ACTION ECo: **Ecological connectivity, landscape patterns and representativity of test areas**

Description:
Quantitative methods that link spatial patterns and ecological processes at broad spatial and temporal scales are needed both in basic ecological research and in applied environmental problems. Ecological processes such as plant succession, biodiversity, foraging patterns, predator-prey interactions, dispersal, nutrient dynamics and the spread of disturbance all have important spatial components. Previous processes all are to be taken into consideration to define and implement forest management options.
Three elements of landscapes, as systems of ecosystems, are practically useful to be considered:

- *structure* refers to the spatial relationships between distinctive ecosystems; that is the distribution of energy, materials and species in relation to the sizes, shapes, numbers, kinds and configurations of components;
- *function* refers to the interactions between the spatial elements, that is, the flow of energy, materials and organism among the component ecosystems;
- *change* refers to alteration in the structure and function of the ecological mosaic trough the time.

The assessment of landscape structure will involve the interactions among landscape patterns within a landscape mosaic, and how these patterns and interactions change over time.
Using the technique of spatial analysis in Geographical Information System (GIS) environment, small and large area analysis will be performed, expressing spatial arrangements of forested patches. The results of spatial analysis will provide quantitative metrics on the spatial structures of forested areas and on the interactions with other land cover patches. The quantitative character of the landscape metrics will enables the comparison of the structural diversity of different areas with an objective method.

This action will be carried out for each site identified by PA action. The area subjected to forest management will be analysed as small area, while a bigger frame, including surrounding forest areas and/or other natural or semi-natural ecosystems will be analysed as large areas.
The analysis will be realised in two main phases along all project development, since it will need to dial with other Actions. The first phase will focus on collecting present forest cover maps with forest type nomenclature system both for small and large areas. For this purpose, forest cover maps (most of the time non existing) will be realised using visual interpretation and/or segmentation technique. In the first phase a landscape analysis will be carried out both on small and large areas in order to define spatial patterns at each site. The small area analysis will be realised in order to define spatial pattern of both forest types and forest stands with homogeneous structural and/or management features, deriving from data collected in ForC and ForBD actions. In the large areas homogeneous patch (forest type) will be taken into consideration.
The second phase will focus on repeating previous analysis after forest management option definition, in order to identify patterns changes, describe landscape alteration and understanding ecological network modification due to different applied forest management options. In this phase results will be compared to biodiversity (ForBD action), in order to correlate landscape patterns and best condition for a set of umbrella species selected from field assessed ones.

The action is using remote sensing and maps, so it is not straightforward to define a “number” of surveys. The analysis will be performed at all test areas using remote sensing images and maps and will be repeated before and after the implementation of forest management operations.

Action ECo will start at month 5 and will be closed at month 54

Methods employed:
- Existing maps (when available) to create a map collection of forest types

- Realisation of forest types maps of small and large areas using visual interpretation and/or object oriented supervised classification (when maps not available).
- Implementation of maps in a GIS environment as both vector and raster layers.
- Spatial analysis using a series of indices (known as metrics) aimed at describing spatial patterns of small and large areas. Three main group of metrics will be computed considering as classes both forest types (small and large areas) and stand structure characteristics (small area only):
    - landscape composition metrics;
    - patch size metrics;
    - patch shape metrics;
    - landscape configuration metrics;
    - ecological network analysis (GUIDOS software realised by European Commission to detect single ecosystem function in an ecological network).
- Processing of the layers obtained from spatial analysis and insertion in a Multi-Criteria Evaluation (MCE) in order to analyse the effect of different management options on landscape.
- Comparison of MCE results to increasing or decreasing of both landscape and faunal biodiversity in order to identify best forest practices.

Constraints and assumptions:
An apparent constraint is the non homogeneous nomenclature and detail of different existing forest maps. It can be overtaken by a previous harmonization of different nomenclature systems up to the most detailed level as possible.

Beneficiary responsible for implementation:
UNIMOL

Expected results:
Expected results concerns different aspects. First of all spatial pattern definition will allow a better forest management option distribution on each site. Furthermore it will provide managers and stakeholders directly linked to each site with a planning instrument supporting decisions. At last a description of good practices for SFM, linked to biodiversity at landscape level and to ecological function of managed forests, will be carried out.

Indicators of progress:
Annually submitted progress reports.
Percentage of analysed surface both for small and large area.
By December 2011, 50% of I phase test area will be analysed. By December 2012 100% of I phase test area will be analysed. By December 2013 50% of II phase test area will be analysed. By December 2014 100% of II phase test area will be analysed

ACTION Eco-SI: **Ecological connectivity, landscape patterns and representativity of test areas**

Description:
To obtain representative test areas that will be used in the study we will first carry out the landscape classification. Within this step we will define the most prevalent and representative landscape types in the regions of Kocevska, Postojna and Tolmin. After a thorough investigation of the most characteristic forest and forested landscape types we will define the representative forest types. The representative types will afterwards be analyzed at two scales, namely at a regional (selected forest type) and community (stand) scale with the sets of biodiversity indices. The very same indices will also be used in the action ForBD-Si and will assist us in testing SFM indicators.

Landscape classification will be performed by means of indicators such as percent of forest cover, land-use type, fragmentation, depth of interior forest area, etc. The analysis, in the view of landscape structure, composition and processes will be conducted in the GIS environment.

Within the selected forest areas we will compare different forest management regimes to assess their impacts on forest structures, Carbon balance, biodiversity along with the processes at the landscape scale (different rotation periods for forest stands, the size and spatial distribution of regenerated areas, regeneration period, natural versus artificial regeneration).

The action is using remote sensing and maps, so it is not straightforward to define a "number" of surveys. The analysis will be performed at all test areas using remote sensing images and maps and will be repeated before and after the implementation of forest management operations.

Methods employed:
- The existing maps and information on forests (forest management classes, forest stand maps used in Slovenian forest practices) will be used to a large extent. In the case of inconsistencies of these classifications we will use additional data sources (satellite images, orthophoto images).
- Maps will be implemented in a GIS environment as both vector and raster layers.
- The sets of spatial diversity indices (known as metrics) will be calculated to describe spatial patterns of forest and landscape structures. The sets of metrics will be computed for forest types and their stand structure characteristics:
- Each layer obtained from spatial analysis will be processed and inserted as a factor in a Multi-Criteria Evaluation (MCE) in order to analyse the effect of different management options on landscape.
- The MCE results will compared to increasing or decreasing of both landscape and faunal biodiversity in order to identify best forest practices.

Constraints and assumptions:
See under Action ECo

Beneficiary responsible for implementation:
SFI
The Associated Beneficiary SFI planned cooperation with SFS (Slovenian Forest Service) and BF (Biotechnical Faculty, Department of Forestry and Renewable Forest Resources) experts to carry out action activities that are expressed in the breakdown of costs, allocating a portion of budget as external assistance costs (close to 10% of the budget).
In this respect, external costs will cover payment for the expected/agreed work with defined hourly rate/ fee, travel costs, needed to cover daily allowances according to the national legislation Specific work: help on the field for measurements. Assistance in data entry, technical support in the field. Support for sampling. All the external assistance will be awarded in agreement with existing regulation for public tendering.

Expected results:
Expected results concerns different aspects. Analyzed spatial patterns will assist in recognizing better spatial and temporal forest management options. Besides that, it will also enable managers, landowners and stakeholders to agree upon the best management options on the long run. Last but not least, on the basis of existing spatial patterns and earlier forest practices we will attempt to assess good management practices to be used in maintaining sustainability, biodiversity, carbon management, etc.

Indicators of progress:
See under Action ECo