# Valuing Soil for Natural Capital Accounting

**David A. Robinson**
**CEH Bangor**

Artist Claire Pentecostin "soil-erg“ 2012.

NERC SCIENCE OF THE ENVIRONMENT

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# Why Soils?

Soils support food, feed and fibre production
Regulate climate, store carbon
Filter and recycle, water, nutrients and waste
Regulate floods, droughts, heatwaves, frost penetration
Habitat and genetic resource, e.g. Antibiotic extraction.

The Office of National Statistics has to present environmental accounts by 2020, hopefully with soil resources!

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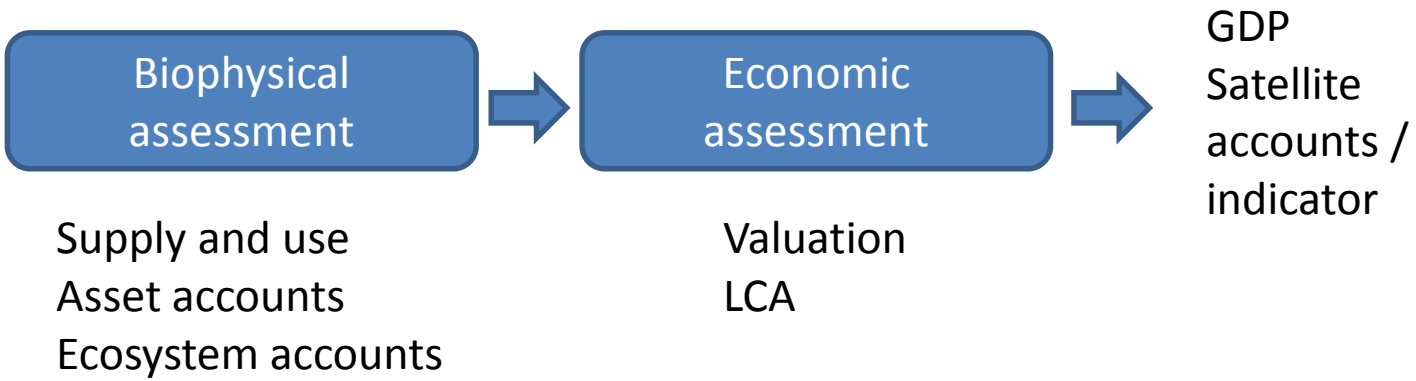
# Placement

Bangor Team:
James Gibbons - Environmental statistician / economics
David Styles - Life cycle analysis
Neil Hockley - Ecological economist

UN System of Environmental Economic accounting




Aspiration is to gain an overview of the economic element of Natural Capital accounting

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# Road map development

We can use Countryside Survey **soil change data** to create biophysical supply and use tables that record the change in stocks of soil Carbon, Nitrogen and Phosphorous

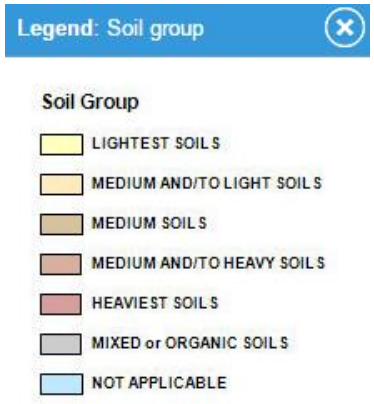
| | Broadleaved, Mixed and Yew Woodland | Coniferous Woodland | Arable and Horticulture | Improved Grassland | Neutral Grassland | Acid Grassland | Bracken | Dwarf Shrub Heath | Fen, Marsh, Swamp | Bog |
|---|---|---|---|---|---|---|---|---|---|---|
| Opening Carbon stock 1998 (t/ha) | 76.9 | 84.0 | 51.8 | 67.9 | 71.7 | 88.9 | 99.2 | 83.9 | 82.1 | 81.3 |
| Total additions to the stock | | | | | | 1.7 | | 6 | 0.7 | 4.3 |
| Total reductions in stock | 4 | 2.6 | 4.5 | 0.7 | 3.1 | | 14.5 | | | |
| Closing stock 2007 (t/ha) | 72.9 | 81.4 | 47.3 | 67.2 | 68.6 | 90.6 | 84.7 | 89.9 | 82.8 | 85.6 |
| Significance | | | Decline | | | | | | | |

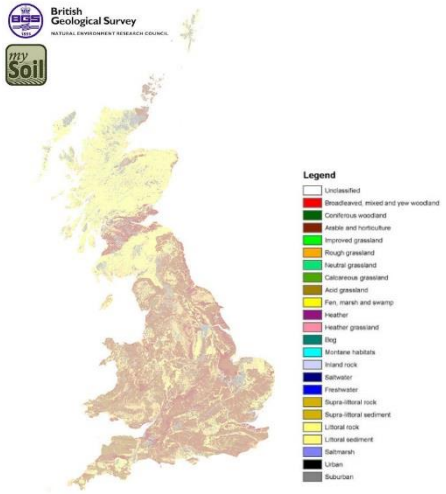
We know the social cost of carbon so can evaluate the cost of change

# Soil area change

Millennial change

Soil Parent material




Decadal change

Broad Habitat change

Decadal change (habitat)

Millennial change

| | Arable | Infertile grass | Fertile grass | Woodland | |
|---|---|---|---|---|---|
| Land/soil class sand | Area and determine % cover, change | % cover, change | % cover, change | | 100% |
| Land/soil class loam | | % cover, change | | | |
| Land/soil class clay | | | | | 100% |
| total | 100% | 100% | | | |

Table 5.17

Physical asset account for area of soil resources (*hectares*)

| | Type of soil resource |
|---|---|
| Opening stock of soil resources | |
| Additions to stock | |
| Due to changes in land cover | |
| Due to changes in soil quality | |
| Due to changes in soil environment | |
| *Total additions to stock* | |
| Reductions in stock | |
| Due to changes in land use | |
| Due to changes in soil quality | |
| Due to changes in soil environment | |
| *Total reductions in stock* | |
| Closing stock of soil resources | |

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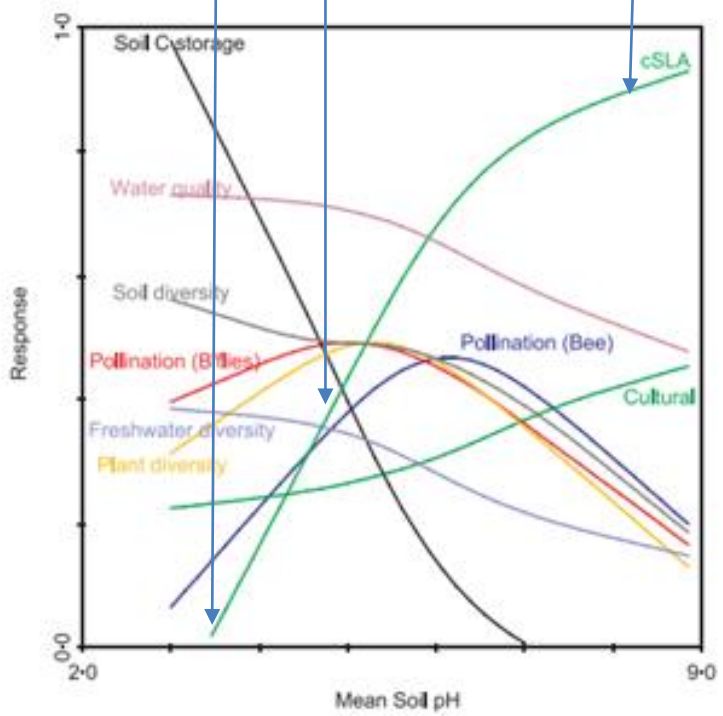
# Estimating price variation extracted soil

Market topsoil value = Benchmark topsoil £ * pH productivity response curve

No real production value

Rough grazing production value

Arable production value (£X pH 8)




Mean pH CS

Arable 7.20

Rough grazing 4.78

Value of topsoil, £20 – manufacture costs and haulage to find £X

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# Value is complex!

- Economics approach, system specific and about learning about the system through valuation. Often the process is more important than the outcome.

- Accounting approach, what's the resource / commodity value?

SEEA valuing is focused on:

- Market prices
- Net present value (NPV) discounted future returns (System specific)
- Replacement value (broad value, but what's its significance, we don't replace soil)

SEEA CF describes that an important principle to value environmental assets is to value them **in situ** – as far as subsoil assets are concerned, the asset itself as it is in the ground – rather than after its removal. For environmental assets which are extracted, the price of the output from extraction can normally be found in the market, but the market price of environmental assets in situ is not commonly available.

# Outputs

**Address the following:** “Integrating information on soil resources with other measures of natural capital and economic activity remains one of the least developed areas of the United Nations System of Environmental Economic Accounting (SEEA).” Carl Obst, former editor in Chief of the SEEA, Nature 2015

Scope a holistic paper responding to Carl Obst:

- Policy relevant questions regarding soils
- How do we monitoring soil change

- Soil metrics for - supply and use tables
- Soil metrics for - asset accounts
- Soil metrics for - ecosystem accounts

- Valuation approaches for soils

Will bring an interdisciplinary team together, and also serve as a road map for the Knowledge Exchange fellowship.