Keywords: QUICKScan, guidelines, decision support, toolbox, participatory, lesson learned

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Introduction
Background: There is a lack of decision support toolbox (DST) that specifically allows decision makers to explore impacts of different policy alternatives and management options in a short period of time, fitting the policy development time horizon. The gap between scientific offer and decision making demand, need new approaches and toolbox that provide policy-science interface with “translators”. It means support policy making process with appropriate functionalities and interfaces to explore and interact, allow stakeholders to play with choices and share knowledge; and facilitate the marrying of quantitative analysis and qualitative judgments in support of flexible decisions to be taken.

In this context, the guiding principles for the development and use of DST could be described as:

- DST not aimed at more high tech development, but more on translating, exchanging and exploring results into understandable/usable/appropriate outputs for decision support.
- DST that ensures avoid complicated and sophisticated toolbox development, cunning substitution of the technique (e.g. models, GIS) for the problem (e.g. explores options and support decisions).
- DST implies that what is important is the process, so transparency in the development and use that allows improvement in capacity strengthening and applications.
- DST should ensure appropriate use of the toolbox to improve communicate results and exchange between scientist, technician, and decision makers to guarantee user ownership and close the gap between scientist, developer and policy makers.

**QUICKSCAN at a glance...**

<table>
<thead>
<tr>
<th>Demands:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy questions change and need to be answered in short period to fit the time horizon of policy and decision making.</td>
</tr>
<tr>
<td>Policy makers request toolbox that is fast, flexible and transparent, requires little data and ease iteration to explore alternatives in multi-stakeholders setting.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Components:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process to identify user’s needs and demands, define suitable information to support decisions and strength actors capacities.</td>
</tr>
<tr>
<td>Approach that facilitate discussions to exchange knowledge, helps to identify content needs and ease to build user driven applications.</td>
</tr>
<tr>
<td>Toolbox based on appropriate functionalities to facilitate assessments, support policy exploration and communicate and iterate results.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Characteristcs:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy to handle, flexible, modular and open.</td>
</tr>
<tr>
<td>Fast, simple and transparent including back tracing, rules and underlying assumptions.</td>
</tr>
<tr>
<td>Dealing with complexity, integration and iteration.</td>
</tr>
<tr>
<td>Qualitative and quantitative approaches and information.</td>
</tr>
</tbody>
</table>
In the case of QUICKScan, the approach is not restricted to identify actual drivers and pressures or the analysis of current condition and trends, but ultimately aims at the exploration of options and alternatives, the evaluation of impacts and the identification of hotspot, to ensure an appropriate definition of policies and actions.

The approach, including the toolbox and the process, therefore address the following main aspects:

1. Scope where is the problem and who is affected.
2. Define key stakeholders, including decision makers, experts, scientist etc.
3. Identify which options are available/acceptable in different policy contexts.
4. Explore what are impacts of different policy alternatives.
5. Assess hotspot areas, natural resources, ecosystem services or land covers/uses to identify and define targets for policy actions and trade-offs.
6. Iterate based on results and stakeholder needs.

Structure and use of the guidelines: These Guidelines, with the User Manual, form the two main supporting materials to help you in the use of QUICKScan (see Roadmap in Figure 1). Guidelines may or may not be read in a linear fashion. The information is structured so that the reader is first introduced to the approach and the toolbox then the main features and uses. The goal of these guidelines is to allow users to learn about the approach (Guidelines 1, 2, 3 and 4), look and understand the features and use of the toolbox (Guideline 5), and strength capacities based on the applications and uses at different scales for decision and policy support (Guidelines 6 to 14) as well lesson learned for a best use (Guidelines 15). The application Guidelines 6 to 12, want to illustrate the use of QUICKScan that respond user demands, in different policy context and in function of scales and decision levels. Thus Guideline 6 (European Green Infrastructure application) shows results at regional and national level. Guideline 7 (Climate change vulnerability and adaptation: The case of Central America application) depict results at regional, national, sectorial and local level. Guideline 8 (Urban sprawl in Europe application) although try to assess the issue at regional level, has sense at national and local level. Guideline 9 (Mapping ecosystem services: Potential timber production in France application) show results at national, sectorial and local level. Guideline 10 (Wetland conservation in the Yellow River Delta in China application) shows results at sectorial and local level. Guideline 11 (Ecosystem Integrity in the Brazilian Amazon: Bayesian Belief Networks (BBN) and GIS application) depict results from uses of BBN. Finally, Guideline 12 (Exploring land and water management options for Eastern Africa application) shows results of assessment at regional scales and implementation at national, sectorial and local scales. Guideline 13 (How climate variability/change affects coffee suitability areas and production) shows the results, at national and regional level, to be used to decision support. Guideline 14 (TRAIN: Training member states of the EU on ecosystem services mapping through hands on workshops) shows the implementation and results on hands on workshop to strength capacities to use QUICKScan. At the end of each application guideline, an abstract about the key points regarding type of application (e.g. participatory workshop or desktop application), use of the outputs (e.g. for policy support, data exploration, reporting or research) and capacity building is given.
Figure 1:
Roadmap on how to use the QUICKScan (QS) user manual and the guidelines
Guideline 1: Why QUICKScan?

There is an increasing knowledge on impacts and effects of human activities on natural resources, ecosystem services and the dynamics of our environment, including availability of environmental and socio-economic data as well development of last generation of process-driven models. Nevertheless a limited understanding remains about the implications and consequences of policy options and the changes in our environment, including use of knowledge to support decision making and exploitation of information for decision discussions, exploration and policy support.

Policy questions change and need to be answered in short period to fit the time horizon of policy and decision making. At the same time policy makers request an easy to handle toolbox that is fast, flexible and transparent, requires little data and ease iteration to explore alternatives in multi-stakeholders setting.

As result, more and more there is a need and demand of new approach and strategies that ensure involvement and participation of all actors (e.g. scientist and technicians, policy and decision makers, civil society and institutions) for exploratory and iterative dialogue to scope and formulate key questions together with users, gather evidence and identify potential alternatives, create a common understanding and produce insight and useful knowledge (Figure 1).

![Figure 1. WHY QUICKScan: Policy dialogue approach](image_url)
Guideline 2: What is QUICKScan?

QUICKScan is both, an approach that allows data use and knowledge organization, and toolbox that offer a working environment to build, edit and execute applications and a process to support exploratory dialogue and facilitate stakeholders exchanges (Figure 1).

The main characteristics of QUICKScan software tool are:

- Flexible and user friendly software environment to create, edit and run simple GIS/Statistical functions to explore policy questions within a very short period.
- Build a project library of model components (e.g. data and algorithms/GIS algebra/knowledge matrices) that can be (re-)used to create (sub)model(s).
- Create/edit/run a model workflow and enabling to view the contents of the components.
- Create/edit and store classifications/statistics (e.g. quantitative and qualitative) to be used in knowledge matrices and map display.
- Create, run, edit and compare (key) outputs of different alternatives of a model (e.g. different scenarios) by editing the model flow and store normalised/standardized to be used in trade-off analysis (e.g. radar diagrams).

The main characteristics of QUICKScan participatory process are:

- Using easy to handle research tool.
- Fast, simple and transparent, also in terms of needed data.
- Can be carried out in a multi-actor as well as a multi-level setting.
- Helping to produce credible policy proposals, based on input of participants.
- Need a preparation and facilitation are crucial for a smooth process.
WHO can use QUICKScan?
Policy questions change and need to be answered in short period to fit the time horizon of policy and decision making. Policy makers request an easy to handle toolbox that is fast, flexible and transparent, requires little data and ease iteration to explore alternatives in multi-stakeholders setting.

QUICKScan is appropriate for targeted user, as:
- Multilateral, regional, national and local policy makers and decision makers.
- Multilateral, regional, national and local policy desk officers and project managers.
- Scientific experts and thematic researchers.
- NGOs staff, corporates staff, government officers.

QUICKScan need to be used for targeted usage, as:
- Participatory settings/workshops.
- Policy settings/explorations/assessments.
- Scientific baselines/iterations/validations.
- Ex-ante/ex-post impact assessments.

How look QUICKScan software tool?. As an empty shell interface that allow build applications (Figure 2).
How QUICKScan participatory process look in practice?. As a workshop around open use of the software tool (Figure 3).

![Figure 3. Participatory process in practice](image)

How QUICKScan measure and visualise results?. Metrics for QUICKScan matters. Indicators should be defined in function of the data available and the users information needs. In general there is a need to define indicators to measure changes and dynamics structures and functions (e.g. land cover and land use or fragmentation and primary productivity). Whereas many policies focus on a single administrative geographic level, the pursuit, reform and implementation of cross cutting policies implies a more functional and flexible approach. Typically, regions are defined administratively or politically. However assess and explore cross cuttinig policy options and alternatives implies new approaches. First because administrative, environmental, social and economic characteristics matters. Secondly because integration of spatial and temporal scales can better capture the positive and negative impacts and externalities. In fact areas are not defined keeping in mind the policy issues. For instance, within-area differences in employment can be as large as between-area differences. Any change in the boundaries between areas could change the results. Also analytical findings depend on the aggregation or spatial scale, for instance the ecological fallacy of inferring characteristics of individuals from aggregate data or considering that the sum of parts give the picture of the whole.
Figure 4, shows an example of metrics needed to assess land cover/use policy alternatives.
Guideline 3: How QUICKScan is developed?

QUICKScan tool was build following a step by step demand driven process, where user needs were all the time at the centre of the design and development. It was the guarantee to ensure the development of a flexible, open and modular tool.

First step was the consultation of experts, scientists and policy makers about needs and demands on decision support tools. The main conclusion of the consultation can be summarized as:

1. Toolbox not aimed at more high tech development, but more on translating/combining results into usable outputs/information (Veldkamp et al., per. comm.; 2009).
2. Avoid complicated and sophisticated tools, cunning substitution of the technique (e.g. models, GIS) for the problem (e.g. explore options and support decisions) (Winograd and Downing; per. comm; 2006).
3. Toolbox using inputs and exchanging outputs from/with Land Use Data Center and SEIS (Daffner, per. comm; 2008)

Based on this consultation, the second step, was oriented to develop a conceptual framework and design toolbox and software architecture in consultation with main users and clients, including functionalities (see Table 1), test and case application.

The third step was centred in the development of new functionalities based on user demands and reality check using the toolbox to build process and application with the EEA and exploring similar initiatives to learn from others (see Table 1). This step included also solving main tool box problems related with software and functionalities and depth reality check with other institutions and applications as well develop a Web for communication and exchange.

The fourth step was oriented to ensure capacity strengthening in the user and clients institutions and outreach and dissemination through applications with other users, institutions and projects and training activities and materials. It includes, as in the previous steps, continuation of development of functionalities, following the modular model, to integrate more user demands and needs.

The fifth step (actual) is centred in the continuation of capacities strengthening and training to ensure easy operate and use of QUICKScan and the improvement and update of the software. It includes a main activity to develop a platform, based on user needs, for QUICKScan support, dissemination and exchange (see Figure 1). The platform allow to download tool software, manual, guidelines, obtain support and create a community of users and exchange experiences, lesson learned and best practices.
Table 1. Main QUICKScan functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Rationale</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standardisation</td>
<td>Bring all indicators in the same domain space</td>
<td>Standardize quantitative and ordinal data between 0.100</td>
</tr>
<tr>
<td>Spider diagram</td>
<td>Trade-off analysis between indicators and alternatives</td>
<td>Display multiple indicators of multiple alternatives in a single spider. Each indicator is standardised.</td>
</tr>
<tr>
<td>Linked maps</td>
<td>Facilitate the visual comparison of several indicator maps</td>
<td>Show a max of 4 indicator maps in separate, but spatially synchronized windows. Zooming and panning in one map makes the other window follow. Moving your cursor on one window makes the cursor in the other maps follow.</td>
</tr>
<tr>
<td>Difference map</td>
<td>Compare alternatives</td>
<td>Highlight the differences from two alternatives that specified the same indicator</td>
</tr>
<tr>
<td>Difference chart</td>
<td>Compare alternatives</td>
<td>Show area loss and gain between two alternatives for each class in the indicator of interest</td>
</tr>
<tr>
<td>Bar chart</td>
<td>Compare alternatives and regions</td>
<td>Show indicator scores summarized per spatial unit (e.g. administrative units) and alternatives</td>
</tr>
<tr>
<td>Limits</td>
<td>Show how a location, or spatial aggregation is from a limit. Either below, or above the limit.</td>
<td>Limits include thresholds, standards and policy targets. Limits can be defined per indicator and may vary per spatial unit (e.g. administrative unit, or biophysical stratification).</td>
</tr>
<tr>
<td>Weighted average</td>
<td>Create a composite indicator</td>
<td>Do a weighted sum on two or more indicators. The indicators are standardised before summing them up.</td>
</tr>
<tr>
<td>Bayesian Belief Networks</td>
<td>Include uncertainty as part of participant knowledge</td>
<td></td>
</tr>
<tr>
<td>ArcPy</td>
<td>Support map algebra</td>
<td>A set-based algebraic language to manipulate geographic data, such as subtraction, or multiplication</td>
</tr>
<tr>
<td>Tracing</td>
<td>Explain how a conclusion is reached</td>
<td>From every location in an indicator map the chain of reasoning can be shown following the chain of participant knowledge and data. The path of reasoning is location specific.</td>
</tr>
</tbody>
</table>

Figure 1. QUICKScan platform

A tool to design and evaluate policy options quick, easy, transparent
Guideline 4: What is the participatory process?
What are the main steps of the process?
Participatory process includes different phases. First phase to identify and formulate key questions together with the stakeholder (Figure 1).

Second phase to prepare the workshop (Figure 2).
Third phase is the workshop itself to create a common understanding (Figure 3).

**NOTE:** To ensure good outputs and ease participation, start simple, then refine in iterations based on results and stakeholder needs.

Finally, the fourth phase is to do a new iteration, to incorporate new insight and demands and then reporting if needed (Figure 4).
HOW an exploratory 2 days' workshop could be organized and carry out?

Before the workshop:
✓ Define the program around a policy question.
✓ Search, get and organize the data needed.

An example of a workshop program/agenda:
Day 1 Morning (9:30 - 12:30)
   Define storylines.
   Determine how to measure the impact (key outputs/key indicators).
Day 1 Afternoon (14:00 - 18:00)
   Build workflow for policy alternatives
   Relate alternatives and key output to data.
Day 2 – Morning (9:30 - 12:00)
   Present results, discuss and iterate.
   Define next steps and needs.

After the workshop:
✓ Produce the report.
✓ Send report to stakeholders and iterate if needed in function of feedback and demands.
**Guideline 5: Which are the QUICKScan main features?**

The QUICKScan software encompasses a modelling environment that needs to be filled with spatial and/or statistical data during the preparation phase. The tool is not restricted to a specific geographic location or spatial resolution. Knowledge rules, capturing participant knowledge, are used to combine data and derive indicators. Typically the rules use classifications to describe quantitative data and typologies to give qualitative data meaning. Rules may be linked together to form a chain of rules. Alternative (chains of) rules are used to capture different options. Derived data from alternatives can be aggregated (e.g. by administrative units, or biophysical units such as catchments, or climatic zones) to be displayed in tables and charts for overviews. The main features and uses are:

**Organise base maps:** Add your raster GIS maps to the library and place them in a custom named logical hierarchy of bio-physical and socio-economic folders and subfolders. These maps form the basis on which you apply knowledge rules.

**Easy knowledge integration:** Knowledge is captured in a variety of rule types, like: what if...then...else structures, map algebra, multi-criteria analysis, sustainability limits, or include uncertainty via Bayesian statistics. Each rule type comes with a specific editor to easily insert or change your rules at the click or swipe of your mouse.
Consistent rule chaining: Drag the maps and rules onto the modelling canvas and link them together using the visual editor. The editor guarantees that only rules that ‘fit’ can be linked. I.e. if your rule requires ‘land use’ as input you cannot put in a climate projection map.
**Transparent modelling:** Track calculation progress and drill down in calculation results by tracing into the causal chain of rules and the underlying data. Don’t guess at the reasoning behind an outcome at any specific location, but simply point and click your mouse, view and understand the reasoning. Update the rules if necessary or create an alternative and try out another idea.
Rapid alternative comparison: Alternatives are used to calculate a (set of) indicator(s) differently, either by using a different set of rules (including weights and values), or scenarios, such as climate projections or land use plans. Compare alternatives by: highlighting regional differences, summary graphs per administrative units, or other reporting units, or trade-off spider diagrams to visually compare different indicators at a single glance.
**Guideline 6: European Green Infrastructure application**

Europe’s landscape has faced more habitat loss and fragmentation than any other continent. Green infrastructure can be defined as a strategically planned network of high quality green spaces and environmental features. It should be designed and managed as a multifunctional resource capable of delivering a wide range of benefits and services. Green Infrastructure includes natural and semi-natural areas, features and green spaces in rural and urban, terrestrial, freshwater, coastal and marine areas. Areas protected as Natura 2000 sites are the core of the Green Infrastructure. Investing in a green infrastructure makes economic sense: maintaining nature’s capacity, for instance in mitigating against negative effects of climate change, is far more cost effective than having to replace these lost services with much more costly man-made technological solutions.

**Stakeholders involved:** European policy makers and assessors, scientist and domain experts/technician from across Europe.

**Setting:** During two days, three half-day workshops were organized with stakeholders. Within workshop 1 a policy context was delineated and alternatives and indicators defined. The experts used previously gathered maps to derive the indicators for all alternatives in Workshop 2. The next morning the results were presented to the assessors in workshop 3 and iterated upon.

**Drivers (and policy context):** Land cover/use change (2020 Biodiversity strategy, Habitat/Birds directive, NATURA 2000; CAP reform), infrastructures development (Cohesion policy, urban sprawl)

**Alternatives to be explored:** Maintain (e.g. NATURA 2000 and CDDA) and/or enhance green infrastructure (e.g. HNV Farmland and Forests, Green ecotones, Green urban areas)

![Different alternatives to be explored](image)
Assumptions: Include other non-protected areas in the Green Infrastructure network, restore at least 15% of degraded ecosystems; protect 17% of the territory; enhance contribution of agriculture and forestry (and reduce negative pressures).

Data used:

<table>
<thead>
<tr>
<th>Data</th>
<th>Spatial resolution</th>
<th>Time span</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protected areas (NATURA2000, CDDA)</td>
<td>Europe</td>
<td>1990-2006</td>
</tr>
<tr>
<td>Land cover changes</td>
<td>Europe</td>
<td>1990-2006</td>
</tr>
<tr>
<td>Urban changes</td>
<td>Europe</td>
<td>1990-2006</td>
</tr>
<tr>
<td>Agriculture changes</td>
<td>Europe</td>
<td>1990-2006</td>
</tr>
<tr>
<td>Green background (GBLI)</td>
<td>Europe</td>
<td>1990-2020</td>
</tr>
<tr>
<td>Ecotones</td>
<td>Europe</td>
<td>1990-2020</td>
</tr>
<tr>
<td>High nature value farmlands (HNV)</td>
<td>Europe</td>
<td>1980-2020</td>
</tr>
<tr>
<td>Fragmentation</td>
<td>Europe</td>
<td>1990-2020</td>
</tr>
<tr>
<td>Protection</td>
<td>Europe/National</td>
<td>1990-2020</td>
</tr>
<tr>
<td>Intensification of agriculture</td>
<td>Europe/National</td>
<td>1990-2020</td>
</tr>
<tr>
<td>Restoration</td>
<td>Europe/National</td>
<td>1990-2020</td>
</tr>
<tr>
<td>Afforestation</td>
<td>Europe/National</td>
<td>1990-2020</td>
</tr>
</tbody>
</table>

Results:
Compare implications for EU of different alternatives

1. Maintain
2a. Enhance
2b. Enhance
2c. Enhance

Compare implications for countries of different alternatives

1. Maintain
2a. Enhance
2b. Enhance
2c. Enhance
Results of participatory knowledge matrix building

Sources: Verweij et al., 2011

Agriculture intensification inside Natura 2000
Sources and further readings:


Winograd M., Pérez-Soba M., Verweij P, 2014, QUICKScan: a Pragmatic Approach for Decision Support in Ecosystem Services Assessment and Management, Chapter 12, Economics of Biodiversity and Ecosystem Services, Nunes, Kumar and Dedeurwaerdere (editors), Edward Elgar Publisher House.
Key points from this Guideline

- Participatory workshop
- Policy and decision support
  - Data exploration
  - Reporting
- Research and publications
- Training and capacity strengthening
Guideline 7: Climate change vulnerability and adaptation application

In Central America, during the last 50 years, the experienced economic losses due to natural events are equivalent to 2% of the region's GDP per year. So reducing vulnerability to climate variability and climate change has become an urgent issue, for at least two reasons. Firstly, because there are significant omissions in the way in which they face up to the impacts and economic and social effects of these changes. Secondly, because the economies of these countries are heavily dependent on sectors that are highly sensitive to natural disasters and climate variations and changes, such as agriculture, coastal resources, water resources and infrastructures. Consequently, for these countries, adapting to natural disasters, climate variability and climate change is a major concern of any policy agenda toward sustainable development. Nevertheless, generally policies, strategies and actions are oriented to solve the consequences more than prevent the causes. In consequence “natural events” became “natural disasters”. What is needed is how devise short and long term strategies to mitigate and adapt against actual and future possible effects on natural disasters.

**Stakeholders involved:** Policy makers and assessors from multilateral institutions, national and local governments, domain experts from donors agencies, scientist and domain experts/technician.

**Setting:** During two days, a workshop were organized with stakeholders. Within the first part vulnerability and impacts and effects of climate variability and climate change were explored. During the second part, mitigation and adaptation alternatives were identified and defined and iterations were carried out in function of sectorial alternatives and integrated options.

**Drivers (and policy context):** Absence of planning and lack of appropriate knowledge for location of population, land use, production systems and infrastructures. In response of natural disasters how best use appropriate information. CCAD strategies at regional level and national policies to prevent natural disaster.

**Alternatives to be explored:** In function of cyclical economic, environmental and human losses due to natural events, explore sectorial alternatives to mitigate natural events and integrated options to adapt to climate variability (i.e. earthquakes, landslides, floods, drought).

**Assumptions:** From environmental factors regions with high vulnerability due to natural disasters, such as flooding, drought and earthquakes. From societal (socioeconomic and institutional) factors, policies, strategies and actions oriented to solve the consequences more than prevent the causes, as results “natural events” became “natural disasters”.


Data used:

<table>
<thead>
<tr>
<th>Component</th>
<th>Index</th>
<th>Spatial resolution</th>
<th>Time span</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment</td>
<td>Climatic risk index</td>
<td>Global/Regional</td>
<td>1950-2010</td>
</tr>
<tr>
<td></td>
<td>Geologic risk index</td>
<td>Global/Regional</td>
<td>1950-2010</td>
</tr>
<tr>
<td></td>
<td>Land use index</td>
<td>Global/Regional</td>
<td>1950-2010</td>
</tr>
<tr>
<td></td>
<td>Environmental vulnerability index</td>
<td>Regional/National</td>
<td>1990-2010</td>
</tr>
<tr>
<td></td>
<td>Land use vulnerability index</td>
<td>Regional/National</td>
<td>1990-2010</td>
</tr>
<tr>
<td></td>
<td>Land degradation index</td>
<td>Regional/National</td>
<td>1980-2010</td>
</tr>
<tr>
<td></td>
<td>Vulnerable environmental hotspots</td>
<td>Regional/National</td>
<td>1990-2010</td>
</tr>
<tr>
<td>Society</td>
<td>Urbanization and accessibility index</td>
<td>Global/Regional</td>
<td>1990-2010</td>
</tr>
<tr>
<td></td>
<td>Poverty index</td>
<td>Global/Regional</td>
<td>1990-2010</td>
</tr>
<tr>
<td></td>
<td>Economic and human losses index</td>
<td>Global/Regional</td>
<td>1950-2010</td>
</tr>
<tr>
<td></td>
<td>Population vulnerability index</td>
<td>Regional/National</td>
<td>1990-2010</td>
</tr>
<tr>
<td></td>
<td>Infrastructure vulnerability index</td>
<td>Regional/National</td>
<td>1990-2010</td>
</tr>
<tr>
<td></td>
<td>Social vulnerability index</td>
<td>Regional/National</td>
<td>1990-2010</td>
</tr>
<tr>
<td></td>
<td>Vulnerable social hotspots</td>
<td>Regional/National</td>
<td>1990/2010</td>
</tr>
</tbody>
</table>

Results:

**Final results: Actual and future vulnerability to climatic events**
Compare alternatives:
Difference maps on actual and future vulnerability

Compare alternatives:
Difference on vulnerability by countries
Compare alternatives:
Difference on vulnerability by ecoregions

Build climatic risk index:
Define knowledge matrix for precipitation and elevation
Build climatic risk index:
Define knowledge matrix for climatic risk index

Zoom results: Actual and future (e.g. with climate change) land cover in protected areas from simulation models
Zoom results: Actual and future (e.g. with climate change) ecosystem services

Zoom results: Actual and future (e.g. with climate change) ecosystem services for selected land cover
Sources and further reading:

Winograd M., 2013, Herramientas de apoyo a las decisiones De la teorías...a las realidades, Taller Análisis de la vulnerabilidad al cambio climático en la región América Latina y el Caribe Ciudad de Panamá, Abril 23-25, 2013


Key points from this Guideline

✓ Desktop application
✓ Policy and decision support
✓ Data exploration
✓ Reporting
✓ Capacity strengthening
Guideline 8: Urban sprawl in Europe application

Europe is one of the most urbanised continents on earth. Today, approximately 75% of the European population live in urban areas, while still enjoying access to extensive natural or semi-natural landscapes. More than a quarter of the European Union’s territory has now been directly affected by urban land use; by 2020, approximately 80% of Europeans will be living in urban areas, while in seven countries the proportion will be 90% or more. As a result, the various demands for land in and around cities are becoming increasingly acute. Major impacts are increased use of energy, land and soil consumption threatening both the natural and rural environments, raising greenhouse gas emissions that cause climate change, and elevated air and noise pollution levels which often exceed the agreed human safety limits. Where unplanned, decentralised development dominates, sprawl will occur in a mechanistic way. Conversely, where growth around the periphery of the city is coordinated by strong urban policy, more compact forms of urban development can be secured.

Stakeholders involved: European urban experts, policy assessors, scientist, domain experts/technician.

Setting: Three one day workshops with European urban experts and policy assessors. Scoping was performed in workshop 1. Workshop 2, resulted in the definition of three alternatives and the identification of required maps and statistics. During the last workshop the alternatives were built and linked to indicators using knowledge of both participating experts and policy assessors then iterations were made and send to stakeholders for feedback.

Drivers (and policy context): Land cover/use changes, infrastructures development (urban sprawl, transport network, green infrastructure, Cohesion policy, CAP reform), climate variability/change.

Alternatives to be explored: Where do we expect urban areas to grow? What are hotspots/conflicts areas if urban intensification/extensification? What happens with urban/peri-urban increase in relation with land cover/use changes?

Assumptions: Urban sprawl intensification is possible only inside the delineation of Urban Morphological Zones (UMZ) included in a Large Urban Zone (LUZ, important to note that a LUZ might have several UMZ inside it). Urban sprawl extensification is possible in areas of predefined minimum and maximum nightlights intensity.

Data used:

<table>
<thead>
<tr>
<th>Component</th>
<th>Data</th>
<th>Spatial resolution</th>
<th>Time span</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment</td>
<td>Land cover</td>
<td>Europe 1x1 km²</td>
<td>1990-2010</td>
</tr>
<tr>
<td></td>
<td>Elevation</td>
<td>Europe 1x1 km²</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td>UMZ as built-up area</td>
<td>Europe 1x1 km²</td>
<td>2000-2010</td>
</tr>
<tr>
<td></td>
<td>Soil suitability for construction</td>
<td>Europe 1x1 km²</td>
<td>2020</td>
</tr>
<tr>
<td></td>
<td>Flood risk</td>
<td>Europe 1x1 km²</td>
<td>2000-2010</td>
</tr>
<tr>
<td></td>
<td>Protected areas/Green urban areas</td>
<td>Europe 1x1 km²</td>
<td>2000/2010</td>
</tr>
<tr>
<td>Society</td>
<td>Urban night light</td>
<td>Europe 1x1 km²</td>
<td>1990-2010</td>
</tr>
<tr>
<td></td>
<td>Population increase</td>
<td>Europe 1x1 km²</td>
<td>1990-2010</td>
</tr>
<tr>
<td></td>
<td>Accessibility to cities</td>
<td>Europe 1x1 km²</td>
<td>2000</td>
</tr>
<tr>
<td></td>
<td>Large urban zone</td>
<td>Europe 1x1 km²</td>
<td>2000/2010</td>
</tr>
</tbody>
</table>
Results:

Final results: Intensification per country and EU

Final results: Minimum and Maximum extensification by country

Minimum

Maximum
Final results: Most important changes

**Biggest compactness increase**
- Dresden
- Dublin
- York
- Amsterdam
- Paris
- Galway
- Warszawa
- Eindhoven
- Rennes
- Napoli

**Biggest compactness decrease**
- Dresden
- Gorlitz
- Leipzig
- Bratislava
- Pleven
- Zwickau
- Plauen
- Neubrandenburg
- Magdeburg
- Ruse

**Biggest sprawl increase**
- Madrid
- London
- Paris
- Athen
- Roma
- Milano
- Lisboa
- Napoli
- Barcelona
- Ruhrgebiet

Zoom results: Intensification in selected country/cities

North Germany

Portugal

East coast of Ireland
Zoom results: View of Minimum extensification in Europe

Comparing alternatives: Zoom in Spain and Portugal

- Intensification Scenario
- Extensification Maximum Scenario
- Extensification Minimum Scenario
Comparing alternatives: Zoom in Germany Czech republic

Intensification Scenario

Extensification Maximum Scenario

Extensification Minimum Scenario

Build knowledge matrix for alternatives: Intensification

Data:
Population increase

Use assumptions:
Intensification is a function of population increase inside the delineation of Urban Morphological Zones (UMZ) included in a Large Urban Zone (LUZ)
Build knowledge matrix for alternatives:
Extensification

MINIMUM:

CHAIN:

MAXIMUM:

Build knowledge matrix for alternatives and zoom results:
Extensification and risk of floods

Knowledge matrix

Zoom of areas of urban sprawl at risk of flood

Total areas of urban sprawl at risk of flood
Sources and further reading:

Key points from this Guideline

✓ Participatory workshop
✓ Desktop modelling
✓ Policy and decision support
  ✓ Data exploration
  ✓ Reporting
✓ Public presentations
✓ Capacity strengthening
Guideline 9: Mapping ecosystem services: Potential timber production in France application.

Ecosystem services is fundamental for human living in many different ways: Provision of food and other resources like water, regulation of key natural cycles as carbon and nitrogen and climate and support ecological processes as population regulation and soil formation. In order to stop biodiversity loss and use and maintain in good condition our ecosystems there is a need, as a first task, to map and assess the state and condition of ecosystems services in the different countries. Thus in the case of France mapping ecosystem services, implies different methodological approaches and integrating the ecosystem services concept into planning and decision making. As a first step an application in the case of forest and forest production were developed.

**Stakeholders involved:** Ministry of the environment, thematic experts

**Setting:** In the context of a 4 days methodological workshop, a half day application workshop was carried out. During the half day workshop alternatives were defined and explored to assess forest production and values and evaluate the usefulness of the toolbox.

**Drivers (and policy context):** Land cover/use changes, accessibility and species value.

**Alternatives to be explored:** What would be ecosystem services if different layers are taken into account? Which could be the effect of different species?

**Assumptions:** Potential timber extraction is based on growing and forest management. Other alternatives are based on including accessibility (as slopes/DTM) and species. Finally calculation of potential value of timber extraction is based on species prices and volume per species.

**Data used:** 1x1 km² resolution maps for one date on forest growing stocks, forest management, slopes, accessibility, forest species, species economic value.

**Results:**

![Final results: Comparing the different alternatives](image-url)
Final results: Comparing differences between alternatives

Alternative 1 = Stock x management

Alternative 2 = 1 + accessibility

Alternative 3 = 1 + 2 + species

Final results: Comparing potential value of alternatives in France

Value in millions of euros

1.180
1.070
1.053
Build knowledge matrix for 3 alternatives

Build knowledge matrix for a new alternative:
Average price per species

1. Knowledge matrix and output map
2. Chain
3. Value calculation
4. Results
Key points from this Guideline

✔ Participatory workshop
✔ Data exploration
✔ Capacity strengthening
Guideline 10: Wetland conservation in the Yellow River Delta in China application

The Yellow River Delta (YRD) is located between Bo Sea Bay and Laizhou Bay in China. It is a delta with weak tide, much sediment transport, frequent displacements and forms the most complete and extensive young wetland ecological system in China. On the east-Asian migration routes it offers breeding, wintering and stop-over places for many migratory birds, among which are very rare species like the Red-crowned crane and the Saunders’s gull. The YRD is also an important base for aqua-culture and has been appointed as national agricultural development area. The delta faces influences of urbanization, pollution and fragmentation caused by oil development. In recent years regulation of the river course to the delta and decreased sediment loads have led to salinization and a trend of rapid decrease of wetlands. The freshwater wetland area has decreased half in size in the last 20 years, destroying the connectivity and integrity of the wetland ecosystems. The habitats that are used by rare birds are facing the danger of disappearance. In river management, changes in the landscape and river system are mostly focused on introduction of measures. Digging or changing the path of the river are some examples of classic engineering. History shows that still damage by flooding will occur if risk prevention is neglecting the occupation of floodplains and the interactions with farmers, nature conservation, recreation or forestry. This will lead to a undesirable situation. To minimize unexpected effects, scenario studies can be used to analyse different solutions and their probable impacts.

Stakeholders involved: Municipality officials, conservation commissioners, farmers and hydrological and ecological experts.

Setting: During one and a half year, five 10-day workshops were organised with local experts and authorities. External consultants and stakeholders define scenarios, management alternatives and compare impacts. Stakeholders were selected based on their dependency of water (for conservation, planning, agriculture and aqua-culture farmers).

Drivers (and policy context): Land cover/use changes, economic development (urban and transport network, agriculture, use of resources, oil fields, aquaculture).

Alternatives to be explored: What would be a more balanced water allocation for sustainable development of the wetland nature reserves, dealing with the effects of land use changes and variations in the flooding regime?

Assumptions: Each flooding scenario calculated in a hydrological model creates new physiotopes due to changes in flooding. Changed in physiotopes results in development crate different vegetation types or ecotopes. The ecotope maps are input for the Habitat population size analysis. The suitability of ecotopes as habitat for a number of species are estimated based on expert knowledge.

Data used: 50x50 m2 resolution maps on land cover, topography (incl. oil pump jacks), soil, water table, hydrological flow, vegetation and elevation, fauna distribution.
Results:

Final results: Comparing the impacts of different alternatives
Ecotopes alternatives 1:
Present situation

Ecotopes alternatives B:
Rehabilitation North and South

Final results: Comparing the impacts of different alternatives
Potential habitat of the Siberian Crane:
Present situation

Potential habitat of the Siberian Crane:
Disturbance of roads, built area and oilfields

HABdist: Habcap incl. disturbance (Siberian Crane)
not suitable
10 - marginal habitat (carrying capacity = 0.1)
50 - medium quality habitat (carrying capacity = 0.5)
75 - good habitat (carrying capacity = 0.75)
100 - optimal habitat (carrying capacity = 1)
Final results: Comparing the impacts of different alternatives

Taking measures to reduce habitat fragmentation

Present situation

Taking measures to reduce habitat fragmentation:

With rehabilitation

Final results: Assess habitat provision of different alternatives

Bayesian Believes Network (BBN) rules types

Using highest probability of BBN

Maintain probability distribution of BBN
Sources and further reading:

Key points from this Guideline

- Participatory workshop
- Policy and decision support
  - Data exploration
  - Reporting
- Research and publications
Guideline 11: Ecosystem Integrity in the Brazilian Amazon: Bayesian Belief Networks (BBN) and GIS application

The Amazon is the most species rich biome in the world of which 80% is a moist broadleaf forest ecosystem. The Amazon plays a key role in the global climate regulation and is source to many societal interests, such as food-, timber- and medicine provisioning, air purification, carbon sequestration historical, spiritual and recreational cultural services. The Brazilian amazon covers 60% of the total Amazon: 4.200.000 km². Deforestation and climate change heavily impact the ecosystem of the Amazon rainforest threatening its resilience and the sustainability of many human activities. Land protection may prevent ecosystems and their services to deteriorate from the pressures of agricultural expansion, population growth and wood harvesting. In the Brazilian Amazon land protection occurs in several forms such as environmental conservation, setting biodiversity priority areas and the delineation of indigenous lands. Still, the effects are not clear as understanding of the ecosystems is incomplete and responses to human actions are highly uncertain.

Bayesian Belief Networks (BBN) are models that probabilistically represent correlative and causal relationships among variables. BBNs have been successfully applied to natural resource management to address environmental management problems and to assess the impact of alternative management measures. By training the probabilistic relationships using field data, Remote Sensing data and GIS data the BBN can provide information on the ecosystems: the ecosystem integrity and their likely response to climate change or alternative management actions.

What and how strong are the relations between ecosystem integrity and land use, management, biomass, evapotranspiration, and leaf area index?

Stakeholders involved: Local ecosystem and conservation experts, modellers and GIS experts.

Setting: During 2 months a BBN was created that fit the perceived reality of the local experts. The initial BBN was conceptualised by Brazilian ecosystem experts and Mexican BBN modellers. The model was tested and iterated upon during several tele-conferences between the Brazilian ecosystem experts, Brazilian Remote Sensing experts and Dutch ecosystem modellers and QUICKScan experts. In between the tele-conferences more Remote Sensing- and GIS data was gathered to be integrated during the tele-conferences. The iterations stopped when the local experts were satisfied with the result and identified the necessity to further tune the model with field data in another project to be organised.

Drivers (and policy context): Land cover/use changes.

Alternatives to be explored: Change in ecosystem integrity using: BBN with highest probability, BBN assuming sample from probability distribution and Knowledge rule.

Assumptions: Under the assumption that human imposed measures drive pressures that impact the state of the Ecosystem Integrity, several scenarios were developed on which basis conservation zones with implicit management were developed and data-intensive models were run for projecting land use changes. The scenario maps will be used to replace the current situation equivalents in the model and to determine the likely impacts of these scenarios on the ecosystem integrity.

Data used: Interpreted remote sensing data: land use (e.g. primary forest, secondary forest, savannah, pasture, crop land, deforested, urban, water and protected areas), biomass, evapotranspiration, leaf area index and vegetation cover. Implicit management from protection status: environmental conservation units and indigenous lands.
Results:

Bayesian Belief Network to define ecosystem integrity.
The bottom nodes implicitly include management

Final results:

Ecosystem integrity maps of each alternative with occupied area per ecosystem integrity category

<table>
<thead>
<tr>
<th></th>
<th>BBN – Highest probability</th>
<th>BBN – sample from probability distribution</th>
<th>Knowledge rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very poor</td>
<td>30 %</td>
<td>30 %</td>
<td>30 %</td>
</tr>
<tr>
<td>Poor</td>
<td>37 %</td>
<td>34 %</td>
<td>33 %</td>
</tr>
<tr>
<td>Acceptable</td>
<td>8 %</td>
<td>11 %</td>
<td>11 %</td>
</tr>
<tr>
<td>Rich</td>
<td>9 %</td>
<td>12 %</td>
<td>12 %</td>
</tr>
<tr>
<td>Very rich</td>
<td>16 %</td>
<td>12 %</td>
<td>13 %</td>
</tr>
</tbody>
</table>
Sources and further reading:

Key points from this Guideline

✓ Desktop application
✓ Research and publications
✓ Capacity strengthening
**Guideline 12: Exploring land and water management options for Eastern Africa application**

This application describes the development of a prototype application meant to link a database on land and water management measures with the QUICKScan knowledge rule based spatial modelling environment. Two sets of measures from the database were evaluated with QUICKScan: 1. Measures to minimise the number of people at risk from flooding; 2. Measures to minimise yield gaps in crop production. A spatial comparison was made with regard to costs and effectiveness of these measures. To provide information on these parameters relevant for the mapping scale of East Africa was difficult. Based on the working process and the results the usability for PBL of the QUICKScan tool, related to the measures database, was evaluated.

**Stakeholders involved:** Scientist and experts.

**Setting:** Using expert knowledge rules, provided by PBL in several consecutive sessions, it was possible to develop prototype applications showing spatially differentiated assessments of land and water management measures (e.g. Measures to minimise the size of the annual exposed population to flooding given different alternatives as forest rehabilitation', implement mixed cropping and changing the cropping system with slower and less runoff; and embankment to reducing the exposed population, including the reallocation of the exposed population to safe places, when embankments are not possible or expensive.

**Drivers (and policy context):** Population growth/Climate change in different land use-land cover with a policy context of adaptation/increase agricultural productivity measures.

**Alternatives to be explored:**

1. Measures to minimise the size of the population exposed to flooding:
   a. ‘Forest rehabilitation’: Increasing the amount of forest in a river basin to reduce the amount of runoff.
   b. ‘Mixed cropping’: Changing the agricultural practise, by introducing a cropping system with slower and less runoff.
   c. ‘Embankment & reallocation of people’: Reducing the annual exposed population to flooding, changing the amount of flooded areas.

2. Measures to reduce yield gaps in crop production:
   a. What is the effect of extra labour input?
   b. What is the effect of adding extra water?
   c. What is the effect of adding extra inputs (nutrients)?
   d. What is the combined effect of adding extra inputs as well as extra water?

**Assumptions:** Soil and water conservation measures are interrelated. The QUICKScan tool could be used to test in a tailor-made way the significance and spatial application of impacts, costs and benefits. Flood risk adaptation measures have to be evaluated at landscape/regional scale to be effective. However, they are often implemented locally. Measures related with forest rehabilitation and mixed cropping show as final indicator the amount of runoff reduction. In the case of measure related with embankment and reallocation of people simplified assumptions could have been set up to estimate the effect of this reduction on the annual exposed population.

For the yield-gap analysis in QUICKScan the following four key measures were selected:

1. What is the effect of extra labour input?
2. What is the effect of adding extra water, in case enough labour is available and used?
What is the effect of adding extra inputs (focusing on nutrients)?

What is the combined effect of adding extra inputs as well as extra water?

Effects were expressed in the amount of yield gain and related to their expected cost. The transparency of the defined calculation rules was ensured by QUICKScan, by providing insight into every used knowledge rule in the chain. Combining all available input datasets with appropriate expert knowledge rules, output maps and graphs were created describing the expected cost and effect of the measures. Measures to minimize yield gaps in crop production: extra labour, adding extra water and/or extra inputs. Again, the combining knowledge rules with FAO-GAEZ input datasets resulted in a series of output maps and graphs, showing the change in yields and their cost for each of the four crop yield enhancing measures.

Data used:
1 x 1 km resolution land cover map, DEM map, Slope map (derived from DEM for 3 classes <2%, 2-10%, >=10% - <120%), World Soil Map, Harmonized World Soil Database (FAO/IIASA/ISRIC/ISSCAS/JRC, 2012), Soil texture map, Precipitation intensity map (derived from raster cell using WorldClim precipitation data), Costs (US$/ha) for rehabilitating forest, Impact (mm runoff reduction) per land cover class, population living in the flood prone area (from a GLOFRIS run showing the annual exposed population to flooding with a return rate of 1:1000 year), Actual yield (for rain fed, irrigated and rain fed & irrigated, for low input, high input, irrigated low input, irrigated high input)

Results:
Building the application:
Workflow of the basic yield gap measures (without calculation of cost efficiency)

Input maps:

A. Input, GAEZ Yield map high output
B. Input, GAEZ Yield map low output

Result maps:

R1. Result, Basic Yield Change: A minus B
R2. Result, Yield Change Classified
R3. Result, Yield Change in current cropland area

Intermediate maps:

M1. Mask, Input Digital Elevation model, classified
M2. Mask, Input Water and Cities as "no yield" areas mask
M3. Mask, Input land cover to define current cropland at fine resolution
M4. Mask, Areas to exclude from yield maps (M1 & M2)
M5. Mask, Current cropland extracted from land cover (M3)

Final results:
Key outputs from the "Forest Rehabilitation" measures case.

New land use after measures
Potential applicable area to take measure

Cost US$/ha
Runoff reduction
Final results:
Key outputs from the "Mixed Cropping" measures.

New land use after measures

Potential applicable area to take measures
mixed cropping/
mixed cropping including using terraces

Cost US$/ha

Runoff reduction

Final results:
Average Cost efficiency for runoff-reduction
(Cost-per-river-basin in mm/US$)

Forest rehabilitation

Mixed cropping
Final results:
Sum of costs (in US$) per river basin for the different alternatives of "Embankment" and "Reallocating people" measures.

Final results:
Amount of yield (in kg/ha) in current agricultural production.
Source and further reading:

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**Key points from this Guideline**

- Desktop application
- Data exploration
- Reporting
- Research and publications

The Federacion Nacional de Cafeteros (FNC, Colombia) need to make quick decisions based on credible analysis and using existing information. For this FNC need to strengthen capacities to use decision support tools as well respond to decision makers urgent demands on how, where and when climate variability/change affects coffee suitability and explore management options. Thus, decision makers and experts will assess percentage of coffee growing and farmers affected if certain environmental variables (temperature, precipitation) and explore what options are most suitable to handling production systems (e.g shade coffee, irrigation system, change variety). Within this context, as first step, an application with experts from FNC and Alterra was developed.

**Stakeholders involved:** FNC and Alterra scientists, experts and information system managers.

**Setting:** A one week workshop was organized, starting with an introductory session on what is QUICKScan, followed by a session to setting the scene to identify FNC needs and demands and ensure learning by doing. Then, during the follow 2 days, the defined application was developed, based on available information and responding to user needs, and first iteration and test carried out. During 3 day experts test the use of the toolbox and the results of the first iteration to build a presentation to selected decision makers from FNC. Finally during 4 and 5 day a new iterations, based on decision makers feedback and expert analysis, were carried out.

**Drivers (and policy context):** Monthly rain (last 20 years and 2015), Coffee density, Mean temperature (last 20 year and 2015), dry months, Harvesting periods.

**Alternatives to be explored:**
1. What if... current climate variability;
2a What if... climate variability/change under pessimistic scenario, 2b. What if... climate variability/change under optimistic

**Assumptions:** Harvest periods, drought and wetness are function of regions (North, Central north, Central, South). Droughts and wetness affecting coffee productivity. The defined drought periods are: more than 4, 3, 2 months without rain. The defined wetness periods are: more than 4, 3, 2 months of rain.

**Data used:**

<table>
<thead>
<tr>
<th>Component</th>
<th>Data</th>
<th>Spatial resolution</th>
<th>Time span</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biophysical</td>
<td>DTM</td>
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<td>n.a.</td>
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<tr>
<td></td>
<td>Monthly rain</td>
<td>10 mts</td>
<td>1995-2015</td>
</tr>
<tr>
<td></td>
<td>Mean temperature</td>
<td>10 mts</td>
<td>1995-2015</td>
</tr>
<tr>
<td>Management</td>
<td>Harvesting periods</td>
<td>10 mts</td>
<td>2000-2015</td>
</tr>
<tr>
<td></td>
<td>Coffee density</td>
<td>10 mts</td>
<td>2000-2010</td>
</tr>
</tbody>
</table>
Results:

Vulnerable zones identified based on 20 year rain records/patterns

Changes in areas of ideal coffee growth areas for Colombia
Differences in changes in areas of ideal coffee growth areas for Colombia

Relation between biophysical and management variables (e.g. altitude, rain, temperature and coffee density, coffee productivity)
Sources and further readings:


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Key points from this Guideline

- Desktop application
- Policy and decision support
  - Data exploration
  - Reporting
- Capacity strengthening
Guideline 14: TRAIN: Training member states of the EU on ecosystem services mapping through hands on workshops

To implement new European Union Biodiversity Strategy to 2020, there is a need to map and assess ecosystems and their services to improve knowledge and evidence base for policy. Map and assess ecosystem and their services implies solve key questions like: Ecosystems are in good shape to continue delivering essential ecosystem services?; Can we value the flow of ecosystem services from ecosystems to society?; Which drivers of change increase or decrease the delivery of ecosystem services?. Nevertheless, moving from question to implementation, implies that EU countries, with the assistance of the Commission, strength their capacities to map and assess the state of ecosystems and their services, to assess the economic value of such services, and to promote the integration of these values into accounting and reporting systems at EU and national level. With this purpose training on ecosystem services mapping through hands-on workshops were organized.

Stakeholders involved: Country teams (policy officer, researcher, GIS expert) and trainers

Setting: During 2 and half days strength countries and institutional capacities to map ecosystem services and produce information for reporting. It includes, among other, QUICKScan as one of the tool for mapping ecosystem services. The information on selected ecosystem services (3-4) will be transferred to BISE and possibly used in the mapping tool developed by JRC and DG Environment.

Drivers (and policy context): In the context of European Union Biodiversity Strategy to 2020 there is a demand to map and assess the state of ecosystems and their services in their national territory by 2014. As result of MESEU project, a second phase was defined to strength capacities to use different toolbox to map ecosystem and their services in the EU (TRAIN). For this a selected group of countries participate in a series of hand on workshop to strength and test their capacities and possibilities to map ecosystem services in the EU countries.

Alternatives to be explored: Selected ecosystem services for each country (Latvia, Hungary, Romania, Slovenia, Slovakia, Estonia, Ireland, Luxemburg, Croatia, Cyprus, Greece, Lithuania and Malta)

Data used: country data

Results:
The following figures show examples of the working sessions during one workshop and some of the outputs obtained by the countries participating in the training.
### Example of session for a hand on workshop

**TRAIN session schedule for workshop III (24-26 Feb, 2015)**

<table>
<thead>
<tr>
<th>DAY</th>
<th>TIME SLOT</th>
<th>IE 1</th>
<th>EE 1</th>
<th>EE 2</th>
<th>EE 3</th>
<th>EE 4</th>
<th>SI 1</th>
<th>SI 2</th>
<th>SI 3</th>
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<td>CI32</td>
<td>Bett</td>
<td>Altis 1/2</td>
<td>A11F</td>
<td>Peter</td>
<td>C030</td>
<td>Graz</td>
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<td></td>
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<td></td>
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<tr>
<td>Tuesday</td>
<td>15:00-17:30</td>
<td>carbon sequestration</td>
<td>timber production</td>
<td>QUlOscan and trade-offs</td>
<td>recreation</td>
<td>timber production</td>
<td>Altis 1/2</td>
<td>Michel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9:00-11:30</td>
<td>animals from in-sire aquacult</td>
<td>swimming and birding</td>
<td>Cont.</td>
<td>maintenance of nursery pop.</td>
<td>carbon sequestration</td>
<td>C032</td>
<td>Graz</td>
<td>C030</td>
</tr>
<tr>
<td></td>
<td>12:30-12:30</td>
<td>preparation of final presentation</td>
<td>lunch</td>
<td></td>
<td></td>
<td>coffee at 11:00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>13:00-16:00</td>
<td>cont.</td>
<td>carbon sequestration</td>
<td>cont.</td>
<td>cont.</td>
<td>cont.</td>
<td>recreation</td>
<td>C032</td>
<td>Graz</td>
</tr>
<tr>
<td></td>
<td>16:00-18:00</td>
<td>fishing</td>
<td>water purification</td>
<td>Recreation</td>
<td>Carbon sequestration</td>
<td>water purification</td>
<td>C032</td>
<td>Graz</td>
<td>Altis 1/2</td>
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<td>carbon sequestration</td>
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<td>groundwater for drinking</td>
<td>C032</td>
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<td>Wednesday</td>
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</table>

**Red: ESTiMAP or alike**
**Green: ArcGIS**
**Blue: QUlOscan**

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### Cyprus case:
**Risk of flood based on slope**

![Diagram showing risk of flood based on slope]
Cyprus case:
Final Erosion Risk Map

Cyprus case:
ESS by combining risk with current land use (CLC)
Cyprus case:
Final ESS service erosion risk prevention

Greece case:
Potential timber production
Greece case:
Potential timber production based on land cover

Greece case:
Potential timber production include High Nature Value Farmland
**Greece case:**
**Compare alternatives for potential timber production**

By including HNV the low quality crop production areas are filtered out. The intention of this ESS is to show those less sustainable areas → use solution of alternative 1.

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**Lithuania case:**
**Identify priority restoration areas**
Lithuania case: Identify priority restoration areas

170,000 / 6,500,000 * 100 = 2.6 %

Lithuania case: Potential forest areas for flood risk mitigation/ecorestoration
Sources and further readings:

Alterra, 2014, **Mapping of Ecosystems and their Services in the EU and its Member States (MESEU)**, Synthesis report, SyENV.B.2/SER/2012/0016.

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EEA, 2015, **European ecosystem assessment — concept, data, and implementation** (Contribution to Target 2 Action 5 Mapping and Assessment of Ecosystems and their Services (MAES) of the EU Biodiversity Strategy to 2020), Technical report, EEA, Copenhagen, Denmark
Key points from this Guideline

- Participatory workshop
- Data exploration
- Capacity strengthening
Guideline 15: Lesson learned

As main lesson learned we can highlight that what is important with DST in general, and QUICKScan in particular, more than the toolbox itself, is the approach to ensure co-construction between stakeholders (including developers, decision makers, and experts). Special attention should be given to the process, in order to support exploratory dialogue for applications and ensure transparency in the tool development and use. It will guarantee capacity strengthening to use toolbox and to communicate results. The development of highly interactive, open and transparent product, like the QuicScan toolbox, implies a balance between tool development, process building and pool together resources and capacities to avoid that too much tool development became controlled by developers or that too much process building became controlled by facilitators. Finally here is a need to explain that QUICKScan is a toolbox that enables to build models to explore alternatives options and emphasize that the tool itself is not a model. QUICKScan as a set, should help users to make better decisions, but the toolbox by themselves will not make better decisions. In conclusion, as depicted in Figure 1., QUICKScan started from needs and demands and end with some outputs and responses.

From toolbox development perspective, we can highlight as barriers, related with decision and policy maker the lack of interest in DST tools and methods. Among other reasons, one of the main causes of this lack of interest is the absence of suitability, reliability, usability and credibility in the results produced, given the gap between the developments of toolbox functionalities, the needs in a dynamic policy context and the communication and use of results. In fact different contexts, increases the gap between toolbox functionalities and
applications and uses. For instance scientific contexts relates with development of new methods, tools functionalities and metrics while decision makers context relates with availability of friendly to use interfaces, open functionalities and appropriate metrics. Also we need to take into account the demands and attitude of users about toolbox and information. For instance it exist an increasing demand for more easy to use and transparent toolbox, but if toolbox too easy to use the results are not credible, and if the toolbox use is complicated and complex the results are not used.

From toolbox development perspective, we can highlight as advantages, that DST allow to bridge the gap between developers, decision makers and scientist through defining real exchanges, application building and capacity strengthening. Nevertheless given that software development has its own dynamics; it therefore would be advisable to better tune tests of functionalities and users’ needs meeting with the progress of the software development. Given that DST, and the process, works with data available and needed for policy making, as well data that might result from complex models, it is clear that an effort should be done to produce and create the appropriate functionalities and data that fit with the policy context and decision needs. QUICKScan itself must be introduced to decision makers before asking the users to formulate questions to be solved with it. There is a need to explain that QUICKScan in particular is a toolbox that enables to build models and constitute a work environment, and emphasise that the tool itself is not a model.

From the building process and use of the toolbox perspective, we can highlight as barriers the difficulties to communicate results for different audiences, users and uses, as visualization in different formats for different policy context is needed. For instance communication and form became more important than analysis capacities and content. The different needs, which increase the gap between data uses and information production, as for example policy makers need easy to use, credible and appropriate data and information to explore options and actions in a changing policy context, while data and information that feed the toolbox are complex to use, and not appropriate to a changing policy context. Is important to note that workshops participants and users do not have the same mind set and goals. It might be wise to do the exercise with small amount of people (6-12) to ensure fluid dialogue and easy exchange. Participatory workshops could be difficult to facilitate and coordinate, given:

- Possible heterogeneity and number of the participants.
- Role of the software tool in the discussion.
- Time in contact with policy makers and experts or policy analysts.
- Time required to run the exercise.
- Time to present and discuss results.

Finally, from the building process and use of the toolbox perspective, we can highlight as advantages, that given the QUICKScan approach, a parallel between development of DST and use of DST help in the test and use the toolbox, for instance using the QUICKScan in workshops with users (policy/decision makers). However, as mentioned, special attention to workshops, given the heterogeneity of the participants, interests and policy needs/contexts. To ensure and improve the use of QUICKScan in decision making, the effort need to be concentrated in using the toolbox to create and strength users capacities instead to using it as a mapping and data machine. This is why the software tool should be used in the discussion and ensures time in contact with policy makers, experts and policy analysts. It will
help to explain what different parts of the workflow do, and the role of the knowledge matrix in the whole workflow. Given that workshops participants and users do not have the same mind set, goals and context, it might be wise to do some starting applications in a given policy context for a given issue. Finally applications for capacity strengthening need to be designed and carry out to ensure decision makers and other user’s toolbox ownership and sustainability of the process.
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This Guidelines 3.0 is another step of a continuous learning and development process and we hope to update permanently the guidelines with new cases studies, new toolbox functionalitites and new lessons learned and insight.
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Further information and support

Who to contact for more information?

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