space4environment sàrl
48, rue Gabriel Lippmann, L-6947 Niederanven, Luxembourg
VAT No. 21621837, Commercial Registration No B124588
PHONE: +352 26 71 41 35
FAX: +352 26 71 45 54
INTERNET: http://www.space4environment.com

LAND USE AND LAND MANAGEMENT RELATED PRESSURES ON FOREST ECOSYSTEMS

1 FOREST PRESSURES

The tree species map will not be used as indicator for land management practices, instead it is proposed to use the indicator for forest condition. A high tree diversity (Shannon index) could be interpreted as indicator for a good ecosystem condition.

Forest management

- Fast track ecosystem capital accounts (forest growth & harvest – disaggregated to 1km grid)
- Potential forest management (gradient of intensity of intervention with the natural processes in a forest)
- Forest fragmentation (forest ecosystem network connected by forest bridges – GUIDOS Morphological Spatial Pattern Analysis)

Methodology

1. **Potential forest management approach** (unchanged in 2017)
   Mapping of the potential forest management approach (FMA) per grid cell:

FMA	Description	Intensity of management
I	Nature reserve	No intervention
II	Close-to-nature	Interventions mimic natural processes
III	Combined objective forestry	Limited interventions
IV	Even-aged forestry	Interventions follow production goals
V	Short rotation forestry	Intensive management for maximum biomass

Combining the five classes to three management pressure classes:

FMA IV & V	3 - bad
FMA III	2 - OK
FMA I & II	1 - good

2. **Forest harvest and regrowth** (unchanged in 2017)
   Fast track ecosystem capital accounts

   - Assessment of harvest rate vs. re-growth → classification on sustainability classes
   - Class boundaries need to be assessed on actual values

   The harvest rate as indicator for the management is evaluated by calculating the average growth and harvest per year in a 11 year period and comparing these for each grid cell. To assess the pressure due to harvest three classes have been defined:

harvest rate > 10% bigger than avg. growth	3 - bad
harvest rate +/- 10% of avg. growth	2 - OK
harvest rate > 10% smaller than avg. growth	1 - good

3. **Landscape fragmentation in forest patches** (updated in 2017)
   Forest ecosystem connectivity

   - Using extent of forest patches and their connection to neighbouring forest patches via bridges
   - Establish thresholds for high – medium – low degree of fragmentation

   The extent of forest networks representing potential habitats for forest-based species has been valued by the use of the JRC GUIDOS Morphological Spatial Pattern Analysis (MSPA) Tool[1] for description of geometry and connectivity of spatial data. This tool has been applied on high resolution forest tree cover density information (HRL Forest 2012 - Tree cover density) of Europe. The outcome is a map describing the structure of forest patches and their connection to other forest patches nearby. By this core forest areas representing essential forest habitats for forest-related species and potential bridges for animal migration between different patches have been identified. For the analysis of pressures on forest ecosystems the size of all interconnected forest patches has been calculated. This patch sizes have afterwards been accessed in terms of fragmentation by classifying the size compared to estimated required habitat sizes for forest based species:

Degree of fragmentation	Threshold value	Remark
low	> 500 km²	defined minimum habitat for large forest-based mammals → report "Spatial analysis of green infrastructure in Europe" (*doi:10.2800/11170)*
medium	50 - 500km²	
high	< 50km²	

[1] http://forest.jrc.ec.europa.eu/download/software/guidos/mspa/

4. **Compilation of all different input datasets on forest pressures** (updated in 2017)
   Combination of (1), (2) and (3)

   - Classification from accounts should basically confirm the potential forest management approaches based on actual timber extraction values. The forest fragmentation gives additional information of potential ecological pressures arising by dissection of forest habitats.
   - Degree of overall pressure by forest management is classified into five classes according to the decision tables below:

111	112	113
121	122	123
131	132	133

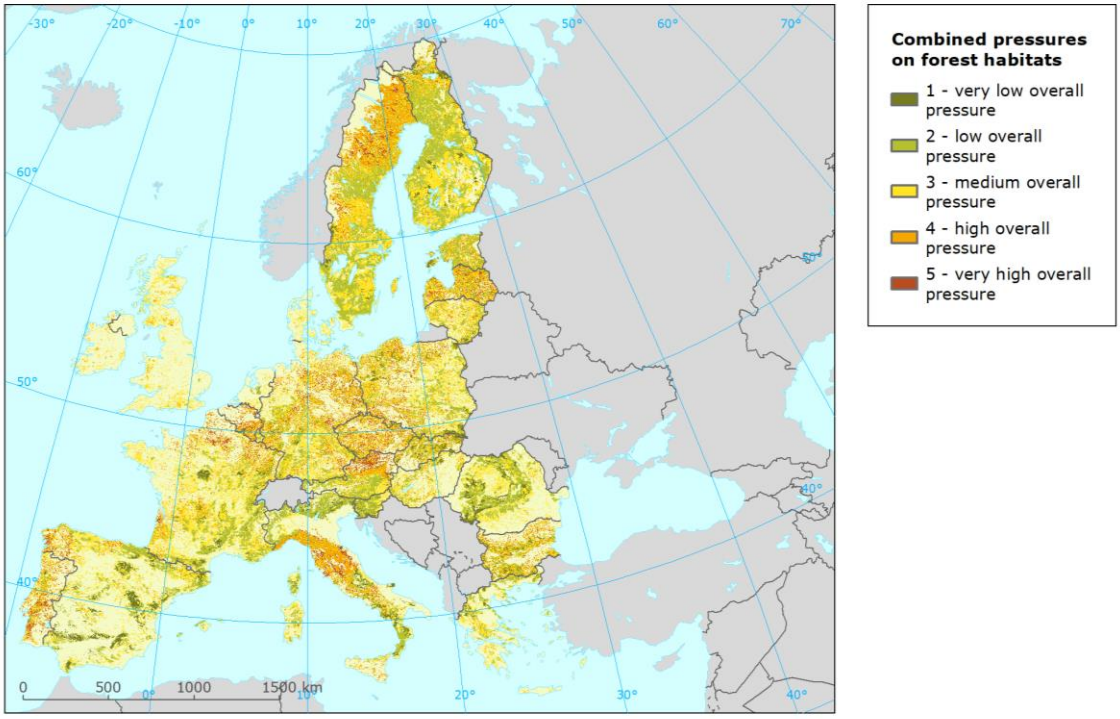
211	212	213
221	222	223
231	232	233

311	312	313
321	322	323
331	332	333

1st character = pressure due to forest management approach (FMA) (1 = low)
2nd character = Fast track ecosystem capital accounts – harvest vs. growth (1 = good)
3rd character = Landscape fragmentation in forest patches (1 = low fragmentation)

1	2	3	4	5
very low overall pressure	low overall pressure	medium overall pressure	high overall pressure	very high overall pressure

   - 1 = very low pressure (management close to nature on huge unfragmented forest patches with more regrowth than harvest)
   - 5 = very high pressure (intensive management with production goals on partially highly dissected forest patches with bigger harvest than regrowth)



Data sets

Name	***Format***	***Origin***	***In-house***
Tree species map	1 km grid	EFI[1]	Yes
Potential forest management	1 km grid	Hengeveld[2]	Yes
Fast track ecosystem capital accounts	1 km grid	UMA	Yes
HRL forest 2012 – tree cover density	20m grid	COPERNICUS	Yes
JRC GUIDOS Morphological Spatial Pattern Analysis (MSPA) – Forest patch connectivity (input: HRL Forest 2012 – tree cover density)	20m grid	JRC / UMA	Yes

1 http://www.efi.int/portal/virtual_library/information_services/mapping_services/tree_species_maps_for_european_forests/

2 http://opendap.cgi-systems.nl/thredds/catalog/projecten/EuropeanForest/FMAmap/catalog.html