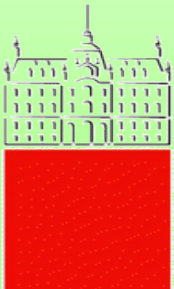


Tools for Evaluating Sustainable and Multi-objective Forest Management Decisions

*LIDIJA ZADNIK STIRN, PETRA GROŠELJ
JANEZ KRČ, VASJA LEBAN,
ŠPELA PEZDEVŠEK MALOVRH*



University of Ljubljana, Biotechnical Faculty, Slovenia
Department of Forestry and Renewable Forest Resources



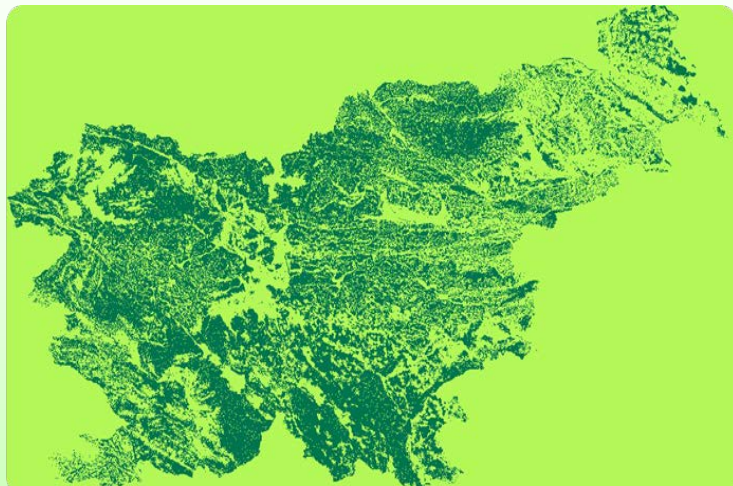
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„Forests provide a wide range of forest products and ecosystem services that are important to humanity; developing effective decisions for the protection of biodiversity and associated ES requires a collaborative interdisciplinary research”

RESULT: The FM strategies must ensure both the owner's income and the other functions relevant to the public as a whole.

CHARACTERISTICS OF SLOVENIAN FORESTS



- ❑ 58,4 % of the territory of Slovenia is covered by forests
- ❑ SLO forests are **diverse**, but of high quality
- ❑ total annual increment cca. 8,3 million m³, annual allowable cut cca. 5,5, million m³
- ❑ very large number of forest owners and co-owners (about 400 000)
- ❑ **Natura 2000** (37% of the total area)
- ❑ **public awareness** and **participation in decision making** is high
- ❑ strong forestry tradition – close to nature, **multifunctional and sustainable forest management**³

TOOLS used in FM decision making

- TOOLS → Models are not new in FMP; they increased after 1980 with great extend
- Prior approaches considered only economic attitudes and one (may be a few) decision maker
- Later economic, ecological, social, technological objectives are respected within participatory process

Methods used in FM decision making

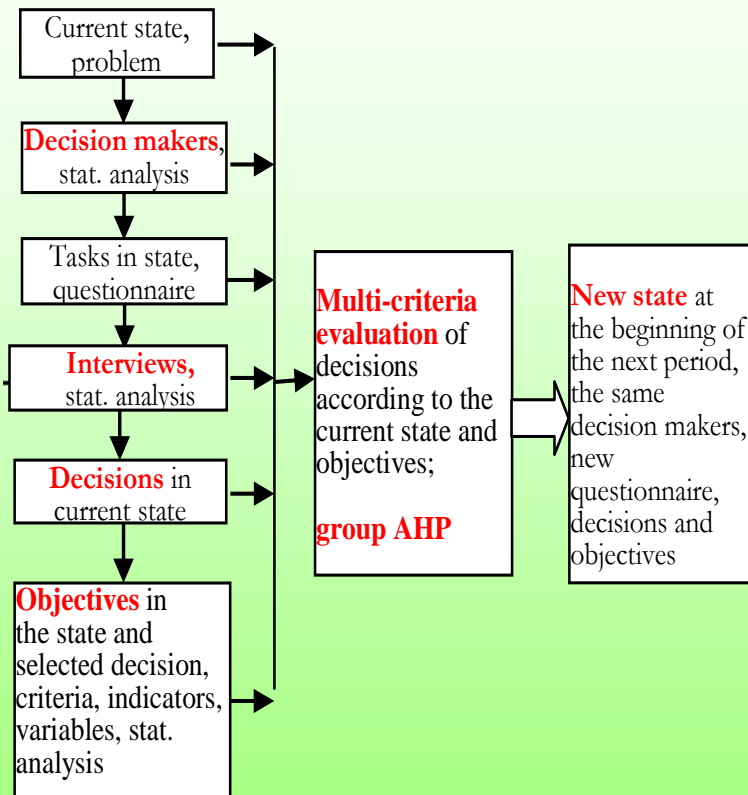
- brainstorming, CATWOE, CAUSE, post-it sessions, diagrams, decision trees, Delphi method, modern **qualitative** methods based on interviews in the sense of exploring and explaining
- **quantitative** methods: deterministic, stochastic and heuristic algorithms, linear, non-linear, dynamic, multi-criteria, fuzzy, iterative, interactive, discrete and continuous

Framework – inspiration for our model

- management in every research field and entity develops **several alternatives** (scenarios, decisions) which must be evaluated, ranked; **decision making problem**
- several decision makers (stakeholders); **GROUP decisions**
- **several criteria**: economic, technological, ecological, social, educational, etc. (**multi-criteria problem**), **MCDA**
- **returns** are weighted outcomes of
 - economic, social and ecological effects (**group AHP**)
- **long term management problem** (multi-phase, **dynamic problem - DP** with steps, states, decisions, returns

DS MODEL - methods

- ❑ Strengths of used methods were merged, disadvantages were overcome and **decision driven model** was generated
- ❑ The **decisions** were determined on survey basis, and multivariate statistical methods
- ❑ The **objectives** of FM were defined using different classifications of ESF and FM regimes dependent on management goals, current forest situation and preferences of decision makers involved
- ❑ Objectives were **evaluated** and prioritized by group AHP and dynamic programming (DP).

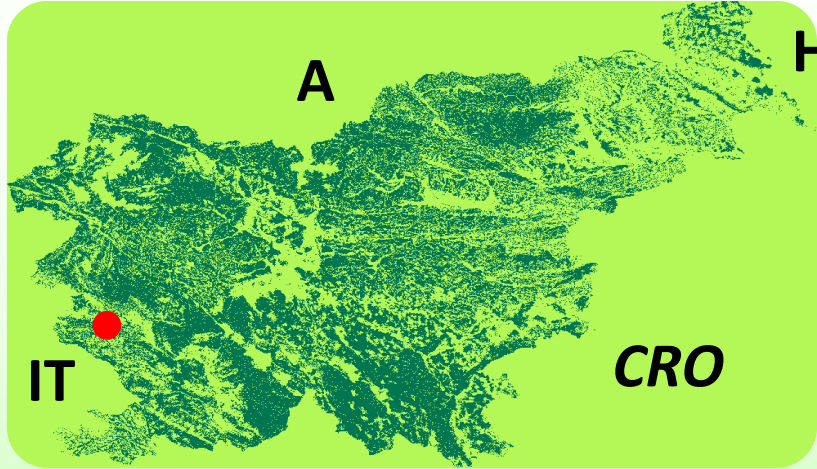


The DSM for optimal FM in first period

CASE STUDY – PANOVEC, SLOVENIA

Details about problems and management of Panovec are described in Zadnik (2003, 2004, EU project MEDMONT).

- area: 380ha, forests 364ha, close to Italian boarder and NG
- preserved old forest, agricultural and urban area **used for:**
 - timber, part of Natura 2000, species diversity, landscape and regional diversity, dendrology (gens), recreation, hunting, learning trail for education, important for fresh water, air, health features, tradition of sustainable and close-to nature forest management







ALTERNATIVES

- Alternative 1: Extensive commercial and recreational development (economically oriented)

This alternative assumes solving the problems which are economically oriented with the project “Forest learning trail Panovec”, i.e. solving the problems of this alternative helps to increase the economic development, especially recreation in the area.

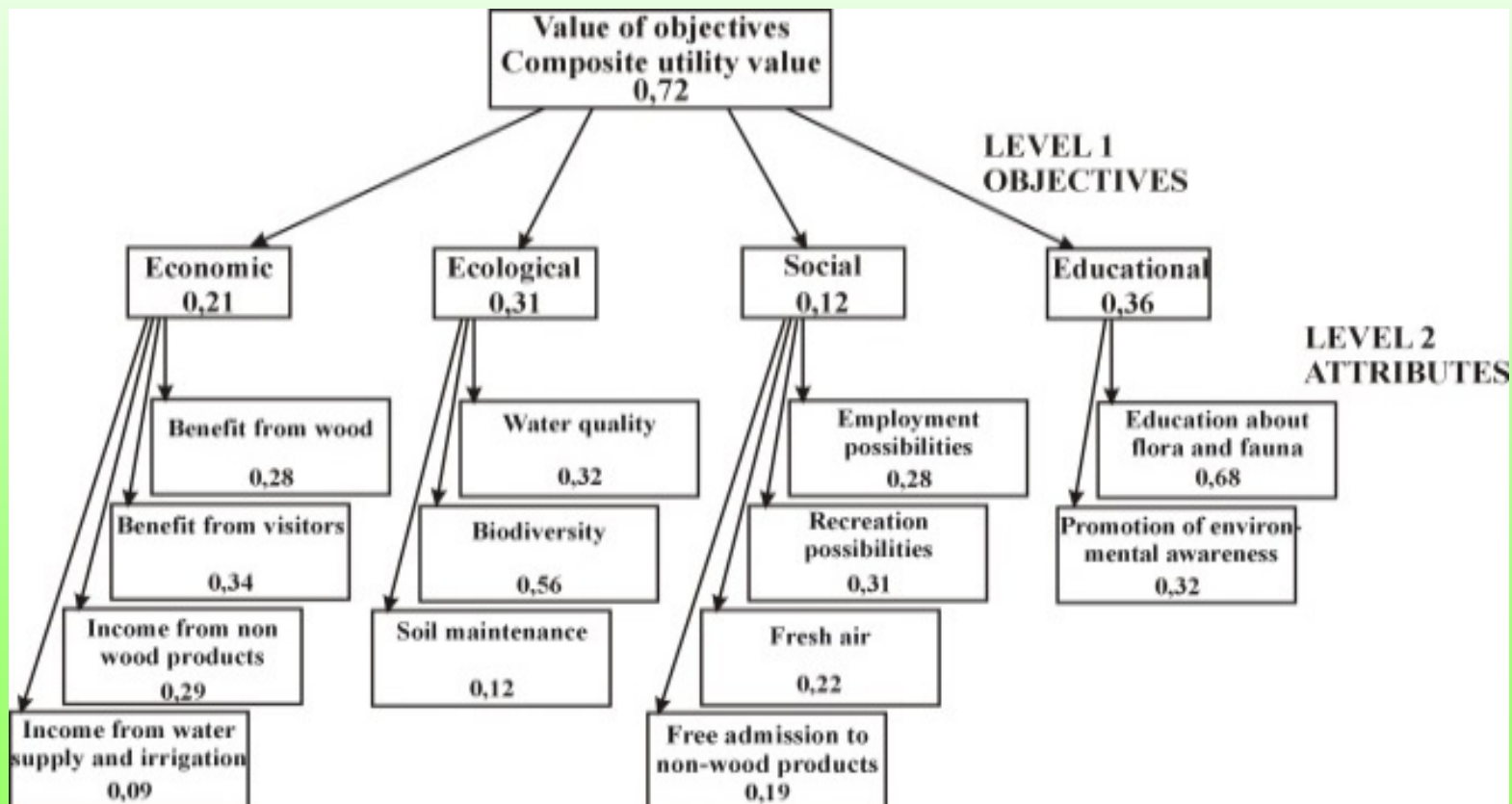
- Alternative 2 : Some development with many natural areas maintained (educational oriented)

This alternative assumes solving the problems which are educational oriented, increases the ecological awareness of public in general, with the project “Forest learning trail Panovec”. No special investment is foreseen; the main role of the project in this alternative is to maintain the current state of the area.

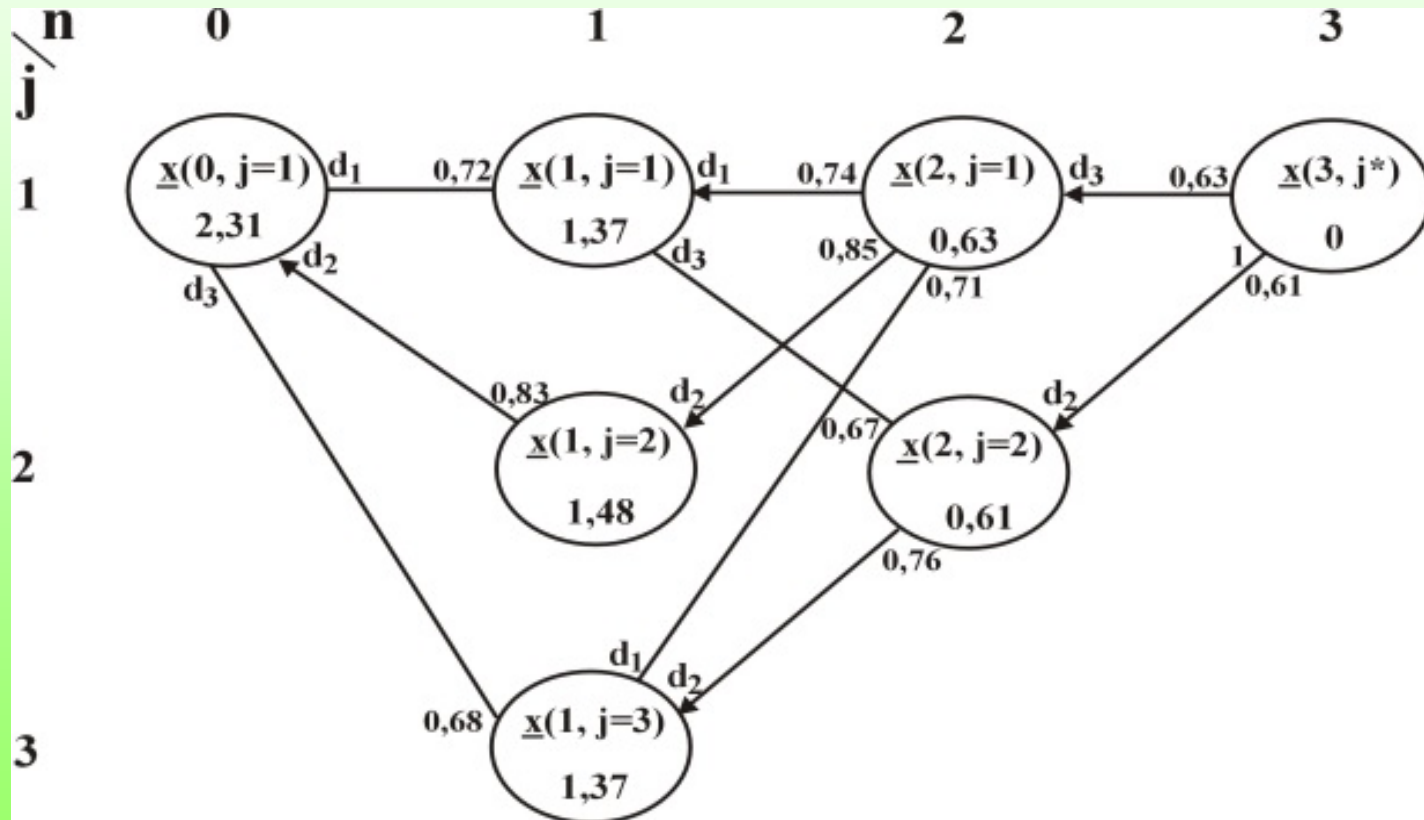
- Alternative 3: Nature protected, sustainable with limited development (ecologically oriented)

In problems (options, tasks), which compile the third alternative, the preservation of nature in biodiversity is considered as a very important concern of the project.

Through meetings and interviews with decision makers several indicators were taken into account and statistically analyzed. After factor analysis 13 main indicators were determined.



Results of discrete deterministic dynamic procedure for the treated forest, with three time periods are obtained by Bellman's procedure.



Conclusions (1)

- ❑ The main goal from the practical point of view was the selection of the optimal strategy for Panovec.
- ❑ The selected strategy can contribute to better Management plan of Panovec. It can serve as the basis for establishment of Regional park Panovec and future projects in Panovec.
- ❑ Results show that all stakeholders unified support to educational development, then economical and in the last place ecological (biodiversity) development.

Conclusions (2)

- A **combination** of qualitative methods, participatory methods, **multi-criteria group AHP and DP** can be a promising approach for better decision making in FMP
- It is shown how to develop feasible scenarios, to evaluate criteria (indicators) to determine the optimal FM comprising production and other ES, including long-term aspect and thus show how system model thinking is used to reach the goals.

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