Interreg Alpine Space project - **NEWFOR**

Project number 2-3-2-FR

NEW technologies for a better mountain **FOR**est timber mobilization

Priority axis 2 - Accessibility and Connectivity

Workpackage: Costs and benefits evaluation

The Slovenian Wood Energy Information System (SWEIS)

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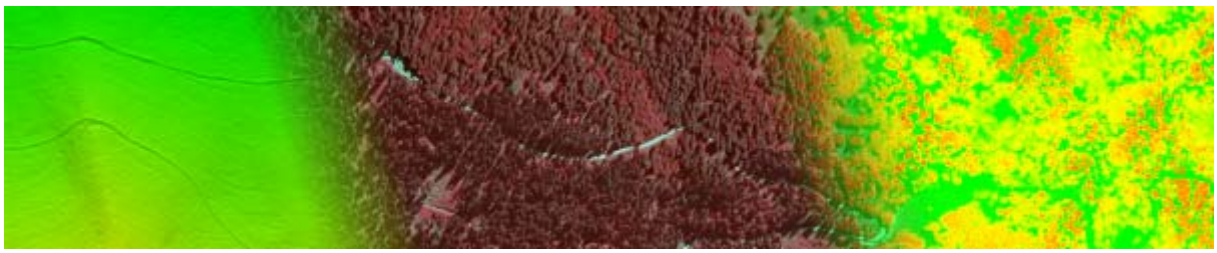

The consortium of the project Interreg Alpine Space NEWFOR

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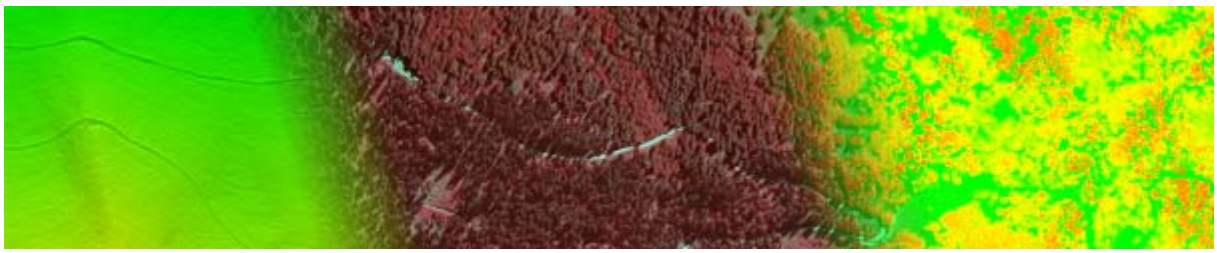
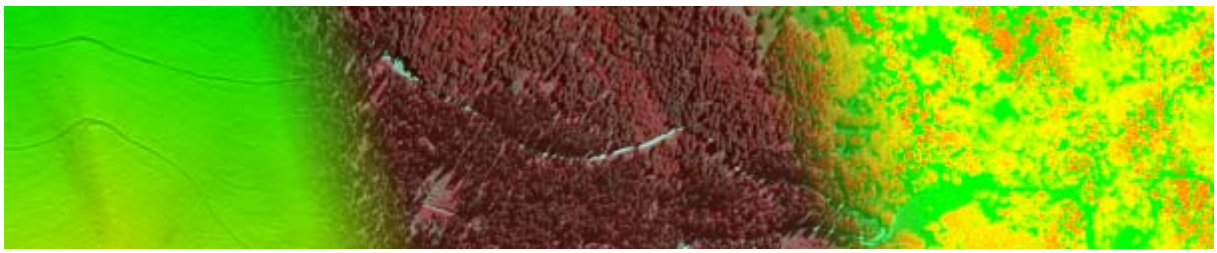
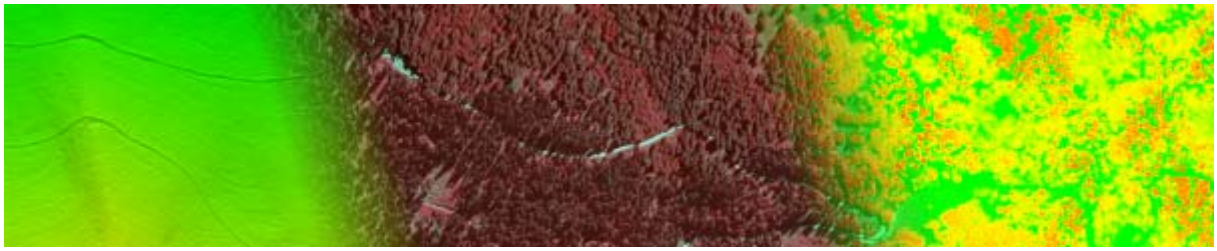


CONTENTS



1 ABSTRACT

During the years 2003-2005 Slovenia Forest Service within FAO TCP project create Slovenian Wood Energy Information System (SWEIS), based on WISDOM methodology. Main goal was to define and locate (GIS) biomass sources, comparing wood biomass demand and supply. This report presents briefly this information system which is a forest management helping tool success story.



2 A SYNTHETIC OVERVIEW OF THE INTERREG ALPINE SPACE PROJECT NEWFOR

2.1 THE CONTEXT

Although forests represent a key resource of mountain environments, their valorization is hampered by accessibility constraints that prevent an efficient mapping, management, harvesting and transport of wood products.

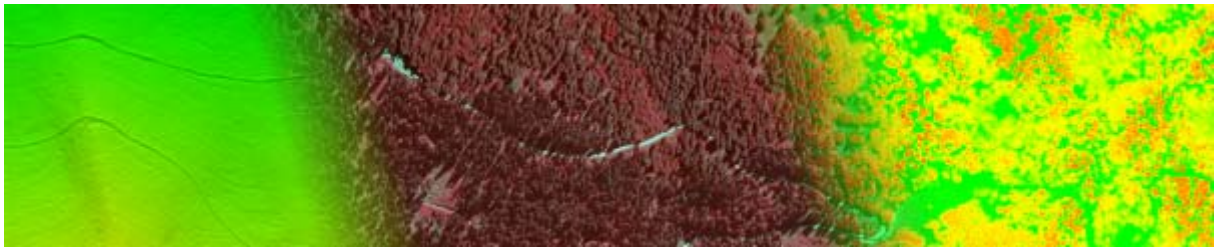
Forests fulfil multiple functions in mountainous areas. They have an ecological function as host of many habitats and species. They also are a leisure area for social activities such as hiking, skiing… From the economical perspective, the production of renewable resources like timber and fuelwood has positive effects both at global scale, with climate change mitigation, and local scale with rural employment and the development of a regional value chain. The objective of preserving and improving the development of mountain forests is a point of public interest. However, managing forests in mountain territories is a difficult task as topography and climate set strong constraints inside a complex socio-economical framework.

In particular, a precise mapping of forest biomass characteristics and mobilization conditions (harvesting and accessibility) is a prerequisite for the implementation of an efficient supply chain for the wood industry. The available information is currently insufficient to provide, at reasonable costs, the required guarantees on the wood supply and on its sustainability. With the recent development of new remote sensing technologies and modelling tools, major improvements regarding the evaluation of the forest growing stock and accessibility are now possible. Upon this highly valuable information, decision-making tools must be build to optimize the investments in forest infrastructures required for a cost-effective wood supply while securing the sustainable management of forests, and to support the implementation of an efficient European policy for mountain forest management..

2.2 OBJECTIVES OF THE PROJECT

According to this context and based on the use of new technologies (LiDAR: light detection and ranging, Unmanned Aerial Vehicle,...) for forest and topography characterization, the project NEWFOR is dedicated to enhance and develop tools and adapted policies for decision making in the field of a sustainable and adaptive mountain forest resources management facing the sustainability of mountain forest ecosystems services.

So, the main objective of the NEWFOR project is the improvement of mountain forest accessibility for a better economical efficiency of wood harvesting and transport in a context of sustainable forest management and wood industry in changing climate.



The 14 partners involved in the project consortium tackle this objective within five thematic workpackages (wp):

- Forest resources and LiDAR

Recent developments in LiDAR technology, combined to other available data sources (aerial photographs, aerial photo series by UAVs, …), are now allowing a precise and fine mountain forest resource quantification, qualification and mapping. Integrating this technology will provide an innovative response to the challenges of a precise and robust knowledge on the available growing stocks. The project aims at testing and developing tools that will help forestry end-users to benefit from this technological advance.

- Forest accessibility

After the identification of forest resources, the second step of an efficient forest management is to evaluate the accessibility to these resources. In mountain areas, topography is the main constraint to a technical and economically efficient exploitation. The project demonstrated how to use topographic LiDAR data coupled with geographic information systems (GIS) for an optimal planning of forest harvesting and logging while taking current and scheduled accessibility of forest resources into account.

- Forest and industry connectivity

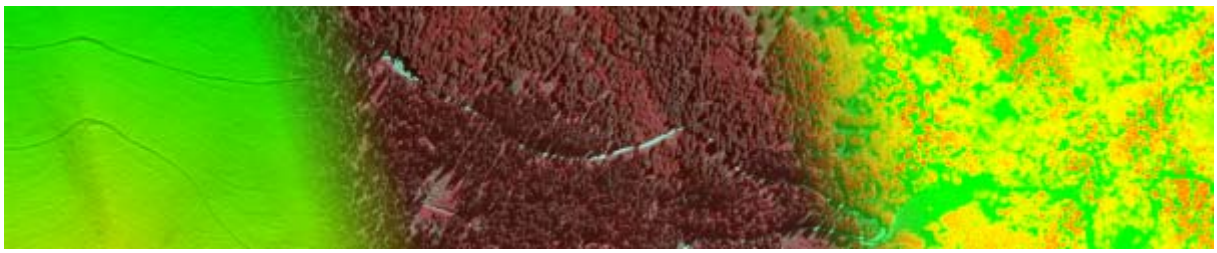
Once the forest resources and accessibility are characterized, then remains the issue of the connectivity between wood piles in the forests and wood yard of mills. This link is often neglected but is crucial for a comprehensive assessment of the wood supply efficiency.

- Costs and benefits evaluation

NEWFOR aims at developing decision-making tools dedicated to the definition of strategies for sustainable mountain wood supply chain. To fulfil this objective, tools for identifying forest resources, their accessibility and connectivity to the wood market are first considered separately. In order to achieve the demarche, and to choose the optimal strategy, it is necessary to evaluate the whole workflow from the economical aspect by comparing the costs and benefits of each possible strategy.

- Logistical planning strategy

There is a need to frequently adjust the planning of forest management to new economical evidence as well as to unforeseeable developments. Such an adaptive management needs to balance ecological, social and economic factors. The final objective was to provide forest managers and decision makers with reliable information for the evaluation of technical and economical conditions for their decision-making on timber supply chain logistical planning and land use strategies.



3 OVERVIEW OF SWEIS A SLOVENIAN FORESTRY INFORMATION SYSTEM

3.1 GENERAL CONTEXT

During the years 2003-2005 Slovenia Forest Service within FAO TCP project create Slovenian Wood Energy Information System (SWEIS), based on WISDOM methodology. Main goal was to define and locate (GIS) biomass sources, comparing wood biomass demand and supply. Till 2013 system was upgrading among other with woodshed analysis which includes cutting and skidding costs to forest roads (figure 2). In year 2014, system was upgraded with estimating forest production costs for all timber quality products, not only for wood biomass.

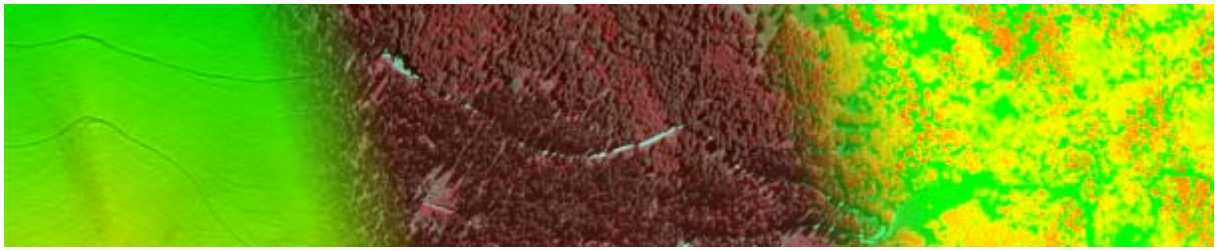
3.2 ECONOMIC AVAILABILITY OF WOOD RESOURCES

3.2.1 METHOD OF CALCULATION FOR THE CURRENT MODULE WISDOM

The parameters to estimate the cost of felling and harvesting have been made on the basis of assessments of the study, published in the publication "Wood - from the forest to the furnace" (Kovac, 2006). Step of analyzing includes: Using the equations from this study to estimate the cost. It is a function of the average tree-level segment, on the basis of the average of stand characteristics (development phase), and the influence of slope and distance to the nearest road. Creating four zones of distance from the road (buffer). Link the zones and terrain slopes. Calculation of the coefficients "a" and "b" and the production cost of tickets: The cost function is shown on the map (pixel, EUR/m3).

Testing calculate the economic potential of the new availability of resources. Inputs for the new test version of the calculation of the actual time spent on logging and harvesting (SFS, data) Segment (file NORME.xlsx, 26,389 records), the stand map of Forest Service (SFS 2013 315 000 records), data on the average tree in the permanent sample plots under development phases within the FMU (1,373 combinations).

Based on the data of the time necessary for logging and harvesting (h/m3), lug distance (m), the average tree volume (m3) were calculated single parameter regression lines (the time dependence of logging and harvesting (separately for skidding means) than the average tree). We formed four groups of hauling assets (tractor, skidder, lift, and others). Lug distance has been combined and is classed into three groups (up to 399 m, 400 m and 799 to 800+ meters).



Depending on the distance were the second and third class added to a fixed percentage (resource base table, the median value depending on the distance) calculated according to the time spent for harvesting (eg tractor class of 400 to 799 m added 37% and grade 800 meters and more added 88%). Based on these features, we brought each stand in relation to its parameters (RF, distance, medium tree) attributed the calculated use of time. The result is the following map:

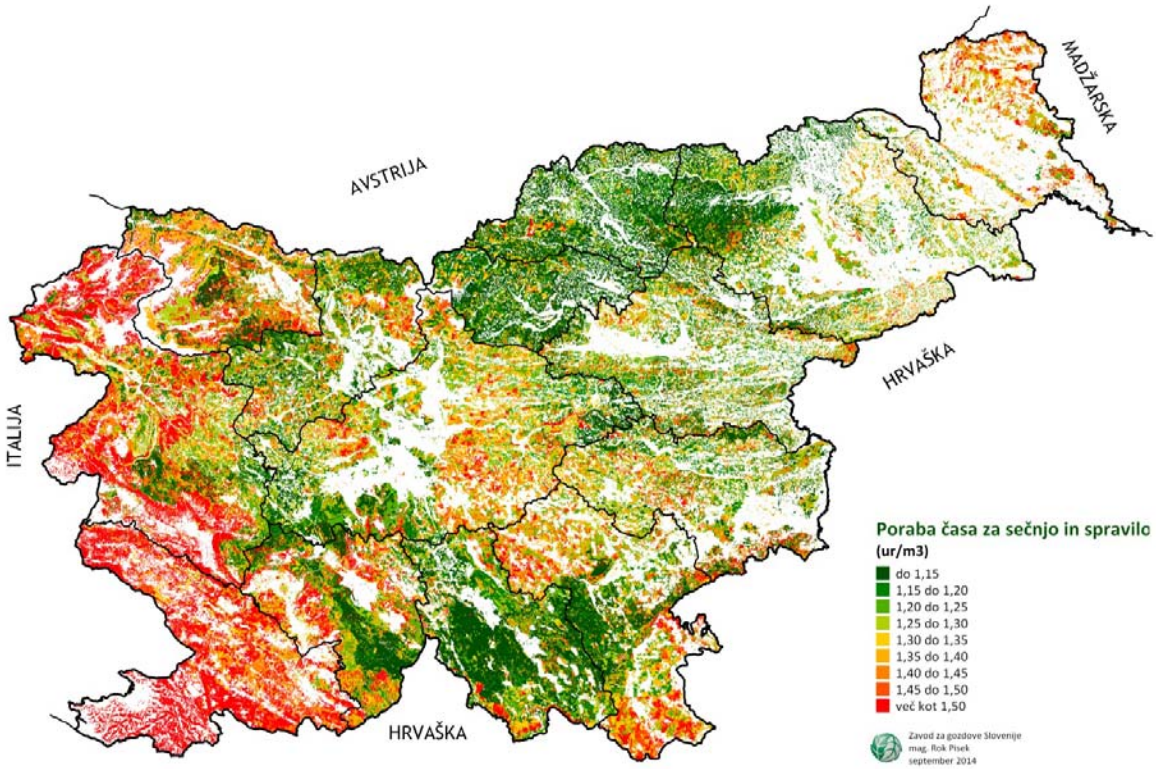
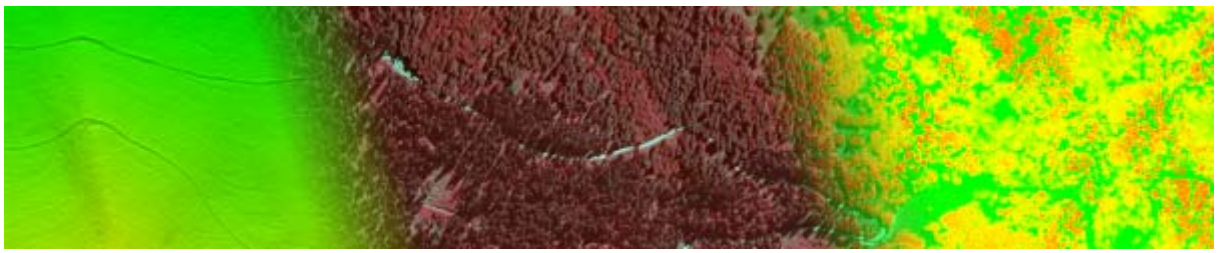


Figure1: Foreseen time spent on logging and harvesting in (hours/m3) for recommended hauling assets



Necessary (N) and the recommended (M) improvements:

N: Using two variables regression to calculate the time of harvesting

N: Consideration of terrain: slope

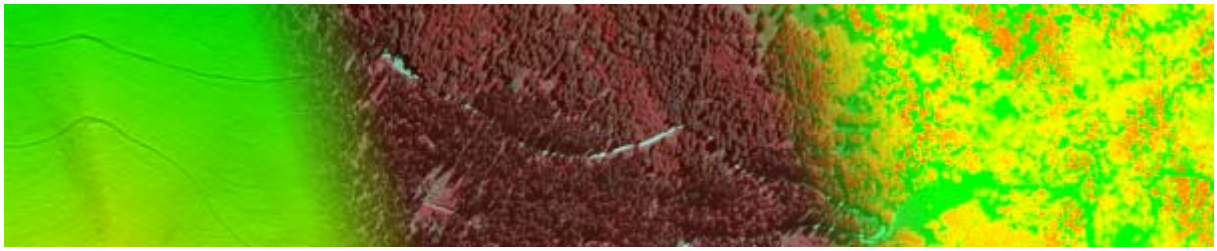
N: Translation from spending time in the costs (EUR) - to obtain inputs Forestry Institute

M: Compliance with relief: stoniness, rockiness

M: Consideration of relief: the shape of the terrain (ditches, flat, etc.).

M: The calculations separately for different spatial units (regions, etc.).

N: When the results will be verified, display on the web site viewer http://prostor.zgs.gov.si/pregledovalnik/



3.2.2 WISDOM ANALYTICAL STEPS. WISDOM BASE (STEPS 1 TO 5) AND WOODSHED ANALYSIS OR PRELIMINARY BIODISTRICT DELINEATION (STEPS 6 AND 7).