems as landscape features, landscape elements/habitats
Cultural diversity	Semi-natural habitats (e.g. heathlands, ponds) and appreciated agricultural landscapes (e.g. fields bordered by hedgerows)
Species of conservation concern	Red list species, genetic diversity



Cultural services

# Step 3: Specify the level/parameters



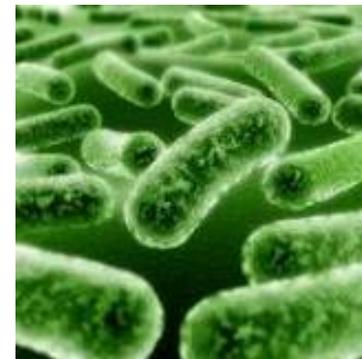
# Ecological entity

- level of biological organisation of the SPU (e.g. individuals, populations, etc.), complemented with the (bio)physical environment where organisms (or group of organisms) live or occur (habitat).
- includes 'community' and 'habitat'

Dimension	Ecological entity to protect
Options	Individual, (meta)population, functional group, community, ecosystem, habitat
Considerations to justify the selection of relevant options	Ecology of the SPU Type of ecosystem service Functional redundancy Spatial distribution of the SPU Biophysical requirements of the SPU Cultural value Legal and pragmatic considerations

# Attribute

- Ecologically relevant



Dimension	Attribute to protect
Options	Behaviour, survival, growth, reproduction, abundance, biomass, process, within- and between-species diversity, landscape or habitat structure
Considerations to justify the selection of relevant options	The selected ecological entity and life history traits of the SPU
	Physicochemical properties of the environmental compartments
	Legal and pragmatic considerations

# Magnitude of relevant effects

- Biologically relevant (predicted) effects
- PPPs, GMOs, FAs and for species intentionally released for biological control of invasive pests: level of change that can be *tolerated*.

Dimension	Magnitude of relevant effect
Options	Negligible, small, medium, large
Considerations to justify the selection of relevant options	Ecological properties of the SPU
	Ecological and structural properties of the receiving environment
	Level of endangerment
	Legal and pragmatic considerations

# Temporal/spatial scale

Time/spatial scale of the biologically relevant effects and of the tolerable effects



Dimension	Temporal scale of effects
Options	Days, weeks, months, seasons, years, decades, generations, rotations
Considerations to justify the selection of relevant options	Ecological properties of the SPU
	Ecological and structural properties of the receiving environment
	Pragmatic considerations

Dimension	Spatial scale of the effects
Options	In crop/field, edge of field/field margin, nearby off-crop, protected area, watershed, landscape, region, continent
Considerations to justify the selection of relevant options	Ecological characteristics of the SPU
	Magnitude and duration of direct or indirect effects
	Spatial scale of exposure
	Habitat and landscape characteristics
	Legal and pragmatic considerations

**Implementation**



## Next steps for implementation

- By RA in problem formulation
- Challenges and wish for more research on
  - Biodiversity vs ecosystem services
  - SPUs vs SPGs
  - spatio-temporal context of SPUs and exposure to potential stressors

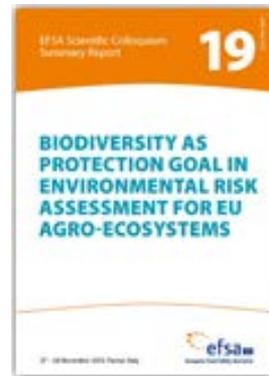
# Visual aid to present the options to RM

Dimensions	Options
Ecological entity	Individual - (meta)population - functional group - community - ecosystem - habitat
Attribute	Behaviour - survival - growth - reproduction - abundance - biomass - process - within and between species diversity - landscape or habitat structure
Magnitude	Negligible - small - medium - large
Temporal scale	Days - weeks - months - seasons - years - decades - generations - rotations
Spatial scale	In crop/field - edge of field/field margin - nearby off-crop - protected area - watershed - landscape - region - continent

+ describe environmental consequence of each option

# Stakeholders involvement

- EFSA 10th Anniversary conference: Challenging boundaries in risk assessment – Session 2: Having an eye for the environment (2012)
- EFSA Scientific Colloquium N° 19: Biodiversity as protection goal in environmental risk assessment for EU agro-ecosystems (2013)
- Contact points/observers: EEA, ECHA, EMA, JRC, SCENIHR, SCHER, OECD, WHO/FAO, EPA (2014-2016)
- Online public consultation (22 June – 10 Sep 2015)
- GMO network (1 June 2016)
- NGOs roundtable (21 June 2016)
- ECPA, Fresenius conferences (2014 and 2016)



# Public consultation

Organisation	Country	Number of comments
Bayer on behalf of the European Crop Protection Association	BEL	65
EuropaBio	BEL	23
Austrian Agency for health and Food Safety	AUT	15
German Federal Environmental Agency	DEU	15
Federal Agency of Nature Conservation	DEU	14
Hungarian Ministry of Agriculture	HUN	10
European Environment Agency	EU	7
Environment Agency Austria on behalf of Austrian Ministry of Health	AUT	6
Italian National Institute for Environmental Protection and Research (ISPRA)	ITA	6
Chemicals Regulation Directorate	GBR	4
Belgian Biosafety Advisory Council	BEL	3
The Swedish Board of Agriculture	SWE	3
Bavarian State Ministry of the Environment and Consumer Protection	DEU	1
Department for Environment Food & Rural Affairs	GBR	1
National Farmers' Union of England and Wales	GBR	1
Sapienza University of Rome	EU	1
<b>Total number of comments</b>		<b>175</b>

<https://www.efsa.europa.eu/en/supporting/pub/1029e>

# Conclusions

# Conclusion

1. Agreement in EFSA on a harmonised **framework, accounting for biodiversity and ecosystem services**, to make broad/vague policy protection goals more precise and operational
2. Biodiversity as a protection goal is considered in a comprehensive manner: Source of many ecosystem services and attribute to protect
3. Implementation ongoing and requires cooperation

Air pollution

Habitat loss

Medicines

**Added Value?**

Climate change

Diseases

PPPs

GMOs

invasive species /Infections

Manure/feed additives



## Towards a holistic approach

- Applicable to **all potential stressors**, species, ecosystems, env. compartments and habitats
- The method provides as common language.  
**Consistent** advice to risk managers when the same agro-environment is expected to be exposed to different types of potential stressors
- Contributes to transparency, clarity and openness in debate. Many **stakeholders** might be involved and trade-offs are to be made
- **Long-term** vision= holistic approach towards ERA



**Thank you for  
your attention!**



[Reinhilde.Schoonjans@efsa.europa.eu](mailto:Reinhilde.Schoonjans@efsa.europa.eu)



## Subscribe to

[www.efsa.europa.eu/en/news/newsletters](http://www.efsa.europa.eu/en/news/newsletters)  
[www.efsa.europa.eu/en/rss](http://www.efsa.europa.eu/en/rss)



## Engage with careers

[www.efsa.europa.eu/en/engage/careers](http://www.efsa.europa.eu/en/engage/careers)



## Follow us on Twitter

[@efsa\\_eu](https://twitter.com/efsa_eu)  
[@plants\\_efsa](https://twitter.com/plants_efsa)  
[@methods\\_efsa](https://twitter.com/methods_efsa)