WP3 Knowledge
- Example Methods -

User board meeting
Lisbon, 6-7 Nov 2014

Example 1

A metric for
biogeochemical climate regulation

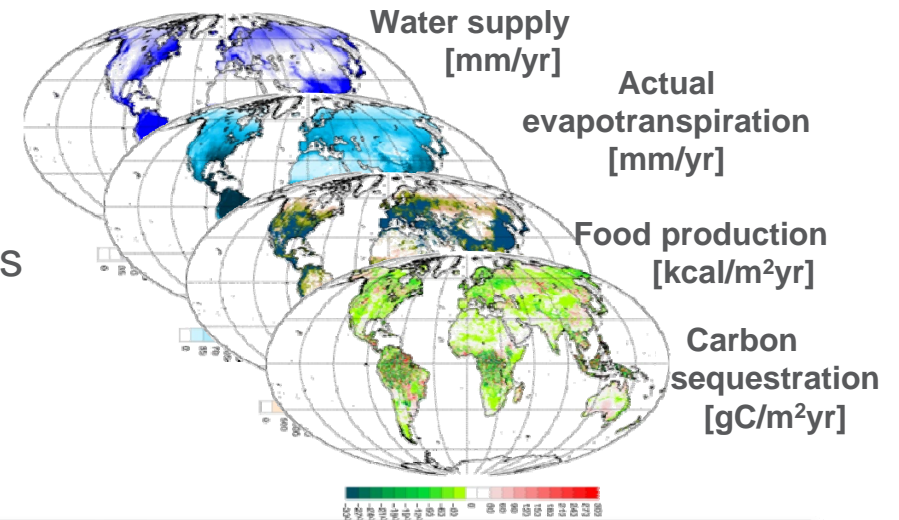**Part of Task 3.1**

Anita Bayer, Almut Arneth

Task 1

Ecosystem function
and quantification

DGVMs for ES assessments

Dynamic global vegetation models
simulate the development of land vegetation using mathematical representations of major ecosystem and plant processes

- Analysis of different biogeochemical cycles and their feedbacks (C, H_2O, N)
- Global scale
- Time perspective: historical to future

Water supply [mm/yr]

Actual evapotranspiration [mm/yr]

Food production [kcal/m²yr]

Carbon sequestration [gC/m²yr]

Climate regulation using DGVM:

➡ How do various ecosystems contribute to the climate?

➡ How does this change over time? under future conditions?

➡ Express these contributions in terms that are meaningful to policy makers?

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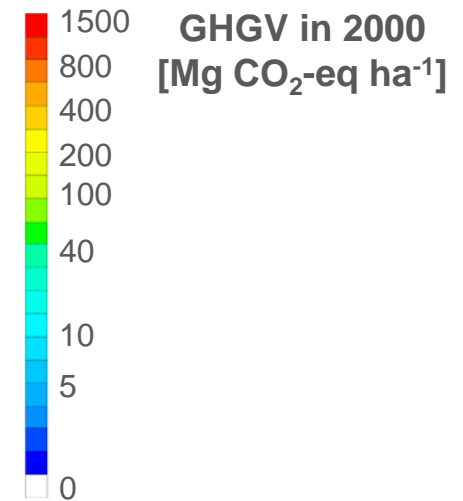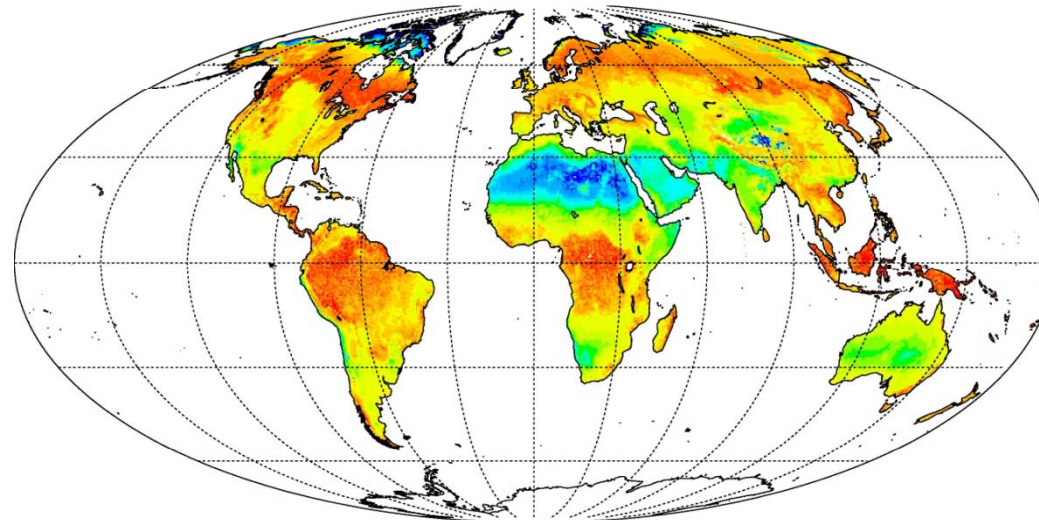
A metric for biogeochemical climate regulation

➡️ **Greenhouse Gas Value of ecosystems** (Anderson-Teixeira and DeLucia, 2011):
Quantifies the value of maintaining an ecosystem over a multiple-year time frame,
by accounting for the total radiative forcing of GHGs that would occur upon clearing
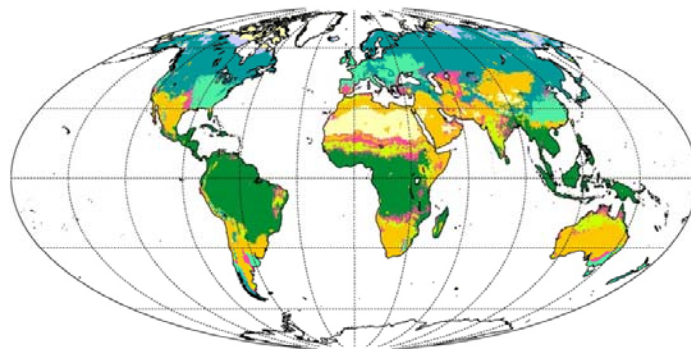
- Considers Storage, Flux and effect of nat. disturbances of multiple GHG
- Accounts for long-term effect of GHGs of an ecosystem
- Units: **[Mg CO_2-equivalents/ha]**
  directly transferable to monetary values

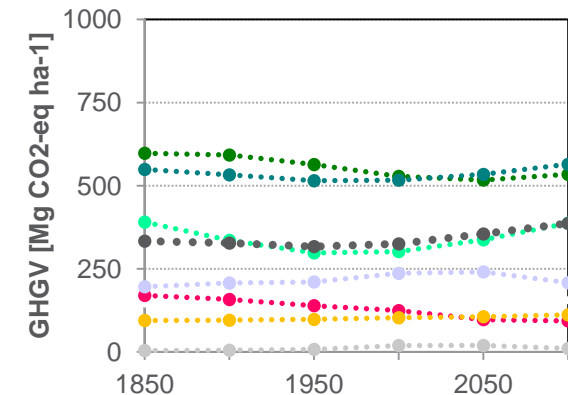➡️ **Contribution of CO_2 to climate for historical and future time periods**

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GHGV of current ecosystems

Process attribution

➡️ The isolated effects of climate, atmospheric CO_2 and land use changes on GHGV

Effect of climate 2000-2100

Effect of climate
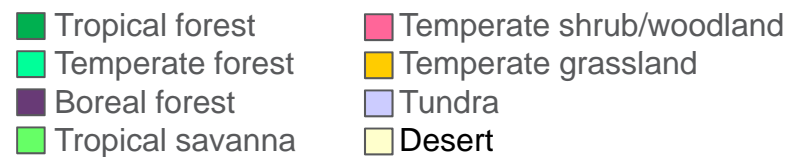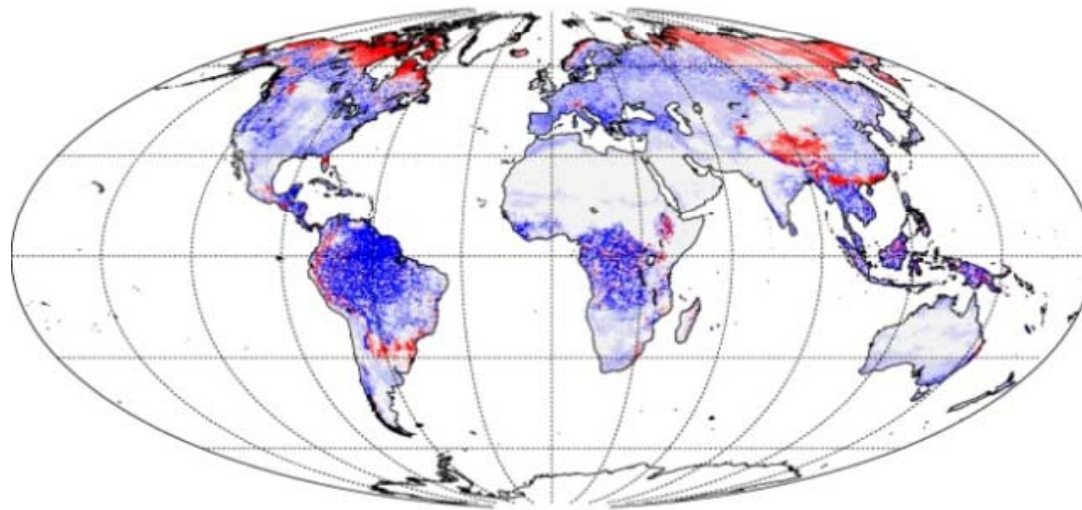

Legend:
- 🟩 Tropical forest
- 🟩 Temperate forest
- 🟪 Boreal forest
- 🟩 Tropical savanna
- 🟥 Temperate shrub/woodland
- 🟨 Temperate grassland
- 🟦 Tundra
- ⬜ Desert

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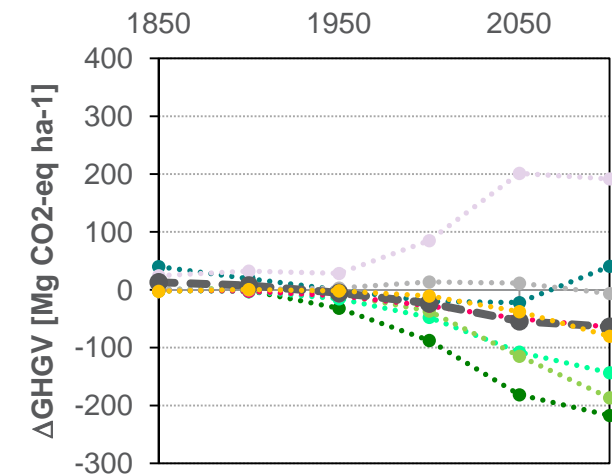
A metric for biogeochemical climate regulation

- Dynamic Global Vegetation Models for ES assessments

- Greenhouse Gas Value of Ecosystems is used as indicator for biogeochemical climate regulation ES
    includes C flux, storage + natural disturbance
    long term perspective
    [Mg CO_2-eq / ha] can be directly translated into monetary values

- Analysis:
    GHGV for specific biomes
    Temporal variation of GHGV
    Which process determines change in GHGV: climate, atm.CO_2, land use?

- Future perspectives:
    Other GHGs (CH_4, N_2O) & biogeophysical effects of climate regulation

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Example 2

Social-cultural valuation in the Fingal/Dublin Exemplar

Part of Task 3.2

Craig Bullock, Deirdre Joyce, Marcus Collier

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Task 2

Socio-cultural valuation

Overview SCV in Fingal Exemplar

Objectives

- Explore fundamental socio-cultural values:
  Identification and mapping
- Devise means to input values into planning process

Key elements

- Semi-structured interviews with stakeholders
  on ES and the planning process
- Two series of workshops with stakeholders and public

Methods/Tools/instruments:

- Document process of value identification
- Development of socio-cultural indicators
- Mapping of physical and ecological indicators
- Participatory multi-criteria analysis

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Identification and mapping of SCV in a series of workshops

**Three sets of workshops
(separately with stakeholders and public):**

1st workshop: Introduction to ES (social learning),
mapping and rating of (mainly) cultural ES
Aim: Identify type and location of socio-cultural values
>> Oct 2014, with ca. 20 Stakeholders from community organisations

2nd workshop: Follow-on workshop to report back
Aim: identify and discuss socio-cultural indicators
and trade-offs for coastal management

3rd/4th workshops: Participatory multi-criteria analysis in relation to local issue
Discuss criteria that affect social-cultural ES
Social and management options (social needs, environment, economic)

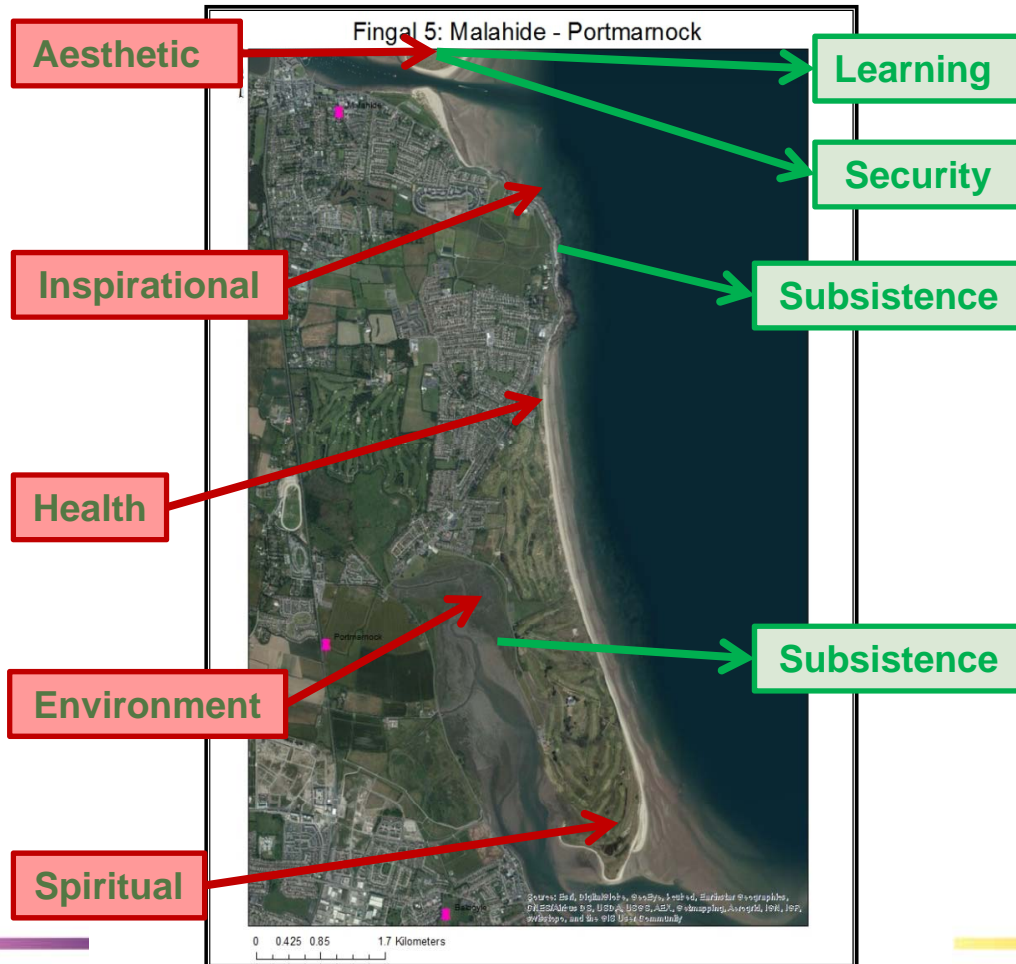**More workshops are to be arranged with general public**

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Workshop 1:
Rating indicators of well-being

Example: Rating of tangible and less tangible indicators of values
Participants rate as many of these as they wish to identify

Map marking CODE	Less Tangible	Type of value and why	RANKING – PLACE STICKERS IN THIS SECTION (only the items that are of importance to you)
AE	Aesthetic	I value the coast for its scenery, sights, smells and sounds	
ENV	Environment	I value knowing that the coast is clean and that its ecology is in a healthy state	
F	Future	I value what the coast has to offer to my grandchildren/future generations - to be able to experience what I've experienced	
HEA	Health	I value the coast as a place where I or others can feel healthy, physically or psychologically.	
HEI	Heritage	I value the coast as a place which has natural and human/way of life history that matters to me	
INT	Intrinsic	I value the coast just because it exists, no matter what I or others use it for	
LR	Learning	I value the coast as it provides a place to learn/teach	
INP	Inspirational	I value the coast because it provides inspiration for art, photography, writing and other cultural expression	
SEC	Security	I value the dunes, mudflats and salt marshes for the protection they provide from storms and flooding	
SOP	Sense of Place	I have the coast as it provides me with a sense of place and of identity for the community	

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Fingal 5: Malahide - Portmarnock

Aesthetic → Learning

Inspirational → Security

Health → Subsistence

Environment → Subsistence

Spiritual

0   0.425 0.85   1.7 Kilometers

Objective of the mapping method
(after McLain and Cervan, 2013) is
threefold:

- Shared and individual social learning
  about ES concepts
- Articulation of cultural ES values
- Researchers can identify hotspots of
  value at particular locations
  (multiple values and conflicts between
  values, if any)

➡ **different groups or individuals
have different values for
different locations**

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Social-cultural valuation in the Fingal/Dublin Exemplar

- The Fingal Exemplar is used as a practical example for identifying and mapping social-cultural ES and to explore means to input values into planning process

- Key elements are interviews and a series of workshops with stakeholders and interested public

    1st: Identification, rating and mapping of social-cultural ES

    2nd: Indicators for social-cultural values

    3rd+4th: Multicriteria-Analysis:
      discussion and rating of criteria that affect social-cultural values

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Example 3

Incorporating spatial heterogeneity in value transfer functions

Part of Task 3.3

Mark Koetse and colleagues

IVM Institute for Environmental Studies

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Task 3

Market and non-market valuation

What is a value function?

A function that relates the monetary value of an ecosystem service (ES)
to various variables, such as:

- ES characteristics (distance to, size, type, ….)
- Study characteristics (method, model specification, …)
- Study area characteristics (region, time period, income, population density, …)

Value functions are generally obtained from a meta-analysis on the relevant ES

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What is value transfer?

Using the value function to predict the value of an ES in a region where no economic valuation study has been done

- **Why interesting?**
  Value transfer saves on time and costs compared to doing separate economic valuation studies, especially when many areas need to be valued (e.g., for a national assessment of recreation values)

- **Central problem**
  Transfer (prediction) errors from existing value transfer functions are large

➡ **Can value transfer errors substantially be reduced by incorporating spatially specific information?**

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Method: Meta-analysis
- Makes use of available empirical evidence, in this case ES values
  e.g. databases of forest, water, … values
- Values and study characteristics are coded in a database
- Outcomes are made comparable
- Econometric analysis used to explain the variation in outcomes
  e.g. relation of variation with spatially specific variables such as income,
  population density, ...

Study types
- Contingent valuation studies on (use and non-use) values
- Travel cost studies on recreation values

Which regions and countries?
Global meta-analysis: Studies from all over the world, generally assessing the value
of a single forest or water area

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Current activities

Ongoing:

- Testing the performance of the 'new' value functions
- Application of value functions in selected OPERA's exemplars:
Scotland, European & Global

Available at IVM-VU website:

- General information on ES value studies, Descriptive statistics of data base
Maps with available studies and outcomes per region
- Value functions published on website
General, up-to-date value functions
Region- and/or ES-specific value functions on request

Perennity of knowledge:

- Database will be updated every two years: new data from empirical studies, wider coverage
Improvement of value functions (more data and information)

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Incorporating spatial heterogeneity in value transfer functions

- A value function relates the monetary value of an ES to various variables (size, type, region, time, …)

- Value transfer: use the value function to predict the value of an ES in a region where no economic valuation study has been done
Saves on time and costs, i.e. for large areas

- Research question: Can value transfer errors be substantially reduced by incorporating spatially specific information in the value function?

- Ongoing:
Testing the performance of the 'new' value functions
Application of value functions in selected OPERAs exemplars
Value functions + metadata available at IVM website

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