D. A. TSENOV ACADEMY OF ECONOMICS

Faculty of Finance

Department of Finance and Credit

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ABSTRACT

of a dissertation for the award of the educational and scientific degree "Doctor" (in Economics) in the doctoral program "Finance, Money Circulation, Credit and Insurance" (Finance) on the topic:

"Financial analysis of the industrial transition to low-carbon transport"

Scientific supervisor:

Prof. Dr. Teodora Dimitrova

Svishtov

2025

The dissertation paper was discussed and directed for defense at a meeting of the Department Council of the Department of Finance and Credit at the Faculty of Finance of the D.A.Tsenov Academy of Economics – in the town of Svishtov.

Parameters of the dissertation work:

Number of pages - 159 pages.

Number of figures - 94 pcs.

Number of tables - 10 pcs.

Number of literary sources - 64 pcs.

Number of publications of the dissertation candidate - 3 pcs.

The defense will be held on 01.10.2025 at 11:00 a.m. in the *Rectorate* Conference Hall of the D.A.Tsenov Academy of Economics.

The materials for the defense are available in the *PhD Studies and Academic Career* Department

Contents

I. General characteristics of the dissertation work

1. Topic relevance

The relevance of the topic is related to the fact that the ecological footprint, as a method for measuring human dependence on nature, significantly exceeds the capacity of ecosystems to provide the necessary resources. This leads to serious negative consequences for the environment in different parts of the world. "According to the *Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services* (IPBES), about 75 % of the terrestrial environment has been seriously altered globally (European Environment Agency, 2022)." In order to mitigate the impacts, in recent years there has been significant engagement in the direction of imposing nature-friendly measures in various spheres of the economy - industry, transport, agriculture, production, etc. For the purposes of limiting the impact of transport, the development and gradual imposition of low-carbon transport plays an extremely important role.

2. ***Object and subject of the study***

Based on the presented relevance, as the ***object*** of the dissertation work is defined the low-carbon transport. In official statistics, transport falls into the *Transport, Postal and Warehousing* sector. For the purposes of the study, the emphasis will be on the transport sector, which is a strategic center of economic activity, encompassing services for the transportation of people and goods. Transport plays a key role in the development of the modern society as a condition for the economic development, increasing competitiveness and achieving social and regional cohesion.

The subject of the study are the opportunities for transition to low-carbon road transport in Bulgaria.

3. Research thesis

The thesis of the dissertation paper, which the author defends in the presentation of the work, is that the transition to low-carbon road transport in Bulgaria is an adaptive process related to the social economic attitudes of the population, the tax policy, the introduction of financial incentives and the construction of appropriate infrastructure for a gentle transport environment.

4. Purpose of the dissertation

The purpose of the research is related to analyzing the practices and prospects in the process of industrial transition to low-carbon transport through the prism of the financial aspects.

5. Research tasks and methodology

Following the thus formulated purpose, object, subject and thesis, the following **tasks** have been formulated:

- research of the analytical profile of the transport sector in Bulgaria;
- analysis of the opportunities for low-carbon mobility as a prerequisite for development of the transport sector.
- empirical study of the industrial transition to low-carbon transport in Bulgaria;

For the purposes of the study, the following **methodology and research techniques** were used: statistical research, synthesis, induction, deduction, literature review, retrospective data analysis, graphic modeling, questionnaire survey. The following software solutions were used to process the data and display the analytical results: Microsoft Excel and IBM SPSS Statistics, in particular the capabilities for processing and presenting cross-analysis between primary data.

6. Scope of the study

To specify the present study and increase its research significance, the author sets the following **limiting parameters:** the time period of the study includes the officially announced statistical data on the transport network in the country according to the road class for the period 2010 - 2020; registered means of transport in Bulgaria by type and fuel as of February 2017 - 2024; carbon dioxide emissions - average level for the period 2007-2018; sales of passenger cars in the EU countries on average for the period 2007 - 2020. In this research, the applicability of financial analysis is presented as part of the decision-making process for the future positioning of low-carbon transport in the automotive sector in Bulgaria through the prism of finance.

Public urban transport vehicles - trains, buses, trolleybuses, trams, metro and others - remain **out of the scope of the research.**

7. Research structure

The dissertation has a total volume of 159 standard pages, structured in three chapters as follows:

CONTENTS

CHAPTER TWO

LOW-CARBON MOBILITY - A PREREQUISITE FOR SUSTAINABLE DEVELOPMENT OF THE TRANSPORT SECTOR

1. NATIONAL AND SUPRANATIONAL NORMS AND POLICIES IN THE TRANSPORT SECTOR
2. GOOD EUROPEAN PRACTICES FOR THE INDUSTRIAL TRANSITION TO LOW-CARBON TRANSPORT - A COMPARATIVE ANALYSIS
3. THE AUTOMOTIVE INDUSTRY IN TRANSITION TO A LOW-CARBON ECONOMY - METHODOLOGICAL FRAMEWORK FOR CONDUCTING AN AUTHOR'S SURVEY

CONCLUSIONS FROM CHAPTER TWO

CHAPTER THREE

EMPIRICAL STUDY OF THE INDUSTRIAL TRANSITION TO LOW-CARBON TRANSPORT IN BULGARIA

1. THE INDUSTRIAL TRANSITION TO LOW-CARBON TRANSPORT - ANALYSIS OF THE RESULTS OF THE AUTHOR'S SURVEY
2. FISCAL INSTRUMENTS - A FACTOR FOR INCREASING ENVIRONMENTAL FRIENDLINESS IN THE *TRANSPORT, POSTAL AND WAREHOUSING* BRACH IN BULGARIA
3. OPTIMIZATION SOLUTIONS FOR FINANCIAL MANAGEMENT OF THE INDUSTRIAL TRANSITION TO LOW-CARBON TRANSPORT IN BULGARIA

CONCLUSIONS FROM CHAPTER THREE

CONCLUSION

BIBLIOGRAPHY

DECLARATION OF ORIGINALITY OF THE DISSERTATION THESIS

8. Applicability of the research results

The theoretical reasoning and conclusions developed in the dissertation, as well as the empirical results of the study, aim to support the thesis that the transition to low-carbon road transport in Bulgaria is an adaptive process related to the social economic attitudes of the population, the tax policy, the introduction of financial incentives for the transition and the construction of appropriate infrastructure for a gentle transport environment. On this basis, the results of the survey and the proposed model for optimal positioning of charging stations is a useful guideline for an attractive and useful investment that could contribute to the easier adaptation of the industrial transition to low-carbon transport in Bulgaria.

II. Core content of the dissertation

Chapter One. Analytical Profile of the Transport Sector in Bulgaria

Chapter one focuses on the role of the financial analysis in transport development, the assessment of the Bulgaria National Road Network and the analysis of transport security on a national scale. The regional profile of the Bulgarian National Road Network is studied, based on the data on the condition, the "road class" and the "road surface type".

As a prerequisite for international connectivity and the development of low-carbon transport, the road network in Bulgaria is considered as part of the transport infrastructure of high public importance, part of the trans-European transport network in Europe. The transport infrastructure in Bulgaria is in the process of completion and of unsatisfactory quality. This is mainly due to the

condition of the road surface and the insufficiently developed expressways (motorways).

The analysis shows the existing regional differences in terms of the quality and quantity of the currently built road network. As a result, the country can be conditionally divided into two parts - the renovated Southern Bulgaria and the still developing Northern Bulgaria. For the purposes of balanced development of the transport infrastructure of Bulgaria, as part of the European Community, it is necessary to determine the complex priorities for action to reduce regional differences. These include the completion of the motorways to the target set in Bulgaria of 2100 km, reconstruction and restoration of the first-class and second-class transport infrastructure, improvement and modernization of the sections with crushed stone and ballast pavement in Northwestern Bulgaria and the South Central region. This could improve the national transport and logistics infrastructure, while contributing to the country's economic development and strengthening its place in the global transport network.

Along with the research of the transport infrastructure in Bulgaria, the registered vehicles in the country were also analyzed, distributed by type and fuel for 2017 and 2024, as follows: moped, motorcycle, motorcycle with sidecar, passenger motorcycle tricycle, cargo motorcycle tricycle, three-wheeled vehicle, four-wheeled vehicle over 50 cc, all motorcycles, passenger car, cargo vehicle, special vehicle, bus, tractor, wheeled tractor, self-propelled chassis, electric forklift, forklift, cargo vehicle trailer, tractor trailer, passenger car trailer, wheeled trailer, semi-trailer, specialized machine (other type), special trailer and all others. The process of vehicle registration in Bulgaria has shown significant dynamics in recent years. This is evident in every segment of vehicles used. Data analyses show that over the past eight years the total use of vehicles in Bulgaria has seen significant growth. The focus on vehicle registration and use in recent years has been on those that run on: petrol/ natural gas, petrol/ liquefied gas, natural gas, diesel/electricity, petrol/electricity, liquefied gas, gas, electric motor and

petrol/gas. It is obvious that the transition to "clean" and significantly more environmentally friendly vehicles is in the process of development and adaptation in Bulgaria.

A negative trend is observed in the growth of vehicles with internal combustion engines using diesel and gasoline. As for specialized vehicles, such as special vehicles, wheeled tractors, tow trucks, self-propelled chassis and others, there is a predominant use of vehicles powered by standard fuels - diesel and gasoline. It is necessary to implement large-scale measures aimed at facilitating the purchase and use of vehicles with low CO_2 emissions in Bulgaria, in order to adapt to the European directives for ecological transport and renew the vehicle fleet in the country.

Chapter Two. Low-carbon mobility - a prerequisite for sustainable development of the transport sector

Chapter two of the research presents an overview of national and supranational norms and policies in the transport sector, with an emphasis on European strategic and regulatory documents. A comparative analysis of good European practices for industrial transition to low-carbon transport is carried out and a methodological framework is created for conducting a survey aimed at the automotive industry in the context of the transition to a low-carbon economy. The analyses are organized into three paragraphs, to which the relevant sub-points are added.

The analyzed European documents and their features serve as a basis for adapting the market environment and the car use in Bulgaria. Frequent changes in European standards and transformations in the industry have significant impacts on the transport sector, the pace of market development, sales and use of vehicles. National strategies and policies regulating the industrial transition to low-carbon transport do not comprehensively consider the opportunities for low-carbon development of transport in Bulgaria. What they have in common is the focus on limiting the harmful impacts of classic transport on the environment and health. Further improvement of strategic documents and their effective implementation is necessary to achieve environmental and climate purposes.

The tax breaks and incentives for the purchase of low-carbon vehicles in European countries are discussed, based on which the need for the introduction of tax breaks and incentives for the purchase of company cars is deduced, since in most countries they are minimal, and in others they are completely absent. Given that they are used intensively, respectively. have a higher degree of carbon emissions into the environment, their renewal is essential. The tax breaks and incentives for the purchase of electric and low-carbon vehicles in EU countries

are presented in Table A-1. Tax breaks and incentives for the purchase of electric and low-carbon vehicles in EU countries:

Table A-1. Tax breaks and incentives for purchasing electric and low-carbon cars in EU countries

Country	Electric cars				Low-carbon cars			Total number
	Tax benefits for acquisition	Property tax breaks	Tax breaks for purchasing company cars	Tax incentives	Tax benefits for acquisition	Property tax breaks	Tax breaks for purchasing company cars	
Austria	✓	✓	✓	✓	✓		✓	6
Belgium	✓	✓	✓		✓	✓	✓	6
Bulgaria		✓						1
Croatia	✓	✓		✓	✓			4
Cyprus	✓	✓			✓	✓		4
Czech Republic	✓	✓		✓	✓			4
Denmark	✓	✓	✓				✓	4
Estonia				✓				1
Finland	✓	✓		✓	✓	✓		5
France	✓		✓	✓	✓	✓	✓	6
Germany	✓	✓	✓	✓		✓	✓	6
Greece	✓	✓	✓	✓		✓		5
Hungary	✓	✓	✓	✓				4
Ireland	✓	✓	✓	✓	✓	✓		6
Italy		✓		✓	✓			3
Latvia	✓	✓	✓			✓		4
Lithuania								0
Luxembourg		✓	✓	✓		✓	✓	4
Malta	✓	✓			✓	✓		4
Netherlands	✓	✓	✓	✓	✓	✓	✓	7
Poland	✓			✓				2
Portugal	✓	✓	✓	✓	✓	✓		6
Romania		✓		✓	✓			3
Slovakia	✓	✓		✓				3
Slovenia	✓			✓	✓			3
Spain	✓	✓		✓	✓		✓	5
Sweden		✓	✓	✓	✓	✓		5

Source: The Automobile industry pocket Guide 2020/2021

In Bulgaria, Estonia, Italy, Lithuania, Poland, Romania, Slovakia and Slovenia, it is essential to review the tax policy related to car taxation and introduce local measures to undertake tax breaks and incentives for the purchase of low-carbon cars in order to improve the environmental performance of the car fleet. Good practices of financial support in Austria, Belgium, France, Germany, Ireland, the Netherlands, Portugal, Spain, Sweden, can be a starting point on ways to integrate low-carbon transport and comply with the European Green Deal.

The increasing role of transport in modern life has put on the agenda a number of challenges, the solutions of which can be achieved through process improvement, progress in science and technology. This leads to a search for new perspectives for the adoption of sensible solutions that will provide a better, adaptive, modern and environmentally friendly automotive environment. Digitization, increasing automation and new business models have already revolutionized other industries, and the automotive industry will certainly follow this trend. These changes are leading to the emergence of four major technological trends in the automotive sector: diverse mobility, autonomous driving, electrification and connectivity.

For the purposes of the research, a survey was conducted with questions related to the key aspects of the use of transport vehicles, the transition to alternative fuel vehicles, the main advantages and disadvantages reported among the population. The study was conducted during the period September - October 2023. The study is systematized into five separate sections, as follows: general information about the respondents who participated in the study; consumer attitudes towards the use of vehicles; motives for choosing a low-carbon vehicle; assessment of the importance of individual parameters of electric vehicles; assessment of the reliefs and incentives for the use of low-carbon vehicles implemented in Bulgaria.

Chapter Three. Empirical Study of the Industrial Transition to Low-Carbon Transport in Bulgaria

Chapter three presents an analysis of the results of the author's survey. Fiscal instruments are examined as a factor for increasing environmental friendliness in the *Transport, Postal and Warehousing* sector in Bulgaria, as well as proposed optimization solutions for the financial management of the industrial transition to low-carbon transport in the country.

Over 80 % of the respondents are individuals or representatives of a household, with the majority of respondents aged 26 - 39 (46 %). A large part of the respondents have an average annual income of up to 50 thousand BGN (65.7 %) and are located in a regional city – 49 %. In terms of the type of fuel, diesel cars are used the most – 50 %. The predominant answers to the monthly fuel cost for the car/s are from 200 BGN to 400 BGN – 50 %, and the amount of cost for maintenance, service and repair is identical. Among the main disadvantages of electric vehicles at the moment is the long duration of charging the cars. For 37 % of the respondents, the optimal time for charging a car in order to consider purchasing or to be satisfied with the purchase of an electric car is up to 1 hour. Nearly half of the respondents would consider purchasing an electric vehicle if it could travel over 450 km on a single charge – 41 %. A major advantage of electric vehicles for 64 % of the respondents is environmental protection through lower emissions of harmful exhaust gases. A major disadvantage for 65 % of the respondents is the high purchase price of electric vehicles, as well as the lack of power supply infrastructure - 57% and the long charging time - 48%. Over 80 % consider it necessary to raise awareness about the benefits of using low-carbon vehicles in Bulgaria.

Among the most important characteristics of electric vehicles are listed as follows: how far it can travel before needing to be recharged, followed by the availability of recharging stations and the initial purchase price. 76 % of

respondents believe that the state needs to build a network of charging stations for electric vehicles. 37 % of respondents believe that the reliefs and incentives on the acquisition, purchase and registration of low-carbon vehicles are "insufficient". Among those surveyed, 58 % say that the charging stations for electric vehicles located in their locality are "insufficient", and for 13 % they are "absolutely insufficient". The largest share of respondents believe that charging stations for electric vehicles in the country should be located every 50 km. - 43 %, followed by the distance "every 100 km." - 21 %, and the greatest need is in the Northwestern Planning Region - 25%, followed by the "Southeastern Planning Region" – 23.9 %.

A significant need for the construction of charging stations is observed at the destination "Border Checkpoint Gyueshevo - Pernik - Sofia - Burgas - Varna" - 37.4%, followed by the transport corridor "Ruse - Veliko Tarnovo - Gabrovo - Stara Zagora - Dimitrovgrad - Kardzhali" – 29.3 %. Through the analysis of fiscal instruments as a means of increasing environmental friendliness in the "Transport, warehousing and postal services" sector in Bulgaria, a lack of significant commitment to environmental taxation is observed, and for the purposes of achieving the requirements of the European environmental directives, it would be good to carry out reforms in fiscal policy, review the environmental tax and introduce additional incentives.

Based on the data obtained from the survey, a sample layout of 23 public charging stations for mass use was made on the junction roads: "Ruse - Veliko Tarnovo - Gabrovo - Stara Zagora - Dimitrovgrad - Kardzhali" and "Border Checkpoint Gyueshevo" - Pernik - Sofia - Burgas".

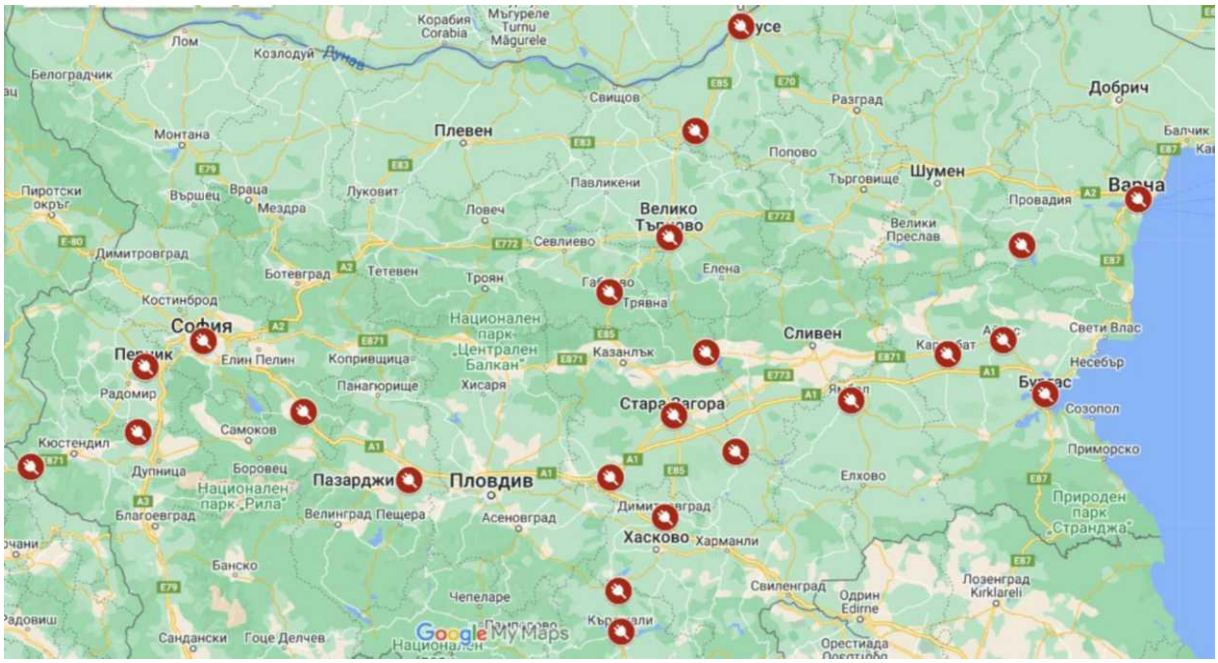

Figure A-1. Distribution of publicly accessible charging stations along the destinations Ruse - Veliko Tarnovo - Gabrovo - Stara Zagora - Dimitrovgrad - Kardzhali and Checkpoint Gyueshevo" - Pernik - Sofia - Burgas

Source: Author's presentation based on maps.google.com

The indicated distributions of publicly accessible charging stations represent the optimal positioning that could be beneficial for the purposes of the more widespread use of low-carbon vehicles, whose main problem is the lack of sufficient universal charging stations. In addition to the central road arteries, it is necessary to build flexible, safe and fast charging stations, which can serve different vehicles in the time range 24/ 7/ 365. A similar type of investment with the proposed distribution of 23 public charging stations for mass use on the junction roads could be in the amount of 4,021,550 BGN at an average price per high-end charging station of 17,485 BGN, referring to a market study and distribution of 10 devices for simultaneous charging. This can be seen as an attractive and useful investment that will contribute to the easier adaptation of the industrial transition to low-carbon transport in Bulgaria.

Conclusion

The dissertation presents a study divided into three main parts: theoretical, methodological and empirical. They focus sequentially on: First. Analytical profile of the transport sector in Bulgaria; Second. Low-carbon mobility - a prerequisite for sustainable development of the transport sector; Third. The industrial transition to low-carbon transport in Bulgaria - financial and optimization solutions. The research conducted allowed to achieve the main purpose of the dissertation: analyzing the practices and prospects in the process of the industrial transition to low-carbon transport through the prism of financial aspects.

The theoretical, methodological and, above all, empirical part of the dissertation research confirms the research thesis that the transition to low-carbon transport in Bulgaria is an adaptive process related to the social economic attitudes of the population, tax policy, the introduction of financial incentives for the transition and the construction of appropriate infrastructure for a gentle transport environment.

A broad review of national and European policies in the transport sector shows the need to build national strategies that will create a basis for the transformation of traditional transport into low-carbon. The main emphasis is on limiting the harmful impacts of classic transport on the environment and health, with the proposed reforms aimed at reducing carbon emissions and increasing the sustainability of the transport sector. To successfully implement these purposes, it is important to improve the strategic documents and their implementation.

Bulgaria’s strategic location, the importance of the transport sector and the road network play a key role in the country’s economic prosperity and international connectivity. Improvements in the state of transport infrastructure depend on investments in the modernization of roads and the network. A comparative analysis of European practices shows the need to introduce tax breaks and incentives for the purchase of company electric vehicles. In Bulgaria

and other EU countries, it is important to review tax policy to encourage the purchase of low-carbon cars and improve the environmental friendliness of the vehicle fleet.

In order to better understand consumer attitudes and motivations for choosing low-carbon vehicles, a survey was conducted. It examines key aspects such as assessing the importance of electric vehicle parameters, as well as incentives and reliefs for their use in Bulgaria.

Reducing the carbon footprint of transport is essential in the fight against climate change. Rethinking urban design and the transition to low-carbon transport are essential steps towards achieving this. The transition to low-carbon transport is currently progressing in most EU Member States, but at a relatively slow pace and is still in the adaptation phase.

This dissertation presents a unique direction towards assisting the Republic of Bulgaria in the process of transition to low-carbon transport for the purposes of achieving "carbon neutrality" and bringing the country to the forefront of ecological progress and environmental awareness in Europe.

III. Directions for future research on the topic of the dissertation

The dissertation does not exhaust the topic of the financial analysis of the industrial transition to low-carbon transport. The following guidelines for future research can be formulated:

1. Expanding the scope of transport analysis with a detailed focus on the transition to low-carbon public transport - trains, buses, etc.

2. Incorporating more data sets and analytical methods into specialized financial analysis to more fully explore the issues of the industrial transition to low-carbon transport

IV. Reference to the scientific and applied scientific contributions in the dissertation work

First. Based on the author's analysis of the transport sector in Bulgaria, regional imbalances in the development of road infrastructure and the need for targeted investments for its modernization in accordance with European standards have been identified. The dynamics of the vehicle fleet structure have been studied and a growing trend towards the use of low-carbon means of transport has been identified.

Second. Based on the author's analysis of the norms, policies and good European practices for industrial transition to low-carbon transport, the need to implement targeted and effective tax incentives and reliefs to stimulate the purchase of low-carbon vehicles in Bulgaria has been deduced.

Third. Based on the author's empirical study of public attitudes, the financial highlights of the industrial transition to low-carbon transport have been derived. For the purpose of accelerating the transition to sustainable and ecological transport, the author's concept for the strategic placement of public charging stations based on transport corridors in Bulgaria has been developed.

Fourth. Based on the author's analysis of the applied fiscal policies, optimization solutions have been formulated for the financial management of the industrial transition to low-carbon transport as a key step towards reducing carbon emissions and achieving long-term sustainability in the transport sector - part of the country's commitment to the environmental and climate purposes of the European Union.

V. List of publications of the doctoral student

Articles:

1. Borisov, T., (2021) The Republican Road Infrastructure in Bulgaria - Specifics and Regional Differences, Annual Almanac of Scientific Research of Doctoral Students, Volume XIV, Book 17, *D.A.Tsenov* Academy of Economics, p. 697 - 709, Svishtov, ISSN 1313-6542,
Link: https://dlib.uni-svishtov.bg/bitstream/handle/10610/4867/078acbc6c8e93012daa5aa9fa5ac228e.pdf?sequence=1&isAllowed=y
2. Borisov, T., (2022) Development of low-carbon transport in Europe: tax breaks and purchase incentives, Yearbook, volume CXXV, *D.A.Tsenov* Economics academy, *D.A.Tsenov* Academy of Economics , Svishtov, ISSN 0861-8054, p. 122 - 135
Link: https://dlib.uni-svishtov.bg/handle/10610/4798

Scientific reports:

1. Borisov, T., (2023) Fiscal instruments - a factor for increasing environmental friendliness in the "Transport, warehousing and postal" sector in Bulgaria, Collection of reports from the scientific conference "Logistics and public systems", March 16-17, 2023, Publishing complex of the National University Vasil Levski, Veliko Tarnovo, ISSN 2738-8042, p. 627-633
Link: https: //www.researchgate.net/publication/3 71082530

VI. Certificate of compliance with the national requirements under the Regulations for the Implementation of the Act on the Development of the Academic Staff in the Republic of Bulgaria

National requirement in number of points: 30

Number of articles indexed in NACID: 2 pcs.
Number of points from articles indexed in NACID: **20.00**

Number of reports indexed in NACID: 1 pc.
Points reported by the author through scientific reports: **10.00**

Total points: **30.00** = 30.00

VII. Declaration of originality of the dissertation work

The dissertation, in a volume of 159 pages, entitled: *"Financial Analysis of the Industrial Transition to Low-Carbon Transport"* is authentic and represents the author's own scientific production. It uses original ideas, texts and visualization through graphs, diagrams, tables and formulas, complying with all the requirements of the Copyright and Related Rights Act by duly citing and referring to another author's thought, as well as data, including:

1. The results achieved and contributions made in the dissertation are original and have not been borrowed from research and publications in which the author has no participation.
2. The information presented by the author in the form of copies of documents and publications, personally compiled reports, etc. corresponds to the objective truth.
3. Scientific results that have been obtained, described and/or published by other authors are duly and in detail cited in the bibliography.

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Doctoral student Teodor Borisov