

# Analysis of Work Accidents in Timber Transport in Slovakia

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**Abstract.** From the aspect of safety at work, we consider the timber transport under the risky works. Data about accidents at work in forestry for the period 1996 – 2014 were summarized. The database contained more than 1500 work accidents in forestry. Laboratory Accident Coding Methodology was used, according to European Statistics on Accidents at Work (ESAW). In total, 105 registered work accidents in timber transport, during the investigated period, were recorded. This correspond to 7% share of registered work accidents. From the anthropological aspect, the legs and whole body were most frequently injured. The highest number of accidents on Tuesday were recorded, with the most risk month of February. The highest accident rate in 2002 were recorded. In general, forestry is classified as a risky activity. The timber harvesting and transport process belongs to the most risky works, from the aspect of the risk formation on the work accident, which are in forestry conducted. From all phases, which are in this process involved, the phase of timber transport is the least risky, in terms of the risk rate on accident formation as well as the absolute abundance of accidents.

## 1 Introduction

Timber transport was in the past one of the main production phases of the timber harvesting-production and transport process in the Slovak forestry sector. With the growth of timber sales directly on the site, respectively on the forest depot, gradually decrease the importance of the main wood storages, and thus also the share of timber transport realized directly by forestry enterprises. The cost on timber transport in Slovakian forestry was highest in the last 7 years in 2010 (over € 38 million) and the lowest in 2013 (almost € 25 million). In the point of view the transported timber volume since 1990, it was in 2005 carried out (almost 9.3 million m<sup>3</sup>), which is also related to the treatment of calamities in the High Tatras. From 2012, the volume of transport is from 5 to about 5.5 million m<sup>3</sup> [1]. In 1990, the volume of wood harvesting was 4.7 mil. m<sup>3</sup>. It is clear that, despite the almost doubled harvested volume in the last 30 years, the volume of timber transported by forestry enterprises has not risen significantly, which confirms the decrease in its share in the individual phases of timber harvesting.

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From the aspect of work safety, we include the timber transport also as hazardous work, even though from the aspect of work accidents share in the production phases of timber harvesting a transport process, here is the lowest risk occurrence of work accident [2]. The most risky phase in this process is the timber harvesting phase. The timber transport is most important phase for the costs calculation and optimization. The risk of work accidents in this phase can partly influence the optimization processes [12, 13].

In the presented paper, we analyze the risk of work accident occurrence in the timber transport phase of State forestry entities and self-employed persons. At the same time, we analyze which part of the body from the anthropological aspect is the most vulnerable to potential occupational accidents in this type of transport.

## 2 Methodology

Data about work accidents in timber transport from records from the National Labor Inspectorate, from the General Directorate of Lesy SR, state enterprise in Banská Bystrica were drawn. The existing database of work accidents has been supplemented by accidents involving the self-employed persons, as well as accidents in the Military forests and properties, state enterprise. Accident questionnaires were sent to several forestry enterprises (to obtain the necessary information on the circumstances of the accident). From the 30 sent questionnaires, half returned.

In the creation of a database of bad work accidents registered in forestry entities, the methodology for the coding of work accidents according to European Statistics on Accidents at Work (ESAW) [3] was used. The consequences of an injury characterize the type of injury and the injured part of the body. Several parts of the body were injured only with the most serious injuries. In order to determine the source and cause of work accident, the Slovakian national classification was used which is governed by a national Decree [4].

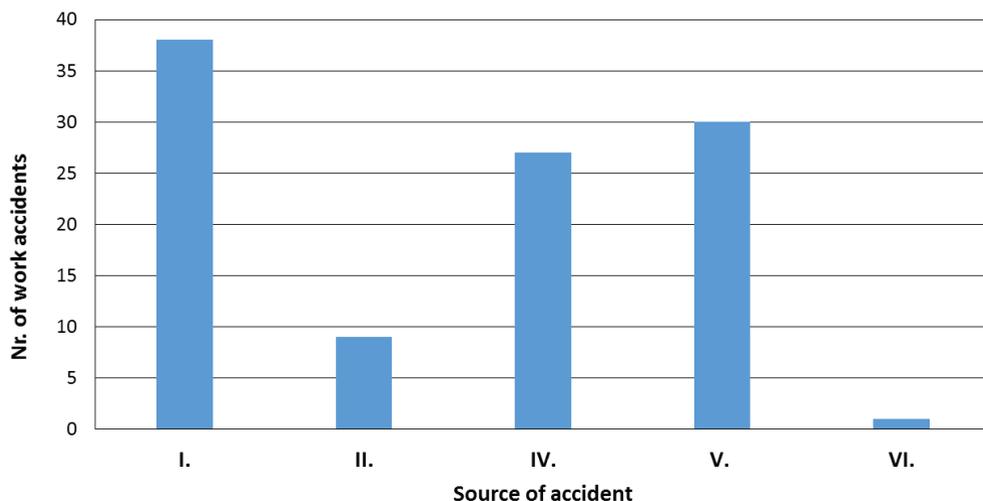
The obtained data include a period of 18 years (from 1996 to 2014). The total database of identified work accidents over the reference period contained approximately 1500 work accidents in forestry.

## 3 Results

In total, 105 registered work accidents in timber transporting were recorded during the period. What represent approximately 7% of registered accidents in forestry activities. Most accidents were recorded in 2003 (totally 17). Any work accident was fatal. In terms of the time of the accident, the most hazardous time is between 10 am - 11 am (17 accidents) and midday between 1 pm - 4 pm (16 accidents). Figure 1 shows the number of accidents by individual sources that were caused according to Decree 500/2006 as amended. According to this classification, the very most important source of accidents was the single transport mean (38 accidents). In terms of the cause of the accident, the ESAW methodology [3] classifies a total 14 causes of an accident:

1. Incorrect or unfavorable source of injury (not workplace).
2. Missing or insufficient protective equipment and security.
3. Unprotected, insufficient or unsuitable personal protective equipment.
4. Unfavorable state or misconception of the workplace or communication (even if the workplace is the source of the injury).
5. Deficiency in illumination and visibility, adverse effects of noise, shocks and harmful air on the workplace or on communication.
6. Incorrect organization of work.

7. Guiltlessness with the conditions of safe work and lack of necessary qualification (e.g. theoretical knowledge, skill, training, adaptation).
8. Using of unsafe practices or methods of work, including unlicensed, anti-burglary, prohibition and instruction procedures, stay in a restricted area.
9. Removal or non-use of prescribed safety devices and protective measures.
10. Do not use or misuse the prescribed and assigned personal protective equipment.
11. Endangered by others, e.g. Distraction at work, jitters, quarrels, other wrong and dangerous actions.
12. Deficiencies in personal assumptions for proper work performance (e.g. lacking physical assumptions, sensory shortcomings, unfavorable personal qualities and immediate psychophysiological states).
13. Endangered by animals and natural elements
14. Uncertain causes

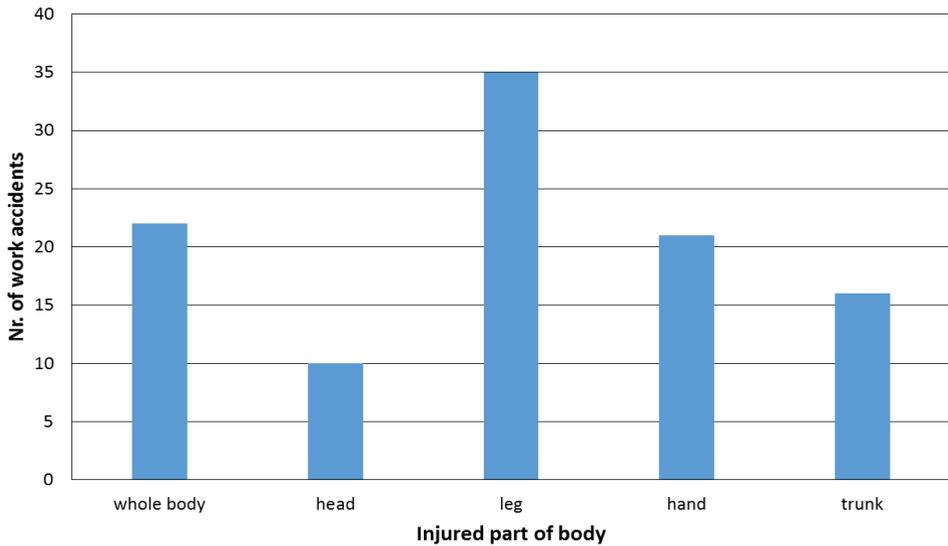


**Fig. 1.** Number of work accidents according to accident. Source: [4]

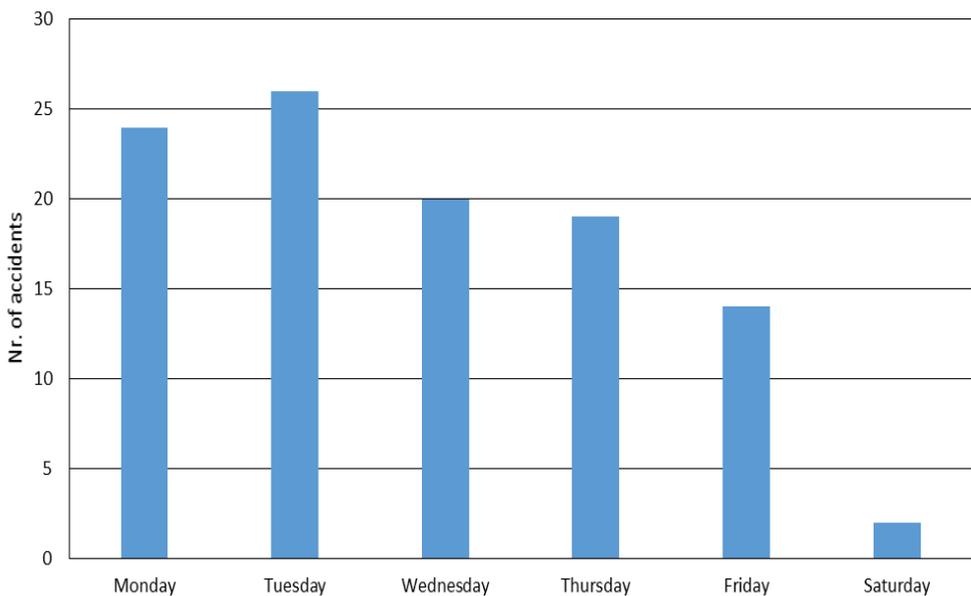
The most common causes of work accidents were the causes of groups 11-14 (72 accidents). Causes of groups 7 to 10 caused 26 accidents, and causes of groups 1-6 caused 7 accidents. Nearly half of all accidents have become workers aged 46 to 55 (48% of accidents). The average age of the affected worker was 44 years.

Figure 2 shows the accident classification according to the injured part of the body. The report shows that the most risky part of the body in the phase of hauling and timber transport are legs (35 accidents). From the anthropometric point of view, the legs are one of the parts of the body that the biggest increase in the past 20 years were recorded [5]. The objectively highest level of foot and hand injuries is understandable in terms of the location of the controls and the work performed in the timber transport.

The most common type of injury was open wounds (38 injuries) and fractures (33 injuries). In eight cases, the brain was shaken, in 5 cases multiple injuries, in 15 cases of foot wrinkling. Three injuries to the trunk did not indicate the type of injury. On average, the most hazardous days for the accident were Monday and Tuesday (Figure 3). In months, the most risky month was February with 16 accidents, then the summer months of June and August with 12 accidents. It is especially interesting from the aspect of the fact that major part of the principal felling (the most volume trees) and their transport is realized mainly in the winter months. The average length of practice in accidents was 14.8 years, so it can be said, that it was not workers who would not have enough work experience in the job.



**Fig. 2.** Number of work accidents according to injured part of body in timber transport. Source: authors



**Fig. 3.** Number of work accidents according to day in week. Source: authors

The rates of accidents are estimated on the number of accidents (d) divided with the volume of transported timber in mil. m<sup>3</sup> (N) [6].

$$\text{Rate} = (\text{Nr. of accidents}) / (\text{transported timber in mil. m}^3) \quad (1)$$

In assessment of accidents rate, it was confirmed, that the timber transport is not a major risk phase in the harvesting and transportation process. In 2000, the level of work accidents in timber transport was 2.85 % and in 2012 at 0.8 % (Table 1). The highest accident rate

was in 2002. Almost exclusively (up to one case), all accidents became male and only one reported accident came from the self-employed person.

For a small number of identified cases in timber transport, would be methodologically known statistical analyzes (regression analysis, contingency tables, classification trees, Mann-Kendall test) have not provided any relevant results. The results of these analyzes to the risks of the whole harvesting and timber transport process are available in [2].

**Table 1.** Rate of accidents in the period 2000 – 2012. Source: authors

Year	Transported timber [in mil. m <sup>3</sup> ]	Rate of accidents
2000	3512	2,85
2001	3763	3,19
2002	3713	4,04
2003	4750	3,58
2004	5041	1,39
2005	9287	1,18
2006	6882	1,02
2007	6744	0,15
2008	7160	0,28
2009	9006	0,33
2010	8294	0,24
2011	5965	0,84
2012	5028	0,80
2013	5103	0,00
2014	5352	0,37

## 4 Conclusion

The philosophy of sustainable development is basically oriented to improve the quality of people’s life, especially the working part. Work safety and health in a comprehensive understanding integrates technical safety, work environment and psychosocial factors and creates and influences the overall quality of life for the individual and society. The number of work accidents worldwide is steadily increasing. According to International Labor Organization data, more than two million people die annually from the consequences of occupational accidents and diseases. Each year, an average of 270 million occupational accidents will occur and more than 160 million people occupational illnesses gets sick to some occupational disease [7].

In general, forestry is classified as a risky activity. The harvesting and timber transport process belongs to the most risky works in terms of the risk of at work accident creation in

the forestry industry. From all phases involved in this process, is the phase of timber transport, the least risky, in terms of both the risk of accident and the absolute abundance of accidents. Timber transport is largely made by trucks, which are optionally equipped with a hydraulic crane. However, it still belongs to the risky works. The current system of registration and evidence of work accidents, especially among service providers, self-employed persons (on this basis provides the main activities of about 90% in forestry subjects) focuses on severe work accidents with serious health consequences and serious occupational accidents resulting to death. For other work accidents is only a registration requirement.

The proportion of accidents in the timber transport phase was around 7%. In another work [8] realized in the state enterprise Lesy SR in 1984-1993, the share of accidents in the following phases was as follows: wood harvesting phase - 32%, wood skidding - 29%, works on forest depot - 9%, timber transport - 8% , work on main wood depots - 6%, repair and maintenance - 15% and control activity - 1%. Analyzes confirm that historically the proportion of accidents in the timber transport phase does not change fundamentally.

The most injured part of the body is the leg (33% of all accidents) and then the whole body (21% of all accidents). The wounds and fractures were the most common type of injury, which is related to the transport of heavy loads and falls from inattention.

The very dangerous factors of the working environment and the working process of private forest entrepreneurs are unfavorable microclimates, increased working load, noise and bad lighting [9, 10, 11]. Inappropriately high work length during the day, insufficient work breaks, inappropriate conditions for a balanced diet coupled with harmful manufacturing factors create fatigue and a considerable vulnerability to worker health damage. Employers and private entrepreneurs, who do not employ anyone, should therefore be in their own interest to ensure compliance with the safety and safety requirements in the forestry business [2].

The research described in this paper was financed jointly by the: APVV-16-0297 Updating of anthropometric database of Slovak population.

This paper is supported by the research project "From horse-drawn railway to intermodal transport" within Visegrad Fund.

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