Recent developments in forest traffic way construction in Slovenia

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Abstract – Nacrtak

After a decade of regression in forest engineering a distinct increase in skidding trail construction and intentional revival of road constructions in state forests have occurred since the year 2000. In this paper novelties and trends in forest traffic way construction in Slovenia are described. Improved procedures for operational road planning and integration of forest traffic ways into relevant national legislation represent major professional achievements. The main barriers related to forestry infrastructure projects are capital weaknesses, short term orientation and poor cooperativeness of private forest owners. In the future we shall have to introduce and implement technical procedures as well as harmonize the legislative framework with financial measures to encourage forest owners to better cooperation, long-term oriented investments and complex technological solutions.

Keywords: forest engineering, legislation, forest road, Slovenia, traffic way

1. Introduction – *Uvod*

Forest traffic ways are a means to achieve the objectives of multipurpose-forest management. Slovenian society and forestry profession have opted for intensified production and use of wood as a domestic renewable natural source. These objectives, however, will not be attained without constructing new and reconstructing old forest traffic ways.

Forest traffic way construction is a traditional forestry activity in Slovenia, involving planning, design, construction and maintenance of forest roads, skidding trails and fire-fighting forest ways. Although some significant social, economic and technological shifts have taken place in the last 15 years in Slovenia, they have been unfavourable as far as forest engineering is concerned. In spite of it, a series of successful as well as unsuccessful novelties have been introduced. This article presents:

- ⇒ construction of forest traffic ways in Slovenia after 1970,
- ⇒ the current conditions in construction of forest roads in Slovenia, and
- ⇒ substantiates the recommendations for the development of forest engineering.

2. Work methods – *Metode rada*

During our study of the completed construction projects, data on two-year reports on the state of machinery and efficiency in forest exploitation were taken into consideration for the period 1970–1992, as well as reports by the Slovenian Forest Service (SFS) on forests for the post-1992 period. The sources of data on the planned constructions were the district forest-management plans for the period 2001-2010. The financial aspects of the present investment projects concerning forest road construction were analysed by the pattern of Soško gozdno gospodarstvo Tolmin d.d. (SGG) for the period 1999–2005. Development, introduction and evaluation of the novelties in the sphere of forest road construction were implemented during our monitoring of four practical cases of forest traffic way construction from its very concept to its use. For the study cases, the project documentation was prepared by SGG as well.

3. Results – *Rezultati*

3.1 Past and expected dynamic of forest traffic way construction – *Dosadašnja i očekivana (buduća) dinamika izgradnje šumskih prometnica*

In 1970, 5,064 km of forest roads in state and privately owned forests were registered in Slovenia (Remic 1971). The annual construction dynamics after 1970 is presented in Fig. 1.

In the period 1971–1980, numerous unpaved and public roads were built in Slovenia that enabled access to farms and villages in forested areas. The construction of roads and skidding trails reached its peak in the period 1982–1984, when over 300 km of forest roads were built annually. In the early 1990s, the financing of road construction system broke down, which in turn caused an utter collapse of forest engineering. The poor state of the existing forest traffic ways resulted in the establishment of the system aimed at financing the maintenance of forest roads. In 2000, the Ministry of Agriculture, Forestry and Food (MAFF) launched the first tender for co-financing road forest building and elaboration of project documentation to the total value of ca. 200,000 €. The Slovenian Agricultural and Forest Land Fund (AFLF) allocated about 625,000 € for the construction of new forest roads. In the last two years, somewhat greater interest by private owners (organised within societies) has been noted in construction of roads and skidding trails. In 2006, all the money offered by the MAFF tender was allotted to private investors. In 2004, we had 4,335 km of forest roads in state owned forests and 8,348 km in other forests (SFS 2005). In 2001, the average openness of Slovenian forests with roads amounted to 20.9 m/ha (SFS 2005). Establishing the infrastructure required also substantial soil movement and disturbance (Fig. 1).

The forest road network in Slovenia is not optimal. It is getting increasingly worn out, and the new transport technologies demand certain adaptations to be made in the existing technical elements. The planned construction for the period 2001–2010 (SFS 2004) was 1,077 km of roads and 2,923 km of skidding trails. In the period 2001–2005, the total length of newly built roads reached 80.9 km and 1,846.4 km of newly built skidding trails. In the first five years of the implementation of regional plans, the planned extent of built skidding trails reached 63%, whereas and the planned extent of built roads reached 7.5%.

3.2 Characteristics of road investment projects in the period 2000–2006 – *Značajke projekata šumskih cesta u razdoblju 2000 – 2006.*

According to the European classification of civil engineering structures (SURS 2006), forest roads and ways are classified as facilities of traffic infrastructure. In planning and construction of roads, applicable laws and regulations related to forestry, environmental protection, spatial planning, work, investment and building must be taken into consideration. The direct participators in road construction are the investor, designer, constructor and supervisor. The investor makes all the main decisions, coordinates the activities and delegates various responsibilities. The construction takes place in five phases: specification of initiatives, selection of the optimal variant, implementation of the plan, implementation of the construction itself, and itemized statement of works and acquisition of the operating permit. There are several obstacles in the implementation of the investment project, the highest among them being of financial nature.

By analysing 43 projects, the total value of investments into roads in state forests amounts to almost 4 million € for the period 2000–2006. The average

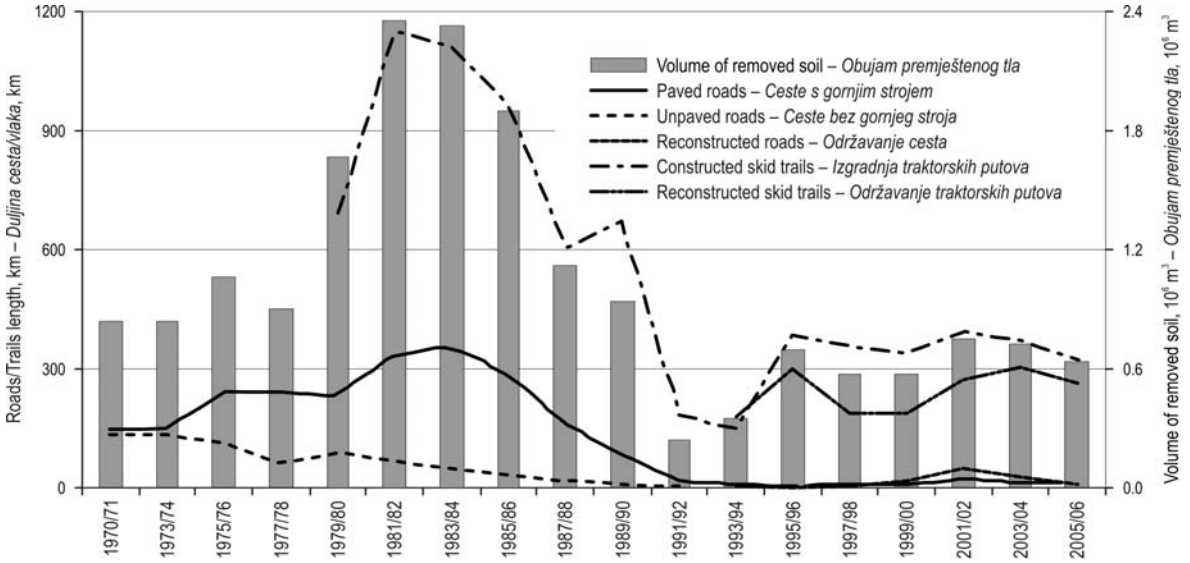

Fig. 1 Average annual extent of constructions and reconstructions in forestry
Slika 1. *Prosječne godišnje količine radova izgradnje i rekonstrukcije šumskih prometnica*

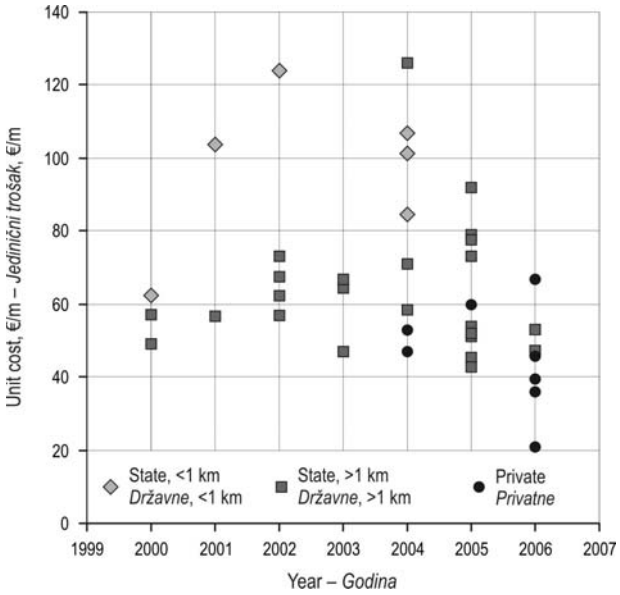

Fig. 2 Direct construction costs for 1 m of forest road
Slika 2. *Izravni troškovi izgradnje šumskih cesta (po m)*

value of construction works (calculated for the year 2006) in road construction for the analysed projects in the state and private sectors amounts to 65 €/m (Fig. 2).

A more detailed analysis of costs incurring in construction of forest traffic ways within the framework of 13 projects has shown that the average costs of project documentation for the accessible projects of forest roads as of simple and less demanding civil engineering facilities amounted to 3.2 €/m (excl. VAT).

During the construction of more forest road longer than 2 km, and skidding trail longer than 1 km, the investor is obliged to provide for professional supervision of the planned construction. The costs of such supervision amount to 1.5–2.5% of the net value of construction works. As a rule, the private investors implement construction supervision on their own or entrust it to corporate bodies that do not fulfil the conditions related to this type of activity.

In recent years, more additional costs have been acquired by the above three standard groups of forest road construction costs depending on the type of project and they will be presented further in the text.

3.3 Novelties and trends in forest traffic way construction in Slovenia – *Novosti i trendovi pri gradnji šumskih prometnica u Republici Sloveniji*

3.3.1 Legislation – *Zakonska regulativa*

The legal basis for the construction of forest traffic ways is the Building and Construction Act (2002) and the related by-laws, particularly directives regarding various demanding, less demanding and simple facilities and conditions for their construction (2004). The sectorial legislation regulates the details that concern permissible special features of forest traffic ways, while all the remaining legislation stipulates the conditions for their construction. The register of the relevant technical construction legislation involves over 100 units (MOP 2006), but the list does not include economic, tax, work, safety or forestry regulations. Such legislation, however, is not suitable from the forestry standpoint as it:

- ⇒ equalizes the legal conditions for building on forest plots with that of building on urban plots;
- ⇒ prevents affirmation of public interest in construction of forest traffic ways within forest smallholds (indifferent, inaccessible owners);
- ⇒ severely limits the autonomy of forestry in the construction of skidding trails, particularly in protected areas;
- ⇒ sets different tax rates in construction and maintenance of forest traffic ways;
- ⇒ burdens construction with various tasks that disproportionately raise the price of investments;
- ⇒ excludes public sector from the entrepreneurial activities of planning and construction supervision.

The major achievement in the sphere of sectorial construction legislation is the adoption of rules for forest traffic ways (2004) that introduces the zero line plan, states the minimal technical specifications and categorisation of forest traffic ways and regulates their planning, design, construction and use. Apart from numerous good solutions, the set of these regulations deals quite inadequately with the status of reconstructions and improvements and indistinctly regulates the construction and preparation of skidding trails.

3.3.2 Access development planning – *Razvoj planiranja*

Today, the planning of forest opening is carried out entirely by the Slovenian Forest Service and is divided into framework and operational planning. The first takes place within the framework of forest-management planning at the management unit (MU) level, whereas the operational planning concerns, at the investor's request prior to the elaboration of project documentation, the area opened up by the planned traffic way.

The basic product of forest opening operational planning is the zero line plan, which has been prepared by SFS since 2005 and stipulates the permitted

type of traffic way and its general course. The analysis of zero line plans for study cases has shown that:

- ⇒ the time for the elaboration of zero line plan is proportional to the size of the area and the number of variants;
- ⇒ the quality of the plan is highly dependent on the available backgrounds;
- ⇒ the major source of costs of the plan is the professional fieldwork personnel;
- ⇒ the plans depict the skidding trail network and the estimates of skidding distances quite inadequately.

One of the open questions of framework forest opening planning is the selection of competent indicators, especially the optimal road density. According to practical experiences the optimal road density is not a relevant parameter for improving the access to the isolated remote areas. The major future treat regarding traffic way planning is the ignorance of professional foresters in future construction legislation.

3.3.3 Design – *Projektiranje*

Design is an economic discipline of preparing project and technical documentation and representing the investor in various construction matters. In design of forest traffic ways, three levels of documentation complexity are distinguished: for less demanding civil engineering facilities (type A), for simple facilities with non-forestry consents (type B), and for simple facilities (type C). The complexity of project documentation depends on technical elements, the degree of interactions of the planned project with buffer zones and protected areas, and the number of owners and investors.

Prior to the construction of every forest traffic way, one has to provide for the availability of land covering the area of the future road as well as the area of influence of the entire project, including the area stemming from minimal distances from abutters. If the investor has the right of ownership over all the plots of land in the area of influence of the planned construction at his disposal, attested land register extracts are to be enclosed to the project documentation, while in case the roadway area of influence is multiproprietary, the investor is obliged to acquire the right of construction with co-investor's or land use contract with land owners. Individual financial participation is stipulated, in simple cases, with the negotiation method, proportional costs or benefits, or with their combinations in complex situations. Apart from the financial structure, the most difficult issue in the construction project is the question of mediation between landowners and various groups of interest. The multiproprietary road projects implicitly require a »spiritus agens« – a person that leads a project on his own initiative over all obstacles. Most often, this is an interested forest owner, only exceptionally the local ranger or project designer.

For type A forest road projects, geodetic plan for the project documentation is to be acquired for conceptual solution alone, whereas for others an accurate graphic presentation of the project in view of the abutters is to be acquired, for which DGPS is increasingly used. The price of these services ranges between 800 and 1,500 € net for the 2,000–5,000 m long alignments.

For all forest road projects, a licensed coordinator for safety and health at work is to be appointed already in the phase of design, whose role is to prepare or revise the safety plan. It is highly practical if the appointed coordinator in the phase of project design is also the coordinator in the phase of actual implementation of works. The coordinator's appointment is the responsibility of the project designer or constructor. The price of this service ranges between 150 and 400 € per individual project.

From the initial idea to the beginning of a legal construction we need, according to some rough estimates, at least 6 months for type A documentation, 3–4 months for type B, and at least 2 months for the documentation of type C. The proportion of time for administrative works, as a rule, amounts to over 50% for type A, 30–50% for type B, and up to 30% for type C, although only in cases when there are no conceptual complications and if all the involved keep to the stipulated time limits which, however, is more the exception than the rule. Any delays and unnecessary costs in the preparation of project documentation are best avoided with the so-called phase approach, where the concluding components of project documentation are developed gradually. The market of design services in the sphere of forest road construction is poorly developed.

3.3.4 Construction – *Izgradnja*

The construction phase begins with the selection of the most favourable constructor. If the public sector is involved, public invitation to tenders is made. Construction in concession forests is carried out by concessionaires as per prices stipulated by project documentation. Private investors, too, are trying to save money within the construction phase. The prices of construction services offered by private constructors are on average by up to 15% lower for comparable works than those of concessionaires with their own personnel. The quality of works carried out in state forests is higher, the guaranteed deadlines for the works carried out by concessionaires are longer, whereas maintenance costs for the roads built in state

forests are lower. A comparison of the structure of costs of the main construction subphases for the studied alignments with the available data shows that about a half of construction costs are incurred by earthworks (Fig. 3). The second highest costs involve the preparation of pavement, which encloses construction of roadside ditches and drains. The share of costs of facilities varies a great deal and depends on the actual conditions on road alignments. Shorter roads are not necessarily cheaper per unit length.

Today we are constructing roads, which are actually by at least 30% more expensive, on average, than those in the 1970s and by over 90% more expensive than those built in the 1980s. The rise in prices has been expected, considering that the average terrain conditions, in which roads are built today, are by far more demanding than in the past. On the other hand, it could be expected that the service market would mitigate the rise of prices to a somewhat greater extent. This, however, has not happened at all. The reasons for such state of affairs could be partly ascribed to the small extent of constructions carried out and to the fact that in accordance with the new regulations the constructors are liable to repair the damages inflicted to roads within the guaranteed deadline at their own expenses. In the guaranteed period, this kind of extent of works reaches 3–8% of the value of construction works and is, as a rule, included in construction costs. Although the prices of construction works in forestry are lower than those of comparable works in public road construction, we estimate that we still have about 10% of manoeuvring space in construction costs, whereas the possible differences are due to the smaller quality of facilities or inferior »post-sale services«.

In the last ten years, the technology of forest road construction has not changed substantially. Most of the works are carried out by diggers (with the power of over 100 kW), and practically no blasting is practised any more. The most noticeable change is the simultaneous presence of diggers, separators and road rollers at working sites. There are more and more longitudinal transports of the excavated material of up to 1 km, which are direct environmental protection costs.

The majority of roads built in the 1970s and 1980s ran across less demanding terrain and needed no special facilities. Today's non-open forests are situated, as a rule, in constructionally extremely difficult terrain, where the supporting, propping, drainage and bridging facilities follow each other. Although technical elements of such facilities are stipulated in project documentation, they cannot be foreseen to the last detail. In spite of a good provision of services concerning construction mechanization, there are only few high quality constructors in the country. This is why the need for supervisors, who can provide for good quality of construction and in most cases compensate for their costs, is becoming increasingly great.

3.3.5 Operation permit and utilisation regime – *Uporabna dozvola i pravila uporabe*

The facilities built on the basis of construction permits cannot be utilised without operation permits. To acquire the latter, suitable technical documentation (the project of the works carried out or the

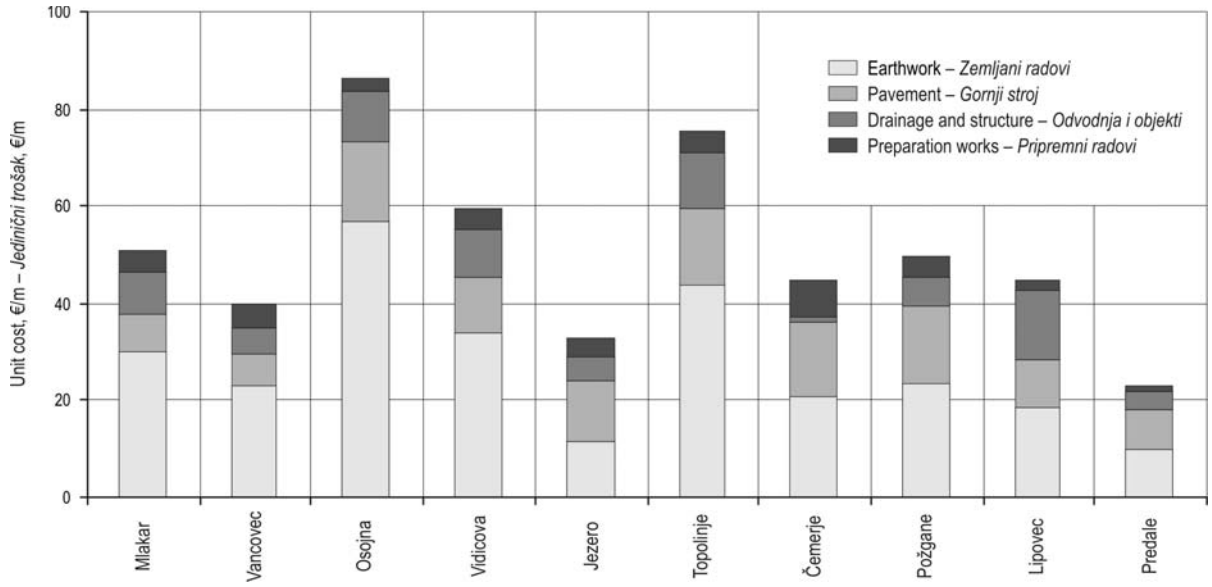

Fig. 3 The structure of calculated construction costs in some forest road projects
Slika 3. *Struktura troškova izgradnje nekih projektiranih šumskih cesta*

designer's statement that the facility was built in accordance with the project for construction permit) and geodetic plan of the new condition of the land must be obtained. Furthermore, a technical inspection of the facility is to be made by administrative body, which issues the operation permit. The price of technical documentation is from 20 to 35% of the project documentation value. The price of geodetic plan depends on the available backgrounds. If the geodetic plan is made for the acquisition of the project documentation, the price of the geodetic plan of the new condition of land in the geodetic plan for entry in the register of facilities is 800–1,000 €, otherwise its price is two to three times higher.

For the roads built as simple and less demanding facilities, which we wish to include in the forest road network and into the system of its maintenance, a professional technical inspection by SFS is also needed. This inspection, however, does not replace technical inspection carried out by administrative body. The operation permit is followed by the final account of works, which during the construction in natural environment often deviates from the estimated and contract values. The wearisome negotiations in the evaluation of additional works can be best avoided with a consistent keeping of construction diary and with construction supervision. The costs of authorized supervisor are, as a rule, smaller than the unfounded demands by constructor.

The forest road utilisation regime is stipulated by SFS in cooperation with forest owners. From the aspect of public significance of forest roads, the most disadvantageous measure of limiting the utilisation of forest roads is their closing with barriers. The latter, however, are simply unavoidable in certain cases.

4. Discussion and Recommendations – *Rasprava i preporuke*

The 1990s were rather dry for the Slovenian forest engineering. At that time, the professional and administrative posts were occupied by people whose motto was that forest transport-network construction should be tackled as gently and as cheap as possible. In general, this is right, but in specific situations the decisions should be made in accordance with the facts dictated by functional units, growing stock, skidding distance and the extent of the area of influence in the multipurpose-forest opening. In multipurpose forests with the growing stock of over 250 m^3/ha and with the average skidding distance exceeding 800 m, a road is a technological necessity. In high quality forests with substantially higher growing stock, this holds true for the average skidding distance of up to 500 m as well. If we are dealing with smaller districts and less profitable forests, we should consider building unpaved roads – with the expected savings amounting to 20% of the investment. As a rule, the districts with average skidding distance of less than 400 m are opened with skid trails and cable yarding.

In the middle of the period covered by district plans from 2001, we can conclude that we shall probably attain the planned objectives regarding the construction of skid trails, but will certainly not be so successful in the construction of forest roads. The situation is particularly unfavourable in privately owned forests, where practically no roads are being built. The reasons for such state of affairs are manifold and concern both the investors and the forestry profession itself.

The new social conditions have brought new investors and an utterly different understanding of property. In this paper we have shown that the state is an example of the owner that has become aware of the need to invest in forests with relative construction of skid trails and roads. In privately owned forests we are witnessing, by contrast, a predominance of skid trail construction with no motifs for long-term investments and lesser environmental consequences. While it is true that in our country smallholds prevail and that private owners are capital-weak, we can witness a fairly low degree of their environmental awareness and readiness for financial participation in various infrastructural projects. Construction of forest roads is, irrespective of ownership, no doubt in public interest. And the owners justifiably expect the state to cooperate in their investment intentions.

In the construction of skid trails and roads, the forestry profession has not succeeded, since 1993, in establishing a system of building forest traffic ways, but has been mainly concerned with adapting to the prescribed legislative framework. In contrast to the maintenance of roads, where the conditions in the mid-1990s virtually enforced the formation of the system, we have the established construction practice as follows:

- ⇒ set of regulations that are giving preference to the form of documentation over its contents;
- ⇒ professional services that are finding it increasingly difficult to implement high quality constructional solutions;
- ⇒ financial instruments that are absolutely too small, unpredictable and ineffective.

If we wish to increase the extent of wood production processes in the period 2007–2013 and to retain the high level of environmental sustainability, we have to continue with a steady construction of

skidding trails and to encourage intensely the construction of roads in places where they are truly needed. The technical solutions introduced in the previous period are not only mostly unsuitable, but there is also a lack knowledge and will to implement them.

In the future we have to continue with the development of technical and administrative procedures in the way that will encourage the investors to participate with integral solutions and long-term investments. The main professional challenges in the construction of forest traffic ways in the ensuing period are:

- ⇒ to implement the zero line plan as a compulsory professional product for all districts, where new major roads or reconstructions are to be built;
- ⇒ to substantiate and implement the instrument that will enable a just affirmation of public interest during the construction of forest roads in multipurpose forests in case of inaccessible or uninterested owners;
- ⇒ to adapt the project and technical documentation to the technical requirements and environmental consequences of the constructions carried out;
- ⇒ to rationalize the implement the construction works on the basis of the actual costs that reflect the project solutions and the actual field conditions;
- ⇒ to increase the amount of financial incentives in all construction phases and to differentiate them per development priorities (associating of forest owners, montane areas, state/private projects …).

By conquering the above stated challenges, the multitude of procedures in forest road construction would become more transparent, manageable and attractive to potential investors. By adding the key solutions to the existing legislation, the so-called »construction system« would be acquired, which would enclose and balance the solutions in the sphere of new constructions, reconstructions and rehabilitation of all built forest traffic ways.

The establishment of the »construction system« building is not the matter of a single institution but a lasting task of all professional and administrative services in Slovenian forestry. The solutions must be first of all prepared, then adjusted within the forestry profession, implemented within other relevant services and monitored, then differences critically judged and adapted to new circumstances. The construction system can be shaped either gradually or radically. The first approach tackles the problems from the smaller to the more complex ones. The other approach changes only one of the basic items of the present arrangement of this sphere and causes changes in most of organizational and financial solutions. More suitable for our conditions is the gradual scenario, although the radical approach cannot be totally excluded either. We can opt for it on our own, or it may be imposed on us by others, as a result of our mistakes or professional inertia.

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Sažetak

Suvremeni razvoj šumskih prometnica u Sloveniji

Šumska je prometna infrastruktura nužna pri višefunkcionalnom gospodarenju šumskim ekosustavima. Također je jedan od strateških ciljeva slovenskoga društva i šumarske struke povećanje proizvodnje i uporabe drva, što je nemoguće postići bez izgradnje novih i rekonstrukcije postojećih šumskih prometnica. Uspostavljanje mreže šumskih prometnica, tradicionalne šumarske aktivnosti u Sloveniji, obuhvaća planiranje, projektiranje, izgradnju i održavanje šumskih cesta, traktorskih putova i protupožarnih šumskih prometnica.

U radu se prikazuje kretanje dinamike izgradnje šumskih cesta i traktorskih putova od 1971. do 2006. godine. Izvori su podataka dvogodišnja izvješća (od 1970. do 1992. godine) te godišnja izvješća Slovenske šumarske agencije (Slovenian Forest Service) od 1992. godine do danas. Kao izvore podataka za planirane radove izgradnje i rekonstrukcije šumskih prometnica koristili smo se osnovama šumskih područja za razdoblje 2001 – 2010. godine. Financijsku sastavnicu projekata analizirali smo na primjeru šumskoga gospodarstva Tolmin d.d. u razdoblju 1999 – 2005. godine.

Dinamika izgradnje šumskih cesta s gornjim strojem i šumskih cesta bez gornjega stroja, rekonstrukcija šumskih cesta, te izgradnja i rekonstrukcija traktorskih putova od 1971. pa do 2006. godine prikazane su na slici 1. Najviše je šumskih cesta s gornjim strojem (više od 300 km godišnje) građeno između 1982. i 1984. godine. Početkom devedesetih godina postojeći je sustav financiranja izgradnje i održavanja šumskih cesta doživio svoj potpuni slom.

Tijekom 2000. godine Ministarstvo poljoprivrede, šumarstva i prehrane raspisuje natječaj za sufinanciranje projektiranja i izgradnje šumskih cesta u vrijednosti 200 000 €. Iste godine Slovenski fond za poljoprivredno i šumsko zemljište usmjerava 650 000 € za izgradnju novih šumskih cesta. Posljednje dvije godine zabilježeno je nešto veće zanimanje privatnih šumovlasnika za izgradnju šumskih cesta i traktorskih putova (potpuni iznos koji je spomenuti Fond izdvojio 2006. godine uložen je u otvaranje privatnih šumoposjeda).

Prosječna je otvorenost svih slovenskih šuma šumskim cestama 2001. godine iznosila 20,9 m/ha i nije optimalna. U 2004. godini Slovenija je imala 4335 km šumskih cesta u državnim i 8348 km šumskih cesta u privatnim šumama. Treba provoditi daljnje otvaranje, ali i rekonstrukciju šumskih prometnica. Sukladno osnovama šumskih područja do 2010. godine trebalo bi izgraditi 1077 km šumskih cesta i 2923 km novih traktorskih putova. Od 2001. do 2005. godine izgrađeno je 80,9 km šumskih cesta (ostvareno je 7,5 % plana) i 1846,4 km traktorskih putova (ostvareno je 63,0 % zacrtanoga plana). U privatnim šumama šumske ceste gotovo i nisu građene.

Analizirana su 43 glavna projekta šumskih cesta, a rezultati su prikazani na slici 2. Prosječna cijena izgradnje iznosi 65 €/m (65 000 €/km), a ukupna je vrijednost svih projekata blizu 4 milijuna eura Cijena izrade glavnoga projekta (bez PDV-a) iznosi 3,2 €/m (3200 €/km). Za šumske ceste duljine veće od 2 km i traktorske putove duljine preko 1 km nužno je imenovati nadzor čija je cijena od 1,5 do 2,5 % od ukupne neto vrijednosti investicije.

Zakonska osnova za izgradnju šumskih cesta je Zakon o gradnji objekata (2002) i Pravilnik o šumskim prometnicama (2004). Iako je Zakon o gradnji objekata dobro riješio neka dotad neriješena pitanja povezana sa šumskim prometnicama: nultu liniju, minimalne tehničke uvjete, kategorizaciju šumskih prometnica, proceduru planiranja, projektiranje izgradnje i održavanja, neke su stvari ostale nedorečene, npr. rekonstrukcija šumskih prometnica, izgradnja i popravak traktorskih putova i dr.

Planiranje je šumskih prometnica pod ingerencijom Slovenske šumarske agencije, a dijeli se na generalno i operativno planiranje. Rezultat je operativnoga planiranja nulta linija koja okvirno definira trasu buduće šumske ceste. Jedno od otvorenih pitanja koje pri generalnom planiranju treba riješiti jest optimalna gustoća šumskih cesta; naime prema praktičnomu iskustvu optimalna gustoća šumskih cesta nije pouzdan parametar za poboljšanje pristupa udaljenim i izoliranim šumskim područjima.

Pri projektiranju šumskih prometnica, sukladno tehničkim značajkama projektiranoga objekta, stupnju interakcija projektiranoga objekta i zaštićenih područja te broju šumovlasnika i investitora, mogu se razlučiti tri stupnja složenosti projektne dokumentacije (A, B i C). Od početne ideje do legalnoga započinjanja s izgradnjom (dovršetka i prihvaćanja projekta) za tip A treba minimalno 6 mjeseci (50 % vremena otpada na administrativne poslove), za tip B minimalno 2 do 4 mjeseca (30 % vremena odlazi na poslove administracije), a za tip C minimalno 2 mjeseca (do 30 % vremena troši se na administrativne poslove).

Postupak izgradnje započinje odabirom najpovoljnijega izvođača radova. Ako se radi o ostvarivanju projekta u državnim šumama, raspisuje se javni natječaj. Uglavnom je kakvoća izgradnje šumskih cesta, uz kraće i poštivane rokove, bolja u državnim šumama. Također su u državnim šumama niži troškovi održavanja šumskih cesta. Raščlamba strukture troškova izgradnje za deset odabranih projekata šumskih cesta prikazana je na slici 3.

Danas je, u prosjeku, cijena izgradnje šumskih cesta 30 % veća nego sedamdesetih godina i 90 % veća nego osamdesetih godina prošloga stoljeća. Razlog leži ponajviše u činjenici kako su tereni na kojima se ceste grade danas puno teži nego u prošlosti, a zahtjevi za zaštitu okoliša puno stroži nego što su bili prije. Prije deset godina postupci izgradnje šumskih cesta nisu se značajnije mijenjali. Glavnina se radova obavlja bagerima snage preko 100 kW, a nadzorni inženjeri imaju važnu ulogu jer unatoč dobroj mehanizaciji izvođači radova vrlo često ne poštuju detaljno izrađene projekte.

Zaključke o potrebi otvaranja određenoga šumskoga područja šumskim cestama treba donijeti ovisno o namjeni šuma, drvnoj zalihi, postojećoj srednjoj udaljenosti privlačenja drva. Općenito se može zaključiti da je u gospodarskim šumama s izraženim općekorisnim funkcijama te drvnom zalihom preko 250 m^3/ha i srednjom udaljenosti privlačenja preko 800 m izgradnja šumskih cesta tehnološka nužnost. U vrijednim šumama s bogatijom drvnom zalihom treba graditi šumske ceste ako srednja udaljenost privlačenja iznosi više od 500 m.

Ako je riječ o neotvorenim manjim šumskim područjima s niže profitabilnim šumama, treba razmisliti o gradnji šumskih cesta bez gornjega stroja. U šumama sa srednjom udaljenosti privlačenja ispod 400 m treba graditi traktorske putove (kada se koriste zglobni traktori) ili koristiti šumske žičare. Država je svjesna potrebe daljnje izgradnje šumskih prometnica kao dugoročno isplative investicije. U privatnim pak šumama prevladavaju traktorski putovi i trenutačno nema motiva za dugoročno isplativo investiranje u šumske ceste. Od države se očekuje pomoć pri ostvarivanju zahtjevnijih infrastrukturnih projekata (izgradnja šumskih cesta).

U budućnosti treba nastaviti s razvojem tehničkih i administrativnih procedura koje će potaknuti investitore na zajednička, međusobno povezana i dugoročno isplativa ulaganja. Nužno je izraditi i postojećim zakonskim propisima, radi rješavanja brojnih otvorenih pitanja povezanih s izgradnjom, rekonstrukcijom i popravcima šumskih prometnica, dodati tzv. »sustav izgradnje šumskih prometnica«. To je posao koji zajednički trebaju odraditi sve sastavnice slovenskoga šumarstva, a pri tome je moguć postupan ili radikalan pristup. Podržava se postupno rješavanje problema od jednostavnijih ka složenijima.

Ključne riječi: šumarsko inženjerstvo, zakonodavstvo, šumske ceste, prometnice

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