
Transactional Environmental Support System

# System Design and Pilot Implementation

## Prof Robert Kenward, TESS science supervisor

**Funded by the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 212304**

**ENV.2007.4.2.1.1. Methodologies for scaling down to regional & local level the analysis of policy impacts on multifunctional land uses & economic activity**


# GANTT-like TESS work-packages

0

MONTH

12

24

33

## WP2

**Central**

Survey design

Workshop & report

## WP3

**Local**

Survey design

Workshop & report

## WP5

**Cases**

Pan-Euro local & central survey

Local mapping & projects & report

## WP6

**Policy + Internet**

Survey, analysis

## WP4

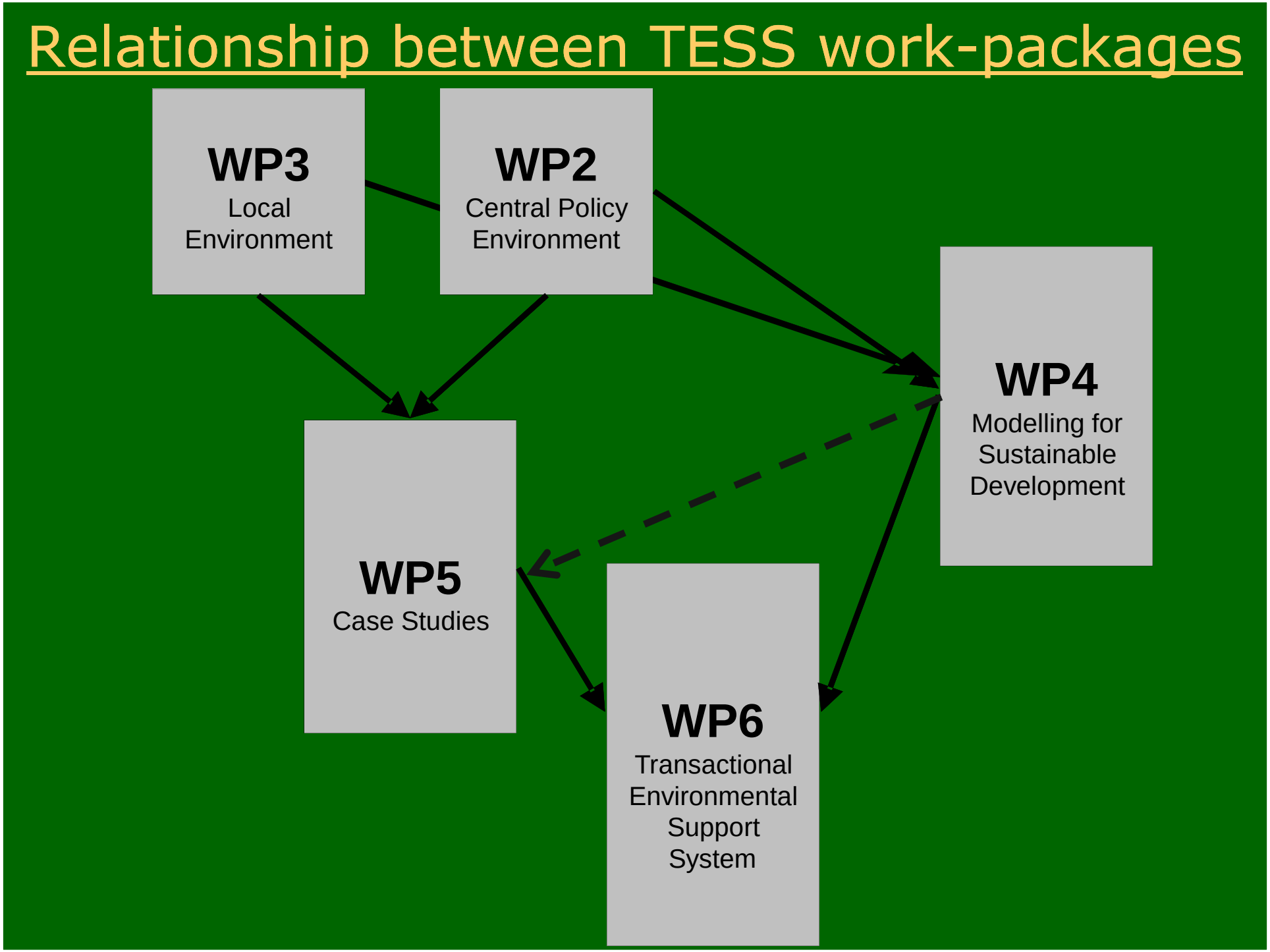
**Models**

Audit of models

Database complete, reported

Gap analysis

# Relationship between TESS work-packages



# GANTT-like TESS work-packages

MONTH

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## WP2

**Central**

Survey design

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Local mapping & projects & report

## WP6

**Policy + Internet**

Survey, analysis,

TESS internet design & report

Policy document

## WP4

**Models**

Audit of models

Database complete, reported

Gap analysis

# WP6 Deliverables

**D6.1** Report on biodiversity trends with SEA & EIA practices across Europe.

**D6.2** Recommendations and guidelines.

**D6.3** Design of a Transactional Environmental Support System.
(i) Technical design (Mapping, Decision Support
(ii) Socio-economic attractiveness of the tool.

**D6.4** Report on Brussels workshop.

# Task 6.3
# (i) Technology Design

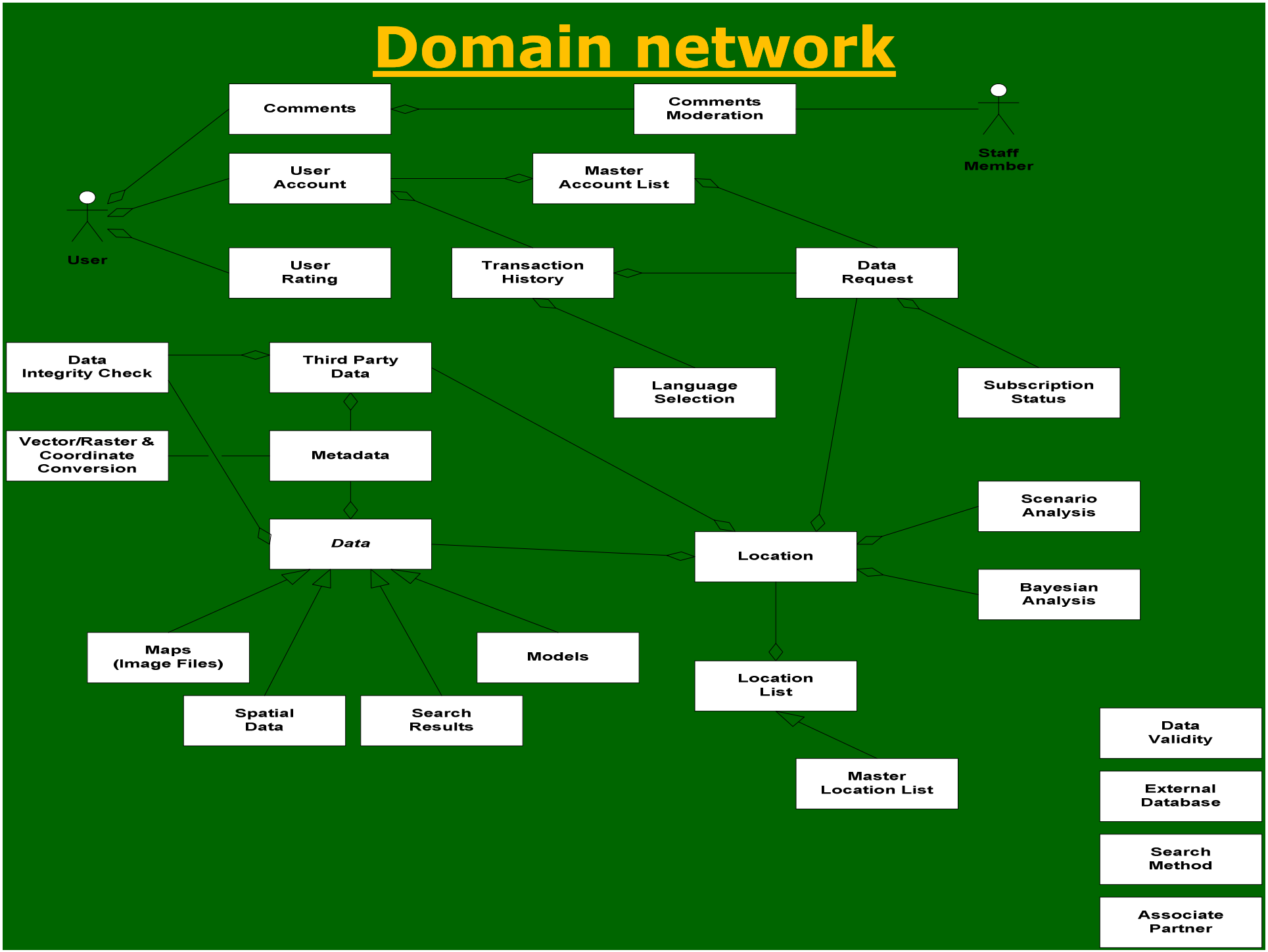
1. **<u>Technology design</u>** – need to agree:
   (a) high level requirements (e.g. inference engine logic, scale, confidentiality, data supplies, ownership & payments etc)
   (b) specifications for design:
      Domain Model,
      Use Cases,
      cost for building.
   (c) priority areas for decision support.

- Meetings with CEH Feb, Sept 2009, Sept 2010
- Workshop 13-15 December (Edinburgh)
- Workshop 25 May 2011

# High level requirements

1. The system shall be web based initially, but its architecture must be flexible enough that alternative frontends may be developed (web services, applets, cloud, etc).
2. The system must be able to contain socio-environmental data (spatial data, map images and mathematical models) and models in various formats and for various locations.
3. All data and models used in the system will be tagged by origin, as public or private and with other appropriate meta-data.
4. The system shall also support standardized data-bases on private computers, on which the user can change data, mark it public or private, and use it with appropriate models in personal computers or on the system.
5. Public data will be acquired by the system, but may be changed by system or originator.
6. Models may be acquired by the system for its use on a public or commercial basis.
7. The user and the system must be able to make requests for data and models of third-party databases, providing payment for access where necessary.
8. The user must be able to compare data and models from different sources and otherwise check for validity.
9. The system must be able to verify and check data and models for integrity.
10. The system must be able to accept subscriptions and payments on account for models and data.
11. The system must be able to present itself and interact with the user in many languages.
12. The system must be embeddable into associate partners' websites using a standard frontend.
13. The user must be able to create a user account so that the system remembers the user's details (name, address, subscription and account details) at login.
14. The system shall maintain a list of accounts in its central database.
15. When a user logs in, his/her password must always be matched against the passwords in the master account list.
16. The user must be able to search for data by various search methods - location, type, keyword, date and so on – and then view the data tags.
17. The user and system must be able to apply models and Bayesian analysis in data and produce scenarios.
18. It must be possible for the user to post comments on the data and models.
19. Comments must be moderated – that is to be checked and permitted by a member of staff before they are published on the website.
20. The system must be able to perform vector/raster and coordinate conversion from all projections, and to interact with large external databases (e.g. CORINE).
21. The system shall be scalable, with the following specific requirements:
    - The system must be capable of maintaining user accounts for up to 100,000 users in its first six months and a further 1,000,000 after that.
    - The system must be able to of serving up to 1,000 simultaneous users (10,000 after six months).
    - The system must be capable to accommodate up to 100 search requests per minute (1,000 per minute after six months).
    - The system must be able to accommodate up to 100 data exchanges per hour (1,000/hour after six months).

# Domain network



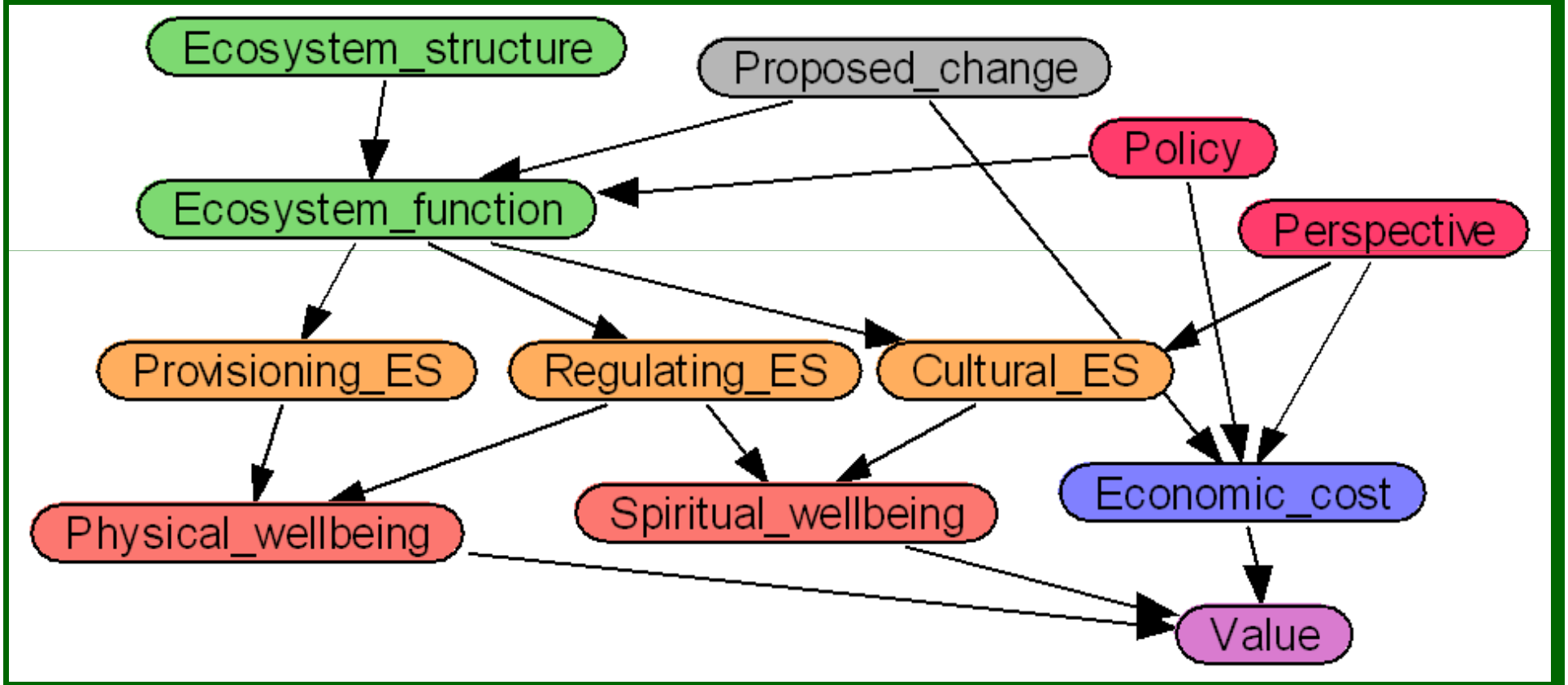
# Use cases (e.g. Model Selection) to populate the domain network

| | ALL SCALES | Functions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Run model selected | Run data input use case | Run data transformation Use case | Run data search Use case | Identify models with compatible input data | Identify models with compatible output data | Identify models that operate at the appropriate scale | Identify model(s ) with 'best fit' to data supplied and output requested | Identify additional data needs | Identify data transformation needs | Identify options to link models | Model selection by user |
| Actor | General User | | | | | yes | yes | yes | yes | yes | Yes | | yes |
| | Local level stakeholder, Local community, Policy manager | | | | | yes | yes | yes | yes | yes | yes | | yes |
| | Decision tool / Domain expert | yes | yes | yes | yes | yes | yes | yes | yes | yes | yes | yes | yes |

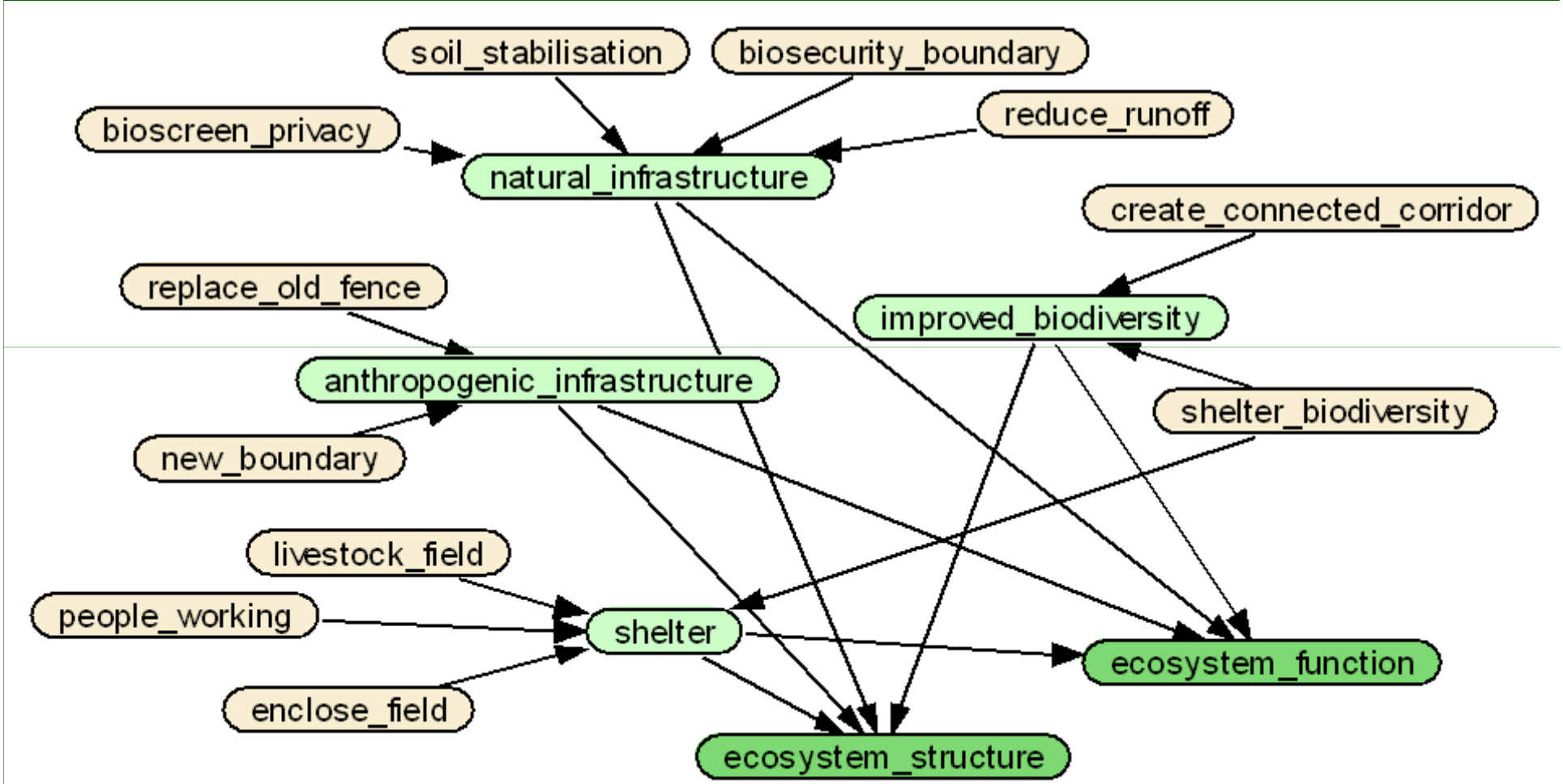
# Lots more Use Cases ....

| Use case | Partner | bee example | recreation (4x4) | Buffer strips in agricultural land | Managed fishery on a lake | Plant trees on this piece of land | Actors and their 'privileges' | Ability to run 'iteratively' | Help information for confidential data | Servicing different level users | Data validation policy | Sensitivity analysis to identify least 'reli | Computational requirements(e.g. for pr | Data tagging – ownership and uncertain | Model evolve or static (it can create nev | List of open source Bayesian tools | Amount of empirical data input over tir | Which items are flagged as issues in ou | Defining the actors | Vector vs Raster within Use Cases | Translation to national languages | Biodiversity gap analysis (What is there |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Issue setting | IST | x | x | x | x | | x | x | | x | | | | | | | | x | x | | | x |
| Criteria setting | Kristjan Piirim | x | x | x | x | | x | x | | x | | | | | | | | | x | | | x |
| Scenario builder | CEH | x | x | x | x | | x | x | | x | | | x | | x | | | x | x | | | x |
| Model selection | CEH | x | x | x | x | | | | | | | x | x | | x | | x | | | x | | x |
| Data entry & modification | workshop | x | x | x | x | | x | | x | x | x | x | | x | x | | x | | x | | x | x |
| Data search | AUTH | x | x | x | x | | | | | | x | | | x | | | x | | | | | x |
| Data quality assessment | CEH | x | x | x | x | | | | x | x | x | x | | x | | | x | x | | | | |
| Error/uncertainty assignment | CEH | x | x | x | x | | | x | | | x | x | x | x | | | x | | | | | |
| Display outputs | AUTH | x | x | x | x | | x | | x | | | x | x | | | | | x | | | x | x |
| System options (menus, etc) | from design | n/a | n/a | n/a | n/a | | | x | | x | | x | | | x | | | x | | | x | x |
| Bayesian analysis & updating | CEH | x | x | x | x | | | x | | | | x | | | | x | x | | | | | x |
| Display Bayesian output | CEH | x | x | x | x | | | | | | | | | | | | | x | | | | x |
| Scenario outputs | CEH | x | x | x | x | | | x | | x | | | x | | | | | x | | | x | x |
| Help | from design | n/a | n/a | n/a | n/a | | | | x | | x | x | x | | x | | | | x | | x | x |
| Vector/raster & coordinate conversion | Anatrack | x | x | x | x | | | | | | | | x | x | x | | | | | x | | |
| Data aggregation & disaggregation | AUTH | x | x | x | x | | | | | x | | | x | | x | | x | | | x | | |
| Spatial analysis | Tero | x | x | x | x | | | | | | x | x | x | x | x | | | | | x | | |
| Log in | Anatrack | x | x | x | x | | x | | | x | | | | | | | | | x | | x | |
| Registration | Anatrack | x | x | x | x | | x | | | x | | | | | | | | | x | | x | |
| Translation to national languages | Anatrack | x | x | x | x | | x | | x | | x | | | | | | | x | | | x | |
| Knowledge gap analysis | from design | n/a | n/a | n/a | n/a | | | | | x | | | x | | x | | | x | | | | x |
| Credits for data and model use | Tero | | | | | | x | | | x | | | x | x | | x | x | | | | x | |

# **Bayesian Logic handles uncertainty**
## e.g. Bayesian Belief Network for Generic land use decisions

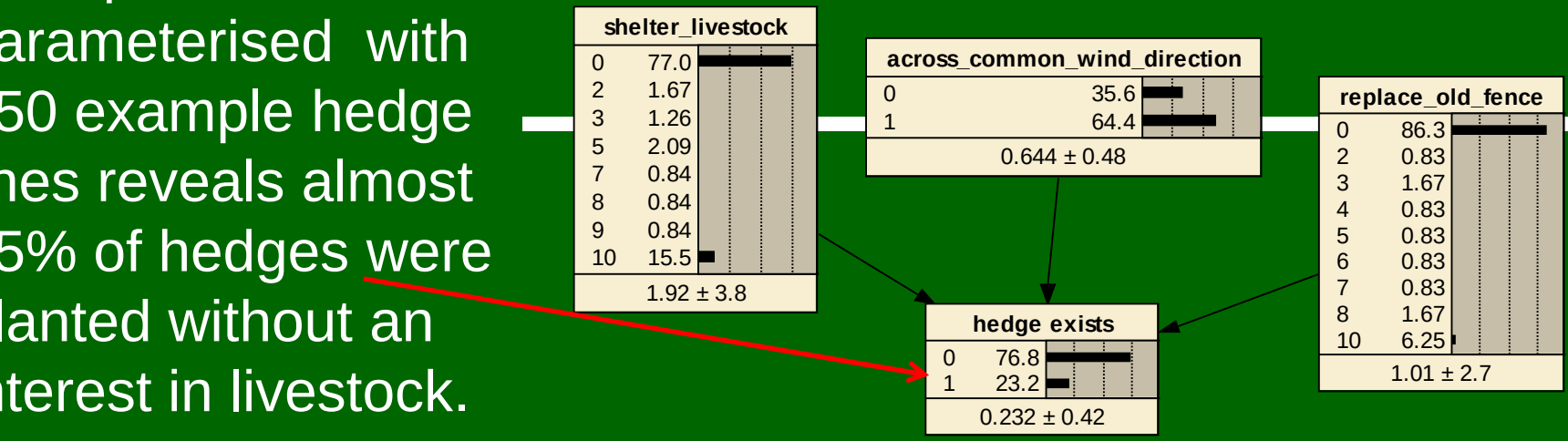


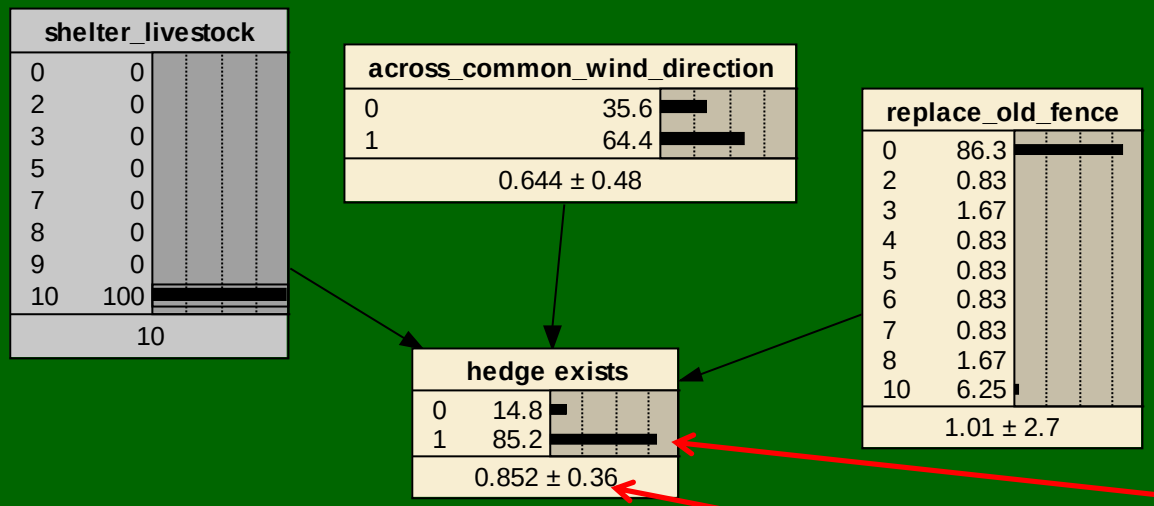
# Bayesian Belief Network to explore decisions on hedge planting



Example of a hedge line selected for planting by the farmer. The line was in an old ditch and offered habitat conductivity for biodiversity.

A simple BBN parameterised with 250 example hedge lines reveals almost 25% of hedges were planted without an interest in livestock.

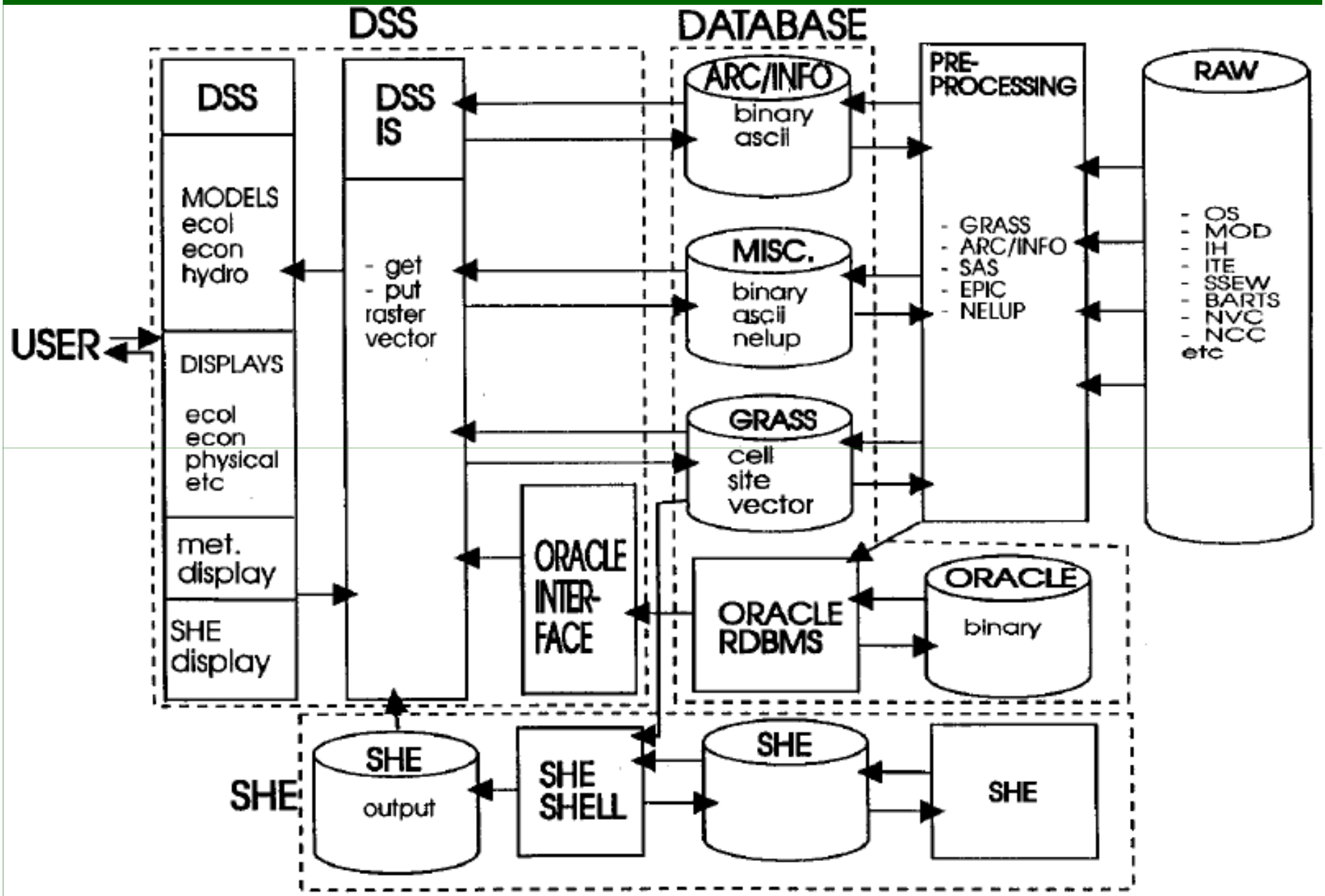



However if the farmer prioritised a need to shelter livestock, the BBN predicts using our test dataset that there would be an increase to 85% of hedges planted with a 36% uncertainty

# Integrated modelling is not new so recall past lessons

- NERC-ESRC Land Use Programme ("NELUP")
- 1989 -1995  £1.2 million (ca 60 man-years)
- Catchments of Rivers Tyne (mixed) and Cam (intensive arable)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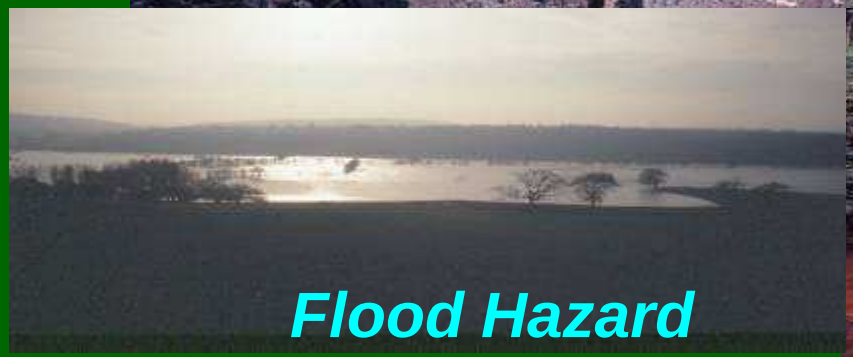
# Also 2001 Environmental Information System for Planners (EISP)

**A prototype demonstrator to help planners apply environment data and understanding in the planning process.**



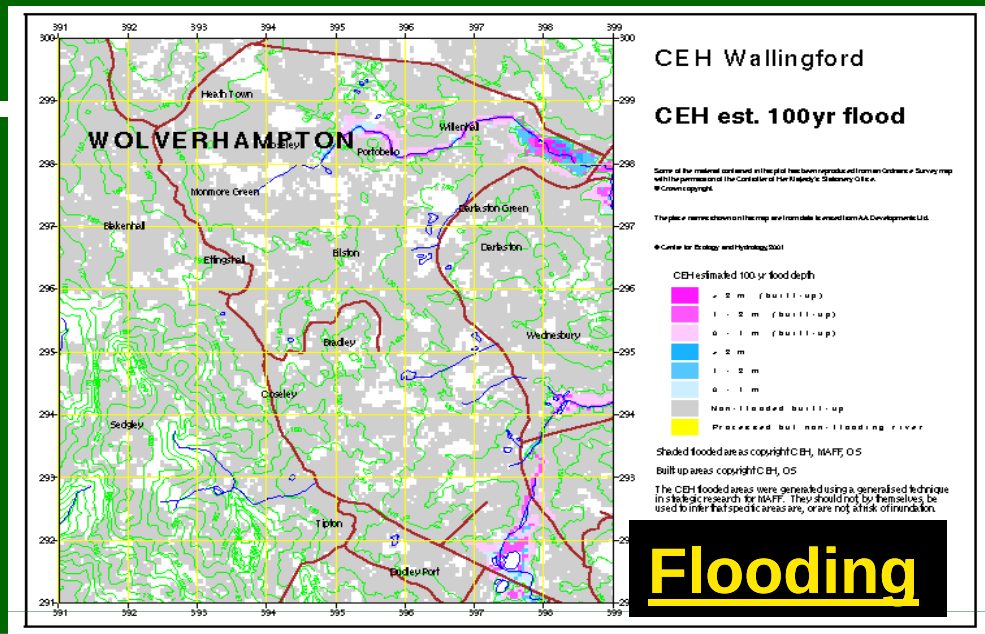




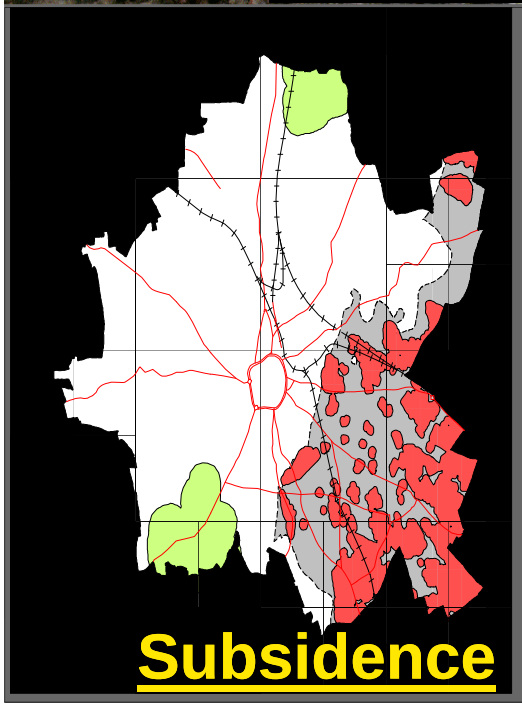

**Origin: BGS, CEH and Nottingham University**

# Some capabilities


## Managing Waste



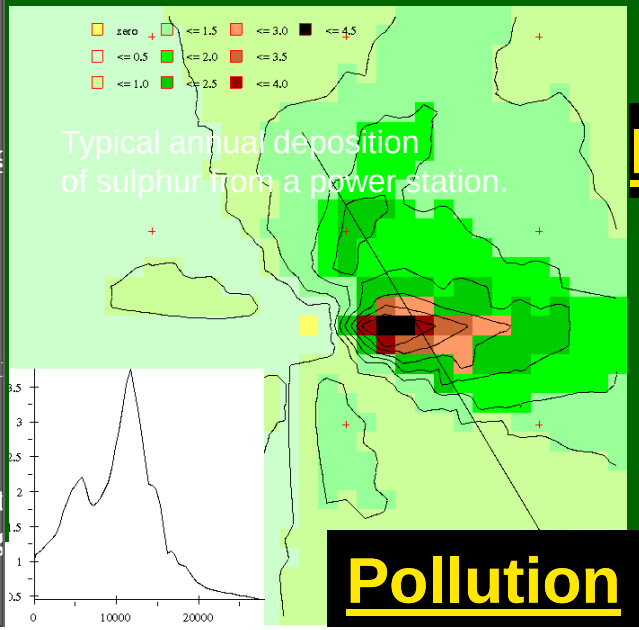

## Flooding



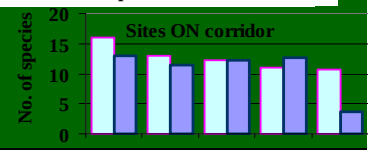
## Subsidence

**UNDERMINING**

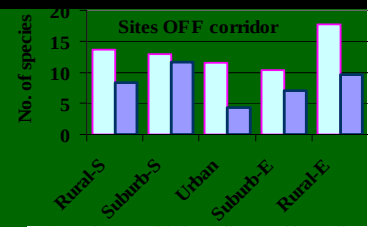
- Exposed coalfield. Risk of subsidence over former working
- Exposed coalfield. Areas of potential subsidence over undocumented work
- Possible minor subsidence relating t modern deep mining

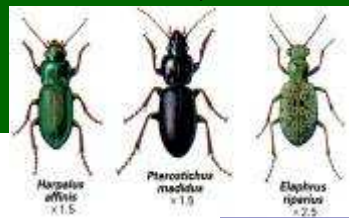



## Pollution




## Biodiversity



# Previous Integrated Models

- NERC-ESRC Land Use Programme ("NELUP")
- 1989 -1995  £1.2 million (ca 60 man-years)
- Catchments of Rivers Tyne (mixed) and Cam (intensive arable)
- Environmental Info. System for Planners
- **Conclusion**: identifying users/stakeholder is critical (most models developed in NELUP were never used); and involve them formally throughout the project life-cycle

TESS
Transactional Environmental Support System

# The challenge of Sustainable Technology

**Q.** How to get people to use a conservation-through-use TESS that benefits biodiversity?

**A.** By building it into a portal that is very attractive because it benefits livelihoods and recreation of those using land and species. A one-stop-shop for the environment.

**Q.** How to design that portal & fund the build?

**A.** By asking (a) organisations AND (b) individuals what services they would like it to provide AND what they are prepared to pay.

# Task 6.3
# (ii) Socio-economic Design

## 1. Technology design

- Meetings with CEH Feb, Sept 2009, Sept 2010
- Workshop 13-15 December (Edinburgh)
- Workshop 25 May 2011

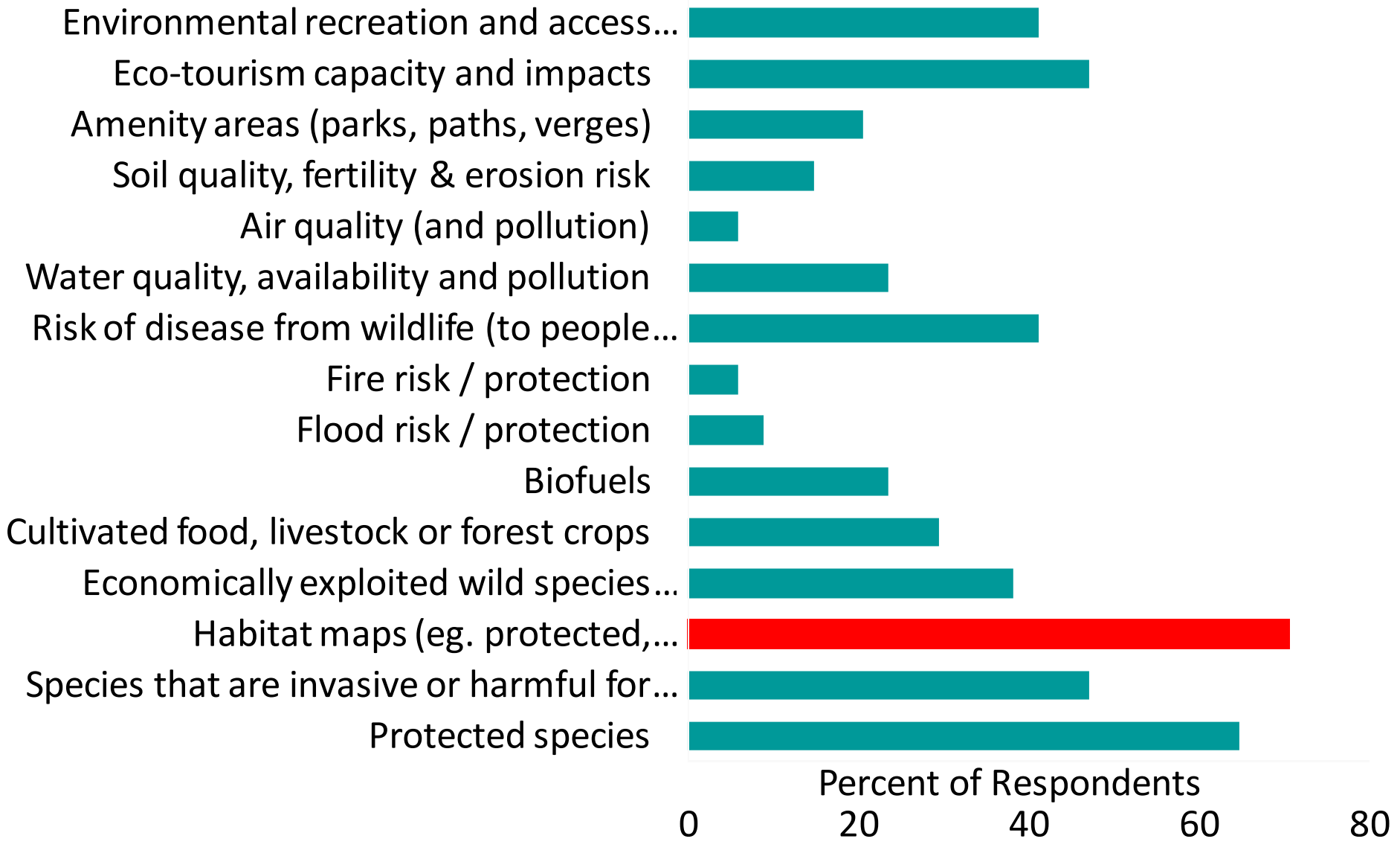
## 2. Socio-economic design - how to deliver to (a) stakeholders (b) their NGOs/consultants (c) local authorities (d) higher government levels.

- Meeting with stakeholders February 2010
- Survey of Organisations summer 2010
- Survey of Individuals summer 2011

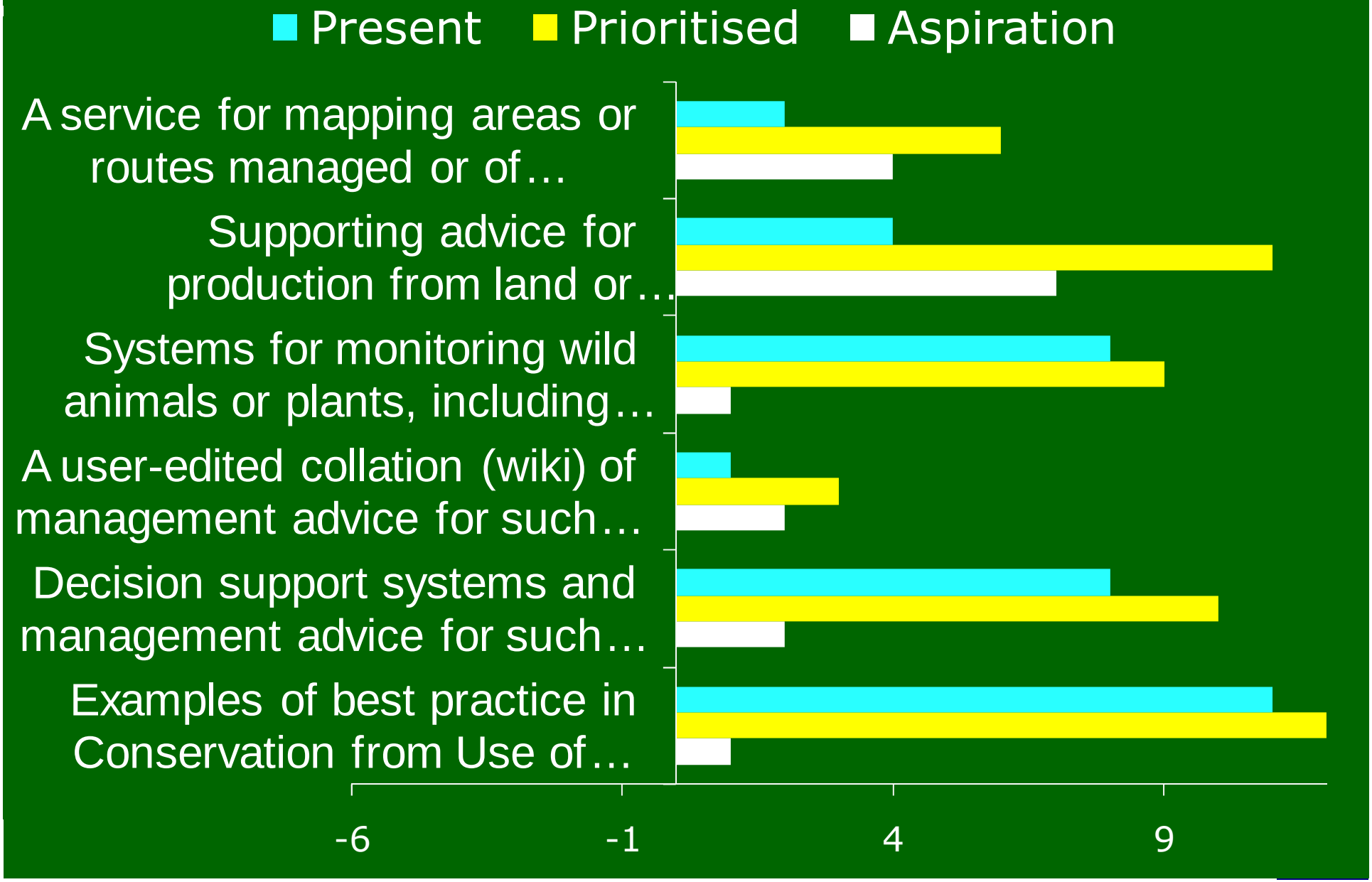
# WP6 surveys & TESS implementation

1. **Survey by FACE of needs of organisations for users of environmental resources;**
2. **Creation of external portal using priorities of the responding stakeholder organisations;**
3. **Inflow from individuals of more extensive data on information priorities and willingness to pay;**
4. Write-up socio-economic design findings in and present to European Commission;
5. Further portal development beyond TESS based on interest in site and willingness to pay.

# On which environmental topics would your members or clients most welcome information?



# What features are on your website and what would you like on an ideal site?



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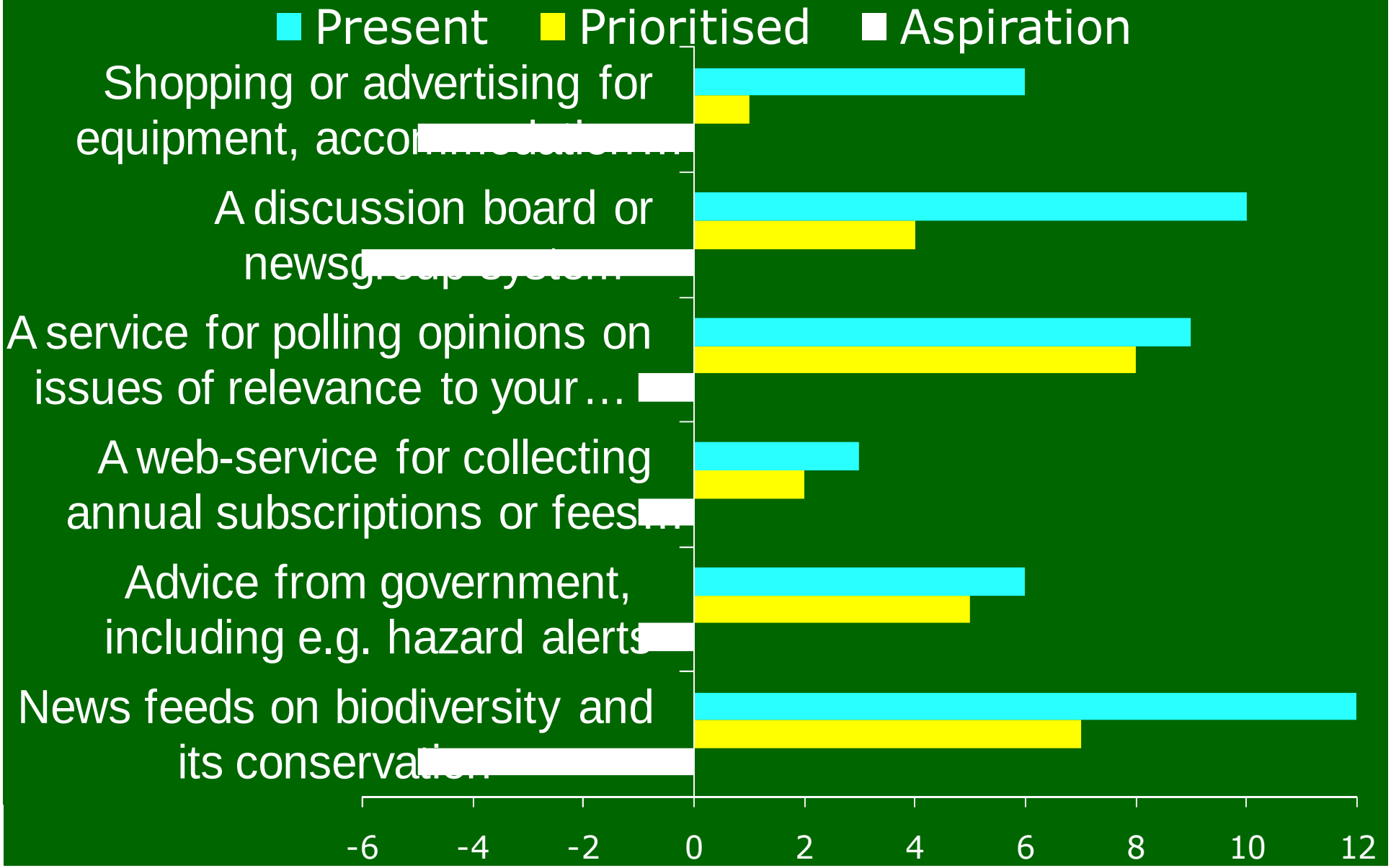

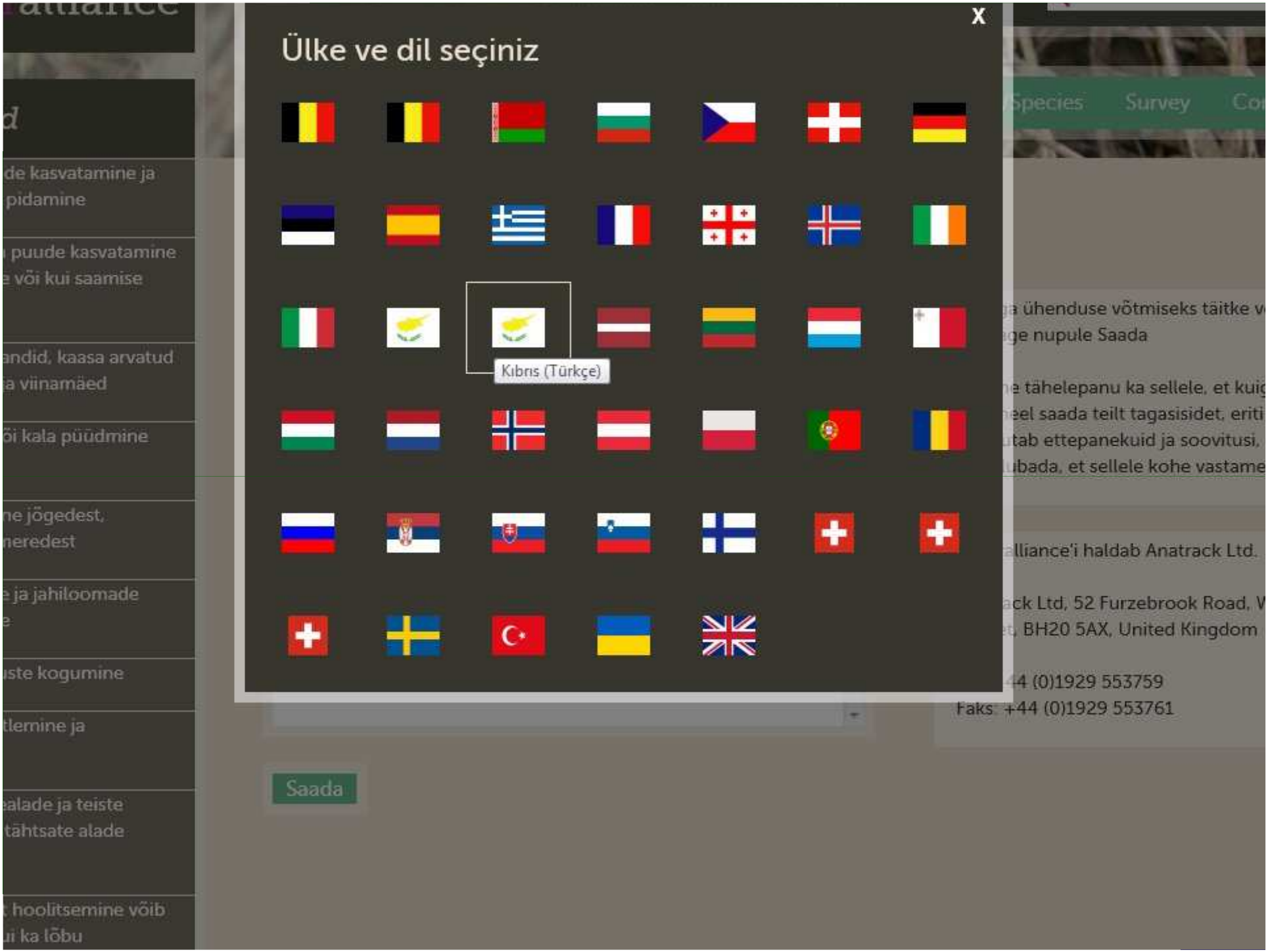
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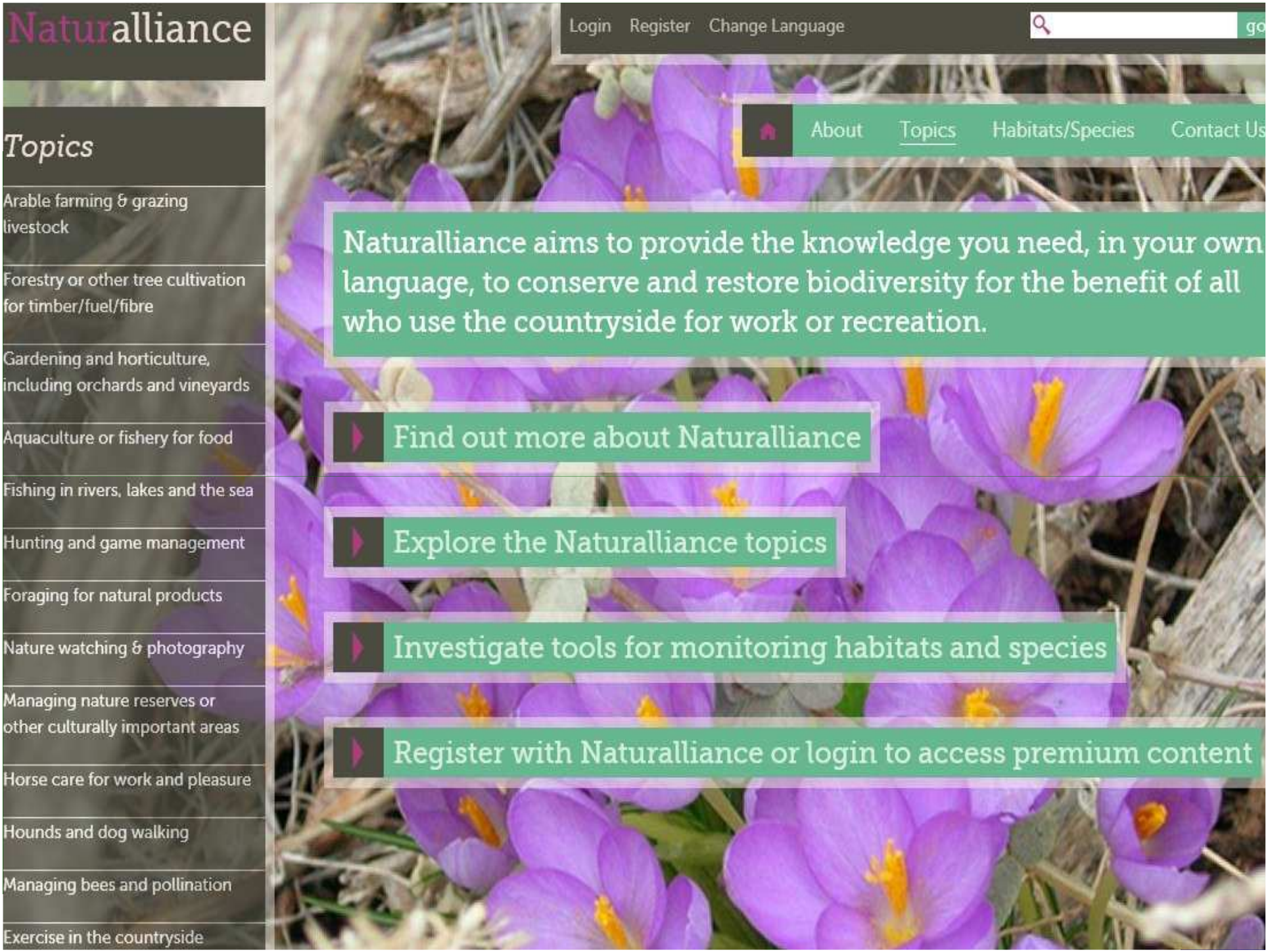
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Topics
Arable farming & grazing livestock
Forestry or other tree cultivation for timber/fuel/fibre
Gardening and horticulture, including orchards and vineyards
Aquaculture or fishery for food
Fishing in rivers, lakes and the sea
Hunting and game management
Foraging for natural products
Nature watching & photography
Managing nature reserves or other culturally important areas
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Hounds and dog walking
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About Topics Habitats/Sp

## Topics

- Uprawa roślin i wypas zwierząt
- Leśnictwo lub inne uprawy drzew na drewno / paliwa / włókno
- Ogrody i ogrodnictwo, w tym sady i winnice
- Akwakultura i rybołówstwo
- Łowienie ryb w rzekach, jeziorach i morzu
- Myślistwo i gospodarka łowiecka
- Zbiór naturalnych produktów
- Obserwowanie i fotografowanie przyrody
- Zarządzanie rezerwatami przyrody lub innymi ważnymi kulturowo obszarami
- Użytkowanie koni do pracy i dla satysfakcji
- Psy gończe i spacerowe

# Obserwowanie

W 2010 roku, wiejskie gospodarstwa domowe w ośmiu krajach Europy zostały zapytane o zajęcia, które zależą od bogactwa przyrody. Około połowa karmiła ptaki i inne zwierzęta w celu ich obserwacji, a większość z nich również organizowała wycieczki w celu obserwowania dzikich zwierząt.

Dokarmianie może zastąpić utracone siedlisko dla zięby.

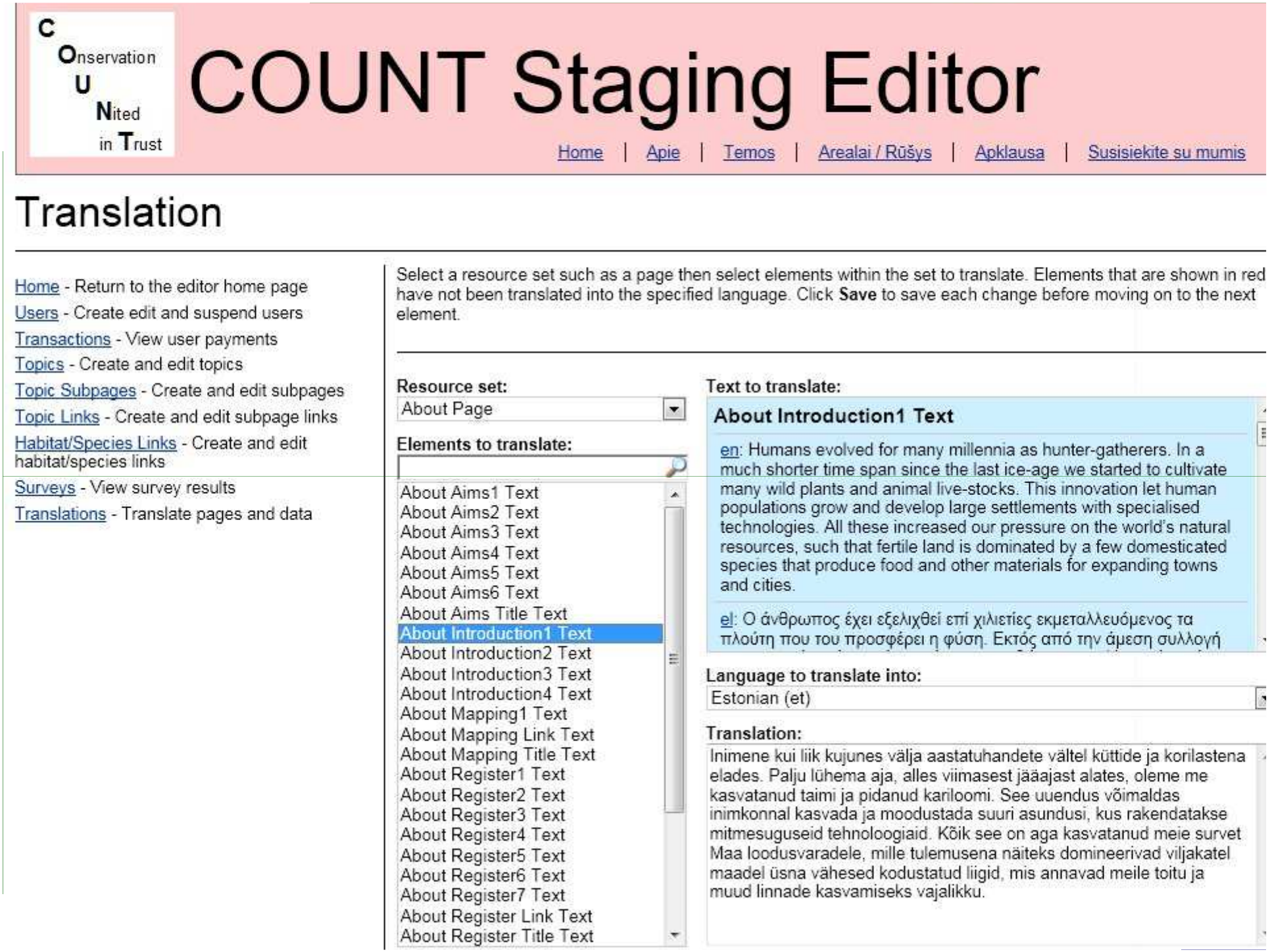
Głównym celem Naturalliance jest pomoc w zachowaniu i ochronie dzikich zwierząt, których obserwowanie daje tak wiele satysfakcji, a także by pokazać jak wszyscy zainteresowani mogą wnieść swój drobny wkład, aby przywrócić to co nieświadomie zostało utracone. Zasadą jest, że lokalne społeczności właścicieli również powinni korzystać, gdy inni cieszą się bogactwem natury na ich terenach.

NAJLEPSZA PRAKTYKA. Przykład korzyści lokalnej społeczności wynikających z obserwowania przyrody.

PRODUKCJA. Bogactwo przyrody zależy od tego jak my wszyscy użytkujemy grunty i gatunki. Jak możemy sprawić, by większa liczba osób uzna iż warto wnieść swój wkład?

Resourc

Best Prac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Transactions - View user payments
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Topic Subpages - Create and edit subpages
Topic Links - Create and edit subpage links
Habitat/Species Links - Create and edit habitat/species links
Surveys - View survey results
Translations - Translate pages and data
Select a resource set such as a page then select elements within the set to translate. Elements that are shown in red have not been translated into the specified language. Click Save to save each change before moving on to the next element.
Resource set:
About Page
Elements to translate:
About Aims1 Text
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en: Humans evolved for many millennia as hunter-gatherers. In a much shorter time span since the last ice-age we started to cultivate many wild plants and animal live-stocks. This innovation let human populations grow and develop large settlements with specialised technologies. All these increased our pressure on the world's natural resources, such that fertile land is dominated by a few domesticated species that produce food and other materials for expanding towns and cities.
el: Ο άνθρωπος έχει εξελιχθεί επί χιλιετίες εκμεταλλευόμενος τα πλούτη που του προσφέρει η φύση. Εκτός από την άμεση συλλογή
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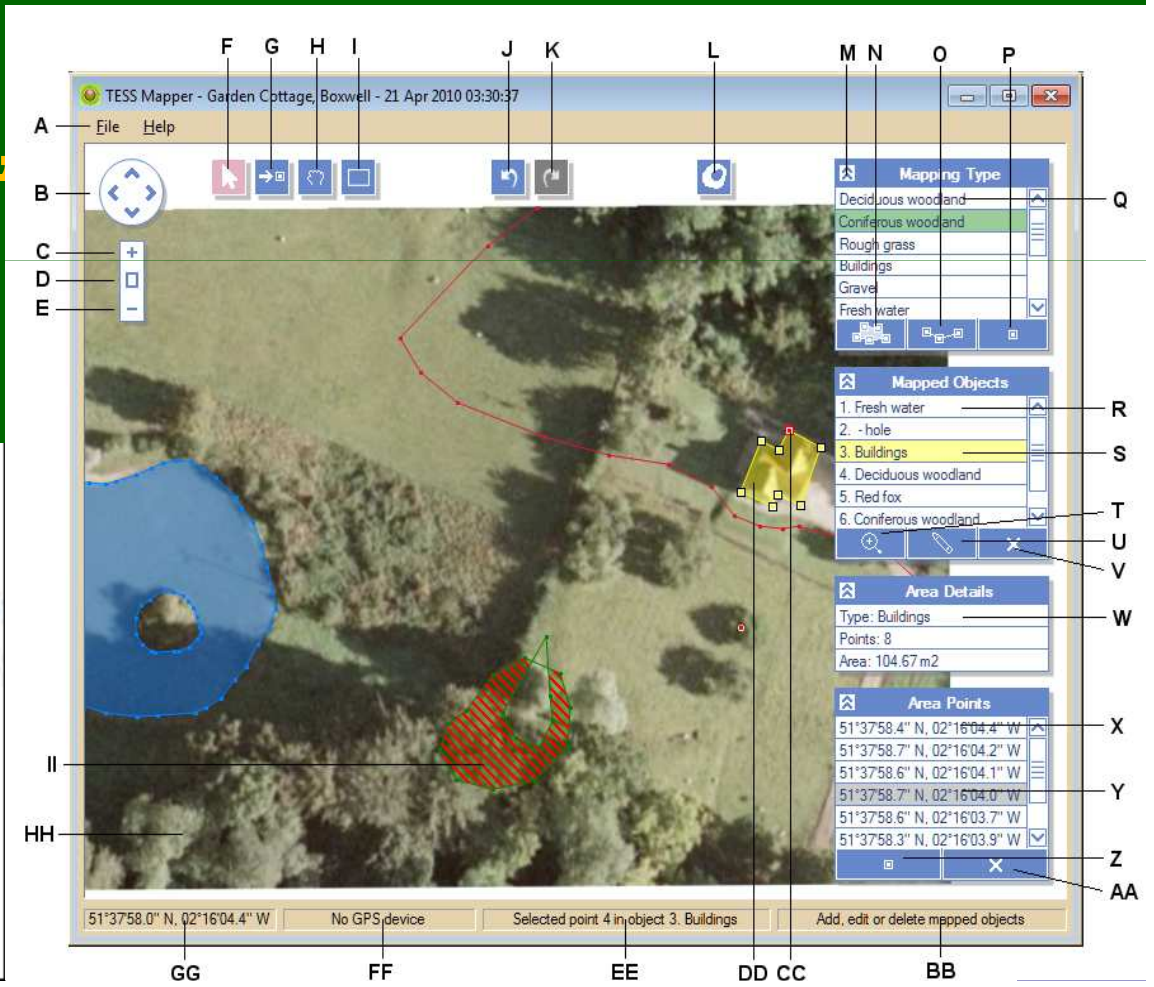
Estonian (et)
Translation:
Inimene kui liik kujunes välja aastatuhandete vältel küttide ja korilastena elades. Palju lühema aja, alles viimasest jääajast alates, oleme me kasvatanud taimi ja pidanud kariloomi. See uuendus võimaldas inimkonnal kasvada ja moodustada suuri asundusi, kus rakendatakse mitmesuguseid tehnoloogiaid. Kõik see on aga kasvatanud meie survet Maa loodusvaradele, mille tulemusena näiteks domineerivad viljakatel maadel üsna vähesed kodustatud liigid, mis annavad meile toitu ja muud linnade kasvamiseks vajalikku.

# Anatrack mapper for TESS with user-friendly principles of Ranges software

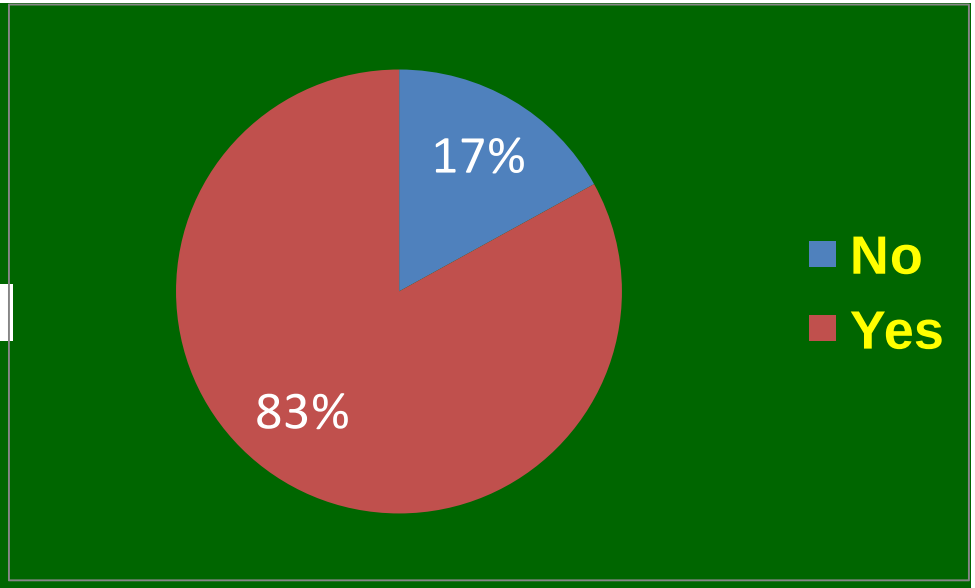
<value>Pour agrandir la carte</value>
<comment>Zoom in to the map</comment>

Thanks to editing by partners in Excel, the mapper is now **in 10 languages.**

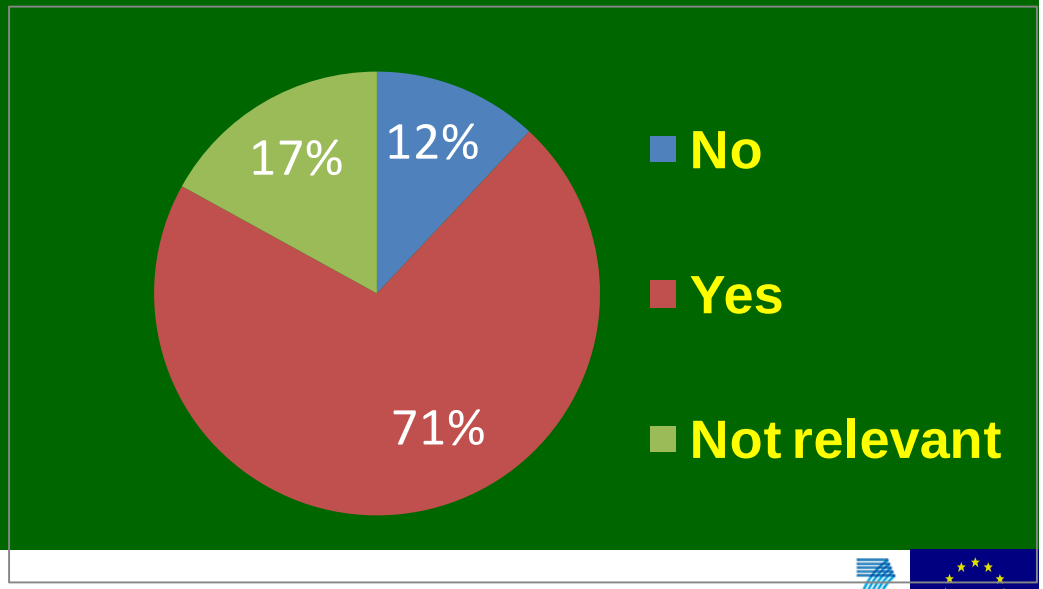


# Maps from farmers

**Do payments to farmers under the Common Agricultural Policy subsidy rules require a map from the farmer?**




**If 'yes', can this be in electronic format?**



# Thank you for listening

www.tess-project.eu

# Mapping Software

**Feb 2009.** Anatrack builds using principles in Ranges (user-friendly software for radio-tracking analyses)

**May 2010:** Translation-Editing in Excel

```
</data>
  <data
    name="MapControl_pbZoomIn_ToolTip"
    xml:space="preserve">
    <value>Pour agrandir la carte</value>
    <comment>Zoom in to the
    map</comment>
```

**Thanks to partners now in 10 languages**

TESS
Transactional Environmental Support System

# Hardware

**Needs: Screen readable in sunlight, robust, low weight, GPS, camera, mobile internet, 5 h battery, low cost.**

Anatrack provided software support for the **Motion J3400** at ca. **€2,200.**

Also used: **Algiz 10/7:** operating temperature –10 to +60 ca. **€3,045**

**New on the block: 7” <€1000 tablets for consumers (Samsung Galaxy runs Android)**