Environmental risk assessment of plant pests, and protection goals

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efsa European Food Safety Authority

Purpose of pest risk assessment in plant health

- Identify whether there is a potential problem with a trade or other economic activity because of a potential invasive plant pest
- Identify potentially effective phytosanitary measures to prevent entry, establishment and spread
- Quantify the seriousness of the potential problem (expected impact)
- Quantify the effectiveness of the measures (quantitatively the reduction in entry, establishment, spread and impact)
- Expert judgement and modelling

Role of the EFSA plant health panel

- Provide the risk manager (the European commission and the EU member states) with science- and expertise-based risk assessments
- Impartial, independent, objective, transparent, reproducible
- Usually responding to requests by the commission, but there is 2-way communication

- Guidance documents describe procedures for making assessments (best practices)

CURRENT PLANT HEALTH GUIDANCES

- **Evaluation of pest risk assessments and risk management options (2009)**
  - Guidance of the Panel on Plant Health following a request from EFSA on the evaluation of pest risk assessments and risk management options prepared to justify requests for phytosanitary measures under Council Directive 2000/29/EC. (2009, EFSA Journal 2009, 1194, 1-18)
- **Harmonised framework for Pest Risk Assessment in the EU (2010)**
  - Guidance on a harmonised framework for pest risk assessment and the identification and evaluation of pest risk management options by EFSA. (2010, EFSA Journal 2010; 8(2):1495, 66 pp.)
- **Guidance on Environmental Risk Assessment (2011)**
  - Guidance on the environmental risk assessment of plant pests. (2011, EFSA Journal 2011;9(12):2460, 121 pp.)
- **Guidance on evaluation of risk reduction options (2012)**
  - Guidance on methodology for evaluation of the effectiveness of options for reducing the risk of introduction and spread of organisms harmful to plant health in the EU territory. (2012, EFSA Journal 2012;10(6):2755, 92 pp.)

Ongoing work in the panel

- Deal with a request from the commission to make 133 pest categorizations to support updating measures in view of the new EU plant health legislation
- Improve the scientific rigour of the panel's PRAs by pursuing a quantitative approach
- Advise the commission regarding ongoing emergencies, such as *Xylella fastidiosa,* horizon scanning, …

Pest categorization

- Provides a template to collect key information to decide whether
  - a pest qualifies as a quarantine pest (that may not be introduced)
  - a pest qualifies as a regulated non-quarantine pest (for which measures may be implemented to prevent further spread in the EU)
  - a pest may be deregulated

- Not quantitative, not detailed, focusing on the key literature

Structure of Pest categorisation

1. **Pest**
    1. Identity (taxonomy, detection and identification)
    2. Current global distribution of the pest
    3. Current EU distribution of the pest (**EPPO PQR** + **MSs data**)
2. **Vectors** (*when applicable*)
    1. Vectors (e.g list, key biological features incl. transmission)
    2. Current global distribution of the vector
    3. Current EU distribution of the vector (EPPO PQR + MSs data)
3. **Host plants**
    1. Host range
    2. EU distribution of main host plants
4. **Regulatory status of the pest**
5. **Potential for establishment and spread in the EU**
6. **Potential for consequences in the EU** (incl. symptoms and records of impact)

<u>Conclusion of pest categorisation</u>

Pest risk assessment (“full” PRA)

- When more information is needed on potential harm, hosts, ecological requirements, impacts
- When more information is needed on effectiveness of risk reducing options

- More elaborate process
- Panel strives to adopt a quantitative approach

WHY QUANTITATIVE RISK ASSESSMENT?

Assessors should always aim to **express** impact and uncertainty in **quantitative terms to the extent that is scientifically achievable** (EFSA Guidance on Transparency; Codex Alimentarius: Working Principles for Risk Analysis; EFSA Guidance on Uncertainty)

Principal reasons

- The ambiguity of qualitative expressions
- Their tendency to imply value judgements outside the remit of assessors
- The fact that many decisions inherently imply quantitative comparisons (e.g. between exposure and hazard) and therefore require quantitative information on uncertainty.

Quantitative methods **score better** on

- Criteria related to technical rigour
- Meaning of the output

WHY QUANTITATIVE RISK ASSESSMENT?

The EFSA Scientific Committee Opinion on risk terminology (2012) recommends that

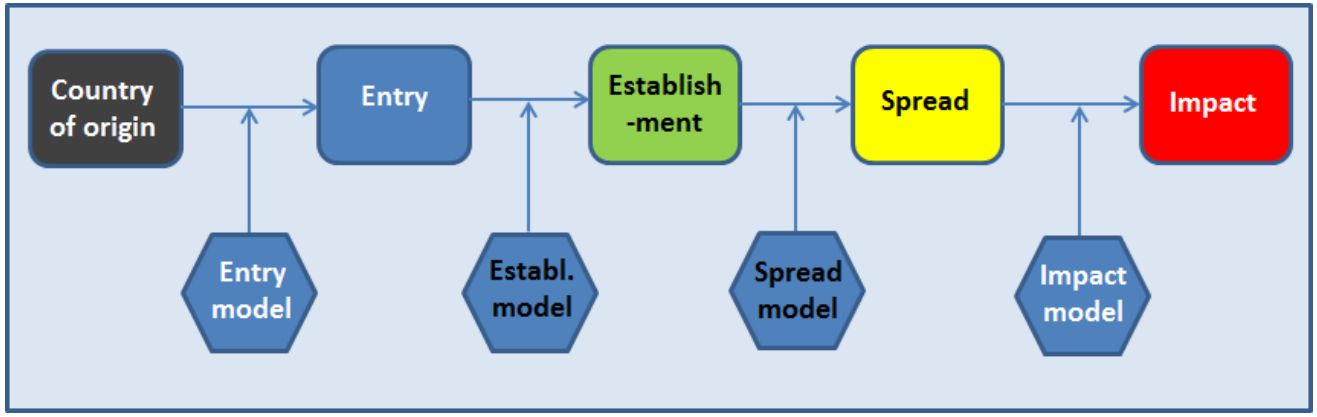
- **EFSA should work towards more quantitative** expression of both risk and uncertainty whenever possible, i.e.
  - Quantitative expression of the probability of the adverse effect
  - Quantitative descriptors of that effect
  - Use of verbal terms with quantitative definitions
  - Associated uncertainties should always be made clear, to reduce the risk of over-precise interpretation.

- Further guidance should be developed on approaches for both qualitative and quantitative expression of risk and uncertainty.

- Consideration should be given to intensify **communication between EFSA and risk managers** to
  - Enhance mutual understanding of the risk expressions and
  - Raise awareness of the potential for interpretational bias

Modelling framework for assessment

- In the PRA procedure the process of invasion is conveniently sub-divided in a series of steps
- Mechanistically-based integration of steps in the assessment by the use of step-specific models (possibly process-based models)



Approach for ERA in 2014 (apple snail)

- Estimate area of potential establishment and biomass of snail, using population modelling (abiotic factors)
- Identify service providing units in affected habitats using expert judgement
- Identify key ecosystem services using expert judgement
- Quantify impacts of the snail on biodiversity and ecosystem services using expert judgement

Working Group ERA Pomacea

Panel experts: Joop van Lenteren, Gianni Gilioli, Gritta Schrader

EFSA staff: Sybren Vos

External experts:

Nils Carlsson (SE, *Pomacea* expert)

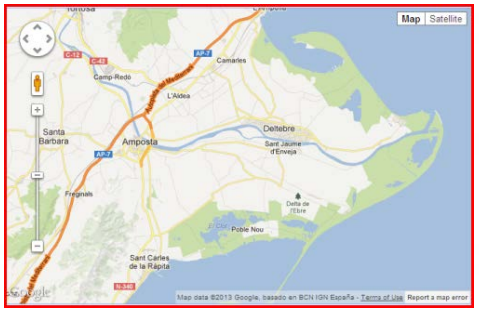
- Pablo Martin (Argentina, *Pomacea* expert)
- Sara Pasquali (IT, models)

Hearing experts:

- Ellen van Donk (NL, aquatic ecologist)
- Montserrat Villa (SP, invasive species ecologist)
- Miquel Robles (SP, Ebro Delta, *Pomacea* expert)
- Casper van Leeuwen (NL, wetland ecologist)

Background for ERA Pomacea

- **2009 apple snail invasion in the Ebro Delta in Spain**
- **2014 20.000 ha infected; eradication unrealistic.**



- **2011 PLH Panel requested by EC to evaluate Spanish PRA focussing on rice cultivation**

- **The Panel recommended that further study should be performed on the potential consequences of apple snail for (semi-) natural environments in the EU (so not only for rice)**

Pomacea biology

- Large freshwater snails from South and Central America
- Survive long dry periods by digging into the mud and closing their operculum (“shell door”)
- Highly polyphagous - will consume many aquatic plant species, but also fish/snail eggs etc.
- Highly reproductive: female produce hundreds of eggs/week

Eggs are laid outside the water

1 snail can eat 17 rice plants per day

Apple snails can transform a macrophyte-dominated wetland in phytoplankton dominated one

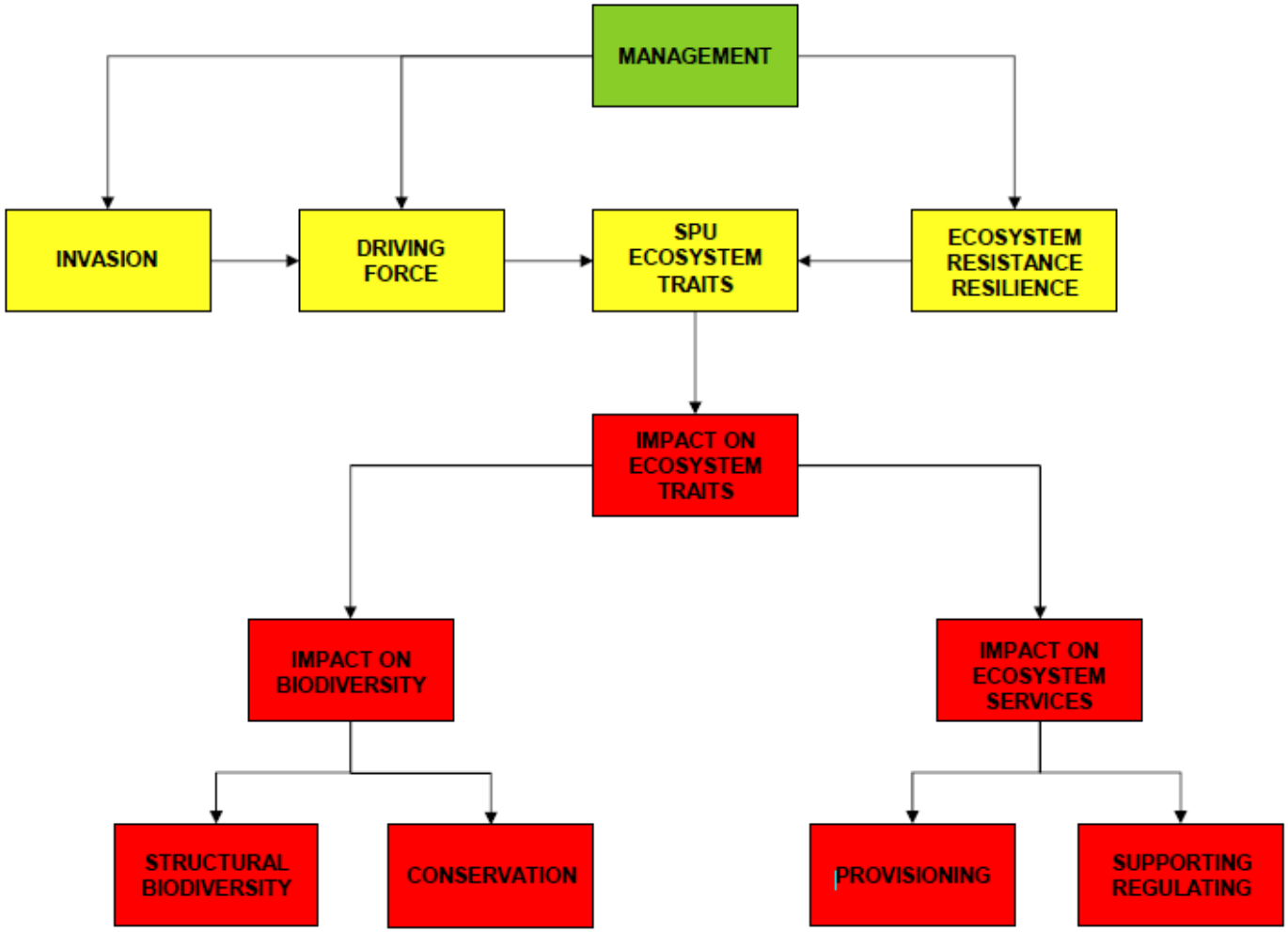
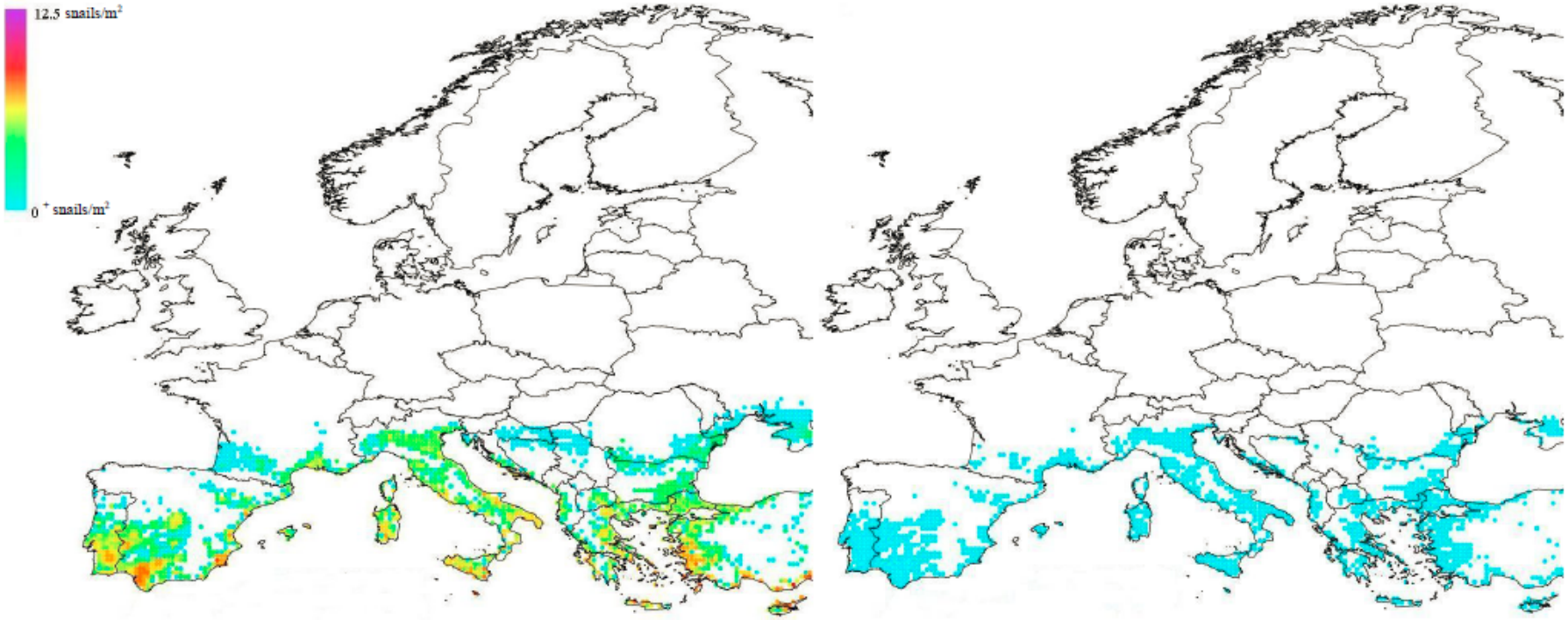


Figure 1: A scheme of the procedure for assessing the environmental risk posed by the apple snail. The scheme is derived from the one proposed in the PLH ERA guidance (EFSA PLH Panel, 2011).



a. juvenile snails **b. adult snails**

Figure 2: Potential distribution and density of *Pomacea canaliculata* in Europe obtained with the apple snail population dynamics model: (a) juveniles; (b) adults. The colour code in the legend corresponds to densities above 0 (individuals per m^2).

Conclusions and recommendations

Complete ERA Guidance 2011 approach was tested resulting in suggestions for changes & simplifications

Snail population densities of eggs, juveniles and adults, were “translated” to snail biomass; simplification

Only one service providing unit - freshwater wetland - was chosen; by far the most influenced spu

Only the area of potential establishment was taken into account for the ERA, not the native area of establishment

Conclusions and recommendations

The changes in influence of resistance, resilience and management over time resulted in choice for two scenarios: short term assessment 5 years after establishment (~ resistance), long term assessment 30 years after establishment (~ resilience)

The 2011 rating system appeared easily applicable: experts estimated the magnitude of impacts and addressed uncertainty first individually, then discussed their ratings during a meeting leading to final ratings

Conclusions and recommendations

Creating trait – ecosystem clusters (EFSA, 2011) is very complex. Now, an evaluation of the impacts was done separately for ecosystem traits, ecosystem services and biodiversity with the use of expert judgment; this procedure also reduced uncertainty

Impacts on biodiversity and ecosystem services were assessed and rated in the same way resulting in an important simplification / harmonization

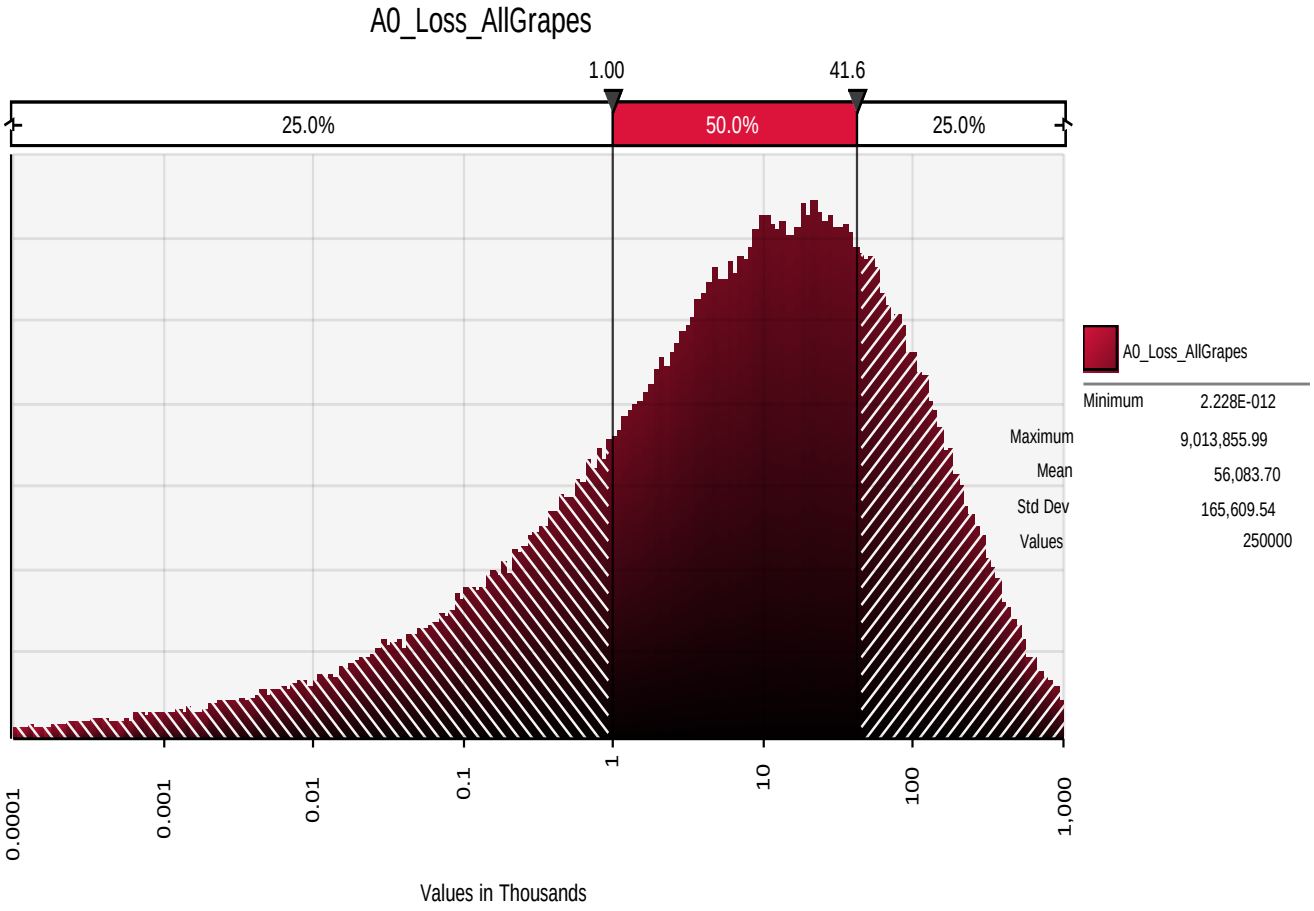
A detailed ERA is not needed in all cases. Before starting an ERA, it is essential to define on which level the assessment needs to be conducted. Suggestions for simplification of the ERA are presented in the opinion

Dealing with uncertainty

- Experts are asked to estimate each model parameter using quantiles describing the
  - 1 and 99% point (values very unlikely to be exceeded)
  - Median (equally likely to over- or underestimate the true mean)
  - 25% and 75% points (quartiles)

- The PRA model uses Monte Carlo simulation to generate a distribution of outcomes, expressing the knowledge and uncertainty of the experts

Dealing with uncertainty



Three questions from organizers

1. **Status of adoption of the EFSA method for SPGs in the plant health field**

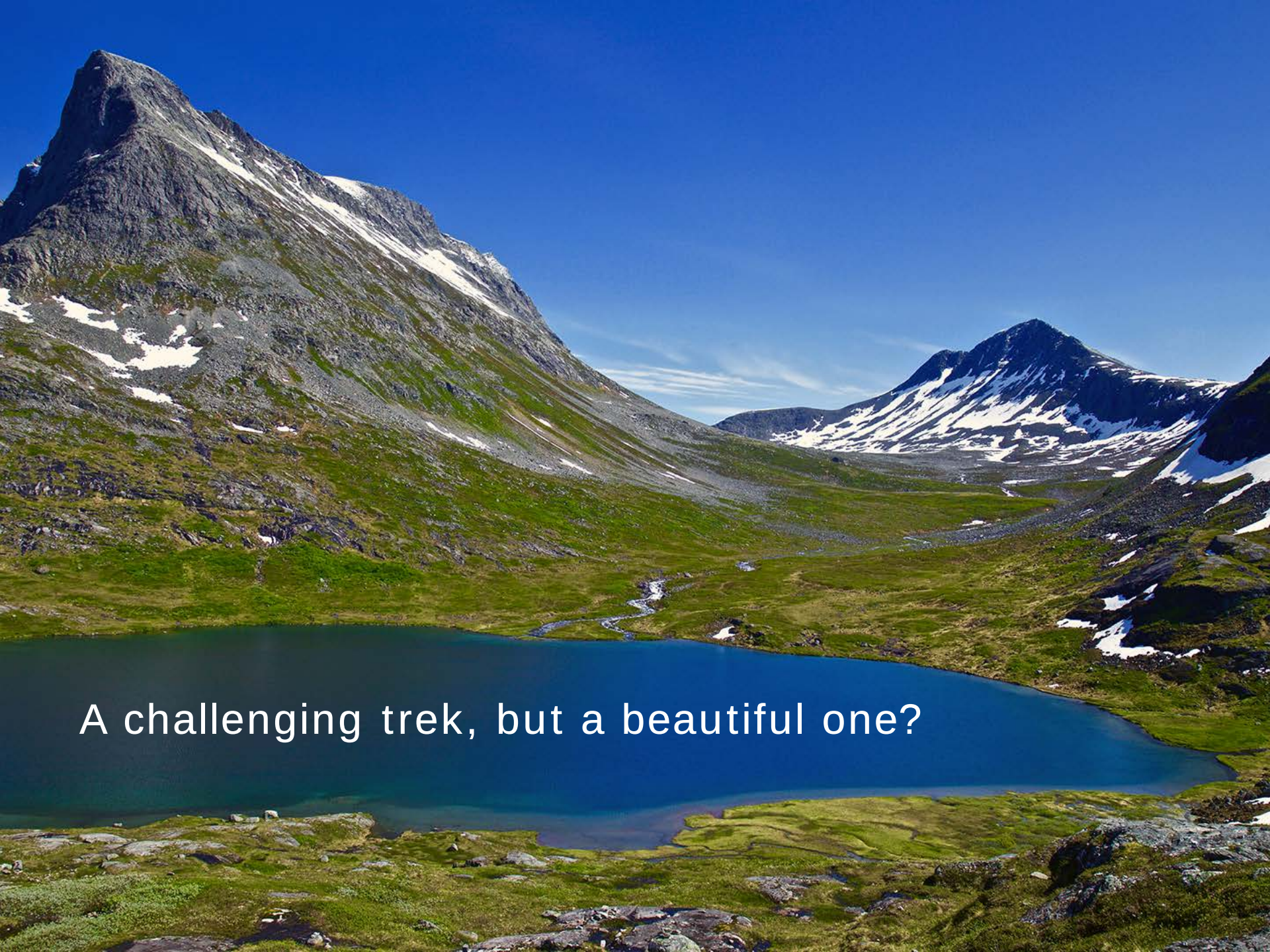
   The PLH panel has done only one specific ERA. When we did this ERA (apple snail), it was broadly in line with the guidance: we used biodiversity and ecosystem services, service providing units, temporal and spatial scales. When we do ERA as part of a full PRA, the approach is usually much simpler

2. **Opportunities and barrier for implementing the guideline**

   The guidance is good and practical. Key issues in implementation are time (money), and dealing with scales and grain (heterogeneity)

3. **The way forward?**

   Simplify and focus (or detail ever more until ...)


A challenging trek, but a beautiful one?