WP.232

SECTORAL ACTIVITIES PROGRAMME

Working Paper

THE ISSUES OF FATIGUE AND WORKING TIME IN THE ROAD TRANSPORT SECTOR

Jon K. Beaulieu
(Consultant (jkbeaulieu@usa.net))

Working papers are preliminary documents circulated
to stimulate discussion and obtain comments

International Labour Office
Geneva

ISBN: 92-2-117719-X (print)
92-2-117720-3 (web pdf)

First published 2005

Printed by the International Labour Office, Geneva, Switzerland

Foreword

The Sectoral Activities Department of the ILO commissioned this report in order to draw attention to the links between fatigue and working time in the road transport sector, and to provide its constituents with information on this issue. In addition, this working paper supports the International Transport Workers' Federation's (ITF) international campaign "Fatigue Kills".

Fatigue is a growing health and safety concern for the road transport sector. It is a workplace hazard that is the main cause of thousands of road transport accidents and fatalities each year.

Although fatigue cannot always be avoided, it can be better managed. Governments and employers and workers and their organizations, are making strides to combat fatigue. In particular, some governments are introducing new technologies, better working time legislation and improved enforcement. However, more needs to be done, especially in less developed countries, to improve the situation in the road transport sector.

Preventive strategies can be implemented within the diverse range of political, economical and social environments in which the road transport industry operates. The ILO's constituents, through social dialogue, can play a crucial role in developing and implementing policies which could improve working conditions for drivers and make the roads safer.

This paper provides some insight into the issues of fatigue and working time. It is by no means an in-depth study, but its purpose is to stimulate discussion, and describe some examples of what is happening today to address these serious health and safety issues in the road transport sector. The opinions expressed are those of the author and not necessarily those of the ILO.

Norman Jennings,
Acting Director,
Sectoral Activities Department.

Contents

Boxes

1. Introduction

Driver fatigue is one of the biggest safety issues facing the road transport industry today and the most dangerous aspect of driver fatigue is falling asleep at the wheel. Fatigue leads to sleep and lack of sleep is one of the leading causes of fatigue. Research has determined that working time, evening work and inadequate periods of rest all play a role in driver fatigue, and growing attention is being focused on the role of fatigue in workplace accidents.

As the most important health and safety issue facing the sector today, it must be addressed so as to improve working conditions for drivers, but also to protect the public from the possible negative consequences which fatigue can induce.

Governments, employers and workers are all working towards combating fatigue through various means. Tripartite efforts should be encouraged and strengthened through social dialogue in order to improve the situation.

1.1. Fatigue

"***Human fatigue is now recognised around the world as being the main cause of accidents in the transport industry.***" [1]

There is no universally accepted definition of fatigue. The European Transport Safety Council has defined it as: "tiredness concerning the inability or disinclination to continue an activity, generally because the activity has been going on for too long".

The following definition and explanation, adopted by the Medical Library, a service of the United States' National Library of Medicine and the National Institutes of Health is provided here to demonstrate how comprehensive the term is. The Library defines fatigue as a feeling of weariness, tiredness, or lack of energy. Synonyms of fatigue are tiredness; weariness; exhaustion and lethargy. It advises that it is different from drowsiness as this is a feeling of the need to sleep, whereas fatigue is a lack of energy and motivation. Drowsiness and apathy (a feeling of indifference or not caring about what happens) can be symptoms of fatigue. In addition, fatigue can be a normal and important response to physical exertion, emotional stress, boredom, or lack of sleep. However, it can also be a non-specific sign of a more serious psychological or physical disorder. Since fatigue is a common complaint, sometimes a potentially serious cause may be overlooked.

The Library also points out that there are many possible physical and psychological causes of fatigue. In addition to the loss of sleep, some of the more common causes are:

- anaemia (including iron deficiency anaemia);
- sleep disorders such as insomnia, sleep apnoea, or narcolepsy;
- ongoing pain;
- an allergy that leads to hay fever or asthma;

[1] Australian House of Representatives Standing Committee on Communications, Transport and the Arts: Report: *Beyond the Midnight Oil: An inquiry into managing fatigue in transport* (Canberra, 2000).

- an underactive thyroid (hypothyroidism);
- use of alcohol or illegal drugs like cocaine, especially with regular use;
- depression or grief.

Fatigue can also accompany the following illnesses:

- infection, especially one that takes a long time to recover from or treat, like bacterial endocarditis (infection of the heart muscle or valves), parasitic infections, AIDS, tuberculosis, and mononucleosis;
- congestive heart failure;
- diabetes;
- chronic liver or kidney disease;
- Addison's disease;
- anorexia or other eating disorders;
- arthritis;
- autoimmune diseases such as lupus;
- malnutrition
- cancer. [2]

Drivers' symptoms of fatigue can include:

- **loss of alertness;**
- **difficulty keeping eyes in focus;**
- **frequent yawning;**
- **loss of concentration and wandering thoughts;**
- **reduced awareness of surroundings – apparent sudden appearance of other vehicles behind or in front of the truck;**
- **memory lapses;**
- **failure to check rear view mirrors as frequently as normal;**
- **unconscious variations in speed;**
- **erratic changing;**
- **driving too slow or too fast;**

[2] Information obtained from http://www.nlm.nih.gov/medlineplus/ency/article/003088.htm, 25 July 2005.

- **drifting out of the lane;**

- **missing a turn-off. [Emphasis added.]**

Lack of sleep is considered to be one of the primary causes of fatigue. Everyone maintains a basic sleep requirement that varies, but the average is seven to eight hours per day. Therefore if a person does not get a full night's sleep, he/she is more likely to be fatigued the following day. One study examined 238 bus drivers who drive on the Northern Pan American Highway of Peru. More than 45 per cent admitted to having an accident. About 55 per cent slept less than six hours per day, and 31 per cent had slept less than six hours in the 24 hours before answering the survey, and 80 per cent were in the habit of driving more than five hours without stopping for a break. [3] It is recognized that losing as little as two hours of sleep can affect reaction time, mental functioning and alertness.

A commercial driver spending several nights on the road in abnormal sleeping conditions (81 per cent of the drivers in the Peruvian study said they always slept in the lower luggage compartment of the bus while another driver was driving the bus or when the bus was parked in the bus terminal) and limited sleep will accumulate hours of sleep deprivation. If a sleep debt becomes too large, the brain will eventually go to sleep involuntarily. This is called micro-sleep. Micro-sleep only lasts for a brief period, but they can be very hazardous if it occurs while driving. **For example, if a driver has a micro-sleep for just one second while travelling at a speed of 100 km/h, the vehicle will have gone 28 metres without the driver in control.** [4] **[Emphasis added.]**

Studies of driving tasks show that the length of time spent on a task affects the quality of performance. As more time is spent on a task the level of fatigue increases, the time to react is slowed, attention and judgment are reduced, and the chances of falling asleep during the task are increased. [5]

1.1. The history of the word "fatigue"

"Fatigue" first appeared in the 16th century as a description of tedious duty; a sense that has persisted in military terms. In the early 19th century, its usage began to shift. Modern life was fast and exhilarating, and its technologies – notably the railways – provoked equal feelings of excitement and fear.

In 1857, the French physician E. A. Duschene identified the joint pains reported by train drivers as "la maladie des mécaniciens" – arthritis caused by the vibrations of locomotives. Travellers' bodies could not cope with hours of clattering: muscles tired and sensory organs wore out. New interest in the diagnosis of "railway fatigue" was sparked when the British railway companies became legally responsible for the safety of their passengers in 1864.

But fatigue was not only physical. Victorian physiology regarded the soul as something that could be exhausted by overstimulation of the body or mind. Therefore, fatigue was not just physical, but also mental.

The idea of modern life as being fatiguing has persisted. One could review debates over the factors associated with chronic fatigue syndrome. The question, however, remains: does modern life make you ill?

Source: Barnett, R: *The Lancet*, Vol. 366, No. 9479, 2 July 2005, p. 21.

[3] Rey de Castro, J. Gallo, J. Loureiro, H.: "Tiredness and sleepiness in bus drivers and road accidents in Peru: a quantitative study", in *Pan American Journal of Public Health*, 16 July 2004.

[4] Land Transport New Zealand: Factsheet No. 24, June 2005, at http://www.ltsa.govt.nz/factsheets/24.html.

[5] ibid.

1.1.1. Sleep disorders

People most often affected by fatigue are those who have sleep disorders, as sleep disorders disrupt the quality and quantity of sleep a person gets. Insomnia, sleep apnoea, or narcolepsy are possible causes of fatigue, but the most common disorder is sleep apnoea. This disorder affects approximately 5 per cent of the middle-aged population. In sleep apnoea, the person's throat relaxes so much that they stop breathing. The sleeper gasps, wakes up enough to start breathing normally, and proceeds to sleep without being aware of any problem. This can occur as often as 600 times a night, leaving the person extremely tired the following day. The most common risk factors for sleep apnoea are being overweight, male and middle-aged.

A study performed on more than 400 Brazilian and Portuguese truck drivers noted that sleep disorders were present in 35.4 per cent of the Brazilians and 21.5 per cent of the Portuguese drivers. In addition, excessive daytime sleepiness was recorded in 32 per cent of the Brazilians and in 21 per cent of the Portuguese. [6] Although it is a small sample, this is a high ratio for an occupation where being alert saves lives.

1.2. Fatigue and accidents

Fatigue causes a loss of alertness in a driver, which is accompanied by poor judgment, slower reaction time and decreased skill levels. In addition, a driver's ability to concentrate and make critical decisions is reduced, and it takes longer to interpret and understand a traffic situation. It is a significant problem in the road transport sector in terms of the health and quality of life of drivers, as well as in the potential for accidents. Therefore it is an important health and safety issue for the road transport sector.

All of these effects can lead to accidents. Data from a number of countries such as the United States, Israel, Germany and Sweden demonstrate that falling asleep at the wheel accounts for a considerable proportion of vehicle accidents on motorways, and the majority of these involve long-haul drivers.

In New Zealand between 2002 and 2004, driver fatigue was identified as a contributing factor in 134 fatal crashes and 1,703 injury crashes (approximately 11 per cent of fatal crashes and 6 per cent of injury crashes each year). Australian estimates indicate that fatigue accounts for up to 30 percent of single-vehicle crashes in rural areas. [7] Official statistics in South Africa show similar trends – with fatigue contributing to 25 to 35 per cent of all fatal accidents. [8]

Driver fatigue in the United States, considered to be the most important road safety factor for large trucks, accounts for approximately 100,000 heavy vehicle accidents and 1,500 fatalities per year, according the National Transportation Safety Board. Fatigue is a factor in an estimated 30 to 40 per cent of trucking accidents and 15 per cent of fatal crashes involving trucks. It is also estimated that the annual cost of fatigue related trucking accidents in the United States is US$5 billion.

[6] Souza, José Carlos: "Sleep, habits, quality of life and accidents in truck drivers of Brazil and Portugal". *Arq. Neuro-Psiquiatr.*, Dec. 2004, Vol. 62, No. 4, pp. 1113-1114. ISSN 0004-282X.

[7] Land Transport New Zealand: op.cit.

[8] Essenberg, B.: Symposium on the Social and Labour Consequences of Technological Developments, Deregulation and Privatization of Transport (Geneva, ILO, 1999).

In the 2001 European Transport Safety Council report "*The role of driver fatigue in commercial road transport crashes*", driver fatigue is identified as a significant factor in approximately 20 per cent of commercial road transport crashes. The report also notes that more than 50 per cent of long-haul drivers have fallen asleep at the wheel.

The Australian House of Representatives Standing Committee on Communications, Transport and the Arts was asked by the Hon. John Anderson MP, Minister for Transport and Regional Services, to inquire into, and report on managing fatigue in transport under the following terms of reference:

- causes of, and contributing factors to, fatigue;
- consequences of fatigue in air, sea, road and rail transport;
- initiatives in transport addressing the causes and effects of fatigue;
- ways to achieving greater responsibility by individuals, companies, and governments to reduce the problems related to fatigue in transport.

The resulting report of October 2000, "*Beyond the Midnight Oil: An inquiry into managing fatigue in transport*", highlighted some very important concerns regarding fatigue in the transport sector and also made recommendations on how to better manage fatigue in Australia. Although this was specific to the country, the suggestions contained therein are relevant to all ILO member States. The study reported that:

> Human fatigue is now recognised around the world as being the main cause of accidents in the transport industry. It is increasingly being recognised as a safety issue of the highest priority. The issue of fatigue in the workplace in all modes of transportation and even beyond transportation is something that is exploding as a priority issue across the industrialised world. Fatigue is not just an industrial issue to be negotiated between employers and employees. It is also an occupational health and safety issue, a commercial issue, a public safety issue and, at times, an environmental issue. **Individuals and organisations that fail to manage human fatigue sensibly, risk having or creating accidents with a broad range of damaging and enduring consequences**. **[Emphasis added.]**

Unlike air crashes or sea wreckages, road traffic accidents draw generally limited public attention because of their frequent and small-scale recurrence, this despite their colossal global human and socio-economic costs. **Australian research indicates that fatigue is four times more likely to contribute to workplace impairment than alcohol or drugs. [Emphasis added.]**

A recent data-matching study of the role of fatigue in work-related crashes performed by Professor Ann Williamson of the NSW Injury Risk Management Research Centre, University of New South Wales, investigated fatigue involvement in work-related road traffic casualty crashes. The results indicated that:

> All fatigue-involved crashes were more likely to result in fatality and incur higher costs than crashes not involving fatigue, especially for rural road crashes. They were markedly more likely to involve heavy and light trucks no matter whether they were work-related or not, and much less likely to involve taxis, emergency service vehicles, buses and motorcycles. Fatigue-involved crashes whether work-related or not were also markedly more likely to involve illegal alcohol and speeding. [9]

[9] Obtained from an abstract of a document to be presented at the International Conference on Fatigue in Transportation Operations, to be held in Seattle, WA, USA, 11-15 Sept. 2005.

It must be borne in mind that driver fatigue is often difficult to identify or recognize as contributing to a crash. This means it is possible that driver fatigue is under-recorded, and contributes to more collisions than we realize. In addition, accidents could be the result of a combination of fatigue with a number of other hazards, including hours worked, the time of starting the shift, the amount of sleep during the previous days and the age of the driver. [10]

1.3. Fatigue, accidents and time of day

The time of day is known to be a significant factor in accidents among commercial drivers. The effect of circadian rhythms (human performance in a 24-hour cycle) is important in analysing fatigue related accidents. The European Transport Safety Council's report notes that a recurring feature is that the maximum incidents of accident level occurs between 2 a.m. and 5 a.m., with a secondary, lower, peak at around 3 p.m. to 4 p.m. The figures in the early morning hours are often ten or more times higher than daytime levels. The previously mentioned Peruvian survey of bus drivers reported that accidents and near-accidents while driving occurred mainly between midnight and 6 a.m., and that having an accident or a near-accident was strongly associated with tiredness and with having the eyes drop shut while driving.

The 1996 Commercial Motor Vehicle/Driver Fatigue and Alertness Study [11] performed in the United States by the Federal Highway Administration's Office of Motor Carriers is the largest and most comprehensive over-the-road study carried out on driver fatigue and alertness in North America. The study focused on the following factors: hours of driving during a work period; number of consecutive days of driving; time of day when driving took place and; schedule regularity. It reported that night driving (e.g. from midnight to dawn) was associated with worse performance. It also noted that the time of day was a much better predictor of decreased driving performance than hours of driving (time-on-task) or the cumulative number of trips made.

The Roads and Traffic Authority of the Government of New South Wales in Australia suggests that high risk times for fatigue-related fatal crashes are at night (between 10 p.m.-6 a.m.) and in the afternoon (between 1 p.m.-3 p.m.).

The Freight Transportation Association in the United Kingdom, which represents about half of the nation's fleet, also recognizes that time of day is to be a major factor in driver fatigue. In its 2002 publication *Driver Fatigue: A guide for transport managers*, it points out that people are most vulnerable to sleepiness between 2 a.m. and 6 a.m., and 2 p.m. to 4 p.m.

[10] Spurgeon, A.: *Working Time: Its impact on safety and health* (Geneva, ILO, 2003), p. 64.

[11] Report obtained at: http://www.fmcsa.dot.gov/facts-research/research-technology/publications/cmvfatiguestudy.htm, 27 July 2005.

1.2. Burning the midnight oil – Recommendations on addressing fatigue in the road transport sector in Australia

Recommendation 2

The National Road Transport Commission should prepare amendments to the Road Transport Reform (Driving Hours) Regulations:

- incorporating time of day considerations into allowable driving and rest periods; and
- in accordance with time of day considerations amend the regulations with a view to increasing the minimum allowable rest periods.

Recommendation 30

The National Occupational Health and Safety Commission should:

- develop and declare a national standard on fatigue in the workplace, identifying **fatigue as a workplace hazard [Emphasis added.]** in the transport industry and setting out common elements for inclusion in State and Territory occupational health and safety legislation; and
- declare a corresponding code of practice to provide guidance to employers and employees on how best to comply with the national standards.

Recommendation 31

The Minister for Transport and Regional Services should:

- work with the Australian Transport Council, transport industry representatives and occupational health and safety specialists to develop workplace safety codes of conduct for each sector of the transport industry to provide guidance of how best to manage fatigue; and
- ensure that these codes are national in application, complement existing regulatory and occupational health and safety requirements and, where appropriate, are given status by being referenced in relevant transport or occupational health and safety legislation.

The report points out that other non-regulatory fatigue management initiatives have also been introduced around the country, including:

- measures taken within companies to carefully plan and manage transport needs across the entire transport chain;
- by governments to build more and better roadside heavy vehicle rest areas; and
- by industry to develop voluntary safety accreditation programmes.

The Commission was particularly interested in the potential of technology to help support broader fatigue management initiatives. Governments should take an active role in sponsoring the development, testing and wide implementation of measures such as:

- computer-based fatigue modelling systems, for the fatigue effect of testing work schedules and rosters;
- safe-T-Cam, [12] an automated heavy vehicle monitoring system;
- fatigue testing devices, particularly those which might be used at the roadside and workplace; and
- car cabin gas monitors and driver vigilance systems.

1.4. Fatigue, local and short-haul drivers

But, it is not just long-haul freight and coach drivers who are affected by fatigue. This is a concern for all commercial drivers. One ILO study on work-related stress among bus drivers cited fatigue and sleeping problems as the main health problems for urban bus drivers. [13] Drivers often have long routes, long days, and drive under less than ideal

[12] For more on Safe-T-Cam see box 2.2.

[13] Kompier, M.: *Bus drivers: Occupational stress and stress prevention* (Geneva, ILO, 1996), p. 5.

conditions; they also differ in physical shape, size, and have varying levels of stamina. Thus, driver fatigue, when increased by strain and uncomfortable or difficult positioning of the driver, is a common cause of bus accidents. The design of the driver's work area can influence driver fatigue. A poor design for the driver's area may cause more accidents and injuries to both the employee and the passengers than any other portion of the vehicle. [14]

Taxi drivers, many of whom work extended shifts of up to 16 hours a day and with frequent night work, are also vulnerable to fatigue. They often start work the following day without sufficient recovery from the previous day's fatigue. A study on taxi drivers reported that driver time-on-the-road is often considerable: 67 per cent of those surveyed drove at least 50 hours per week, yet time off in long shifts (up to 12 hours) was often short (as low as three minutes, with an average of 37 minutes). [15] Interestingly enough, the same report examined the relationship between fatigue-related variables and accident involvement in taxi drivers. It reported a significant negative correlation between total average break time and accident rate. But fatigue, according to the report, is not just about accidents; for all commercial drivers fatigue can also impair a driver's ability to handle violence in the work environment, an issue of growing concern. [16]

Local/short-haul drivers have been identified through research to have fatigue related accidents. The top five fatigue-related issues, ranked in order of importance by local and short haul drivers, were: not enough sleep, hard/physical workday, heat/no air conditioning, waiting to unload, and irregular meal times. This study also determined that drivers who have more sleep at night are less likely to cite fatigue as an issue during the workday. [17] One study in Israel concluded that the "work risks and adverse outcomes of truck drivers in large countries with long overnight journeys occur in a small country with small distances, relatively short work journeys, and little overnight travel." [18]

Another study performed in the United States analysed and compared accidents among local/short-haul and over-the-road trucks and examined the prevalence of driver fatigue as a principal factor in truck crashes. The report noted that trip distance had the most pronounced effect on the percentage of fatal crashes that were fatigue-related; shorter trips were associated with a much lower incidence. The risk of local/short-haul truck involvement in fatigue-related fatal crashes is a fraction of that of over-the-road trucks. [19]

Although fatigue is an issue for local and short-haul drivers, it does not seem to be as critical an issue – for workplace accidents as it is in long-haul driving since many operators primarily drive during daylight hours, have work breaks that interrupt their driving, end

[14] US Department of Transportation report: *Bus and passenger accident prevention*, 1996.

[15] Dalziel, J.R., Job, R.F.: "Motor vehicle accidents, fatigue and optimism bias in taxi drivers" in *Accident analyses and prevention*, 1997 Jul;29(4):489-94.

[16] For valuable information on workplace violence, please see the ILO code of practice on workplace violence in services sectors and measures to combat this phenomenon.

[17] *Improving Traffic Safety From The Local/Short-Haul Trucker's Perspective* – Proceedings of the Human Factors and Ergonomics Society 42nd Annual Meeting, 5-9 October 1998.

[18] Sabbagh-Ehrlich, S., Friedman, L., Richter, E.D.: "Working conditions and fatigue in professional truck drivers at Israeli ports", in *Injury Prevention*, April 2005.

[19] Michigan Univ., Ann Arbor. Center for National Truck Statistics.; Federal Highway Administration, Washington, DC. Office of Motor Carriers: *Short-haul trucks and driver fatigue* (FHWA-MC-98-016) June 1997.

their shift at their home base, and sleep in their own beds at night. However, fatigue, combined with normal complaints of headaches, backache, eye strain and the stress of urban driving, creates an unsafe work environment and therefore makes drivers vulnerable to accidents. Other factors impacting on this situation include prolonged sitting in cramped conditions, exposure to exhaust fumes and body vibration. Another major aspect of fatigue is whether or not loading and unloading occurs in the time frame the driver expects. If a driver is delayed at a loading dock, his/her whole schedule is affected. Improved sleeping and eating habits for local and short-haul drivers could help to reduce fatigue during their workday, as would avoiding driving after restricted sleep, even on relatively short trips if they feel sleepy.

1.3. Driver fatigue quiz – *Answers on the last page*

1. Coffee overcomes the effects of drowsiness while driving. (T or F)
2. I can tell when I'm going to go to sleep. (T or F)
3. Rolling down my window or singing along with the radio will keep me awake. (T or F)
4. I'm a safe driver so it doesn't matter if I'm sleepy. (T or F)
5. You can stockpile sleep on the weekends. (T or F)
6. Most adults need at least seven hours of sleep each night. (T or F)
7. Being sleepy makes you misperceive things. (T or F)
8. Young people need less sleep. (T or F)
9. Wandering, disconnected thoughts are a warning sign of driver fatigue. (T or F)
10. Little green men in the middle of the road may mean the driver is too tired to drive. (T or F)
11. On a long trip, the driver should never take a break but try to arrive at the destination as quickly as possible. (T or F)
12. A micro-sleep lasts four or five seconds. (T or F)

2. Fatigue and working time

2.1. Introduction

Tired people exhibit the same levels of performance impairment as those who are legally intoxicated. Tests have shown that moderate levels of fatigue produce higher levels of performance impairment than the proscribed level of alcohol intoxication. For example, after 17 hours of wakefulness, cognitive psychomotor performance among a group of 40 people decreased to a level equivalent to the performance impairment observed when the group had a blood alcohol content of 0.05 per cent. This is the proscribed level of alcohol intoxication in many countries. After 24 hours of sustained wakefulness, the group's performance decreased to a level equivalent to the performance deficit observed when it had a blood alcohol concentration of 0.1 per cent, which is twice the legal limit in most countries. [20] It is interesting to note that most countries have legislation limiting the amount of alcohol a person can consume before they drive, but do not really address the issue of fatigue and being tired behind the wheel.

The transport sector in many countries should be more concerned about the qualitative and quantitative aspects of working time. Excessive and irregular hours, poor working conditions, high levels of stress, long waiting periods and inappropriate training can lead to driver fatigue and human error. The resulting economic and social consequences are reduced productivity, higher accident and occupational disease rates, absenteeism, higher turnover of staff, and increased workers' compensation rates, vehicle insurance and liability rates. Effective management of work-related and non-work related fatigue would benefit all stakeholders. Responsible levels of working time and periods of rest can be considerable commercial, financial and industrial relations benefits in the long run. Working conditions in the road transport sector, including factors leading to fatigue, could also be a reason for an extremely low level of youth and women working in and entering the sector. It could also be the rationale for a shortage of qualified truck drivers in the United States.

Regulating hours of driving combined with improved enforcement is one answer to the problem of fatigue and sleepiness in the transportation industry but it is far from being enough. Limiting driving hours does not address all the other causes of fatigue. For this, effective fatigue management is required.

2.2. Addressing fatigue through legislation

When considering the issue of driver fatigue, the pressures on business must also be taken into account. The demands on transport businesses, including owner-operators, to be competitive have led to decreasing staffing levels, increasing hours of work and higher asset utilization levels, all of which have contributed to an increased risk of fatigue-related accidents. After all, working time is the primary economic input to transport.

Another important aspect to consider is regulation and enforcement. Although many countries have adequate laws concerning working time and periods of rest, their enforcement is relatively weak. This is a very serious issue as regulations on drivers' hours, including periods of rest, are often ignored. It is difficult to pinpoint the blame for

[20] Dawson, D. and Reid, K.: "Fatigue, alcohol and performance impairment" in *Nature* (London, McMillan Publishers Ltd.), Vol. 388, 1997, p. 236.

infractions on either the worker or the employer. Regardless of culpability, increased competition has led both operators and workers often to disregard the laws. It is acknowledged that improved enforcement can help to reduce accidents.

Fatigue is taken very seriously in the commercial vehicle industry. Most drivers of commercial vehicles are required by law to fill out logbooks about the hours they drive and the breaks they take. The logbooks are used to assess whether the drivers are following the driving hours regulations. However, economic necessity, as well as certain terms of remuneration, such as pay per load or the lack of pay for an empty return trip, put strong pressure on the driver to operate for excessive hours and then to make false log entries, or carry multiple books. The mechanical tachograph is an improved tool to manage driving time and periods of rest. But, although more secure than a logbook, drivers can tamper with these devices also. The most recent development is the digital tachograph, currently being introduced into the European Union.

The new system will allow for easier and better control of drivers' hours by operators and the enforcement authorities, and should be fitted into all vehicles manufactured after 5 August 2006. This will ensure that the original objectives of road safety, social legislation, and providing a more even commercial playing field between operators are supported in a robust fashion. This new generation of tachograph is also designed to allow operators to utilize the technology to enable low cost expansion to support other functions for fleet management.

2.1. What is a digital tachograph?

A digital tachograph is a vehicle-mounted machine that measures and records speed and driving time, combining the functions of a clock and a speedometer. It will record not only the vehicle's speed but also the length of time that it is moving or stationary. It will help to ensure that appropriate breaks are taken.

The main part of the digital tachograph, the Vehicle Unit (VU), is located within the driver's area of the vehicle cab. It sends a signal to the speedometer/odometer unit that is located where the driver has a clear view of it. The VU receives a signal from the vehicle (usually from the gearbox) as the analogue units do, via a cable.

The VU is the brains of the system. It is able to store data on drivers of the vehicle and their periods of driving and duty for about a 12-month period. It will also hold data relating to faults, attempts to tamper with the system, speeding, calibration details, and when data has been accessed, for example, by enforcement officers.

The VU and the motion sensor from the gearbox will be encoded as a pair and the signals from the sensor will be fully encrypted so that any attempt to interfere with them will be registered and recorded in the VU. [This is greater than with the current analogue tachographs.]

Drivers, companies (operators), workshops (tachograph calibration centres) and enforcement officers will each will be issued with smart cards according to their specific needs. These enable them to use and/or give access to the data in the VU.

Regarding the use of the new digital tachograph in the European Union, the Minister of State for Transport in the United Kingdom, Dr Stephen Ladyman, said that: "Effective enforcement of these drivers' hours limits helps reduce the risk that commercial vehicles will be involved in fatigue-related accidents. Enforcement also helps to ensure a level playing field among operators and to maintain decent working conditions for drivers. The new Regulations do not introduce any new limits on drivers' hours and their effect on law abiding drivers and operators will be negligible. Indeed, drivers and operators should benefit from better enforcement against law-breakers. It is important that we continue to keep the drivers' hours enforcement regime up to date. With this in mind, we intend to review the new rules in 12 to 18 months time (the tachograph should be initiated in August 2006). By that time we should have accumulated sufficient practical experience with digital tachographs to determine whether any further changes to the legislation or associated guidance are necessary."

In 2004, the United States amended its commercial driving time legislation. The new rules increase the on-duty/off-duty work cycle from 18 hours to a normal 24-hour work

cycle. They also increase the number of hours provided for sleep, mandate sufficient "weekends" (wherever they actually fall in the calendar), and include special provisions to address the effect of operations between midnight and 6 a.m. Drivers may not drive more than 11 hours, following ten hours off-duty, beyond the 14th hour after coming on-duty, following 10 hours off-duty and after 60/70 hours on-duty in 7/8 consecutive days. A driver may restart a 7/8 consecutive day period after taking 34 or more consecutive hours off-duty. The total working day is reduced from 15 to 14 hours and time spent waiting at loading docks is counted as working hours. These regulations only apply to property carriers and drivers, and passenger carriers and drivers will continue operating under the existing rules while fatigue issues specific to the passenger carrier industry are assessed.

The European Commission is working thoroughly to ensure that European rules regulate working time in the road transport sector. These laws seek to improve road safety and working conditions of drivers, whilst guaranteeing a level playing field in terms of competition between road transport companies. The European Union Directive on working time came into effect in 2005. In addition, two Commission proposals to revise the 20-year old driving time rules and improve the quality and quantity of minimum enforcement levels within the Union are close to agreement. The means of checking driving time, other work and rest periods are also now to be improved by the obligatory installation of digital tachographs in all new vehicles.

Working time rules in the European Union state that a driver can work up to 60 hours in any one-week, but that over a four-month period one should work on an average 48 hours per week. In terms of driving time, there are currently daily and fortnightly driving limits of nine hours and 90 hours respectively. The daily rest period is at least 11 hours, but can be reduced to nine hours up to three times per week with compensation within the following week. There is also a provision for split daily rest of eight hours plus a combination of one- or two-hour rests to make a total of 12 hours rest per day. Weekly rest is 45 continuous hours, which can be reduced to 36 hours if at home, or to 24 hours if away from home. Compensation arrangements apply for reduced rest periods. Breaks of at least 45 minutes (separable into blocks of 15 minutes) should be taken after four-and-a-half hours at the latest. Member States are required to check at least 1 per cent of all days worked by drivers of vehicles falling within the rules every year. These driving time and rest period rules and minimum enforcement levels will be revised by the new package of measures to be adopted in the spring of 2006.

In New Zealand, drivers may not drive for more than five-and-a-half continuous hours and must have at least a half-hour rest after five-and-a-half hours driving and before they do any more driving. Over any 24-hour period, a driver must not spend more than 11 hours driving, spend more than 14 hours on-duty and must have at least nine continuous hours off-duty. In addition, after doing 66 hours driving or 70 hours on-duty (whichever occurs first) a driver must have at least 24 continuous hours off-duty. The total of 66 hours driving or 70 hours on-duty has to be counted from the last off-duty period of 24 hours or more.

2.2. What is Safe-T-Cam?

Safe-T-Cam is an initiative of the Roads and Traffic Authority of the Government of New South Wales of Australia that aims to reduce the incidence of heavy vehicle speed and fatigue in an effort to prevent heavy vehicle accidents.

Safe-T-Cam is an automated monitoring system that uses digital camera technology capable of reading the front number plate of heavy vehicles.

Safe-T-Cam will identify vehicles that:

- have travelled at excessive speed;
- have travelled beyond prescribed driving hours;

- have attempted to avoid detection by Safe-T-Cam;
- are unregistered.

Safe-T-Cam is part of an overall enforcement programme which includes:

- 300 heavy vehicle regulation inspectors;
- 42 cars fitted with technology which allows inspectors to use risk based methodology randomly to stop and check heavy vehicles to ensure they are in compliance with RTA regulations;
- 7 heavy vehicle checking stations;
- 24 Safe-T-Cam sites across NSW;
- 170 roadside inspection areas.

2.2. The International Labour Organization (ILO)

The ILO, from its earliest days, has attached importance to the issue of hours of work. This is reflected in the Preamble of the ILO Constitution which states: "conditions of labour exist involving such injustice, hardship and privation to large numbers of people … and an improvement of those conditions is urgently required; as, for example, by the regulation of the hours of work, including the establishment of a maximum working day and week …". The underlying principle is that human life does not consist of work alone but that every human being should be effectively protected against undue physical and mental fatigue. The duration of working time and time for rest are an essential condition of every single employment relationship. Accordingly, every worker in the global economy should be entitled to a certain standard concerning maximum duration of her or his work as well as minimum duration of rest, and should be entitled to such protection regardless of where she or he happens to be born or to live.

The ILO Hours of Work and Rest Periods (Road Transport) Convention, 1979 (No. 153), concerns hours of work and rest periods in road transport. It is the only ILO Convention which deals exclusively with conditions of work in road transport. The main clauses of the Convention state that:

- every driver is entitled to a break after four hours continuous driving or after five hours continuous work;
- the maximum daily total driving time should not exceed nine hours;
- the maximum weekly total driving time should not exceed 48 hours;
- the daily rest period must never be less than eight consecutive hours.

As of August 2005, only eight ILO member States (Ecuador, Iraq, Mexico, Spain, Switzerland, Turkey, Uruguay and Venezuela) had ratified this instrument. Although still relevant to the sector today, it is to be considered for revision.

2.3. Examples of current practices or activities to address fatigue

Fatigue in transport probably cannot always be avoided, but it can be managed. Governments, employers and workers' organizations are addressing the issue of driver fatigue through various means. Governments, which establish working time and safety and health legislation, are looking at ways to improve the situation through enhanced regulation and enforcement. They are also undertaking research and awareness in order to understand the issue of fatigue and its impact on drivers, and developing fatigue

management schemes. In addition, some are improving roads, rest areas and border crossings to make the road a better and safer place to work. Employers are developing codes of practice, participating in governmental fatigue management schemes and educating their personnel on how to recognize fatigue, and what to do in case a driver becomes fatigued. Workers' organizations are also raising awareness of the severe impact fatigue has on drivers and the public at large, through international campaigns. Some examples of what governments, employers and workers are doing are outlined below.

2.3.1. Governments

In the United States, the National Transportation Safety Board holds workshops and provides participants with information and guidance to evaluate the role human fatigue plays in causing accidents. They cover fatigue-related issues including sleep length, sleep disorders, circadian rhythms, work schedules, and the effects of fatigue on performance and alertness. They also examine the types of information that should be collected during an investigation.

The Western Australian Government has developed a code of practice for fatigue management for commercial vehicle drivers "*Code of practice for fatigue management for commercial vehicle drivers*" – in conjunction with industry representatives and representatives of unions and employer organizations. The code of practice provides practical guidance on managing fatigue for commercial vehicle drivers.

The Department for Transport, Energy and Infrastructure of the Government of Australia has established the Transitional Fatigue Management Scheme (TFMS), which aims to reduce the number of driver fatigue-related accidents and improve road safety within the heavy vehicle transport industry. The scheme will increase industry awareness of the causes of driver fatigue, encourage those involved to take greater responsibility for driver health and promote the principles and practices of safe driving and fatigue management. It provides for greater flexibility and productivity within regulated hours as it allows registered heavy truck drivers to drive for up to 14 hours in a 24-hour period and enables their driving, working and rest times to be restored over a 14-day period.

Obligations of employers include:

- manage the employment of participating drivers so that they can comply with the scheme's requirements;
- ensure that participating drivers have regular medical examinations;
- ensure that participating drivers and employees responsible for driver rostering and trip scheduling complete an approved training course in fatigue management;
- endorse each driver's participation in the scheme and certify his or her Driver Certification Manual (DCM);
- arrange a review of management practices and an assessment of the performance of employed and responsible employees in the scheme. The review must be carried out within nine months of becoming registered in the scheme and annually thereafter.

Participating employers must be able to demonstrate that they are complying with the requirements of the scheme. Employers are required to:

- maintain a record of the names, addresses and driving licence numbers of all participating drivers; all trip schedules and driver rosters to demonstrate that drivers are complying with the working and rest requirements of the scheme;

- demonstrate that a system is in place for the review of each driver's log book daily sheets;
- produce evidence that drivers and employees have completed the approved training course in fatigue management and that drivers have current medical examinations;
- retain copies of review and assessment reports for at least two years.

Drivers who are self-employed must meet both employer and driver obligations. Drivers employed by companies are only able to participate in the Transitional Fatigue Management Scheme if their employer is registered. Drivers are required to:

- have regular medical examinations in accordance with the scheme's requirements;
- complete an approved training course in fatigue management;
- obtain their employer's endorsement;
- register with any Customer Service Centre;
- carry their Driver Certification Manual when driving a heavy truck;
- record driving, working and rest times in an authorized log book;
- produce their Driver Certification Manual and log book when requested to by an authorized officer.

2.3.2. Employers

A Canadian company, Challenger Motor Freight, operates in Canada, the United States and Mexico with a fleet of more than 625 trucks. The company's first step was to create awareness of fatigue among its drivers and dispatchers. Working through its occupational health and safety consultant, Challenger provided information to its employees on the need for adequate rest along with strategies for maintaining alertness in the cab. Brochures and company newsletters were used to convey the information. It also provides a quarterly "audio newsletter" to their drivers. Since 1997, three of the audio newsletters have featured a discussion on fatigue. Challenger drivers listen to the tapes on the job. Management feels these audiotapes have been successful in creating an awareness of fatigue/alertness among its drivers. All new trucks purchased for the fleet have a heater and massage unit incorporated into the driver's seat. This type of seat was originally installed to relieve back problems, but drivers reported that it also reduces fatigue.

Greyhound Lines, Inc., a unit of Laidlaw, Inc., is the largest North American provider of intercity bus transportation, serving more than 3,700 destinations with 20,000 daily departures across the continent. On an average day Greyhound has 4,500 drivers on duty. Greyhound has two primary components to address fatigue: driver training and schedule design. The new hire training programme includes modules on personal fatigue management and nutrition. One of the goals of training is to educate drivers about off-duty behaviour and how it can affect on-duty performance. The training programme also covers nutrition and its relationship to driver performance. (For example, from experience Greyhound has found that eating high-fat foods reduces driver alertness.) Workers themselves developed the majority of the training materials.

Company policy requires the following with respect to hours of work: scheduled on-duty time must be less than nine hours; off-duty time between scheduled runs must be at least nine hours at an away from home location and ten hours when at a home location and;

for standby drivers, call time when away from home is at least two hours and at home it is two to three hours, depending upon commuting conditions in the driver's home location.

At least four times a year a group of managers and drivers meets to establish driver runs. In addition, an attempt is made to minimize inverted work cycles that require a driver rapidly to rotate starting times. The company has software that assists the scheduling group in establishing runs.

Greyhound has the following procedures that are designed to facilitate healthy rest periods for its drivers:

- a centralized dispatch facility handles all driver assignments. To assist extraboard drivers in planning their personal time, these drivers can call the dispatch centre to determine their position on the call list;
- a driver who feels too fatigued to drive on a given day can ask to be removed from the call list for 24 hours without penalty;
- while on duty, a driver who becomes fatigued or otherwise unable to continue a run can call the dispatch centre and request a relief driver;
- Greyhound has strict company rules against coercing drivers to work when they indicate they are fatigued or under the influence of drugs or alcohol. All calls are recorded and any violation of this policy by a dispatcher or supervisor receives management attention.

2.3.3. Workers

The International Transport Workers' Federation holds an Annual International Road Transport Action Day. The campaign mobilizes hundreds of thousands of bus, lorry and taxi workers in more than 60 countries. Under the slogan "Fatigue Kills", the demonstrations call the attention of workers, employers and users of the transport system to the hazards of working excessive hours, especially for drivers. In some regions it has achieved a heightened awareness among the public regarding safety on the roads and the status of working conditions of commercial drivers.

The campaign has resulted in positive steps being taken to address working time. In Luxembourg, a tripartite agreement was reached to reduce the total shift duration to 11 hours in the bus sector. Bulgaria enacted legislation in line with ILO Convention No. 153 in 1998. In Honduras in 1998, workers earned increased rest periods for drivers working for a multinational oil company. The Lithuanian Government agreed to demands by workers in 2001 to improve drivers' working conditions and border crossing facilities. A new law enacted in 2002 limited working hours in Thailand to eight hours per day with rest periods after four hours. Furthermore, in Bangladesh, new legislation was enacted in 1997 which requires two drivers to be on duty when eight hours of driving time are exceeded.

The primary demands of workers in the road transport sector are:

- limitation of working time to a maximum of 48 hours per week, in line with ILO Convention No. 153;
- proper enforcement of working time legislation;
- proper resting places for long-haul drivers so that they may have the opportunity to rest in comfort and in a safe environment free from violence;

- improved administrative procedures and facilities at border crossings so that drivers do not have to wait hours or days without access to basic facilities.

2.3. Employers and workers working together to fight fatigue

The truck drivers who work for Australian transport and logistics operator Linfox have volunteered to participate in the testing of new drowsiness detection technology, which alerts both the driver and the depot, when the driver is experiencing drowsiness. The technology, known as Optalert, has been developed over the last decade and comprises a pair of glasses fitted with tiny infrared sensors, which monitor all eye and eyelid movements.

When the driver becomes drowsy, these movements become slower. As the sensors detect this slowdown, the information is transmitted to a small in-dash processing unit, which broadcasts an audible alert. The depot is simultaneously informed using satellite technology. The technology has been developed by a Melbourne-based company called Sleep Diagnostics and development is being conducted in conjunction with the Monash Accident Research Centre. The Australian Government has awarded a grant to help further the research.

Source: *Transport News Network*, June 2005.

3. Conclusions

Commercial road transport occupies an irreplaceable socio-economic position linking supply to demand. It is a necessary link between the various industrial sectors. As the mode that brings the majority of passengers and goods to their final destinations, road transport is indispensable to tourism, trade and the well-being of any economy. Yet the most important safety and health issue, fatigue, is the cause of numerous driving accidents and fatalities each year. The correlation has clearly been established between the length and lateness of driving and the frequency and severity of trucking accidents, but many people fail to address the concern. It must be borne in mind that some of the best-known manmade disasters – Bhopal, Chernobyl, the Exxon Valdez, and the Challenger explosion – involved decisions made during non-traditional working hours by people already working long hours.

Challenges lie ahead for working time in the road transport sector. There is a need to limit excessive hours of work and irregular working hours, and to provide for adequate periods of rest in order to protect the health and safety of road transport workers, and the public. However, these must be achieved with costs in mind. New legislation reducing working hours could also increase the cost of goods carried throughout the supply chain. Over the last several decades, a number of broad economic trends (such as globalization, rapid advances in technology, and new patterns of consumer demand for goods and services in the 24-hour economy) have emerged, which have had an enormous impact on working time in the road transport sector. Some of these have been positive for the industry, while others have been negative.

The study performed by the European Transport Safety Council suggested that the most important factors that will ensure safety are to implement and effectively enforce regulations, and that both working time and driving time need to be considered in the same regulation. They also note however, that powerful economic and social forces influence and control the normative pattern of work of commercial drivers. To balance the need for improved safety and the smooth flow of goods, the Council recommends that the "dialogue between the social partners must move beyond the balancing of economic factors and social conditions of work to fully encompass the critical role working time plays in road transport safety, which should be paramount".

Equating fatigue-related impairment to blood alcohol equivalent provides policy makers and the social partners with a clear index of the extent of impairment associated with fatigue. Improved social dialogue and recognizing that health and safety should supersede other priorities are important in addressing fatigue in the road transport sector. Improving working conditions, by establishing responsible working time and periods of rest for road transport workers that have been established in consultation with the social partners, is an important and necessary step towards managing driver fatigue, and reducing commercial driving accidents and fatalities.

Some countries have recognized the hazards which fatigue presents and have begun to address the issue. However, many others need to develop preventive strategies that can be implemented within the diverse range of political, economical and social environments in which the transport industry operates. The first step is a concerted effort to provide a strong and coherent research base for the development of sound policies. Much is known about sleep, fatigue and the risks involved, yet knowledge of actual working hours and how they should be distributed in the road transport sector is limited. The economic and social determinants of working time need to be balanced to find the right legislation and ample enforcement which satisfies both, and maintains a high level of health and safety.

The ILO is a valuable platform, through the process of social dialogue, to find the right balance that would improve the working conditions of drivers, whilst maintaining a level playing field for business in the transport sector.

Driver fatigue quiz – *Answers*

1. FALSE. Stimulants are no substitute for sleep. Drinks containing caffeine, such as coffee or cola, can help you feel more alert, but the effects last only for a short time.
2. FALSE. Sleep is not voluntary. If you're drowsy, you can fall asleep and never even know it. You cannot tell how long you've been asleep.
3. FALSE. An open window or the radio has no lasting effect on a person's ability to stay awake.
4. FALSE. The only safe driver is an alert driver. Even the safest drivers become confused and use poor judgment when they are sleepy.
5. FALSE. Sleep is not money. You can't save it up ahead of time and you can't borrow it. But, just as with money, you can go into debt.
6. TRUE. The average person needs seven or eight hours of sleep a night. If you go to bed late and wake up early to an alarm clock, you probably are building a sleep debt.
7. TRUE. One of the warning signs of a drowsy driver is misjudging surroundings.
8. FALSE. Young people need more sleep than adults. Males under 25 are at the greatest risk of falling asleep. Half of the victims of fatigue-related crashes are under 25.
9. TRUE. If you are driving and your thoughts begin to wander, it is time to pull over and take a break.
10. TRUE. Seeing things that are not there is a good indication it is time to stop driving and take a rest.
11. FALSE. Driving, especially for long distances, reveals a driver's true level of sleepiness. To be safe, drivers should take a break every three hours.
12. TRUE. During a "micro-sleep" of four or five seconds, a car can travel 100 yards, plenty of time to cause a serious crash.

Source: United States Department of Transportation Federal Motor Carrier Safety Administration.

Sectoral working papers [1]

	Year	*Reference*
The Warp and the Web Organized production and unorganized producers in the informal food-processing industry: Case studies of bakeries, savouries' establishments and fish processing in the city of Mumbai (Bombay) (Ritu Dewan)	2000	WP.156
Employment and poverty in Sri Lanka: Long-term perspectives (Vali Jamal)	2000	WP.157
Recruitment of educational personnel (Wouter Brandt and Rita Rymenans)	2000	WP.158
L'industrie du textile-habillement au Maroc: Les besoins des chefs d'entreprise et les conditions de travail des femmes dans les PME (Riad Meddeb)	2000	WP.159
L'évolution de la condition des personnels enseignants de l'enseignement supérieur (Thierry Chevaillier)	2000	WP.160
The changing conditions of higher education teaching personnel (Thierry Chevaillier)	2000	WP.161
Working time arrangements in the Australian mining industry: Trends and implications with particular reference to occupational health and safety (Kathryn Heiler, Richard Pickersgill, Chris Briggs)	2000	WP.162
Public participation in forestry in Europe and North America: Report of the Team of Specialists on Participation in Forestry	2000	WP.163
Decentralization and privatization in municipal services: The case of health services (Stephen Bach)	2000	WP.164
Social dialogue in postal services in Asia and the Pacific: Final report of the ILO-UPU Joint Regional Seminar, Bangkok, 23-26 May 2000 (Edited by John Myers)	2000	WP.165
Democratic regulation: A guide to the control of privatized public services through social dialogue (G. Palast, J. Oppenheim, T. McGregor)	2000	WP.166
Worker safety in the shipbreaking industries: An issues paper (Sectoral Activities Department and InFocus Programme on Safety and Health at Work and the Environment)	2001	WP.167
Safety and health in small-scale surface mines – A handbook (Manfred Walle and Norman Jennings)	2001	WP.168

[1] Working Papers Nos. 1-155 are not included on this list for reasons of space, but may be requested from the Sectoral Activities Department.

	Year	*Reference*
Le rôle des initiatives volontaires concertées dans la promotion et la dynamique du dialogue social dans les industries textiles, habillement, chaussure (Stéphanie Faure)	2001	WP.169
The role of joint voluntary initiatives in the promotion and momentum of social dialogue in the textile, clothing and footwear industries (Stéphanie Faure)	2001	WP.170
La situation sociale des artistes-interprètes de la musique en Asie, en Afrique et en Amérique latine (Jean Vincent)	2001	WP.171
The social situation of musical performers in Asia, Africa and Latin America (Jean Vincent)	2001	WP.172
Guide sur la sécurité et hygiène dans les petites mines à ciel ouvert (Manfred Walle and Norman Jennings)	2001	WP.173
Seguridad y salud en minas de superficie de pequeña escala: Manual (Manfred Walle and Norman Jennings)	2001	WP.174
Privatization of municipal services: Potential, limitations and challenges for the social partners (Brendan Martin)	2001	WP.175
Decentralization and privatization of municipal services: The perspective of consumers and their organizations (Robin Simpson)	2001	WP.176
Social and labour consequences of the decentralization and privatization of municipal services: The cases of Australia and New Zealand (Michael Paddon)	2001	WP.177
1st European Forest Entrepreneurs' Day, September 16, 2000 (European Network of Forest Entrepreneurs ENFE)	2001	WP.178
The world tobacco industry: trends and prospects (Gijsbert van Liemt)	2002	WP.179
The construction industry in China: Its image, employment prospects and skill requirements (Lu You-Jie and Paul W. Fox)	2001	WP.180
The impact of 11 September on the aviation industry (Peter Spence Morrell and Fariba Alamdari)	2002	WP.181
The impact of 11 September on the civil aviation industry: Social and labour effects (Prof. Peter Turnbull and Geraint Harvey)	2002	WP.182
Employment trends in the tobacco sector in the United States: A study of five states (Maureen Kennedy)	2002	WP.183
Tobacco: An economic lifeline? The case of tobacco farming in the Kasungu Agricultural Development Division, Malawi (Michael Mwasikakata)	2002	WP.184
A study of the tobacco sector in selected provinces of Cambodia and China (Yongqing He, Yuko Maeda, Yunling Zhang)	2002	WP.185

	Year	*Reference*
Child performers working in the entertainment industry: An analysis of the problems faced (Katherine Sand)	2003	WP.186
Informal labour in the construction industry in Nepal (Kishore K. Jha)	2002	WP.187
The construction labour force in South Africa: A study of informal labour in the Western Cape (Jane English and Georg Mbuthia)	2002	WP.188
Social dialogue in health services – Case studies in Brazil, Canada, Chile, United Kingdom (Jane Lethbridge)	2002	WP.189
Teachers and new ICT in teaching and learning modes of introduction and implementation impact implications for teachers (Chris Duke)	2002	WP.190
Best practice in social dialogue in public service reform: A case study of the Norwegian Agency for Development Co-operation (NORAD) (Torunn Olsen)	2002	WP.191
Best practice in social dialogue in public service emergency services in South Africa (Bobby Mgijima)	2003	WP.192
Case studies in social dialogue in the public emergency services – Argentina (Laura El Halli Obeid and Liliana Beatriz Weisenberg)	2003	WP.193
Employment trends in the tobacco sector: Selected provinces of Bulgaria and Turkey (Roska Ivanovna Petkova and Nurettin Yildirak)	2003	WP.194
How to prevent accidents on small construction sites (Illustrated by Rita Walle)	2003	WP.195
Sectoral trends: A survey (Katherine A. Hagen)	2003	WP.196
The impact of the restructuring of civil aviation on employment and social practices (Bert Essenberg)	2003	WP.197
Raising awareness of forests and forestry. Report of the FAO/ECE/ILO Team of Specialists on Participation in Forestry and the FAO/ECE Forest Communicators Network	2003	WP.198
Teaching and the use of ICT in Hungary (Eva Tót)	2003	WP.199
Violence and stress at work in the postal sector (Sabir I. Giga, Helge Hoel and Cary L. Cooper)	2003	WP.200
Violence and stress at work in the performing arts and in journalism (Sabir I. Giga, Helge Hoel and Cary L. Cooper)	2003	WP.201
Making ends meet: Bidi workers in India today. A study of four states	2003	WP.202
Civil aviation: The worst crisis ever? (Bert Essenberg)	2003	WP.203

	Year	*Reference*
Informal labour in the construction industry in Kenya: A case study of Nairobi (Winnie V. Mitullah and Isabella Njeri Wachira)	2003	WP.204
Violence and stress at work in the transport sector (Bert Essenberg)	2003	WP.205
The impact of Severe Acute Respiratory Syndrome (SARS) on health personnel (Christiane Wiskow)	2003	WP.206
How we work and live. Forest workers talk about themselves (Bernt Strehlke)	2003	WP.207
Workplace violence in service industries with implications for the education sector: Issues, solutions and resources (Richard Verdugo and Anamaria Vere)	2003	WP.208
International migration of health workers: Labour and social issues (Stephen Bach)	2003	WP.209
Violence and stress at work in financial services (Sabir I. Giga, Helge Hoel and Cary L. Cooper)	2003	WP.210
Violence and stress in hotels, catering and tourism sector (Helge Hoel and Ståle Einarsen)	2003	WP.211
Employment and human resources in the tourist industry in Asia and the Pacific (Travel Research International, London)	2003	WP.212
Democracy and public-private partnerships (Jerrold Oppenheim and Theo MacGregor)	2003	WP.213
Social dialogue in the public emergency services in a changing environment (Bulgaria) (Pavlina Popova)	2003	WP.214
Training of machine operators for mechanized wood harvesting. A study carried out under the EU-funded ERGOWOOD project (Bernt Strehlke and Kristin Warngren)	2004	WP.215
Social dialogue in the public emergency services: A case study on Kenya – pdf, 146k (Leopold Mureithi)	2004	WP.216
Public emergency services: Social dialogue in a changing environment: A study on Japan (Minawa Ebisui)	2004	WP.217
Academic tenure and its functional equivalent in post secondary education (Donald C. Savage)	2004	WP.218
Study of the Kerala Construction Labour Welfare Fund (R.P. Nair)	2004	WP.219
The Joint FAO/ECE/ILO Committee: Fifty years of international cooperation in forestry (T.J. Peck and E.G. Richards)	2004	WP.220
La permanence et son équivalent fonctionnel dans l'enseignement postsecondaire (Donald C. Savage)	2004	WP.221
Academic employment structures in higher education: The Argentine case and the academic profession in Latin America (Garcia de Fanelli)	2004	WP.222

	Year	*Reference*
An introduction to labour statistics in tourism (Dirk Belau)	2004	WP.223
Labour implications of the textiles and clothing quota phase-out (Hildegunn Kyvik Nordas)	2005	WP.224
Baseline study of labour practices on large construction sites in Tanzania (coordinated by the National Construction Council, Dar es Salaam)	2005	WP.225
Informal construction workers in Dar es Salaam, Tanzania (Arthur Jason)	2005	WP.226
Prospects for micro, small and medium enterprises in the food and drink industries in Guyana (Abdul Rahim Forde)	2005	WP.227
Alimentation et boisson au Burkina Faso: au delà de la survie (Dié Martin Sow)	2005	WP.228
Social dialogue in education in Latin America: A regional survey (Marcela Gajardo and Francisca Gómez)	2005	WP.229
Good industrial relations in the oil industry in the United Kingdom (Dr. Chris Forde, Dr. Rob MacKenzie, Dr. Mark Stuart, Dr. Rob Perrett)	2005	WP.230
The future of civil aviation in Africa: Restructuring and social dialogue (Bert Essenberg)	2005	WP.231
The issues of fatigue and working time in the road transport sector	2005	WP.232