IMPACT ANALYSIS OF FOREST ROADS

1. Problem rising and research objectives

As a result of rapid development of technology and due to a fact that human labour has been becoming more and more valuable, and forest policies have also been changing, these factors have influenced the practice of our forest management. It definitly means that our *relation* to the forest has changed as well.

Forest management will only be able to meet the social and professional demands if it is perfectly aware of the effects and limits of its own activity. Only a fair awareness can provide finding suitable compromises to avoid today's clashes and irretrievable damages of our future interest.

In Hungary due to site conditions and the existing tree stand structure decisive significance of forest lands require regular intervention, which is carried out by effective management plan. That is why opening up road network is the most important infrastructural establishment in the forests, since this system provides trafficking in the area. Forest soil and nature preserve forest management policy can not be implemented without suitable forest road system.

Construction and operation of forest road opening up establishments dramatically change the life of our forest. Forest road is also one of those establishments, which means a special utulization of the forest for an indefinit but in any case for a long time. That sort of utilization is different from the cutting of forest cropland.

Construction and utilization of forest roads mean significant influence on the forest's environment.

Current forest management policy in Hungary should not look for the proper answer if there is a need of forest roads at all, but *where* forest roads *are necessary to be constructed, how to be constructed,* and *how to utilize* them.

The thesis was designed to answer the following questions:

- What sort of aspects should be reasonable to be taken into consideration to implement forest road network construction to guarantee sustainable forest management?
- What kind of environmental conditions should be regarded in the process of design, construction and utilization in order to minimize disadvantageous effects and clashes?
- How to adopt the costs of forest road construction and maintenance to profit oriented forest policy management?
- Is shouldering certain parts of financial support of road construction and maintenance reasonable? If yes to what extent?

2. Works completed

2.1 Field investigation and evaluation

Three forest roads' field investigation was carried out according to the same scientific point of views (the forest roads were constructed in different time and different methods were applied in construction). Control area, which served as the basis of comparative study was the forest stands of the neighboring area. Findings were compared to conditions of that forest compartment, where forwarding was done since the lack of opening up roads.

Field evaluation to define the characteristics of forest roads were such as follows:

- objective of roads constructed, justification;
- road particulars, location of road, strip width, road crown, structure,
- passing bay, landings, disposal sites, borrow pits, drainage, resistance to erosion, applied method and machinery fleet;

road strip and conditions of its environment were evaluated:

- description of topography, soil and erosion conditions;
- description of abiotic environmental elements;

- evaluation of vegetation based on ecological sectio analisys (Zólyom- type T, W, R value numbers), Simon-type nature conservation categories and Borhidi-type social behavior attitudes;
- description of artificial environment;
- landscape management, social aspects.

2.2 Impact analysis of road construction and utilization

Based on field investigation and evaluation, elaboration of technical literature and other accessible pieces of information I have worked out the list of advantageous and disadvantageous effects of road construction and road utilization. Individual characteristics and possible ways of improvement of those effects have also been identified. The Gilford procedure was an ideal method to identify the relative importance of each individual effect. Results were displayed in an interval level scale.

The parallel comparative procedure were carried out on the basis of the following contributors:

- Opening up Section of Hungarian Forest Association (38 people) **A**
- Employees of four National Parks (42 people)
- Activists of Hungarian Association of Ornithologists, National Conservation Society and activists of WWF of Hungary (7 people) **C**.

Each of the groups was provided opportunities to carry out individual debates on the issues. Repugnance resulted in a sort of value judgment as far as design, implementation and utilization of forest roads are concerned. On the basis of that mutual outcome of the debates, declaration of what aspects and considerations are to be highlighted seemed to be reasonable to have been summarized. In particular, individual cases this procedure is suitable to breathalyze interested partners at local level.

2.3 Cost efficient analysis of forest management and opening up

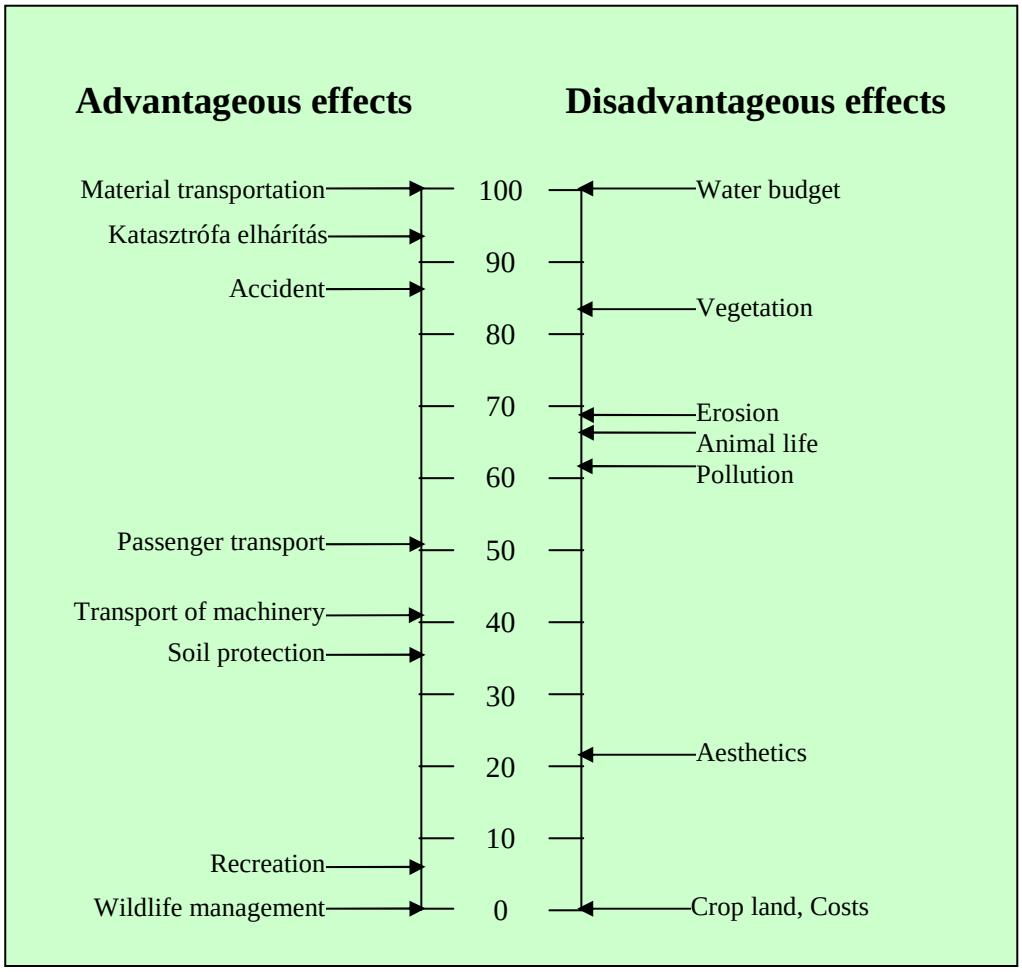
Forest road requirements can not be rendered independent from the economic considerations. That is why factors defining the optimal road net density were investigated, so were financing possibilities of forest road construction and maintenance.

A particular analysis of a forest company helped me to demonstrate the calculation of the collective optimal loading of forwarding and road maintenance. Three slope in degree categories and four forwarding tools were applied in the process.

3. Results

3.1 Weighting effects of road construction and utilization

General value judgment can be identified with the application of the Guilford procedure resulting in defined order. Based on the result, in case of limited possibilities, it is easy to define which factors should be supported.



3.1-1. diagram. Guilford - type weighed - number scale Collective evaluation of effects

The importance of material transport justifies the significance of forest roads. The loss of croplands and the relative overshadowing of costs call for debts of public relations of forestry.

3.2. Forest roads in the system of forest management

Elaboration of technical literature, environmental impact study and other evaluations have reinforced the infrastructural characteristics of forest roads. Reasonable forest management activities can not be implemented without suitable infrastructure. That is why opening up forest road network is an indispensable segment of forest management. Forest roads do not only play significant role in forest management. Beyond that sort of activities - in connection with production - forest roads can support some other services, which

can be regarded as a part of transportation of general nationwide infrastructure.

3.2.1 Road density

To achieve a required measure of forest opening up implementation, different aspects should be harmonized.

Justification of a forest road can be accepted just in the very case of collective realization of the following criterias:

- it is in accordance with the outlined opening up basic concept;
- silvicultural and forest tending objectives of the forest compartment justify the implementation;
- to choose from the acceptable alternatives cost-benefit analysis may help, benefits and cost should be taken into serious consideration as far as external forest management services are concerned;
- environment impact can not be worse than endurable.

Despite the fact that the rate of forest accessibility is **generally** regarded to be very low in Hungary, the necessary investigations and assessments can not be neglected. This sort of attitude should be favorable for those who are involved in forest management activities when the question of road network density occurs.

This attitude will result in a new public awareness policy, which proves that construction of forest roads is indispensable. That is why the rate of acceptable measure of opening up seems to be moving within a wide range (0 linear meter/hectare – 50 liner meter/hectare).

3.2.2 Requirements of forest road design, construction and utilization

To achieve the goal of construction required road network density, construction of individual forest road both in the process of implementation and utilization may pose a high level of risk. Rude intervention into natural environment, lack of suitable landscape design, exaggerated application of unfamiliar materials, negligence of maintenance and repair works may destroy the results of sophisticated network design. Careful design, disciplined execution and utilization may help to avoid clashes.

Improper utilization of forest roads should be changed in order to reduce the unfavorable effects of the forest road. That way those who criticize forest road construction can be persuaded.

Findings of the investigations of the three roads highlighted the most significant viewpoints as follows:

- minimum strip width should be guaranteed in the process of design,
- compliance with the minimum width in the process of construction,
- to minimize the intervention of aquiculture,
- to control erosion,
- professional placement and transportation of the unnecessary materials (stump, earth , structure , building material)
- to avoid sensitive areas.

An environmentally friendly attitude, which is supportive at the possible highest level of not to disturb natural procedures meanwhile designing, constructing and utilizing a forest road. We should be aware of the fact that it will result in certain limits and cost increment. But we have to accept it in the similar way so as we do it with the regulations of Forest Law, regulating certain measures of clear cutting.

3.2.3 Forest maintenance in the framework of profit - oriented forest management

Investments of forest opening up establishments were influenced at the largest extent by external factors (mainly subsidies). Relation of forest management, and road construction and maintenance has not identified a significant correlation of aspects of interests as far as ideas of road maintenance are concerned.

A non - satisfactory and rhapsodically changing forest opening up does not only pose a daily economic problem but in a long run it also manifests a timing problem.

It is the very basic problem that profitability of forest economy does not cover the costs of road network construction

Legislators, authorities and forest managers should act in accordance to meet the demands of sustainable forest development. In that procedure forest road construction plays a very important

role. Professional and public awareness of this attitude would create a new correlation between the legislators and forest managers, between the authorities and forest managers, even between the forest managers and professionals of silviculture. In case this attitude is accepted everybody can adopt a supportive attitude in the implementation procedure.

3.2.4 Financing road maintenance

The necessary forest road density is **generally** lower than required. This backwardness causes serious problems especially in the hilly and mountainous forest areas.

The term of sustainable forest development also covers some other services, which are utilized besides the forest managers. That is why the importance and significance of the forests far beyonds the interests of the forest owners. Forest is one of the possible resource of natural renewable energy so it is a significant element of national asset. Preservation, protection and maintenance of our forest is general public interest.

Since forest roads are not only utilized by professionals of forest management, forest roads play a dominant role in general nationwide infrastructure.

That is why the best solution seems to be state subsidy. Telling the truth we can not speak about subsidy but moreover it should be regarded as a compensation of rendered services.

Forest management has also a lot to do in the field of improvement of financial conditions. Attitude of economic awareness should be supported both in practical and theoretical ways. Forest management also has to persuade the public, especially environmental pressure groups, and NGOs that this new attitude has really been accepted and it will last long. It may result in a tremendous support in finding external resources.

3.3 Summary

Access roads - as units of road network - are primary establishments of silvicultural activities. Simultaneously some other services - individually different scales - are available as parts some

general issues of transportation policy. That **attitude** should be typical of forest managers, legislators, who outline the legal background of economic procedures, representatives of nature

conservation and environmental protection, forest authorities and the civil sphere. That mutual approval should provide a new, more beneficial relationship between the parties interested as far as forest roads are concerned.

Having analyzed the findings of my research and having elaborated the technical literature I have defined the most significant elements to describe that new relation. These are as follows:

1. I have stated that applying a multi-functional system of criterias is reasonable to define the road network **density** of a gravity unit or property creating a forest – block, meanwhile justification of a particular forest road is also available. The most significant elements are as follows:

   - establishment opening up network , long term factors should be taken into
   - consideration ,
   - meeting forestry and other demands at the highest level,
   - cost - benefit analysis based on the properties of the area to be opened up,
   - endurable disturbance of the social and natural environment.

2. I have compiled the general advantageous and disadvantageous characteristics of forest road construction and utilization based on field investigations, assessments and recommendation of technical literature.

3. Applying the Guilford - procedure I could define the particular individual effects, which made it possible to itemize the relative order of significance. It seems to be an indispensable tool of constructing forest roads in order to provide the best possible conditions of the implementation procedure. The process of assessment provided an excellent forum for the parties interested to have a professional debate in connection with forest road construction.

4. On the basis of the findings of the assessment I have worked out a system of viewpoints so as to improve effects of forest roads. Its main issues are as follows:

   - strip width - minimum is required,
   - steady ,stable earthwork , resistance to erosion,

- proper management of materials , transportation,
- preservation and utilization of special forest road engineering skills,
- regular repair and maintenance.

5. I have called the attention to the fact that different measure of opening up - depending on the characteristics of the forest block - is an indispensable factor of the implementation of sustainable forest management.
6. I have stated that generally the forest road-matter still carries little way in strategic planning of forest management.
7. I have disclosed that financing of investments of necessary forest opening up suffers from suitable own financial resources. As the size of the forest property declines the lack of satisfactory financial resource rapidly increases.
8. I have proved that since forest roads play important external roles, and simultaneously forest sector faces significant lack of sufficient internal resources, state subsidy of forest road construction is required. As a matter of fact we can rather speak about compensation of rendered services than state financing.
9. I have also worked it out that the present funding (30 % + interest support) lags behind the expected estimated value of services to be projected, and also lags behind the suitable measure generated by the low profitability of forest management.
10. I have stated that the system of state subsidy should be reasonable to be expanded to renewal projects of existing forest roads, and machinery fleet procurement for organization who are involved in forest road construction and maintenance.

. The author's other publications relevant to the thesis

MAROSI, GY. (1981): Possibilities and limits of technical development in state forests and wood processing workshops.
VEAB Értesítő, 1982, 294-296. p.

MAROSI, GY. (1982): Development of fixed assets in forest companies.
Az Erdő, No: 9., 420-422. p.

MAROSI, GY. (1983): Fixed assets development in state forest companies.
ERTI Gépesítési Információk, 20. p.

MAROSI, GY. (1984 - 85): Sector evaluation of resource-utilization.
Erdészeti Kutatások, Vol. 76-77., 347-350. p.

MAROSI, GY. (1986): Conditions to contribute to the efficiency of forest management.
Erdészeti Kutatások, Vol. 78., 411-414. p.

MAROSI, GY. (1987): Location rent in forest management.
VEAB Értesítő, 149-151. p.

MAROSI, GY. (1992): Incomes and taxes in forest economy.
Erdészeti Kutatások idegen nyelvű kiadása, Vol. 82-83., 133-146. p.

MAROSI, GY. (1992): Methodology of environmental impact assesment of forest opening up.
(Kutatási jelentés, ERTI, Sopron).

MAROSI, GY. (1993): Environmental effects of forest opening up.
II. Országos Agrár-környezetvédelmi konferencia, Budapest.

MAROSI, GY. (1994) : Environmental impact assesment of forest access roads.
Erdészeti Kutatások, Vol. 84., 197-220. p.

MAROSI, GY. (1994) : Importance of environmental impact assesments forest management.
Erdészeti Szakmai Konferencia kiadványa, Sopron, 84-87. p.

MAROSI, GY. (1994): Environmental impact assesment of forest access road.
Kutatási jelentés, Sopron.

MAROSI, GY. (1995): Importance of environmental impact asesments in forest management.
I. Országos Agrár Ph.D. Konferencia kiadványa, Debrecen.

MAROSI, GY. (1995) : Limits of entrepreneurship in forest management.
III. Erdészeti Szakmai Konferencia kiadványa, Sopron.

MAROSI, GY.-GÓLYA, J.- RUMPF, J. (1995): Is forest management profitable?
Alföldi Erdőkért PJT., Kutatói Nap kiadványa, Szolnok, 14-17. p.

MAROSI, GY. (1996): Forest Resource Assessment - multifunctional forest management.
Erdészeti Szakmai Konferencia kiadványa, 132-137. p.

MAROSI, GY. (1996): Forest management, nature conservation, income.
Alföldi Erdőkért PJT. kiadványa, Szolnok.

MAROSI, GY. (1996): Supporting private forest management.
ERTI 2. kiadvány, 100-102. p.

MAROSI, GY. - GÓLYA, J. (1997) : Support of private forests in Hungary.
ERTI 3. kiadvány, 147-150. p.

MAROSI GY. - ILLYÉS B. (1997): Die Rolle des Waldes in der Raumplanung in Ungarn.
Europaforum Forstverwaltung 7. Riederalp. 271-276. p.

MAROSI, GY. (1997): Economic conditions of technological development. Technological development of a multifunctional nature friendly forest management.
Konferencia MTA Erdészeti Bizottság kiadványa, Budapest.

MAROSI, GY. (1999): Comparative cost analysis in forest enterprises.
Erdészeti Kutatások, Vol. 89., 203-222.