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## ТРУДОВИ

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## CONTENT - СОДРЖИНА

<b>1. prof. Dr. Aleksa STAMENKOVSKI</b> MARKETING FOR TIME OF CORONAVIRUS COVID -19.....	7
<b>проф. д-р Алекса СТАМЕНКОВСКИ</b> МАРКЕТИНГОТ ЗА ВРЕМЕ НА КОРОНАВИРУСОТ КОВИД -19.....	8
<b>2. Prof. Vanche BOYKOV, PhD, Marieta GOCEVA</b> COTHING AS FASHION, ETIQUETTE AND BUSINESS COMMUNICATION.....	21
<b>3. Sasha DJORDJEVIC, PhD, Deyan ANDREYEVICH, PhD</b> FACTORS AND RESOURCES FOR TOURISM DEVELOPMENT.....	34
<b>4. Ass. prof. Darjan BOYKOV, PhD, Stefan ĐORĐEVIĆ</b> LACON SPEECH IN BUSINESS COMMUNICATIONS.....	40
<b>Доц. др Дарјан БОЈКОВ, Стефан ЂОРЂЕВИЋ</b> ЛАКОНСКИ ГОВОР У ПОСЛОВНИМ КОМУНИКАЦИЈАМА.....	40
<b>5. Tijana BOMBOL DELEVSKA, MSc</b> DIGITAL RESPONSE TO KOVID-19 PANDEMI IN THE GLOBAL WORLD - A CHALLENGE FOR SCIENCE AND PRACTICE.....	45
<b>м-р Тијана БОМБОЛ ДЕЛЕВСКА</b> ДИГИТАЛЕН ОДГОВОР НА КОВИД 19 ПАНДЕМИЈАТА ВО ГЛОБАЛНИОТ СВЕТ – ПРЕДИЗВИК ЗА НАУКАТА И ПРАКТИКАТА.....	46
<b>6. Assoc. Prof. Biljana PETROVSKA, PhD, Ass. Natasha PETROVSKA, Biljana GALOVSKA, M.Sc</b> THE CUSTOMERS SATISFACTION WITH QUALITY OF THE OFFERED CONDITIONS IN MATICAL VETERINARY LINICS.....	57
<b>Вонр. Проф. д-р Билјана ПЕТРОВСКА, Асс. Наташа ПЕТРОВСКА, М-р Билјана ГАЛОВСКА</b> ЗАДОВОЛСТВОТО НА КЛИНТИТЕ ОД ПОНУДЕНИТЕ УСЛУГИ ВО МАТИЧНИТЕ ВЕТЕРИНАРНИ АМБУЛАНТИ.....	58
<b>7. Teaching assistant Mimoza STAMENKOVSKA, M. Sc.</b> STRATEGIC MEASURES ON PEOPLE’S LIFESTYLE IN THE PREVENTION OF THE OXIDATIVE STRESS.....	67
<b>Асистент М-р Мимоза СТАМЕНКОВСКА</b> СТРАТЕГИСКИ МЕРКИ КОН ЖИВОТНИОТ СТИЛ НА ЛУЃЕТО ВО ПРЕВЕНЦИЈАТА НА ОКСИДАТИВНИОТ СТРЕС.....	68
<b>8. Prof. Riste TEMJANOVSKI, PhD, Prof. Biljana POPESKA, PhD</b> THE POTENTIAL OF CYCLING TOURISM TO PROMOTE HEALTHY LIFESTYLE HABITS.....	78
<b>9. Atanas KOZAREV, PhD, Ljupco SOTIROSKI, PhD</b> CYBER SECURITY PROTECTION AND IMPLEMENTING OF LEGAL FRAMEWORK.....	88
<b>10. Ljupco SOTIROSKI, PhD, Atanas KOZAREV, PhD</b> MARITIME LAW ON SAFETY AND ENVIRONMENT.....	104

<b>11. Prof. Riste TEMJANOVSKI, PhD,</b> <b>Prof. Tamara JOVANOVA APASIEVA, PhD</b> TRANSFORMING FREIGHT MOBILITY IN THE CITIES AND PROMOTING OF GREEN LOGISTICS .....	112
<i>Проф. д-р Ристе ТЕМЈАНОВСКИ,</i> <i>Проф. д-р Тамара ЈОВАНОВ АПАСИЕВА</i> ТРАНСФОРМИРАЦИЈА НА МОБИЛНОСТА НА ТОВАРНИТЕ ВОЗИЛА ВО ГРАДОВИТЕ И ПРОМОЦИЈА НА ЗЕЛЕНАТА ЛОГИСТИКА.....	113
<b>12. Elenica SOFIJANOVA, PhD, Marko MANEV, Gjorgjina KIMOVA</b> HEALTH DANGER AT WORK - REASONS AND CONSEQUENCES .....	121
<i>Проф. д-р Еленица СОФИЈАНОВА, Марко МАНЕВ, Ѓорѓина КИМОВА</i> ЗДРАВСТВЕНИ ОПАСНОСТИ ПРИ РАБОТА - ПРИЧИНИИ И ПОСЛЕДИЦИ.....	122
<b>13. Prof. Tamara JOVANOVA APASIEVA, PhD,</b> <b>Assoc. prof. Zlatko BEZOVSKI, PhD</b> <b>Prof. Riste TEMJANOVSKI, PhD</b> IMPORTANCE OF THE MARKETING PLAN FOR SUCCESSFUL BUSINESS OPERATIONS .....	130
<i>Проф. д-р Тамара ЈОВАНОВ АПАСИЕВА,</i> <i>Доц. д-р Златко БЕЖОВСКИ,</i> <i>Проф. д-р Ристе ТЕМЈАНОВСКИ</i> ЗНАЧЕЊЕ НА МАРКЕТИНГ ПЛАНОТ ЗА УСПЕШНО ДЕЛОВНО РАБОТЕЊЕ.....	131

## ОРГАНИЗАЦИОНЕН ОДБОР

- проф. д-р Алекса СТАМЕНКОВСКИ, Македонско здружение за маркетинг „Маркетинг“ Скопје,
- проф. д-р Ленче ПЕТРЕСКА, Меѓународен Славјански Универзитет „Г. Р. Державин“ – Свети Николе
- проф. д-р Ристе ТЕМЈАНОВСКИ, Економски факултет, Универзитет Гоце Делчев Штип, Република Македонија,
- проф. д-р Атанас КОЗАРЕВ, Асоцијација за корпоративна безбедност, владеење на право и човекови права
- Prof., Dr. Galina V. ASTRATOVA, The Ural State University of Economics (USUE) – Russian Federation
- Prof. Dragan KOLEV, PhD, Pan-European University „Apeiron“, Banja Luka, Босна и Херцеговина
- Проф. др Ванче БОЈКОВ, Универзитет у Нишу, Електронски факултет, Србија
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- Катарина РАДЛОВАЧКИ, Факултет за примењени менаџмент, економију и финансије, Србија
- проф. д-р Божо МИХАИЛОВИЌ, Економски факултет Подгорица, Универзитет Црне Горе, Република Црна Гора
- проф. д-р Љиљана СТАНКОВИЌ, Економски факултет, Универзитет у Нишу, Република Србија
- проф. д-р Ненад БРКИЌ, Економски факултет у Сарајеву, Република Босна и Херцеговина,
- Проф. д-р Елена СТАВРОВА, Стопански факултет - Југозападен универзитет Неофит Рилски - Благоевград, Република Бугарија
- проф. д-р Динка ЗЛАТЕВА, Стопански факултет - Југозападен универзитет Неофит Рилски - Благоевград, Република Бугарија,
- М-р Сашо НЕФОВСКИ, WEB Организационен секретар
- м-р Божин ПЕТРЕВСКИ, Организационен секретар,
- м-р Мимоза СТАМЕНКОВСКА, Административен секретар

## **РЕЦЕНЗЕНТИ**

проф. д-р Алекса СТАМЕНКОВСКИ

проф. д-р Ленче ПЕТРЕСКА

проф. д-р Ристе ТЕМЈАНОВСКИ

проф. д-р Атанас КОЗАРЕВ

проф. д-р Елена СТАВРОВА

проф. др Ванче БОЈКОВ

**Prof. Riste TEMJANOVSKI, PhD**  
Faculty of Economics,  
Univeristy “Goce Delcev” - Shtip  
[riste.temjanovski@ugd.edu.mk](mailto:riste.temjanovski@ugd.edu.mk)

**Prof. Tamara JOVANOVA APASIEVA, PhD**  
Faculty of Economics,  
Univeristy “Goce Delcev” - Shtip  
+38975265707  
[tamara.jovanov@ugd.edu.mk](mailto:tamara.jovanov@ugd.edu.mk)

## **TRANSFORMING FREIGHT MOBILITY IN THE CITIES AND PROMOTING OF GREEN LOGISTICS**

### **Abstract**

Urban areas have always been the center of increased economic activity in the spatial sphere. It is estimated that cities' contribution to national GDP is more than 80 percent of total GDP. The role of cities in the spatial sector, their spatial expansion and population growth, increasing social, economic, political and cultural impacts have been accompanied by a number of transport problems. Having a sustainable transport system is not only an option but a necessity and a natural legality to meet the growing demand, as well as to maintain the quality of life for city dwellers.

A sustainable logistic system also requires the provision of a diverse, integrated and balanced public transport service and manage freight transport operations. This particularly applies to freight traffic in urban areas. With the increase in economic activity and the growing population in cities, freight traffic needs are increasing. It is

estimated that about 10% of total traffic is related to freight traffic, while about 40% of pollution caused by the transport sector in the urban area is caused by urban freight transport.

The logistics activity with transport sector in each urban metropolis causes substantial negative impacts on the environment and human health. Transport is responsible for a quarter of the EU's greenhouse gas (GHG) emissions, and causes air pollution, noise pollution and habitat fragmentation.

For these reasons, we must build a clean, smart and comprehensive "mobility" system that caters to mobility needs by offering a service tailored to all user requirements, without disrupting the natural balance of the existing ecosystem.

**Keywords:** urban area, green logistics, freight transport sector, air pollution, sustainable environment

**Проф. д-р Ристе ТЕМЈАНОВСКИ**  
Економски факултет,  
Универзитет „Гоце Делчев“ – Штип  
[riste.temjanovski@ugd.edu.mk](mailto:riste.temjanovski@ugd.edu.mk)

**Проф. д-р Тамара ЈОВАНОВ АПАСИЕВА**  
Економски факултет,  
Универзитет „Гоце Делчев“ – Штип  
+38975265707  
[tamara.jovanov@ugd.edu.mk](mailto:tamara.jovanov@ugd.edu.mk)

## **ТРАНСФОРМИРАЦИЈА НА МОБИЛНОСТА НА ТОВАРНИТЕ ВОЗИЛА ВО ГРАДОВИТЕ И ПРОМОЦИЈА НА ЗЕЛЕНАТА ЛОГИСТИКА**

### **Апстракт**

Урбаните области отсекогаш биле центар на зголемена економска активност во просторната сфера. Се проценува дека учеството на градовите во националниот БДП е повеќе од 80 проценти од вкупниот БДП. Улогата на градовите во просторниот сектор, нивната просторна експанзија и растот на населението, зголемените социјални, економски, политички и културни влијанија се придружени со голем број проблеми со транспортот. Да се има одржлив транспортен систем не е само опција, туку неопходност и природна законитост за задоволување на зголемената побарувачка, како и за одржување на квалитетот на животот за градските жители.

Одржливиот логистички систем исто така бара обезбедување на разновидна, интегрирана и урамнотежена услуга за јавен превоз и управување со товарниот транспорт. Ова особено се однесува на товарниот сообраќај во урбаните области. Со зголемувањето на економската активност и растечкото население во градовите, потребите за товарниот сообраќај се зголемуваат. Се

проценува дека околу 10% од вкупниот сообраќај е поврзан со товарниот сообраќај, додека околу 40% од загадувањето предизвикано од транспортниот сектор во урбаното подрачје е предизвикано од градски товар.

Логистичката активност со транспортниот сектор во секоја градска метропола предизвикува значителни негативни влијанија врз животната средина и здравјето на луѓето. Транспортот е одговорен за една четвртина од емисиите на стакленички гасови во ЕУ (GHG) и предизвикува загадување на воздухот, зголемена бучава и фрагментација на живеалиштата.

Поради овие причини, мора да изградиме чист, „паметен“ и сеопфатен систем на „мобилност“ кој одговара на потребите на мобилност, нудејќи соодветни услуги прилагодени на сите барања на корисниците, без нарушување на природната рамнотежа на постојниот екосистем.

**Клучни зборови:** урбана област, зелена логистика, сектор на товарниот транспорт, загадување на воздухот, одржливо опкружување



## Introduction

According to the predictions more than 4 billion people worldwide - more than half of the global population - live in cities and the trend is expected to continue. By 2050, with urban populations more than double their current size, nearly 7 out of 10 people in the world will live in cities. According to the UN report [1], the world's economically strongest urban centres contain 25 per cent of the global population and produce 60 per cent of global GDP. But, undoubtedly, there are significant regional differences in the GDP per capita of cities. There is a great disparity between high-income countries and more developed regions have largely completed their urban transitions.

The development of a sustainable transport system begins with the functional organization of urban space. The main objectives are to reduce the demand for private transport by reducing the number of journeys and the length of travel, but on the other hand by favoring public transport and increasing green zones for pedestrian traffic.

Urban freight logistics of freight transport in cities can be defined as all movements of goods in to, out from, through or within the urban area made by light or heavy vehicles, including service transport and demolition traffic as well as waste and reverse logistics. Household purchasing trips are not considered to be part of urban freight transport as these are considered to be passenger transport trips.[2] Although the definition is simple, it includes a huge variety of very different transport operations and logistics activities and requirements. The only common factor is that they take place in an urban area (geographical aspect) and concern the movement of goods (transportation aspect) and service-related trips by commercial entities (commodity aspect; i.e. transport of things as distinct from people).

Urban freight transport particularly creates difficulties in large city cores, but also in times of high traffic congestion due to commuting or leaving work. However, in many cases, those who drive vehicles have the least decision-making power across the entire supply chain of actors. For example, carriers are paid by freight forwarders who can determine delivery terms and receivers (eg shop owners) determine with their working hours when the carrier can deliver.

Most of the products sold in the city centers come from production facilities or distributors located outside the city. Within the supply chain management system, transport elements in cities are often referred to as the "last link" or "last mile" in the supply chain. Trucks remain the dominant mode of transport as they are considered to be the most suitable for transporting goods between specific origins and destinations in the complex city networks on the streets. However, trucks generally have significant environmental impacts such as CO<sub>2</sub>, NO<sub>x</sub>, particulates (PM<sub>10</sub>, PM<sub>2.5</sub>, PM<sub>1</sub>), and noise emissions

The ability of developing countries to urbanize and develop their standards of living will substantially depend on their ability to attract capital through mobilizing domestic resources and Foreign Direct Investment. The acceleration in economic growth also bears an environmental cost. It should be borne in mind that cities are hotspots where more than 2/3 of world energy is consumed and more than 70% of global greenhouse gas emissions are emitted. Further research suggests that it is estimated that about 10% of total traffic is related to freight traffic, while about 40% of pollution caused by the transport sector in the urban area is caused by urban freight transport.

Part of freight transport is carried out using large trucks that have a higher turning radius than most vehicles in the city. In addition, trucks require considerable time to load and unload goods at various locations in the city. In the dense part of cities, these all contribute to traffic congestion.

To make the transport system economically viable and socially inclusive, one of the major goals of sustainable transport will be to establish an institutional mechanism for reducing the demand for private transport by reducing the number of journeys and the length of travel and encouraging changes in behavior and raising awareness of all participants in traffic services. Undoubtedly, a sustainable transport system is an essential aspect of the city's pulsation, and it is on the other hand that delivers a high quality of life, numerous amenities and true harmony of living. [3]

## 1. Green infrastructure strategy to better life conditions

The EU Working Group on green infrastructure strategy is committed to promotes integrated spatial planning by identifying multi-functional zones and incorporating habitat restoration measures into land-use plans and policies. Ultimately, green infrastructure can benefit human populations and contribute to a more sustainable economy based on healthy ecosystems delivering multiple benefits and functions. One of the key attractions of green infrastructure is its multifunctionality, i.e. its ability to perform several functions and provide several benefits in the same spatial area. These

functions can be environmental, such as conserving biodiversity or adapting to climate change, social, such as providing water drainage or green space, and economic, such as supplying jobs and raising property prices.

A good example of this multifunctionality is to contribute to a healthy living, better places to live, provisioning open spaces and recreation opportunities, increasing urban-rural connections, contributing to sustainable transport systems and strengthening the sense of community.



Figure ES.1 Green Infrastructure provides multiple functions

Ecotec & NENW, (2008). The economic benefits of Green Infrastructure: The public and business case for investing in Green Infrastructure and a review of the underpinning evidence. p.2.

According to the EU strategy, Green infrastructure will also be a necessary adjunct to

reducing the carbon footprint of transport and energy provision, mitigating the negative effects of land uptake and fragmentation and boosting opportunities to better integrate land use, ecosystem and biodiversity concerns into policy and planning. Green infrastructure solutions can contribute significantly to the development of

Green Transport Corridors, using the potential of healthy ecosystems e.g. to sustainably mitigate carbon emissions.[4]

## **2. Logistics and logistics performance in green cities**

Maybe someone asks how important logistics today when technological advancements have no limit in the conquest of space, when computer systems are sufficiently fed with data alone to regulate mobile assets.

„Logistics“ are at the heart of modern transport systems. As has been demonstrated earlier, the term implies a degree organization and control over freight movements that only modern technology could have brought into being. It has become one of the most important developments in the transportation industry. „Greenness“ has become a code-word for a range of environmental concerns, and is usually considered positively. It is employed to suggest compatibility with the environment, and thus, like „logistics“ is something that is beneficial.[5]

Green infrastructure cannot develop, survive and deliver its benefits without proper synchronization with transport and logistics infrastructure. Mobility and the transportation of people, goods, and capital are part of the circular system of the economy and are key to organizing people's daily lives, social participation and economic exchange and overall social processes. The transport sector is an integral part of the logistics system, as it enables production and daily consumption, which also adds to the quality of life provision.

In today's business developments, it's worth noting that modern companies will have to face, not only with time and performance constraints, but with the society's points of concern about the

environment [6]. Because of environmental problems and the worsening scarcity of natural resources, companies must be producing more reliable, healthier products which damage the environment minimally. Starting from that point, companies have been moving forward with a sense of social responsibility and adopting green logistics in order to design cleaner manufacturing processes and manage environmental risks.

The meaning and importance of the terms green logistics are most vividly and content-richly described by the authors Jean-Paul Rodrigue, Brian Slack and Claude Comtois in the paper with title Green Logistics [7]. Namely, according to the mentioned authors the notion “Logistics” are at the heart of modern transport systems. As has been demonstrated earlier, the term implies a degree organization and control over freight movements that only modern technology could have brought into being. It has become one of the most important developments in the transportation industry. ‘Greenness’ has become a code-word for a range of environmental concerns and is usually considered positively. It is employed to suggest compatibility with the environment, and thus, like ‘logistics’ is something that is beneficial. When put together the two words suggest an environmentally friendly and efficient transport and distribution system.

According to Saroha [8] green logistics is a form of logistics which is calculated to be environmentally and often socially friendly in addition to economically functional. It describes all attempts to measure and minimize the ecological impact of logistics activities. This includes all activities of the forward and reverse flows of products, information and services between the point of origin and the point of consumption. It is the aim to create a sustainable company value using a balance of economic and environmental efficiency.[Figure 1]

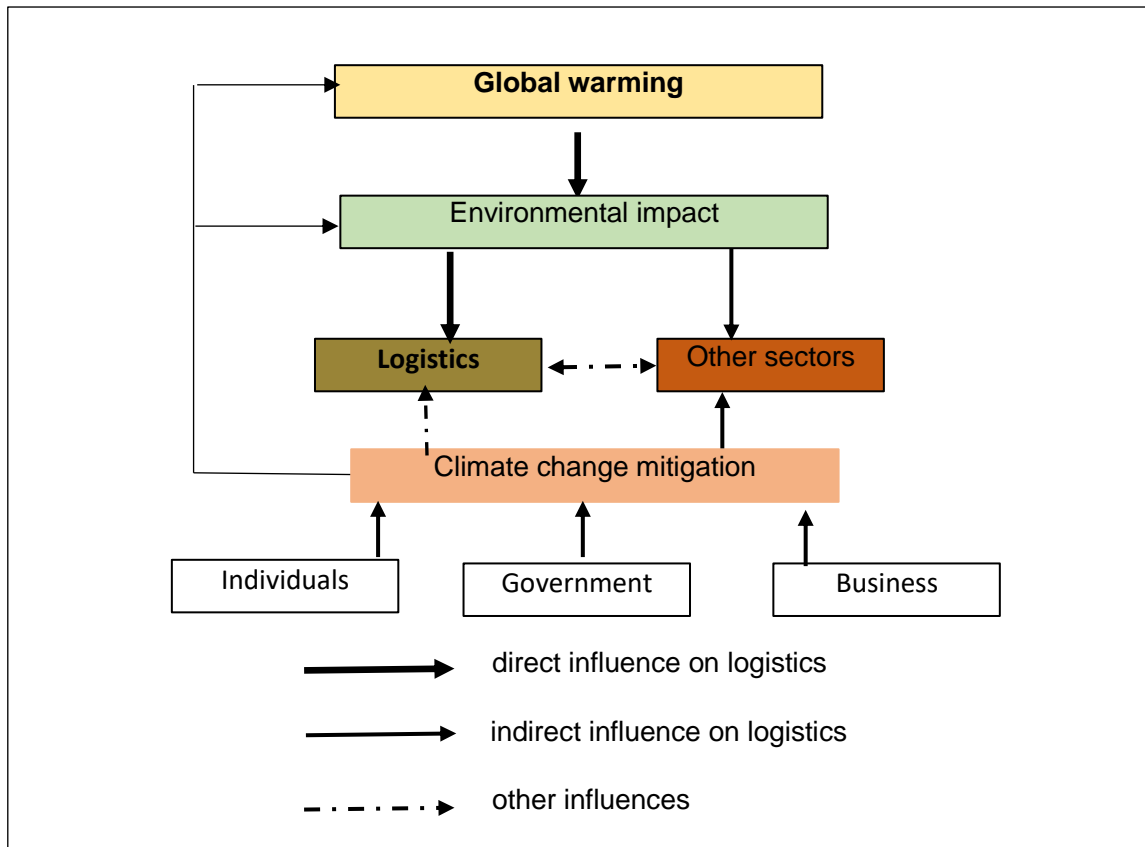


Figure 1: Direct and Indirect Pressures on Logistics to Adapt to Climate Change

Source: McKinnon A., Kreie A. (2010): Adaptive logistics: preparing logistical systems for climate change. Paper to be presented at the Logistics Research Network Conference in Harrogate, 8-10 Sept 2010 p.3.

<https://pdfs.semanticscholar.org/26ab/4590e6c4175d5ef9be974c555ab485bcd680.pdf>

However, boosting the volume of transport and logistics in the economy causes adverse effects such as road congestion, greenhouse gas emissions, and other environmental hazards, thus disrupting the balance of green infrastructure. An efficient, reliable and sustainable freight logistics sector is therefore essential to economic growth and competitiveness, the quality of life, but also to support and develop green infrastructure as a desirable phenomenon. Therefore, comprehensive logistics planning in a city is needed to achieve efficient freight transport for development.

Cities and metropolitan regions as agglomerations of people, industries, and service providers have an especially large demand and expectations for freight movement. Urban freight transport is characterized by the presence of many stakeholders who are responsible for sending,

carrying and receiving goods are distinguished. The main reason for this is that it takes place in the city – the central location where flows and activities intersect. Additionally, goods move through cities that do not originate from or serve these cities themselves. Thus, many cities and urban regions today face the challenge of making freight logistics faster and just in time, more efficient and reliable, and at the same time socially and ecologically sustainable to meet their goals and respond to future trends and reduce negative effects of freight logistics.[9]

### 3. Green logistics as the main element of Sustainable development concept

The application of logistics to solve the environmental problem and implementation of the principles sustainable development began in

the 1980s. The impact of logistics on climate change has attracted increasing attention in recent years, partly because tightening controls on pollution and road safety improvements have alleviated the other environmental problems, but also because new scientific research has revealed that global warming presents a much greater and more immediate threat than previously thought.[10]

According to Kahn Ribeiro and Kobayashi [2007] transport activity is expected to grow robustly over the next several decades. Unless there is a major shift away from current patterns of energy use, world transport energy use is projected to increase at the rate of about 2% per year, with the highest rates of growth in the emerging economies, and total transport energy use and carbon emissions is projected to be about 80% higher than current levels by 2030 (medium agreement, medium evidence).[11] But, Freight transport has been growing even more rapidly than passenger transport and is expected to continue to do so in the future. Industrialization and globalization have also stimulated freight transport, which now consumes 35% of all transport energy, or 27 oxyjoules (out of 77 total). Freight transport is considerably more conscious of energy efficiency considerations than passenger travel because of pressure on shippers to cut costs, however this can be offset by pressure to increase speeds and reliability and provide smaller 'just-in time' shipments. [12]

The problem of climate change and environmental pollution, as a global phenomenon, must include much more a system of measures, activities, both mitigation and adaptation of logistics systems as well as important link for interaction with the environment. No doubt, that actively developing research and possible directions during the final 20 years based on principles of sustainable development that are the green logistics and green supply chain management have reached a high level of maturity in Europe, the USA, and some Asian countries.[13]

According to McKinnon A., Kreie A.[14] up to date, most of the research and debate on climate change has focused on mitigation, with the aim of reducing the rate of global warming and keeping it within environmentally sustainable limits. It is now accepted, however, that our response to climate change must be 'twin-pronged', with the implementation. At of mitigation measures

accompanied by efforts to adapt economies, societies, built environments and individual lifestyles to a warmer climate. In essence, 'adaptive logistics' reverses the causality that has underpinned green logistics research, namely that logistics causes environmental damage, and considers how logistics will have to respond to environmental change. This response can either be *direct* where logistics systems must be modified to minimise adverse climate impacts or *indirect*, where climatic change alters the demand for logistical services and systems must be reconfigured accordingly. The scope of the subject can also be expanded to include the impact on logistics and supply chains of mitigation efforts by businesses, governments and individuals to cut their greenhouse gas (GHG) emissions.

According to Jedliński [15] the aim of sustainable logistics is, therefore, to strive for optimization of the relationship between society, economy and the natural environment, so that they are balanced. It is therefore important to ensure sustainable economic growth, but with the use of renewable energy sources in an environmentally friendly way, taking into account the management of natural resources (especially water and energy) in such a way as to achieve the optimum in integrating the requirements of legal and executive security. This striving is reflected in the idea of "co-opetition", because on the one hand companies compete, and on the other, they cooperate in creating a green supply chain using green technologies (and adjust their activities to legal regulations). This strengthens their powers, and especially the so-called "green experience".

## Conclusion

Cities, especially large agglomerations, are also transport nodes; thus, the transportation of goods from different regions causes an increased volume of mobility of different means of transport. The increased traffic flow caused by freight movement burden cities and reduce the quality of life of its inhabitants. Particularly negative are the consequences for cities that are growing at a rapid pace, with a high influx of population, inadequate infrastructure, resource depletion and the environment. The effects of increased and dimensionless transport activity can

severely hamper the efficient supply and distribution of goods.

Cities today face a real challenge making logistics smarter and more sustainable in meeting its goals and responding to future trends using modern technology. Using state-of-the-art technology, carriers are able to coordinate their movements through downtown cores and reduce traffic jams and dampen environmental impacts. Otherwise, increased and unsynchronized transport in cities would reduce the functional advantages of being economic, political and cultural centers.

Given the time lag effects of adverse atmospheric and environmental impacts, even if we want to achieve dramatic decarbonisation of the human environment today, it will take decades to have a positive impact on the global climate. Hence, it must be noted that green infrastructure cannot achieve the desired goals unless it is aligned with the overall logistics system in one area. Balancing the objectives of cost-effectiveness and reliability with these overarching development goals can contribute to a better quality of life in the region, improve policy efficiency, mitigate the risk of unintended consequences and position the sector as a model for inclusive development.

The existing conventional transport models and the fuels used are not sustainable in the long run. Whether we choose to change technology, transport habits to build a clean, affordable and quality life is our choice. A combination of legal measures, technological and innovative research, alternative fuels and cultural habits and adaptations is needed to achieve health benefits, including cleaner air, fewer accidents, less traffic jams and pollution. The long-term development of every European urban environment means a cleaner Europe. It might seem like a colossal society task. It can be done and we know how we can make it happen in the future. It is also a must, given the current transport system's impacts on the environment and public health.

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