The International Conference on Climate Friendly Transport

Shaping Climate Friendly Transport in Europe
Key Findings & Future Directions

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Session 1

Future research priorities in climate friendly transport

Title: ***Reduction of RTG Cranes CO2 Emission by Using Hybrid Technology***

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Institutions : i) **University of Belgrade**, ***Faculty of Mechanical Engineering*** ii) **Dunav Insurance Company**

Abstract: Emissions from land transport (on-road and off-road mobile sources) have significant impacts on the atmosphere and on climate change. With 25% of world CO2 emissions and energy consumption, transport has significant contribution to global warming. Environmental impact of transport is increasing at greater scale then any sector. On the other side container transport industry is experiencing massive growth, due to the boost of container shipment from China. Consequently, this fact affects the growth of seaports and container terminals and corresponding cargo handling equipment (CHE) as well. The scale of above mentioned, growth is expected to reach its peak after 2025, increasing share of container handling in global CO2 emissions. Port cargo handling equipment as an off-road mobile source considerably contributes to the regional emissions inventory, including CO2 and NOx emissions. This paper deals with growing interest for sustainable logistics and environmental condition surrounding port terminals. In the paper are analyzed the effects of implementation of hybrid technologies in port container machinery propelled by diesel engines for reducing the fuel consumption and carbon-dioxide emissions. The objective of this paper is someway twofold. Firstly, the authors discuss the implementation possibilities and benefits of hybrid technology used in port container transport. RTG cranes as the world's largest mobile cranes are the key generators of CO2 emissions in container ports and terminals. Focusing on alarmingly large diesel exhaust emissions of RTG cranes, and number of operating units per terminal, this paper presents hybrid technologies as a part of reducing emission path. Secondly, in order to determinate the exact ecological costs and benefits of hybrid RTG cranes, including production, exploitation and end of life phase, the authors show their research concerning the application of life cycle assessment (LCA) tools for this purpose. Life Cycle Assessment (LCA) is used as a method of measuring the relative environmental impacts of RTG cranes across their full life cycle. LCA also allows designers of CHE to make informed decisions on where the greatest impacts are and what design strategies need to be developed to design out the greatest impacts. The obtained results of life cycle assessment show a significant reduction of carbon-dioxide in hybrid RTG cranes to a level higher then 50%. With further improvement of diesel catalytic systems, lowering of exhaust emissions becomes more promising. Initial negative effects of hybrid installation and devices in the production stage of RTG cranes were measured through life cycle

assessment and are also presented in this paper. The reduction of CO2 is considered as a rising priority and this paper deals with both environmental and economical aspects. Eco-efficiency has been compared with economical benefits and the corresponding overview is additionally given. In the conclusion, the paper deals with the acceptance and critical observation of modern trends of hybrid technology application. Future trends and technological solutions in port logistics for improvement of environmental condition and reducing CO2 emissions in container port terminals are finally observed.

Title: The Role of Urban Planning into a long-term Climate Friendly Transport Vision.

Authors: ***Prof. Michela TIBONI Eng. Silvia ROSSETTI***

Institutions: ***Università degli Studi di Brescia Department of Civil engineering, Architecture, Land and Environment (DICATA)***

Abstract: How can urban planning help in achieving a carbon reduction in the transport sector? Which territorial governance policies and measures can be applied? Recently lots of researches about sustainability of cities layout demonstrates that compact urban layouts with a mix of land uses show the highest levels of sustainability: reduce urban sprawl and move away from functional land use zoning are nowadays imperatives. The aim of our paper is to highlight some priorities of intervention related to the reduction of GHG emissions through a climate friendly spatial planning. We are convinced that urban planning can highly affect the sustainability of transport systems in a long term vision: for this reason it is necessary to move towards the implementation of integrated policies gathering urban planning and transport. The paper will focus on the link between spatial planning and modal choices at urban level, with particular regard to public transit and slow mobility (walking and cycling are the most environmental friendly modes of urban transportation). The design of the public transit network plays a key-role in daily transports sustainability: the service has to be competitive, fast, frequent and efficient but at the same time it should provide a good penetration into residential areas. Pedestrians are the main users of public transports: there is a need to work on the link between public transit and pedestrian accessibility, integrating transit services with new facilities and infrastructures for pedestrian and bicycles. Furthermore, in order to encourage non-motorized mobility, there is a need of a behavioral shift: educational and marketing activities must be performed, with young people as main target. The case of Freiburg, in Germany, is of particular interest. Freiburg is a city that in the last decades highly invested on an integrated management of public transport, urban mobility and spatial planning, obtaining a reduction in the number of passenger cars per 1000 inhabitants. The new Vauban district has been designed as a whole district where cars are completely useless: densities are high enough to justify good public transport services (no houses are located more than 400 meters away from streetcar-stops), there is a no car parking policy in residential streets (residents who own a car must buy a parking place on multi store parks located on district edges) and non-motorized mobility is highly encouraged. Furthermore a functional mix of housing and working places has been realized in order to minimize trip lengths and services are all located within walking distances from the apartments. The results are not only a drastic reduction in cars usage (and consequently a reduction of emissions and pollution) but also a great improvement in the quality of life.

Title: ***Electric Vehicles Integration in Multi-Business Vehicle Sharing Model: the "key-less mobility"***

Authors: ***Giovanni Alli and Sergio Savaresi***

Institutions: ***Politecnico di Milano, Dipartimento di Elettronica e Informazione***

Abstract: The personal mobility is a key issue for the next future; one possible answer to the increasing of demand of flexibility for the personal mobility can be the "last-mile" vehicle sharing. The traditional models of car-rental are too "hardware-dependent" (rigid vehicle ownership, car keys, fuel refill, fixed take/leave locations, etc.) to be a real answer to the future mobility needs. The key idea of the project is the "key-less-mobility", where personal smartphones are the main tool to use shared vehicles. This can radically transform the user experience: a single smartphone application (suitably co-designed with on-board vehicle electronics) can solve seamlessly all the steps of the vehicle-sharing experience: - Registration - Booking - Localization of available vehicles - Enabling/disabling the vehicle - Lock-unlock for intermediate stops - Navigation - Help and tutoring - Re-fueling - Billing (including roaming for multi-model business) This "key-less-mobility" will open to a completely new generation of vehicle-sharing business models, where the distinction between rental-vehicles and personal-vehicles will fade. Today "my car" and "my key-car" are the central elements of personal mobility. In this new scenario the "electronic identity" with wireless local/global networking will be the key element of personal mobility. This will be the only realistic way to permit a higher usage of sophisticated (and expensive) electric cars, having (with 2000+ cycles of LiIon batteries) 300.000+Km of Battery-pack break-even. The extension of a vehicle sharing model to a multi-vehicle/multi-business model can allow more actors to be involved. One of the issues for the standard vehicle sharing model is the fact that usually the whole investment on both stations and vehicles is done by only one holder. That brings non sustainable costs for spreading the service out over a significant amount of users. This can mean a failure in the model itself. The introduction of a multi-business "key-less" model can gain the number of stakeholder of the station/vehicles, dividing the installation and management costs of the whole vehicle sharing scenario. Moreover the integration of on-board services on the vehicles, based on off-the-shelf, high-end smartphones, can allow a better usability of the vehicles by the users, while also bring important real-time information to the orchestrating authority (e.g. traffic, driving style, safety, consumption, etc.).

Title: ***Application Effects of GPS Technology in Fleet Management of State Owned Enterprises Inspired by Application of GPS Technology in Public Utility Company "Water Supply and Sewage of Belgrade"***

Authors: ***Radivojevic Gordana, Bratislav Lazic, Drazen Popovic***

Institutions: ***University of Belgrade***

Abstract: The main purpose of the fleet management is the satisfaction of transport demands between locations in a given network. Depending on the characteristics of the demand which can be represented as passengers that need a ride, goods that need to be transported for latter production or sales, or different equipment that is needed on some location, the fleet can have vehicles of various features. The control and management of a given fleet have purpose of achieving high level of efficiency of vehicles exploitation without negative impact on the service quality. The efficiency of the fleet can be generally measured by the number of realized demands. Usually companies neglect negative effects of transportation activities on environment, unless they are restricted by government legislations. But, in recent years more and more companies try to find technologies and solution that will minimize environment pollution, mainly because they realize the importance of the company reputation in public. In that sense, the fleet management must also reduce number of used vehicles and traveled empty and especially full load mileage with intention of reduction the emission of greenhouse gases.

Modern fleet size management systems usually relay on computer aided systems that are based on state of the art information and communication technologies. The world market offers large number of Fleet Management System (FMS) that combine characteristics and functions of modern Automatic Vehicle Location (AVL) systems and Global Positioning System (GPS) technology.

In this paper we present effects of the SPIDER system (the System for real time PosItioning, Data Acquisition, Automatic Control, SurvEillance, and MonitoRing) that was firstly implemented and used since 2003 in Public Utility Company "Water Supply and Sewage of Belgrade" (PUC BVK). The main activities of PUC BVK are construction, regular and emergency maintenance of Belgrade water supply and sewage infrastructure. They have the fleet of different types of special vehicles and mechanization. Significant effects from SPIDER BVK were obtained in the vehicles utilization, reduction of traveled mileage and fuel consumption.

SPIDER BVK system is based on GPS technology and is used for the fleet management. In this system, vehicles are equipped with GPS devices by which they are monitored in the control center. The control center has insight on the real time position of vehicles, traveled mileage, fuel level in vehicles tank, fuel consumption etc. Operators in control center make device to task decisions based on the current status of vehicles (type of vehicle, free capacity, current position, working time) and type of task, all obtained from SPIDER BVK. So far, the application of SPIDER BVK system has shown a number of positive effects and PUC BVK plans to expand this system by implementation of GPS devices in all vehicles in ownership and development of decision support system for the real time vehicle route construction. With certain level of customization, SPIDER BVP system can be easily applied to wide set of companies that have their own vehicles and objects that need to be serviced, especially if fleet consists of vehicles with special purpose.

Title: ***Participation of railways in climate friendly transport through the intermodality***

Authors: ***Ivan Belošević, Msc Sanjin Milinković, Phd Miloš Ivić, Phd Slavko Vesković, Phd Milan Marković, Msc Norbert Pavlović***

Institutions: ***University of Belgrade, Faculty of Transport and Traffic Engineering***,

Abstract: Fast world population and industrialization growth raise question on sufficient natural resources amounts. Transport represents one of economy drivers through access and mobility. However, transport structures today represent one of main pollution and climate change reasons. Unfortunately, number of proofs of it is greater and transport can now be categorized into the sector of growing adverse effects. Expressed dependence on fossil fuels of transport activities is responsible for extreme pressures on energy resources and ecosystems. Due to these reasons, one of main transport researchers' tasks is finding a way to eliminate the negative influence or decrease it to an acceptable level, at least. One of the main railway advantages is low carbon usage. Further research in the field of energy efficiency improvements and implementation of modal split are crucial to support the transition to low carbon mobility. Passenger modal shit to rail can be tackled especially within areas of Urban Transport and High Speed Trains. From sustainable development freight modal split is more important. Railway freight transport appeal can be achieved within ''door to door'' principle application. Accomplished transport service in railway can be achieved through its own concept of transport via industrial tracks or within intermodal transport chain which will be analyzed in this paper. As maritime containerized transport continues to increase, relocation of port facilities inland is one way to achieve efficiency of the transportation chain as a whole. Inland intermodal terminals are important nodes in the transport network and have attracted considerable attention. One of the contemporary concepts of intermodal transport is dry port concept. The dry port concept is based on creating direct railway linkages between seaport and inland intermodal terminals where shippers can leave and collect their goods in intermodal loading units as directly at the seaport. Implementation of a dry port in a seaport's hinterland increases seaport's terminal capacity. This provides increasing productivity since bigger container ships will be able to call at the seaport. With dry port implementation seaport's congestion from numerous trucks is avoided because one train can substitute toward forty trucks in Europe. With reduced required fleet of trucks congestion, accidents, maintenance costs and local pollution on roads are reduced as well. Benefits from dry ports derive from the modal shift from road to rail, resulting in reduced congestion at the seaport gates and along the routes. Also this concept can be stated as climate friendly because of reducing external environmental

effects in seaport's surroundings and hinterland. Huge amounts of Far East goods are imported by South East Europe. Freight containers are transported by cargo ships to Europe. Due to underdevelopment of intermodal transport service, containers are further transported by trucks. Considering adverse effects of huge road transport and positive effects of railway, dry port concept application in Adriatic ports and hinterland in the area of the Balkan Peninsula should be examined. For such service, adequate technical foundations and organizational, regulatory and promotional measures are necessary. This paper takes a technical, technological, economic as well as environmental perspective.

Title: ***Climate friendly transport: Typology of transport impacts on climate change – mitigation and adaptation***

Authors: ***Prof. Dr. Zoran Radmilovic, Prof. Dr. Radovan Zobenica, Vladislav Maras***

Institutions: ***University of Belgrade, Faculty of Transport and Traffic Engineering***

Abstract: Climate change and transport are in close mutual dependence and in the relatively unfavourable mutual respect. Motorized transport affects climate change by impacting negatively on its environment, both globally and locally, increasing the temperature of the air, changing the composition of the atmosphere, water and land. On the other hand, the feedback effects of climate change act negatively on transport. These negative impacts are present in all transport modes, in various and very complex ways. For example, increasing temperature, rising sea and ocean levels with strong winds and storms, increased rainfall intensity and duration of dry periods make the transportation processes slower or even interrupted and cause serious damage to transport infrastructure. This means that the transport must adapt to these climate changes in order to influence them as less as possible. For the time being, there are solutions or recommendations. In policy; alternative fuel energy, design, construction, operation, maintenance, safety and system usage, freight and public transport and aviation, they are not serving the needs of sustainability at the global level; therefore the problems must be solved at the global level. For these reasons, this paper discusses the typology of the impact of transport on climate change with mitigation and adaptation measures and the aim to support research in climate friendly transport. Key words: Climate change, Transport, Typology of transport impacts on climate change

Title: ***Automated Preform Fabrication by Dry Tow Placement***

Authors: ***Klomp - de Boer, Ronald***

Institutions: ***National Aerospace Laboratory NLR, Netherlands***

Abstract: With the ever increasing percentage of composites in aircraft structures aiding weight reduction and fuel reduction, so is the level of automation expanding rapidly. One of the most notable being Automated Fibre Placement offering high lay-up rates combined with very precise ply thickness control, in-process compaction, high consistent quality, low void content, unlimited fibre angles and low material scrap rate. Another manufacturing method being used more and more is often referred to as Liquid Composite Moulding (LCM). The advantages of this process are that it is possible to use cheaper materials and simpler tooling. It also enables cheaper processing, tight tolerances, part integration, reducing assembly costs. So far, the potential advantages of LCM could not be fully exploited, because preforming is either a manual process or else an automated process with limited scope, such as weaving or braiding. The aim of the AUTOW project was combing the best of both techniques through the development of manufacturing technology for automated preforming with a matching parallel development of a design capability. The basis of this innovation is dry tow placement using AFP technology. This paper will inform on the background objectives, the technical progress and the results achieved

Title: ***Delivery of Intelligent Transport Systems through the Application of Computational Intelligence***

Authors: ***Eric Goodyer, Samad Ahmadi, Francisco Chiclana, David Elizondo, Yinjie Yang***
Institutions: ***The Centre for Computational Intelligence, De Montfort University, UK***

Abstract: DeMontfort University's (DMU) Centre for Computational Intelligence (CCI), is engaged in a range of programmes applying modern Computational Intelligence techniques to provide superior analysis of complex real-time data sets that arise within transport systems. Better use existing transport infrastructures can achieve positive sustainable outcomes, reducing congestion, improving air quality, providing real-time travel information and supporting low carbon vehicles. 1) Logistics Logistics management presents a complex problem for system designers. CCI have successfully applied Neural Networks to road based logistics scenarios, offering superior solutions to traditional algorithmic methods. 2) An information system for the quality of aerial transportation This project aimed at building an artificial intelligence based observatory of the quality of Spanish aerial transportation. Including the production of a ranking of airline companies to help customer s plan their journeys, and to help companies improve services. Objective/quantitative criteria (prices, timetable, punctuality, etc.) and subjective/qualitative criteria based on customer opinions (collected via questionnaires) were presented on websites for users to review. Complementing the ranking of airlines, an advisory system was developed comapring services according to their profile, characteristics of companies and also on opinions previously obtained on such services by other users. 3) iTRAQ-integrated traffic management and air quality control iTRAQ will deliver a dynamic traffic management system for optimising use of the road network balanced with the need to sustain high standards of air quality. Financed by the European Space Agency's Integrated Applications Programme, the consortium of industry, academic and local authority partners combines expertise in intelligent traffic management, applying GNSS, developing air quality applications using Earth Observation and other GMES technologies. Consortium partners are Infoterra , Leicester City Council, DMU and Leicester University. Operational priorities for iTRAQ are to mitigate traffic congestion, improve public transportation network delivery and improve air quality. The system will use downstream space services from GNSS and GMES, integrated with intelligent traffic management technology, to deliver real-time optimisation strategies for urban traffic flow and air quality management. 4) Data Mining evidence to support hydrogen fuel cell vehicles 3) Hydrogen Fuel Cell vehicles will be trialled in Leicester in partnership with Riversimple and Leicester City Council from 2012. CCI will equip the

vehicles with sensors, including GNSS location, occupancy, weight and a connection to the vehicles CAN network. The ethos being that the technology is proven; what requires examination are the economic and environmental impact of using low carbon vehicles in a City. CCI will apply data mining techniques to analyse the live data captured from the vehicle sensors, the vehicle's CAN network, and subjective information provided by the users. The outcome will be a business model to support low carbon vehicles. 5) Decision support system for sustainable airports Increasing operations have significant impact on noise and emission around airports. This project applied computational intelligence (neural networks) to map relationships between airport operations and environment indicators. A 3D prototype CAD system combining airport operation, environment evaluation, and GIS was produced. The results show that neural networks produced more accurate evaluations than a general model like INM.

Title: ***SEETRANS 2011: main conclusions and its potential relevance towards a climate-friendly transport and mobility***

Authors: ***Fedor Cerne***

Institutions: ***Ministry of Transport, Republic of Slovenia***

Abstract: Climate-friendly transport and mobility is one of the dominant objectives within transport policy. SEETRANS conference, which will take part in Ljubljana on 12th and 13th of April this Year was not designed as a specific, towards climate changes oriented event. The leading idea was to bring the transport researchers first of all from the CEE countries together and offer them the opportunity to establish new, or join the existing research networks within the EU research area. The event was designed within the FP6 project TRANSLO, first focusing to strengthen the networks within Slovenian research community as a mechanism to improve results within FP7. The idea of TRANSSLO PLUS was to assured sustainability of already achieved results and to go further towards the CEE region where quite a similar set of challenges, problems and needs were expected. SEETRANS is the most visible result of that approach. The intention was not just to organise the event, but to start with the process of regular gathering of transport researchers and research organisation. Most of the environmental problems are able to be resolved only in a broader context. A single country can't do much concerning for example transit, rationalises in logistics. It is important to open the floor to all individual researchers and organisations which might contribute to all emerging objectives, climate changes are one of them. When designing the whole process it was one of the presumptions that CEE region is a potential pool of good project ideas which needs to get a chance within the EU research area. This might become reality by offering a structured area of dialogue, a chance to present themselves and the ideas, and to have time to start a needed networking.

Title: ***Impact of transport on climate and other elements of Belgrade area environment***
Authors: ***Lana Ristic and Ana Repac***

Institutions: ***Ministry of Environment and Spatial Planning***

Abstract: Transport has a negative impact on on the nature and the quality of human environment. This is especially manifested through: pollution of air, soil and water, noise, conversion of natural to the technical environment (various forms of environmental degradation), increasing pollution etc. All this contributes to the disruption of ecological balance, which is difficult to maintain a dynamic balance of a complex system. Air pollution through emission of harmful substances from motor vehicles (carbon monoxide, nitrogen oxides, hydrocarbons, etc..), soot and dust from combustion and friction tires and increased noise deteriorate living conditions and negatively affect the human health. Environmental pollution from traffic is not locally connected as pollution from industry, because motor vehicles are mobile (power source is mobile), so there is outstanding interest in greater international cooperation. Vehicle manufacturers have already intervened with other certain systems of constructive solutions and thus contributed to reduce the adverse impact (unleaded petrol, etc.).. By increasing the level of urbanization and purchasing power of citizens and therefore increase the level of motorization, rising the number of vehicles on the roads, more frequent traffic jams on the roads, increasing the number of traffic accidents, adverse impacts on the environment etc. Emission of polluting gases through the exhaust system of motor vehicles was one of the reasons that legislators respond by introducing the criteria and procedure of technical inspection. However, the technical inspection and also by the owners of motor vehicles are not paying enough attention to this problem. The result of joint action Auto-Moto Association of Serbia, Ministry of Interior of the Republic of Serbia - of Traffic Police and the Association technical review: "Proper vehicle-driving safely" from 7.11.- 12.11.2005. show that out of 1444 vehicles 135 vehicles possessed faulty device for emission of exhaust gases, which means that every 10th vehicle had faulty device. The reasons for increasing emission of polluting substances through the exhaust gases can be found in poor quality of fuel, increased traffic load on roads, obsolete rolling stock, etc. Given the fact that our country is still using gasoline with high percentage of lead additives (lead content ≅ 0.4 g / l), as well as increased traffic levels in Belgrade in recent years, initiate research through the study of spatial distribution of pollution of urban land by lead from vehicle emissions near roads. Impact of roads on the environment depends on many factors, primarily on the existing environmental potential, ranking in the network of roads and traffic volume. This means that the needs and structure of the process

of environmental research depend on conditions such as: width of the operation, content and level of details. The goal of environmental risk assessment of traffic impact on the climate and other environmental elements in the Belgrade area and its surrounding is protection and improvement of living conditions quality in the territory.

Title: ***The role of aircraft mainenance in emission reduction***

Authors : ***Ljubiša Vasov***, ***Slobodan Gvozdenovic***, ***Petar Mirosavljevic***, ***Olja Cokorilo***, ***Branimir Stojiljkovic***

Institutions : ***University of Belgrade, Division of Aircraft, The Faculty for Traffic and Transport Engineering***

Abstract: ABSTRACT: One of the main goals of sustainable development, which is predicted for the next decade by ACARE, is to reduce emissions. The amibitious goal of reducing CO2 emissions by 50% and NOx by 80% with new types of aircraft by 2020 gives additional impulse to the technological development of aircraft design, and can be achieved through improving the efficiency of aircraft engines, ATM, and the use of alternative fuels. However, taking into account the estimated growth in air traffic, which is predicted to be doubled by 2017 by EASA, and the limited abilities of companies in renewing its fleet with new aircraft, there is the necessity of applying a rapid and concrete action on reducing emissions within the existing fleet. The identification of key items in the maintenance of aerodynamic structure and engines which can contribute to reducing emissions is done in the first part of this paper. Performed ranking of critical areas and maintenance tasks in terms of reducing CO2 emissions indirectly by reducing fuel consumption is based on the empirical data presented by IATA, Airbus Industrie and engine manufacturers. Expansion of the tasks of aircraft monitoring and scheduled maintenance of aircraft is proposed in accordance with operational requirements and aspects of reducing emissions. The role of education and extension training of personnel engaged in aircraft maintenance, to create awareness of their role and potential contribution to reducing emissions is perceived in the second part of this paper. Finally, the authors point out the importance of motivating the airlines to take specific measures, and the importance of coordination and simultaneous action of a large number of small improvements in the area of environmental protection. The scope of this paper belongs to sub-theme of evaluating policies and measures in climate friendly transport. This paper is a part of new research project "Environment management system framework respect to aircraft engine emissions and risk of aircraft accidents around airports in Serbia", supported by Ministry of Science and Technological Development of Republic of Serbia.

Session 2

Policy Interventions in climate friendly transport

Title: ***Green Urban Transport for Shopping (GUTS)***

Authors: ***Kuo-Ming Chao, Weidong Li***

Institutions: ***Coventry University***

Abstract: The aim of this research is to transform urban shopping behavior to green, efficient and enjoyable experiences. It can reduce the number of shoppers taking their cars to the city centre and revive urban commercial activities by providing an advanced technology infrastructure and effective management system to encourage them to shop in the city centre, but leave their cars outside of the urban areas. The proposed system is intelligent, reliable and integrated logistics transport and shopping system. It does not consider the effective and efficient goods delivery, but it also consider the shoppers' convenience. It provides a real-time demand-oriented shopping and transport system. GUTS can encourage the shoppers to park their cars in the rural areas (i.e. park and ride) to reduce urban traffic and it also guarantees the quality of shopping and transport services in terms of performance, reliability, security, and convenience. It offers two types of services: transport and shopping services. In terms of transport services, the shoppers can go to and leave the urban areas rapidly, so the waiting time for public transport and goods delivery services can be minimized. For the shopping services, the shoppers can reduce their burdens to carry their bags and have their goods delivered to their car parks safely and timely. In other words, the shopping bags become virtual bags in the process. The proposed approach shares a number of features with airport luggage transfer system, but it includes its advantages and overcome its disadvantages. In addition, the concept for flight and luggage services cannot be applied directly to urban shopping services due to differences between these two domains. GUTS is an intelligent and fault tolerance logistic system which is aimed at scheduling goods shipping and shoppers transportation effectively and efficiently. Its design is to utilize the existing urban shopping subareas and park and ride areas. A park and ride area provides car park and secure lockers to store the shopper's goods for collection. Each urban subarea includes a number of shops or retailers and each has a smart locker system and secure containers. So, the shopper can leave their shopping bags in containers and deposit in a secure locker. The container is an intelligent container, which will be tagged with a wireless ID (such as RFID). When the container is secured in the locker, the system in the locker can notify the logistic service system, which can start to schedule goods dispatching. Each shopper will be issued a readable ID card to book their secure containers and lockers. In order to reduce possible bottlenecks in the delivery during the peak time, these containers will be collected and dispatched regularly. A smart baggage train which has

a number of intelligent slots to ensure that the number of containers needs to be collected and where they should be delivered are correct. This also applies to the buses which also deliver containers to the collection areas in park and ride. The collection areas also have lockers to store these containers according to the customer ID. The proposed system can minimize the number of shoppers carrying their bags, as it provides secure and speedy delivery services to the park and ride areas. Dedicated public transports can take the shoppers in and out to urban areas. The shoppers can collect their goods from the secure lockers located in the car parks, so the shoppers can have their flexibilities and conveniences in transport.

Title: ***Implications of EU directives for exhaust emission in the Serbian market***

Authors: ***Dipl.-Ing. Jevto Lucic, Prof. Dr.-Ing. Nenad Zrnic***

Institutions: ***University of Belgrade, Faculty of Mechanical Engineering***

Abstract: As transport volume continues to grow, it is more and more important to revise and evaluate measures defined and implemented in order to decrease emissions in road transport, to recognize characteristics of different markets and to find additional alternative measures that could, together with existing ones, help reduction of vehicles exhaust emission. One of the main measures implemented to reduce harmful emission in road transport is implementation of so called EURO standards. These mandatory standards, defined by EU directives, besides noise, limit the permitted level of CO, HC, NOx, particles and smoke, emitted by vehicles. By implementation of these standards, the permitted level of emitted gases decreased significantly (from EURO 1 to nowadays mandatory EURO5, CO emission decreased for 69.39%, HC decreased for 62.6%, NOx decreased for 77.78%, while particle emission decreased for 95%). In developing countries, such as Serbia, decarbonisation process/ transport increase ratio, together with the specific situation on the market and economic slowdown makes EURO standards insufficient as a main tool for exhaust emission decrease. Average age of the vehicles is too high, and new vehicles import is insignificant in comparison with the total number of registered vehicles. This situation needs recognition of feasible additional measures, and their implementation, both at a governmental and at a vehicle owner's level. This paper will focus on EU directives introduced to reduce vehicles exhaust emission and their implication on Serbian market. We will try to define alternative measures, that, together with existing ones, can help us achieve the goal to make transport more climate friendly.

Title: ***Strategy to reduce CO2 emissions by buses for Public Transport in EU***

Authors: ***Slobodan Misanovic***

Institutions: ***City Public Transport Company "Belgrade"***

Abstract: This paper describes the experience in the exploitation of energy efficient and environmentally clean buses in the system of public transport EU countries. Starting from the fact that in addition to passenger cars only in the 50 largest cities of EU in use around 55,000 buses, led to the adoption of a series of increasingly stringent standards that apply to limit emissions and CO2. Today the five largest bus manufacturers (Mercedes, MAN, Volvo, IRISBUS, SCANIA) produces about 12,000 buses per annum, representing 60% of world production of buses. These figures show that bus transport subsystem powered by diesel fuel because of its historic investment in developing vehicles and technologies, will remain the most dominant form of transportation in the next 20 years. In parallel with the EU over their bodies as the European Commission launched a series of strategic issues in the field of development of alternative fuels and further reduce exhaust emissions. Directive EC33/2009 Since December 2010. in EU countries apply the EC Directive 33/2009 concerning the promotion of energy efficient and environmentally clean vehicles in road transport, which are used in public sector such as buses for public transportation base year 1990. year. The concept of development with a diesel powered buses Combustion of 1 kg of diesel fuel deliver 3.2 kg of CO2. Improvements to diesel engines in terms of reducing emissions of CO2 and include: - Improved control injection (over 1500 bar) resulted in significant reduction in emissions of particulate matter (PM) and noise of 2-3 dB less than the conventional injection. - Chargers variable geometry turbo (VGT) - Combustion control electronic control time and duration of injection which leads to reduction of emissions of nitrogen oxides (NOx) - Improving the quality of components (surface area of cylinders, pistons, rings, etc.). Use of renewable bio-fuels (biodiesel, ethanol, bio-gas) Biodiesel (FAME) is the product of esterification of vegetable oil made from rapeseed seed, soybean, sunflower, flax, peanut, etc..It is used alone or blended with fossil diesel (B100, B20, B5 or B2 - the number indicates the percentage of biodiesel in a blend). When combustion emits 70% less GHG emissions (gases "greenhouse"), and significantly lower emissions of particulates, Directive 2003/30 / EC adopted a decision binding on all members of the EU that member states undertake to provide the minimum proportion of biofuels and other renewable fuels in their markets. Use of diesel-electric hybrid vehicles The main advantages of using hybrid buses are: Lower consumption of diesel fuel, lower emissions of CO2 and gases, lower noise and vibration. At this point, most hybrid buses represented in the United States and Canada where the end of

2009. years in service was 2872 diesel-electric and 160 CNG-electric buses. In Europe, currently running the 151 and the hybrid bus in 2011. year. Many cities and companies are planning significant procurement of these buses, so it is estimated that at the end of 2011. in Europe be 476 hybrid buses in operation. Application of technology Fuel cells - Project CUTE-ECTOS-STEP-CHIC The project CUTE (Clean Urban Transport for Europe) - ECTOS (Ecological City Transport System) - STEP AND CHIC pristekao is an initiative of the EU Commission for Energy and Transport in cooperation with Daimler Chrysler - Evobus with the aim to review the technical, environmental and economic aspects of using fuel cell technology in vehicles for public transport. It is estimated that just this type of alternative fuel is a possible solution to the problem of energy globally. This is by far the largest project of its kind in the world, with the idea that experiences from this project definitely decide the future strategy of this type of alternative facilities for the period after the 2025th year.

Title: ***Climate and environmental friendly transportation: Active moss biomonitoring of trace element atmospheric pollution in the Belgrade urban area***

Authors: ***Mira Aničić (1), Milica Tomašević (1), Marina Frontasyeva (2), Zdravko Špirić (3)***

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Abstract: Trace elements are persistent and widely dispersed in the environment and, interacting with different natural components, remain a major risk for human health and ecosystems. Most of trace elements are present in all aerosol fractions, including the high-risk respirable particulate matter (< PM2.5). Within urban areas, emissions from road traffic (exhaust emissions, non-exhaust particles from vehicles and resuspended road dust) comprise a substantial proportion of primary air PMs. Quantification of the magnitude of trace element emissions is problematic and implies a lot of measurements in the urban environment, i.e. monitoring of suitable tracer elements and following source apportionment. The use of native moss as biomonitors is a convenient way of determining levels of trace elements atmospheric deposition, as an complementary and possibly alternative to instrumental monitoring techniques. To clarify the peculiarities on the influence of exposure time on trace element accumulation in moss bags technique (active biomonitoring), moss Sphagnum girgensohnii Rusow were exposed in bags in the urban area of Belgrade. Different treatments, with (wet) and without (dry) irrigation, were applied to the exposed moss bags. Moss bags was exposed in several experimental set-ups at representative urban sites for five 3-months periods (July, 2005-October, 2006), as well as, at one sub-urban site for 1 up to 5 months (July-November, 2007) to examine effects of spatial and temporal variations of the trace elements atmospheric concentration on their content in the moss tissue. Also, moss vitality during the exposure period of five months was assessed determining the pigments contents and indexes (Chl a/b, D665/D665a) and applying colour (TTC) test. Up to 60 trace elements content were determined in the moss bags samples combining three analytical methods (INAA, FAAS, HR-ICP-MS). The moss element accumulation capability was also tested in relation to atmospheric bulk deposition. The most of the investigated elements showed a statistically significant increase of the elements concentration with the time of exposure regarding the initial content of elements in unexposed moss. However, some physiologically active elements (Na, P, Na, P, Cl, K, etc.) were depleted from moss tissue with time due to damaging of cell walls and leaking of the elements. The majority of measured elements was accumulated more efficiently by wet moss bags (especially Cu, Sr, Zn, Cr, Al, Fe, Pb, Cd) and depletion of physiologically active

elements was diminished comparing to dry ones. A significant correlation between moss and bulk deposition was obtained for some of the elements (especially V and Ni). According to the obtained results, S. girgensohnii moss bags may be applied as an appropriate biomonitor of certain trace elements atmospheric deposition in urban areas. Also, wetting of moss bags during exposure period improved element accumulation abilities and sensitivity of the moss.

Title: ***Port-city closeness and turnaround time critical for Short Sea Shipping sustainable performance. A case study: Spain.***

Authors: ***Juan José Usabiaga Santamaría Marcel·la Castells i Sanabra F. Xavier Martínez de Osés***

Institutions: ***Nautical Science and Engineering department Universitat Politècnica de Catalunya***

Abstract: Air pollution is the most relevant externality of maritime transport and its effect is mainly local. As Short Sea Shipping (SSS) services call ports frequently and expend significant time in port, both the overall turnaround time and the port city closeness, become critical in its sustainable performance. This paper analyses the impact of maritime transport at Spanish SSS ports and identifies the ideal ones, reflecting the differences in their sustainable performance and finally identifying the characteristics that a harbour needs to gather in order to minimize air pollution impact in the maritime transport sector.

Title: ***Optimization of trips to the university: a new algorithm for a carpooling service based on a Variable Neighborhood Search***

Authors: ***Maurizio Bruglieri* Tatjana Davidovic** Sanja Roksandic****
Institutions: ** Politecnico di Milano, Milan, Italy ** Serbian Academy of Sciences and Arts, Belgrade, Serbia*

Abstract: Car pooling is a promising policy intervention in climate friendly transport since it aims to decrease the number of circulating cars and by consequence their total air pollution emissions. It consists in a shared use of private cars. Typically it is organized by a large company for encouraging its employees to pick up colleagues while driving to/from work to minimize the number of private cars travelling to/from the company site. The core of the efficient management of such a service is to decide an optimal matching between the users and their preferred routing [4,5]. In this work we consider the special case where the users are the students of a university. This case differs from the classic car pooling problem [4,5] mainly for the following characteristics: • the users (students) can have very different timetables (depending on the classes attended); • drivers are able to set partial pre-arranged crews; • users may indicate other users they would prefer to car-pool with (friends) or they don't want to (enemies); • besides the campus premises, users can select – as destination of their car pooling trips – the main railway and subway stations (to encourage the use of more environmental friendly means than cars). The objectives are to maximize the number of served users, minimize the total route length, and maximize the satisfied user preferences (e.g. friendships), respecting the user time windows, possible partial pre-arranged pools and car capacities. The problem has been proposed for the first time in [2] and tackled with a Monte Carlo algorithm in [1]. In this work we propose a more sophisticated solution approach based on Variable Neighborhood Search (VNS). VNS [3] is a simple and effective meta-heuristic for solving combinatorial and global optimization problem based on a systematic change of neighborhood within a possibly randomized local search algorithm. Considering the real instances of the University of Milan [1,2] we compare the VNS results with those of the Monte Carlo algorithm and, when computationally possible, with the exact results of a Mixed Integer Linear Program formulation of the problem solved by the commercial solver CPLEX. [1] M.Bruglieri, A.Colorni, A.Luè, A web-based carpooling service for universites: a case study in Milan, In proceedings of EUROXXIV, July 11-14, Lisbon 2010. [2] A. Luè, A. Colorni, A software tool for commute carpooling: a case study on university students in Milan, International Journal of Services Sciences, Volume 2 - Issue 3/4 - 2009. [3] N. Mladenović and P. Hansen, Variable neighborhood

search: principles and applications, European Journal of Operational Research, 130 (2001) 449-467. [4] Teodorovic D., Dell'Orco M. Mitigating Traffic Congestion: Solving the Ride-Matching Problem by Bee Colony Optimization. Transportation Planning and Technology, Vol. 31, No.2, (2008) 135-152. [5] Wolfler Calvo, R., de Luigi, F., Haastrup, P., Maniezzo, V. A distributed geographic information system for the daily car pooling problem Computers & Operations Research, Vol. 31, (2004) 2263–2278.

Title: ***Green Move: design and evaluation of a ZEV sharing system for the city of Milan***

Authors: ***Diego Ciccarelli, Alberto Colorni, Alessandro Luè, Roberto Nocerino, Valerio Paruscio***

Institutions: ***Dipartimento INDACO - Politecnico di Milano; Poliedra - Politecnico di Milano***

Abstract: Green Move (GM) is an ongoing project financed by the Lombardia Region that aims at designing and implementing a vehicle-sharing system in Milan, able to offer to users different categories of ZEV (Zero Emission Vehicles). The system aims to be open, standardized, interoperable, modular and multi-business (a central agency will manage the coordinating system, but the single element may be owned by different public administrations or companies), in order to support the spread of the service on the territory and among new vehicle fleets owners and users. A trial will be carried out with a limited number of docking stations in a specific area of Milan. Given the multidisciplinarity of the project and the multiplicity of the tasks to be carried out, the project involves 8 departments and research centres of Politecnico di Milano. ---- Public decision-making procedures can be made rational and transparent using a decision aid methods, which support the selection of the best performing configurations of the service, allow the decision-maker and all the stakeholders to understand how the results are obtained, can be used to manage the conflicts. The model describes a decision aid method to support the design process of GM service. The first step is represented by the generation of a wide range of possible service alternatives. Each alternative is characterised by a combination of peculiar features, such as: technology of the vehicle, business model, fares, capillarity of the service, number of stations. Such generation is a particularly important and time-consuming process. Due to the strong innovation brought by this service, a new frame of stakeholders interaction has to be designed. Moreover, social acceptability, new business models, economic and marketing means to promote the service diffusion have to be investigated and are strictly bounded with the service design itself. The effects of the service alternatives will be estimated using mathematical models, i.e. by running simulations of the service given different future scenarios, as well experts' estimates. The evaluation criteria used in the assessment of the alternatives are the following: the effects on mobility, the environmental impacts, the financial aspects, customer satisfaction and the feasibility of the alternatives. This last criterion takes into account both the technical feasibility and the institutional and bureaucratic issues. The alternatives are compared using a multicriteria method in order to find a final proposal. The method used derives by multi-attribute utility theory, which is appropriate because of the presence of conflicting objectives and conflicting actors, with

different interests and decision powers. Such method allows ranking different alternatives by assigning to each one a global utility based on its scores as regards a selected set of criteria.

Title: ***ECDIS System in function of sea environment protection***

Authors: ***Srđan Žuškin, mag. ing. Marko Valčić, mag. ing. dr. sc. Igor Rudan***

Institutions: ***University of Rijeka Faculty of Maritime Studie***s

Abstract: Heretofore, ECDIS system development and implementation have been linked primarily to safety of navigation. Further development allows for the implementation from other aspects of navigation. This primarily pertains to timely on-line ECDIS system updating that contains all the necessary information vital for safe navigation, but also to the information updates that can significantly improve sea and sea environment protection. The paper contains an overview of important legal aspects of sea environment protection on global as well as on local state scale. Integration of these and other aspects of sea environment protection into the ECDIS system can lead to a global ship information system that can, apart from enhancing navigation safety, significantly contribute to sea and sea environment protection. This approach also ensures a reduction of possible consequences an ecological incident can cause to ships passing through a navigation area in which such an incident is recorded.

Title: ***Pollution reduction strategy for Serbian pushboats***

Authors: ***Aleksandar Radonjić, Danijela Pjevčević***

Institutions: ***Faculty of Transport and Traffic Engineering, University of Belgrade***

Abstract: The price of pollution is increasing with all new and increased industrialization. Today, sources of power or engines in automobiles, trucks, aircrafts and ships are examples of how modern world is breathing from day to day and from hour to hour, but on the other side, they (engines) generate atmospheric chemicals. The pollutants from transportation means degrade the quality of life in decreasing visibility, damaging infrastructure, natural world and society health. Today, diesel main propulsion engines are used for main propulsion for almost all ships in Serbian fleet including pushboats, self propelled vessels and many large and small auxiliary ships. Although economic pressures forced conversion to more efficient diesel powering, it also brought production of more pollutants from ships like oxides of nitrogen (NOx) and sulphur oxides (SOx). Moving a cargo with ships from one point to another point is a fuel-efficient method and certainly presents the lowest pollutant method of all transport systems if we consider long distance movement per tonne basis. Diesel engines are already efficient and while highly efficient, ships are not insignificant source of carbon emissions at a global level. A strategy for overall decerase in pollution from ships is presented in this paper. Combining ship hull form characteristics and propulsion plant parameters it is showed that there are more options for reducing the carbon impacts of ships. The study is based on self-assessment of hull powering performance using propulsion shaft torque data from torsionmeters installed on ships and ship speed data obtained from experimental measurements. Periodic speed/power measurements could enable ship's crew to forecast the appropriate time for hull maintenance in order to achive the minimizing of fuel consumption, as well as to lower pollution from ships. The concept of speed measurements for assessing power performance is not a new concept. What is new, is the procedure to gain the maximum sensitivity to changes in the resistance of a ship's hull or propeller. Results for Serbian pushboats are presented. Results show that this procedure could be applied over time during the life of ship.

Title: ***Climate friendly transport by using synchronized multimodal transport systems – The case of the Aegean Islands***

Authors: ***Dr. Julia Th. Costaki***

Institutions: ***Hellenic Civil Aviation Authority***

Abstract: The scope of this paper is to present, analyse and evaluate the advantages of intergraded and synchronized multimode transport systems especially in order to reach long distance destinations or regions with geophysical peculiarities that cannot be easily accessed by road. It examines - as a good example - the case of Aegean islands in Greece. This region suffers from many typical disadvantages of insularity and the accessibility of the inhabitants to services, work, health, infrastructures and recreation is not well served. Transportation in the extended island region of Greece and especially in the Aegean Archipelagos has always been problematic. In the old times the inhabitants owned boats or larger vessels and the majority of them lived from the sea (fishermen, mariners, etc.). Nowadays tourism is the major activity and societies depend a lot on ferries, high-speed ships and aircrafts. The location of ports and airports has thus become very important for the distribution of goods and the well being of the human installations. Almost all of the islands have a port (sometimes we find 2 or 3 in the larger ones) but very few have an airport able to accept airplanes coming from the E. U. Each mean of transport is being organized by a different authority and regulated by a different Ministry. It is obvious that these traditional transportation systems are no more sufficient and cannot cover the demands for the future development of the whole region. In addition to that pollution caused by the transport of products and humans is recognized as a major contributor to CO2 emissions. Reduce of pollution during transportation through involving multimode transport systems is very important and can save energy and sources in multiple ways. This paper is based on my doctoral thesis: “The regional airports of Greece – spatial development and growth” presented in the National Technical University of Athens.

Title: ***Stakeholders engagement in municipal sustainable transportation programs – Comparison between Poland and Germany and recommendations for Poland***

Authors: ***Kinga Mazur***

Institutions: *Independent* (the article was written during a scholarship at the Wuppertal Institute, Germany)

Abstract: A shift towards sustainable transport and mobility in cities is necessary in order to diminish the negative impact on environment and improve quality of life of the citizens. Cycling is an example of an environmentally friendly means of transport that is popular and well established in many Western European countries. In order to encourage people to cycle investments in infrastructure do not suffice. It is important to influence people's behavior by providing them with information, and giving them possibilities to engage in the decision-making process. Bicycle use is well-established in Germany. The modal share of cycling traffic is among the highest in Europe. German municipalities have rich experience in the process of engaging stakeholders in the cycling projects. In Poland cycling investments came to life in the recent decade. Cycling is not as popular as in Germany, and riding a bike is connected with a high accident risk. According to available statistics the number of fatalities among bicycle users in Poland is the highest in the EU. In Poland there is a need for development of measures that strengthen the position of non-motorized transport and in the same time to educate and encourage people to switch to environmentally friendly means of transport. The aim of this article is to presents the stage of cycling promotion in Poland and in Germany. The main focus lies on projects that have been created to influence people's behavior and to engage them on the communication level, in the consultation field and cooperative participation between municipalities and local stakeholders. At the first stage, after interviews with mobility experts in Poland, information about Polish projects has been collected. Fields of cycling promotion and stakeholder engagements needing improvement have been defined: - image campaigns, - educational projects designed for children, projects in the field of traffic safety instruction, - projects designed to activate local communities. After a literature analysis, the analysis of existing databases, examples of good-practice in Germany that deal with those challenges have been identified: - Image and information campaigns: Nürnberg steigt auf (Nuremberg mounts a bike) and „Kopf an: Motor aus. Für null CO2 auf Kurzstrecken." (Brains on. Engines off. For zero CO2 on short distances). - Innovative traffic education projects for children in the city of Marl, - Project activating local communities: Radverkehrförderung für Quartiere in Stadt und Peripherie (Cycling promotion for urban and suburban areas) in Dortmund. After selecting such projects

interviews with municipality representatives and members of local NGOs involved in those projects had been made, where questions about the process of stakeholders engagement have been asked. Results of the interviews were used to form recommendations for Poland. In order to achieve progress in Poland it is necessary to intensify the efforts on integration of stakeholders in the planning and realization process of cycling projects.

Session 3

Evaluating policies and measures in climate friendly transport

Title: ***Climate Change and Environmental Regulations for better Transport***
Authors: ***Dr Nataša Tomić-Petrović***

Institutions: ***University of Belgrade***

Abstract: There are many changes around us and as we know, the challenges of environmental protection are very complex and have to be observed continuously, because production, processing, transportation and utilization of fuels are global polluters and these pollutions do not recognize state borders. Disharmony of the speed of development of the law and technology requires that regulations are more actual in accordance with the needs of time we live in. Daily life is becoming increasingly dependent on energy consuming devices. The transport sector is the fastest growing consumer of energy and producer of greenhouse gases, even if advances in transport technology and fuel have resulted in marked decreases in emissions of certain pollutants. Among renewable energies, the most important sources are biomass and waste. In 2001, the European Commission (EC) adopted a policy to promote biofuels for transport. The EC adopted its second strategic energy review in 2008. We are conscious that renewable energy has an important role in reducing carbon dioxide emissions. The Integrated energy and climate change Strategy adopted in December 2008. provided a further stimulus for increeasing the use of renewables to 20% of total energy production by 2020 (including a 10% biofuels target for transport). This Strategy foresees the share of renewables, such as biofuels, in total fuel consumption rising to 10% in 2020. These steps give us hope that climate friendly transport will prevail all over the world. There are many factors that produce impacts on energy use within the transport sector, such as, overall economic growth and lifestyle choices, the efficiency of individual transport modes and the take-up of alternative fuels. The growth in the demand for energy from the transport sector has been accompanied by an expansion in personal travel. Time has shown that legal and other social norms can be the significant factor in prevention of antiecological behaviour. Government of the Republic of Serbia in 2009 adopted Strategy for introduction of cleaner production in the Republic of Serbia.

Title: ***Evaluation of an e-bus: what did it reveal about attitudes to climate change***
Authors: ***Andree Woodcock***

Institutions: ***Coventry University***

Abstract: Sustainability and sustainable transport form the background to the evaluation of an electric bus operating in a small, historic town in the UK, which is a popular tourist destination. The town has a steady stream of tourists who come in to the city centre on diverse forms of transport to visit tourist attractions and attend the theatre. The interaction between the various vehicular and pedestrian traffic is chaotic. Associated problems are high levels of congestion and pollution. A survey was undertaken with residents, retailers and visitors to gather insights into different facets of the transport problems and to determine the acceptability and usefulness of an electric Park and Ride bus.

Title: ***Monitoring of chemical pollution from the ships in coastal area***

Authors: ***dipl.ing. Goran Bakalar prof.dr.sc. Vinko Tomas***

Institutions: ***Faculty of maritime studies Rijeka University of Rijeka***

Abstract: ABSTRACT Use of satellite communication technologies for sea pollution monitoring has been analyzed in this review. Satellite communication technology today, covers monitoring of big pollutions only. Technological limitations and improving potential of that kind of monitoring were listed. Particular attention has been payed to the oil discharge monitor. It has been researched possibility of use that monitoring potential for chemical pollutions from the ships in coastal areas. Real cases from the experience and registered accidents were explained in this paper. Possible reasons of the accidents were brought out after experience cases were analysed. Chemical pollution cases were taken as good examples in this review, being compared against oil pollution cases. Minor oil pollutions in coastal area were drastically reduced since oil discharge monitor is in use. That advantage in oil cases is being taken into consideration in this paper and another solution proposed. Proposed solution in this review is possibility of use satellite positioning system combined with good software programs and emergency procedures already in use on the ships. In another solution satellite communication technologies would force up ship operators to work in accordance with the pollution prevention law. Automation would stop chemical pollution in coastal areas. Key words: sea protection, liquid chemicals transportation, coastal area contamination, satellite communications technologies, global satellite positioning system, chemical pollution monitoring.

Title: ***A computational method for assessing the impacts of climate-change related weather events on transport networks***

Authors: ***George Giannopoulos, Evangelos Mitsakis, Jose Salanova, Anestis Papanikolaou, Eliza Gagatsi, Dimitris Margaritis***

Institutions: ***Centre for Research and Technology Hellas - Hellenic Institute of Transport***

Abstract: The paper aims to present a computational method for assessing the impacts of extreme weather events due to climate change on transport networks. A mathematical programming formulation for assigning the demand for transport onto a transport network is used, together with an iterative procedure for computing the importance of network components, i.e. links and nodes, and a method for assessing the network wide impacts due to the closure of specific network components due to climate-change related extreme weather events. Three case studies of the proposed assessment procedure are presented, which include actual extreme weather events that occurred in the past in Germany, Greece and the Netherlands, demonstrating the applicability of the method.

Title: ***Impact of emissions of marine diesel engines to air pollution on the example of the Yugoslav River Shipping***

Authors: ***Dragan Ljevaja***

Institutions: ***World Transport Overseas Serbia***

Abstract: The subject of this paper is the impact which marine diesel engines have on air pollution. The combustion of fossil fuels for marine diesel engines produces emission of various greenhouse gases; including carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), carbon monoxide (CO), oxides of nitrogen (NOx), non-methane volatile organic compounds (NMVOCs), and sulphur dioxide (SO2). Gas emission calculation is shown on the example of the Yugoslav river shipping with two methods for calculating harmful emissions of the marine diesel engines. Technologies for reduction of harmful emissions of marine diesel engines and other engines are also presented, as well as the implementation of those technologies, using the example of the Yugoslav river shipping. One of the objectives of this paper is to determine the actual condition of the fleet, as well as the impact it has on air pollution in Serbia, as a country which plans to become a member of the European Union. A measurement on diesel engines of different production date was done with a special device, in order to get the results that represent reality (about harmful emissions) in Serbia. Final task of this paper is to collect information in order to reduce harmful emissions of the marine diesel engines, along with preservation of the environment.

Title: ***Supporting regional rail decision makers to award green: The ECORailS project***

Authors: ***Martin Schipper, Matthias Pippert, Vera Raabe***

Institutions: ***TSB Innovation agency Berlin GmbH, Pro Rail Alliance Germany***

Abstract: Railways are one of the most environment-friendly means of passenger transport. Modal shift towards rail transport can be an appropriate measure for reducing energy consumption, CO2 emissions, pollutants and noise. Energy consumption and CO2-emissions are related to each other. This area is the strategic key area for the sustainability of transport in general. The inherent advantages of rail transport are most prominent in terms of energy efficiency. However, the railways have not yet realized all their energy-efficiency and environmental potentials, and the ECORailS project therefore focuses on this issue. In most European countries, regional rail services are today coordinated by regional or national Public Transport Administrations (PTAs). National ministries, regional governments or purposely founded management organisations usually organise train services by Public Service Contracts (PSC). These contracts define the extent and the quality of services as well as the price the PTA has to pay to the contracted TOC. The quality of services (including e.g. energy consumption) depends to a great extent on the quality of the rolling stock which is used. If the TOC procures the rolling stock, it must fulfil the qualitative requirements of the PTA. Some PTAs procure rolling stock themselves and provide it to the contracted TOC; thus the PTA can influence the quality of the fleet directly. Wherever European PTAs are committed to environmental goals, have sufficient and reliable funds, and respect some basic principles of passenger-friendly service concepts, regional railway passenger services have become a great success in terms of increasing numbers of passengers and enhanced service quality. A lot of PTAs already have their experiences with quality criteria. However, criteria concerning energy efficiency and environmental effects have their own challenges. This is the reason why the ECORailS consortium took the effort to elaborate Guidelines for involving energy-efficient and environmentally-friendly criteria into the tendering and procurement by regional rail decision-makers. The Guidelines comprise the main economical, ecological and political arguments and contain a comprehensive list of relevant criteria. They can be used to choose, to concretise and to evaluate energy efficiency criteria as well as noise and pollutant criteria, and show present and future potentials and solutions for saving energy in regional passenger rail transport. Four Administrations from Berlin-Brandenburg, Lombardy, Øresund and Timisoara have undertaken tests of the Guidelines which led to an energy reduction potential of 5% compared to current awarding and 10% compared to actually used rolling stock. Stakeholder Forums have been built up at all four

test sites and Europe wide with 14 further Administrations and Administration Associations, 13 Train Operators and Infrastructure Managers, and 7 Vehicle Suppliers. The Guidelines benefit from both the own ECORailS research activities and the results of previous and currently ongoing technological projects like EVENT, PROSPER (resulting in UIC Leaflet 345), and Railenergy in order to enable and encourage the European PTAs to profit from already available results.

Title: ***Exploring the youth environmental attitudes and intentions to travel behavuour change***

Authors: ***Svetlana Čičević***

Institutions: *Independent*

Abstract: During the past few decades, rising concern about environmental problems has led to international scientific debate. It follows the growing necessity to increase the levels of concern about the environment and climate change including the contribution of transport, and the extent of its potential to influence travel behavior. The purpose of this pilot study was to explore young individual's beliefs regarding climate change, and to use the data to understand peoples' behavior regarding car use in the context of climate change. The sample consisted of 30 college students (57% females and 43% males; with the mean age of 21.68 years). Participants completed a questionnaire assessing demographic information, self-reports of behavior, and items measuring EA (Environmental Attitudes).

According to the results, understanding of the causes of climate change was somewhat limited and confused. Regarding the question that humans are running out of their supply of oil, 31% of the students were unsure, while 13% strongly agreed and 22% agreed to some extent. The majority of students believed that human beings have the right to change and alter nature in order to satisfy their needs. Subjects were against of use non-renewable natural resources. Over 84 % of the population showed strong trust that science and technology will solve problems with pollution and diminishing resources. With the opinion that the positive benefits of economic growth far outweigh any negative consequences strongly disagreed the majority (73%) of subjects. They claimed that environmental goals are more important than economic. Also, the majority of students agreed for giving full support to people and organizations that are campaigning to preserve nature from being used or altered by human activity. On the other hand, 30% disagreed for their willingness to join and actively participate in environmentalist groups, until over 50% agreed. Surprisingly, the majority of student population did not favored the (24% strongly disagreed, 20% disagreed, somewhat disagreed 10% and 13% were neutral) need to decrease the use of the motor car as a major means of transportation. On the other hand, they very often (33%) or often (40%) conserved gasoline by walking or bicycling, while a further 17% indicated that they sometimes do that, and never, only 3%. The activity that was most commonly mentioned as performed during last year was recycling and reusing things and engaging in encouraging friends or family to recycle. But, they were not ready to try to persuade others that the environmental protection is important. From this fact, obviously, there is a need to understand the role of information in improving public awareness. Communicating the

contribution of personal transport decisions is key. The hypothesis of a pro-social behavior as a driver of individual climate mitigation action may deserve attention. It has to be pointed to the importance of social norms and social support as drivers of individual actions. In this respect, information and educational campaigns deserves attention as means to change people's behavior. Fortunately, the social norm is obviously moving fast towards more sustainability in areas of energy management and transportation sector.

Title: ***Technological and capacity optimization of the Novi Sad shunting station***

Authors: ***Gordan Stojić, Ilija Tanackov, Jovan Tepić, Siniša Sremac, Marija Stanić***

Institutions: ***Faculty of Technical Sciences, Novi Sad, Serbia***

Abstract: Shunting stations are centers where railway transport components spend considerable time in the process of the fulfillment of their demands. They perform a maneuvering operation, consisting of composing and recombining the train components. They are placed at points of large scale loading and unloading, as well as at railway line connection or intersection points and major traffic nodes. Shunting stations, according to their characteristics, can be considered complex technical - technological systems. They service trains that require the processing, preparation, dissolution, accumulation, re-assembling, as well as locomotive servicing and shipping. At each stage, the system is comprised of the three basic components: input, service and output, as well as frequent queues. These serve as guidelines in identifying the key mass-servicing system components. This work presents modeling of the technology and capacity of the shunting station loading park, based on mass-servicing theory. The loading park models were based on non-Markov mass-servicing systems (MSS) and developed on the example of shunting station in Novi Sad.

Title: ***Intermodal technology application on the Belgrade-Bar railway line***

Authors : ***Gordan Stojić, Jovan Tepić, Ilija Tanackov, Siniša Sremac, Dušan Tešić***

Institutions : ***Faculty of Technical Sciences, Novi Sad, Serbia***

Abstract: Combined intermodal transport is a well known philosophy and has become practically the only strategic solution to global commodity distribution problems. The goal for European railways is the development and implementation of technology that can be commercially competitive with road transport, whilst providing compatibility with road and water transport, as well as handling technologies at ports and terminals. Ministry of Science and Technological Development of Serbia recognized the current trends, and has selected the intermodal transport as a possible solution for the expected increased transport demand in Serbia. Intermodal transport allows fast and safe transport of large quantities of goods, whilst reducing road congestion, number of traffic accidents and pollution. It also requires technology that can, at present, be successfully accommodated and implemented by the transport sector in Serbia. Intermodal transport also contributes towards raising the standard of Serbian transport services to the European level. Due to underdeveloped terminals in Serbia, intermodal technology A (transport of complete road vehicles) is identified as particularly suitable for application. Namely, it does not require special loading devices and devices at the terminal; using a simple and inexpensive equipment (ramps and crossovers) instead. This paper presents detailed characteristics of intermodal technology A, including its advantages and disadvantages, and technical requirements for its introduction on the Belgrade-Bar railway line.

Title: ***Environment friendly transport solution – Transadriatic Balkan Transport Corridor***

Authors : ***Natasa Gojkovic Bukvic***

Institutions: ***Management Consultancy Bari, Italy***

Abstract: Key words: Balkan, EU, intermodal, CO2 reduction, environment, climate The idea of the project is to find a way how to connect South Italy (South Europe- Spain and Portugal) to South East Europe/Balkan Peninsula countries in the most suitable way with less air pollution, more traffic safety and reduction of road congestion. This approach could be seen as immediate implementation of the European Union Common Transport Policy and enlargement of European Union on Balkan Peninsula, countries which are still out of EU and also to establish joined traffic management as one of the most industrialized topic areas within transport research. This means that this research area is very dynamic and fast moving and should continue to be so, obviously with special attention on environment . Creation of a new intermodal/combined transport corridor could reduce CO2 emission with enormous advantage on the environment, reduction of greenhouse gas emission, not only because of reduction of number of kilometers, which a new corridor permits, but also because we are focusing on creation of railways joined practice between all Balkan countries with interoperability and interconnection operations and management. The project takes care, promotes, underlines protections of the environment and natural resources. The governments need to impose more determent air quality standards, this requires action to achieve these standards first in those areas where larger numbers of people are exposed. Key issues will be if the technological improvements can keep pace with expected growth in transport industry and if appropriate incentive structures are able to encourage further developments and side effects that should be effectively compensated. Climate change and increase in energy efficiency creating a new intermodal corridor will have a direct and indirect influence on many others domains. European Union found out that transport has a determinant impact on regional development and regional cohesion. The South-East Europe countries should be more sensitive on this issue because of facing with more or less critical levels of socio-economic and stability. As regards of the automatic link between economic growth and growth in freight transport, the solution is not in reduction of transport but in redistribution between modes. This is a reason why a project idea could have success. In this case we are not only talking about redistribution between modes of transport but also implementing a new corridor with environment benefits.

Title: ***Expert and public attitudes to sustainable transport options***

Authors : ***Lorraine Whitmarsh, Dimitrios Xenias***

Institutions: ***Cardiff University***

Abstract: Government adoption of strict targets on curbing CO2 emissions will have profound impacts on individual choices. Transport accounts for a large, and growing, proportion of total CO2 emissions in the EU, with approximately 80% coming from road transport, including car use. This, in conjunction with other aspects of unsustainability of current transport systems (e.g., accidents, air pollution, inaccessibility), means sustainable transport policies need to be defined and implemented. While expert and special interest (e.g., industry) groups are likely to be involved in defining such policies, the general public will experience and enact them. In the light of high-profile examples of public protests against transport policies (e.g., the UK fuel duty protests) it is critical to gain an understanding of how citizens understand transport problems and their attitudes to potential solutions for tackling them, and how these understandings and attitudes differ from expert/ professional groups. In two mixed methods studies we investigated (a) understanding of, and attitudes to sustainable transport and relevant policies and technologies in an expert and a public sample and (b) areas of convergence and divergence between samples, between individuals, and depending on the alternative elicitation methods we used. In Study 1, we compared attitudes to sustainable transport between an expert sample (i.e. policy, academic, and industry transport experts, N=44) and a general British public sample (N=30). We employed qualitative (interviews, deliberative workshops) and quantitative (attitudinal scale, preference ranking) methods. Both expert and public samples identified reduction in transport demand as their priority in qualitative measures. In quantitative measures, however, experts prioritised economic and technological measures while the public prioritised behaviour change and improvement of public transport. Study 2 was a replication and extension of Study 1 in four ways: we added new quantitative measures of preferences (e.g. Advanced Hierarchical Processing, AHP), in addition to traditional ranking scales and aforementioned qualitative measures; we included salient psychological and behavioural measures (e.g., environmental values, perceived responsibility, past behaviour); we added a telephone follow-up interview to assess medium-term attitude and behaviour change; and we recruited new but comparable samples of transport experts (N=42) and general British public (N=40). Results from both samples broadly replicated findings from Study 1 in the comparable measures; i.e. in quantitative measures, experts preferred economic and technological solutions and the

public focused on behaviour change and improvement of public transport, while in qualitative measures the experts generally agreed with the public about the importance of modal shift (albeit in written answers as opposed to oral feedback in Study 1). The replication of these expert-public discrepancies has important implications for public engagement in policy-making as well as the risk perception literature. However, we also note significant variation in attitudes and perceived responsibility in respect of sustainable transport according to individuals' values, suggesting that expertise alone does not fully account for variation in attitudes. Finally, we highlight variation in findings according to method, and argue for the value of mixed methods research.

Session 4

Future research priorities in climate friendly transport

Title: ***Intelligent voyage model for emissions lowering***

Authors: ***Professor T. Varelas, S. Archontaki***

Institutions: ***Danaos Shipping Co***

Abstract: The last years several weather including wind-wave, swell, wind and currents forecasting models have been developed by research centers like ECMWF, NOAA, UOA and are widely adopted by the shipping industry. The prognosis horizon has been expanded to two weeks and sophisticated interpolation techniques improve the resolution to 0.25 degrees. On the other hand ship performance models have also been developed that enable the theoretical calculation of the performance index of the vessel as l=FOC(tns/mile) taking into consideration hydrodynamic data, the added resistance because of weather conditions as well as the current's effect. Today weather information providers offer their services either interactively through WEB or by transferring data over communication links in near to real time. For celestial to our day's satellite navigation, voyage planning remains one of the most Master's important tasks. So far its continuous alignment within the new technology and increased environmental awareness is a must. Searoutes is EC funded R&D innovative project on routing based on weather forecasting simulation of ship in a seaway.. Danaos being participant in the project invested to apply the results implementing a decision support tool for voyage planning to optimize bunkering cost and moreover to reduce emissions. During the evaluation period different type of vessels (containers, tankers etc), and clients (owners, managers or charterers) participated. The useful feedback of hundreds passages was analyzed and system has been adjusted to be feasible, functional specifications adopted and the concept has proven. In this paper the outline of the optimum model is presented the importance of models integration with navigation expertise is underlined, the key factors are emphasized, and the optimality against the least cost routing is proven. Paper will be also focused in the theoretical hydrodynamic model calibration using neural networks as it has been developed within the scope of IP EU Flagship project. Keywords: Voyage optimization, Neural Networks, Control Theory, Added resistance

Title: ***Railways as a climate friendly transport mode facing the consequences of climate change and adapting to them. Lessons from the ARISCC project***

Authors: ***Dr. Roland Nolte, Christian Kamburow***

Institution: ***IZT Institute for Futures Studies and Technology Assessment, Berlin***

Abstract: Railways have very low specific CO2 emissions per transport output due to the system inherent energy efficiency and are therefore the favourable transport mode also for the low carbon/ carbon free future. On the other side, railway infrastructure is facing special challenges resulting from the consequences of global climate change, notably local and regional extreme weather events and changing weather patterns. The paper presents ongoing adaptation measures at European railways and introduces an integrated natural hazards management for today's challenges and for the adaptation of railway infrastructure to the consequences of climate change. The presentation highlights how an already low carbon transport mode is facing the consequences of climate change and discusses further research and action needs.

Title: ***2DECIDE: Design of a Tool to support decision making in Intelligent Transport System Deplyoment***

Authors: ***Studer Luca, Marchionni Giovanna, Caprile Elena, Böhm Martin, Schwillinsky Stefan***

Institutions: ***Politecnico di Milano - Laboratory for Moility and Transport, AustriaTech – Gesellschaft des Bundes für technologiepolitische Maßnahmen GmbH***

Abstract: The toolkit solution presented in this paper addresses one of the most important ITS deployment related challenges on European level: Support and speed up consistent decision making related to ITS deployment for road and public transport (timely, cost-effective, interoperable, positive impact to urban and interurban mobility, positive cost/benefit ratio). It is planned to implement that solution in the 2DECIDE project, which is funded by the European Commission. The aim of the 2DECIDE project is to develop an ITS Toolkit in order to support authorities to best exploit ITS to address problems such as congestion, accidents or environmental pollution, as well as to improve user services, promote inter-modality, access information, enhance safety and security aspects, etc. 2DECIDE will suggest different solutions via the toolkit interface, depending on the problem or situation encountered by the user. Solutions include the deployment of systems integrating telematics with transport engineering in order to plan, design, operate, maintain and manage transport systems, in the road and public transport sectors. The following key information shall be provided to the user by the ITS Toolkit: • Best practice examples of ITS deployments • Information about costs, benefits and impacts of ITS solutions • A database of evaluation reports on ITS projects • Information on technical and legal aspects for ITS solutions • Targeted information in response to a user query.

Title: ***Does New Rail Service Discourage Car Use? - Evidence from four English Cities***

Authors: ***Shin Lee*** *and* ***Martyn Senior***

Institutions: ***Cardiff University***

Abstract: There appears to have been little use of Census data to examine transport policy impacts. Although English Census data refer only to work trips, they provide origin-destination information by travel mode at reasonably small geographic scales. The decennial interval of the Census is also suitable for examining medium-to-long-term changes in travel behaviour. The paper examines the impacts of four light rail schemes opened between 1991 and 2001 on car ownership and travel mode along the rail corridors. The effects of these schemes are isolated by comparing the changes in the new light rail corridors with those in 'control' areas. Control areas represent what would have occurred in the light rail corridors if the schemes had not been built. The control areas are selected on the basis of: car ownership, the distance from the city centre and the relative importance of rail commuting in 1991. Despite two schemes achieving and even exceeding the forecast ridership, the proportion of households owning multiple cars increased in the light rail corridors and typically by more than in the control areas. Growing rail shares in the light rail corridors have mainly been at the expense of bus trips and the evidence for light rail reducing car use is less clear.

Title: ***The Role of Mobility Management Strategies in GHG Emissions Reduction: Library - based Approach for Impacts Evaluation***

Authors: ***Nataša Bojković Snežana Pejčić-Tarle Dragana Macura Nebojša Bojović***

Institutions: ***Faculty of Transport and Traffic Engineering, University of Belgrade***

Abstract: In line with the growing interest to reduce the greenhouse gas emissions from transport, this paper explores the role of strategies that encourage more efficient operating of transportation systems, called mobility management. The objective is to address one of the main challenges in the commitment for the mobility management strategies - evaluation of their impacts. Combining the evidence and research on policy instruments from the most comprehensive information sources, the paper develops a framework for comparative assessment of potentially effective measures. In the core of the proposed approach is the consideration of additional benefits provided by selected mobility management strategies for emission reduction. Delivering knowledge about potentials of the specific measures and their overall benefits to society, allows policy-makers more accurate decision-making. Keywords: Mobility management, Policy instruments, Library-based approach, Decision-making process. Sub-theme: Evaluating policies and measures in climate friendly transport.

Title: ***Is the utilization of methane gas, the solution of air pollution in difuse sectors. The case of Port of Castellòn***

Authors: ***F. Xavier Martínez de Osés & José María, Gil Aizpuru***

Institutions: ***Universitat Politècnica de Catalunya***

Abstract: Within an scenario of highly sensitivity on environmental questions, followed by an international regulation body, that is restricting the emission levels from ships in ports with the future possibility of more stringent local regulations; the challenge for the world's fleet are not only technical but economic and logistical. From one side, there are different technical alternatives affording to accomplish the nowadays international regulations. Even avoiding on board modifications, the owner can decide to use low sulphur content fuels, together with slight changes in engines to reduce the levels of nitrogen oxides. But the question posed in this paper is how to support the decision to use high quality oil derivatives, because environment questions, but with a favorable economic balance. That superior cost will be translated in a higher transport chain cost. Additionally regarding coastal navigation, it is possible in the future that some new regulations could penalize elevated rates of CO2 emissions, not yet considered by MARPOL convention. This paper will analyze the availability of the use of methane as ideal fuel to get compliment of the nowadays and even future, local and international regulations of CO2 and NOX, regarding the fuel derivatives and no emissions of sulphur oxides and ashes. The structure of the work, will describe the state of the art regarding the regulation scenario, due to the entrance of the European directive 99/32, limiting the sulphur quantity in fuels, used for ships berthed at port during more than 2 hours, below to a 0.1% in mass content; but also the technical and the operational scenario. After that, there will be described the assessment model to validate the economical and operational viability to provide methane gas to ships berthed at port. The proposed model is going to be checked in Castellón port (Spanish Mediterranean coast) which is an example of regional size port, with traffic figures exceeding the 11 millions of metric tons. At a first glance the most immediate solution is to use gas oil with low sulphur content, but its cost is not negligible above the IFO or MDO prices. Despite this, the paper is going to analyse the viability to use methane directly provided by port devices to ships, keeping in mind that Castellón is one of the destinations of the Methane imported by sea in Spain.

Title: ***Assignement of Service Zones to Capacited Vehicles with Time Constraints***

Authors: ***Dražen Popović, Milorad Vidović, Marko Ivković***

Institutions:

Abstract*:* Distribution of parcels in city area in most cases relies on vehicles with internal combustion that cannot be described as climate friendly. In that sense it is of great importance to minimize harmful emissions of used vehicles in distribution by minimizing the total travel distance. Problem observed in this research is inspired by the distribution of parcels in courier service of Serbian Post where city area is divided into service zones which have its own expected total volume of parcels demand and available total time of delivery. I the system the problem is to assign service zones to vehicles' capacity and allowable working time in which all deliveries must be realized, where the assignments must incur minimal travel distance of vehicles between given zones. Therefore, this problem can be described as Capacitated Vehicle Routing Problem (CVRP). To solve the problem, we have developed Mixed Integer Programming (MIP) model and proposed heuristics. Complexity of the problem allows using MIP model only in the case of smaller problem instances which do not correspond to dimensions of real case problems in courier service parcel distribution. That was the main reason why we proposed heuristics, which is used to solving the real case dimensions of CVRP problem. Heuristics can be described as constructive heuristic with neighborhood search improvements of solution.

Title: ***The role of aircraft maintenance in emission reduction***

Authors: ***Ljubiša Vasov, Slobodan Gvozdenovic, Petar Mirosavljevic, Olja Cokorilo, Branimir Stojiljkovic***

Institutions: ***University of Belgrade, Division of Aircraft, The Faculty for Traffic and Transport Engineering***

Abstract: ABSTRACT: One of the main goals of sustainable development, which is predicted for the next decade by ACARE, is to reduce emissions. The amibitious goal of reducing CO2 emissions by 50% and NOx by 80% with new types of aircraft by 2020 gives additional impulse to the technological development of aircraft design, and can be achieved through improving the efficiency of aircraft engines, ATM, and the use of alternative fuels. However, taking into account the estimated growth in air traffic, which is predicted to be doubled by 2017 by EASA, and the limited abilities of companies in renewing its fleet with new aircraft, there is the necessity of applying a rapid and concrete action on reducing emissions within the existing fleet. The identification of key items in the maintenance of aerodynamic structure and engines which can contribute to reducing emissions is done in the first part of this paper. Performed ranking of critical areas and maintenance tasks in terms of reducing CO2 emissions indirectly by reducing fuel consumption is based on the empirical data presented by IATA, Airbus Industrie and engine manufacturers. Expansion of the tasks of aircraft monitoring and scheduled maintenance of aircraft is proposed in accordance with operational requirements and aspects of reducing emissions. The role of education and extension training of personnel engaged in aircraft maintenance, to create awareness of their role and potential contribution to reducing emissions is perceived in the second part of this paper. Finally, the authors point out the importance of motivating the airlines to take specific measures, and the importance of coordination and simultaneous action of a large number of small improvements in the area of environmental protection. The scope of this paper belongs to sub-theme of evaluating policies and measures in climate friendly transport. This paper is a part of new research project "Environment management system framework respect to aircraft engine emissions and risk of aircraft accidents around airports in Serbia", supported by Ministry of Science and Technological Development of Republic of Serbia. KEYWORDS: aircraft emissions, airframe, turbofan engine, maintenance, education.

Title: ***Heuristic Approach to Ride Matching Problem: Case Study of Gazela Bridge in Belgrade, Serbia***

Authors: ***Milica Šelmić, Dragana Macura, Dušan Teodorović***

Institutions: ***Faculty of Transport and Traffic Engineering, University of Belgrade***

Abstract: Transport networks in many cities are generally very seriously congested. Consequently, travel time, number of stops, unexpected delays, transport costs, level of air pollution, noise and traffic accidents are increased. Congestions in the streets of world capitals during some special events or road reconstructions and reducing negative transport impact on the environment are issues that are very important for transport authorities all over the world. Beside daily congestions, there are also congestions and traffic jams as a consequence of reconstructions of the roads` lanes. During the reconstructions, road capacity is reduced or completely closed for the individual trips. Serious roads' renewals can take several months, so it is necessary to adopt a strategy that will prevent the potential problems. Planners, engineers and economists have proposed and developed different strategies for managing traffic demand One of available strategies is a ride matching (sharing) concept. This strategy means that several participants share only one private car when travelling from origin to destination. A model for grouping drivers into cars for ride matching, according to similarities of a place of living and working, working hours and type of car license plates is developed in this paper. We apply the ride matching concept on congested traffic during the reconstruction of the main bridge in Belgrade, Serbia, Gazela Bridge. Proposed model is based on heuristic approach and Even-Odd concept. Reduction of external costs and negative impacts caused by traffic congestions is possible to obtain by applying different types of state policy. It is possible to use rigor regulations, such as the so-called Even-Odd approach - which was very popular in the second half of last century. Vehicles with license plates ending in an odd number are only allowed on the roads every other day. On days when odd numbered license plates are allowed, vehicles with license plates ending in an even number are prohibited. Theoretically the number of vehicles on the roads in the city can be reduced by half. In this paper we proposed heuristic approach for solving ride matching problem. The proposed model is general and can be implemented in numerous scenarios of traffic congestions. We use a case study of passengers' characteristic travelling across the main bridge in Belgrade, Serbia (Gazela Bridge) for numerical evaluation and testing. The purpose of this paper is proposing heuristic approach in which an Even-Odd concept is embedded for solving a ride matching problem. The ride matching issue is not new and it was used by numerous researchers, but to the best of authors' knowledge, there

are no papers dealing with application of heuristic approach together with Even-Odd concept.

Title: ***Transport aspects of local and regional energy autonomy***

Authors: ***Hans-Martin Neumann, Till Berger, Peter Droege, Dieter Genske***

Institutions: ***University of Liechtenstein***

Abstract: Many regional and local communities in Europe aim at "energy autonomy" (Scheer 2005). They try to cover their energy demand for electricity, heating and cooling to 100% by renewable energies from local and regional sources. Is this approach also useful and viable for transport? Should the European institutions support such strategies? In this paper we will present and discuss modeling results for Liechtenstein and Basel and give an outlook to an ongoing research project focusing on the cross-border region around Lake Constance.

96.5% of the transport energy demand in Europe is covered by fossil fuels (International Energy Agency 2009b). Thus, the transport sector is responsible for 19,. % of the CO2 emissions (International Energy Agency 2009a). As world climate is rapidly changing and oil production peaking, many ideas for postfossil transport systems that rely on renewable energy have been developed recently (e.g. Gilbert, Perl 2010;Canzler, Knie 2009;Schindler et al. 2009; Brake 2009).

It is not so clear however, where the renewable energy should come from. Big solutions like the proposed photovoltaic plants in the deserts of Africa, or the extensive fields of energy crops that can be found in many southern countries, are also associated with big risks in terms of ecological impacts and project funding (Scheer 2010; Scheer 2005; Umweltbundesamt 2009).

Projects that provide renewable energy on the local and regional level seem to be more successful. Thus, a whole European movement of local and regional communities aiming at energy autonomy has evolved. Many of these communities are very successful in terms of electricity and heat generation, and efficiency gains in the building stock. Few of them focus on transport issues. (Droege 2009; Radzi 2009).

The space type energy model (STEM) allows analyzing the potentials of a community for energy autonomy.

It calculates the energy demand and the production capacity for renewable energies in a region using typologies of built-up and open spaces. Until recently, the model covered the statistical energy parties "private households" and "small businesses and retail" (Genske 2009). We are now working on an expansion to the field of transport.

In the study for the canton of Basel-Stadt we found out that the energy demand can be covered by 100% from renewable sources until 2050. Due to the high degree of urbanization, it will not be possible to generate all the renewable energy needed *intra muros*. Thus, a cross-border energy supply network is needed that could include canton Basel-Stadt and its surrounding communities in Switzerland, France and Germany.

In the case of Liechtenstein, it will be possible to cover the energy demand of transport completely from local sources until 2050, if all ice-vehicles are replaced by electric vehicles.

At the moment, we are working on a more refined energy model for the cross-border region around Lake Constance that will deal with the transport sector more in detail. This is carried out as part of the BAER project, funded by Interreg IV (www.baernet.org).

References

- Brake, Matthias (2009): Mobilität im regenerativen Zeitalter. Was bewegt uns nach dem Öl? Aufl. Hannover: Heise (Telepolis).
- Canzler, Weert; Knie, Andreas (2009): Grüne Wege aus der Autokrise. Vom Autobauer zum Mobilitätsdienst-leister. Heinrich-Böll-Stiftung. Berlin. (Reihe Ökologie, 4).
- Droege, Peter (Hg.) (2009): 100% renewable. Energy autonomy in action. London: Earthscan.
- Genske, Dieter D. (2009): Nutzung städtischer Freiflächen für erneuerbare Energien. Ein Projekt des Forschungsprogramms "Experimenteller Wohnungs- und Städtebau" (ExWoSt) des Bundesministeriums für Verkehr, Bau und Stadtentwicklung (BMVBS) und des Bundesamtes für Bauwesen und Raumordnung (BBR). Bonn: Bundesamt für Bauwesen und Raumordnung.
- Gilbert, Richard; Perl, Anthony (2010): Transport revolutions. Moving people and freight without oil. 2., rev. ed. New in pbk. London: Earthscan.
- International Energy Agency (2009a): CO2 Emissions from Fuel Combustion 2009. Paris.
- International Energy Agency (2009b): Energy Balances of OECD-Countries 2009. Paris.
- Radzi, Anis (2009): 100% Renewable Champions. International Case Studies. In: Droege, Peter (Hg.): 100% renewable. Energy autonomy in action. London: Earthscan, S. 93–165.
- Scheer, Hermann (2005): Energieautonomie. Eine neue Politik für erneuerbare Energien. 3. [Aufl.]. München: Kunstmann.
- Scheer, Hermann (2010): Der energethische Imperativ. 100 Prozent jetzt: wie der vollständige Wechsel zu erneuerbaren Energien zu realisieren ist. München: Verlag Antje Kunstmann.

- Schindler, Jörg; Held, Martin; Würdemann, Gerd (2009): Postfossile Mobilität. Wegweiser für die Zeit nach dem peak oil. Bad Homburg: VAS.
- Umweltbundesamt (2009): Nachhaltige Flächennutzung und nachwachsende Rohstoffe. Optionen einer nachhaltigen Flächennutzung und Ressourcenschutzstrategien unter besonderer Berücksichtigung der nach- haltigen Versorgung mit nachwachsenden Rohstoffen. Umweltbundesamt. Dessau-Roßlau. (UBA-Texte, 34/2009).

Title: ***Market-up – Identification of barriers and drivers for the market uptake of transport research***

Authors: ***Jonathan Köhler; João Vieira; Chiara Francia; Gabor Szendro; Daniela Carvalhol***

Institutions: ***TIS PT, CONSULTORES EM TRANSPORTES, INOVACAO E SISTEMAS,SA COMITE DE LIAISON DE LA CONSTRUCTION D'EQUIPEMENTS ET DE PIECES D'AUTOMOBILES CLEPA AISBL European Marine Equipment Council/Conseil Europeen de l'equipment naval INNOVA SPA FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V BUDAPESTI MUSZAKI ES GAZDASAGTUDOMANYI EGYETEM INOVAMAIS - SERVICOS DE CONSULTADORIA EM INOVACAO TECNOLOGICA S.A. ZILINSKA UNIVERZITA V ZILINE UNIVERSITEIT ANTWERPEN***

Abstract: A good market uptake of research results implies that the generated research and scientific and technological developments are accessible to a wide target, including private organisations. Such stakeholders should be encouraged to develop further the technology into new products, processes, materials, or services to enhance the industrial competitiveness. The MARKET-UP project aims to identify barriers (both social and technical) and drivers for the market uptake of transport research results along Aeronautics, Air, Road, Rail and Waterborne transport. Via this identification process, a contribution will be made to the increased role of the transport sector in delivering a low carbon economy. MARKET-UP will also create the necessary tools to enable the achievement of two main goals: a) that research results are utilised by the market b) that European research support covers all actors, including the weakest ones. Through the involvement of National Contact Points, technological platforms and SME networks, the MARKET-UP project will create the basis for a network with potential to become the first step towards the formation and development of a consolidated structure for the support of SMEs, acting both as Technology Seekers (Pull) and Solvers (Push). This will be done, building on the knowledge, tools and services developed in the project and will be also supported by the EU research funds instruments available for SMEs. Within Market-Up, selected cases on transport innovation and with high potential for market uptake will be object of a detailed analysis. That assessment will enable to obtain more concrete data on its context of development (i.e. key players, institutional and policy settings, market structures, etc.) which will serve as basis for the development of recommendations towards a more targeted uptake of transport research results. Market-up content proposed for presentation on 16th/17th of May The MARKET-UP consortium would like to present findings from the first work package of activity. The work completed is centred around the understanding and creation of

theoretical foundations for the system of innovation in each transport sector. Therefore establishing the basic framework for the full assessment of actors and regions in funding activities. The specific activity and results to be presented include the following • Review of literature on Innovation Systems with application to Transport • Theoretical fundamentals for Success of Transport Research Initiatives • Identification of Innovation Trends: Innovation Sectors in Transport • Analytical / methodological framework for the subsequent phases of MARKET-UP. The relevance of this work to the subject of the conference lies in the fact that it is the results of initiatives like MARKET-UP that will carry climate friendly transport research results to the market. Therefore, being a key stage in realising the goals of climate friendly initiatives.

Session 5

Policy Interventions in climate friendly transport

Title: ***Transport and Low-Carbon Governance: A city-regional perspective.***
Authors: ***Mr Stephen Hall***

Institutions: ***University of Hull***

Abstract: This paper examines the disparate governance landscapes of transport and carbon across English city-regions. Although the UK is committed to developing low-carbon alternatives to carbon intensive transportation, the impact of this transition on city and regional governance arrangements is poorly understood. How carbon control (or 'climate friendly') regimes come to ground at the city and regional level is likely to differ depending on the divesting of carbon responsibilities by nation states both outwards to non-state actors and downwards to municipalities (While, Jonas & Gibbs 2010). Climate change policy and the transition to a 'low carbon' economy could profoundly impact upon governance capabilities and paradigms for city-regions (Bulkeley 2005 a,b), yet little is known about the interface between transportation and urban governance as this transition proceeds. This paper considers to what extent a low-carbon economy is driving or replacing sustainability as an agenda in transport governance in cities. It draws on a multilevel governance analysis to compare the historically disparate disciplines of carbon governance and transport governance in English city-regions. The recent and continuing devolution of transport policy to UK constituent countries has marked a divergence in the delivery and development of low-carbon transportation (Docherty & Shaw 2011). This is also true to varying degrees within English regions (MacKinnon and Vigar 2008). In parallel the governance of carbon emissions in the UK has developed into a myriad of shifting responsibilities which do not necessarily match up to deliver low carbon transport interventions on the ground (Docherty & Shaw 2008). By developing a comparative multilevel governance analysis for transport and carbon this paper outlines mismatched priorities at different institutional and territorial scales. It outlines a wider research agenda of comparing transport and carbon governance structures across US and European city-regions. This future research agenda will include an evaluation of the capacity of the Yorkshire and Humber region (England) to benefit from models of city-regional governance in other contexts where low-carbon land use and transportation alternatives are already being adopted.

Title: ***Enterprise Europe Network: Support of R&D and Innovation in Transport Sector***

Authors: ***Aleksandar Sedmak (1), Dejan Ninkovic(1), Igor Stankovic (2)***

Institutions: ***(1) University of Belgrade, Faculty of Mechanical Engineering, (2) University of Belgrade, Institute of Physics***

Abstract: Problems connected with the utilization of R&D results within production facilities and finding appropriate program for financing innovation resulted in creation of Europe wide network of Innovation Relay and European Information Centers. Today, successor organization Enterprise Europe Network brings together business support organizations from across 47 countries. Network experts are teamed-up in 17 key sectors aiming to provide customized support. In particular, sector group for automotive, transport and logistics industry is aiming in finding partners for joint European research and commercial projects, sourcing new and innovative transport technologies, licensing, joint ventures, technical cooperation and other formal business agreements across Europe. Using Europe's largest database of cutting-edge technologies, containing more than 13,000 profiles the Network brings together research and commercial applications. About 25% all registered profiles are related directly or indirectly to Transport Sector. Other issues, considering availability of information on the European and local policies and project are solved by Network through provision of advice and support in all aspects of the transport including efficiency, emissions and traffic regulation. In addition to afore mentioned functions, the Network is supporting feedback of SMEs to European Commission (EC). This is especially important feature of the Network for the SMEs in Transport Sector, as they are continuously facing changes in their business environment in recent years. The Enterprise Europe Network connects SMEs with the feedback channels to EC available from commenting on planned legislation and taking part in test panels to proposing alternative solutions.

Title: ***Future Challenges in Motivating People to Choose Walking as Climate Friendly Transportation Mode Case study: Municipality Vračar, Belgrade***

Authors: ***Ass. Prof. Aleksandra Djukic, MSc Teach. Ass. Milena Vukmirovic,***

Institutions: ***Faculty of Architecture, University of Belgrade***

Abstract: Abstract—A large percentage of CO2 (carbon dioxide) emissions in Serbia come from the transport. In the last two decades, number of private car users in Belgrade evidently increases, contrary to the number of users of environmental friendly transport modes. The purpose of this paper is an overview of approaches for improving the physical aspect of urban environment, open public spaces, which aim to increase the number of users of climate/environmentally friendly transport modes, with the focus on walking. In addition to this, the second objective of the study is to activate local centers in the Municipality Vračar (Belgrade, Serbia) with enhancement of the intensity of pedestrian movement along the main streets, which connect them. In the research there were used three methods. First method was determining the intensity of pedestrian movement in relation to different periods of time during the day. Second were direct surveys of citizens who live in Municipality Vracar. The aim of this part of the research was to determine the mood of citizens to choose walking as a form of movement. Third was the evaluation of immediate pedestrian surrounding, which was reduced to analyze of activities and physical characteristics in the ground floor of buildings along the observed streets which connect local centers. Given that the study used three research methods, we obtained three kinds of results. The above results it was possible to overlap and synthetically interprets. The results showed the trends and concentration of pedestrian movement along the main street lines; attitude of citizens of reliable pedestrian movement and elements which contribute to their commitment; and rhythm of activity units along the street front, transparency (permeation of public and semi public space) and variety of activities in the ground floors of buildings. Contribution of the study is in combining different research methods. Interpretation of the results forms the basis for directing future research and campaigns on the topics of climate friendly modes of transport in urban areas. In addition, this could be applied on specific area like Vračar as well as the examples of other cities in Serbia, or Europe.

Title: ***Sustainable mobility: a chimera or a social imperative? Should policy-making intervene for the realization of sustainable mobility?***

Authors: ***Dimitris Micharikopoulos, Elena Tavlaki***

Institutions: ***Institute of Social Innovation, Arachni Ltd***

Abstract: During the last 200 years, the choices the society has made for modes and technologies of transportation has redefined the contemporary living and provided an unprecedented personal freedom and global interaction. It also true, that this enhanced mobility has a high cost to society, to the environment and to the economy. Issues such as fuel prices, congestion, accidents, parking restrictions are just a few of the implications of the dramatic increase in personal mobility; with the most critical issue of CO2 emissions contributing to climate change on the environment. Sustainable mobility refers to an integrated approach, where the limitations of environmental and social costs of traffic movements should not undermine the aspirations for economic growth and immense personal mobility. The pursuit of sustainable mobility is a contemporary challenge, as it has to reconcile the constantly augmenting social demands for increasing mobility and the avoidance of environmental degradation. Sustainable mobility has its roots to sustainable development; where the economic growth does not lead to environmental decline. It is often considered that technology alone could solve this problem. Technologically breakthrough solutions are perceived as a mean to an end. Electric and hybrid cars, increased fuel efficiency, reducing dependence on oil from the current level of 98%, by using alternative fuels and improving the energy efficiency of modes of transport, could reduce carbon impact of these transport modes. But for a genuinely sustainable transport future, far more radical change, affecting many aspects of society, is needed. The recognition that we need to do something about these interconnected problems came initially with the realization that deteriorating urban air quality, prompting a wave of legislation aimed at controlling automobile emissions. This has now extended into other areas, including car production and use. Regulation now applies to safety, noise, end-of-life vehicles and fuel efficiency, regulatory controls on waste management in the maritime sector and certification of aircraft and rail vehicles. It is not a fiction but in the future it is likely to take an increasingly holistic or life-cycle perspective of reducing noise and carbon footprint at European level. Therefore, regulation is an effective means of controlling the environmental impacts of transport. Indeed, the regulatory approach towards emissions standards, the regulatory approach, has created vehicles that are much improved in many respects. A modern car, driven under the right conditions, could be up to 95–99% 'cleaner' in terms of

toxic emissions than its equivalent of 40 years ago. Sustainable mobility is a vital parameter for achieving the aim of the sustainable development, where the balancing of economic health, social equity and environmental resilience, serves as the integrative concept which offers a long term perspective and provides opportunities for win–win solutions.

Title: ***The management of port-transhipment processes***

Authors: ***Prof. dr. sc. Đorđe Nadrljanski dr. sc. Mila Nadrljanski Ljubo Djula, dipl.ing***

Institutions: ***Faculty of Management Novi Sad***

Abstract: The basic objective of this paper is to present an overview of important theoretic methods, models, techniques and tools which have been used, both in science and practice, in modern management of port systems, and to provide adequate proposals to enhance port resources management. Optimisation and simulation are basic techniques in addressing the issues related to managing transhipment processes. The former, i.e. optimisation, includes approaches and methods belonging to mathematical programming. The latter, i.e. simulation, is less rigorous from the mathematical point of view and closely refers to all the methods which explore the possibilities and seek the best solutions to the set tasks, with no criteria that have been set in advance and precisely defined for completing the search procedure. As both of these techniques, individually and mutually, have their advantages and shortcomings, one of the ways of improving the computer-supported decision-making in maritime management is to focus on connecting these techniques, i.e. designing the sort of approaches in the mathematical modelling of complex issues that would benefit from the advantages of the techniques and reduce their individual shortcomings. Apart from statistical and operations research methods, the artificial intelligence, based on the theory of learning, has improved the potentials of using the already acquired knowledge (through expert systems) and information (through neuron networks), with the aim of making efficient management decisions. The task of a system optimisation is to choose the best alternative from a number of likely and favourable variants, by acquiring the criteria leading to the optimum solution to the optimisation task. Key words: optimisation, artificial intelligence, mathematical modelling, simulation.

Title: ***Estimation of pollutants emissions form road transport in the Republic of Serbia using COPERT IV, Period 1990 – 2009***

Authors: ***Jelena Trifunovic, M.Sc.*, Aleksandar Manojlovic M.Sc.*, Vladimir Momcilovic M.Sc.*, Nebojsa Redzic, M.Sc.*****

Institutions: ** **University of Belgrade - Faculty of Transport and Traffic Engineering** ** **Serbian Environmental Protection Agency, Belgrade***

Abstract: Passenger and freight transport demand are closely related to economic development. Transport is a significant and indispensable part of modern society, but its extent and intensity are identified as factors that contribute to certain side effects. Traffic congestions in cities make the environment less pleasant, reducing quality of life, but also decrease transportation system efficiency by increasing the travel time, increasing fuel consumption etc. European Union has made an effort to create transport policy that would effect on reduction of emission of pollutants from road transport. First steps, in achieving the objective, are submission of annual report on the road transport emissions (Member States), implementation of policy measures and impact assessment of implemented measures on emissions. Further steps would refer on making assessment of transport indicators among which are indicators concerning pollutants emissions. With the aim to follow new European trends of sustainable transport development, Republic of Serbia has accessed the assessment of pollutants emissions from road transport. The paper refers on following theme "Evaluating policies and measures in climate friendly transport". Vehicle fleet of the Republic of Serbia consists of 1.9 million registrated road vehicles. The largest part of the fleet, of about 87%, consists of passenger cars while the remaining part consists of freight vehicles, buses and motorcycles. Each vehicle type is characterized by differences in the structure, purpose, capacity and age. Analysing vehicle fleet for a twenty year period, previously mentioned characteristics have been determined based on which the necessary ground for assessing pollutants emissions from road vehicles was obtained. Software COPERT IV has been used in assessment of the amount of pollutants emitted from road transport. Application of the mentioned software for calculation of pollutants emissions from road vehicles enables development of transparent, standardized and comparable data bases and procedures for reporting on pollutants emissions, in compliance with international agreements and EU legislation. Emissions of major pollutants (CO, NOX, VOC, PM, NH3, SO2, heavy metals) and greenhouse gases (CO2, N2O, CH4) from the vehicle fleet of Republic of Serbia have been assessed applying COPERT IV model for 1990 – 2009 period. The analysis of the results obtained has been made observing the trend in regulated

pollutants emissions and greenhouse gases by vehicle type. Effects of Euro standards implementation on pollutants emissions trends have been considered in the analysis. Obtained assessments of pollutants emissions for the period 1990 – 2009 can be applied for the prediction of future road transport emissions. Transport policy measures, among other things, affect on future emissions trends. Some of the important measures are change in vehicle fleet structure by introduction of Euro standards, fuel quality improvement, internalization of external costs etc. Mentioned possibility of the impact assessment provides a basis for adjustment and improvement of transport policy measures.

Title: ***Creation of a Mobility Manager for mountain areas: the Access Interreg Pilot Project in Valsassina (Italy)***

Authors: ***Chiara Bresciani*, Federico Lia*, Cristina Pellegrino**, Roberto Zaggia******
Institutions: ****Poliedra – Politecnico di Milano, Italy, **Lombardia Region, Italy, ***Finlombarda, Italy***

Abstract: The maintenance of a spatially and socially equal accessibility to services of general interest (SGI) is a core issue to the functionality of mountain areas and any regional development strategy both on a national as well as on a transnational level. Within this frame ACCESS, an INTERREG IV B project within the Alpine Space Programme of the European Commission, aims at improving the accessibility to services of general interest in sparsely populated mountain areas, mainly by finding new forms of organisation of SGI, using information and communication technologies (ICT) and fostering demand oriented, integrated mobility systems. ACCESS is a following project of the former PUSEMOR (Public Services in Sparsely Populated Mountain Regions) and involves 9 partners from 5 alpine countries: Switzerland, Austria, France, Germany and Italy. The project started on 01/09/2008 and it will end on 31/08/2011. ACCESS pilot project in Italy concentrated on the creation of a mobility manager in three low-access mountain areas: Alta Valtellina, Valsassina and Valli del Verbano. This idea is particularly innovative since the Italian law introduced the duty of having a mobility manager only in big companies in metropolitan areas. One of the most representative pilot project is the one developed in Valsassina, which is a narrow valley located within the pre-Alpine strip: many middle-sized manufacturing industries attract everyday commuters who mostly live in the mountainous and scarcely populated surrounding municipalities, but since the public transport is rather poor, the 74% of them travel by car by their own. Therefore, ACCESS pilot action aimed at reducing reliance on cars of manufacturing employees, suggesting and promoting smart choices about other forms of transport, informing and motivating people to change their travelling behaviour, through the creation of a local expert figure: the Mobility Manager for mountain areas. His tasks consist in gathering workers' issues, liaise with industries managers and elaborate soft and sustainable actions for overcoming issues. The innovative choice of relying on local institutions – the Mountain Community – allows the SMEs to benefit of an instrument, the Mobility Management, that is usually affordable only by bigger companies in metropolitan areas with hundreds of workers. The training of the Mobility Manager for mountain areas has been provided by organizing focused lessons and with an "on field" working experience: he involved SMEs for evaluating travelers behaviors via questionnaires, he analyzed the

Valsassina transport network and came out with a feasibility study for the implementation of a enterprise based car-pooling system. Local stakeholders, involved at different stages of the project, will now have the possibility of tailoring and integrate new flexible measures for improving quality of life of Valsassina employees.

Title: ***Multimodal Transport Technology "A" for Reducing Carbon Dioxide Emission***

Authors: ***Jovan Tepić, Siniša Sremac, Dejan Aleksić, Ilija Tanackov, Gordan Stojić***
Institutions: ***Faculty of Technical Sciences, Novi Sad, The Railway technical school, Belgrade***

Abstract: Serbia, among many other countries is trying to find a way to reduce greenhouse gas (GHG) emission. There is an estimate that in 2003 emission of GHG was 13 630 000 tons, which is approximately 1.81 tons per capita. By this parameter Serbia takes a significant place in the world biggest pollution countries, with constant rising emission of GHG in every year. Due to the high number of heavy road vehicles per year on Corridor X through Serbia, there are some side effects such as emission of CO2 gas as product of organic fuel combustion. Fossil fuels combustion causes high emission of mainly CO2 gas and results with higher rate of dangerous substance than it can be naturally absorbed. Role of traffic in process of environment polluting is significant. Road transport is the biggest polluter in traffic as it makes 80-90% of total amount of CO2 that is emmited by all means of traffic. Various studies abouth energy consumption and CO2 emission by road and rail traffic have been performed in EU during previous 15 years. The results of these studies clearly indicate a significant saving in CO2 emissions using both rail and multimodal road – rail transport compared with pure road transport. Therefore, one of the ways to reduce emission of CO2 is to increase share of railway traffic as an ecologically clean means of transport, since railways mainly use electrical power to operate trains. In this paper we discuss possibilities of introducing multimodal transport technology „A" (transport of heavy road vehicles by railway) on part of Corridor X through Serbia with analysis of effects that are reflected in reduction of total GHG emission, cost-effectiveness of introducing technology „A" (adding environmental costs in the total investments), relationship between tariffs, distance and cost effyciency, etc.

Title: ***Huff Location Model of the Bicycle Parking Services***

Authors: ***Sanja Roksandić*, Dragan Urošević*, Emilio Carrizosa**, Nenad Mladenović*, Tatjana Davidović****

Institutions: **** Mathematical Institute of the Serbian Academy of Sciences and Arts, Belgrade, Serbia ** Faculty of Mathematics, University of Seville, Seville, Spain***

Abstract: Global warming is the biggest and most serious problem humanity is facing in this century. Therefore, the governments of developed countries encourage their citizens to use human-powered transport, most commonly bicycles. Here arises the problem of locating bicycle parking services in urban zones. In this paper we propose new model for this problem based on the Huff location model on networks [1]. Therefore, we assume that customers probabilistically choose parking spaces. The objective is to locate bicycle parking spaces in competitive environment in order to capture as many customers as possible. The parking spaces, as well as customers, can be located not only at nodes, but also at any point along each edge of the network. In such a way, our problem becomes continuous and therefore we propose to solve it by using adequate meta-heuristic methods, in particular Variable Neighborhood Search (VNS) [3]. Our VNS is implemented in the software package GLOB [2] which is a stand-alone solver for minimization of a continuous function subject to box constraints. We consider here simple variant of this problem: location of bicycle parking services along single street and present experimental results on randomly generated examples. [1] Huff, D. L., A Probabilistic Analysis of Shopping Center Trade Areas, Land Economics, 39, 81-90, 1963. [2] Dražić, M., Kovačević-Vujčić, V., Čangalović, M., Mladenović, N., GLOB - A New VNS-Based Software for Global Optimization, Global Optimization - From Theory to Implementation, (L. Liberti and N. Maculan, Eds), Springer, 2006. [3] Mladenović, M., Hansen, P., Variable neighborhood search: principles and applications, European Journal of Operational Research, 130, 449-467, 2001.

Title: ***Impact of CO2 Pricing and Biodiesel on Container Transport in the Netherlands***

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Abstract: This paper analyzes the impacts of CO2 pricing policies and using biodiesel on container transport of the Netherlands in terms of reducing CO2 emission and modal shift from road to intermodal transport. The paper presents a GIS-based flow estimation model which is developed and applied to quantify, visualize and evaluate various scenarios. The model presents the detailed Dutch container transport network with connections to an overall European network. It simulates the container flows among 57 origins/destinations and the possible transshipment at terminals. The model is validated based on the Dutch container movement statistics 2006. The scenario analysis shows that the impact of CO2 pricing is limited in terms of both reducing CO2 emission and modal shift. A price of €200 per ton CO2 emission results in only 8.33% of CO2 emission reduction. €90 per ton CO2 achieves 4% of CO2 reduction, but results in an increase of system cost of 3.60%. With the same extra system cost, by using biodiesel (B30) the CO2 emission can be reduced by 19.57%. Biodiesel is also preferable from user's perspective. Using B30 increases the fuel cost by 25%, while CO2 price at rate €90 causes a fuel cost increase of 38%.

Title: ***Environmental Taxes as Policy Instruments for Sustainable Urban Transport- results and dilemmas***

Authors: ***Jelica Petrovic-Vujacic, Snezana Kaplanovic***

Institutions: ***Faculty of Transport and Traffic Engineering, University of Belgrade***

Abstract: The paper analyses the effects of environmental taxes. The analysis deals with their theoretical foundation, social and political viability and environmental effects. The special case of all of this is its application in urban transport policy related to urban transport, the relationship between public and private transport, pricing policy and decision making. Special attention is given to real achievement in this area, that is, to identifying the advantages and disadvantages of different types of environmental taxes. The experience of different countries that have introduced environmental taxes is used for the analysis of the main effects of environmental taxes. The question arises: to what extent do taxes applied to transport contribute to the goals of sustainable urban transport?

Title: ***Model for Selection of the Railway Agenecy Organization with Emphasis on EU Standards for Railway Sector in Serbia***

Authors: ***Vera Raičević, Slavko Vesković, Milan Marković, Norbert Pavlović, Slaviša Aćimović, Gordan Stojić***

Institutions: ***Faculty of Transport and Traffic Engineering, University of Belgrade***

Abstract: The legal framework for integration of European railways and Serbian Railways in the functional unit is based on establishing a regulatory authority of the Member States (according to Directive 2001/14/EC) and the formation of the European Railway Agency ERA. The establishment of regulatory authorities in Serbia must be implemented according to the Law on Railways and by defining the organization of the regulatory function of the railway system. This paper proposes a possible organization of the Railway Agency, based on the experience of harmonization of regulations with EU regulations in selected countries and the railway administrations. The proposed model was analyzed and tested by SWOT analysis. The European dimension is very important for the railways, because when they were organized as national railways they were limited to small size of individual states. With a participation in the transport market and the possibility of future development of sustainable transport conditions, the European market for railway transport will be much more important than the national framework. The EU transport policy is the economic need for our country arising from the necessity of including our economy in Europe and Eurasian economic trends. Keywords: railways, model of organization, regulatory functions, compliance with EU standards, SWOT analysis.

Session 6

Evaluating policies and measures in climate friendly transport

Title: ***The TURBOFAN transport aircraft pollution calculation software***

Authors: ***Petar Mirosavljevic, Slobodan Gvozdenovic, Olja Cokorilo, Ljubiša Vasov***

Institutions: ***Faculty of Transport and Traffic Engineering, University of Belgrade***

Abstract: The sustainable development of air transport in next decade will be under strong influence of pollution minimization trend. The Advisory Council of Aeronautical Research in Europe-ACARE already set aims, which drastically lower transport aircraft air pollution. European Countries, such as Sweden and Switzerland introduced pollution charges as a method of sustainable development of air traffic. All entities in air transport sector: airports, airlines, air traffic management and civil aviation authorities develop in cooperation measures and efforts to minimize pollution. This paper is review of newly developed software for turbo fan transport aircraft pollution calculation as a support for air transport sector effort in pollution minimization process. This pollution calculation software is develop as a part of new research project ‘‘Environment management system framework respect to aircraft engine emissions and risk of aircraft accidents around airports in Serbia’’, supported by Ministry of Science and Technological Development of Republic of Serbia. The impact of pollution is measured from CO2 pollutant directly, and NOx non-directly, related to fuel consumption The first part of paper describe pollution calculation model, as a core of pollution calculation software. The presented model is based on real aircraft performances and real aeronautical meteorological conditions in form of universal parametric functions. This pollution functions parameterization guaranties application to any turbo fan transport aircraft type, which is also contribution to universality of obtained results. The second part of paper describe software calculation process on base of input parameters and pollution functions. This part of paper is deducted to two part of software: the first for en route pollution calculation or above 3000ft and the second for calculation of pollution bellow 3000ft in area of takeoff and landing airport. The final part of paper describe software result presentation which is use full for all entities in air transport sector. The scope of paper belong to area of evaluating policies and measures in climate friendly transport.

Title: ***Is a new metro line a mean of sustainable mobility for commuting? The case of Thessaloniki city***

Authors: ***Nikolaos Gavanas, Ioannis Politis, Konstantinos Dovas, Emmanouil Lianakis***

Institutions: ***Transport Engineering Laboratory, Department of Civil Engineering, School of Technology, Aristotle University of Thessaloniki***

Abstract: No one can argue the fact that fix route transport systems, like metro, tram and light rail, can significantly contribute to the target of sustainable mobility. Due to their characteristics (e.g. travel times, accuracy, reliability etc.), the above systems can be used to swift an important number of persons from their current travel mode of preference - in most cases private cars- to the new alternative solution. However, this fact could not be considered as an absolute outcome for all cases. The technical features of the mode itself in relation to the characteristics of the area of implementation as well as the individual characteristics (like the trip purpose, the socioeconomic background, the level of readiness to change travel behavior etc.) can affect the demand for this new mode and a posteriori can foster the vision of green mobility and sustainability. This paper addresses a number of these questions and attempts to find answers using as a case study the new Metro Line of Thessaloniki, Greece, which is currently under the phase of construction. The main line of the Thessaloniki Metro is Line 1 which will be consisting of 13 stations with a total underground network of 9,6 Km, crossing the central areas of the city. The total budget has been estimated to 1 billion euros and the completion date is foreseen for the year 2016. In addition, 2 new lines are planned to be constructed, feeding the first one, however without secured funding resources. These two lines will connect the eastern and the western part of the city, which comprise the highest and lowest income areas respectively, with the city center. The main objective of the research is to estimate the potential use of the new mode by commuters taking into account specific travel, behavioral and socioeconomic characteristics, such as travel time and length, estimated cost, type of trip (passing through the city center or not), level of income, car ownership level etc. In order to investigate the impact of these parameters on the demand of the new transport mode, a questionnaire survey was conducted at the areas of three future metro stations. The first area is located at the eastern part of the city (area of highest incomes), the second one at the city center (area of mid incomes) and the last one at the western part of the city (area of lowest incomes). The survey was structured in such a way that included a stated and revealed preference part so as to facilitate the estimation of future possible choices of the responders regarding their travel mode preferences. The ex ante estimation of the potential demand for a new

transportation mode is vital not only for transportation planners but also for policy makers who are bound to locate the existing resources in such a way that social, economic and environmental balance is simultaneously fulfilled.

Title: ***REACT Open Consultation - preliminary results***

Authors: ***Dragan Cisic, Ana Peric Hadzic, Edvard Tijan, Dario Ogrizovic***

Institutions: ***University of Rijeka***

Abstract: REACT Open consultation procedure engages leaders of national and European projects, National Contacts Points in transport among Member States and Associated States, all the European Countries' funded project participants and the general public. It is performed through an on-line questionnaire, in an open web software. In this paper authors present preliminary results of open consultation procedure.

Title: ***Supporting regional rail decision makers to award green: The ECORailS project***

Authors: ***Martin Schipper, Matthias Pippert, Vera Raabe***

Institutions: ***TSB Innovation agency Berlin GmbH, Pro Rail Alliance Germany***

Abstract: Railways are one of the most environment-friendly means of passenger transport. Modal shift towards rail transport can be an appropriate measure for reducing energy consumption, CO2 emissions, pollutants and noise. Energy consumption and CO2-emissions are related to each other. This area is the strategic key area for the sustainability of transport in general. The inherent advantages of rail transport are most prominent in terms of energy efficiency. However, the railways have not yet realized all their energy-efficiency and environmental potentials, and the ECORailS project therefore focuses on this issue. In most European countries, regional rail services are today coordinated by regional or national Public Transport Administrations (PTAs). National ministries, regional governments or purposely founded management organisations usually organise train services by Public Service Contracts (PSC). These contracts define the extent and the quality of services as well as the price the PTA has to pay to the contracted TOC. The quality of services (including e.g. energy consumption) depends to a great extent on the quality of the rolling stock which is used. If the TOC procures the rolling stock, it must fulfil the qualitative requirements of the PTA. Some PTAs procure rolling stock themselves and provide it to the contracted TOC; thus the PTA can influence the quality of the fleet directly. Wherever European PTAs are committed to environmental goals, have sufficient and reliable funds, and respect some basic principles of passenger-friendly service concepts, regional railway passenger services have become a great success in terms of increasing numbers of passengers and enhanced service quality. A lot of PTAs already have their experiences with quality criteria. However, criteria concerning energy efficiency and environmental effects have their own challenges. This is the reason why the ECORailS consortium took the effort to elaborate Guidelines for involving energy-efficient and environmentally-friendly criteria into the tendering and procurement by regional rail decision-makers. The Guidelines comprise the main economical, ecological and political arguments and contain a comprehensive list of relevant criteria. They can be used to choose, to concretise and to evaluate energy efficiency criteria as well as noise and pollutant criteria, and show present and future potentials and solutions for saving energy in regional passenger rail transport. Four Administrations from Berlin-Brandenburg, Lombardy, Øresund and Timisoara have undertaken tests of the Guidelines which led to an energy reduction potential of 5% compared to current awarding and 10% compared to actually used rolling stock. Stakeholder Forums have been built up at all four

test sites and Europe wide with 14 further Administrations and Administration Associations, 13 Train Operators and Infrastructure Managers, and 7 Vehicle Suppliers. The Guidelines benefit from both the own ECORailS research activities and the results of previous and currently ongoing technological projects like EVENT, PROSPER (resulting in UIC Leaflet 345), and Railenergy in order to enable and encourage the European PTAs to profit from already available results.

Title: ***Development of light rail system in Belgrade – modelling approach to scenario analysis***

Authors: ***Vladimir Djoric Ivan Ivanovic Dragana Grujicic***

Institutions: ***Traffic and Transport Enginering Faculty Universitz of Belgrade***

Abstract: The basic equation in transportation planning puts the sign of equality between the transportation demand and transport supply. Transportation planning process usually involves long periods, 20-30 years. On the transportation demand side of the equation, there is the need to determine the real number of trips in public transport. On the other side, transportation and infrastructure planning is the process of establishing the necessary capacity to meet the future transportation demand. Development of sustainable way of thinking in the transport sector brought a change in the general approach to solving problems. Throughout history, the problems were solved by adding capacity in areas where it was needed. Today, improving the efficacy of existing capacity is more important together with the investments in new technologies that bring sustainable benefits. In addition, there are some traffic management measures with the aim to decrease the transportation demand within a certain group of passengers, activities or modes. Public transport in Belgrade can strongly affect the quality of the overall transportation system. Modern, high capacity, rail transportation system is capable to solve the problem of large transportation demand. This paper presents the transformation of public transport systems of Belgrade in order to become the system based on light rail transportation system. The planned solution has positive effects on public transport travel time, reducing environmental impact by decreasing the number of buses on the network and handling transportation demands. Particularly important is the possibility to influence transportation demand through modal split and keeping public transport share at the level of about 50%. The future public transport network has been developed in line with the vision provided in the Belgrade master plan. Demand matrices are reduced to the total number of trips based on the survey results. All the relationships from survey, between the matrix fields are kept. The changes in socio-economic indicators were used to produce future transportation demands. In forming and testing a public transport network overall capacity on the main corridors was the main consideration. Development of high-capacitive system on those corridors fully changed the spatial distribution of lines within the public transport system. Adjusting and changing elements on the level of system, sub-system, lines and passengers produced the changes in the number of passengers carried by different lines. Indicators on different levels were defined in order to detect the capacity gaps and quantify the modelling results. Defining the

criteria's for ending the modelling procedure needed a great experience and knowledge of Belgrade public transport systems. The criteria's are based on number of transfers, passenger kilometres and passenger hours travelled. The iterative process of adjusting the parameters of the system was very complicated considering that they are closely related.

Title*: The Political Economy of the European Union Environmental Governance: Voluntary Agreement to Reduce Carbon Dioxide Emissions from New Cars*

Authors: *Elah Matt*

Institutions: *School of Environmental Sciences, University of East Anglia, UK*

Abstract: The attempts of the European Union to reduce carbon dioxide (CO2) emissions from new cars up to 2008 were characterised by the employment of New Environmental Policy Instruments (NEPIs). The advocacy and adoption of NEPIs are emblematic of a wider putative shift from 'government' to 'governance', which implies changes in the relations between public and private policy actors. While the promotion of NEPIs in the European Union (EU) has been widespread, their adoption has been much sparser. One high-profile exception is the voluntary agreement between the EU and the Association of European Car Manufacturers (ACEA) to reduce carbon dioxide emissions from new cars. This agreement, which came into force in 1998, was concluded in 2008. The voluntary targets were not met by the carmakers, and the EU subsequently introduced mandatory regulations in 2009. The literature on policy instruments in general, and on NEPIs and voluntary agreements in particular, can explain the technical reasons for the agreement's failure. However, it is not geared to examine how the complex relations between public and private policy actors shaped the policy process and outcomes. This understanding is important in order ensure the success of future policy interventions. This paper sets out to explore the ACEA agreement from a Neo-Gramscian political economy perspective. A neo-Gramscian approach contributes to understanding the complex relations between public and private actors involved in EU car governance. Applying this perspective, it is possible to observe a process of contestation and compromise between various policy actors, in which the dominance of economic actors was maintained. ACEA agreed to enter a voluntary agreement in 1998. This agreement was not legally-binding and did not threaten the European car industry's operations. The (unsuccessful) implementation of the agreement resulted in incremental technological advancements, but maintained dependence on fossil-fuelled cars within European society. The process of policy re-design reflected upon the growing power of environmental interest groups, but ultimately upon the close relations between the car industry and political actors. The result was the uptake of targets and deadlines that were less ambitious than previously recommended. Thus, it can be seen that economic interests outweighed environmental considerations. Understanding how these governance arrangements shaped the policymaking process can contribute to the design of more effective policy interventions in the future. The main recommendations of this

research suggest that the EU needs to adopt more ambitious medium and long-term CO2 emissions reductions targets that will encourage the uptake of low carbon technologies. In order to ensure that economic and environmental interests are compatible, the EU must seek international agreement on these targets. Fiscal measures can also be employed to promote the renewal of the European car fleet. However, the reliance of European society on car use needs to be addressed. This can be done through a combination of demand-side measures, the promotion of a modal shift, and policy interventions to address motorists' behaviour.

Title: ***Towards a Climate-Friendly Urban Transport in Skopje: Problems and Prospects***

Authors: ***Valeriy Kokot***

Institutions: ***Embassy of Ukraine in the Republic of Macedonia***

Abstract: The purpose of this paper is to analyze the factors affecting the development of a climate friendly transport in the city Skopje. The analysis shows Skopje's approach to public transport that offers the plan for development of sustainable urban system and intelligent traffic management, technical solutions increasing the use of alternative fuels for reducing emissions and pollution, as well as the problems and prospects that city has in the process of implementation the necessary reforms in the urban transport sector. The results of this paper are useful to policymakers from the Western Balkans and Eastern Europe in case of implementation innovative transport concepts for environmentally friendly, resource-saving, secure and efficient urban mobility. Keywords: Climate Friendly Urban Transport, Intelligent Traffic Management, Urban Mobility

Title: ***Managing of reverse logistics systems as an element of sustainable development***

Authors: ***Branislava Ratković, Nenad Bjelić, Milorad Vidović, Milan Andrejić***

Institutions: ***Department of Logistics, Faculty of Transport and Traffic Engineering, University of Belgrade***

Abstract: Nowadays changes in the production and consumption patterns resulted in shortening the products lifecycle and earlier products discarding. Accordingly, environmental concerns about the disposal of increased quantities of products have resulted in efforts to take back end-of-life (EOL) consumer products. Legislation aimed at forcing manufacturers to take back EOL products in order to reduce needed landfill space, underscores the importance of developing efficient methods and models for the management of EOL products. The solution to this problem offers reverse logistics, because products recovery, in any form, benefits to both the environmental and socio-economic perspective. Reverse logistics covers a range of activities aimed at the management and handling of materials, products, components, subassemblies or even entire technical systems to environmentally acceptable disposal or implementation of environmentally sound treatment. Namely, processing EOL products instead of raw resources saves money not only by purchasing fewer raw materials but also by decreased level of EOL disposal. A well-managed reverse logistics system should be able to provide important cost savings in procurement, disposal, inventories and transportation. However, some reverse logistics activities may put many side-effects on environment or even they can destroy the positive effects brought by recycling, remanufacturing and the reuse of new products and materials, etc. One of those activities is collection or acquisition of EOL products discarded by last owners, or consumers. Namely, road transport has significant influence on the EOL collection process, both in terms of its functional importance and in its contribution to total cost. It is also a key issue in sustainable development, significantly affecting the environment in terms of fuel consumption, air quality, noise pollution, safety and health. Therefore, the focus of this paper is to consider the problem of operating recycling collection vehicles that pick-up recyclables from collection points and transfer them to a recycling facility. Due to the low value of EOL products and because recycling takes places on centralized level, the transportation cost makes significant part of the total reverse supply chain cost. Reduction in costs comes partly from a reduction in unnecessary distance traveled by making use of better routes, which eventually leads to a reduction in fuel consumption and hence to a reduction in greenhouse gas emissions. Therefore routing represents very important aspect

in optimization choices and this research addresses the issue of determining adequate dispatching strategies in recyclables collection.

Title: ***A view on the liberalization of railway passenger transport***

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Abstract: Regardless of the environmental, security and other advantages of passenger rail transport, its market share compared with road, had been drastically reduced in the second half of the twentieth century. The reasons are the impact of historical, traditional and national reasons on the railway companies: a very high level of state intervention that has become counterproductive: the costs are subsidized without plans for reform. Passenger traffic is developed under the pressure of the increasing mobility. Due to improper transportation system results are congestions, poor quality of transport services, and hence the recommendation of the European Council for the revitalization of railways in terms of optimal use of infrastructure, modernization of services and integration of rail transport in the single European market. Integrated transport strategy for trans-European network is based on the principle of gradual opening of the transport market. Of particular importance is the strategic goal for creating the financially sound basis for railways. We emphasize the following measures: • establishing mechanisms for stable financial operations; • establish contractual relations with the state where the liability of passenger transport and the provision of infrastructure provides adequate compensation according to previously defined standards; • implementing the concept of Obligations of public transport in passenger traffic, (fee for the railway companies for the difference between the approved tariff and the actual cost of transportation). The reforms taken by the states primarily interested in facilitating the burden of debts of national railway companies were aimed at opening the market of railway services and development of competition in the railway sector in order to obtain - the benefits of "market forces" and reduction of interventions in the railway sector. In order to create a harmonized market environment where the carriers of different modes of transport could be affirmed on the basis of equal conditions of competition necessary to introduce the principle of charging all expenses incurred. The total cost that Transportation Company creates in the performance of services, are not only operating costs and infrastructure, but also external costs of transport.

Title: ***Measuring Energy Efficiency of Refrigerated Warehouses***

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Abstract: In recent years, energy efficiency has become a critical issue for logistics systems. Namely, as logistics systems are becoming more sophisticated, energy consumption in these systems grows too. Long term storage of products in warehouses and a wide range of services influence on increased energy consumption of these systems. In situation of increasing energy demands and rising energy costs, conserving energy becomes very important issue. Refrigerated warehouses (RWs) represent a special type of warehouses, which uses about 2.8 times more energy for operating than conventional warehouses. The basic problem associated with energy efficiency in RWs regards to varying in energy consumption due to seasonality of products. However, energy loads for all RWs types typically peak during summer months. RWs use energy for products refrigeration, which accounts for over half of a typical RWs energy consumption. Also, in RWs energy consumption is needed for processes such as lighting, maintaining water temperature, HVAC (Heating, Ventilating, and Air Conditioning), charging forklift batteries, etc. There are different ways to improve energy efficiency in these systems like improving building envelope insulation, installing fast-acting doors, computerized HVAC (Heating, Ventilating, and Air Conditioning) systems, using natural light, and upgrading to more efficient equipment. Further, regularly scheduled maintenance could improve overall operational efficiency and sustain the impact of efficiency measures. Except brief overview of RWs efficient energy consumption, this paper also proposed a model for evaluating RWs energy efficiency. Proposed model is based on one of the most frequently used methods for evaluating efficiency - Data Envelopment Analysis (DEA). Model is tested on numerical example, and the corrective actions are proposed. The results show that about 40% of examined RWs were technically efficient. Most of the inefficiency is in scale inefficiency, about 18%, while about 2% of inefficiency corresponds to pure technical inefficiency. These results show that RWs do not operate on an optimal scale and the most of the inefficiency corresponds to inadequate size of the facility, and environmental factor, rather than management of RWs.

Title: Improvement of employees education in Serbian railways

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Abstract: Modern Railway system is a climate friendly transport mode. Present situation in Serbian railways addresses the need for more efficient way of employees' education that includes constant improvement of knowledge related to new EU regulations and new technologies. This paper presents some facts of current form of educational process with proposal of its improvement based on distant and e-learning technologies. Two possible types of proposed improvement are presented with corresponding analysis. Implementation of these technologies should lead to significant savings in costs, time and energy. Hence, it should be encouraged by appropriate policy modifications according to new ecological efforts.


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