Optimal design of climate change policies through the EU's rural development policy

(071201/2011/609681/SER/CLIMA.A.2)

Dr John Tzilivakis & Dr Kathy Lewis

Brussels, Thursday 21 June 2012

Presentation

- Part 1
  - Introduction
  - Project aims and objectives
  - Project partners & roles
  - Dissemination activities
- Part 2
  - Overview of each task
  - Progress to date

Introduction

- The project encompasses two policy areas:
  - Climate change action
    - Mitigation
      (GHG emissions reduction and carbon sequestration)
    - Adaptation
      (adapting to the consequences of climate change)
  - Rural development
    - Multiple environmental, social and economic objectives (competitive agricultural & forestry industries; environmental improvement; quality of life and economic diversification)
- Optimal or integrated approaches require holistic thinking…

Rural areas

Land use activities








Nutrient use

Water use

Energy/fuel

Pesticide use

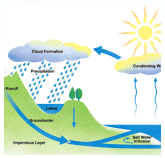
Waste management

Livestock

Soil management

Crops

Ecosystem services



Climate regulation

Nutrient cycling

Water regulation

Aesthetic

Pest regulation

Water provision

Biomass

Cultural heritage

Pollination

Soil formation

Food

Recreation

Environmental issues






Air quality

GHG emissions

Biodiversity

Landscape

Wildlife

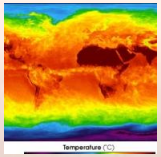
Water quality

Use of non-renewable/scarce resources

Soil quality

Carbon sequestration

Climate change



Sea level change

Precipitation change

Drought

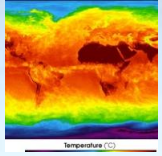
Extreme weather events

Temperature increase

Flooding

Crop pests

Crop yields





Climate change

Land use activities

Environmental issues

RDP measures
(intervention)

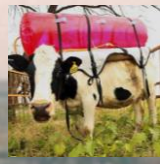
Ecosystem services

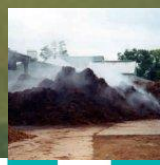


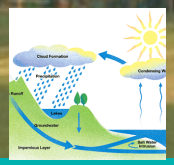




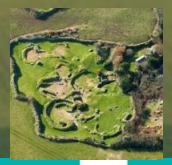


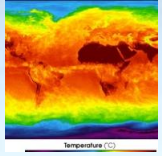









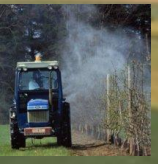




Climate change

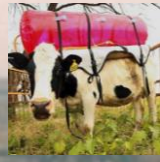





Land use activities

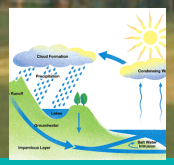




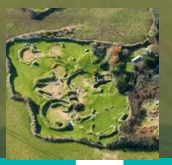
Environmental issues

Mitigation
Adaptation
Productivity
Practicality

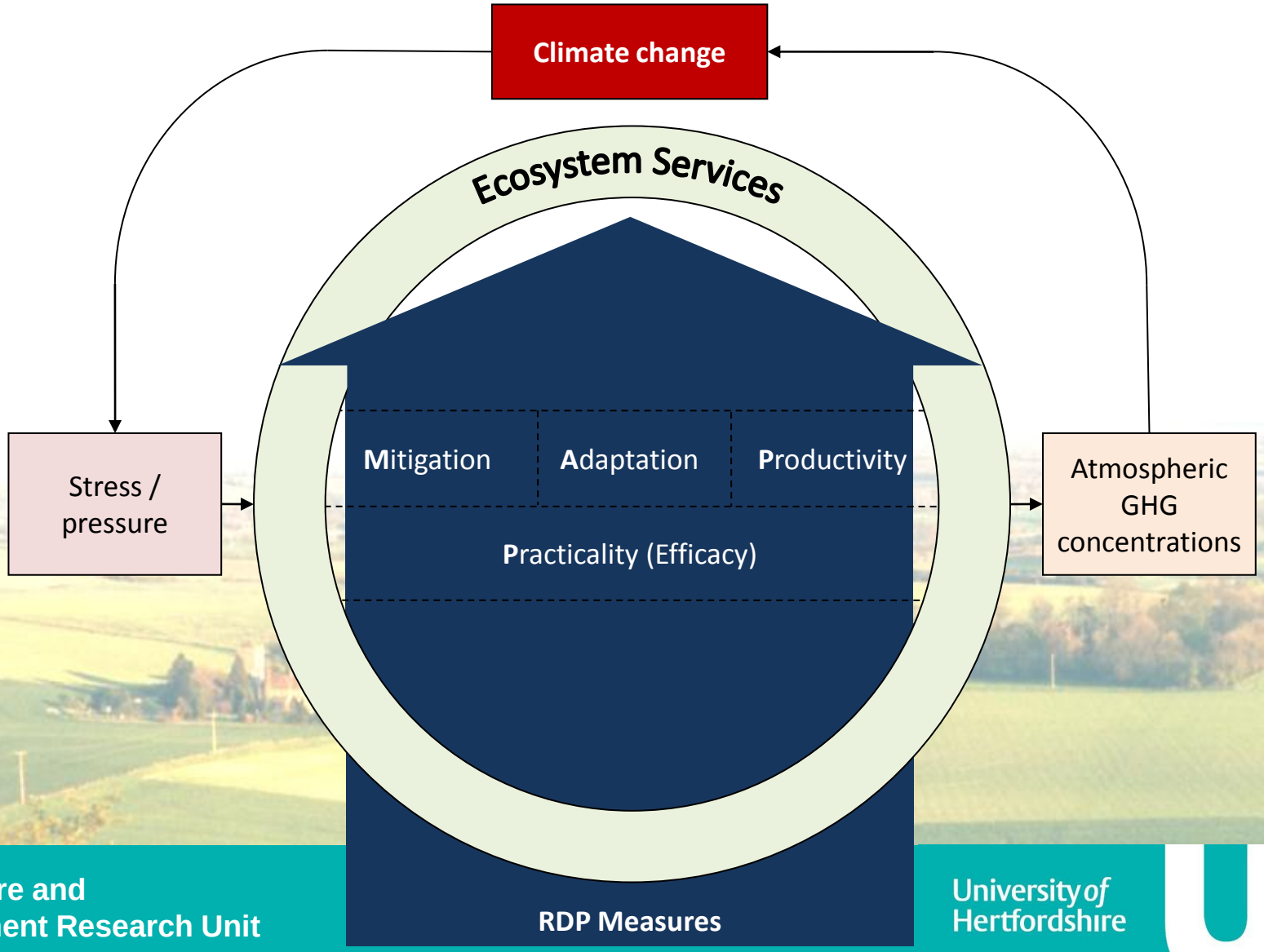
Ecosystem services



Conceptual framework for the project



Aims

- The principal aim of the project is to produce a manual and checklist on "optimal design of climate change policies within Rural Development Policy" for Member States

- This will contribute towards meeting EU targets on emission reduction and adaptation to climate change impacts

Objectives

- Identify optimal strategies to address climate change objectives in Rural Development Policy Programmes post 2013
- Establish the cost and effect of each RDP operation in relation to the expected climate benefits
- Provide guidance to Member States on the design of RDPs at regional level in order to achieve optimal climate change benefits from implementation

Key considerations

- Previous studies, knowledge and data
  - Draw upon previous work and data where relevant
- Familiarity with case study regions
  - Areas where previous studies have been undertaken
- Pragmatic choices
  - Finding an acceptable trade-off between high resolution/site specific modelling and data, and simplified processes for a step-by-step manual and checklist for the whole of the EU
- New approaches
  - Explore novel approaches: drawing upon the best and discarding the worst

Tasks

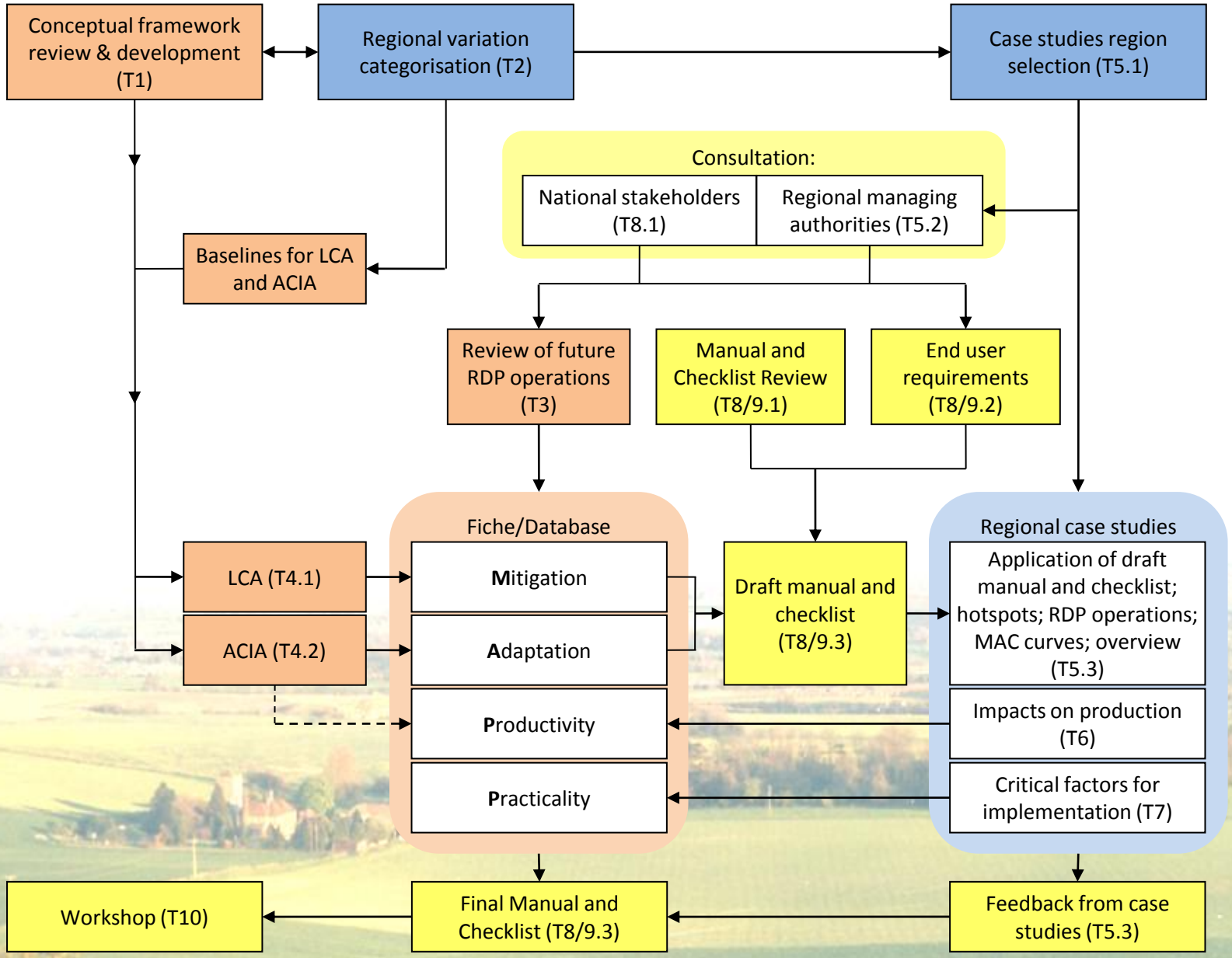
1. Conceptual assessment framework design
2. Regional variation categorisation
3. Review of future RDP operations
4. Analysis of future RDP operations
5. Regional case studies
6. Productivity Impact Assessment
7. Practicality Impact Assessment

8/9. RDP Manual and Checklist

10. Workshop

Project flow

- The tasks can be broadly categorised into three areas:
  - Assessment of RDP operations
  - Development of the manual and checklist
  - Regional case studies
- The following flow chart shows how all the tasks fit together…

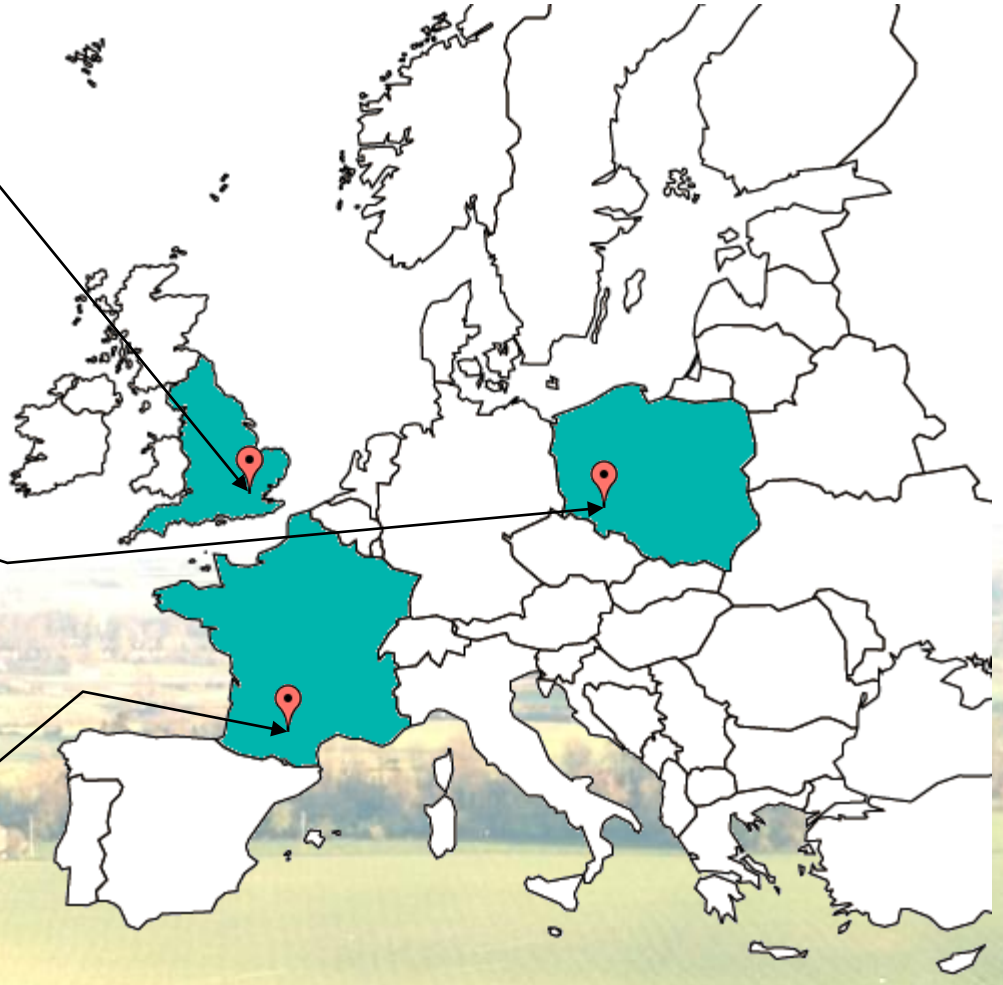


Project partners

AERU, University of Hertfordshire
Hatfield, UK

Wroclaw University of Environmental and Life Sciences (WUELS)
Poland

Solagro
Toulouse, France



Project roles

- AERU, UH, United Kingdom: Lead contractor
  - Project coordinator and technical lead
  - UK case study and consultation exercise
  - Assessment and evaluation of RDPs and GIS work
- WUELS, Poland: Sub-contractor
  - Polish case study
  - Economic policy analysis
  - Photogrammetry, GIS & cartography
- Solagro, France: Sub-contractor
  - French case study
  - Consultations
  - Field research and EIA support

Project branding

- The official project title is: "Optimal design of climate change policies through the EU's rural development policy"

- To aid dissemination, a project title and brand has been implemented:

OSCAR

Optimal **S**trategies for **C**limate change
Action in **R**ural areas

Dissemination

- Websites:
  - Project page on AERU website: http://www.herts.ac.uk/aeru/projects/oscar/
  - Dedicated project site: http://www.herts.ac.uk/aeru/oscar/
  - Information on partner websites
- Project leaflet (available in English, French and Polish)
- Project poster
- Case study information

End of Part 1

Part 2: Tasks

3. Review of future RDP operations

1/2/4. 1. Conceptual assessment framework design,
2. Regional variation categorisation &
4. Analysis of future RDP operations

8/9. RDP Manual and Checklist (and software)

5. Regional case studies
6. Productivity Impact Assessment
7. Practicality Impact Assessment
10. Workshop

3. Review of future RDP operations

- This task has generated a definitive list of RDP measures and operations that may be taken forward post-2013. This includes:
  - Existing measures and operations that are likely to continue
  - Existing measures and operations that are likely to be amended (particularly with respect to those that may be more compatible with climate change objectives)
  - Completely new measures and operations (particularly those that tackle new rural development issues, climate change objectives or both)

3. Review of future RDP operations

- A review of RDP measures and operations in EU Member States resulted in a list of over 2600 operations
- Therefore a rationalisation process was undertaken
- Currently have 380 rationalised RDP operations
- Classified by:
  - 46 RDP Measures (i.e. 111 to 511)
  - 20 Operation types/groups…

Operation types/groups

- Land management:
  - Conservation:
    - Birds (habitat/feed)
    - Heathland
    - Hedges
    - Trees
    - Water courses, wetlands management
  - Cropping
  - Grassland and grazing
  - Irrigation and water management
  - Land issues
  - Livestock and manures
  - Other boundary features
  - Other habitats and conservation
  - Soil management
  - Woodland & forestry
- Financial and infrastructure support
- Markets, products and diversification
- Other
- Renewable energies
- Tourism and leisure
- Training and education

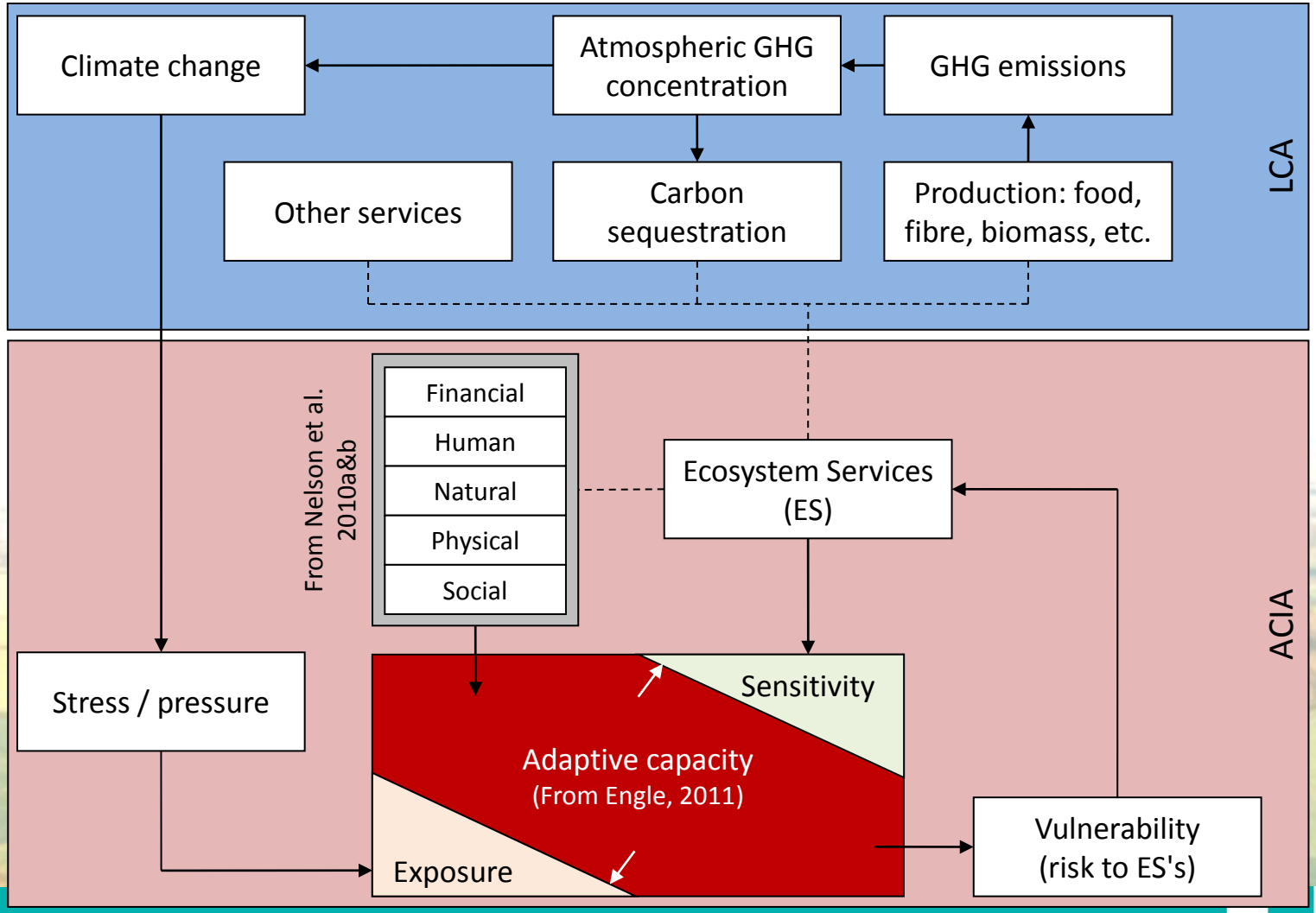
Conceptual assessment framework design (T1)

- At the core of the framework are 4 assessment criteria - the 'MAPP criteria':
  - **M**itigation
  - **A**daptation
  - **P**roductivity
  - **P**racticality
- Each RDP operation is being assessed against the MAPP criteria

Conceptual assessment framework design (T1)

- Mitigation:
  - A Life Cycle Assessment (LCA) to identify and quantify impacts in relation to GHG emissions (and sequestration) and mitigation potential.
- Adaptation:
  - An Adaptive Capacity Impact Assessment (ACIA) to assess impacts in relation to the ability of an area to provide ecosystem services when faced with climate change stresses.
- Productivity:
  - A Productivity Impact Assessment to quantify impacts on agricultural productivity.
- Practicality:
  - A Practicality Assessment to identify critical caveats, constraints and moderating factors which may influence the efficacy of an RDP operation.

LCA and ACIA



Life Cycle Assessment (LCA): GHG Emissions

- The purpose of the LCA work is quantify the net change in GHG emissions that arise from the implementation of RDP operations.

- This includes:
  - Direct and indirect emissions (Scopes 1-3) from:
    - Machinery operation
    - Use of inputs (e.g. pesticides and fertilisers)
  - Soil N_2O emission
  - Soil CO_2 emission and soil carbon equilibrium
  - CH_4 emissions from livestock
  - Carbon sequestered in soil
  - Carbon sequestered in plant biomass

LCA Example

- Grass strip on an arable field:
  - Reduced field operations, reduced GHG emissions from fossil fuel combustion
  - Reduced inputs of pesticide, and GHG emissions from manufacture
  - Reduced inputs of N fertiliser, and GHG emissions from manufacture and denitrification
  - Change in soil organic matter – soil carbon sequestration
  - Change in vegetative land cover – biomass carbon sequestration

Adaptive Capacity Impact Assessment (ACIA)

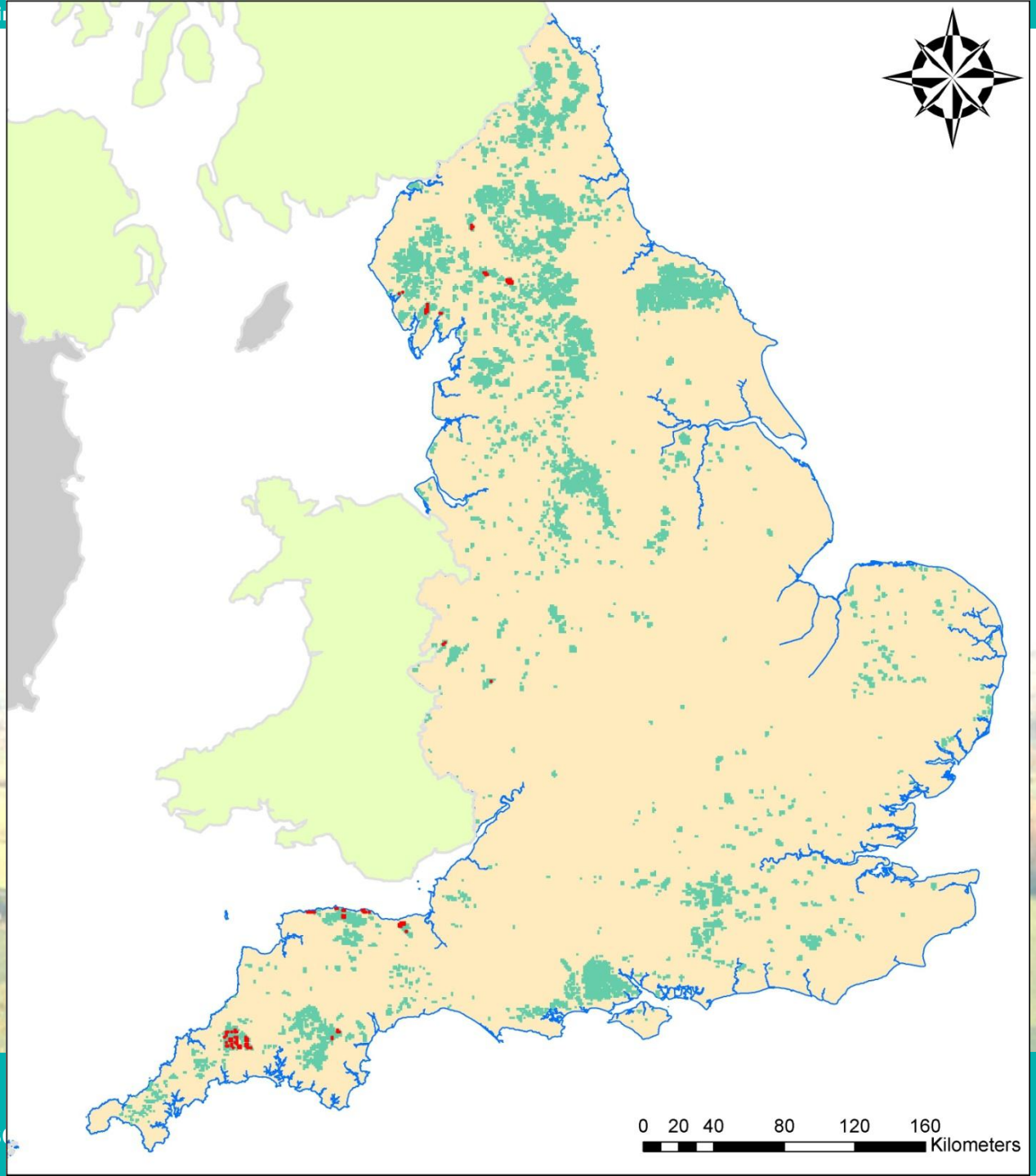
- This is a completely new and bespoke assessment process developed specifically for this project
- The objective has been to define metrics and factors of adaptive capacity in relation to specific ecosystem services
- Similar approaches have been applied in recent years…

ACIA

- For example, Natural England (2011) assessed the vulnerability of biodiversity assets to climate change.
  - Where biophysical adaptive capacity is based on the assumption that permeable, topographically heterogeneous landscapes, with a greater number of soil types and land cover diversity, will have a greater adaptive capacity to climate change

- These factors were combined with climate change projections and habitat sensitivity data to produce a vulnerability assessment…

Climate vulnerability assessment: Upland heath: 2080-CDF 10 high emission scenario



Red = the most vulnerable areas

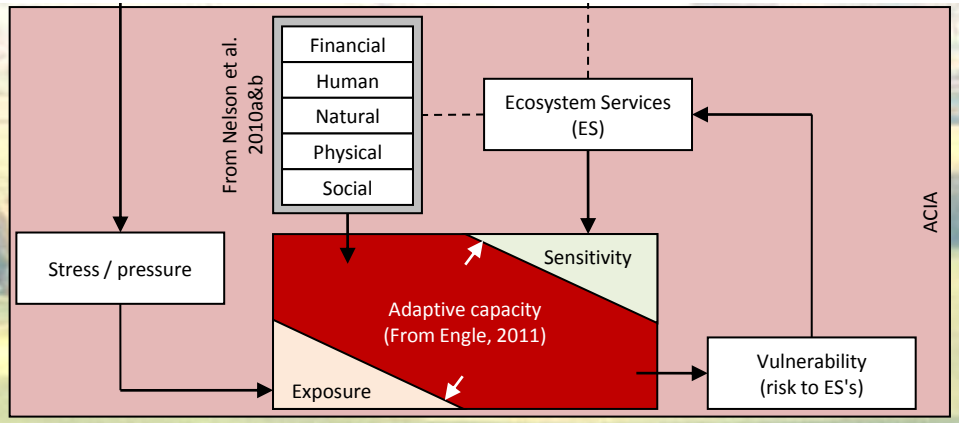
Green = all vulnerable areas

Clarification of objectives of ACIA

- Need to be clear about the purpose of the ACIA:
  - ACIA is not:
    - Quantifying the impact that an operation has with respect to an amount of an ecosystem service
    - A model of ecosystem services
  - ACIA is:
    - Identifying ecosystem services that may be impacted upon by RDP measures and operations
    - Identifying the natural, biological, physical, financial, human and social factors within a region that influence ecosystem services
    - Identifying how those factors will be affected by climate change – their vulnerability
    - Identifying metrics that convey the relative benefit or burden of an operation with respect to reducing the risk/vulnerability of ecosystem service factors to climate change stresses

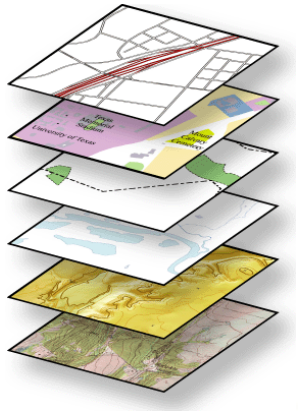
ACIA

- The ACIA assesses:
  - The impact of RDP operations with respect to whether they increase or decrease the adaptive capacity of ecosystem services in a given region.
  - This will depend on the sensitivity of the ecosystem services in the region and degree of exposure (to climate change).



Regional variation categorisation (T2)

- GHG emissions, carbon sequestration and adaptive capacity impacts vary spatially.
- This needs to be taken into account in the impact assessment process.
- In OSCAR this is done using Regional Variation Categories (RVCs) developed using spatial data in GIS



Regional Variation Categories (RVCs)

- The work has included a review of:
  - Key geographically variable factors that may significantly impact on GHG emissions, carbon sequestration, mitigation potential, and adaptive capacity
  - Data availability across the EU-27
- It is an iterative process that has resulted in 18 RVCs:
  - 8 for Mitigation
  - 10 for Adaptation

Mitigation RVCs

- GHG Emission related:
  1. CO_2 from fossil fuels (e.g. field operations)
  2. CO_2 release from soil due to tillage
  3. N_2O from denitrification
  4. N_2O from nitrate leaching
  5. Loss of Soil Organic Carbon (SOC) due to soil erosion

- Carbon sequestration related:
  6. SOC (scope for increase)
  7. CORINE land cover class – biomass C
  8. Susceptibility to soil compaction – SOC accumulation

Adaptation RVCs

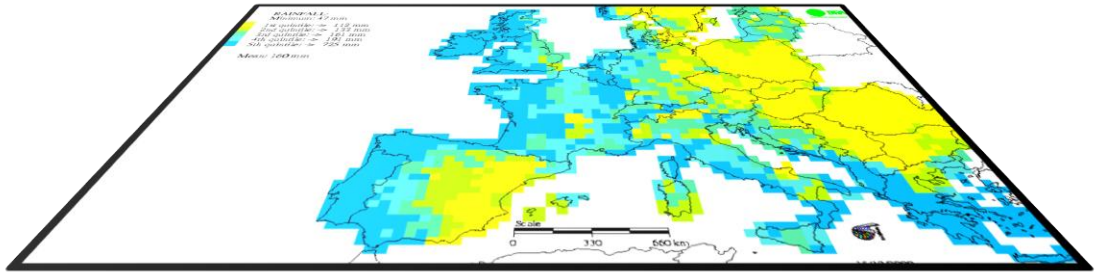
9. Soil erosion
10. Loss of SOC
11. Risk to pollinators
12. Water provision (quantity)
13. Water quality dilution
14. Water quality filtration
15. Flooding
16. Risk of forest fires
17. Risk to biodiversity in Natura 2000 sites
18. Landscape impact from soil erosion and forest fires

Some examples…

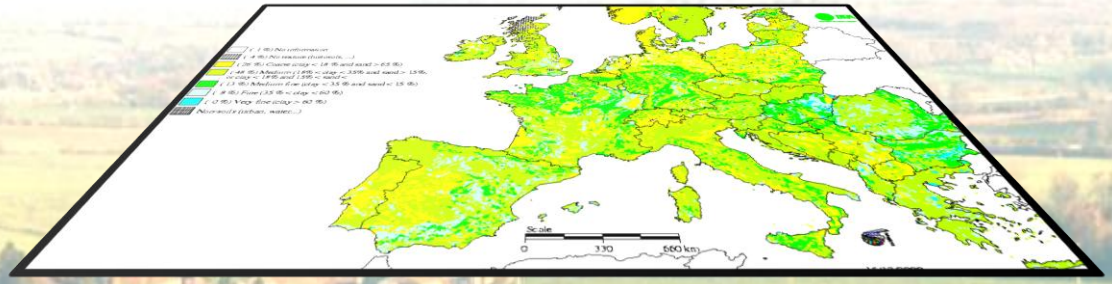
Leaching risk

High rainfall and permeable soil = high leaching risk

Winter rainfall

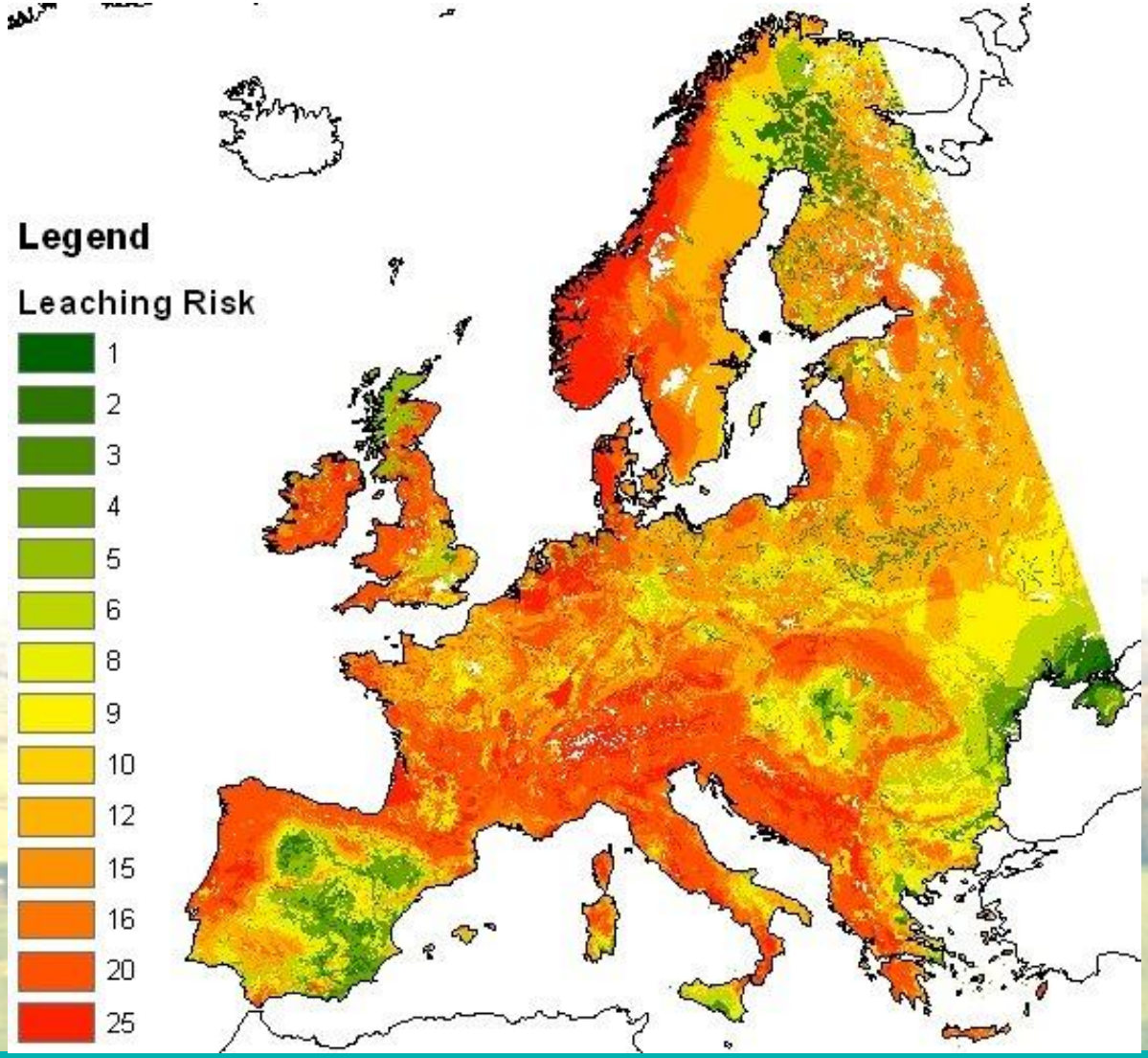


Soil type



Low rainfall and non-permeable soil = low leaching risk

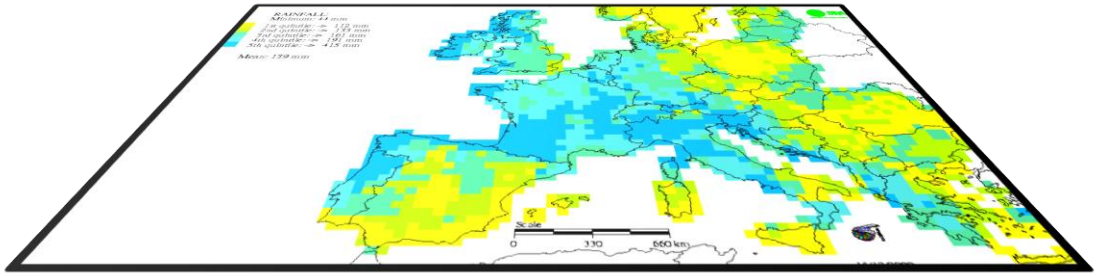
Leaching risk



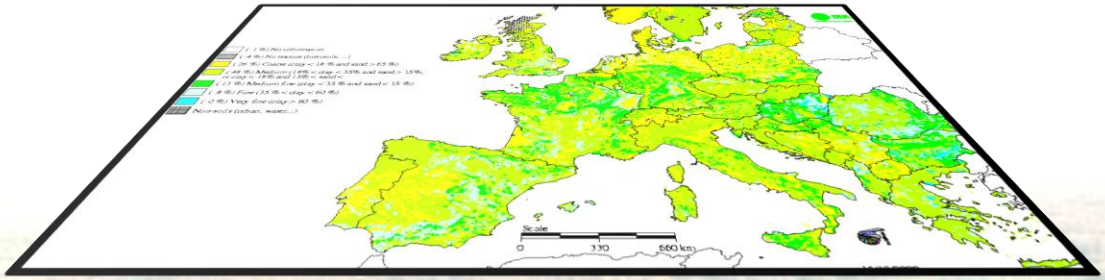
Denitrification risk

High rainfall, heavy clay soil & high compaction = high denitrification risk

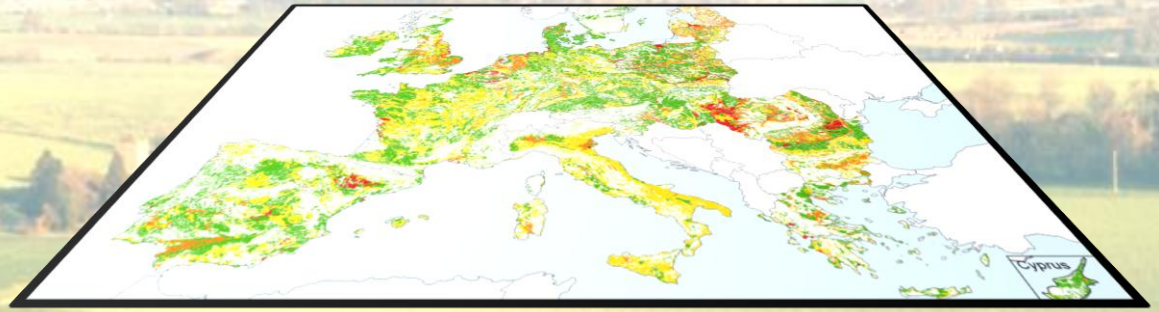
Spring rainfall



Soil type

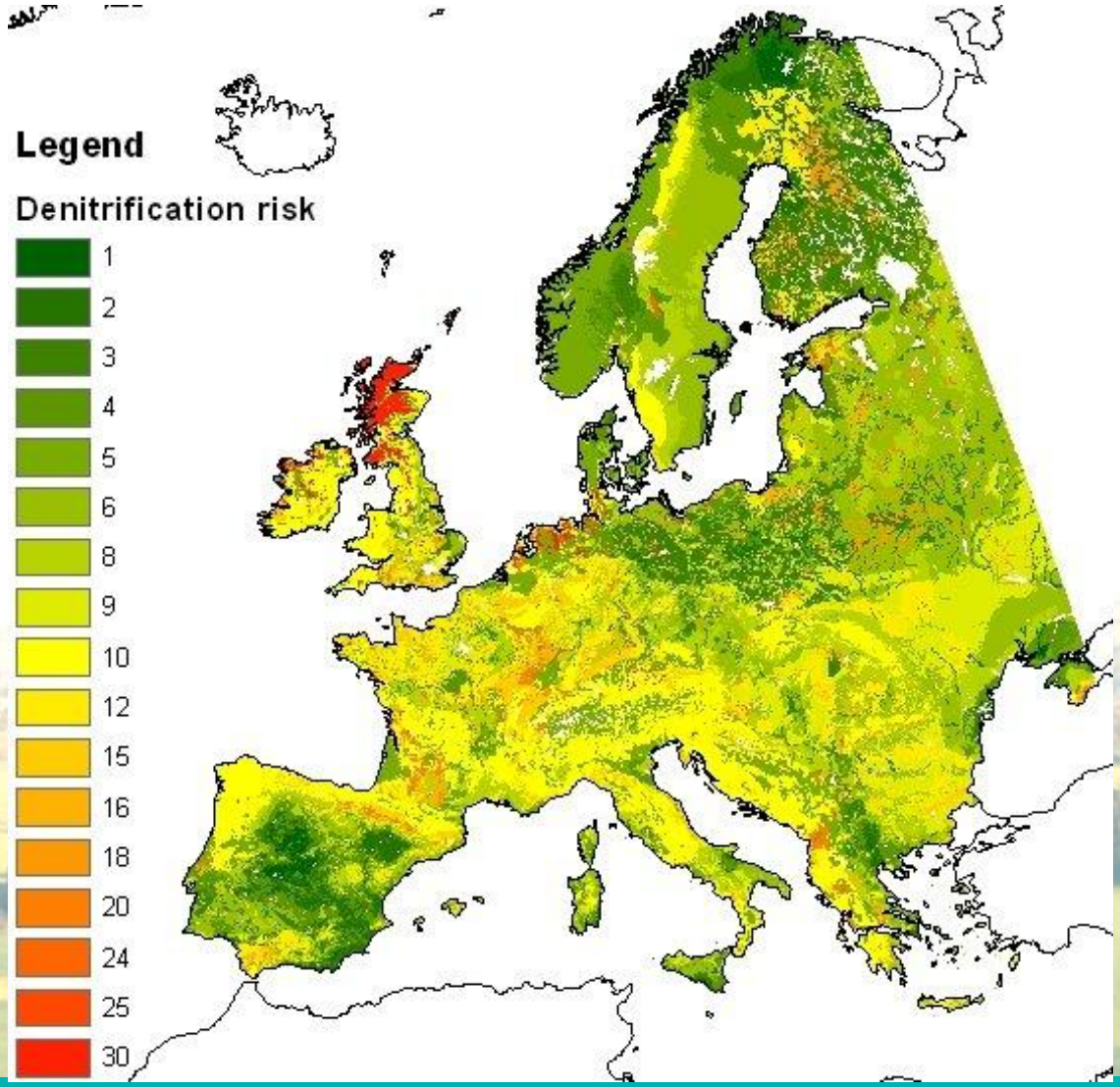


Soil compaction susceptibility



Low rainfall, coarse soil and low compaction = low denitrification risk

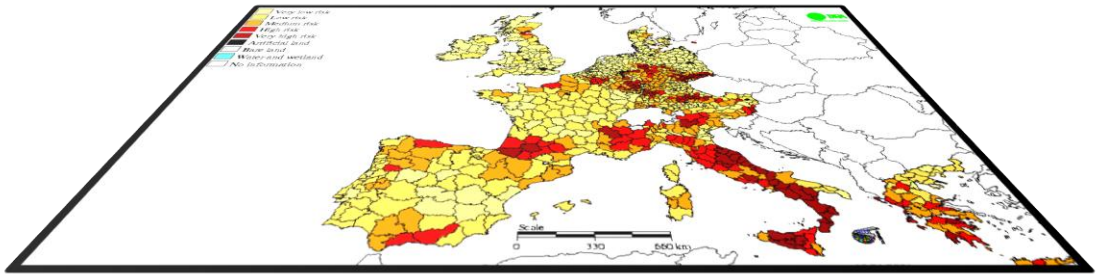
Denitrification risk



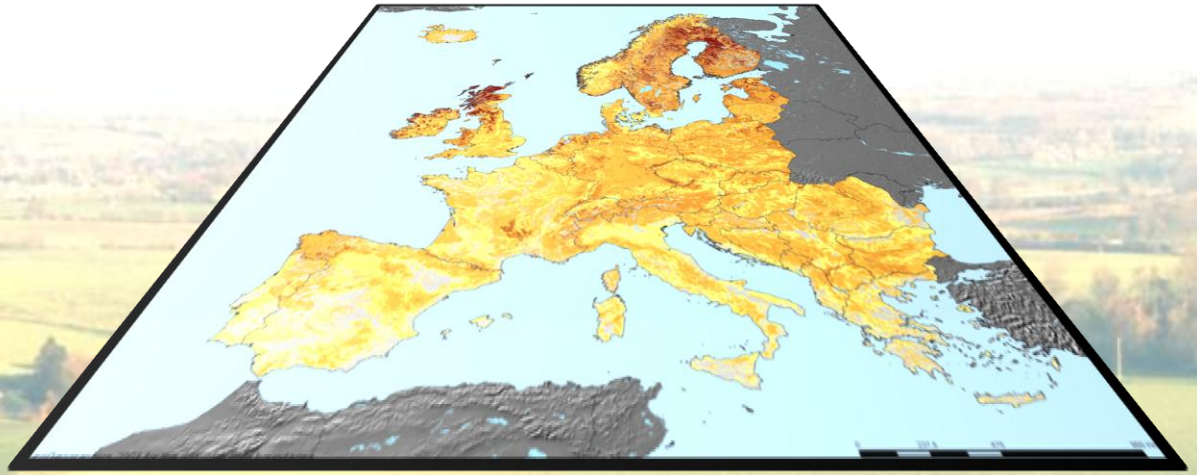
Loss of soil organic carbon from soil erosion

High erosion vulnerability and high soil organic carbon = high risk of loss of soil organic carbon

Soil erosion vulnerability

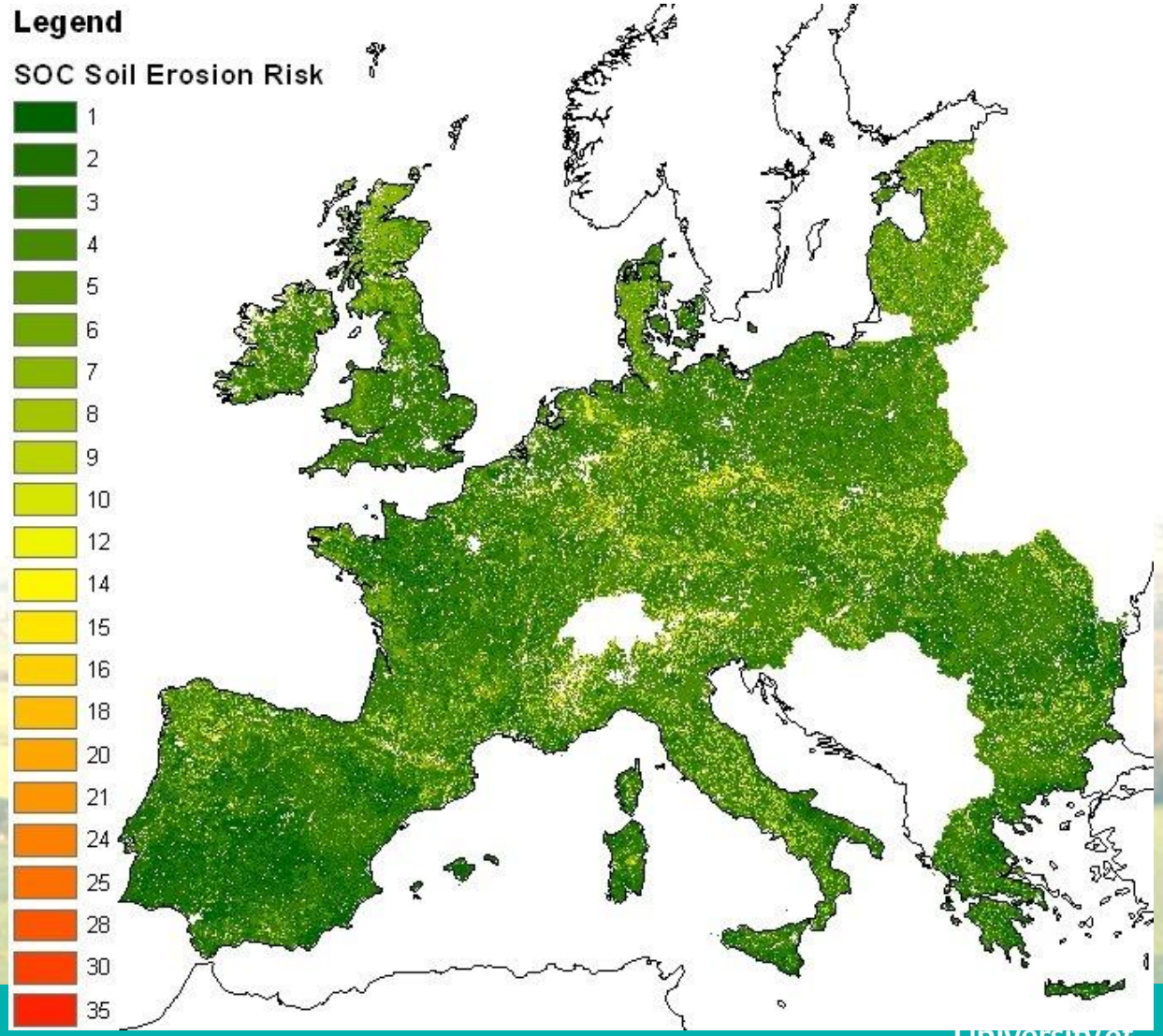


Soil organic carbon



Low erosion vulnerability and low soil organic carbon = low risk of loss of soil organic carbon

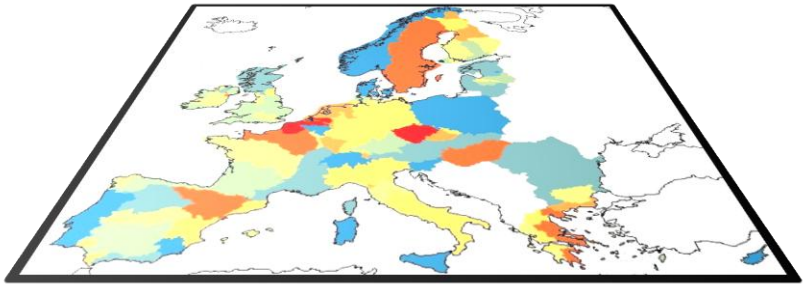
Loss of soil organic carbon from soil erosion



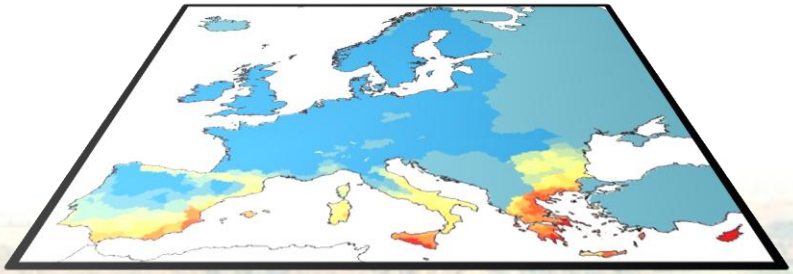
Water quality dilution

Poor water quality, lower rainfall = reduced dilution function

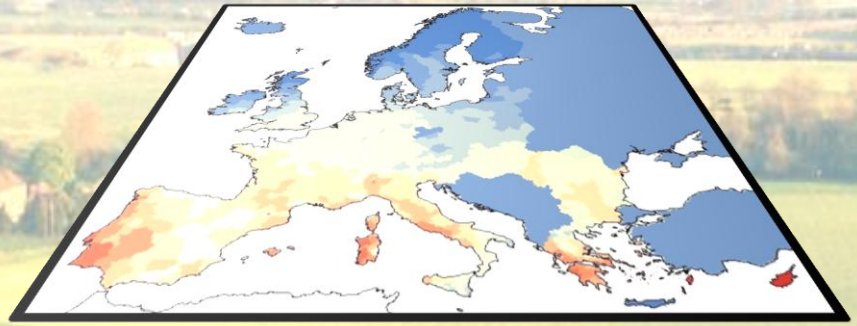
Current WFD surface water quality



Projected winter rainfall decrease

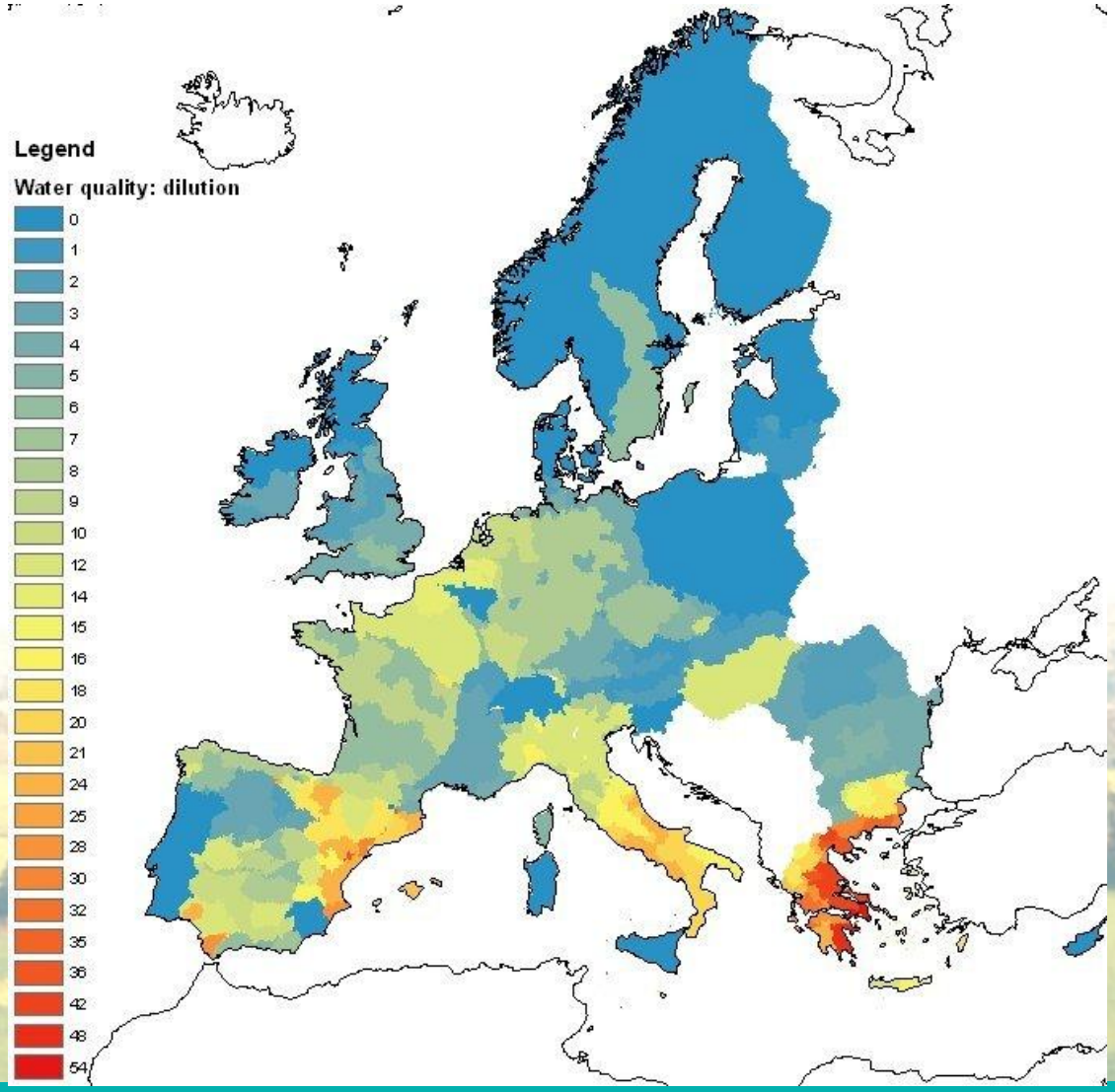


Projected summer rainfall decrease



Good water quality, rainfall maintained = dilution function maintained

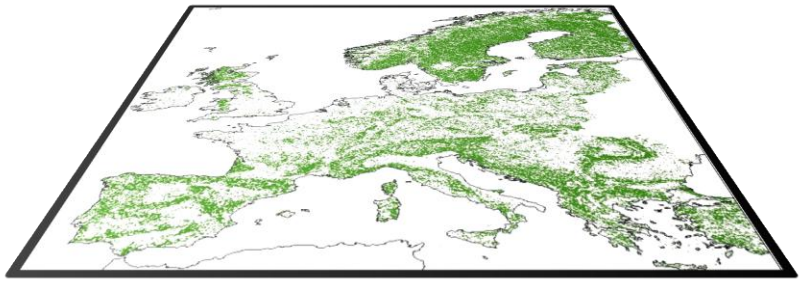
Water quality dilution



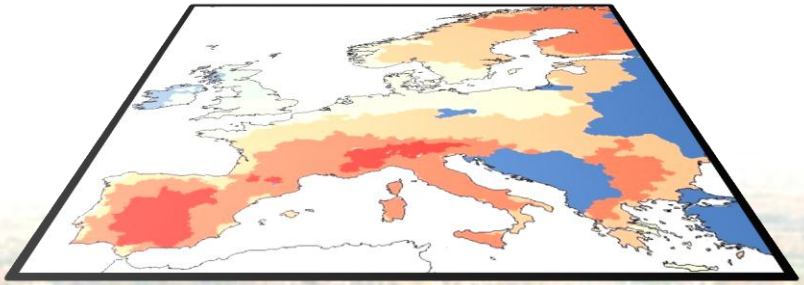
Forest fires

Highly forested area, lower summer rainfall, increased temperature = high risk of forest fires

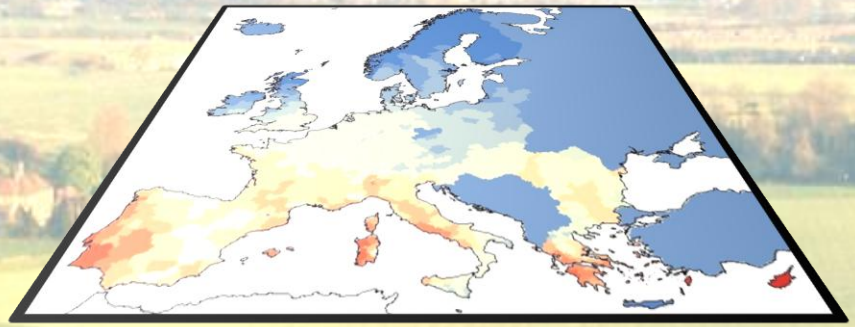
CORINE forest cover



Projected temperature increase

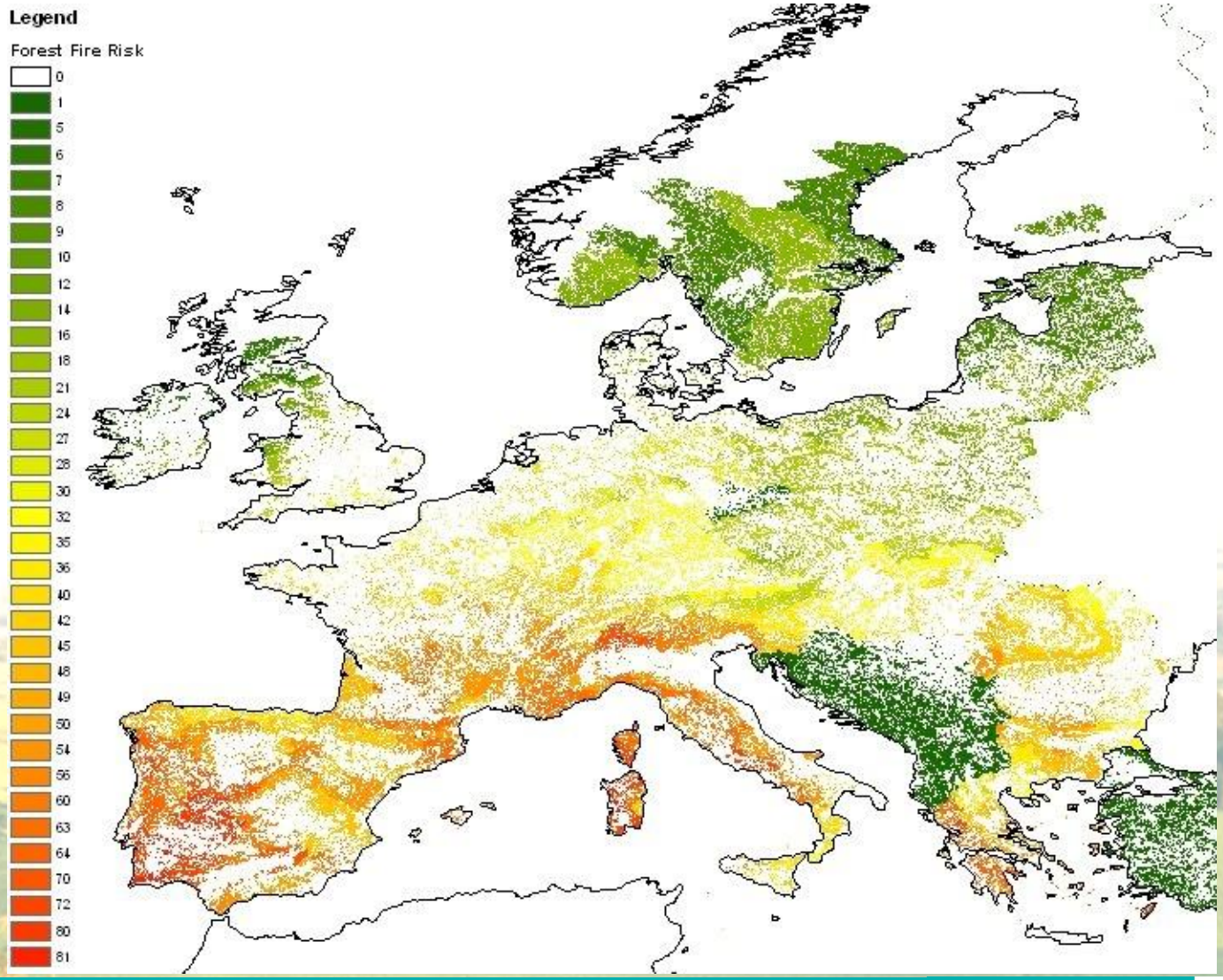


Projected summer rainfall decrease



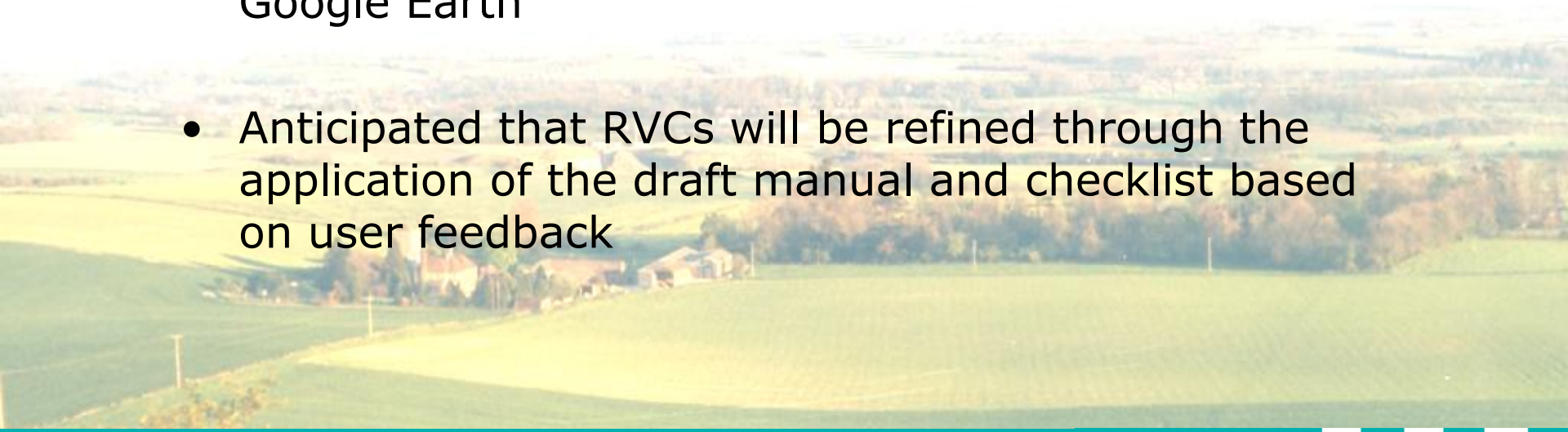
Low forested area, summer rainfall maintained, no increase in temperature = low risk of forest fires

Forest fires



Regional Variation Categories (RVCs)

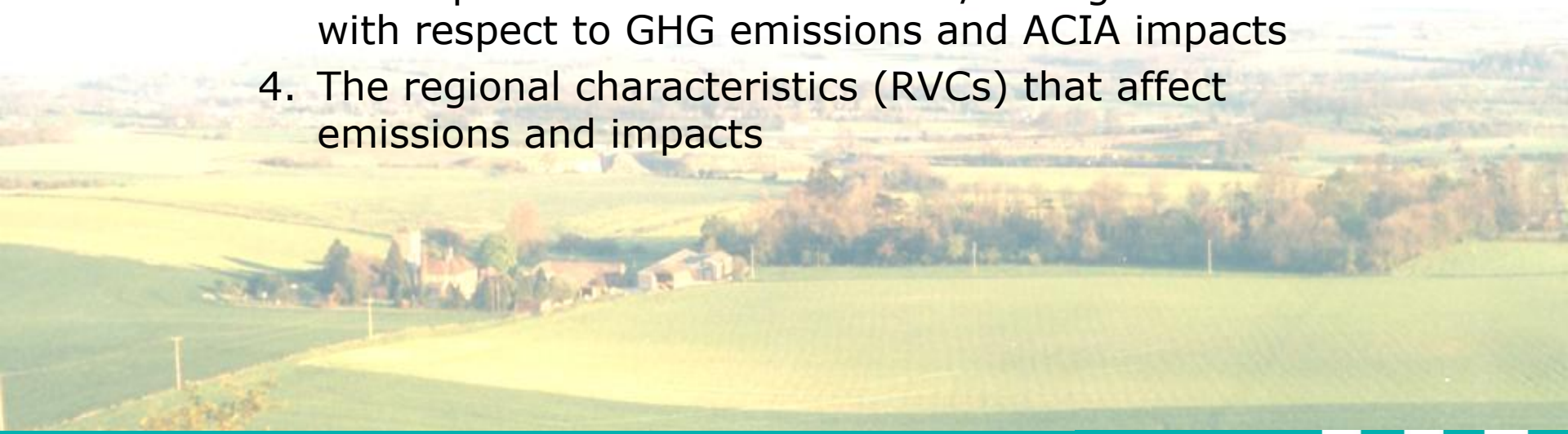
- All RVCs have been averaged to NUTS 0 to 3 levels
- Distribution of RVC classes (by area) have also been calculated for NUTS 0 to 3 levels
- Some data are also available to be visualised in Google Earth
- Anticipated that RVCs will be refined through the application of the draft manual and checklist based on user feedback



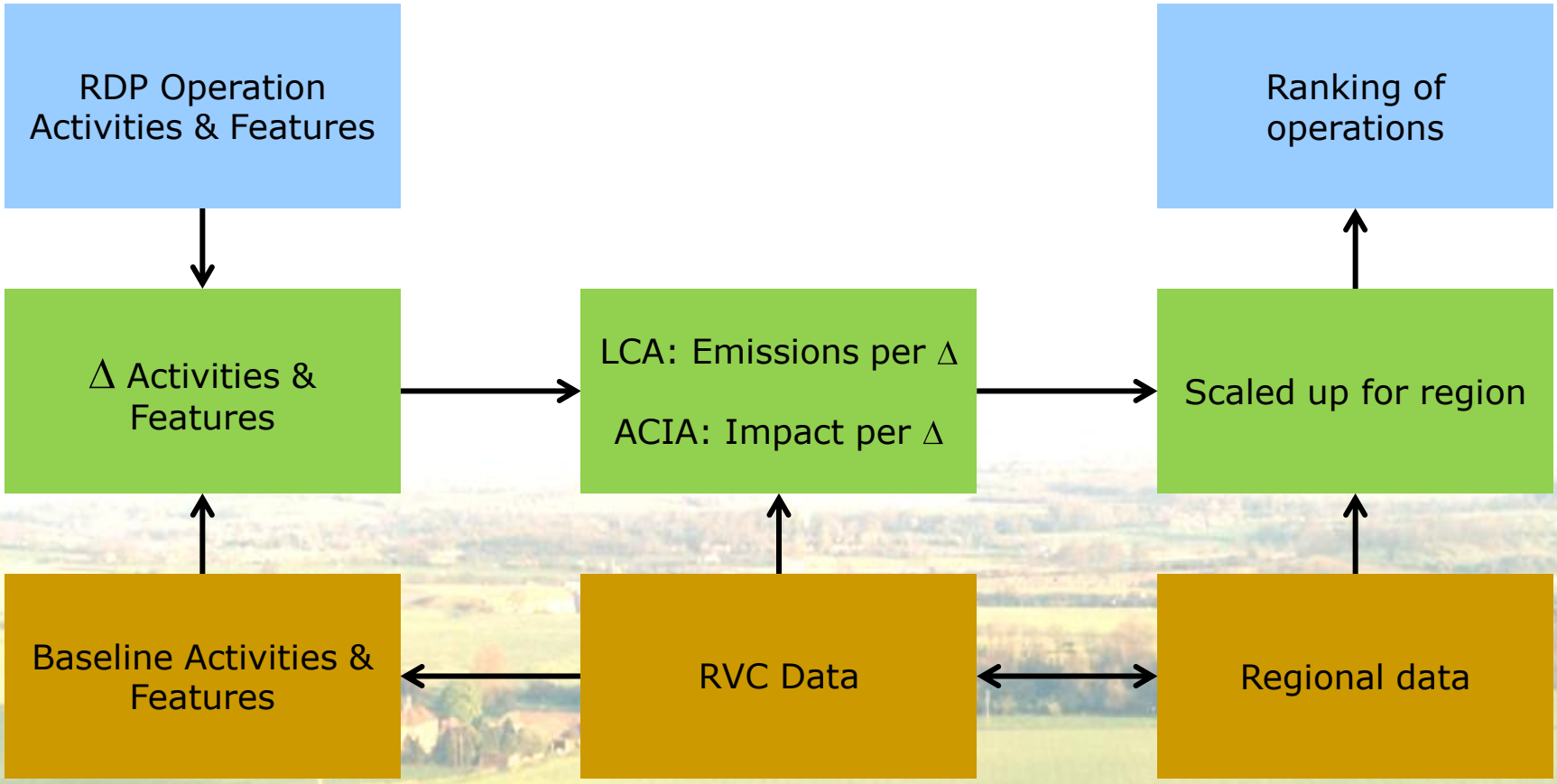
Assessment process (T4)

- In order to calculate emissions and impacts for the LCA and ACIA we need to know 4 details:

1. The baseline
2. The changes introduced by the RDP operation (new activities / changes in land use)
3. The impact of the new activities / changes in land use with respect to GHG emissions and ACIA impacts
4. The regional characteristics (RVCs) that affect emissions and impacts



Assessment flow chart

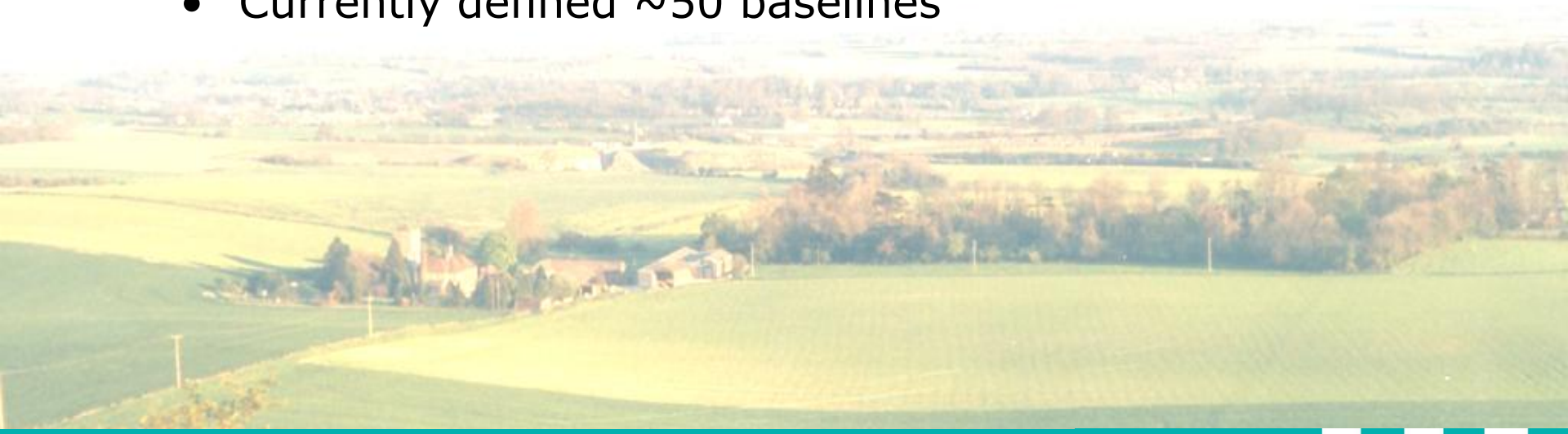


Baselines

- In order to determine emissions and impacts, we need to know what changes are introduced by an RDP operation, in relation to defined baseline scenario
- For example, the implementation of a buffer strip on a field edge will have different impacts on an arable field compared to grassland
- Additionally, some baseline activities will vary based on regional parameters, e.g. N fertiliser rates will vary with soil type and rainfall

Baselines

- Each baseline is defined by a number of activities and features, e.g. field operations, changes in vegetation and land use, changes in inputs, etc.
- Currently ~120 activities and features
- Currently defined ~50 baselines



RDP Operation Activities

- Each of the 380 RDP operations are also defined using the same activities and features used to define the baselines

- Consequently, when we select an RDP operation and baseline, a comparison reveals the changes (Δ) in activities and features associated with that RDP operations

Impacts

- Each activity and feature has an impact associated with it, in terms of GHG emissions, C sequestration and impact on adaptive capacity
- Consequently, the change (Δ) from the RDP operation/baseline comparison has an associated impact
- For GHG emissions and C sequestration, the impacts will vary with RVC
- For adaptive capacity, the RVC is used to weight the impact factor

Scaling up

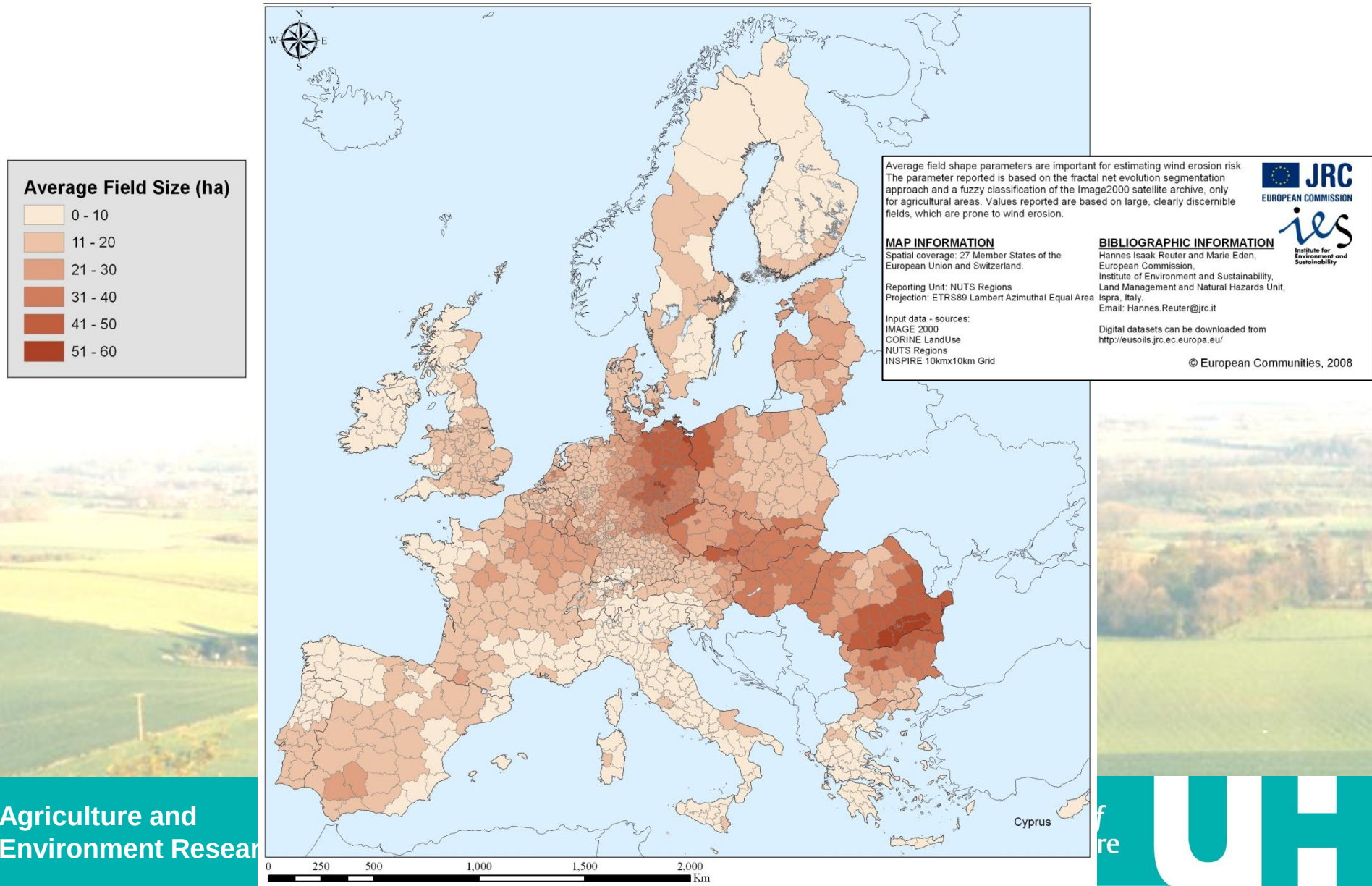
- Each RDP operation impact is calculated on a per hectare basis
- In order to determine the potential impact within a defined region, these impacts need to be scaled up
- At the moment this is done based on the percentage of each RVC within the region, and on a percentage basis with regard to implementation
- However, this process can be improved…

Scaling up

- For example, where an operation is applicable to a field boundary we can use average field sizes - because per field the buffer strip is applicable only to a proportion of a field, and that proportion depends on the size of the field.
  (If we assume all small field sizes then we risk over-estimating the potential length of buffer strips that could be implemented in a region and likewise, under-estimate if large field sizes are used)

- E.g. UK mean field size is ~12 ha (400m x 300m):
  - 400 + 400 + 300 + 300 = 1400m of boundary/12 ha
  - If a region is 12000 ha then roughly 1400000m (1400*(12000/12)) is available to which the buffer strip could be applied for that region

Average field size



Ranking

- Once impacts (GHG and AC) have been calculated for RDP operations, they can be ranked based on their performance
- This is done by converting the impacts to 0 to 100 index, where 100 is the best performing and 0 is the lowest performing RDP operation
- Indices for mitigation and adaptation are calculated
- Plus a combined index, where the indices for mitigation and adaptation are simply combined to a single 0-100 index using 50:50 weighting

RDP Manual and Checklist (T8/9)

- A key output from the project is to provide guidance to Member States on the design of RDPs at regional level in order to achieve optimal climate change benefits from implementation - this will be in the form of a manual and checklist.

- There are three parts to the development process:
  - Review
  - End user requirements
  - Manual and Checklist Production

Task list

Review

- A comprehensive review of manuals, checklists and other tools used in policy formulation
- Findings:
  - Little directly applicable to rural development AND climate change.
  - Important that the manual complements existing RDP development processes.
  - Many different presentation styles have been used, some are a lot better than others – so the review has provided examples of good presentation formats and also what should be avoided.
  - Full details in interim report.

End user requirements

- Consultation with National and Regional Managing Authorities (MAs)
- Consultation document distributed and available on the OSCAR website
- A disappointing response
(in terms of numbers of respondents)
- We view the case studies and application of the draft manual and checklist as an extension of the consultation, so still welcome comments and suggestions as development will be ongoing throughout the project.

Consultation responses

- From responses received, comments included:
  - RDP design is often devolved to relevant experts
  - Climate change objectives are being considered by all MAs, but to varying extents
  - Information contained with EU legislation is often the only form of guidance followed, but in some instances MAs have developed their own guidance documents
  - Guidance needs to remain stable during the programming period
  - Guidance being developed by OSCAR is welcomed

Consultation responses

- OSCAR Guidance should:
  - Take a holistic approach taking into account the impact on other environmental objectives
  - Have clear and concise guidance and examples of good (and possibly poor) use of measures
  - Include details on economic and production related impacts
  - Have a clear intervention logic
  - Have a clear definition of relevant indicators
  - Aid in the monitoring and evaluation of measures
  - Be kept simple to apply in a practical situation
  - Have a helpdesk and/or advice forums
- OSCAR Guidance should avoid:
  - Too much academic work
  - Moving impacts to other sectors and/or regions (i.e. pollution swapping and/or displacement)
  - EU jargon

Manual and Checklist Production

- It was apparent early in the project that any manual would need to be supported by interactive software tools and databases (because of the amount and type of data involved).

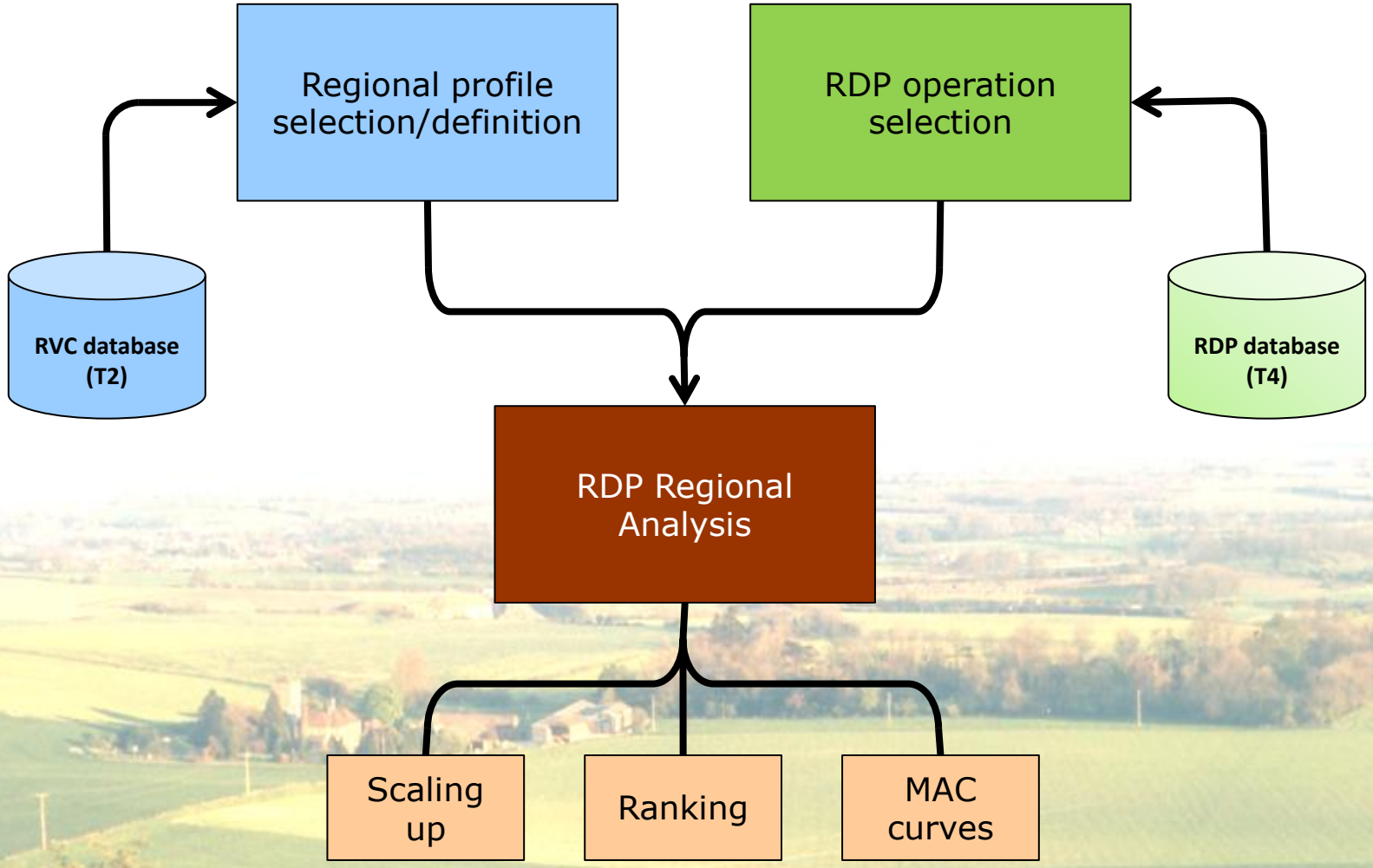
- The OSCAR software stores all the data that is emerging from Tasks 1-4, and supports the process of determining the climate change benefits of RDP measures and operations.

- The manual/checklist will operate in conjunction with the software and will provide a bridge between existing RDP development processes and optimisation for climate change objectives.

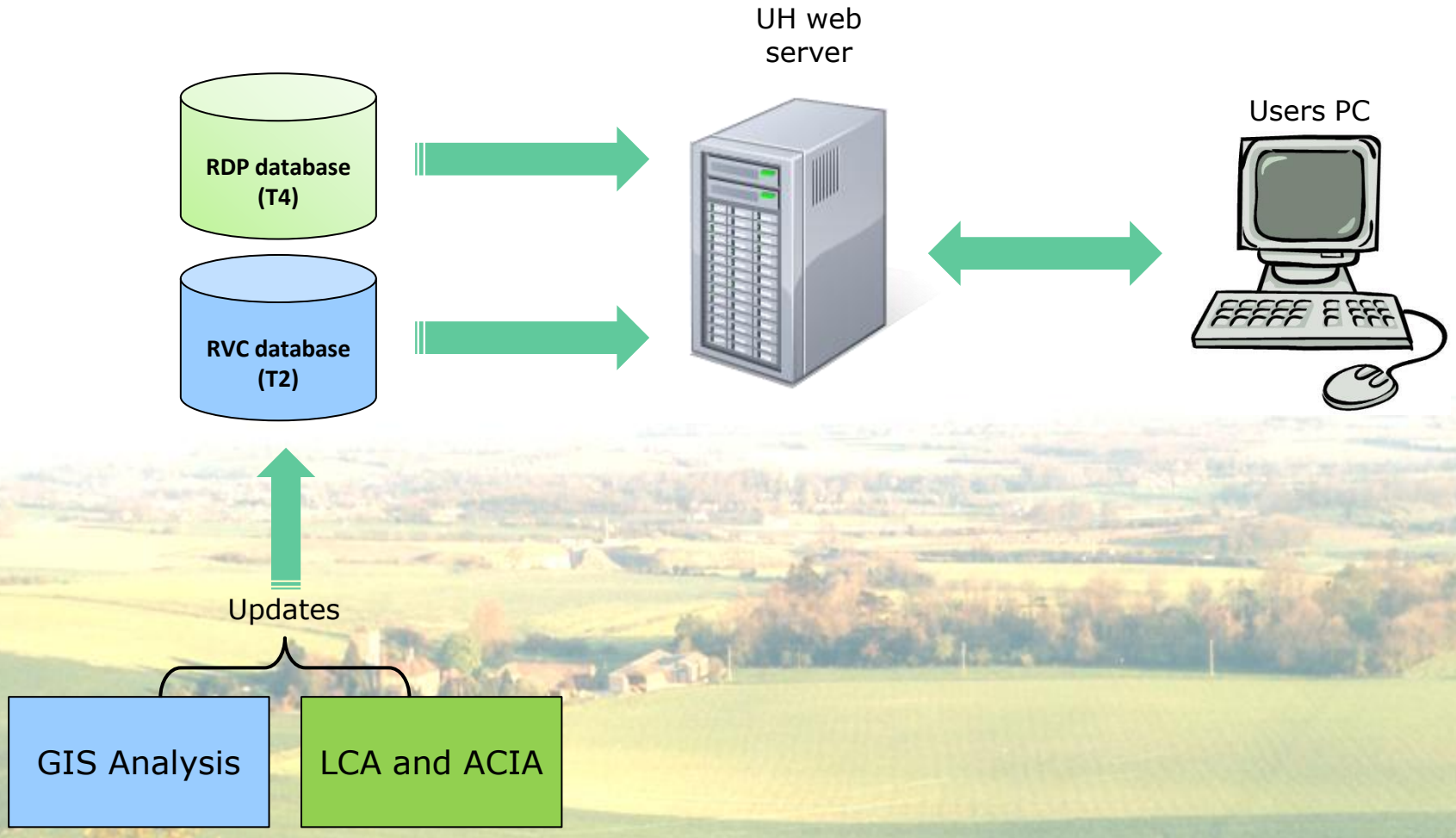
Manual and Checklist Production

- Prototype software has been created.
- Manual and checklist are currently being drafted.
- Plan to start piloting early July

OSCAR Software: use



OSCAR Software: updates



OSCAR Software

Software demonstration

Regional case studies (T5)

- Case studies regions are in place for:
  - Regional consultation
  - Application of draft manual and checklist

- Three case studies, which have:
  - Mitigation and/or adaptation 'hotspots'
  - Have different climate change risks or groups of risks
  - Data from previous studies
  - Capable to be covered within the resources available

- The following regions have been selected…

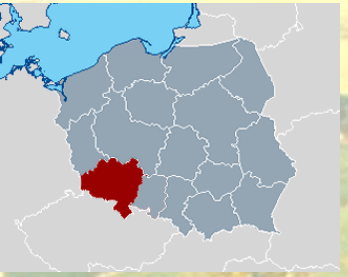
Case study regions

Northumberland, UK:

- ~0.5 million ha of which 20% is NNR; includes 13 SACs & 6 SPAs; upland and lowland farming: livestock and arable cropping; includes LFA of grazed moorland; variable soil types including deep peats & waterlogged soils; high rainfall; number of farms: ~2,300

Midi-Pyrénées, France:

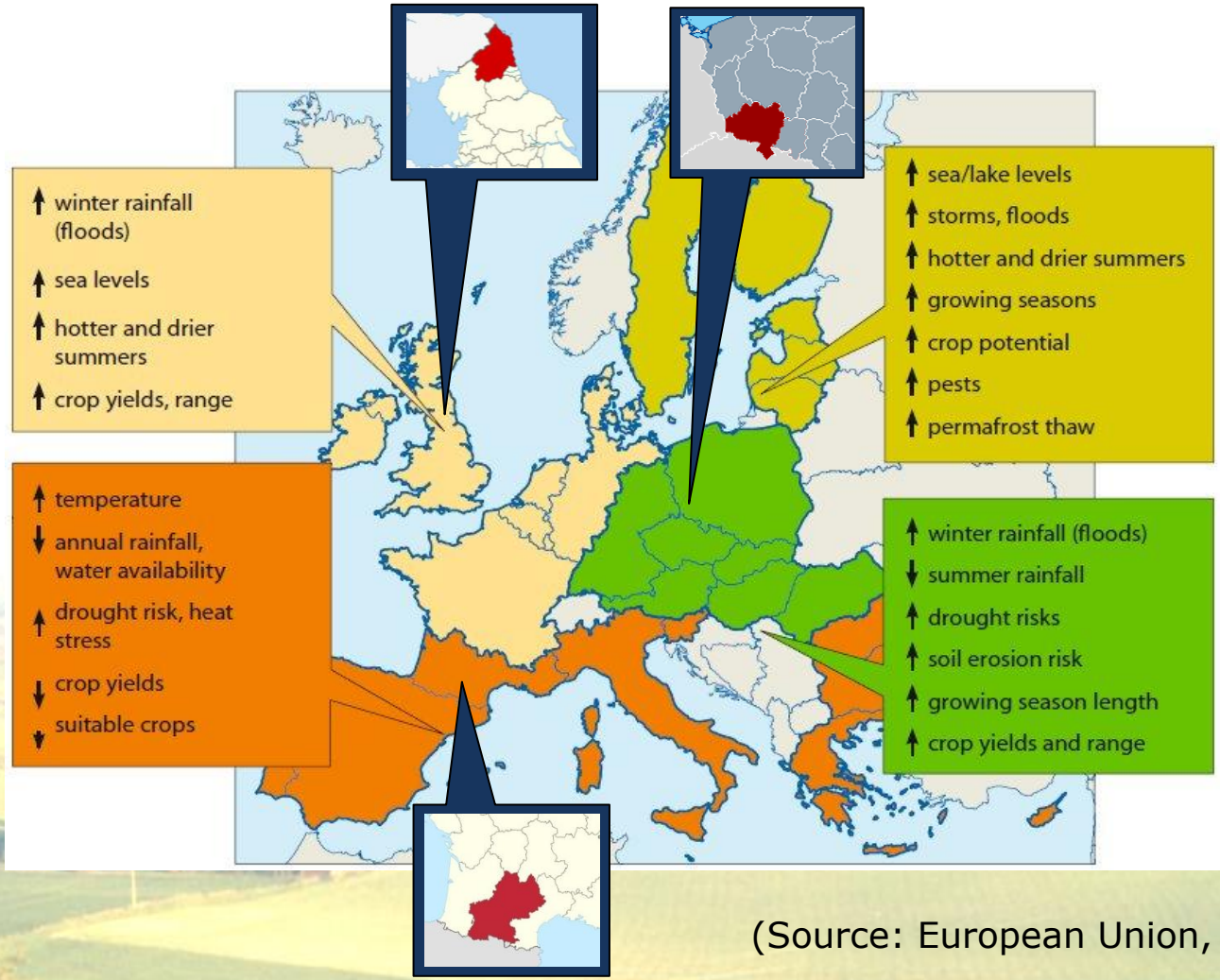
- ~4.5 million ha including 245,000 ha irrigated and 1.3 million ha of forestry; predominantly clay soils; main farming systems: crops, meat, vineyards, milk; number of farms: ~48,000



Lower Silesia Province, Poland:

- ~2 million ha; lowland area with glacial elements includes 2 national parks and 12 landscape parks, forests; high rainfall; fertile soils; farming systems: cereals, potatoes, sugar beet; number of farms: ~65,000

Climate change issues in the EU

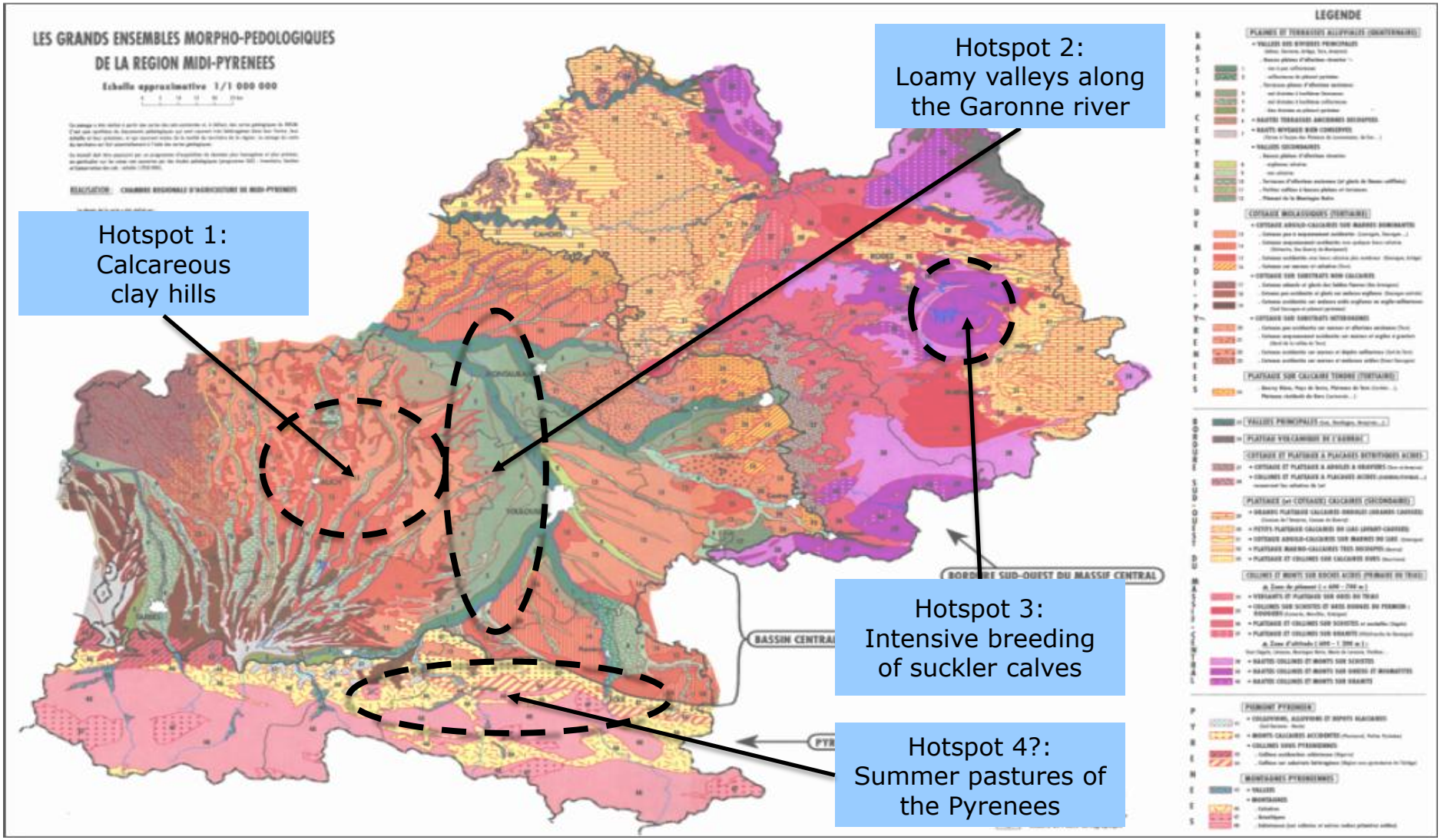


(Source: European Union, 2010)

Regional case studies (T5)

- Application of the manual, checklist and software, will include:
  - Baseline data collection (done)
  - Identification of hotspots (ongoing)
  - Identification of measures and operations that can be applied to the hotspots
  - Assessment of the cost of implementing measures and operations
  - Creation of MAC_{GHG} and MAC_{ADAPT} curves
  - Interpretation and overview: the proportion of the funding for a particular measure that is dedicated to climate action

Potential Hotspots in Midi-Pyrénées



Productivity Impact Assessment (T6)

- 6.1. Productivity change per unit of production
  - For each of the main business types within each region, an estimation of the productivity before and after the implementation of the suggested measures and operations will be undertaken. Productivity will be calculated using the following standard approach:

Output = [Cropped area or livestock number] x product yield x market value
Input = Cost of producing the output
Productivity = Output / Input

- 6.2. Change in regional output
  - The above calculation for Output will be repeated and scaled by enterprises in the region (e.g. area of productive land, numbers of animals) before and after the suggested measures and operations have been implemented.

Practicality Impact Assessment (T7)

- Tasks 4, 5 and 6 will generate data for each RDP operation with respect to its potential benefit or burden in relation to Mitigation, Adaptation and Productivity

- This task completes the MAPP criteria by providing an assessment of practicality.

- It is split into two sub-tasks:

  1. Identification of practical issues
  2. Normative assessment

Identification of practical issues (T7)

- Task 4 will highlight under which circumstances (including some of the RVC factors) RDP operations could provide positive impacts.

- This data will be supplemented by information from the case studies (Task 5), which may reveal additional practical issues that affect the efficacy of the measures and operations.

Practicality Example (T7)

- Grass buffer strips can help filter pollutants that run-off from fields.
  - In the OSCAR database we have given them an 80% efficacy/impact factor
  - However, this can vary depending on a number of site-specific factors, including:
    - Slope/topography (5-10% slope ideal)
    - Position of the strip
    - Infiltration rate
    - Pollutant type and properties (e.g. sediment size, Koc, chemical characteristics, dissolved or particulate)
- These practicality criteria need to be considered to achieve the best efficacy. If they are not met, then efficacy may need to be lowered

Normative assessment (T7)

- This task will review the normative assessment undertaken in Task 4.4
- A practical issues (identified in Task 7.1) will then be used to modify the performance scores (using an efficacy factor/weighting) so the score for operations with significant practicality issues can be moderated (performance will be known for when the practical issues are or are not in place)…

RDP	With practicality (maximum efficacy)			Practicality	Without practicality		
	Mitigation	Adaptation	Productivity		Mitigation	Adaptation	Productivity
RDP 1	20	40	-5	0.5	10	20	-2.5
RDP 2	50	0	10	0.1	45	0	9

Workshop (T10)

- A workshop will be organised in Brussels for 80-100 people, at which the findings of this study will be presented

- Progress:
  - Stakeholders are being notified about the workshop as part of the consultation exercise and project awareness raising activities

  - Proposed date: week starting 12 November 2012

Further information:

http://www.herts.ac.uk/aeru/oscar/