Estonia’s effort of building ecosystem extent account and discussing the typology national perspective

7-9 OCTOBER 2019, Central Statistics Office of Australia
1. Compilation of the ecosystem extent account in Estonia: Creation of the explicit spatial database on land cover/land use/habitat

2. From spatial database to ecosystems typology

3. Sjoerd Schenau’s questions
ECOSYSTEM EXTENT COMPILATION, WHAT STATISTICS ESTONIA HAS DONE SO FAR IN 2019:

...collected all relevant and up to date spatial data concerning Estonian ecosystems

...compiling spatially explicit base map

...created the link between land owners and „ecosystems“ for example study area

...working on typology and crosswalks
PROCESS FOR THE COMPILATION OF THE FULL LAND COVER/LAND USE/HABITAT DATABASE

MAP LAYERS

1. Agricultural land and semi-natural communities (Support bases!)
2. Forest land
3. Wetlands
4. Semi-natural communities (Eligible for support)
5. Natura 2000 habitats inventory
6. Meadows database
7. Estonian Topographic Database
ECOSYSTEM ACCOUNTING AREA (EAA)
1. AREA UNDER AGRICULTURAL SUPPORT SCHEMES:
Estonian Agricultural Registers and Information Board

Base year: 2018

Original classification:
7 different classes for agricultural land including permanent and short-term grasslands.

Potential problems: Field parcels/areas that receive support are precisely mapped.

Area under agricultural support schemes:

Satellite image:
2. FOREST REGISTRY OF ESTONIA

Base data: ten years time frame

Potential problems:
• Clearcut areas not recorded (outdated registry)
• There are unmapped areas (15%) of forests
• Original classification: 28 forest site types (national classification)

Forest cadastral units:

Satellite image:
3. WETLANDS DATA: ESTONIAN NATURE FOUNDATION

Base data: within ten 10 years of time

Potential problems:
• Could be slightly outdated for some records
• Some areas have multiple classifications „Transition areas“

Original classification: Uses Natura 2000 habitat codes: 7 types (without „Transition areas“)

Wetlands:

Satellite image:
4. SEMI-NATURAL COMMUNITIES WHICH ARE ELIGIBLE FOR SUPPORT (Estonian Environment Agency)

Base data: 10 year time frame.

Potential problems:
- Could be slightly outdated
- For some records
- What is the actual state for older records are not known

Original classification: Natura 2000 habitat codes: 15 types.

Seminatural communities:

Satellite image:
5. NATURA 2000 HABITATS (ESTONIAN ENVIRONMENT AGENCY)

Base data: Most of the data is older than 10 years

Potential problems:
• Consist in inaccuracies
• Probably outdated for some records
• What is the actual state for older records is not known

Original classification: Uses Natura 2000 habitat codes: 60 types.

Natura 2000 habitats:

Satellite image:
6. MEADOWS, ESTONIAN SEMINATURAL COMMUNITY CONSERVATION ASSOCIATION DATABASE

Base data: Data is older than 10 years.

Potential problems:
• Consists inaccuracies
• Probably mostly outdated
• What is the actual state for older records is not known

Original classification: Uses Natura 2000 habitat codes: 12 types.

Seminatural meadows:

Satellite image:
DATA SOURCE FOR NON DETERMINED

LAND COVER TYPES:
ESTONIAN TOPOGRAPHIC DATABASE

Classification types:
40-50 major land cover/use types:
MERGED DATASET

1. Agricultural land and semi-natural communities (support bases!)
2. Forest land
3. Wetlands
4. Semi-natural communities (eligible for support)
5. Natura 2000 habitats inventory
6. Meadows database

MERGED DATA SET (1-6):
Covers 83% territory

Satellite image:
MERGED DATASET + ESTONIAN TOPOGRAPHIC DATABASE
Final dataset

Merged data set (around 100 mapping classification units):
1. Agricultural land and semi-natural communities
2. Forest land (41)
3. Wetlands (7)
4. Semi-natural communities (13)
5. Natura 2000 habitats
6. Meadows database
...other

Estonian Topographic Database (50 categories):
forest, grasslands, agricultural land ...

ESTONIAN TOPOGRAPHIC DATABASE:
MERGED DATASET IS FURTHER LINKED TO THE CADASTRAL DATA

THE DIMENSION OF THE OWNERS OF ESTONIA’S „ECOSYSTEMS“* IS DERIVED

<table>
<thead>
<tr>
<th>Land Cover and Land use</th>
<th>Forest land</th>
<th>Cropland</th>
<th>Cultivated grassland</th>
<th>Semi-natural grassland</th>
<th>Wetlands</th>
<th>Shrub and bushes</th>
<th>Inland waterbodies</th>
<th>Quarries</th>
<th>Settlements</th>
<th>Roads and Routes</th>
<th>Other land</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households</td>
<td>51,802</td>
<td>34,170</td>
<td>14,496</td>
<td>6,304</td>
<td>1,413</td>
<td>202</td>
<td>668</td>
<td>58</td>
<td>1,515</td>
<td>2,221</td>
<td>58</td>
<td>117,644</td>
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<tr>
<td>Corporations</td>
<td>33,701</td>
<td>17,096</td>
<td>3,763</td>
<td>1,734</td>
<td>761</td>
<td>71</td>
<td>253</td>
<td>50</td>
<td>840</td>
<td>1,046</td>
<td>24</td>
<td>59,341</td>
</tr>
<tr>
<td>General government</td>
<td>5,491</td>
<td>4,881</td>
<td>2,311</td>
<td>1,373</td>
<td>530</td>
<td>65</td>
<td>161</td>
<td>1,359</td>
<td>690</td>
<td>1,873</td>
<td>6</td>
<td>18,740</td>
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<tr>
<td>State Forest Management Centre</td>
<td>63,403</td>
<td>286</td>
<td>69</td>
<td>854</td>
<td>29,748</td>
<td>38</td>
<td>489</td>
<td>62</td>
<td>70</td>
<td>928</td>
<td>58</td>
<td>96,005</td>
</tr>
<tr>
<td>Rest of the world</td>
<td>685</td>
<td>372</td>
<td>99</td>
<td>106</td>
<td>18</td>
<td>3</td>
<td>5</td>
<td>167</td>
<td>39</td>
<td>0</td>
<td>1,493</td>
<td>1,493</td>
</tr>
<tr>
<td>TOTAL</td>
<td>155,082</td>
<td>56,805</td>
<td>20,738</td>
<td>10,371</td>
<td>32,470</td>
<td>370</td>
<td>1,576</td>
<td>1,530</td>
<td>7,918</td>
<td>6,108</td>
<td>147</td>
<td>293,123</td>
</tr>
</tbody>
</table>

* - actually by the mix of land cover/use, habitat / ecosystem classes

Land accounts data relevant for ecosystem services accounts is the basis for the compilation of an accounting basic matrix in the sense of ecosystem extent account with an additional data layer by economic and institutional units.
In order to create a specifically explicit map of Estonia’s landcover we need to monitor the ecological tax reform in Estonia.

### NATIONAL EXPLICIT MAP FOR ESTONIA, IN PREPARATION

- **EUNIS; LULUCF**
  - **Mapping units classification (number of elements)**
    - Forest land (41)
    - Cropland (5)
    - Grassland (18)
    - Settlement (14)
    - Wetland (17)
    - Other (8)

### MAP LAYERS

1. **Agricultural land and semi-natural communities (Support bases)**
2. **Forest land**
3. **Wetlands**
4. **Semi-natural communities (e for support)**
5. **Natura 2000 habitats inventory**
6. **Meadows database**
7. **Estonian Topographic Database**

**World Ecosystems data (UDGS/ESRI) is a 250 m global dataset of biophysically distinct (GDBBS) areas**
How to get from 103 land cover/use/habitat types to national ecosystems typology? Work in progress.
At the moment, what we have:

Original Classification: 103 different types

Types are: the mix of different habitats, land-use and land cover classes.

These classes cover 100% of Estonia’s terrestrial area (incl inland waters).

We still miss common aggregate ecosystem classes, these have to be agreed

• CROSSWALK is feasible to the high level:
  • UNFCCC/IPCC land use classes (LULUCF) classes
  • EUNIS habitat classification (mostly, to variety of levels but to the broad classes for sure)…
## Grasslands: crosswalk from national categories used for mapping to EUNIS categories

<table>
<thead>
<tr>
<th>n/o</th>
<th>A: Marine habitats</th>
<th>B: Coastal habitats</th>
<th>C: Inland surface waters</th>
<th>D: Mires, bogs and fens</th>
<th>E: Grasslands and lands dominated by forbs, mosses or lichens</th>
<th>F: Heathlands, scrub and tundra</th>
<th>G: Woodlands, forests and other wooded land</th>
<th>H: Inland unvegetated or sparsely vegetated habitats</th>
<th>I: Regularly or recently cultivated agricultural, horticultural and domestic habitats</th>
<th>J: Constructed, industrial and other artificial habitats</th>
<th>X: Habitat complexes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Grasslands and lands dominated by forbs, mosses or lichens</td>
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<td>Perennial calcareous grassland and basic steppes</td>
<td>6210</td>
<td>E1.2</td>
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<td>Perennial calcareous grassland and basic steppes</td>
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<td>Low and medium altitude hay meadows; Boreal and sub-boreal meadows</td>
<td>6270</td>
<td>E2.24</td>
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<td>Low and medium altitude hay meadows; Boreal and sub-boreal meadows</td>
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<td>Moist or wet eutrophic and mesotrophic grassland</td>
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<td>Moist or wet eutrophic and mesotrophic grassland; Northern boreal alluvial meadows</td>
<td>6450</td>
<td>E3.47</td>
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<td>Moist or wet oligotrophic grassland</td>
<td>6410</td>
<td>E3.5</td>
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<td>Moist or wet tall-herb and fern fringes and meadows; Boreal river bank tall-herb communities dominated by [Filipendula]</td>
<td>6430</td>
<td>E5.4</td>
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<td>Temperate thickets and scrub; [Juniperus communis] scrub</td>
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<td>F3.16</td>
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<td>Dry heaths</td>
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<td>Intensive unmixed crops</td>
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<td>Arable land with unmixed crops grown by low-intensity agricultural methods</td>
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<td>I1.3</td>
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<td>Pasture woods (with a tree layer overlying pasture)</td>
<td>6530</td>
<td>X09</td>
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<td>Pasture woods (with a tree layer overlying pasture)</td>
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<td>Large parks</td>
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</tbody>
</table>
Is there enough granularity in the World Ecosystems to capture what we have mapped already in terms of ecosystems?

14 distinguished broad classes for Estonia. Distinguishing flat Estonia on the basis of altitude does not seem relevant to us.

How well these types match to our own map is too early to say.

Idea to have IUCN classes incorporated sounds promising.

Good: it is all mapped.

World Ecosystems data (USGS/ESRI) is a 250 m global dataset of biophysically distinct (GDBBS) areas.
Desired features of IUCN RLE types classification:
- represents ecosystems, spatially delineated, geographically and conceptually exhaustive, mutually exclusive both conceptually and geographically, practicable, linkable to other established classifications.

Criteria are good but IUCN RLE typology has not been used yet.

- Crosswalk from national level lowest level probably feasible to level 3 but does this level contain enough relevant detail?
Crosswalk from national level lowest level probably feasible to level 3 but does this level contain enough relevant detail?

What is relevant from the extent account (changes) and ecosystem service flow accounting perspective?

Table 3.2: Ecosystem extent account (hectares)

<table>
<thead>
<tr>
<th>Ecosystem type</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<th>11</th>
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<th>13</th>
<th>14</th>
<th>15</th>
<th>TOTAL</th>
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<tr>
<td>Artificial surfaces</td>
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<td>Herbaceous crops</td>
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<td>Woody crops</td>
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<td>Multiple or mixed crops</td>
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<td>Grasland</td>
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<td>Tree-covered areas</td>
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<td>Mangroves</td>
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<td>Bare-covered areas</td>
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<td>Regularly flooded areas</td>
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<tr>
<td>Grassland barren land</td>
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<td>Permanent snow and glaciers</td>
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<tr>
<td>Coastal water and intertidal</td>
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<td>Sea and maritime areas</td>
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</tbody>
</table>

Opening extent:
- Additions to extent
- Managed expansion
- Natural expansion
- Upward reappraisals
- Reductions in extent
- Managed regression
- Natural regression
- Downward reappraisals
- Net change in extent

Closing extent

Table 5.1: Ecosystem services supply and use table

<table>
<thead>
<tr>
<th>Type of economic unit</th>
<th>Ecosystem type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ecosystem services (detail corresponding to supply table)

<table>
<thead>
<tr>
<th>Providing services</th>
<th>Regulating services</th>
<th>Cultural services</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Products

* The types of ecosystem services shown are indicative only.
Sjoerd Schenau’s questions:
1. Do you agree with the next steps for testing?

CROSSWALKING THE ‘GLOBAL’ EFGs WITH SELECTED ‘LOCAL’ NATIONAL ECOLOGICAL CLASSIFICATIONS

- test the unambiguous mapping of local classes to the EFGs
- Identify possible gaps in the EFGs
- Identify other issues, e.g. related to gradients and ecotone

2. ASSESSING THE USABILITY OF THE USGS/ ESRI WES PRODUCT.

- Assess the correspondence between WES mapping units to locally (country scale) known ecosystems.
- For cases where this correspondence is insufficient for adequate SEEA EEA accounting purposes, identify if, and which, additional global data sets underlying the WES product, may be helpful to increase this correspondence

3. CROSSWALKING EFGs WITH OTHER INTERNATIONAL CLASSIFICATION SCHEMES I.E. IUCN HABITAT CLASSIFICATION, RAMSAR, EUNIS, MAES ETC. Some of this work is in progress within IUCN.
2. What is needed in addition to test and implement a reference classification for ecosystem types?

Question is relevant as most of the countries are lucky with their own systems and classifications. So, how to get countries to test the crosswalks?

- Provide the examples to the users (testers) how their data would be managed and which kind of benefits would be generated?
  - summing up to comparable classes
  - spatially explicit maps
- Make the testing easy and enjoyable…in a style…do you want to compare…
- Try to figure out if the data/comparisons still make sense if you make them on EFG level 3.
- For some countries international databases could help/assist in building ecosystem type classification, tell them.
- Which are important parameters to consider (soil, climate, water regime, habitats)?
- While IUCN is now mapping the IUCN RLE for providing global maps of the EFGs, they should inform focal points in countries in order to facilitate the testing.
- Provide funding for testing
2. WHAT IS NEEDED IN ADDITION TO TEST AND IMPLEMENT A REFERENCE CLASSIFICATION FOR ECOSYSTEM TYPES?

3. WOULD YOU WANT TO VOLUNTEER AND HELP IN THE TESTING?

The RLE is based on ecosystem assembly theory and focuses on ecosystem function. In addition, levels 1 and 2 are on a strictly ecological basis (i.e. organization in biomes).

For SEEA-EEA purposes additional socio-economical organization is appropriate as it helps to build the links and to integrate with other statistics. Ownership and land use are first ones to consider.

We could test:

- the crosswalk to international IUCN-RLE Classification of ecosystems
- the match of the USGS WES classification to our own map
Some thoughts

- In general, ecosystem accounting needs full coverage, common infrastructure and language 😊

- Most of the land use and land cover classifications refer for the plant communities, IUCN RLE includes other dimensions of ecosystems 😊

- Most of the relevant information (in sense of the services and condition) lies on lowest levels but the countries practices and ecosystems differ.

- We hope that IUCN RLE types classification helps to reflect the condition of ecosystems and the ability to provide the services? 😊
Thank you!

Kaia Oras (Statistics Estonia), Üllas Ehrlich (Tallinn Technical University), Kätlin Aun (Statistics Estonia), Argo Ronk (Statistics Estonia), Veiko Adermann (Statistics Estonia)

https://www.stat.ee/
https://ec.europa.eu/eurostat/web/environment