Results from research project – stage 2

Contract No: №КП-06-Н27/12 from 11.12.2018г.
Initial and final date of the project: 07.12.2020г - 03.12.22 г
Project title: ***MODELING AND ELABORATION OF COMPLEX SYSTEM FOR SELECTION OF TRANSPORT TECHNOLOGY IN TRANSPORT NETWORK***
Research organization: Technical University - Sofia ***Partner organizations:*** University of Ruse „Angel Kanchev" – Ruse University "Prof. Dr A. Zlatarov"– Burgas
Principle investigator: Prof. DSc Svetla Dimitrova Stoilova

Publication from the project

Publication with Impact Factor Tomson Reuters:

1. **Stoilova, S**. 2022. A New Aggregated Multi-Criteria Approach for Evaluation of the Autonomous Metro Systems' Performance in the European Countries. Symmetry 2022, 14, 2025. https://doi.org/10.3390/sym14102025
   IF:2.94; SJR:0.54; Q2
   Линк: https://www.mdpi.com/2073-8994/14/10/2025
2. **Stoilova S**, Munier N. 2021. Analysis of Policies of Railway Operators Using SWOT Criteria and the SIMUS Method: A Case for the Bulgarian Railway Network. Sustainability. 2021; 13(12):6948. https://doi.org/10.3390/su13126948
   IF:3.889; SJR:0.66; Q1
   https://www.mdpi.com/2071-1050/13/12/6948
3. **Stoilova, S**.; Munier, N. 2021. A Novel Fuzzy SIMUS Multicriteria Decision-Making Method. An Application in Railway Passenger Transport Planning. A Novel Fuzzy SIMUS Multicriteria Decision-Making Method. An Application in Railway Passenger Transport Planning. Symmetry 13(3):483, DOI: 10.3390/sym13030483
   IF:2.94; SJR:0.54; Q2
   https://www.mdpi.com/2073-8994/13/3/483

Publication indexed Scopus, SJR

4. **Asenov A.,** I. Georgiev, **V. Pencheva**. K. Mineva.2022. Prediction of fine particulate matter in low emission zones using a modified numerical method for a system of ordinary differential equations. International Scientific Journal Transport Problems. 2022, Volume 17 Issue 3, p/197-210, ISSN:1896-0596,

DOI: 10.20858/tp.2022.17.3.17
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5. M.P. Dimitrova, Is. D. Lazarov, **Y. Tasheva**, Investigations for improving the yield of middle distillated fraction throught additives, Oxidation Communications, 45, (2), p. 475-482, 2022,
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6. **Tasheva Y.,** Study on the possibility of using modern technologies to control the efficiency of fuel consumption by truck, Oxidation Communications, 44, (2), p. 464-474, 2021
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https://scibulcom.net/en/article/bSbtezzVF1kQrGFheOKx
7. **Stoilova, S.** 2020. Study of a relationship between the criteria for selection of the transport technology for the passenger's carriage using the DEMATEL method. Komunikacie 22(4):46-55. DOI: 10.26552/com.C.2020.4.46-55,
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8. **Tasheva Y**., E. Dimitrov, **L. Kunchev.** Effect of treated gasoil under effective performance of engine, Oxidation communications, 43, (3),p.536, 2020
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9. **Tasheva Y**., Evaluation of thermodynamic and kinetic parameters of extraction of sulphur from gasoil fraction, Oxidation communications, 42, (4), p.443, 2019
SJR:0.22; Q3
https://scibulcom.net/en/article/vMAdcXSCG4YSJvDj31o8
10. **Pencheva V., A. Asenov, D. Grozev**, I. Beloev, **P. Stoyanov,** K. Mineva.2022. Study of the Spatio-Temporal Characteristics of the Traffic on the International Road Artery Passing Through the Settlement. International Scientific Conference on Aeronautics, Automotive and Railway Engineering and Technologies BulTrans-2022, AIP Conference Proceedings, indexed in Scopus, accepted for publication
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11. **Stoilova, S**. 2020. Study of Criteria for Evaluating the Development of Intermodal Services of the Type "Car on the Train" by Applying SWOT Analysis and Best-Worst Method. Conference: 24th International Scientific Conference, TRANSPORT MEANS 2020, Sustainability: Research and Solutions, Proceedings of 24th International Scientific Conference. Transport Means 2020.At: September 30 - October 2, 2020; pp.75-80
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12. **Stoilova, S.; Martinov, S.** 2022. Evaluation of semi-trailer rail transport technologies by using multi-criteria analysis. 21st International Scientific Conference Engineering for Rural Development, 25.-27.05.2022, Jeglava, Latvia, pp. 682 - 691;
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13. **Kunchev, L.; Sokolov,E.;** Dimitrov,E. 2022. Experimental study of transport flows in big cities. 21st International Scientific Conference Engineering for Rural Development, 25.-27.05.2022, Jeglava, Latvia, pp. 590-598,
DOI: 10.22616/ERDev.2022.21.TF192
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14. **Martinov, S.** 2022.Simulation model of a rail container terminal described as a queueing system. Proceedings of 26th International Scientific Conference. Transport Means, 25.-27.05.2022, Jeglava, Latvia, pp. 682 - 691; DOI: 10.22616/ERDev.2022.21.TF219,
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https://en.ktu.edu/events/26th-international-scientific-conference-transport-means-2022/
15. **Pencheva, V., A. Asenov, A**. Sladkowski, B. Ivanov, I. Georgiev. 2022. Current Issues of Multimodal and Intermodal Cargo Transportation. Book Chapter from monography: "Modern Trends and Research in Intermodal Transportation", Springer Science and Business Media Deutschland GmbH, 2022, 400, pp. 51-124, ISBN 978-3-030-87119-2, eISSN 2198-4190, DOI:10.1007/978-3-030-87120-8_2,
SJR:0, Scopus, book
https://www.springerprofessional.de/en/current-issues-of-multimodal-and-intermodal-cargo-transportation/20056658
16. **V. Pencheva, A. Asenov** and I. Georgiev. 2022. Multiobjective modelling in choice of route and vehicle for public city transportation for minimum travel time, low cost and energy consumption, 2020 7th International Conference on Energy Efficiency and Agricultural Engineering (EE&AE), 2020, pp. 1-4,
doi: 10.1109/EEAE49144.2020.9279062
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17. **Stoilova, S.** 2021. An Integrated Approach of Strategic Planning and Multi-Criteria Analysis to Evaluate Transport Strategies in Railway Network. In book: Railway Transport Planning and Management. ISBN: 978-1-83880-692-7; EBOOK (PDF): 978-1-83962-902-0; PRINT ISBN: 978-1-83880-691-0
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Main results from the research project

• A new fuzzy method of multi-criteria analysis for decision-making in a state of uncertainty (Fuzzy SIMUS method) was developed. Direct services with intercity trains with a reduced number of stops are offered for the main directions in the Bulgarian railway network. The obtained results allow transport managers to make operational decisions to change the number of trains without affecting the chosen optimal transport plan, i.e. routes, train categories and train compositions.
• A simulation model of a rail container terminal described as a mass service system was developed. The developed simulation model of a railway container terminal allows to study the processes related to the handling of the containers, to determine the expected periods of waiting and service of the container trains and trucks and to determine the necessary duration of the operation of the terminal.
• A complex methodology based on multi-criteria analysis has been developed for evaluating technologies for railway transport of semi-trailers. The model is applicable to transport operators.
• A methodology has been developed for evaluating the relationship between the criteria for selecting transport technology for passenger transport. The mutual influence of twenty-four criteria, united in four main groups - business, environmental, social and technological, was studied.
• A methodology has been developed for choosing a transport strategy for the development of railway passenger transport. The most suitable strategy for the Bulgarian railway passenger transport, including the service with trains carrying cars, is proposed. The methodology is suitable for use by railway operators.
• A methodology has been developed for evaluating the policies of a railway operator. The methodology provides rail stakeholders with concise, objective and unbiased information to then make decisions and allows them to determine the strengths and sensitivities of the best solution found. The results may help the Bulgarian railways to obtain international financing and loans for the improvement of the railways.
• A new aggregated multi-criteria decision-making approach has been developed. The new approach has been experimented for the evaluation of the European autonomous metro systems.
• An overview of the development of multimodal and intermodal transport in Bulgaria was made in accordance with the development of the international transport corridors passing through the country.
• A mathematical model was developed for the selection of cargo transportation based on multi-criteria optimization with three criteria: direct costs, time and external costs.
• A methodology based on multi-criteria modelling has been developed for choosing a route and vehicle for public urban passenger transport, according to the criteria of shortest time, low cost and energy consumption.
• A methodology has been developed for the prediction of fine dust particles in low emission zones, based on a modified numerical method for a system of differential equations. The methodology is applied to the city of Ruse.
• Experimental studies were carried out in real conditions to establish the influence of car exhaust gases in urban and suburban environments. Three main groups of problems have been studied: influence of the quality or type of fuel on harmful emissions and the operation of the internal combustion engine, influence of car exhaust gases in urban and suburban environments, and ecology related to noise phenomena in cars. Sections of Sofia and the road network in the region of Montana were studied. Tests were made in real conditions with a truck.
• An analysis and laboratory studies and tests in real conditions were made for the influence of the composition of the fuel on the efficiency of consumption of trucks. Experimental studies were conducted with a Volkswagen 1.9 diesel engine with modified diesel fuel, created at "A. Zlatarov" University - Burgas.
• A "Mobile system for measuring emissions in the air" was created, which measures and collects data with reference to the geographical position of the ambient temperature, humidity and atmospheric pressure, and pollutants.
• The developed methodologies, methodologies and the results achieved during the second stage of the project have been published and indexed in global databases: IF Thomson Reuters: 3 nos..; ; SJR Scopus: 14 pcs. In total, for the two stages of the project, the publications are as follows IF Thomson Reuters: 7 nos. ; SJR Scopus: 30 pcs.
• The developed methodologies, methodologies and the obtained results are applicable for improving the organization and efficiency of transport. The tested purified fuel is applicable to improve the environmental parameters of a diesel engine.