

**TOROS UNIVERSITY FACULTY OF ECONOMICS,
ADMINISTRATIVE, AND SOCIAL SCIENCES**

DEPARTMENT OF INTERNATIONAL TRADE AND LOGISTICS

2nd International Symposium on Sustainable
LOGISTICS
"CIRCULAR ECONOMY"

PROCEEDING BOOK

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MERSİN





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Preface

Dear All,

Welcome to the "International Sustainable Logistics Symposium" with the theme of Circular Economy. We are proud of being a stakeholder and hosting such an important symposium. Foreign trade is of great importance for countries to increase their economic growth rates and to get a larger share from global markets. For Türkiye, logistics is of great importance in terms of achieving economic goals and global competition. Approximately 12% of the world economy is related to the logistics sector or industry.

Today, although transportation comes to mind when it comes to logistics, many important issues, from picking up the product from where it is produced, to the warehouses, to stocking it, and to the transportation of the product to the desired location, are the basic subjects of logistics. Parallel to these developments in the world, there are serious breakthroughs in the sector. The sector has reached such a large volume today that any malfunction in the system can cause serious damages.

Approximately 90 percent of Turkey's foreign trade loads are transported by sea. 60 percent of our country's import and export volume (which is about 238 billion dollars) is realized by sea. Mersin, which is known as the pearl of the Eastern Mediterranean, of course has a strategic importance for our region and country. Located in the Eastern Mediterranean, this port city; has a critical importance for the imports and exports of industrial facilities located in Çukurova, the Southeastern Anatolia and Central Anatolia regions. Mersin Port is an important transportation point for the cities in its hinterland. It is also the driving engine of our city's economy. Our city, which has land, air and sea connections, also has the potential to become a logistics center for our country. The closest airport to our city is Şakir Paşa Airport in Adana. With the completion of Çukurova Regional Airport, built within our provincial borders, we will be one step closer to our goal of becoming a logistics base.

As Toros University, we are investing in the logistics industry, which is of great importance for our Mersin and our country, and the future of the industry. Last year, we held the first International Sustainable Logistics Symposium. In this symposium, very important issues for the future of the sector and industry were discussed. At Toros University; In our Faculty of Economics, Administrative and Social Sciences, there is International Trade and Logistics department, and in Graduate Education Institute, there are thesis and non-thesis master's programs in International Trade and Logistics. This year, we applied to open an International Trade and Logistics PhD program. We aim to train well-equipped industry people in line with the needs of the industry, thanks to the advisory boards consisting of industry representatives, academics and graduates, which are formed separately for each of our departments.

Today and tomorrow we will discuss a very important issue for our world here: "Circular economy". I would like to express my gratitude to all our stakeholders, especially the Logistics Association LODER, and Toros University International Trade and Logistics department and who contributed to the formation of this symposium and greet you with respect. Have a nice symposium.

Ömer ARIÖZ

Toros University Rector

Preface

Dear all,

It is my great honor to hold the Second International Sustainable Logistics Symposium as one of the organizers of this symposium with a highlighted theme on Circular Economy. This symposium is an international symposium hosted by Toros University, Faculty of Economics, Administrative, and Social Sciences, Department of International Trade and Logistics and is conducted in cooperation with the Turkish Logistics Association(LODER), L'Université Clermont Auvergne (UCA), Jean Monnet Center of Excellence on Sustainability (ERASME), and the Department of Logistics and Information Engineering at Tokyo University of Marine Science and Technology(TUMSAT). I would like to express my sincere gratitude to all those who contribute. I especially thank Ayhan Demirci for his great collaboration. I also thank Mehmet Tanyas, the president of LODER, for his continued support of the friendly relationship between the Japan Logistics Society and LODER.

As you know, Japan and Turkey have been building a friendly relationship for many years, despite the long distance between the eastern and western ends of Asia. It has been 132 years since the Turkish warship "Ertugrul" was lost in 1890 off the coast of Kushimoto City in southern Japan. The desperate rescue of the Turkish crew by coastal residents has created a strong bond through the ocean. As Mersin City, where Toros University is located, has a sister city relationship with Kushimoto City, I am very pleased to be able to hold this symposium here.

SDGs and Circular Economy are important issues in logistics for the future. In addition, TUMSAT has just published "Vision 2040" which is a medium- to long-term action plan, that should take into account SDGs and Circular Economy. In order to achieve the SDGs, each researcher at TUMSAT is posting their research achievements on our website to show what they can contribute to the 17 goals.

While TUMSAT has a long history since 1875, the Department of Logistics and Information Engineering established in 1978 is a relatively young department and is characterized by its professional education in logistics with an engineering approach. Therefore, the theme of this symposium, Sustainable Logistics is also a very important research topic for our department.

As governments, companies and universities around the world are working on SDGs, I sincerely hope that this symposium will deepen the international academic exchange on Sustainable Logistics.

Thank you.

Daisuke WATANABE, Professor
Department of Logistics and Information Engineering
Tokyo University of Marine Science and Technology

Preface

Dear all,

Since the 1990s, the internationalization of trade and corporate relocation strategies have made logistics an essential part of the global economy. The idea of a factory making a computer or a car has disappeared. Today, car manufacturers, cell phone manufacturers, computer manufacturers, etc. have become assemblers who receive spare parts from many countries. Logistics is the result of these flows of goods and services, fueled by global stocking and destocking policies. Carriers transport these goods by land, water and air. This international fleet will rely on nearly 5,500 container ships in 2021 (compared to 3,500 in 2006). Container traffic is increasing by nearly 10% per year and demand is not slowing down. Logistics is essential to the smooth running of the economy. Logisticians are not only present in the trade sector, but online business is also a huge growth driver.

Nevertheless, over time, this healthy global economy has generated certain issues that need to be addressed urgently. The main problem is social and environmental concerns. Logistics is at the crossroads of production, consumption, exports, imports and waste, especially in Europe. As such, it must be part of a process of sustainability, which integrates both environmental limits and a sort of social threshold (avoiding social dumping or the emergence of precarious jobs). If trade flows have been maintained for a long time by a decrease in transport costs, energy constraints (the war in Ukraine reminds us that competitiveness relies on cheap energy) and climate constraints (greenhouse gas emissions from the transport sector) are in the process of stopping this beautiful mechanism. The actors of the logistics sector are fully aware of the problem, but the solutions require radical changes. It is a question of engaging logistics in a strong sustainability logic. As such, human societies will have to reduce their consumption and production to reduce their environmental footprint. Decoupling - whether relative or absolute - is not a sufficient solution. We need to shift to degrowth, and imagine a society in which the size of the economy is reduced to be compatible with planetary limits.

The circular economy - in particular the 7 Rs policy is an alternative, especially when it leads us to Re-evaluate our needs (basic needs vs. superfluous desires or products), to Reconceptualize (development of the economy of functionality in which the use of a good is preferred to the ownership of the good), Relocate (even if the cost of relocation is significant), Reorganize (industrial symbioses emphasize collaborative relationships, proximity and resilience), Repair, Reuse or Recycle. However, such a model requires us to make a qualitative breakthrough, moving from a linear system (extraction, production, consumption and waste) to a complex recursive system (in which feedback loops would articulate several value chains). The use of system dynamics and causal loop diagrams (CLD) could offer new perspectives, including the transition to Industry 6.0. The current literature highlights Industry 4.0 and 5.0 by insisting on the importance of artificial intelligence and the desire to reintegrate humans into the production process. These developments are real and many companies are investing in data management and seeking to take advantage of the information collected.

Nevertheless, it is necessary to engage in a strong sustainability approach, to reduce our extraction of natural resources and waste, to open up value chains in order to create synergies between different sectors (food, textile, energy, health...). Logistics must undergo its own revolution and produce its own scenarios (it is no longer a question of predicting how many goods will be transported tomorrow, but of imagining the logistics of the future). Sustainability and circularity are the two foundations on which sustainable logistics must emerge. It is the guarantee of a new form of organizational resilience.

Arnaud Diemer

University of Clermont Auvergne, HVL

CERDI, ERASME

Jean Monnet Chair on Circular Economy and Industrial Ecology

Preface

Dear all,

Last year, we successfully completed the sustainable logistics symposium which was organized on April 30, 2021 with the cooperation of our partner Tokyo University of Marine Sciences and Technology and with the support of the Turkish Logistics Association. And today we've come together for the 2nd International Sustainable Logistics Symposium with the highlighted theme of circular economy. This symposium is hosted by Toros University, with the Corporation of Tokyo University of Marine Science and Technology from Japan, and this year University of Clermont Auvergne and Jean Monet Center of Excellence on Sustainability from France joined us and also supported by Turkish Logistics Association.

Sustainability is an increasingly crucial concept in recent few decades. The Covid-19 Pandemic, which has made its mark especially during the last two years, once again revealed the importance of a sustainable structure in logistics processes. And this period also strengthened the governments' recognition of the importance of logistics in all over the world, while also placing the focus of the policy-makers and the industry on circular economy recovery in the coming years. All you know that circular economy which is also known as circularity is very important topic nowadays. In its core principle, the European Parliament defines circular economy as; a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. The idea and concepts of circular economy have been studied extensively in academia, business, and government over the past ten years. Circular economy has been gaining popularity since it helps to minimize emissions and consumption of raw materials, open up new market prospects and principally, increase the sustainability of consumption and improve resource efficiency.

There is a major issue setting the tone among supply chain's current challenges: achieving sustainable logistics. As is well known, achieving efficiency in the supply chain mainly involves improving customer service and decreasing costs. To do this, the distribution and transport activities – which are part of the chain's last stage – face risks directly related to the speed in deliveries demanded by clients and to the impact of transport on the environment. Both aspects require a focus on sustainability considering a logistics system that promotes the optimal design of routes and shorter trips to lower the emissions that pollute the environment. Consumers and companies from all sectors are increasingly developing an environmental awareness, which is put into practice in their operations and daily lives, is also demanded from their direct suppliers.

Sustainable logistics aims to decrease the ecological footprint of its tasks, such as CO2 emissions, noise pollution, and accidents. In this sense, logistics suppliers must look for a balance between financial growth, environment care, and the health of society. In any case, continuity of a business is much more important than beginning. For this reason, the theme of the symposium has been determined as sustainability and circular economy and brought together all of us, valuable participants. This year, the interest and also participation increased, compared to the previous symposium. So we are excited about the scientific studies will be presented at the symposium within both these scope. There are well-known keynote speakers from Turkey, Germany, Japan and France, and also lots of valuable scientific studies will be presented at this organization, I hope it to be fruitful and efficient for everyone.

I would like to thank to Prof. Daisuke Watanabe from Japan and Dr. Arnoud Diemer from France for their strong support. And also I would like to thank to President of the Turkish Logistics Association, Prof. Gülçin Büyüközkan and Vice President of Turkish Logistics Association Prof. Mehmet Tanyaş, who contributed us for this organization and provided all kinds of support. In addition, I would also like to express my special thank to Chairman of Toros University Founding Board of Trustees Mr. Ali Özveren, Chairman of Toros University Board of Trustees Mr. Sertaç Özveren and Rector of Toros University Prof. Ömer Arıöz. And finally I would like to thank to all my colleagues again, contributing to all processes of the symposium from the beginning of the preparation phase to the end.

Thank you.

Ayhan DEMİRCİ

Head of Department of International Trade and Logistics

ABSTRACTS PRESENTED AT THE SYMPOSIUM

DOES CIRCULAR ENERGY SOURCES IMPROVE BOTH ECONOMIC GROWTH AND HEALTH LEVEL? EVIDENCE FROM EU

Gökçe MANAVGAT¹

Today, it is an accepted fact that the economic growth of countries is directly related to the use of energy. Although the use of energy is effective on production and growth, providing resource efficiency for environmentalism and sustainability together may help overcome the limits of growth. Therefore, the circular economy offers a significant paradigm for transcending the limits of economic growth. Since the circular economy is generally considered to be a transition from a linear (take, make, use, dispose) model to a circular (restorative, repair and regenerative) model, the energy to achieve this is an important resource. Energy has the potential to play a huge role in the development of the circular economy. In addition, the fact that energy is renewable also contributes to the circular economy. These circular approaches can also further play a significant role in improving the level of health. The possible effects of circular energy on health are related to reducing pollution and preventing the deterioration of natural resources. Circular energy, which contributes to a circular economy, clearly support to growth and wellbeing variables (e.g., health level and sanitation) by reducing environmental pressures. The aforementioned that chain of values has considerable place in the sustainability agenda and discussions, especially in developed countries. The concept of the circular economy is often presented in the EU action plan, as enabling wider economic and social benefits, such as greater well-being, sustainable growth, environment, and health. This paper analyses the causal relationship between economic growth, combustible renewables and waste in energy and health level in EU during the period 1990-2018. In the study, cointegration analysis and Granger-causality test have been used to determine these relations. The cointegration test primarily results indicate that there is evidence of unidirectional causality from economic growth to combustible renewables and waste energy consumption without feedback but bi-directional causality from health level to combustible renewables and waste energy consumption. In other word, GDP growth and life expectancy at birth is Granger-causality of combustible renewable and waste consumption but life expectancy at birth has bidirectional. These results show that in renewable energy, the reuse of waste is dependent on the growth of EU, but it has no effect on go beyond the growth. However, it is important in terms of supporting environmental operations and sustainability, where the share of renewable and waste-related energy has an impact on the improvement of the health level and might be a direct determinant of the health level.

Keywords: Combustible renewable and waste, health, economic growth, sustainability, EU.

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KEY-DRIVERS SHAPING CIRCULAR ECONOMY TRANSITIONS: SYSTEM DYNAMICS METHOD IN THE MANUFACTURING VALUE CHAINS

Manuel E. MORALES², Lina DAGILIENE³

The complexity of circular manufacturing systems (CMS) plays a critical role in figuring out the best business strategy mechanisms and policy intervention mix according to the value chain context to accelerate and pave the transition pathway towards circular economy. The transition studies framework offers the ground to integrate Complex Adaptive Systems (CAS) and System Dynamics (SD) to build up a better transition towards a more circular economy CE in the manufacturing industry. The aim of this study is to identify the key-drivers that shape the value chain system's behavior applying a multi-level perspective to better understand the CMS transition. The study uses a meso-level perspective to address value chain connectivity unfolding behavioral patterns between key-drivers in the Lithuanian CMS. Based on the review of the existing literature the key-drivers that engage the circularity transition were identified, then empirical data was gathered from a series of interviews applied to firm's responsables, academics and experts from Lithuania, figuring out the links and connections of the key-drivers. The information obtained from those interviews and the data collected from statistical databases is used to build the Stocks and flows diagram (SFD) describing the behavioral patterns through feedback loops in the CMS. Comparative analysis has pointed out divergences and similarities in the direction (bottom-up/top-down) of the interventions (policies and strategies) that figure out the best-case scenario for each national context coming from the key-drivers effects on the CMS. The originality of this study stands on taking a step back and trying to identify the causal drivers that shape the CE transition in the CMS, instead of looking independently at firms to disentangle the symptoms, barriers and business models in the micro-level.

Keywords: Interventions, multi-level perspective, complex adaptive systems, circular manufacturing systems, circular economy key-drivers

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PREDICTING EXPECTED PEAK VALUE OF CONFIRMED CASES AND MANAGING LOCKDOWN STRATEGIES IN MAJOR TRADE HUBS AMID PANDEMICS

Ata ÖZKAYA⁴

As the number of daily COVID-19 cases increases, the risks for even more severe outcomes like swelling hospitalization rate, blocking intensive care units, broadening lockdown strategies across the world trade hubs, reducing economic activity and production, and ceasing supply chains become concrete. Thus, the governments first, focused on the peak value of confirmed cases that can be reached on a certain period. Second, the governments across the world aim to control the accumulation of confirmed cases which increase the uncertainty on sustainability of the economic activity in various respects. Because of quarantine by either hospitalization or lodgments, the production sectors stopped their activity, international trade flow has been disrupted on many routes, logistics process was ceased and prices fluctuated, and supply chains were break down especially in economic agglomeration centers. In nowadays, in many high-tech sectors in China, Covid-19 lockdown policies are implemented for labor force and these strict measures dent the production and weaken the supply chains. This manuscript introduces a nonlinear dynamic, novel model in order to predict the expected peak of hospitalization. The dataset used in this study is derived from international flights among major trade hubs across the world. Our findings aim to give policy makers more room to implement real-time interventions on the outbreak process and to prevent a crisis blocking health service capacity. Moreover, these findings may enable policy makers to better manage the lockdown process, it is temporal dynamics and related mild measures to prevent weakening supply chains and to accelerate logistics processes with more efficient and sustainable policies. We also test the efficiency of our model by real-time data of the outbreaks in economic, trade and transportation hubs of selected OECD countries. These hubs are Istanbul, Lombardy, the State of New York and Tokyo. Our study can be considered to propose a theoretically and empirically collaborative solution method to better manage lockdown strategies, and to enhance sustainability of supply side of the economy.

Keywords: Covid-19 pandemics, hospitalization, health system breakdown, lockdown in trade hubs, sustainable policy making

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3D PATH PLANNING OF UAVS IN COMPLEX URBAN TERRAINS: A CASE OF EMERGENCY MEDICINE DELIVERY IN SHANGHAI

Shan XU⁵, Yutaka WATANABE⁶

Unmanned aerial vehicles (UAVs), widely known as drones, have been used in various domains for tasks including geological prospecting, e-commerce business, and emergencies. For emergency medicine delivery, because of the necessity for fast and efficient delivery, drones can play a crucially important role by passing through complex urban environments. Drones might therefore contribute to saving patients living under strict lockdown conditions during the surge in COVID-19 cases. However, distribution routes are usually planned in two-dimensional space while restricted areas in urban aerial domains are overlooked because of complex environmental considerations. To boost the feasibility of the solutions, three-dimensional (3D) path routing should be applied when planning aerial distribution routes for drones, such as those used for delivering emergency medicines. This study specifically examines a more reliable method using heuristic algorithms and software ArcGIS. First, location data of chronic patients in lockdown areas are collected from the Shanghai official information system database. Then 3D visualization of the terrain and the complex airspace was done using ArcGIS. Secondly, the UAV routing constraints are summarized according to the current laws and regulations for UAV operation at low altitudes. Also, feasible solutions are incorporated into this model. Finally, after improved ant colony optimization (ACO) was applied to 3D route planning problems, with programming done using MATLAB (ver. 2017b). Assuming guaranteed safety and compliance with regulations, the solutions demonstrate the algorithmic efficiency and provide a satisfactory route plan for emergency medicine delivery that might guide emergency delivery system routing design in similarly complex urban environments.

Keywords: 3D route planning; emergency; geographic information system; heuristic algorithm; medical emergency; unmanned aerial vehicle

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EFFECTS OF THE WAR BETWEEN RUSSIA AND UKRAINE ON GLOBAL TRADE AND SUPPLY CHAIN

Didem DEMİR⁷

In this theoretically designed study, it is aimed to determine the effects of the Ukraine-Russia war on global trade and supply chain. Although the Ukrainian and Russian economies are small compared to the global economy, they are important in some key areas, especially for energy and food. Russia has a great influence especially on the European Union and the United Kingdom. The main impact of the Russia/Ukraine conflict on the world economy is financial markets, supported by high energy prices and strong international sanctions against Russia. The impact of the conflict on commodity prices and therefore on household expenditures is enormous. An important channel of trade expansion is agricultural exports. According to the US Department of Agriculture, wheat exports to Russia and Ukraine are about a quarter of the global export total. As countries around the world seek to recover from the economic impact of the Covid-19 pandemic, Russia's latest 2022 attack on Ukraine could worsen the situation, as global economies could cause another rise in commodity prices and 'supply chain bottlenecks'. Significant amounts of maize and other coarse grain exports account for Ukraine and Russia, of which about one-fifth of global exports. About 80 percent of sunflower oil exports are carried out by Ukraine and Russia. In some emerging economies that rely on imported grain and where food has a high share of household expenditures, this may also have some negative political consequences. Gas in Europe is nearly six times higher than it was at the beginning of 2022, as Russia's latest attack on Ukraine led to a 20% increase in gas prices, thus increasing inflation and rising bills. Estimates by the European Commission reveal that the impact of Covid-19, supply chain restrictions and the rise in energy prices (inflation) could reduce the economic growth curve to 4.0% for all EU countries using the euro by the end of 2022, and this is the current forecast. It may become even more uncertain with Russia's attack on Ukraine. The chief economist of Berenberg bank, on the other hand, predicts that the drag from higher prices and the negative confidence effect could reduce real GDP (Gross Domestic Product) growth in the euro area from 4.3% to 3.7% for 2022. Experts, like the UK and many other countries around the world, suggest that European countries will face higher inflation rates and supply chain disruption due to Russia's attack on Ukraine in 2022. Saudi Arabia's refusal to release more oil supplies to support Russia's if its exports decline will also greatly affect the price of the commodity globally. Russia and Ukraine are major players in the export of oil, natural gas, coal, wheat and other commodities in the global market. Mark Zandi, chief economist at Moody's Analytics, stated that both countries produce 70% of global neon, a vital commodity in semiconductor manufacturing, which is causing panic with the current crisis and nations, and especially automakers,

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are witnessing a shortage in computer chips. Zandi observes that both countries are responsible for 13 percent of the global supply of titanium used in the manufacture of passenger planes, and 30 percent of the global palladium used in automobiles, cell phones and dental fillings, and therefore the impact of this crisis on the global supply chain and the impact on the global economy equally. It is clear that this crisis will lead to a decrease in household consumption due to higher inflation, higher prices (oil, gas, wheat, minerals), supply chain disruptions, uncertainty, an economic growth barrier, and a decrease in consumption. Since both countries are important exporting countries to Europe, they will cause investment and stock fluctuations both globally and especially in Europe. It is therefore important for politicians in these countries, which are heavily dependent on Russia for the import of vital commodities, to find alternative solutions.

Keywords: Global trade, Russia, supply chain, Ukraine.

OPTIMIZATION OF MODE SELECTION AND ROUTING IN SUSTAINABLE INTERMODAL FREIGHT TRANSPORTATION

Mu-Chen CHEN⁸, Ying-Ju CHIU⁹

Due to the increase in freight volume and the development of containerization, freight operators have begun to integrate various transportation modes to transport cargos. By integrating the advantages of different freight transportation modes, it can improve transportation efficiency, and reduce transportation cost. Due to the climate change, sustainability has become an important issue in both academic and industry. With the substantial increase in the emphasis on sustainability of transportation, freight transportation operators need to consider green transportation and carbon emissions reduction in their operations and planning while pursuing profit. This study intends to construct an intermodal freight transportation network model, in which the cost of carbon emissions is taken into consideration, to optimally determine the distribution modes and routes. In the constructed mathematical model, the objective function is to minimize the total cost, which consists of transportation cost, transshipment cost, penalty for exceeding time limit, and carbon emission cost. A numerical example, scenario analysis and sensitivity analysis are performed to generate results for analysis. The results of this study show that the increase in the carbon emission cost drives freight transportation operators to use less energy-intensive modes. However, the modes with lower carbon emissions travel at lower speed, thus making the total transportation time longer. The shorter the required distribution time, the more the freight transportation operators select the modes with higher speed and higher carbon emission coefficient, which leads to increased transportation cost and carbon emission cost. In the literature of intermodal freight transportation routing problem, there are relatively few previous works considering carbon emissions in selecting modes and routes. Therefore, this study contributes in optimally selecting modes and routes of intermodal freight transportation.

Keywords: Sustainable transportation, intermodal freight transport, mode selection, routing, carbon emission, optimization.

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THE CIRCULAR ECONOMY AND SUSTAINABILITY: A PARADIGM SHIFT?

Yılmaz KAPLAN¹⁰

The industrial revolution achieved a paradigm shift from the agrarian society to an industrial one since the paradigm of production and consumption to meet the basic needs in the agrarian system was replaced by the paradigm of mass production and consumption. Particularly, the discovery of the machine power encouraged the human to dominate and exploit nature (rather than being a part of it). In this industrial paradigm, a linear logic depending on the exploitation of the natural resources became dominant in shaping socio-economic actions. However, the scientific studies in the 1970s pointed out the unsustainability of this linear system due to the brutal exploitation of the Earth. As a respond to this fact, the concept: sustainability started to be used as a means to achieve a symbiotic relationship between ecology and economics. At this point, the circularity of socio-economic behaviours started to gain attention. The circular economy as a sustainable model suggests that socio-economic actions from design to consumption should be connected and resources should be kept within this circularity as much as possible, because according to this understanding, the resource leakage from the economic system is the main reason behind unsustainability. From Polanyi's perspective, this idea aims to achieve a great transformation from market society to ecological society in which human being will develop a socio-economic behavioural pattern in appropriate to her ecosystem. This means a paradigm shift from money-centred thinking to ecology-centred thinking, and in the new paradigm, the notion of waste will be replaced by resources. As a result, the new circular paradigm will create a sustainable socio-economic system. Despite this hypothetical promise, the circular economy is still an elusive idea, and there is not any clear map to achieve it. This research has focused on the question to what extent the circular economy promises a paradigm shift from the linear economic system to a more sustainable circular system. The study has carried out a qualitative analysis on the secondary data derived from a comprehensive literature review. Here, policy analysis has been conducted through the empirical findings of recent researches which scrutinizes the circular economy policies of the leading global actors (e.g. the EU, China, the USA, and Japan). By benefiting from these empirical studies, the research investigated, from a Kuhnian perspective, to what extent the conceptualization of circular economy as a means of systemic change represents a paradigm shift in the real-life context. The findings mainly support the argument that a paradigm shift to a circular economic system could provide further progress in the name of sustainability. However, there are two important structural constraints which might prevent/weaken the achievement of this progressive transformation. Firstly, the circular transformation attempts in practice are gradual, which decreases the effectiveness of the circular economy in dealing with the worsening environmental crisis. Secondly, the isomorphic effect of the linear economic system on this transformation is noticeable,

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and this effect could weaken the sustainability of the circular economy. As a novel finding, it could be argued that transformation to an ecological society will take time despite the urgent environmental problems and a pure paradigm shift from the linear economic system is less likely due to its isomorphic continuity in this transformation process.

Keywords: Circular economy, sustainability, paradigm shift, ecological society

INVESTIGATING THE CAUSAL LINKAGES AMONG ECONOMIC GROWTH, TRANSPORTATION, AND CO₂ EMISSION IN TURKEY

Salih ÖZDEMİR¹¹, Nadide AKTAŞ¹², Tuncay ÇELİK¹³, Neslihan DEMİREL¹⁴

Economic growth is a priority and main goal for all countries. However, since environmental pollution causes serious environmental and social damage, it is necessary for the countries to aim for sustainable growth. Although the relationship between economic growth and CO₂ emission, which is the main variable of environmental pollution, has been a research topic for a long time in the literature, the relationship between transportation and CO₂ emission is a current issue. The relationship among economic growth, transportation, and CO₂ emissions is the focus of researchers and decision-makers in theory and practice since examining the relationship among the relevant variables contributes to the policy decisions and ensures to reach sustainable growth. In that light, the purpose of this study is to investigate the causality relationship among economic growth, transportation, and CO₂ emission over the period 1994 to 2018 in Turkey. The employed model is analyzed using the modified Granger causality test Toda Yamamoto which allows analyzing the causality relationship without taking into account the cointegration relationship between variables. The findings indicate that there is bidirectional causality between economic growth and transportation. Additionally, unidirectional causality running from CO₂ emission to transportation is determined and there is no causal relationship between economic growth and CO₂ emission.

Keywords: CO₂ Emission, economic growth, transportation, Toda Yamamoto causality test

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SATISFACTION OF CITIZENS IN ISTANBUL WITH URBAN PUBLIC TRANSPORT

Özgür SOY¹⁵, Leyla TAVACIOĞLU¹⁶

Critical city subsystems, such as the urban mobility system, provide a severe challenge in rebuilding city infrastructure to become sustainable and future oriented. Intermodal travel is becoming increasingly popular, especially in major cities. The ability to mix and match multiple modes of transportation on a single journey is highlighted as critical to a more efficient and sustainable urban transportation system. However, intermodality research has primarily focused on long-distance transportation or specialized combinations. Many people employ intermodal combinations in their daily movement, according to the findings. Intermodal combinations are necessary for a successful urban transportation system. Public transportation options and journeys to work play a crucial role in intermodal travel behavior. Combinations of bike and public transportation are common in urban areas, automobile and public transportation are common in decentralized communities, and combinations of diverse modes of public transportation are common in well-connected neighborhoods. In this study we want to determine the parameters that cause the preference of sea transportation or alternative vehicles Metrobus and Marmaray, especially in journeys made between the two sides of Istanbul "Asian side and European side". The preliminary analysis of the "Sea Transportation Satisfaction Survey", which was conducted with 2346 participants. In this period, a model was created by accepting the "frequency of use" question in the survey as an output (dependent variable). Some other selected questions in the survey were also accepted as input and this model was tested with different approaches. Furthermore, as seen by the reasons they provide for taking intermodal trips and their ratings of interchanges, the study highlights the significance of time efficiency for intermodal users. Intermodal travel behavior and user expectations must be considered in urban planning if the objective is to make the most of intermodal combinations for a successful urban transportation system. Maritime transportation survey with 2346 participants (Separate surveys were conducted with City Lines, Private Motors, Metrobus and Marmaray users to compare their preferences and reasons). All the obtained data will be analyzed using SPSS software and all the data will be analyzed. According to the Multinomial Logistic Regression and Discriminant Analysis models used in the Multivariate Statistical Analysis method, 8 features were valid in the Regression model, and 4 features were valid according to the K-fold and Leave-one-out criteria in the Discriminant method and for MLR features, $p > 0.05$ was found in accordance with the Hosmer-Lemeshow test criteria. Based on the results obtained when the "Age 18-25" reduces the "frequency of use of a steamboat engine" as "10 times and above" compared to "60 and above years old" by 1,961 (1/0.510) times, whereas "users being male" increases the "frequency of use of steamboat engines" 10 times or more compared to "female users" by 2.615 times compared to occasional usage.

Keywords: Public transportation, maritime, sea transportation, accessibility, optimization, urban mobility

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INTEGRATING MACHINE LEARNING TO TIME DEPENDENT CASH IN TRANSIT VEHICLE ROUTING PROBLEM WITH TIME WINDOWS

Khaled DANDIS¹⁷, Alev TAŞKIN¹⁸

Vehicle routing problem (VRP) is an optimization problem that tries to find the optimal set of routes for a fleet of vehicles to serve a set of customers. A special case of the vehicle routing problem is called the cash-in-transit (CIT) problem which specializes in the field of transporting valuable items such as banknotes, coins, or any other valuable items from one location to another. Studies always try to find better solutions for various CIT problems to reduce the risk of robbery of these valuable items during the transportation operation. Traffic density is one of the most crucial factors of the CIT problem. We are aiming at integration of machine learning to optimization to predict the traffic speeds of a region in Istanbul. After that the traffic speed values will be fed to time dependent model in order to minimize the total traveling time of the routes. We are dealing with a time-dependent VRP where a fleet of fixed capacity vehicles pick up predefined amounts of cash from customers. Customers are assigned to vehicles and the vehicles are routed, thus minimizing the overall duration of routes. In our application, the vehicles start the routes from the vehicle depot of the CIT company, pick up the money from the customers, deliver it to the bank, and lastly return to starting point. The travel time between customers, and between customers and the depot or the bank depends on the distance between the points and the traffic speed at the time of the day. Time windows will also be offered to serve customers. For better estimation of the vehicle routes, a comparison of machine learning methods for the prediction of traffic speed is represented. In this study, we focus on comparing the prediction effectiveness of the most common machine learning and deep learning methods. This will then be used to predict the traffic speed during the day to solve the time-dependent optimization model.

Keywords: Vehicle routing problem, cash-in-transit, machine learning, optimization, traffic speed.

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MARKETING APPROACHES THAT AFFECT CONSUMER BEHAVIOR IN THE CONTEXT OF THE CIRCULAR ECONOMY

Ashhan YAVUZALP MARANGOZ¹⁹

Circular economy is a model that emphasizes environmental benefits. It is seen as a solution to environmental problems. Also marketing has a role in this view. Because it is important to develop and market recyclable products that do not cause environmental pollution and allow less consumption of natural resources. In this context some marketing approaches gain importance such as green marketing, social marketing and sustainable marketing. These approaches affect consumer choices and behaviors. And their main aim is to cause minimal damage to nature and more benefit for society. Green marketing includes all kinds of environmental and nature-friendly marketing activities to meet consumer needs and desires. Social marketing can be defined as using marketing techniques to shape behaviors for social benefit. Sustainable marketing is an approach to cover all the environmental costs of production and consumption to create sustainable economy. In this study the role and importance of marketing in the context of circular economy is examined. Marketing approaches that affect consumer behavior and create sustainable consumption are also explained with the cases and examples.

Keywords: Circular economy, marketing, green marketing, social marketing, sustainable marketing.

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GREENHOUSE GAS EMISSION AND THEIR TREND PREDICTION USING AIS AND TRADE DATA

Thuta Kyaw WIN²⁰, Daisuke WATANABE²¹, Shigeki TORIUMI²²

In this age, decarbonization and greenhouse gas (GHG) emission reduction has become an important issue due to global warming and environmental concerns. International Maritime Organization (IMO) adopted the strategy to set the target to reduce the current GHG emissions by at least 50% by 2050. To achieve the 2050 target and beyond, alternative fuels must be used. Among them, liquefied natural gas (LNG) fuel is widely used as one of the alternatives, and the LNG market sector is expected to continue to grow. Therefore, this study primarily focuses on LNG shipping and their emissions. In this study, LNG carriers and oil tankers in Japan and their greenhouse gas emissions are focused. The motivation behind the study is that Japan is the top LNG importer, which accounts for 21% of the global LNG market. As LNG is already practically applied as alternative marine fuels and as energy use, LNG import to Japan is expected to increase. In addition to LNG, Japan is one of the largest crude oil importing countries. Therefore, it is important to note and keep track of the import volumes and vessels in Japan waters and their GHG emissions. First, the emission estimation model is constructed based on the Holtrop-Mennen power prediction model. Using Automatic Identification System (AIS) database, fuel consumption and GHG emissions are estimated at each position. From the calculation, seasonal trends and emissions can be known. The results show that emissions tend to get higher in the second quarter of each year after the peak import season in the first quarter. Next, GHG emission is predicted for the long-term using the Japan trade statistics. Combining the vessel movement data and trade statistics, GHG emission in Japan is projected to decline over years. The results could be considered in formulating environmental and trade policy. It is hoped the study will provide useful insights for zero emission projects and implementations in Japan.

Keywords: Automatic identification system, ship emission, greenhouse gases, LNG

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HETEROGENEOUS FLEET MULTI PRODUCT NETWORK DESIGN:

AN APPLICATION IN GLASS INDUSTRY

Ezgi Zehra KADIZ²³, Burak DURMAZ²⁴, Ezgi ÖZDEMİR²⁵, Alev TAŞKIN²⁶

Companies focus on making improvements in all their processes in order to compete in constantly changing and developing market conditions. The most effective way out of this competition is to respond to customer needs and be quick and flexible in responding. This is possible with good management of the process starting from the supply chain to delivery to the customer. The main goal in the supply chain is to have the right product in the right quantity in the right place. One way to respond quickly to customer needs might be to have distribution centers close to customers and stocked in warehouses. However, this would be a costly alternative given the large distribution of customers and storage costs. On the other hand, distribution to all customers from a single distribution center will increase the shipping cost. How many distribution locations should there be and where should they be? The best way for this optimization is to design a network. In this paper, a network design model that considers capacity, demand, fixed facility cost, transportation cost and distance factors in a heterogeneous fleet multi product multi level supply chain is proposed.. The objective function of the proposed model is the minimization of the total transportation cost. In order to achieve this goal, the minimum cost objective function is determined by taking into consideration the distances between the locations, the types and numbers of products transported and the mode of transport. A company operating in glass industry has been studied as a case study. In conclusion, it is aimed to reduce in the current transport cost is aimed. The proposed model is solved in the GAMS (21.6) Mixed Integer Programming (MIP) Solver program. In our model, it is decided to open 1st, 3rd and 4th warehouses. Kırklareli factory sends the 1st and 3rd warehouse products while Eskişehir factory sends the 4th warehouse products. In the design of the production and distribution network in a supply chain; the performance values of the model are affected by fixed operating costs, unit transportation costs between stages, transportation times and qualitative factors. In the proposed approach, only distribution network design is implemented and qualitative criteria are neglected. The method used may be more flexible than the initiative of the decision maker. In the model, the change in logistics costs can be observed with the change in capacities. The effects of priorities given to different purposes on each other can be observed clearly. When the model is solved with different scenarios, it is observed that the capacities, locations, fleet numbers of the companies and the number of products distributed among the components in the supply chain have a very significant effect on supply chain

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costs. As a result, companies should pay attention to these criteria when making strategic decisions in the supply chain.

Keywords: Supply chain management, network design, heterogeneous fleet, multi product, multi-level, optimization.

FLIGHT TO THE ‘TP-METAVEVERSE’: A PERSPECTIVE OF VIRTUAL AIRPLANE CABINS

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Metaverse, which was first defined as fictional, refers to a virtual universe where people feel entirely mentally with engaged augmented virtual reality devices today. Based on previous periods, it was observed that cultural characteristics and differences between generations are quite effective in the spread of innovations like the Metaverse. But at this point, it'd be wrong to not point out these emerging Meta universe being in their infancy. In other words, the Metaverse is currently in a transition period where the real and the virtual merge occurs in the vision of science fiction. This period is the ‘Transition Period to Metaverse’, abbreviated as ‘TP-Metaverse’, which was introduced for the first time in this study. It's no surprise that the aviation industry is entering the Metaverse in intriguing ways. In this transition period, airline companies have already developed projects keeping pace with the Metaverse. Some of these innovations; Meta-Human cabin crew, new generation airplane in the virtual world and NFT flight ticket. In this way, Metaverse will enable us to manage them digitally on what we physically experience in travels, such as airports, airplanes. While all these projects open up a new field of business possibilities, they still don't always seem tangible to the individuals at large. From this point of view, the subject of this study is whether such a universe will really exist, whether developments can become massive and whether it can give people the most real sense of freedom in the civil flights. This research is limited that passenger conveniences in virtual airplane cabins put forward for the purpose of transition to Metaverse. Social and psychological effects of Metaverse were left out of the research. The study consists of three main parts. In the first part, it is focused describing the Metaverse as a product/service, as a place or as a moment. In the second part, it serves the purpose of explaining the period that augmented/virtual reality technologies and extended reality combining them, which develops as a natural result of the first part. The issues examined in the study have been compiled with the method of examining international documents and statistical data sources in order to create a fundamental understanding about the subject, and the interpretation of this compilation has been revealed with an interconnected approach. Metaverse applications revealed in the study were interpreted with a systematic and nomothetic perspective within the framework of academic studies on the subject and international documents presented in a filtered form. In accordance with this method, the study sought the solution of a unique problem: ‘Can there be a progression from the real world to the Metaverse in flights, can perspectives be developed in this process?’ The most basic finding of the study is that the aforementioned process will be carried out much more effectively by directing the perspectives towards the transition from real world to Metaverse in aviation. In the last part of the study, solution proposals for the development of Metaverse applications and effectiveness that guide aviation are presented.

Keywords: Air Transport, airlines, aviation, cabin crew, metaverse, technology, TP-metaverse

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ROLLOVER PREVENTION BY MAXIMUM LATERAL FORCE BASED ON THE DETECTION OF THREE-DIMENSIONAL CENTER OF GRAVITY

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Height of center of gravity (COG) is an essential factor which affects rollover. In previous studies by the authors, the theory of Detection of Three-Dimensional Center of Gravity (D3DCG) provides an innovative and accurate method for the detection of height of COG. This research is the development of D3DCG which is also used to prevent rollover accidents by calculating the maximum height of COG and the maximum lateral force without causing rollover. When the total weight of a vehicle is fixed, the height of COG has an upper limitation. Based on the law of energy conservation, if the height of COG is lower than its upper limitation, the vehicle has potential energy against rollover. When the vehicle is running, the disturbances on the road make its body shaking. Here, some potential energy transfers to springs' energy to provide a restoring force to make COG return to its original position. Therefore, when the height of COG reaches its maximum value, the potential energy disappears causing rollover. The highest COG can be expressed according to the principle of the balance of rotational torque. To verify this theory, COG adjustable experiment is designed with a table top D3DCG device and a tower object. The total weight of object doesn't change, but its height of COG becomes higher and higher until the object cannot keep stability on the device anymore. By comparing the real COG and the highest COG, it is confirmed that only when the COG is lower than the highest COG, the object will not roll over. If there is a lateral force acting on a moving object such as a vehicle, the object will tilt. At the same time, the restoring moment will resist the rolling moment. According to the theory of D3DCG, the lateral force has relationship with rolling angle. When the vehicle starts to roll over, based on the physical structure of moving vehicle, the critical lateral force can be represented by the rolling angle. Therefore, by eliminating the rolling angle as an unknown variable, the maximum lateral force can be expressed by two known variables which are the real height of the COG and the maximum height of COG. To verify this theory, a remotely controlled truck is made to rotate in a random rotation radius, and its speed gradually increases until it rolls over. The real-time lateral force is recorded and compared with the calculated maximum lateral force. It turns out that rollover occurs when the real-time lateral force reaches the maximum lateral force. This research introduces a novel method of rollover prevention without knowing either the total weight, the vehicle speed or turning radius. The accuracy of this theory is well confirmed by comparing the real-time lateral force and the calculated maximum lateral force based on D3DCG.

Keywords: Safety of vehicles, D3DCG, accidents prevention, motions of moving objects

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CAN HYPERLOOP BE A SUSTAINABLE TRANSPORT MODE OPTION FOR TURKISH LOGISTICS?

Dilay ÇELEBİ³⁰

Hyperloop is a proposed sustainable high-speed surface mode of transport, thanks to the prospect of low energy consumption and the possibility of this energy coming from renewable sources. The purpose of this study is to provide a preliminary analysis on feasibility and commercial viability of Hyperloop in freight transportation in Turkey. Over a desk research, we first carried out a preliminary market analysis for examining existing conditions of the transport system, detecting changes as well as forecasting future freight flows and freight transport demand in Turkey. For conducting this analysis, we have used the latest available data for a large number of economic and technical parameters, obtained from various publicly available datasets. In a second step, we conducted semi-structured interviews with 20 executives from selected shippers and logistics service providers operating in Turkey. The questions are first shared with the respondents with an introductory and informative letter to allow them some time to get familiar with the questions and collect some information if required. The interviews are then conducted online or over the telephone due to constraints related to Covid-19 pandemic measures. An initial review of the existing studies was undertaken before and during the questionnaire design phase to help the design and revision of the survey. The interview questions are divided into three basic parts: general information, shipment information, and general comments. Finally depending on our findings from the data analysis and interviews, we developed some suggestions and identified the routes with the highest potential for a successful implementation of Hyperloop in Turkey. Our findings show that for Hyperloop to become an attractive and preferred mode of freight transport, it should be positioned as a complementary rather than a competitive mode of transport and it should support tackling the current problems with the existing transport modes. To our knowledge, this is the first study that analyses the potential use of Hyperloop in freight transportation in Turkey.

Keywords: Hyperloop, freight transport, preliminary analysis

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GREEN LOGISTICS CHAIN AND FILYOS VALLEY PROJECT

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Green logistics is the work of minimizing the harmful effects of transportation activities that aim to create a sustainable balance between economic and environmental issues. New ports are being built to meet future shipping demand for Europe, the Eastern Mediterranean, Central Asia, and the Middle East. Filyos Port is being developed under modern green logistics strategies to provide combined transportation services on the north-south axis in the Western Black Sea Region as a container transfer center. Using different transportation methods to achieve optimum efficient routes will save fuel and reduce harmful gas emissions. The growth of the industry in the Western Black Sea and the launch of new business lines, research of energy resources in the Filyos and Danube region, infrastructure investments, diversification and increase in consumption, and works to improve the infrastructure and service quality of the ports will increase the amount of cargo handled in the Western Black Sea ports. Between 2011 and 2021, 4.80% of the total cargo handled in Turkish ports was handled in Bartın and Zonguldak ports. The documentary scanning method was used to analyze the current situation in the Bartın and Zonguldak hinterland before the Filyos port was fully operational. Information about the port capacities, cargo handling, the number of ships calling at the ports, and the cargoes carried in cabotage of the Western Black Sea ports were compiled and analyzed. This study defines GDP, total cargo handled, and population as independent variables to predict the long-term change in cargo handling of Bartın and Zonguldak ports. According to the forecast time series model based on the collected data, it is calculated that the amount of cargo handled in Zonguldak and Bartın ports will be over 30 million tons in 2029 and over 40 million tons in 2041. For the efficient operation of Filyos port, infrastructure investments in the Western Black Sea Region should be prioritized, and investments focused on multimodal transportation and containerization should be made in the region.

Keywords: Green logistics, Filyos port, green port, sustainability

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ANALYZING AIR FREIGHT IN TERMS OF SUSTAINABLE ECONOMIC GROWTH OF TURKEY

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Within the scope of today's economic perspective, economic development can be defined as raising people's living standards by increasing the purchasing power of people and economic activity in the market, causing an increase in GDP and reflecting this increase to people. Another important concept of today is sustainability that can be described as a process that adopts the careful use and respect of cultural, scientific, environmental and human resources and contributes to the formation of a perspective on this basis. In addition to economic development and sustainability concepts, sustainable development has arisen as an important phenomenon. Sustainable development is an economic system that enables the needs of the present to be met without compromising the ability to meet the needs of the future, without causing irreversible damage to the environment, without impeding the regeneration of resources. In order to achieve sustainable development, every step taken should be linked to each other in terms of economic, social and environmental aspects. From the economic point of view, one of the main indicators of economic perspective is per capita GDP considered for determining the economic growth of a country. The 8th of the 17 goals set under the '2030 Agenda for Sustainable Development' adopted by the UN in 2015 is 'promoting sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all'. In accordance with the sub-target of this goal, which is 'sustain per capita economic growth in accordance with national circumstances and, in particular at least 7 percent GDP growth per annum in the least developed countries', it has become important to carry out studies that will enable us to find out which factors can contribute in an increase in GDP. Hence, in this study, we examine the effect of air freight transportation on the sustainable economic growth of Turkey which is represented by per capita GDP, for the sample period of 1998:Q1- 2019:Q4. For this purpose, we apply the Engle- Granger cointegration analysis. The finding of the study reveals that there is a significant and positive linear relationship between air freight and per capita GDP even the effect of air freight on the economic growth is very small. This finding is important in terms of determining the economic growth strategy related to air freight, which plays an important role in the supply chain and trade.

Keywords: Air freight, sustainable economic growth, Turkey

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INVESTIGATING ATMOSPHERIC EFFECTS OF RO-RO SHIP OPERATIONS DURING COVID-19 PANDEMIC: A CASE STUDY

Fırat BOLAT³⁵

Green House gases (GHG) pollution that is resulted from the transportation sector is one of the challenging problems of the world. Climate actions have been taken by all of international transportation organizations such as International Maritime Organization (IMO), International Civil Aviation Organization (ICAO) etc. IMO mapped out a plan and has introduced initial strategy for reduction GHGs in 2018 after that forced shipping industry to take specific measures after 1st of January 2020. It is a fact that one of the important factors affecting global climate change and human health is anthropogenic emissions. It is inevitable that ports, which are one of the interfaces of maritime transport, will also be affected by these emissions. Anthropogenic emissions resulting from the use of ship generators in cargo handling operations create air pollution at Ro-Ro ports. For this reason, it is important to examine ship movements in Ro-Ro ports and the amount and characteristics of fuel consumed by generators used in these ships. For the data used in this study, 19 different ships' hotelling times by day at the quays in 2019 and 2020 were used to obtain ship movements of a Ro-Ro port operating in Tuzla administrative port area. In 2019 and 2020, ship movements in the relevant port were examined, and the duration of the ships at the quays was obtained. In-port emissions from these ships were calculated based on the fuel consumption data and the estimation model introduced by European Environment Agency (EEA) in its Air Pollutant Emission Inventory Guidebook. Ship emissions at the quay were compared according to years.

Keywords: Maritime, ro-ro transportation, generators, ship emissions, atmospheric effect

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OPTIMIZATION OF PLATOON FORMATION CENTER LOCATION FOR TRUCK PLATOONING

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In Road Transportation, truck transportation is commonly being categorized into Less Than Truckload (LTL), Partial Truckload and Full Truckload (TL). The standard LTL transportation is carried out by means of consolidated freight at optimized depots of designation, in the form of single or multiple assignment. Nowadays, freight transportation industry is now facing a serious problem of scarce labor force and environmental concerns. One solution for that is truck platooning. A truck platoon is a convoy of electronically connected vehicles, which can be achieved by using Cooperative Adaptive Cruise Control (CACC). Platooning technology still needs a lot of infrastructure development and legal maturity for large scale business operation and spontaneous platoon formation. There are still compatibility challenges existing for platoon creation among different truck makers. Hence, platoon planning is required to obtain the best results of platooning. Therefore, the objective of this study is to find the optimal locations of PFC for (de)formation truck platoons by using discrete mathematical optimization. Most hub location models consider the discount factor due to the economies of scales. Two different assignment systems are used for PFCs formation, single assignment and multiple assignment. Single assignment is that trucks from a certain origin must (de)form a platoon only at a single PFC, while platoons can be created more than at a single PFC in multiple assignment. We test our linearization using dataset with 20 cities, which is extracted from Turkish network dataset of 81 cities.

Keywords: Truck platooning, facility location, optimization

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A NEW DELIVERY CONCEPT FOR QUICK COMMERCE: MOBILE DISTRIBUTION CENTERS

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Several systems for quick delivery of fast-moving consumer goods (FMCG) are currently used by Quick Commerce (Q-Commerce) companies throughout the world. In this article, a new delivery concept is introduced for FCGM delivery. In conventional systems, a central warehouse and certain number of sub-regional depots with different types of delivery vehicles such as vans, motorcycles, even drones are deployed as elements of the FMCG distribution network. Instead of sub-regional depots, mobile distribution points namely diesel vans equipped with refrigerating systems are suggested as delivery vehicle and mobile depots of FMCG. Main advantages of the proposed delivery concept are to save some portion of fixed costs related with warehousing, to reduce average delivery time and to increase the customer satisfaction. To explain the proposed delivery concept, a case study for city of İstanbul is also included in this article. For further detailed studies, the related subjects such as optimizing the number of vans and replacement of these vans with electrical ones to reduce the air pollution are also discussed briefly.

Keywords: Mobile distribution depots, Q-Commerce, FMCG distribution

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AN OBJECT DETECTION IMPLEMENTATION TO 5S: AN APPLICATION FOR MAINTENANCE WORKSHOP IN A WAREHOUSE

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5S (sort, set, shine, standardize and sustain) is a technique used in any organization to ensure the sustainability of the organization and to create a quality working environment. The main purpose of 5S is to improve working conditions within the organization in terms of performance, safety, cleanliness and comfort. It also reduces waste and variability by providing a clean and tidy work environment. The visibility and elimination of waste becomes easier. Control increases in the working environment and the materials used within the organization. By motivating teamwork within the enterprise, it can ensure the participation of the entire company. This will increase the overall quality level; the higher the quality, the lower the costs. With the increase in occupational safety, it is possible to increase production and added value in a certain period of time. In this study, the steps of 5S are applied in maintenance workshop in a logistics warehouse, with the help of object detection. To integrate 5S with artificial intelligence, the “Sort” phase is emphasized here and YOLOv4 object detection method is used to sort the work tools. This model is expected to work in harmony with the operator and creates a warning system. Thus, the working conditions in the workshop have improved and an increase has been observed in all performance criteria. The companies aim to increase the quality in their working areas increasingly. The pursuit of quality for work areas increases the quality of the produced storage and transportation service in logistics warehouses. At the same time, it increases the occupational safety of the employees and ensures that they work in a regular area. It is aimed to design a generalizable study for different industries based on the warehouse implementation.

Keywords: 5S, warehouse, working conditions, maintenance, waste, object detection, YOLOv4.

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R&D-BASED GREEN TRANSFORMATION IN LOGISTICS: CASE STUDY OF TOYOTA COMPANY

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The goal of sustainable logistics requires systematic and dynamic innovations. The aim of this study is to understand the logistics processes in the automotive sector and to investigate green transformation practices within the scope of R&D activities. The study is created in a qualitative pattern and is carried out with a structured interview form. Verbal consent was obtained from the Turkey-Toyota company representative, and the interview was held. In the study, information about the innovation-based green transformation of Toyota Company, which is interviewed, is obtained. As a result, a review of the reasons why Toyota Company is successful in implementing sustainable logistics is presented within the framework of its adoption of lean principles in its production system. It can be explained that practices at the point of preventing the waste of logistics such as overproduction, delay/waiting, transportation/conveyance, motion, inventory, over-processing, and defects/correction are internalized as seven significant steps for Turkey-Toyota.

Keywords: logistic, Toyota Company, R&D, green

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MULTI-CRITERIA DECISION-MAKING TECHNIQUE FOR PERSONNEL SELECTION: PSI SAMPLE

Ayhan DEMİRCİ⁴⁶

Considering that it will not be easy to make an improvement in production factors without any cost, the most critical field for businesses to minimize costs is logistics and supply chain structures. Likewise, the most important production factor that provides competitive advantage for businesses is human resources, also known as intellectual capital. In this context, it is vital to assign the right personnel to the right job. In case of selection and assignment of personnel based on merit, efficient use of business resources will be ensured and the final efficiency of the business will be positively affected, thereby paving the way for competitive advantage. Today, a wide variety of applications and tests are carried out for personnel selection. These methods, most of which are based on intuitive and personal judgments, can sometimes lead to wrong selection. It is obvious that short job interviews and/or job trial periods will not be enough to get to know the individual with his/her personality. In this context, the importance of multi-criteria decision making techniques, which are frequently used in choosing the most suitable one among different personnel alternatives, is mentioned in the study. Multi-criteria decision-making techniques are an important aid for decision makers in personnel selection, as in many different areas. Although a significant part of the methods still require intuitive approaches such as expert opinion, the PSI method used in the study allows for the impartial evaluation of the alternatives and to reach conclusions on the numerical values they have, with the application stages in a completely rational way. In the study, a personnel selection decision to be made under the influence of many criteria with different importance levels is solved with the PSI method, which is one of the multi-criteria decision-making techniques and has been frequently used in different fields recently, and the results are shared. In this context, one of them is cost-oriented (C1-Negative Personality Traits) and the others are benefit-oriented (C2-Foreign Language Grade, C3-Year of Experience, C4-Team Work Skill, C5-Empathy Ability, C6-Problem Solving Ability and C7-Appearance) considering a total of 7 criteria, the most suitable one among 6 candidates was determined.

Keywords: Multi-Criteria Decision-Making Techniques, personnel selection, PSI.

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A STUDY ON THE CURRENT SITUATION OF THE MAJOR PORTS ALONG THE MARITIME SILK ROAD ROUTE WITHIN THE SCOPE OF THE MARITIME SILK ROAD PROJECT

Mehmet Serdar ÇELİK⁴⁷, Demir Ali AKYAR⁴⁸, Bulut Ozan CEYLAN⁴⁹

Belt and Road initiative (BRI) consists of two main parts which cover the sea and land transportation projects of the initiative. Silk Road Economic Belt (SREB) consists land side of the project and Maritime Silk Road (MSR) covers the sea transportation of the initiative. BRI is open to new partners and countries and infrastructure projects therefore MSR and SREB are both dynamic initiatives for the transportation sector. China has the second-largest economy in the world and it has the capacity to establish these tremendous transportation ventures. China's government and investors try to add new ports and intend to make new cooperations along the MSR route. The aim of the study is to show ports that have the possibility to join MSR and are already a part of the route in terms of MSR perspective. While explaining the current situation of the ports, different perspectives such as China, the USA, and European countries' involvement in the project are explained. A detailed literature review was made to explain the past and current situation of the ports from the perspective of the MSR to learn about changes since 2013, the first declaration of the MSR initiative. There are few studies in the literature related to port participation in the MSR, however comprehensive studies were not observed. Port ownership, new investments, political background, and MSR's participation in the ports along the route were explained in detail.

Keywords: Belt and road initiative, maritime silk road, transportation, port

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A MULTI-OBJECTIVE MODEL FOR URBAN WASTE COLLECTION AND TRANSPORTATION PROBLEM

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Population and the average life expectancy increase and there is a rising demand for health services. Many people suffer from multiple chronic diseases, and they face increasing health concerns during the Covid-19 pandemic. Due to intensive urban growth, the negative impact on the environment and human health has increased. As a result, air quality has deteriorated, water resources have reduced, waste disposal problems have arisen, and energy consumption has increased. Health concerns and risks have increased with the pandemic. The municipalities are responsible for waste collection activities, and these activities constitute a significant part of the budget. Hence, the transportation of wastes should be performed with a cost-effective way. It is crucial in this respect that medical wastes should be collected safely from health care centers and transported to the landfill. In this study, we deal with the collection of medical wastes from health centers located in different locations of the city and transporting them to the landfill with minimum cost and risk. In the first stage of the study, the locations of a number of health centers in Samsun, their bed capacities and the amount of waste produced were collected from the different sources. Then, the distances were calculated by considering the locations of the health centers. The considered problem is formulated as a multi-objective mixed-integer programming model. The objectives of the problem aim to minimize travelling cost and the health care risk of transporting medical waste. Competing two objectives of the model were calculated with different relative weights. By examining these results, Pareto efficient solutions on the trade-off curve are examined. In this way, it has been revealed that the multi-objective programming model with different relative weights produces different solutions.

Keywords: Urban waste collection and transportation problem, mixed-integer programming, minimum health care risk and cost

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FORKLIFT SELECTION BY MCDM METHODS BASED ON THE MEREC METHOD

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The logistics sector has been growing and developing rapidly in recent years. In the logistics sector, various activities such as transportation, warehouses, and handling are carried out. While performing logistics activities, various work equipment is needed. There is a frequent need for forklifts in production industries, transportation, and especially in warehouses. Transferring an object (products, raw materials, semi-finished products, etc.) from one place to another using a forklift can be done in a shorter time, effortlessly, and easily. This study aims to the selection of forklift trucks that effectively help the user in production, warehouses, and transportation. There are many types of material handling equipment on the market with various functions and many characteristics. Criteria are determined to select the most suitable forklift among the alternatives. So as to determine the criteria used in forklift selection, similar studies in the literature have been examined. Moreover, information has been obtained from manufacturing and transportation companies operating in the market. In the selection of the most suitable forklift, it is decided to use six criteria: price (TL), weight (kg), loading capacity (kg), movement speed (km/h), speed of lifting loads (mm/s), and engine performance (kW). While determining the criteria weights, the MEREC method, which was introduced to the literature as an objective criteria weight determination method, was used. The criteria weights are respectively; 27.8% price, 21.2% loading capacity, 21.1%, engine performance, 13.9% weight, 10.4% speed of lifting loads, 5.6% movement speed, found. We have determined 13 different alternatives from 5 different brands on the market. We used different methods to evaluate alternatives; ARAS, COPRAS, MABAC, EDAS, and CoCoSo. We integrated the rankings found according to different methods with the BORDA method. The MEREC method, which is a very new objective criteria weight determination method, has been introduced and applied. Many decision-making methods were used together in an integrated way, and alternatives were listed with a common decision. For these reasons, contributions have been made to the literature. According to the findings, in the first three places: according to the ARAS method, A9 alternative (0.7363), A4 alternative (0.6835), A13 alternative (0.6761); according to the COPRAS method, A9 (100), A4 (92.74), A13 (91.56); according to the MABAC method, A9 (0.1284), A12 (0.0685), A13 (0.0617); according to the EDAS method, A9 (0.9583), A4 (0.7973), A13 (0.7260); according to the CoCoSo method, A9 (2.5421), A12 (2.5084), A8 (2.4881), found. Alternatives A9>A13>A8>A4>A12>A6>A11>A3>A10>A7>A5>A1>A2 were found by integrated ranking via BORDA method. The fact that the A9 alternative is in the first place can be explained because it has optimum values even if it is not the most suitable in most criteria, and moreover, it is far ahead of the others in engine performance criteria. As a result, the alternatives were successfully ranked according to the determined criteria and the most suitable alternative was determined.

Keywords: MEREC, ARAS, COPRAS, MABAC, EDAS, CoCoSo, BORDA, Forklift

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FOOD SUPPLY CHAIN AND BLOCKCHAIN: BIBLIOMETRIC ANALYSIS

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Food is a fundamental phenomenon for mankind. Nowadays, the number of people who approach food more selectively is increasing. They want information about the food they consume be accessible. Details such as the production time and producer of the food, whether it is served at a fair pricing and its content are all matters the consumers feel curious about. With the ability to create immutable data, blockchain technology can respond to consumer demands from the agricultural supply chain. Blockchain provides traceability and anti-counterfeiting solutions in the agricultural supply chain. Due to the fact that blockchain technology is becoming more and more popular in the agricultural supply chain, the level of its academic interest is also increasing. In order to reveal the characteristics of academic interest in the subject, an inquiry was conducted on the topic of food supply chain and blockchain in the Web of Science (WoS) database. The publications obtained at the end of the inquiry were classified under such headings as category, country and publication type. In addition, bibliometric analysis was performed on the publications obtained.

Keywords: Food Supply Chain, Blockchain, Bibliometric analysis

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EVALUATION OF SYRIAN DIASPORA ENTREPRENEURSHIP IN TURKEY IN THE SCOPE OF SUSTAINABILITY

Hakan Ömer TUNCA⁵⁵

Diaspora Entrepreneurship in their destination nations has been studying for the last 50 years among researchers. Immigrants' contributions to local economies have been generally highlighted through the small and medium companies' establishment, running, being innovative, contribution to the social capital with cultural and linguistic diversity, involvement in creating and expanding specialized markets in immigrant communities, and their ability to employ natives and other immigrants, positive effect on economic development and sustainability. Migrants and the diaspora are quickly establishing themselves as a valuable source of revenue for the government. Most governments use migrant contributions to achieve economic growth and development for their citizens. The phrase "sustainability" refers to a variety of programs, efforts, and actions aimed at preserving a certain resource. It relates to four distinct areas: personal, social, economic, and environmental sustainability, which are referred to as the four pillars of sustainability. The main purpose of the study is to investigate whether Syrian Diaspora Entrepreneurship contribute the economic sustainability of Turkey and an assessment of this contribution of will be made. In 2022 the number of Syrians living under temporary protection statues in Turkey exceeds 3.7 million and their involvement in the economy indisputably visible. The Ministry of Interior official statistics, reports and articles together with the Ministry of Labor and Social Security will be used in this research. The contribution Syrians to Turkish economy, integration policies and some diaspora were studied but not the contribution to economic sustainability. The limited and regional contribution of Syrian Diaspora Entrepreneurship was found.

Keywords: Syrian diaspora entrepreneurship, Turkey, entrepreneurship and economic growth, sustainability, Syrian refugees.

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DISADVANTAGES OF E-LOGISTICS OPERATIONS:

A CASE STUDY IN E-COMMERCE SECTOR

Begüm ŞAHİN⁵⁶

Recent developments in information technologies have contributed to many areas and fundamental changes have been raised in the business sector. International trade is one of them causing that the way of commerce has shifted from the traditional one to online platforms due to the wide range of internet usage. Logistics as the most important dimension of international trade has been affected by technological improvements. According to these developments, e-logistics applications are emerged providing many advantages for the customers. The most important ones are accepted as time and cost-saving advantages. Although there are benefits and advantages of e-logistics operations for the customers, the disadvantages and the difficulties for the providers should be taken into consideration. It is also recognized that there is a research gap in the literature related to the area. In this regard, the study is aimed to investigate the difficulties of e-logistics applications of an e-commerce company in B2B sector. The company's head office is located at Ostim which is one of the leading industry zones of Ankara. Through the face-to-face dept-interview with the logistics director of the company, it is found out that order returns, operational failures, incorrect banking transactions and systematic problems are accepted as the disadvantages of the system causing waste of time and cost to the company. The results revealed that future studies should focus on the field to make contribution for the practitioners and managerial approach.

Keywords: E-logistics, e-commerce, B2B.

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LITERATURE REVIEW ON THE USE OF BLOCKCHAIN TECHNOLOGY IN SUPPLY CHAIN MANAGEMENT

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Globalization of production and technological developments can make competitive advantage in supply chain management (SCM) more dynamic. The use of blockchain technology (BT) in SCM is recommended as a new generation information technology tool in sustainable growth. It is estimated that about 33% of SCM activities are conducted with the help of BT. The aim of the study is to evaluate academic studies on the sustainable performance of SCM via BT. As many as 20 academic articles for the years 2018-2022 were evaluated comparatively in terms of data, methods and findings of the related academic literature. It has been observed that almost all of the BT studies in SCM, except for two, are international studies applied in countries such as the USA, South Korea, China, and India. In the studies, analyzes were made with a high sample volume data set obtained from sectors such as food, oil and automotive. It was observed that quantitative analysis techniques such as confirmatory factor analysis, structural equation modeling, and qualitative analysis techniques such as content analysis and case study were used in the studies. It has been observed that with BT, inventory items are better traceable, increases the reliability and transparency of transactions. It is seen that transparency, reliability and traceability features created by using BT increase SCM performance. By providing companies with more transparent SCM processes, it increases customer satisfaction, trust between companies, improves the level of cooperation, and develops operational capabilities. BT operations capabilities can improve competitive performance with SCM integration. BT helps to increase the level of information sharing and information security, prevent fraud/theft, reduce costs and increase efficiency.

Keywords: Supply chain, supply chain management, blockchain, sustainable performance

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A MIXED-INTEGER LINEAR PROGRAMMING MODEL FOR THE TOURIST TRIP DESIGN PROBLEM

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There are many tourist destinations in Turkey and around the world called points of interest (POIs) that reflect the history and culture of these regions. However, the spread of these POIs to a vast geography usually prevents visitors from assessing their time efficiently and having the travel experience they want. Therefore, efforts should be stepped up to create optimal travel routes for visitors requests and needs in order to increase the satisfaction level of the visitors and improve the economic contribution of the tourism industry. This study also introduced a mixed-integer linear programming (MILP) model for the Tourist Trip Design Problem (TTDP) to achieve optimal travel routes. TTDP can be seen as a variant of the Orienteering Problem (OP), which is implemented in the tourism sector. The main objective of this problem is to ensure that visitors travel all the POIs within a defined set of time limits and to maximize the satisfaction level of the itinerary, which is calculated based on the points collected from visitors. The aim of this study is to determine optimal routes for these objectives. In this study, firstly, it has been ensured that POIs in the region, in which trip planning will be applied, are determined according to the preference frequency. Furthermore, research has been conducted to include some specific information POIs, such as opening & closing hours and occupancy, etc. In the next phase, finalised POIs are divided into various categories by historical and cultural characteristics. In addition, travel time between destinations has been defined using the distances between the POIs and the regional traffic conditions. Then, a mixed-integer linear programming model is developed to solve the TTDP. This model aims to optimize time spent on trip, taking into account visit durations and in consideration of the opening and closing hours of the POIs. The MILP model has been solved using the General Algebraic Modelling System (GAMS). The results obtained show that the proposed mathematical model can use to determine optimal route for a limited number of tourist destinations.

Keywords: Mathematical modeling, sustainable logistics, logistics management, operations research.

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RELATIONS BETWEEN TRADE AND LOGISTICS' MOVEMENTS IN PANDEMIC

Bura Sabiha KELEK ⁶¹

This paper indicates that some changes for workers and demanders such as automation solutions how effecting the logistics' labour and extensive mechanization needed how important to logistics' flows and activities especially human beings problems and insufficient movements on its using seems having to face with them and finding some solutions and making re-solutions and to build a new logistics' cube in case of emergency situations like Pandemic 2020. The World Economic Forum has mentioned some deep problems about the logistics' management and its hub and labor precisions to handle on both aspects for trade makers so called as " senders" and trade users meanwhile knowing as " receivers".. Supply chain management has included within this kind of problems during it so both sides (mercants-shoppers) face to huge demands but lacking of capability to complete all them. The first important issue is that human resource crisis shows us how huge loss of talent and skills in Pandemic duration. All managers or companies undertand the shortages even if developed countries follow the progression to adapt all kinds difficulties. Cooperation has been appeared on use strategic labour in trained and determined skilled workers and useful technical achievements for transformation and re-solution both Supply chain and logistics' management. In addition, digital enviromentals' chances and hardware innovation are determined not to underestimate to make a path and chart between workers' suggestions because of the fact that all them have a big importance or dignity to answer all demands in first hand and urgent mode. In this paper, we also express the propotion between successful and incomplete spokes while defining the main problems in hub areas so that Changable Principle have been led to find the best Logistics' Cube for transportation in any case of forced shutdown. All evaluation opens to tie up European Countiries getting more definitions and solutions from UK and US regions.

Keywords: Re-solution , logistics' area, digital development, pandemic 2020-2022

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THE IMPACT OF CONTAINER FREIGHT RATES ON THE GLOBAL ECONOMY

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Maritime transportation is the most effective instrument that directs world trade. According to the data of the United Nations Conference on Trade and Development (UNCTAD), it is stated that approximately 80% of the current world trade in volume or 70% in value is transported by waterways and handled via ports. While container transportation has a share of around 15 percent among all maritime transportation modes, about 60 percent of the commercial value transported by sea is carried by container ships. Therefore, it is not surprising that container shipping is the fastest growing area compared to other shipping modes. The container freight rate predominantly interacts with factors such as costs, supply, and demand. The problems in the supply-demand balance caused by the Covid-19 pandemic have dramatically affected the container freight rate. The documentary scanning method was used while researching the container freight rate and global shipping. The container freight rate, which was 1400 dollars at the end of 2019, increased to over 10000 dollars in September of 2021, and it was around 7500 dollars in May 2022. The decrease in the index can be explained by the sudden reduction in consumer demand due to the US interest rate hike after the effect of the pandemic faded. The rate rise caused a drop in demand. Despite the changes in monetary policies around the world and the decrease in demand, the limited decline in container freight charges is thought to be due to another variable, costs. It can be thought that the increase in oil prices due to the war between Russia and Ukraine prevented the rapid decrease in freight prices. As a result, since high container freight rates directly affect sales costs, it is thought that global inflation will be adversely affected by this situation.

Keywords: Sustainable logistic, container freight rates, global economy

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SUSTAINABLE LOGISTICS CENTER LOCATION SELECTION WITH GRAY RELATIONAL ANALYSIS METHOD*

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Europlatforms reports that 240 logistics centers (LC) in Europe serve approximately 2400 transport companies and operate on an area of approximately 25,891 Ha. In Turkey, it is planned that a total of 25 LC will be operational by 2030, with 9 LC still in operation. Turkey has started practical studies on LC since 2006, and projects and planning have been carried out by public and private sector institutions/organizations. LC that will be considered to be active are handled from many aspects, feasibility studies are carried out and suitable locations are selected. However, while choosing the location of LC, developments that can meet the needs of the present without damaging the capability of future generations to meet their demands should be considered, and it is thought that sustainability should be kept at the vanguard of the future plans. This study aimed to choose a LC location with multi-criteria decision-making methods by emphasizing sustainability while choosing a location. Environmental, social and economic criteria were considered in the selection of a sustainable LC location, in addition, trade potential, transportation networks, and land and infrastructure criteria were used. In total, 29 sub-criteria were used under 6 main criteria. As alternatives, since the LC operating are already established, they were not considered within the scope of the research, instead, 8 LC in the planning, project and design phase and 4 different LC locations in the Western Black Sea that were considered to have LC location potential were considered. For the evaluation and comparison of the alternatives according to the determined criteria, the gray relational analysis (GRA) method, which takes into account the relationship of reference series with respect to other series, was used. The GRA method was used because of the uncertainties in the measurement values used/the complicated views of the decision-makers, the desire to produce robust index scores from the alternatives according to the determined criteria and to compare them, and because there was no study found that used this method in the LC location selection before. According to the GRA method, Kayseri-Boğazköprü comes first in the selection of a sustainable LC location. Then, Konya-Kayacık, Zonguldak-Çaycuma, Bilecik-Bozüyük, Düzce-Center, Karabük-Eskipazar and Bolu-Gerede are in the top 7 places. 4 different places that are not included in the projects of the public institution, which are the implementers of the LC, but suggested in this study, were among the first 7 places. By choosing the appropriate LC location, it is thought that various damages namely global warming and emissions, air pollution, traffic congestion and noise, and decrease/depletion of energy resources can be minimized.

Keywords: Logistics center location selection, sustainability, gray relational analysis

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**SUSTAINABLE SUPPLY CHAINS FOR BIOECONOMY:
A SURVEY ON PROJECTS AND LITERATURE ON AGRO BIOMASS**

Tümay YAVUZ⁶⁶, Atiye TÜMENBATUR⁶⁷

Issues such as tackling climate change, the supply chains broken by the pandemic, the paradigm shift from globalization to localization, and the ability to supply cheap and clean energy resources considering supply security and geopolitical developments, leave their mark on our day globally. In order to overcome these challenges and achieve sustainable development goals, it is essential to switch from the linear economy model in the past, which can be summarized as take-make-consume-dispose, to a circular economy model that uses resources in a more efficient and environmentally friendly way. This requires a redesign of value chains and fundamental changes in business models and policies. Bioeconomy, which is based on the replacement of materials and energy production based on fossil resources with biomaterials and/or biofuels or energy generation from biomass resources and has an important place in the circular economy. For effective bioeconomy management, supply chains must first be structured and optimized. This study aims to provide a theoretical framework to make use of the untapped biomass potential in Turkey and pave the way for a sustainable bio-based economy that has been limited to biomass resources based on agricultural residues and agro-industry waste streams for being able to conceptualize an agro-biomass business in Turkey. In the first section, a survey on EU-funded projects for the utilization of agricultural residues as bio commodities or biofuels to substitute fossil-based materials or fuels has been conducted. The second section includes a survey on literature for designing sustainable biomass supply chains which is essential for biomaterial utilization and/or energy generation from agricultural biomass and a steppingstone for the successful application of the projects for a successful bioeconomy. This study will be a pillar for further dissertation studies, which will be held by the author(s) of this paper.

Keywords: Agricultural residues, agroindustry waste, bioeconomy, bioenergy, biomass supply chains, circular economy

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A STUDY ON THE RELATIONSHIP BETWEEN ENERGY CONSUMPTION AND ECONOMIC GROWTH: TURKEY

Ecem ÖZHAN⁶⁸

Energy is a critical component of economic and industrial development for all countries. Turkey's demand for energy has increased since its involvement in industrialization process. Since electrical energy is more easily converted and used, it accounts for a larger share of total energy consumption in Turkey. Therefore, electricity consumption data was used as energy consumption in the study. Long-term impact of total electricity consumption on economic growth in Turkey was investigated in this study. Study was conducted between 1998 and 2020, taking into account the continuity of the variables data. Turkish Statistical Institute (TUIK) obtained data on electricity consumption and Gross Domestic Product (GDP) which represents economic growth. The Granger Causality/Block Externality and Johansen Cointegration tests were used in study to examine long-term relationships between related variables. Natural logarithm (ln) of data was computed prior to analysis, and then stationarity tests were performed using the Augmented Dickey Fuller (ADF) unit root test. The series have been determined to be stationary at the first difference. A Vector Autoregressive (VAR) model was used in order to estimate the related model. According to results of FPE (Final prediction error), AIC (Akaike information criterion), SC (Schwarz information criterion) and HQ (Hannan-Quinn information criterion) appropriate number of delays was determined as 2. An autocorrelation test was performed on the errors to determine the suitability of the selected delay. It was determined that the delay was appropriate. As a result, the VAR (2) model was found as appropriate. The Granger Causality/Block Externality test rejected the H_0 hypothesis, leading to the conclusion that GDP is the unilateral cause of energy consumption (0.0483). This finding implies that energy consumption in Turkey can be forecast using GDP data. The Johansen cointegration test was used to test the long-term relationship between the variables because their degrees of stationarity are the same. Using the Trace and Maximum Eigenvalue test statistics, the probability values at the 5% significance level were (0.0015; 0.0026); the H_0 hypothesis was rejected, and one vector was found. This finding implies that in Turkey, there is a long-run relationship between energy consumption and GDP. Because of the presence of the cointegrating vector, the Vector Error Correction model was used at the end of the analysis. It was concluded that the error correction mechanism worked because the error correction coefficient was negative (-8.6609) and significant (0.0156). The results of the analyses corroborate the findings of Mucuk and Uysal (2009) and Hepaktan and Sertkaya (2016) in the literature. New studies can also include variables to investigate the relationships between energy consumption and Turkish economic growth, CO₂ emissions, renewable energy consumption, and so on.

Keywords: Economic growth, energy consumption, granger causality test, Johansen cointegration.

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CONTRIBUTION OF CONVERSION OF EXISTING MOTOR LAND VEHICLES TO ELECTRIC SYSTEM TO TURKISH ECONOMY AND THE ENVIRONMENT

Köksal HAZIR⁶⁹

Tackling environmental problems has become a global priority. One of the biggest environmental problems is global warming, another is the damage caused by wastes to the environment, and another important problem is the limited possibility of resources and their rapid depletion. Some of the prominent solutions in terms of tackling environmental problems are reducing the use of fossil fuels, replacing them with renewable energy sources, preventing waste polluting the air, water and soil from being released to nature freely, collecting these and recycling the recyclables and, properly disposing of the non-recyclable ones. Today, international environmental agreements such as the Paris Environment Conference and the Green Deal, which limit the use of fossil fuels, have been accepted by many countries. In this context, vehicles operating with alternative fuels such as electricity, hydrogen, boron carbide are being developed rapidly, especially the use of electric vehicles. The aim of this study is to draw attention to the planning of conversion of existing vehicles to electric vehicles and to consider the contribution of this transformation to the Turkish economy and environmental protection in terms of different criteria. Within the scope of the study, a literature review was made and the conversion costs and benefits were calculated using mathematical methods based on secondary statistical data. The bodywork, chassis and undercarriage of electric vehicles that we have started to see on the roads are no different from motor vehicles. The difference is the use of an electric motor instead of an internal combustion engine, batteries that will store large volumes of electricity instead of normal batteries, and special power transmission systems. As of 2020, the current number of motor vehicles in Turkey is approximately 24 million and, the number of automobiles is around 13 million. Even if only the existing cars that have half their economic life and younger ones are converted, this means close to 6 million vehicle revisions. With this transformation, a significant economic and environmental contribution will be created. Instead of being scrapped, these vehicles can continue to be used with revision in acceptable costs. The revision costs incurred with the low cost of fuel will be returned within reasonable time. More importantly, thanks to this transformation, the damage to the use of fossil fuels and the environment will be significantly reduced. In addition, resources such as materials, labor and time that will be spent on vehicles that are not produced from scratch will be saved.

Keywords: Electric system, environment, Turkish economy

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THE EFFECT OF GREEN LOGISTICS APPLICATIONS ON EMPLOYEE JOB SATISFACTION

Köksal HAZIR⁷⁰, Güven TEKİNERDOĞAN⁷¹

Green logistics activities have become an important organizational philosophy for companies that try to reduce the environmental impact of commercial activities and follow the sustainability line. Organizations that try to integrate it into their daily activities due to the pressure of the competitive environment show increasing interest in Green Logistics practices in improving their business performance and increasing their sales and profitability. It is known that environmentally friendly and low carbon footprint products have a positive effect on consumer demand and satisfaction. This study aims to determine the effect of green logistics practices of companies on job satisfaction of their employees. For this purpose, a literature review was conducted. There is no academic article or thesis written on this subject in the Turkish literature. In the foreign literature, there is a study in South Korea examining the effects of the Green Supply Chain practices of SMEs operating in the Electronics Industry on the business performance of the company . The findings obtained in this study show that Green Supply Chain practices affect business performance positively. On the other hand, within the scope of this study, various obstacles were determined for the Green Logistics application. When these obstacles are grouped in terms of firm performance; Main barriers emerge such as Lack of Information, Financial Barrier, Lack of Customer Awareness. Researching this subject will make an important contribution to the literature.

Keywords: Green logistics, job satisfaction, green supply chain, sustainable development

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BLOCKCHAIN TECHNOLOGY AND SUSTAINABLE LOGISTICS: INTEGRATION IN THE CIRCULAR ECONOMY

Emel YONTAR⁷²

Companies dealing with sustainable logistics, while trying to reduce carbon emissions, also set the goal of reducing noise pollution, increasing recycling gains, increasing efficiency by reducing costs and increasing customer satisfaction with environmental studies. In this respect, sustainable logistics includes reducing the environmental impact of all logistics activities and increasing social and economic gain. In this context, blockchain technology can offer many advantages. The features of blockchain technology such as transparency, immutability, anonymity, ownership and uniqueness, and contract automation have an important potential in terms of applicability in the logistics industry as well as in many other areas. Blockchain technology; it includes four core technologies: asymmetric encryption algorithms, distributed data storage, consensus algorithms, and smart contracts. Thanks to these technologies, blockchain technology allows to greatly reduce production and logistics costs, speed up production processes, reduce intermediaries in production processes, and also prevent forgery in documents and processes. On the other hand, the circular economy has become a necessity in the execution of logistics activities with its position that contributes to sustainability as opposed to the linear economy. Recycling, reuse and reduction, which are among the “3R” actions of the circular economy, have an important place in ensuring resource efficiency. Minimizing the use of resources, ensuring their reuse and obtaining gains by recycling them at high standards can contribute to the sustainability studies of the logistics sector. This study covers associating the circular economy with blockchain technology, taking into account sustainable logistics studies. From the circular economy perspective, the features of blockchain technology that are thought to affect sustainable logistics; carbon emission reduction, logistics cost reduction, ease of communication, hacking, increased performance, data immutability, effective information sharing, transparency, uncertain legal situation, new technology and trust. From this point of view, the place of blockchain technology on the road to circular economy has been examined in the current study.

Keywords: Blockchain technology, circular economy, sustainable logistics, logistics

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THE ETHICAL DILEMMA OF CUSTOMER SATISFACTION AND SUSTAINABILITY IN LAST-MILE LOGISTICS

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Because retailers deliver very small quantities of products individually to their ultimate customer, the last mile problem is one of the most costly and polluting segments of the supply chain. Environmental concerns regarding this type of logistics are increasing. Furthermore, the need of taking steps to reduce Greenhouse Gas (GHG) emissions is highlighted. Despite the rising sensitivity to green practices, companies continue to prioritize competitiveness, high performance, and profitability. All these primary goals of retailers could be accomplished through establishing strong customer relationships, increasing customer satisfaction, providing after-sales support, and doing so consistently and quicker than rivals. For this reason, companies that adopt ultimate-customer-oriented strategies try to bring the product and the ultimate-customer together as soon as possible. This situation brings alone an ethical dilemma that associates environmental destructive problems with company performance and profitability. Especially in the post-pandemic period, increased transportation, and shipping services (Trendyol Go, Bana Bi, Getir, Migros Express) triggered an uncontrolled greenhouse gas emission. On the other hand, green, sustainable, and environmental initiatives tried to solve this dilemma. Collection points (Kiala collection point, GLS collection point, Morhipo, Boyner), smart trucks (DHL), and other items are real-world practices of these efforts. The aim of this research is to examine the increasing last mile applications in the post-pandemic period and to offer creative, innovative and sustainable solutions. In this context, the last mile logistics practices of retailers offering online sales services across Turkey will be examined.

Keywords: Last mile logistics, customer satisfaction, Greenhouse Gas (GHG) emissions, business ethics.

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**ABSTRACTS PRESENTED IN TURKISH AT THE
SYMPOSIUM**

SEMPOZYUMDA TÜRKGÇE SUNULAN ÖZETLER

**THE EFFECT OF CRISIS MANAGEMENT APPLICATIONS ON THE JOB SATISFACTION
OF INDIVIDUALS IN ENSURING SUSTAINABLE COMPETITIVE SUPERIORITY IN
LOGISTICS FIRMS**

Özlem KÖROĞLU⁷⁵, Abdullah ÇALIŞKAN⁷⁶

Sustainability is defined as a concept that should be used globally in almost every field for the great problems of our age and future such as increasing environmental problems and climate change. In today's "COVID 19" process and its aftermath, crisis management practices are gaining importance and are being implemented for all institutions in the context of ensuring managerial sustainability. Crisis management facilitates the adaptation of institutions to rapidly changing environmental conditions and enables them to produce the most suitable position within the competitive environment. This method also motivates the personnel working in the enterprises operating in the logistics sector against environmental changes in the best way, increasing their job satisfaction and performance, and thus improving corporate sustainability in the long run. Today, businesses in the logistics industry must adopt and implement crisis management practices in order to maintain their activities in a healthy way and to compete with other businesses. In this study, it is aimed to conduct a research on crisis management practices in organizations and the effects of these practices on businesses in the logistics sector so that institutions can develop sustainable managerial practices, provide sustainable competitive advantage and adapt to changing environmental conditions. The effects on job satisfaction were examined. The participants in this research, which aims to determine the effect of the three sub-dimensions of Crisis Management, Pre-Crisis Activities, During the Crisis and Post-Crisis Activities on each other and on the perceptions of employees' job satisfaction, are logistics sector employees operating in Mersin. Approximately 10000 personnel work in these enterprises. It is planned to apply a survey to 500 people in total with the convenience sampling method. Of the questionnaires sent, 418 were returned and 404 were found suitable for analysis. The data obtained as a result of the research were analyzed in SPSS and Amos programs. In this context, confirmatory factor analyzes of the scales used in the research were carried out in the first stage. Then, analyzes were made regarding the reliability of the scale, and in the last stage, the averages, standard deviations and correlations between the data obtained regarding the crisis management practices and job satisfaction perceptions of the employees in the logistics sector were examined. As a result of the research, it was concluded that crisis management practices and its three sub-dimensions, Pre-Crisis Activities, Activities During the Crisis and Post-Crisis Activities, affect the job satisfaction of individuals in a meaningful and positive way.

Keywords: Crisis Management, Job Satisfaction, Sustainability

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SOCIO-DEMOGRAPHIC AND ECONOMIC DETERMINANTS OF EXPERIENCING PROBLEMS WITH ONLINE SHOPPING

Şeyda ÜNVER⁷⁷, Ömer ALKAN⁷⁸

The growth of Internet use, along with the ever-evolving and changing technology, has shifted trade made by traditional methods to electronic media. Although there are several definitions, online shopping can be defined as any step in the reciprocal exchange of money, commodities, or services between the buyer and seller through the use of internet technologies. Online shopping has evolved into one of the most important mega-trends in the world economy, with a broad scope. The scope of Internet buying activities is quite broad, extending from individuals to other businesses, governments, and other relevant organizations, and it is possible to reach any market or consumer through quick communication. As a result, economic, political, legal, institutional, cultural, social, and other aspects influence online shopping activities. When purchasing goods or services through the Internet, buyers encounter a variety of problems. The goal of this study is to look into the socio-demographic and economic elements that are important in cases when people experience problems with their online purchases. The study used a micro data set from the 2021 Information and Communication Technology Usage Survey in Households conducted by Turkey Statistical Institute. The research's sampling method is a 2-stage stratified cluster sampling. The factors connected to the problems individuals have with online purchases have been determined using binary logistic regression analysis. In the last three months, 52.4% of the men in the research said they had problems with purchases made through the website or mobile application. According to the study, 51.9% of individuals in the eastern region reported having difficulty with transactions made through the website or mobile application. As a result of the research, it has been discovered that education level, income level, age, gender, profession, family size, financial transactions conducted over the Internet, and regional characteristics are all linked to experiencing problems with online shopping.

Keywords: Online shopping; online purchase; e-commerce; Turkey; binary logistic regression.

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MACHINE LEARNING APPROACH ON TRAFFIC CONGESTION MONITORING

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With the increasing number of vehicles around the world, traffic congestion is becoming more and more important. Road congestion is a major concern for most countries across the globe. The increase in the urban population, the lack of infrastructure and roads, and the signalling systems that do not work in an optimized way can be shown as the cause of this situation. Increased fuel consumption and loss of time can be shown as a result of traffic jams. For such reasons, city governments should develop new strategies and technologies for traffic planning. Congestion is a severe problem in urban areas, resulting in accumulated traffic. New technologies and methods have been created to forecast traffic congestion and use this traffic-related information for congestion predictions and recognition as the intelligent internet of vehicles has progressed. In this study, an LSTM-based deep learning model has been developed to predict the traffic load at intersections. A public dataset on Kaggle has been used as the dataset. The dataset used consists of the number of vehicles passing through the junction recorded at one hour intervals for 3 different junctions between 2015/11/01 and 2017/06/30. To test the effectiveness of the developed model, Decision tree (DT), Linear regression (LR), Random Forest (RF), Support Vector Machine (SVM), Multiple Linear Programming (MLP), Convolutional Neural Networks (CNN) and Recurrent Neural Networks (RNN) have been compared with MSE, RMSE, MAE and R2 metrics. The experimental results showed that the developed LSTM-based deep learning model has more successful results than other models compared according to all evaluation metrics. The developed model has R2 values of 0.905, 0.800 and 0.616 for the 1st, 2nd and 3rd junction, respectively.

Keywords: Machine Learning, traffic Congestion, City Logistics

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**EFFECTS OF FINANCIAL GLOBALIZATION AND RENEWABLE ENERGY
CONSUMPTION ON CARBON FOOTPRINT: FINDINGS IN TURKEY**

İhsan OLUÇ⁸¹

The carbon footprint has the fastest increase and the largest share in Turkey's total ecological footprint. Considering Turkey's sustainable future and ecological borders, reducing the carbon footprint has a strategic importance in closing the ecological deficit. International finance can have important effects on reducing greenhouse gas emissions and carbon footprint. The process of financial globalization can directly affect the economies and thus create threats and opportunities. Financial indicators such as foreign direct investments, portfolio investments, international debts and reserves, international income payments, have been tested in many studies separately. "De facto financial globalization" includes all these financial variables, so that it can reveal the effects of financial indicators in a more inclusive and consistent manner. Indeed, the fact that the environmental impacts of de facto financial globalization have not been identified in the Turkish sample indicates a significant gap in the study. The aim of the study is to fill this gap and test the effects of financial globalization and renewable energy consumption on carbon footprint in Turkey within the scope of environmental kuznets hypothesis and pollution haven hypothesis. For this purpose, the relevant hypotheses were tested by using the 1971-2018 period data for Turkey. In the study, the relations between the variables were investigated by using ARDL model. As a result of the ARDL test, it was concluded that there is a long-term cointegration relationship between the variables. In addition to ARDL bounds test, FMOLS, DOLS and CCR were used for long-term coefficient estimation. According to the long-term coefficients, it was concluded that the Environmental Kuznets Curve Hypothesis and Pollution Halo Hypothesis are valid. However, it has been concluded that "de facto financial globalization" and renewable energy consumption reduce the carbon footprint and positively affect environmental sustainability.

Keywords: Carbon footprint, financial globalization, ARDL bound test, Turkey

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EFFICIENCY EVALUATION OF AIRPORTS IN TURKEY BASED ON WINDOW-DEA METHOD

Mustafa OLUKKAYA⁸²

The aviation sector, which has been in continuous and rapid development and changes from the past to the present, is increasing its share in the transportation sector day by day. This increase brings with it the investments made in the sector. Undoubtedly, airports are one of the factors that have the largest share of the investments made. Considering the size of the investments made, a study to measure the effectiveness of these investments is extremely important in terms of understanding and transferring the effective and efficient use of resources. The results to be obtained with the Data Envelopment Analysis (DEA) will provide useful information for airport operators to increase the effective and efficient management of airports. The purpose of this study is to determine the efficiency of the airports in Turkey, interpret the findings obtained from the analysis, and offer solutions to increase the efficiency of the airports that are determined to be ineffective. Window DEA, which allows for annual comparisons, will be used for activity detection. DEA is a productivity measurement model that allows the relative efficiency of homogeneous Decision-Making Units (DMU) to be measured. DEA is a method that has found a wide place in the literature due to the reasons such as allowing detailed analysis, being relatively easier in terms of application and interpretation compared to other analysis techniques, and the use of DEA in various sectors is becoming increasingly common. Window DEA method was developed by Charnes, Cooper, Clark, and Golany in 1985. In the Window DEA method, DMUs are considered as different units in each period and are used to measure the efficiency values over a certain period. The data to be used for the analysis were obtained by the General Directorate of State Airports Authority (DHMI) and the Directorate General of Civil Aviation (DGCA), which are the competent authorities in the civil aviation sector in Turkey. In this study, all airports with uninterrupted data were tried to be examined by keeping the sample as large as possible. When the airports with data in the study were examined, it was seen that the efficiency status of the airports changed according to the periods. In addition, it was observed that the efficiency score of some airports examined within the scope of the study was not at a level that could be evaluated as efficient, and suggestions were offered to increase their efficiency.

Keywords: Window, data envelopment, efficiency, airports

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**DETECTION OF SUSTAINABLE LOGISTICS SUB-COMPONENTS AND,
DETERMINATION OF IMPACT LEVELS OF SUSTAINABLE LOGISTICS
COMPONENTS WITH DEMATEL METHOD**

Onur DERSE⁸³

Sustainability is all of the efforts applied to protect and maintain the existence of natural and human resources. Although sustainability is encountered in many areas of our lives, technological changes, globalization, increasing population, use of fossil fuels, and social and environmental pressures have integrated sustainability into the field of logistics. Sustainable logistics can be defined as all logistics activities carried out by preserving and maintaining the present and the future for generations in environmental, economic, and social dimensions. In the study, the impact levels and subcomponents of the main components in environmental, economic, and social dimensions, which are important for sustainable logistics, are examined. When the environmental dimension is examined, it is seen that its sub-components are resource (energy, water, material, etc.) usage, water/soil pollution, greenhouse gas emissions, noise pollution, and waste disposal. When the sub-components of the economic dimension are examined, it includes the components of product and service quality, cost minimization, recycling, market share/growth, and goods transport intensity. When the sub-components of the social dimension are examined, it is seen that the components of occupational health and safety, education and training, working conditions, and public health are covered. The impact levels of the main components of sustainable logistics are evaluated with The Decision-Making Trial and Evaluation Laboratory (DEMATEL) method, which is one of the Multi-Criteria Decision Making (MCDM) methods. According to the DEMATEL method, while economic and environmental criteria are in the affecting group, social criteria are in the affected group. In addition, when the importance levels are examined, it is seen that each main component takes approximate values.

Keywords: Sustainable logistics, MCDM, DEMATEL method

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ENVIRONMENTALIST VEHICLE RECOMMENDATIONS FOR LAST MILE DELIVERY IN E-COMMERCE

Adnan DUYGUN⁸⁴

It is possible to observe that e-commerce has become more widespread recently with the effect of the Covid-19 pandemic, and accordingly, the delivery method called the last mile delivery has come to the fore. According to Kiba-Janiak et al. (2021), last mile delivery in the e-commerce market is a relatively new research area that has not been fully explored in the literature. Wang et al. (2021) have pointed out that the activities of businesses that make last mile deliveries are needed more than ever, because of the rise of e-commerce, in addition to the importance of businesses that make reliable last mile deliveries due to customers' higher expectations for speed, convenience, and sustainability. Freitag and Kotzab (2020) stated that the amount of home delivery of consumer goods purchased online has increased significantly in recent years, but the ecological environment is negatively impacted as more packaging and additional delivery rounds emerge for the logistics of home delivered goods. In the article published by Švadlenka et al. in 2020, evaluation criteria for sustainable last mile delivery were set forth. These criteria are economic, environmental, social, and technical. Environmental criteria consist of air pollution, traffic congestion, noise pollution, waste generation, and weather adaptability. Caspersen and Navrud (2021) stated that consumers prefer reductions in airborne emissions from last mile deliveries, so online retailers and freight operators should offer environmentally sustainable last mile delivery solutions to online shoppers. Tiwapat et al. (2018) stated that transportation has the largest share of greenhouse gas emissions, and in terms of last mile delivery, the majority of greenhouse gas emissions are related to unsuccessful first-time delivery. Depending on the explanation which has been put forward so far, this study is aimed to present environmentalist vehicle recommendations that can be used in the last mile delivery in e-commerce. It is possible to state that thanks to environmentalist vehicles, greenhouse gas emissions can be reduced in the last mile delivery.

Keywords: E-commerce, last mile delivery, environmentalist vehicles

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LOGISTICS CENTER LOCATION SELECTION WITH SUSTAINABLE TRANSPORTATION

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With the rapid increase in competition in world trade, there is a need for more systematic and faster transportation. Logistics centers, which play a key role in freight transportation, can respond to fast and systematic transportation, as well as reduce carbon emissions, prevent traffic congestion, environmental pollution, and provide more environmentally friendly sustainable transportation. With this study, in order to support sustainable transportation in freight transportation, it is aimed that railway and sea transportation modes that have less carbon emission value than air and road transportation modes to play a more active role in logistics centers in our country. In this context, the locations of 51 railway freight stations and 71 port authorities in our country have been entered into the Geographical Information Systems in order to find the optimum location in the logistics center location selection by providing sustainable logistics. The provinces which have both railway freight stations and port authorities have been determined as alternative provinces. “Environmental Sensitivity”, “Reliability” and “Risk” criteria have been determined by the opinions of experts in the field of logistics and these criteria include the carbon emission value, the development level of the provinces and climate changes for sustainable logistics. The importance weights of these criteria relative to each other have been evaluated according to the opinions of experts in the field of logistics. Alternative provinces have been ranked according to the criteria and the data obtained from the relevant institutions of the provinces using the AHP technique, and the most suitable location for the logistics center location selection was found.

Keywords: Sustainable transportation, logistic center, GIS, AHP

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STUDIES ON SUSTAINABILITY IN LOGISTICS: A BIBLIOMETRIC ANALYSIS BASED ON WOS DATA (2007-2021)

Suzan OĞUZ⁸⁶, Deniz YALÇINTAŞ⁸⁷

In today's world, the concept of "sustainability" is gaining importance with the increase of problems such as global warming, drought, unplanned industrialization and inadequate regulations of governments in this regard. This concept is of great importance in terms of the logistics sector, as in many other sectors. Most of the management practices that contribute to the improvement of a business's environmental performance have been developed in the field of logistics management. Therefore, the approach of enterprises that takes into account the "green" strategies in the logistics industry and academic studies in this area are gaining in importance. The aim of this study is to examine the studies on sustainability in logistics between 2007-2021 with the VOSviewer visual mapping method. Sustainable logistics practices are of great importance for both the use of natural resources and the protection of the environment and human health. Due to the limited number of bibliometric studies on sustainable logistics in international and national literature, this study is expected to contribute to the literature and guide researchers. Current publications in the relevant field were examined to decide which terms to search, and in this context, the concepts of "green logistics", "sustainable logistics", "environmental logistics" and "ecological logistics" were searched on the Web of Science database. As a result of the search, 881 publications were reached. Afterward, these publications were visualized and interpreted through the VOSviewer mapping method. As a result of the analysis, the most frequently used keyword was "green logistics". This keyword is followed by "sustainability" and "sustainable development", respectively. It has been determined that the author with the most publications and the highest number of citations is "Syed Abdul Rehman Khan" with 814 citations. This author is followed by "Yu Zhang" with 489 citations and "Heris Golpira" with 366 citations, respectively. It has been seen that the country with the highest number of publications among the countries is China with 271 publications. China is followed by Poland with 149 publications and Germany with 52 publications, respectively. China was also the country with the highest number of citations.

Keywords: Sustainability, logistics, visual mapping, bibliometric analysis

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LOGISTICS 4.0: A COMPREHENSIVE LITERATURE REVIEW

Mehmet İNCE⁸⁸, Şule SİPAHI⁸⁹

Each of the periods in which the industrial revolutions took place laid the groundwork for the next period. With Industry 4.0, the Fourth Industrial Revolution, the impact of technology and digitalization has been intensely active in human life. The fourth social transformation process has begun to take place. While labor is not considered as a necessity as before; data transfer, innovative approaches in production and modern automation systems have become a necessity. With the effect of Industry 4.0, developments in technology and the need for change have affected the sectors and the relevant period has begun to be expressed as a new era. In this context, businesses operating in the logistics sector, customers who have expectations from these businesses and based on the needs of the customers, flexibility, high adaptability, increase in efficiency and the ability to make quick decisions have become important gains. Having these skills and being able to direct them to customers in need is possible if the companies in the logistics sector can benefit from the benefits of modern technology. The concept of Logistics 4.0 has emerged with the possibility of technological innovations to fill the gaps in the logistics sector. The concept represents the link between computing and high-performance sensors and innovative robotic applications in logistics. In addition, Logistics 4.0 is also expressed as the networking of the entire supply chain through information technologies. There are studies that deal with the non-negligible impact of Logistics 4.0 on the logistics industry. In the literature review on the impact of Industry 4.0 on the logistics industry and its presence in the industry, it has been found that there are studies on the subject from different aspects. From this point of view, this study aims to analyze the academic literature of the concept of Logistics 4.0 in a comprehensive way and to convey the remarkable issues, studied subjects and methods. This study may be a guide for future studies.

Keywords: Logistics, Industry 4.0, Logistics 4.0, literature review

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GENDER DIFFERENCES IN ONLINE CLOTHING SHOPPING

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The flow of information has quickened as a result of widespread Internet use, and this has transformed the way consumers shop. As a result, online shopping, which is currently a hot trend, is becoming increasingly popular. E-commerce is the delivery of products and services, as well as advertising, ordering, sales, and marketing operations, over telecommunication networks. Online shopping removes geographical barriers and allows customers to obtain more information in less time and at a lower cost. Factors such as consumer lifestyle change, work intensity, and time constraints have accelerated online purchasing in Turkey, as they have everywhere in the world. Many virtual stores have been opened on the Internet, each offering a different number and quality of alternatives and services, allowing customers to choose from a global product range. Many products can now be bought and sold from anywhere in the world thanks to e-commerce. Clothing is a popular product that e-commerce markets and sells. Changes and advances in the field of technology and the Internet are touching every element of our lives today, and they are spreading quickly. The Internet, like many other aspects of life, has had an impact on people's purchasing habits, which account for a significant portion of their lives. Individuals' demographic traits influence their perceptions of internet shopping elements, their decisions to purchase ready-to-wear clothing over the internet, and their attitudes on the internet shopping. The goal of this study is to look into gender differences in online purchasing for clothing (including sportswear), shoes, and accessories (bags, jewelry, etc.) in Turkey using binary logistic regression analysis. The study used a micro data set from the 2021 Information and Communication Technology Usage Survey in Households conducted by Turkey Statistical Institute. The research's sampling method is a 2-stage stratified cluster sampling. Age, occupation, family laptop ownership, income, geography, and education status all have an impact on women's clothing shopping via the website or mobile application, according to the study's findings. Age, occupation, income, region, household computer ownership, and household laptop ownership, on the other hand, are all useful factors when shopping for men's clothing online or through a mobile application.

Keywords: Online shopping; e-commerce; clothing shopping; binary logistic regression

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DETERMINING THE IMPORTANCE OF ECONOMIC, SOCIAL AND ENVIRONMENTAL FACTORS IN SUSTAINABLE MARKETING: DAIRY PRODUCER COMPANY EXAMPLE

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Today, the changing behaviors of the consumers, their demands and increasing sensitivity towards the environment force businesses and brands to keep up with these changes and to carry out their activities with a sustainable marketing approach. It is expected that the businesses will meet the needs and demands of the consumers without ignoring the economic, social and environmental factors in their activities. However, the factors and criteria that businesses prioritize in sustainable marketing activities differ in terms of their sectors and the characteristics of their products. In this context, the aim of the research is to determine the economic, social and environmental dimensions of a firm that produces dairy products within the scope of sustainable marketing. In the research, by making use of multi-criteria decision making techniques (MCDM), the criteria and their importance levels were determined for the company. It has been concluded that the level of importance of the company related to the research for economic factors is higher than that of social and environmental factors. It has been determined that the company does not consider the concept of sustainable marketing from a holistic perspective, that there is no organizational culture and structures for environmental factors yet, and that they can only be involved in this process with government support and incentives.

Keywords: Sustainable marketing, economic factors, social factors, environmental factors, MCDM.

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THE IMPORTANCE OF COLD CHAIN AND PROBLEMS IN FRESH FRUIT AND VEGETABLE LOGISTICS

Esen HAZIR⁹⁷

Increasing food problems in the world increase the importance of the cold chain issue. The cold chain serves the prevention of economic losses, efficient use of resources, and the processes it follows from the supply of the inputs of products such as drugs and food to their production and delivery to the end-use point make safe. The cold chain gains importance in the safe delivery of fresh vegetables and fruits produced in suitable places to both the domestic and foreign markets. The aim of this study is to draw attention to the importance of the cold chain in the logistics processes in the fresh vegetable and fruit trade, to reveal the administrative and structural deficiencies in cold chain applications and to develop solutions. In Turkey, there are significant losses in fresh vegetables and fruits due to the increasing temperatures in the summer period. It is estimated that 25%-40% of the average 45-55 million tons of fruit and vegetables produced annually are deteriorated during the production, distribution or consumption phase due to insufficient and incompletely applied cold chain processes. Turkey's fresh fruit and vegetable export in 2019 is 4.02 million tons, which corresponds to approximately 7% of annual production. High losses in fresh fruit and vegetable logistics are generally caused by; the absence of pre-cooling of the products during the collection phase and the absence of temperature control in the transfer centers. Storage and transportation of different products together that require different temperatures. Insufficient protective packaging. Insufficient temperature control and monitoring in warehouse and transportation processes. Using standard vehicles instead of refrigerated vehicles in domestic and neighboring countries. In addition, inadequate marketing efforts cause some products to spoil without being collected. Investing in heat control technologies, vehicle monitoring systems, and warehouse management systems as solution suggestions. To produce in line with demand. It appears as rational management of production, harvesting, packaging, transportation, and storage systems.

Keywords: Cold chain, fresh fruit and vegetable logistics, problems

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ENVIRONMENTAL PORT INDUSTRY IN A BIBLIOMETRIC ANALYSIS PERSPECTIVE

Gökhan AKANDERE⁹⁸

As a result of the understanding of the negative effects of environmental effects by countries, businesses, and consumers, businesses have transformed their logistics processes and initiated environmental implementation processes. In the last decade, initiatives and studies have been carried out for environmental and sustainable technology transformation to increase the performance and effects of infrastructure and superstructure, energy use, port applications, and equipment in ports due to the negative events experienced by human beings. In this context, this study aims to examine scientific research on smart port management in the environmental (green) area with a bibliometric approach. For this purpose, this article contains 159 articles in SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, SCOPUS, and other databases in terms of chronology, discipline, source, center, country, and citations are analyzed according to their parameters. The data set consists of articles in scientific journals published in the period 2010-to 2021. In addition, the information about the articles on the "green port" was transferred from the Web of Science database electronically to the R program, and all calculations and operations on tables and graphics were carried out through the Rstudio program. As a result of the analyzes made in the research, it has been determined that environmental port management is an area that has increased and developed significantly in the last eight years. It was determined that most studies were based in China and Japan. Topics of study include (1) management, port, and implementation, (2) emissions, models, and impacts, (3) sustainability, performance, and supply chain management, (4) ships, air pollution, and energy efficiency, and (5) infrastructure, emissions reduction, and air quality. It has been seen that it is structured around the concepts. In addition, it has been concluded that the concepts of green port, sustainable development and port are frequently used keywords in the studies.

Keywords: Green port, environment, logistics, bibliometric analysis

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IMPACT OF LOGISTIC PERFORMANCE ON ECONOMIC GROWTH TURKEY-CHINA SPECIFIC EVALUATION

Hüseyin Alpaslan İŞBİLİR⁹⁹

The logistics performance of countries is an important situation today, as global trade is considered as an important input. For this reason, according to the Logistics Performance Index report published by the World Bank, the relationship between the logistics performances of Turkey and China and economic growth has been evaluated, and in this context, the effects of the investments made by the two countries in logistics over the years have been shown. The Logistics Performance Index is published by the World Bank every two years as of 2007. There are six sub-criteria as the basic criteria in determining the logistics performance in Turkey and China. These criteria are; Comparisons were made with the criteria of "Customs Clearance, Logistics Infrastructure, Tracking and Tracking, International Shipments, Logistics Quality and Timing". When the investments made by the two countries in the logistics sector are examined within the framework of the gross domestic product, the logistics infrastructure investments made by Turkey are seen as insufficient with respect to China. In return, Turkey can use its power to become a regional logistics center by considering its current potentials.

Keywords: Logistics performance index, Turkey, China, economic growth

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EXAMINING THE EFFECTS OF INDUSTRY 4.0 IN THE LOGISTICS SECTOR IN THE DIRECTION OF SUSTAINABILITY PERSPECTIVE

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Industry 4.0, which combines industry and technology, ensures that cheap labor is met by robots and automation instead of humans. In this sense, it becomes a hope for countries that want to reduce production costs and achieve comparative advantage in competition. In this revolution, which brings with it unprecedented paradigm shifts, technology includes the transformation of countries, societies, sectors and companies together with the breadth of the field it covers. In the global age where everything is intertwined and interacting with each other, it is of course inevitable that the logistics sector will be affected by the wind of change. The reflections of Industry 4.0, which consists of many technological components integrated with each other with its complex and gigantic structure, in the Logistics sector are coded as "Logistics 4.0" or "Smart Logistics". Smart Logistics, in addition to making intelligent the products that turn out to be output in a production ecosystem, it also makes their distribution and management autonomous. In this respect, it is thought that adding smartness to products and services will be effective in evaluating reverse logistics activities such as repair, recall or disposal of products and in making future supply chain management sustainable. With the adoption of the new ways of doing business brought by Industry 4.0, companies will be able to contribute significantly to the environmental dimension and other criteria, which is one of the main criteria of sustainability. Despite this opinion, the limited number of studies on the subject in the literature constitutes the main motivation of the research. For this reason, the aim of this study is to examine the changes created by Industry 4.0 technologies in the Logistics sector within the framework of the three pillars of sustainability (Economic, Environmental and Social). Within the scope of the research method, the keywords constituting Industry 4.0 technologies were identified and scanned in different databases (Web of Science, Prequest, Science Direct, etc.). In this direction, the positive and negative effects of technological components in the logistics sector were discussed and it was determined which of the sustainability criteria they contributed. With the findings obtained, the use of the Internet of Things in the Logistics sector will reduce carbon emissions, deliver products to mountainous areas with less cost and faster thanks to UAVs, achieve cost and time savings with the most appropriate routing technologies in autonomous cars and with autonomous robot technology in warehouse management it has been concluded that efficiency will be achieved in order picking processes. In addition to the fact that the use of such technologies contributes partially or completely to the sustainability criteria, it is thought that the research results will benefit practitioners in the logistics sector to gain a sustainability-oriented perspective and help them develop forward-looking strategies.

Keywords: Industry 4.0, logistics 4.0, smart logistics, sustainability, sustainable supply chain management

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CONTENT ANALYSIS OF POSTGRADUATE THESES WRITTEN ON REVERSE LOGISTICS

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In today's world, people are struggling with problems such as drought, climate change, global warming and sustainability is seen as an important solution strategy in dealing with these problems. For this reason, being environmentally and socially sustainable in terms of economy has started to be important in the logistics sector as well as in many sectors.

The concept of logistics, which is defined as the right product, at the right place, at the right time and without any damage, has an important position for companies to gain competitive advantage in the global world. In the current global world, logistics activities have complex processes and carry out their activities according to these complex processes. As a result of the increasing need for sustainability and environmental pollution, logistics processes have turned into reverse logistics with the recycling of products and materials and the disposal of waste. Reverse logistics; It is whole of activities that express the flow of all kinds of products, services and information from the point of consumption of raw materials, semi-finished products or final products to the point of origin. Today, with the increase in the level of consciousness of people, the importance given to the environment has increased, and this situation has also increased the importance given to reverse logistics. The aim of the study is to determine the general characteristics of the theses written on reverse logistics in graduate programs. For this purpose, the scope of the study consisted of 72 theses written on reverse logistics obtained from the National Thesis Center of YÖK and 2 theses were excluded from the sample because they were not allowed access. The data obtained through these theses were digitized using the content analysis method. The findings are presented as frequency tables. Within the scope of content analysis, 72 theses were discussed one by one in terms of university, advisor title, writing language, year, number of pages, type of thesis, university type, city, department, institute, method, data type, data collection and analysis methods. As a result of the findings of the study, it is thought that it will guide the researchers who want to work in the field of reverse logistics and contribute to the literature, since it is determined in which subjects, which data collection and analysis methods are used and in which language.

Keywords: Reverse logistics, master's thesis, PhD thesis, content analysis.

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THE ENVIRONMENTAL EFFECTS OF FRESH FRUIT VEGETABLE LOGISTICS IN MERSIN PROVINCE

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Fresh fruits and vegetables, one of the product groups produced and traded in the world among agricultural products, have an important place in human health and nutrition. The fresh fruit and vegetable sector, which is a sub-sector of the agricultural sector, consists of products with different supply and demand from different geographies. Turkey is one of the important producer in the world for some types of vegetables and fruits that earns a significant export income in this sector. Approximately, 3.5 billion tons of fresh fruit and vegetables are exported annually in Turkey. Mersin is one of top exporting province with 3 billion 83 million dollars of fresh fruit and vegetable exports in Turkey. Logistics of fresh fruit and vegetable export in Mersin province was done by 59% land transportation, 40% sea transportation and 1% air transportation (AKİB, 2021). Critical elements in the logistics processes of the fresh fruit and vegetable sector; order management and planning, storage and storage conditions of products, transportation methods and wrapping/packaging are important in delivering the products to the end consumer. The aim of this study is to examine the environmental effects of fresh fruit and vegetable logistics (picking, storage, packaging, distribution) in Mersin province. Literature review method is used in the research. In additionally, environmental impact assessments are included with statistical data.

Keywords: Fresh fruit and vegetable sector, logistics, supply chain, environmental effect

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