Cartographic dissemination of peat land re-use scenarios – Intelligible and accessible web maps for specialists and the masses

Ossi Kotavaara
Geography research unit,
University of Oulu
Po. Box 3000,
90014 Oulu, Finland
ossi.kotavaara@oulu.fi

Miia Parviainen
Natural Resources
Institute Finland (Luke)
Paavo Havaksen tie 3,
90570 Oulu, Finland
miia.parviainen@luke.fi

Jarmo Rusanen
Geography research unit,
University of Oulu
Po. Box 3000,
90014 Oulu, Finland
jarmo.rusanen @oulu.fi

Abstract

Even though traditional printed maps have certain place in disseminating research results, with extensive and accurate spatial data on-screen visualisations have clear advantages in readability and accessibility. Peatlands, where timber production is not commercially productive without specific maintenance options, cover 20 % (i.e. 0.8 million ha) of the drained peatland area in Finland, and optimising the re-use for these low-productive drained peatlands is one of the key issues concerning peatland future use in Finland. **"**Quantification and valuation of ecosystem services to optimize sustainable re-use for low-productive drained peatlands (LIFEPeatLandUse)" project has produced impact assessment of different types of peatland re-use options for Finland with geospatial modelling techniques. Material includes predictions for seven different re-use scenarios, which are realised to four spatial measures including 1) biodiversity, 2) environmental loading to t water cources, 3) greenhouse gas balances and 4) monetary value. Predictions cover the time period of 100 years with 5 moments of time. To disseminate these results for specialists and masses, including stakeholders, general public and international actors working with peatland use, interactive GIS based maps will be created and made accessible in the web. A special attention will be paid to intelligibility of web-maps as, four raster data layers per seven scenarios per five moments have to be comparable in understandable form.

Keywords: cartography, peatland. raster, scenario, web-map.

1 Peatland re-use scenario data for dissemination

Peatlands, where timber production is not commercially productive without specific maintenance options, cover 20 % (i.e. 0.8 million ha) of the drained peatland area in Finland. To optimize the re-use for these low-productive drained peatlands, is one of the key issues concerning peatland future use in Finland. The main objective of the LIFEPeatLandUse project is to quantify and valuate peatland ecosystem services to assist land use planners and policymakers in making ecologically, economically and socio-culturally sustainable land use decisions. This is done by developing and demonstrating a decision support system, where ecological and economic information is aggregated to numerically optimize cost efficient land use options so that benefits of ecosystem services are safeguarded. The monetary value of the land use options is maximized under given constraints set to the biodiversity, environmental loading, and GHG emissions, to fulfill the constraints set in the regional, national, and EU level policies.

In addition to consolidating and increasing the knowledge base on the impacts of peatland use on ecosystem services through the compilation of multiple datasets and geo-spatial modelling, aim is also to enhance general awareness, reduce conflicts, and promote stakeholder co-operation concerning the use of peatlands and to promote the sharing and utilization of long-term monitoring data and scientific information in the land use planning. Thus, in addition to sharing project outcome data for the use of specialist, it is aimed to be disseminated to the general public.

Project output includes spatial statistical predictions (see Elith and Leathwick, 2009) for seven different re-use scenarios including no measures (i.e. abandonment from active forestry), tree biomass harvesting and then abandonment from active forestry, intensive forestry, restoration, peat harvesting without after-use, peat harvesting with reforestation and peat harvesting with peatland rewetting. Predictions are realised as a scenarios including spatial measures of biodiversity, environmental loading to t water courses, greenhouse gas balances and monetary value. Predictions cover the time period of 100 years with 5 moments of time. Thus final number of published spatial data layers may be relatively high (140 data layers), but however, the size of datasets are aimed to be controlled with generalisations (Figures 1a. and 1b.).

2 Cartographic communication and web maps

Cartographic communication with static paper maps and interactive web-maps have similarities in basic principles, including choices in colours, symbols and classifications and users ability to read maps. However, it is clear that also deep differences exist. A huge number of web maps are produced, but cognitive theory basis for interactive map production is rather thin (see. Montello, 2002). In additional to basic mapping functions of zooming and scrolling, and abilities change visibility of layers, a number of addition

Figure 1a. Analytical scale of the spatial statistical predictions of GHG balance at forest compartment level.

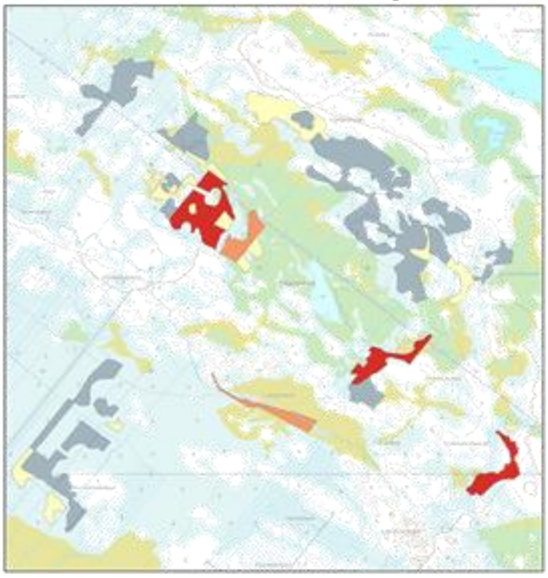
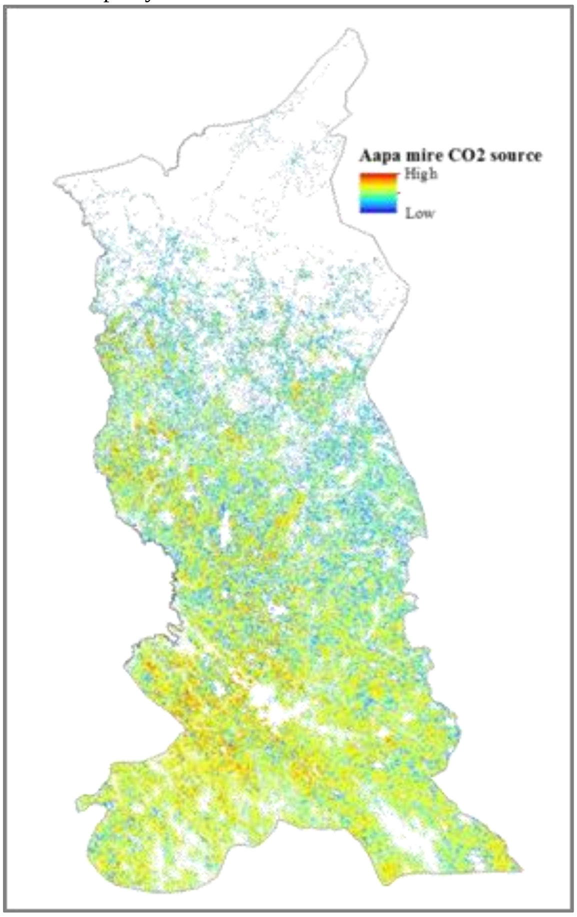


Figure 1b. Representational scale of the GHG balance generalised to 1×1 km grid cell resolution for publishing openly at sub-national and national level.



functionalities may be applied. Persson et al. (2006) have recognized 70 applicable interactivity functions within 8 categories, and within over 10 years, this group has likely been evolved. Even a short overview gives a comprehension that opportunities are diverse. 1). Interaction with representation may be adjusted with a wide range on visual actions with scale and data layers, and 2) more advanced tools may change the data classifications and selections also by the acts of map user. 3) Interactivity may be extended to data management and variable production on demand, and 4) opportunities to arranging simultaneous views. 5) Different display types, including combined statistical analysis and data selections, may be realised by brushing. 6) Temporality may be taken into account with continuous or periodical ways, and 7) visualisations may be realised in 3D. Last, 8) group includes system interaction in technical and supporting role.

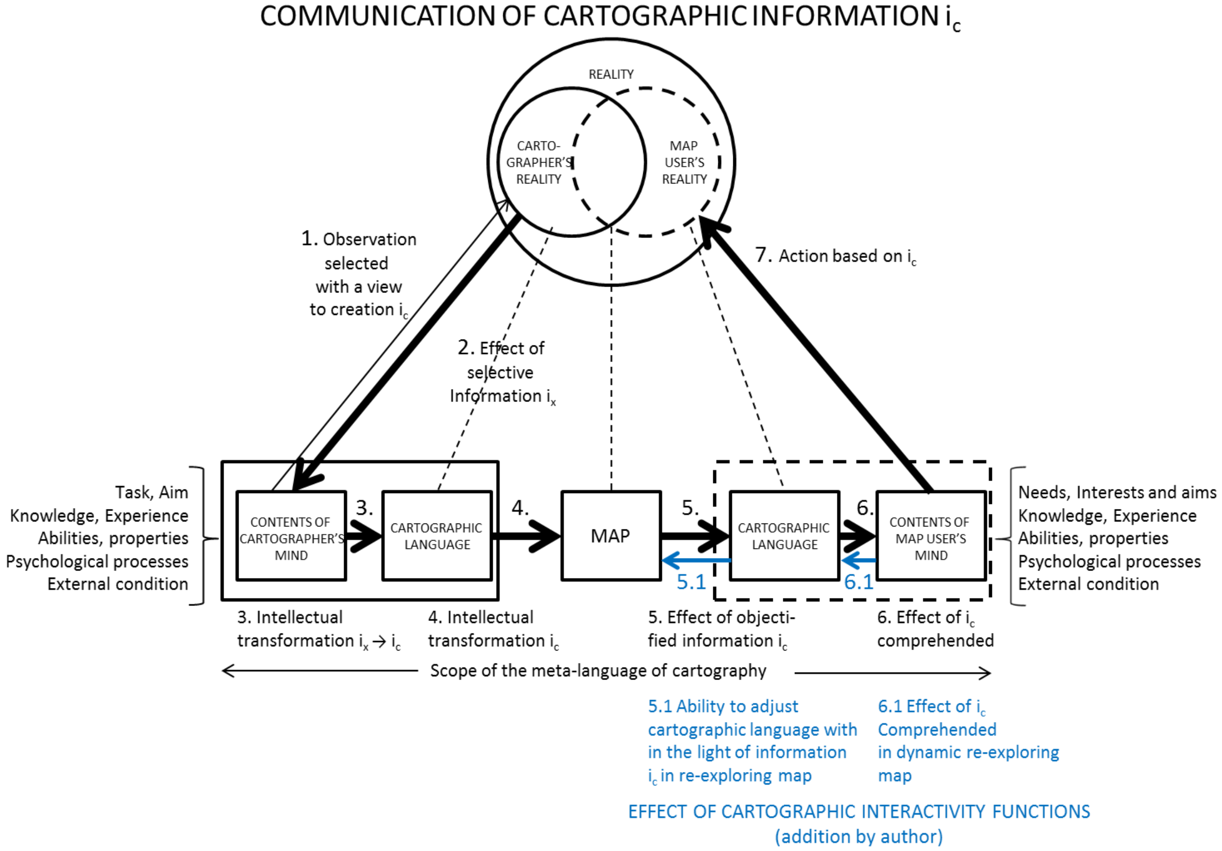
If these functionalities are brought to the context of a classical cartographic communication model (Figure 2.) of Koláčný (1969), the deep traditional division of map production and its utilization are changing to more diverse form. Instead of producing a map of already interpreted information, cartographer produces rather a mapping environment including data, its representation functions and context. Basic principles of mapping are still corresponding, but the map user acts also as a cartographer by oneself. Therefore, cartographic information alters more in relation to cartographic abilities and motivations of user. This increases the freedom of scrutinizing the data, but decreases partly the benefits of professional interpretation of mapped phenomenon. With synchronous, distributed and interactive access to spatial data, the role of a map user has changed significantly. In this light, map use turns towards user defined mapping, and instead of a map, the focus is in the mapping environment as a whole (see Crampton, 2001).

3 Web mapping techniques and opportunities for interactive maps

Practical publishing process of web maps and sharing geographic information data in the web is relatively easy, by applying commercial, open source or public administration funded solutions. In web publishing, both a platform and server space are needed. The simplest opportunity is to produce a based web map based on geographic information data attached to web page. The most extensive service would include web map services and geographic information data sharing surfaces in self installed and maintained service at own server space.

As an example, GeoServer (or other suitable platforms for web maps) give powerful tool to publish maps based directly on geographic information data. Again, for example leaflet-map is light and easy to use web-map format, which enables to apply a wide variety of interactivity functions. Leaflet-map functions work well in different web browsers in desktops, tablets and also advanced phones. Web map can be customised with additional functions by e.g. with HTML5.

Figure 2: Cartographic communication model and interactive web-maps.



Source: Redrawn from Koláčný (1969) and updated by authors (blue texts and graphics)

4 Towards intelligible and accessible web maps

With web-mapping, peatland re-use information may be disseminated by highly accessible way, but at the same time, responsibility of interpretations in relation geographic information is shifted towards user. Thus, to develop intelligibility of data including about 140 raster layers, consisting of geospatial predictions, there is need for supplementary material related to data collection, modelling methods and model interpretations. Thus, in addition to traditional map legend information, a special attention is paid to intelligibility of text, artwork and audio-visual material, offering the scientific background and framework of peatland re-use scenarios.

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