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Isentropic analysis of entire intermediate pressure steam turbine cylinder and cylinder segments

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Abstract: In this paper is performed an isentropic analysis of the entire Intermediate Pressure Cylinder (IPC) and all of his four Segments. Obtained results show that the first Segment (Seg. 1) is the dominant mechanical power producer of all Segments and it produces 16816.70 kW of mechanical power in the real (polytropic) expansion process. Analyzed IPC produces more than half mechanical power of the entire turbine in which he operates (in real expansion process IPC produces mechanical power equal to 58499.48 kW). Isentropic loss and isentropic efficiency of IPC Segments are reverse proportional – Seg. 3 which has the highest isentropic loss simultaneously has the lowest isentropic efficiency (equal to 82.44%), while Seg. 4 which has the lowest isentropic loss has the highest isentropic efficiency (equal to 87.26%). Entire IPC has an isentropic efficiency equal to 87.78%. Any improvements and modifications which can potentially be performed in the observed IPC should firstly be based on the turbine stages mounted inside Seg. 3.

KEYWORDS: ISENTROPIC ANALYSIS, STEAM TURBINE, INTERMEDIATE PRESSURE CYLINDER (IPC), CYLINDER SEGMENTS, LOSSES AND EFFICIENCIES

1. Introduction

In the electricity production worldwide, steam turbines are inevitable components [1, 2]. Steam turbines nowadays can be found in many systems and processes, such as conventional [3], supercritical [4], nuclear [5], cogeneration [6], combined [7], marine [8, 9] and other power plants. In all mentioned power plants, steam turbines can be composed of only one or more cylinders.

High power steam turbines are dominantly composed of several cylinders mounted on the same shaft, while medium and low power steam turbines can be composed of only one cylinder [10, 11]. In addition, low power steam turbines are usually used for the auxiliary equipment drive [12].

Steam turbine cylinders can be single flow or dual flow cylinders. In single flow cylinders, steam expands throughout the cylinder in one direction only (from cylinder inlet to outlet), while in dual flow cylinders steam enters in the cylinder at the cylinder midpoint and simultaneously expands in two directions. Dual flow cylinders have many benefits, so they are dominantly used as the last (low pressure) cylinders before main condenser [13].

Steam turbine cylinders usually have several steam extractions. Each steam extraction from the turbine cylinder lead a certain amount of steam mass flow rate to the components of condensate/feedwater heating system, or for auxiliary heating purposes [14].

Steam inlet, steam outlet and all extractions of the same turbine cylinder defines cylinder Segments and make a clear division of the entire cylinder into several parts. Cylinder Segments allow analysis of the steam expansion processes not only in the entire cylinder, but also in (at least) several cylinder parts [15]. Analysis of the process inside each Segment of the same turbine cylinder allows more precise detection of potentially problematic parts which cannot be obtained considering entire cylinder as a whole.

In this paper is performed isentropic analysis of the entire Intermediate Pressure Cylinder (IPC) and all of his four Segments. Such analysis allows detection of the Segment with the lowest isentropic efficiency and the highest isentropic loss, which should be a baseline for any improvements and modifications.

2. Description and operating characteristics of the analyzed IPC

The analyzed Intermediate Pressure Cylinder (IPC) is a part of a complex three cylinder steam turbine from Kolubara A5 steam power plant. All the cylinders of this turbine are connected to the same shaft which drives an Electric Generator (EG). The entire turbine has a nominal power of 110 MW [16].

General scheme of the IPC analyzed in this paper, along with operating points necessary for his isentropic analysis is presented in Fig. 1. IPC gets steam from steam Re-Heater (Re-Heater is mounted inside the steam generator), operating point 1, Fig. 1. Analyzed IPC is a single flow cylinder which means that steam expands through the cylinder in only one direction – from the inlet until the outlet.

IPC has four steam extractions. The first steam extraction (operating point 2, Fig. 1) delivers a certain amount of steam to High Pressure Feedwater Heating System, second steam extraction (operating point 3, Fig. 1) delivers a certain amount of steam to Deaerator, while the last two extractions (operating points 4 and 5, Fig. 1) deliver a certain amount of steam to the components of Low Pressure Condensate Heating System. The remaining steam mass flow rate at the IPC outlet (operating point 6, Fig. 1) is delivered to the Low Pressure Cylinder (LPC).

Steam inlet, outlet and extractions divide analyzed IPC into four Segments. As presented in the Fig. 1, the first Segment is IPC part between steam inlet and first extraction, second Segment is defined between first and second steam extraction, third Segment is defined between second and third steam extraction, while the last fourth Segment is defined between the last two (third and fourth) steam extractions. Isentropic analysis performed in this paper will be related to each of four IPC Segments as well as to the entire cylinder (EC).

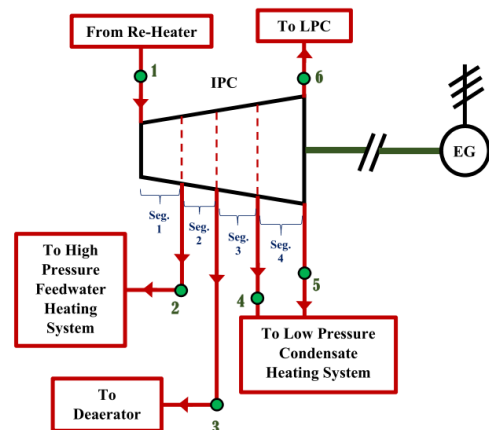


Fig. 1. General scheme of the Intermediate Pressure Cylinder (IPC) along with operating points necessary for the isentropic analysis

Isentropic analysis of the entire IPC (EC) and each of his Segments strongly differs. The most notable differences between these two isentropic analyses are graphically presented in a specific enthalpy/specific entropy (h/s) diagram which shows the difference between real (polytropic) and ideal (isentropic) steam expansion processes, Fig. 2.

It should be highlighted that real (polytropic) steam expansion process in any Segment or in the EC is characterized by an increase in steam specific entropy, which is related to losses during the expansion process. In ideal (isentropic) steam expansion process, all the losses which occur during the expansion are neglected, so steam specific entropy remains unchanged. Therefore, in ideal (isentropic) steam expansion process, any Segment or EC will develop the highest possible mechanical power.

Isentropic analysis of the entire IPC is based on a comparison of real (polytropic) and ideal (isentropic) steam expansion processes in the entire cylinder. In Fig. 2, real (polytropic) steam expansion process of the EC is represented with operating points 1 – 2 – 3 – 4 – 5, while ideal (isentropic) steam expansion process of the entire IPC is represented with operating points 1 – 2_{is,EC} – 3_{is,EC} – 4_{is,EC} – 5_{is,EC}.

Isentropic analysis of each IPC Segment is based on a comparison of real (polytropic) and ideal (isentropic) steam expansion processes in each IPC Segment. For the first IPC Segment, real steam expansion is represented with operating points 1 and 2, while ideal steam expansion is represented with operating points 1 and 2_{is,Seg}. In second IPC Segment, real expansion is represented with operating points 2 and 3, while ideal steam expansion is represented with operating points 2 and 3_{is,Seg}. In third IPC Segment, real expansion is represented with operating points 3 and 4, while ideal steam expansion is represented with operating points 3 and 4_{is,Seg}. In the last, fourth IPC Segment, real expansion is represented with operating points 4 and 5, while ideal steam expansion is represented with operating points 4 and 5_{is,Seg}. Finally, it should be highlighted that, due to steam extractions, steam mass flow rate through each Segment differs, what must be considered in the equations for the real (polytropic) and ideal (isentropic) mechanical power calculation of each Segment. The operating points of the real (polytropic) steam expansion process throughout the observed IPC in Fig. 2 are marked in accordance to Fig. 1.

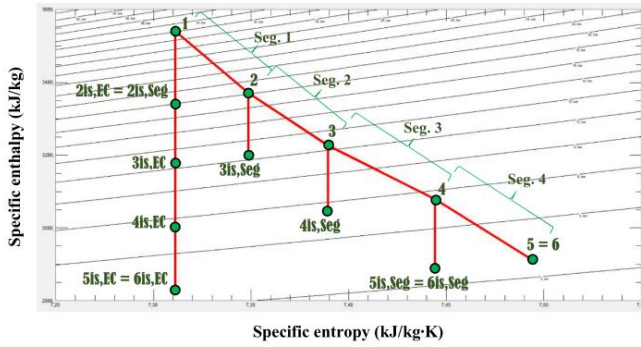


Fig. 2. Steam expansion process (ideal and real) throughout entire IPC and all his Segments in specific enthalpy/specific entropy (h/s) diagram

3. Isentropic analysis equations of the entire IPC and his Segments

In an isentropic analysis of any steam turbine, turbine cylinder and cylinder Segment are compared real (polytropic) and ideal (isentropic) steam expansion processes [17], as presented in Fig. 2. Steam operating parameters in real (polytropic) expansion process are obtained by measurements during the turbine (and each turbine cylinder) exploitation in the power plant. Steam operating parameters in ideal (isentropic) expansion are obtained mathematically. The ideal steam expansion process is the process between the same pressures and it uses the same steam mass flow rates as real (polytropic) process, but during the ideal expansion steam specific entropy remains always constant.

The baseline for isentropic analysis is calculation of real and ideal mechanical power (for the entire turbine, cylinder or cylinder Segment). Isentropic loss is the difference between ideal and real mechanical power, while the isentropic efficiency is the ratio between real and ideal mechanical power.

It should also be highlighted that isentropic analysis must be performed in a different manner for the entire turbine cylinder and for the cylinder Segments [18]. For the cylinder Segments must be used ideal (isentropic) specific heat drop from the Segment inlet until the Segment outlet. Parts of the main isentrope (which is used for the entire IPC) cannot be used in the isentropic analysis of cylinder Segments (for all Segments except the first one) due to isobars spread during the increase in steam specific entropy.

Equations for the isentropic analysis of the entire observed IPC and all his Segments are composed according to the recommendations from the literature [19, 20]. Operating points used in the equations through this Section are related to Fig. 1 and Fig. 2.

3.1. Isentropic analysis equations of the entire IPC

Real (polytropic) mechanical power of the entire observed IPC is calculated according to the equation:

$$P_{re,EC} = \dot{m}_1 \cdot (h_1 - h_2) + (\dot{m}_1 - \dot{m}_2) \cdot (h_2 - h_3) + (\dot{m}_1 - \dot{m}_2 - \dot{m}_3) \cdot (h_3 - h_4) + (\dot{m}_1 - \dot{m}_2 - \dot{m}_3 - \dot{m}_4) \cdot (h_4 - h_5). \quad (1)$$

Ideal (isentropic) mechanical power of the entire IPC is calculated by using an equation:

$$P_{id,EC} = \dot{m}_1 \cdot (h_1 - h_{2is,EC}) + (\dot{m}_1 - \dot{m}_2) \cdot (h_{2is,EC} - h_{3is,EC}) + (\dot{m}_1 - \dot{m}_2 - \dot{m}_3) \cdot (h_{3is,EC} - h_{4is,EC}) + (\dot{m}_1 - \dot{m}_2 - \dot{m}_3 - \dot{m}_4) \cdot (h_{4is,EC} - h_{5is,EC}). \quad (2)$$

Isentropic loss of the entire IPC is:

$$IS_{L,EC} = P_{id,EC} - P_{re,EC}. \quad (3)$$

Entire IPC isentropic efficiency is:

$$\eta_{is,EC} = \frac{P_{re,EC}}{P_{id,EC}}. \quad (4)$$

In the above equations and throughout the paper, P is mechanical power, $\dot{m}$ is fluid mass flow rate, h is fluid specific enthalpy, index re is related to real (polytropic) process, index id is related to ideal (isentropic) process, index EC is related to the entire IPC, while index L is related to isentropic loss.

3.2. Isentropic analysis equations of the IPC Segments

Real (polytropic) and ideal (isentropic) mechanical power of the first IPC Segment (Seg. 1) are:

$$P_{re,Seg,1} = \dot{m}_1 \cdot (h_1 - h_2), \quad (5)$$

$$P_{id,Seg,1} = \dot{m}_1 \cdot (h_1 - h_{2is,Seg}). \quad (6)$$

Real (polytropic) and ideal (isentropic) mechanical power of the second IPC Segment (Seg. 2) are:

$$P_{re,Seg,2} = (\dot{m}_1 - \dot{m}_2) \cdot (h_2 - h_3), \quad (7)$$

$$P_{id,Seg,2} = (\dot{m}_1 - \dot{m}_2) \cdot (h_2 - h_{3is,Seg}). \quad (8)$$

Real (polytropic) and ideal (isentropic) mechanical power of the third IPC Segment (Seg. 3) are:

$$P_{re,Seg,3} = (\dot{m}_1 - \dot{m}_2 - \dot{m}_3) \cdot (h_3 - h_4), \quad (9)$$

$$P_{id,Seg,3} = (\dot{m}_1 - \dot{m}_2 - \dot{m}_3) \cdot (h_3 - h_{4is,Seg}). \quad (10)$$

Real (polytropic) and ideal (isentropic) mechanical power of the fourth IPC Segment (Seg. 4) are:

$$P_{re,Seg,4} = (\dot{m}_1 - \dot{m}_2 - \dot{m}_3 - \dot{m}_4) \cdot (h_4 - h_5), \quad (11)$$

$$P_{id,Seg,4} = (\dot{m}_1 - \dot{m}_2 - \dot{m}_3 - \dot{m}_4) \cdot (h_4 - h_{5is,Seg}). \quad (12)$$

The isentropic loss of each IPC Segment is:

$$IS_{L,Seg,(i)} = P_{id,Seg,(i)} - P_{re,Seg,(i)}, \quad (13)$$

while isentropic efficiency of each IPC Segment is:

$$\eta_{is,Seg,(i)} = \frac{P_{re,Seg,(i)}}{P_{id,Seg,(i)}}. \quad (14)$$

In Eq. 13 and Eq. 14, index i is equal from 1 to 4 and is related to the IPC Segments numeration (according to Fig. 1 and Fig. 2).

4. Steam operating parameters required for the isentropic analysis

The IPC operating parameters, obtained by the measurements, are related to the real (polytropic) steam expansion process – they are

found in the literature [16] and presented in Table 1. It should be highlighted that all operating points presented in Table 1 contained superheated steam. In the literature [20, 21] can be found that IPC has optimal operating conditions in a three cylinder steam turbine, because he is not influenced by the steam of the highest pressure and temperature (as the High Pressure Cylinder) and simultaneously, it is not influenced by additional losses related to wet steam (as the last stages of Low Pressure Cylinder).

Steam specific enthalpies related to the ideal (isentropic) steam expansion processes (for entire IPC and each of his Segments) are obtained by numerical calculations, according to the previously described procedure. For the entire IPC, steam operating parameters in the ideal (isentropic) expansion process are presented in Table 2, while for each IPC Segment, steam operating parameters in the ideal (isentropic) expansion process are presented in Table 3. Steam parameters in each operating point from Table 2 and Table 3, are calculated by using NIST-REFPROP 9.0 software [22].

Table 1. Steam operating parameters in the real (polytropic) expansion process

O. P.*	Temperature (°C)	Pressure (bar)	Mass flow rate (kg/s)	Specific enthalpy (kJ/kg)	Specific entropy (kJ/kg·K)
1	538.70	32.2	98.98	3542.1	7.3111
2	455.31	18.2	5.23	3372.2	7.3486
3	383.07	10.5	1.80	3227.6	7.3893
4	307.92	5.5	4.70	3079.7	7.4442
5	222.13	2.5	4.33	2913.2	7.4939
6	222.13	2.5	82.92	2913.2	7.4939

* O. P. = Operating Point (in accordance to Fig. 1 and Fig. 2)

Table 2. Steam operating parameters in the ideal (isentropic) expansion process for the Entire Cylinder

Isentropic - Entire Cylinder			
O. P.*	Pressure (bar)	Specific entropy (kJ/kg·K)	Isentropic specific enthalpy-Entire Cylinder (kJ/kg)
1	32.2	7.3111	3542.1
2 _{is,EC} = 2 _{is,Seg}	18.2	7.3111	3345.1
3 _{is,EC}	10.5	7.3111	3177.2
4 _{is,EC}	5.5	7.3111	3004.8
5 _{is,EC} = 6 _{is,EC}	2.5	7.3111	2826.6

* O. P. = Operating Point (in accordance to Fig. 2)

Table 3. Steam operating parameters in the ideal (isentropic) expansion process for the cylinder Segments

Isentropic - Segments			
O. P.*	Pressure (bar)	Specific entropy (kJ/kg·K)	Isentropic specific enthalpy-Segments (kJ/kg)
3 _{is,Seg}	10.5	7.3486	3201.2
4 _{is,Seg}	5.5	7.3893	3048.2
5 _{is,Seg} = 6 _{is,Seg}	2.5	7.4442	2888.9

* O. P. = Operating Point (in accordance to Fig. 2)

5. Results and discussion

Real (polytropic) and ideal (isentropic) mechanical power of the entire IPC (EC) and each of his Segments is presented in Fig. 3.

Due to neglecting all the losses during the expansion process, ideal (isentropic) mechanical power of the EC and each Segment must be higher in comparison to real (polytropic) one, what is confirmed in Fig. 3. Observation of all Segments shows that the first Segment (Seg. 1) is the dominant mechanical power producer which produces 16816.70 kW of mechanical power in the real expansion process and his potential in mechanical power production (ideal expansion process) is equal to 19499.06 kW.

Entire IPC produces 58499.48 kW of mechanical power in real (polytropic) steam expansion process, while it can produce mechanical power equal to 66639.82 kW if the expansion process through this cylinder is ideal (isentropic).

The entire turbine, which observed IPC is a constituent part, produces nominal power equal to 110 MW, so it can be concluded that IPC is the dominant mechanical power producer of all cylinders, and that this cylinder produces more than half mechanical power of the entire turbine in the real expansion process.

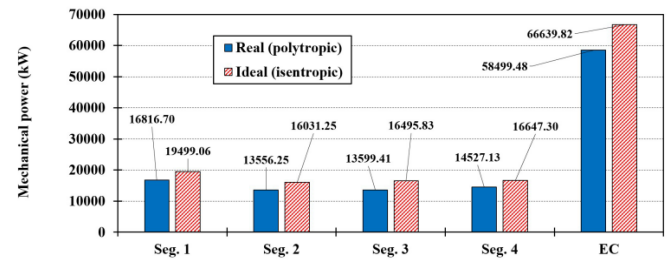


Fig. 3. Mechanical power (ideal and real) produced in the entire IPC and each cylinder Segment

Isentropic loss of the entire IPC and each of his Segments is presented in Fig. 4.

The first Segment (Seg. 1) which produces the highest mechanical power (both ideal and real) did not have the highest isentropic loss. The highest isentropic loss of all Segments has Seg. 3, equal to 2896.43 kW. On the other side, the last, fourth Segment (Seg. 4) has the lowest isentropic loss equal to 2120.17 kW.

Entire IPC isentropic loss is equal to 8140.33 kW, Fig. 4.

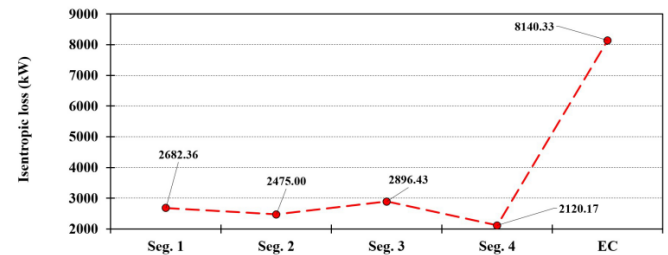


Fig. 4. Isentropic loss of the entire IPC and each cylinder Segment

Comparison of Fig. 4 and Fig. 5 shows that isentropic loss and isentropic efficiency of IPC Segments are reverse proportional – Seg. 3 which has the highest isentropic loss simultaneously has the lowest isentropic efficiency (equal to 82.44%), while Seg. 4 which has the lowest isentropic loss has the highest isentropic efficiency (equal to 87.26%). It should be highlighted that Seg. 1 which has higher isentropic loss also has higher isentropic efficiency in comparison to Seg. 2. Entire IPC has isentropic efficiency equal to 87.78%, Fig. 5.

Entire IPC has very high isentropic efficiency, while Seg. 3 can be further improved with an aim to increase his isentropic efficiency. Any improvements and modifications which should potentially be performed in the observed IPC should firstly be based on the turbine stages mounted inside Seg. 3.

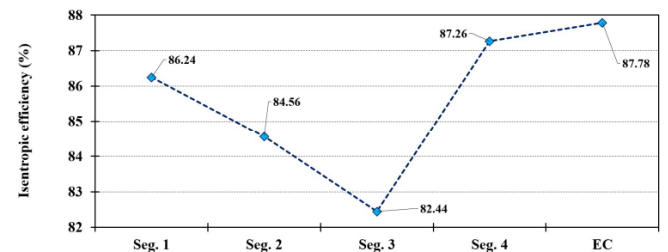


Fig. 5. Isentropic efficiency of the entire IPC and each Segment

Further analysis of the observed IPC will be based on the results of this research. It can (and it will) be used various conventional [23, 24] and artificial intelligence [25-27] methods and techniques to find optimal operating regimes of this cylinder, in which the efficiencies will be the highest (for the entire cylinder and each his Segment).

6. Conclusions

This paper presents isentropic analysis results of the entire Intermediate Pressure Cylinder (IPC) and all of four his Segments. The most important conclusions and obtained findings are:

- The first Segment (Seg. 1) is the dominant mechanical power producer of all Segments and it produces 16816.70 kW of mechanical power in the real (polytropic) expansion process.
- Entire IPC produces 58499.48 kW of mechanical power in real (polytropic) steam expansion process. Analyzed IPC produces more than half mechanical power of the entire turbine in which he operates.
- The highest isentropic loss of all Segments has Seg. 3, equal to 2896.43 kW, while the last, fourth Segment (Seg. 4) has the lowest isentropic loss equal to 2120.17 kW. Entire IPC isentropic loss is equal to 8140.33 kW.
- Isentropic loss and isentropic efficiency of IPC Segments are reverse proportional – Seg. 3 which has the highest isentropic loss simultaneously has the lowest isentropic efficiency (equal to 82.44%), while Seg. 4 which has the lowest isentropic loss has the highest isentropic efficiency (equal to 87.26%). Entire IPC has an isentropic efficiency equal to 87.78%.
- Any improvements and modifications which can potentially be performed in the observed IPC should firstly be based on the turbine stages mounted inside Seg. 3.

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Academic entrepreneurship roadmap as an innovative model at university level

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Abstract: The paper presents the conceptual framework of an international project focused on the development of entrepreneurship culture at academic level. Academic entrepreneurship is seen as a means of commercialization, which is the transformation of knowledge into products, processes, and organization and their contribution to economic growth and innovation. In this regard the project is aimed to explore hidden strengths of academic entrepreneurship in detail and in various aspects oriented to students, academic staff, and businesspeople. The project will suggest training materials in line with the changes in the economic environment in recent years to create both entrepreneurial culture and skills to start own business under the supervision by academic entrepreneurs.

KEYWORDS: ACADEMIC ENTREPRENEURSHIP, ENTREPRENEURIAL CULTURE, COMMERCIALIZATION, INNOVATION

1. Introduction

The scientific potential generated by universities can be promoted and transferred through commercial application and be a source of revenue. Educational institutions with a strong entrepreneurial culture are thought to be leaders in molding students' entrepreneurial attitudes and helping them form close relationships with industry partners. When university academics incorporate specific business-related activities into their research with the intention of implementing and profiting from the study, this is referred to as academic entrepreneurship. [1]

Academic entrepreneurship is seen as a means of commercialization, which is the transformation of knowledge into products, processes, and organization and their contribution to economic growth and innovation. In this regard **the project is aimed** to explore hidden strengths of academic entrepreneurship in detail and in various aspects oriented to students, academic staff, and businesspeople. The project topic is "Academic Entrepreneurship Roadmap" and is funded by Erasmus+ Programme, Action type KA220-HED - Cooperation partnerships in higher education, 2023.

The general **project objective** is to explore the ways for success in entrepreneurial activities to trigger students' initiative in an adapted way bringing together students from various social categories with focus on those who are discouraged in their study and lagging their peers. The project will suggest training materials in line with the changes in the economic environment in recent years to create both entrepreneurial culture and skills to start own business under the supervision of academic entrepreneurs.

The **specific objectives** of the project are:

- Revealing trends and influencing factors on entrepreneurship by exploration of entrepreneurial culture and attitudes across the targeted students.
- Closing the gap in cultivating academic and students' entrepreneurship by creation of methodologies for entrepreneurial education among the targeted students.
- Development of Entrepreneurial Journey based on Academic Entrepreneurship Roadmap, accompanied by series of lectures, seminars, and workshops.

Within the project, **the team will produce** the following:

- Development of Methodology to study the entrepreneurial attitudes of the students.
- Creation of teaching materials for entrepreneurial education of students in risk of falling out.
- Development of model entrepreneurial journeys.
- Piloting the developed content at workshops.
- Holding thematic seminars with business experts.
- Organizing local dissemination meetings.
- Organizing cross border final events.

The authors' thesis is that all the efforts focused on the development of the triangle of knowledge: science-business-

education including participation and lectures by business representatives is helpful in the educational process because this collaboration provides practical experience and know-how gained by professionals in their practice. This method is called action learning and provides opportunities for the theory to "meet" the practice. Furthermore, this activity creates opportunities to develop internship programs for students. Business representatives will have the opportunity to meet motivated and talented students that thrive on innovation development and are focused on their professional realization. A good example exists but it is not in the news and everyday topics that are discussed. The project is a good chance for the students to believe in themselves and try to be entrepreneurs. The development of entrepreneurial culture is a long process, and it is necessary to be applied in university education. The business representatives will share their experiences and how they have overcome the difficulties. This is a chance for the students to believe that they can do more and use their potential in entrepreneurship projects.

The paper aims to promote and raise awareness of the project contents and developments, i.e. to present the project objectives, expected results and relevance as part of the dissemination strategy of the team of experts. **The paper is organized as follows:** after the introduction, the project description is presented in the second part. The latter paves the way for the third section, which focuses on the needs that the project addresses. The paper concludes with the potential wider impact of the project and recommendations for future research in the field of investigating the entrepreneurship and improvement of the entrepreneurial culture in Bulgaria.

2. Project Description

2.1. Partners

The University of Plovdiv Paisii Hilendarski is a coordinator of the research project. By a decision of the Academic Council of the University of Plovdiv Paisii Hilendarski on March 29, 2021 was established Office for Technology Transfer (TTO) as a separate unit of the Center for Technology at the University of Plovdiv. The TTO maximizes the impact of new knowledge gained from research and discoveries and aims to be recognized as a trusted and creative negotiator of fair, mutually beneficial agreements. It aims to engage the community by encouraging and supporting the development of innovation and entrepreneurship at the University of Plovdiv Paisii Hilendarski and in the wider ecosystem. The office provides competent consultation and timely services to the researchers from university for the realization of their inventions. At the same time, TTO adheres to the highest ethical standards, both in the protection of intellectual property and in partnerships with business. TTO is highly motivated for construction of infrastructure to support innovation activities at the University of Plovdiv Paisii Hilendarski. The success in its work is based on a set of values and motivation that guide the team, earning the trust of the university researchers and our partners. Standing at the border between science and business, the team supports academic entrepreneurship and

establishes connections with potential beneficiaries of innovative products and services. Members of the business development team liaise with both university researchers and external partners. Staff foster connections with industry collaborators, create comprehensive economic plans to advance technologies in laboratories across the university toward licensing and commercialization, and catalyze the launch of innovative projects.

A partner of the project is the Association for Support of the Development of the Intellectual Capital that is a non-governmental organization acting as consultancy and networking umbrella entity combining capacity and capability of experts in domains such as insertion of social innovation, usage of digital technologies, human aspects of industrial modernization, development of personal skills, support for disadvantaged people and ameliorating their carrier perspectives. The organization is based on voluntary membership of various entities and individuals all solidified around common goals towards raising intellectual capital of the country and across the EU.

The partners from abroad include “Gheorghe Asachi” Technical University of Iasi that is a prestigious Romanian university with the oldest tradition in engineering education; The University of Malta that is the sole public and highest teaching institution in Malta, with its structures being in line with the Bologna Process and the European Higher Education area; L'Aquila University, Italy, that is a public teaching and research institution offering a full range of academic programs including biotechnologies, economics, engineering, education, humanities, medicine, psychology, and sport sciences and the Çanakkale Onsekiz Mart University that is a public research university in Turkey. The strategic partnership contributes to the priorities to stimulate innovative learning and teaching practices and to support innovation and entrepreneurial skills of students.

2.2. Project Inclusion and Priorities

Even with similar educational achievement, students having poorer background have much less chances to retain into top rated university specialties than their privileged peers. Very often students from lower socioeconomic families encounter a virtual wall which blocks them from the moment of applying to the graduation at the end of their studies due to serious financial issues and widening gap between their daily routine and desired carrier. Scholars in education and sociology have observed generally that low-income students often feel alienated from their better-off peers, fear approaching professors, and lack the experience to exploit existing networks to arrange their future. Low-income students are more challenged by the pursuit of access to and academic success in university than their more affluent peers. These students are not only financially disadvantaged in comparison to their peers but are also culturally disadvantaged and constrained in their professional realization. Unleashing their potential will be in favor of their carrier development as well as in favor of society in general.

Education innovation is both a pedagogic and organizational challenge. Often the pedagogic dimension is the easier of the two. Universities are places of amazing intellect, creativity, and drive to create a better world, yet they are also places of competing aims, intricate hierarchies, embedded ways of working and intense workloads. To design and implement meaningful innovation, educators must connect with students. Their thinking needs to be informed by the actual, rather than partial or imagined, expectations and experiences of students. An ongoing dialogue with students should be brought into all innovative teaching initiatives. Students learn best when they feel part of an academic community to which they can actively contribute. Teaching, research, and support staff are most fulfilled when they feel that their work positively influences people and makes a difference.

The project will provide hands-on experience via offering students the opportunity to work on real-world projects and start their own businesses to help them apply what they have learned in the classroom [2]. The project promotes the culture of innovation by creating an environment that supports risk-taking, experimentation

and creativity by encouraging students to think outside the box and pursue their ideas. The project is aimed to encourage networking by connecting students with successful entrepreneurs, innovators, and investors to help them gain insights and build valuable relationships. As a side effect, the project will celebrate success to recognize and reward successful innovations and entrepreneurial ventures to encourage students to continue developing their skills and pursue their passions.

2.3. Added Value at European Level

The project provides opportunities for interaction between students from different fields of education. We are going to prepare target educational materials for them to provide training in entrepreneurship. Furthermore, the materials will be supplemented by meetings with successful entrepreneurs, who will share their experience with the youth. The shared values and aims toward start-ups and entrepreneurship will be the motion to participate and interact with other peers, even in common business projects because the contacts create the contracts.

The EU goals in this programming period are toward the development of entrepreneurship and more precisely academic entrepreneurship. Using different financial mechanisms and programs the EU strikes to gain more entrepreneurial initiatives and established business projects. According to Erasmus for Young Entrepreneurs, the students that have just started a business or intend to soon could qualify for the Erasmus for Young Entrepreneurs exchange scheme. The scheme - which is partly funded by the EU - allows students to spend some time in another EU country working for and learning from an experienced entrepreneur. To qualify for the scheme, students must be able to demonstrate their motivation and firm intention to start a business. They will have to present a solid business idea, including a realistic business plan. In this regard, the efforts of the project team will complement the participation of more students in the program.

Alongside, performing such research across different European countries will contribute to identifying the common issues regarding academic entrepreneurship, and particularly the opportunities of the disadvantaged groups of students. The identification of common challenges will allow the partners to propose approaches to overcoming the gaps and improving the entrepreneurial environment at the universities especially for disadvantaged students.

3. Needs that the Project Addresses

In January 2023 the National Statistical Institute of Bulgaria [3] published a series of results from the last population survey where migration for educational reasons has been put at second place after seeking for a job (19,1% as mean value among men and women). Internal migration for studying is well known by all universities across the country. The capital is notorious as an attractive center for young people from all regions to move to for their higher education. A similar flow though with lower intensity is seen in the biggest university cities outside the capital. Such migration requires stable financial support by the parents and poses needs for temporary job and increased expenses for rent and subsistence to those who cannot rely on sufficient support from home.

Unlike the opportunities for temporary student jobs related to their future specialties provided in the capital area, those in the other regions are significantly fewer. In this way the students are forced by reality to work in positions requiring low-level qualifications and sometimes very far away from their field of studying. While for some student groups such as students in technical specialties there is some possibility of work in the same field, for students in economic programs for example finding a temporary job related to their courses becomes mission impossible. Very often such students coming from smaller towns and having weak financial family support work as executive staff in non-stop shops, clothing stores, restaurants, etc. till the moment of getting their diplomas. Thus, those young people lose their motivation for

self-improvement in the selected carrier field and face serious barriers in the transition period from study to work. In this regard, the initiating team wants to address the following needs of the targeted students:

- To be introduced in near-real business environment matching developed skills during studying and practice of enterprises in terms of management, finances, administration, economics, and accountancy.

- To be inspired to follow the entire way from theory to business reality on the surface of academic entrepreneurship.

- To be allowed to take practical action towards addressing the needs of business by means of science and thus to be supported in unfolding their creativity and research initiative.

- To meet peers with similar challenges and to exchange experiences to explore their strengths.

- To be equipped with a variety of examples which they could follow to solve situations which they could face after graduation.

The overall activity framework of the project has been designed with the purpose of addressing the needs targeted for intervention. The framework will be realized through the thematic work packages which cover the specific project objectives. This will guarantee achievement of the envisaged end state as well as will ensure proper monitoring and loopback. In this regard the project embeds the logical chain needs - objectives – activities in the following way:

- Introduction in near-real business environment which matches developed skills during studying and company practices by revealing trends and influencing factors on students' entrepreneurship

- Inspiration for following the way from theory to business reality on the surface of academic entrepreneurship by closing the gap in cultivating academic and students' entrepreneurship

Both elements above will be done within the WP2 and through its outputs and results – methodology content and workshops.

- Taking practical action towards addressing the needs of business by means of science and launching creativity and research initiative by creation of methodologies for entrepreneurial education among the targeted students. This will be addressed by WP3 and respective outputs and results – developed training content and organized piloting events.

- Meeting peers facing similar challenges and exchanging experience how to explore strengths by series of lectures, seminars, and workshops

- Provision of a variety of examples which students could follow to solve problematic situations in their future carrier by development of Entrepreneurial Journey based on Academic Entrepreneurship Roadmap.

The two needs above will be addressed within WP4 through creation of model materials and organizing exchange events.

4. The Potential Wider Impact of the Project

Successful project achievement is seen by the initiating team as a measurable and positive result that is received upon completion of a project's aims and outputs as well as throughout all organized activities. It is a process of achieving a desired outcome within a project under certain criteria that determine success and failure of the project, and it will start well before actual project implementation and will last after the official project end. The team will apply the following basic steps to gain successful project achievements:

- Setting SMART goals that clearly explain what to achieve within a project

- Detailing the goals to make the path to achievement shortened and easier

- Estimating and allocating all necessary resources, such as time, knowledge, funds, skills, etc.

- Assigning the goal elements in the efforts and do the work

- Monitoring and controlling performance

- Completion of the goals and confirmation that these have been successfully achieved.

The team will assign project objectives as subsets of the general project goal. Such short-term tasks will be essential for achieving consistency within the project staff and reaching the project goal. Project objectives will serve as milestones, spread across the project, that are communicated to the team in measurable detail. While project goals have a measure of vagueness attached, objectives will be clearer for all involved staff.

The SMART acronym stands for Specific, Measurable, Achievable, Realistic, and Time-bound. It is a definitive approach to finalizing project objectives. The SMART approach adopted by the team will implement the elements as follows:

- Specific – All stage objectives of the project will be clearly defined. The team will express the 5Ws and H of the objective (Why, Where, When, Who, What and How) into tangible determinants, so no project objective will lack clarity and specific details.

- Measurable – The objectives will be quantifiable. For this purpose, the team will use impact gathering questionnaires measuring indicators in quantitative and qualitative aspects.

- Achievable – While considering an objective, the team will be able to determine what needs to be done to achieve it. Then the answer will be how to do that.

- Realistic – The achievement of the project objectives must be a realistic possibility. For this purpose, achieving the objectives will be bound to the timeline and the budget. The resources, knowledge, skills, and support required for the project objectives will be constantly revised by the team to decide if the achievement is realistic.

- Time-bound – The project is time-bound, and it won't go on as a perennial exercise. In this way, its objectives will have a clear deadline that is communicated to all team members. The completion of one activity very often is dependent on another activity. In such cases, the time allowed will take into consideration all such dependencies.

Participation in the project will contribute to the development of the involved organizations in the following ways:

- Improving skills and knowledge: Participation in the project will provide opportunities for organizations to build skills and knowledge in areas related to the project objectives. This will help organizations to grow and improve their capabilities over the long term.

- Networking and collaboration: Participation will facilitate cooperation with other organizations, helping organizations to build relationships and partnerships that can benefit them in the future.

- Exposure to new ideas and approaches: Participation will bring organizations to new ideas and approaches, providing them with opportunities to learn from others and to incorporate best practices into their own work.

- Building reputation and credibility: Successful participation in the project will help organizations to raise their reputation and credibility, to increase their visibility and to attract new opportunities in the future.

- Access to resources and funding: The participation will provide organizations with access to resources and funding that can support their ongoing development and growth.

The team intends to utilize impact assessment as a tool for planning and decision-making to evaluate the possible outcomes of the project. Numerous variables will be considered during the assessment process, which will also identify ways to lessen the negative effects of projects. Better judgments about a project can be made early on, during the planning stage, thanks to the impact assessment processes. Additional benefits will be demonstrated by strengthening participant safeguards, lowering the chance of causing environmental damage, preventing negative effects, boosting positive effects, and improving public and core target group comprehension of project consequences. [4]

The team will evaluate whose purpose is to attribute outcomes and impacts to project operations. This will be done by establishing a counterfactual, which is what would have happened in the absence of the envisaged project activities and deliverables. Establishing a counterfactual in turn will be accompanied by creation of a monitoring group which won't receive project services but which will be like project participants in terms of observable and unobservable characteristics.

The project team will apply the following steps:

- Assessing the impacts both intended and unintended of all project actions, measuring the magnitude of the influence, and determining the causal factors.
- Improving the effectiveness of accomplished and planned project activities and assigned tasks.
- Getting informed decisions about remaining activities, tasks and available resources.

5. Conclusion

The desired impact will equally benefit each participating organization as the developed materials will be used in their training process.

On local level the project will impact the following groups:

- Raising the attractiveness of the scientific achievements through facilitating the touch among students, researchers, and business
- Expanding and complementing the capabilities of students with disadvantaged background
- Raising positive attitude towards EU projects and the EU goals for growth based on innovation and science.

On national level the project will impact:

- Other students as users of the elaborated content through their active involvement in learning processes, stimulating developing of practical and critical thinking, problem solving, reasoning, synthesizing information, posing of interrogative questions, ameliorating personal confidence, ability to decompose complex notions, adaptability, capability for presenting, listening, teamwork, etc.

- Stronger interconnections among different university faculties towards fruitful transfer of scientific inventions to real business.

On European level:

The project will establish a network among organizations with similar profiles. It will concentrate efforts of various actors towards common challenges in development of new generation specialists with proper view on how to address the needs of business and to raise its efficiency. Sharing and promoting the project results is essential for uptake and further use of the developed outputs and keeping the impetus of the activities.

Successful sharing and promotion of project results and developed project outputs in terms of their sustainable use is related to several criteria, which should be presented at the first stage as a basis for the development of the project outputs. Project results can only be of sustainable value and use if sharing and promotion of them is well planned and implemented at different levels. The strategy aims to support all activities in the fields of sharing and promotion and sustainability by presenting general aspects as well as specific information to be used by each project partner according to the national sharing and promotion plans. Furthermore, the strategy tries to highlight specific indicators for achieving high impact as well as for how high quality can be assured in the implementation of the sharing and promotion process.

The next step of project development is focused on the development of research design and research methodology. It is planned to be presented at an international conference. In this way, this desk work contributes to the general project objective on exploring the ways for success in entrepreneurial activities to trigger students' initiative in an adapted way bringing together students from various social categories with focus on those who are discouraged in their study and lagging their peers. However, this addresses the second project specific objective on closing the gap in cultivating academic and students' entrepreneurship by creation of methodologies for entrepreneurial education among the targeted students.

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Stock management strategy

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Abstract: *The set of methods and rules in the process of providing raw materials can be considered a strategy for stock management. Each strategy is associated with specific and expected costs. Still, optimally, we can call that strategy that, under the given conditions, leads to minimal expenses related to the material provision of the studied system. Part of the stock management process is establishing the timing of the deliveries, the necessary volumes and the distribution of the incoming lots to the various warehouses and units. The search for optimal strategies is subject to the theory of optimal stock management. This makes it possible to release significant funds frozen in the form of stocks, which leads to increased efficiency of the material resources used. The optimal inventory management strategy and flexibility also lead to improved production processes and reduced and excluded possible interruptions caused by lack or shortage of materials. The stock management process influences the planning, forecasting, and fulfilment of production needs and orders.*

The elements of the business system described so far, in which raw materials, materials and their stocks have a significant impact, show the importance of the stock management strategy of each economic unit. That the chosen and functioning system is optimal is a substantial part of the overall success in any enterprise or other form of business process implementation.

Keywords: MATERIALS, STOCK, OPTIMIZATION, EFFICIENCY, STRATEGY, COSTS, BENEFITS

1. Introduction

Stock management is one of the most critical logistics activities, influencing the rest of the logistics and management activities of the company. By their very nature, inventories are manufactured products that are fit for use. Still, they are temporarily not involved in consumption but are stored to ensure a continuous production and delivery process. Material stocks in companies are formed for various reasons, such as:

- Producing a larger quantity of products that are expected to be sold over a longer period to reduce production costs.
- Purchase of larger quantities of raw materials and materials due to a discount on the price.
- Use of price discounts for transporting larger quantities of raw materials.
- Created warranty stocks due to uncertainty in future supplies of raw materials and materials needed to produce products.
- Expected a delay in the supply of raw materials and ordered a more significant quantity so as not to interrupt the production process.
- Seasonality of raw materials and materials that are used in production and stocking in larger quantities.
- Speculative pricing.
- Creation of the so-called promotional stock due to the company's planned promotional campaigns to sell products and the need for ready-made products to meet increased demand.

Stock management in companies is carried out by analyzing various indicators, among which the size of material stocks at a particular moment and the average size of stocks are of primary importance [1]. Point-in-time inventory analysis measures the amount of inventory in a company on a specific day, week, month, or year to assess a company's ability to produce products and fulfil customer orders. The average stock is calculated as the arithmetic mean of the stock at a certain point in time. Relative metrics related to inventory analysis, measuring the amount of inventory using absolute metrics for inventory, sales volume, and product consumption [7]. Such an indicator is inventory turnover. The company's stock management approaches are determined depending on the demand for products produced by the company, which determines the demand for material stocks necessary for the implementation of production and performance of the activity to achieve the defined short-term and long-term development goals.

2. Specificity of stock management strategy

2.1. Nature of stock

Stock is part of the assets of enterprises from which they can participate both once and repeatedly in the production of goods or the provision of services, transferring their value to the cost price of the manufactured product/provided service. As assets, inventories are held for sale in the ordinary course of business, being in the process of production for such sale, in the form of materials or stocks consumed in the production process or the provision of services [4]. Stock can take different forms, such as materials acquired primarily through purchase and intended primarily for input into the production process to produce output or services. When the enterprise considers this, it can also be subject to direct sales. Material stocks can also be in the form of production, created because of a production process in the enterprise and intended for sale; goods acquired mainly by purchase and intended for sale; work-in-progress, representing a set of costs from which output is expected to be produced; investment in inventory – tangible assets acquired for investment purposes and not for use [8].

2.2. Need for stock management strategy

In each enterprise, material flows pass through all the chain links, which in turn are subdivided into three additional ones. The first chain covers the movement of raw materials from suppliers to the manufacturing plant. The second chain includes the logistics units in the enterprise itself, and the third - is the finished product from the manufacturing enterprise to its customers. The information flow between the units in the logistics process is two-way. Various types of information are exchanged between them. Information is obtained from customers about the expected quantity demanded and the sales that the enterprise can realize within a certain period. For its part, the company sends its existing and potential customers offers and information about the production it can produce for this period. Based on the results, the suppliers are provided with information about the need for a specific type of raw materials and materials that must be delivered [1]. The commercial-practical relationship characteristics of the participants within the macro-logistics process determine the financial flow. The financial flow is in the opposite direction to the material flow. The specified types of flows are carried out from the place of loading of material flows to the end users, and in various cases, there is also a reverse movement, which is back along the supply path. This reverse movement defines reverse logistics. Information flows, because of which movement of material flows is achieved, are extremely important for the implementation of logistics. The information flows in logistics are provided by monitoring, counting, and measuring facts transferred on different media. In its essence, stock management strategy is a system of approaches methodology principles for the planning, control and management of production,

transport, storage and other tangible and intangible operations related to the process of supplying raw materials, materials, components for embedding and others to the enterprise; their storage and movement to workplaces; the movement of intermediate products between them; delivery to warehouses for finished products; the delivery of finished products to end customers and users by their needs and requirements; the transmission, storage and processing of the relevant information. The need for a stock management strategy is determined by the need to have a process of managing the movement and storage of items of work, finished products, information and related cash payments to suppliers, transport companies, etc., on the one hand, and cash receipts from customers of the enterprise, on the other. The use of stock management strategy allows for predicting the needs and requests of customers; acquiring the capital, materials, people, technology, and information necessary to meet those needs and demands; optimizing the network producing goods and services to meet customer demands; and using the network to fulfil customer requests promptly [4]. Stock management strategy is the implementation and integrated management of material and related flows from their loading point through all phases and stages of movement to end users to ensure the necessary level of customer service with minimum costs. In the implementation of logistics, many activities are included through which the movement of material flows is achieved. In the processes of stock management strategy, suppliers, transport companies, production companies, customers of the company and all its personnel are involved - material flows, information flows and financial flows flow between all participants in the stock management strategy [6].

2.3. Effectiveness of stock management strategy

The organization of the stock management strategy is influenced by various factors, depending on the tasks that need to be solved, namely financial optimization, in terms of the provision of materials and coordination with other logistics activities, as well as researching the market for the supply of goods, purchase and storage of the goods, as well as their storage and transportation [2]. A reduction in total costs should be achieved by reducing the time of routine operations such as:

- Shipment coordination is done through warehouse management systems (such as SAP) through a set of transactions, not through phone, fax and e-mail.
- Calculation of the various types of reports for the needs of the current implementation control within the enterprise, as well as for the authorized state institutions.
- Extraction of information necessary for making managerial decisions about the commercial strategy of the enterprise. This, in turn, increases employee capacity and reduces the need to commit labour within the ever-expanding business.
- Strict control over customer receivables.

Thanks to the shared database, the stock management strategy allows one to report the amounts due to a customer in real-time, not only to a specific supplier from the group but also to the general obligation [3]. The system automatically blocks any subsequent shipment to a given customer if his liability exceeds the limit set by the credit manager. In this way, the control is technically realized, but it also avoids the accumulation of costs on provisional or uncollectible receivables, which in many cases can amount to significant amounts. The cost of storing raw materials, materials and finished products is reduced. Through good planning of production and shipments, which the system allows, an analysis can be made for the production needs of raw materials. This will lead to the provision of time and moral determination of contingent suppliers, the selection of the most favorable offers for the delivery, and the reduction of warehouse costs for storing raw materials and materials [8]. The planning of the expeditions allows for arranging

the logistics in the warehouses for finished products and reducing the costs of transport to the warehouse and rent of warehouse premises. Other benefits are reducing the risk of claims and payment of compensation in case of delay or cancellation of delivery and increasing income from logistics activities. This direction is associated with developing a central sales system common to the entire group, which provides the possibility of remote access. The main advantages of the stock management strategy system are easy real-time access to statistical information, necessary for the timely making of adequate and suitable management decisions in the field of commercial communications and negotiations and achieving the most favorable conditions for the group at the time of sale; allows access to information, enabling the realization of market opportunities that would be missed in case of delay or lack of data.; helps to achieve the so-called "total quality", defined as the totality of product and service qualities associated with delivery [7].

The system allows a quick response to inquiries. It shortens the process and processing time of offers and orders, guaranteeing security and reliability when coordinating shipments and satisfying the client's requests. Depending on the place and direction of movement of material flows within the enterprise, incoming, internal and outgoing processes are distinguished, which must be included in the logistics and stock management strategies. Inbound (delivery) logistics is a logistics process consisting of moving material flows from suppliers to the enterprise. The main goal of delivery logistics is to deliver the necessary items of work at the right time to the right place in a way that minimizes transport and storage costs and ensures the rhythm of the production process. As participants in the delivery logistics process in each production or commercial enterprise, the individual logistics units of the logistics system are considered - the suppliers, the units for transport services, the "Enterprise Supply" department and the specific functions they perform supply, information, and warehouse. Internal stock movement includes the logistics processes and flows that take place within the enterprise itself. Its scope includes material and information flow from the warehouse for raw materials and materials to the relevant production units in the enterprise. The movement of flows between the production units themselves [1]. The movement of the flows from the production units to the storage units of the finished product and its shipment. The primary task of stock management strategy is optimizing the logistics processes and related operations within the enterprise's production system. As a result, saving time and labour, minimization of movement costs and optimization of the level of material stocks maintained in the enterprise warehouse is achieved [5].

Achieving efficiency from a stock management strategy requires the solution of various tasks, including operational-calendar planning of the finished product; operational management of technological production processes; comprehensive quality control; strategic and operational planning of the supply of material resources and material stocks; organization of the domestic production warehouse; forecasting, planning and rationing of material resources in production; organization of the work of internal production technological transport; control and direction of material resources, work-in-progress, semi-finished products and finished products at all levels of production; physical and internal production distribution of material resources, finished products, etc. Outbound (distribution) logistics, which covers the movement of finished products from the enterprise to the final points of sale, is of essential importance for the effectiveness of the stock management strategy [6]. Characteristic functions are like those of supply logistics, with the difference that material flows from the enterprise to its customers are covered. The main goal is to ensure the delivery and availability of the necessary products in the required quantity at the right place and time while minimizing the costs of transportation, loading, and unloading and warehouse activities. Within the framework of the stock management strategy, the tasks related to the outbound logistics refer to the planning of the process of implementation and production; organizing the receipt,

processing and execution of requests; choosing suitable transport packaging by type and quality; organization and implementation of transport control; organization of after-sales service (service); selection and application of a distribution scheme for the material flow of finished products; determining the optimal number and distribution of warehouses in the serviced areas; the optimal level of warehouse stocks, the point and days of requests and their fulfilment are determined [7].

In recent years, inventory management has increasingly been digitized. Digital transformation is a process in which the organization begins to work with more and more digital technologies in its daily activities and the production of its products. Digital transformation replaces traditionally used business processes with innovative ones dictated by new customer requirements and their market behaviour. Digitalization involves changing the information technologies used to change the existing business processes. Therefore, information technology is critical in exploiting new business opportunities by changing existing business processes, such as communication, distribution, or business relationship management. Through digitization, companies apply digital technologies to optimize existing business processes by enabling more effective coordination between processes and creating additional value for customers by improving their service. Digital transformation has several benefits for companies, providing an opportunity for innovation, cost reduction due to changes in business processes and increased productivity, despite the currently limited scientific research proving the benefits indisputably. However, reaping these benefits requires the companies' overall commitment and identification of the company-specific factors that significantly impact digitization. The companies' internal capabilities, the availability of human and technological resources, the factors related to the changes, and the adopted leadership style are the three main internal factors influencing the time required and the effectiveness of digitalization. About factors external to the organization, all aspects included in the business environment in which the company operates, such as the availability of resources, government policy, economic development, etc., can have an impact [8].

In stock management strategy, digitization can be a prerequisite for improving stock management and significantly reducing operating costs. The appropriate application of digital technologies within various logistics operations will allow the organization to achieve competitive advantages. From optimizing activities in resource planning and warehouse management systems to implementing intelligent warehouse systems, digital technologies influence and support the logistics industry within multiple activities while ensuring the preservation and security of data. Digital technologies can also be integrated into the supply chain as they are used for data processing. Digitization will allow the company to change the logistics processes used and provide real-time data for supply management, as well as change the visibility of the integrity control implemented in the supply chains - the right products at the right time, place, and quantity, with optimized logistics costs. Real-time monitoring of the means of transport used for logistics will reduce logistics fuel costs and optimize the use of transport and warehouse space for stock storage. Another benefit for companies from using digitalization is improving customer service by increasing service quality and satisfying customers' demands for fast service.

3. Conclusion

The processes and activities in the stock management strategy are aimed at planning, implementing, and controlling the procedures for the transportation and storage of materials, aiming to create products and services to satisfy customers' needs. Within the production process, the stock management strategy includes integrated management of the movement of the material flow - incoming flow (supply), internal flow (production) and outgoing

flow (distribution). Depending on the individual stages through which the material flow in the company's output passes, three subsystems of logistics are distinguished: supply, production and distribution. The use of modern technologies allows efficient organization of stocks, as well as checking the availability of finished products by the customer service department to provide quick information to customers; the ability to check routes and available vehicles to organize delivery according to customer requirements; calculation of the cost of finished products; receiving a request to the warehouse for the preparation of finished products for shipment and preparation of the documents accompanying the goods, with the customer's data. Modern companies are highly dependent on suppliers, and the main goal when choosing them is to provide the necessary raw materials and materials according to production needs at the most effective costs possible. Choosing suitable suppliers shows how well the company can deliver customers' desired products. A central question before the company is how to provide the necessary materials and raw materials for production at low prices, guaranteeing security in terms of deliveries. In addition to the cost of materials and raw materials, a leading criterion is also compliance with delivery deadlines, which lead to shorter delivery planning periods on the one hand and, on the other hand, provide an opportunity to react to individual customer orders that are not satisfied by the standard products manufactured by the company. Finding external suppliers complying with the initially agreed delivery terms and having the ability to make deliveries in short terms ensures the security of the company's production and the efficiency of the organized logistics process. Customers' changing wishes can be realised quickly without requiring capital to secure many materials and raw materials. In conclusion, modern information and communication technologies provide a competitive advantage to companies and optimize the logistics and production process and the effective use of available resources. Automation of processes offers the opportunity to create innovative products in response to the changed requirements of modern customers, with optimal use of resources.

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The natural carbon sinks in the fight against climate change

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Abstract: Experts' climate models predict a continued trend in global warming over the coming decades. They present climate change as a major challenge to modern society with a clear and complex nature in various aspects – ecological, social, technological, economic and political. The EU's response to the challenges of climate change and the environment is contained in the Union's strategic goals and objectives for 2030 with a horizon of 2050, agreed in the Green Deal and the Digital Compass of the European Union.

The purpose of this report is to present the state of environmental indicators for Bulgaria and the region and the role of natural carbon sinks for their improvement.

Keywords: ECO-INDICATORS, CARBON SINKS, CLIMATE CHANGE, WARMING TRENDS

1. Introduction

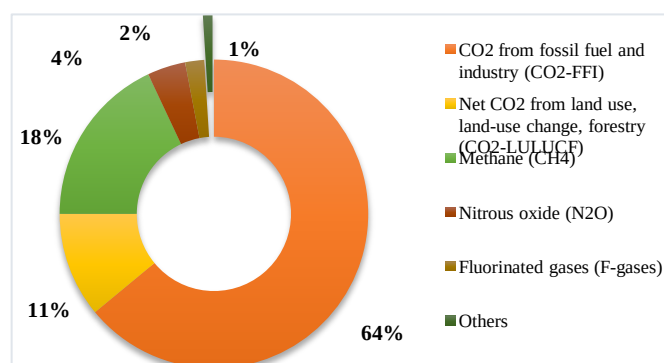
Climate change is among the main problems of our society. To a large extent, they are the result of human activity. Scientific studies show that the state of the environment has deteriorated over the past few decades. [1]

The main factor influencing climate change is the greenhouse effect. Certain gases in the Earth's atmosphere act somewhat like glass in a greenhouse, trapping the sun's heat and stopping it from returning to space, causing global warming. [2]

Greenhouse gases are the result of natural processes or human activity. Naturally occurring gases are changes in solar radiation or volcanic activity, but research shows that they contribute only about 0.1°C to overall global warming.

Human activity causes an increase in the concentration of gases such as carbon dioxide, methane, nitrous oxide and fluorine-containing gases in the atmosphere. Among the reasons causing an increase in greenhouse gas emissions are the burning of coal, oil and gas, deforestation by cutting down forests, the use of nitrogen fertilizers, etc.

According to the scientific community, human activity is the main source of climate change and carbon dioxide (CO₂) is the greenhouse gas that mankind emits in the largest quantities. [3] The latest data from the IPCC Climate Change report from 2022 [4] shows that CO₂ (CO₂ from fossil fuel and industry (CO₂-FFI) and Net CO₂ from land use, land-use change, forestry (CO₂-LULUCF) accounts for 75% of the total amount of greenhouse gases. In second place is methane (CH₄) with 18%, followed by nitrogen oxide (N₂O) with 4%, fluorinated gases (HFC, PFC, SF₆) – 2% and



others – 1% [5] (Fig.1).

Fig. 1. Distribution of types of greenhouse gases emitted by human activity

Source: IPCC Climate Change 2022 Report: Mitigation of Climate Change, https://www.ipcc.ch/report/ar6/wg3/IPCC_AR6_WGIII_FullReport.pdf

According to the latest report of the Joint Research Center [6], the distribution of global greenhouse gas emissions (Fig. 2) shows that carbon dioxide is the largest.

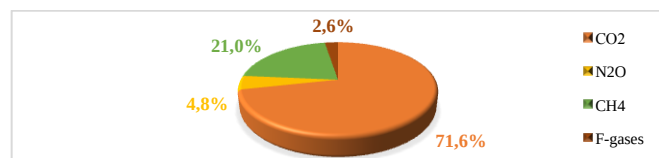


Fig. 2. Types of greenhouse gases in %, 2022. [6]

The increase in CO₂ has been significant over the last 5 decades (Fig.3) [7]

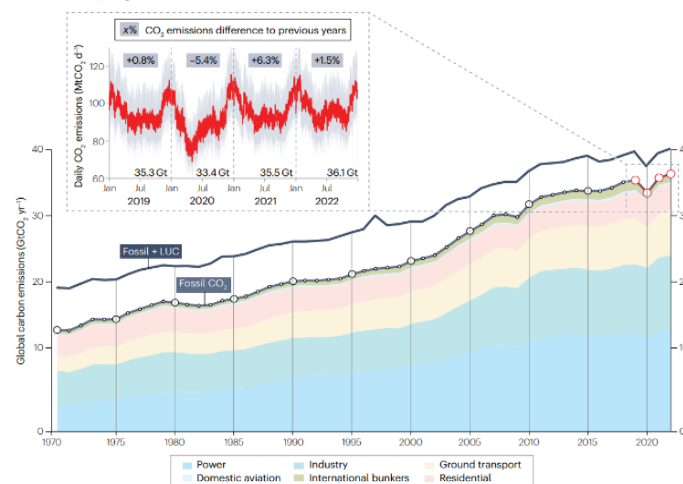


Fig.3. Global CO₂ emissions 1970–2022

Source: Liu, Z., Deng, Z., Davis, S. et al. Monitoring global carbon emissions in 2022. *Nat Rev Earth Environ* 4, 205–206 (2023). <https://doi.org/10.1038/s43017-023-00406-z>

The percentage distribution of the sectors causing CO₂ pollution are presented in fig. 4 [8]

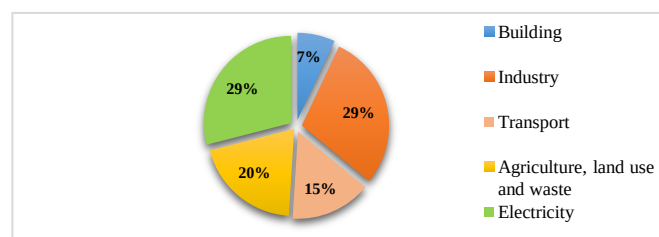


Fig. 3. Global emissions of CO₂ by sector

Source: GHG_emissions_of_all_world_countries_booklet_2023report.pdf

The data show that the sectors with the largest share in CO₂ pollution are industry with 29% and energy – 29%. In third place is the agricultural sector – 20%, followed by transport (15%) and building – 7%.

2. Literature review

The global warming trend is an important indicator of the scale of climate change and its possible consequences. [9] We witness natural disasters such as devastating floods, prolonged droughts,

forest fires, strong storms and hurricanes, unbearable heat. [10] The data shows that the global average temperature has risen more than 1°C from pre-industrial times, and the last 8 years (2015–2022) have been the warmest in human history. [11] (Fig. 4)

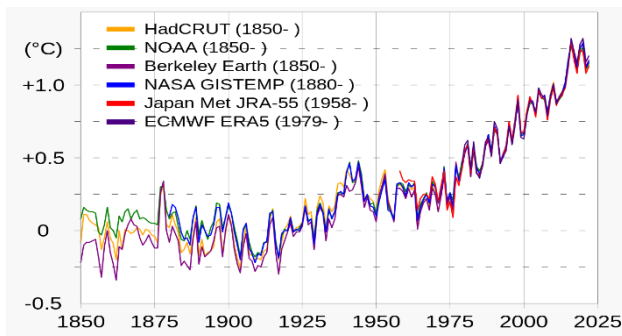


Fig. 4. Global average temperature change

Source: https://en.wikipedia.org/wiki/Instrumental_temperature_record

The data from various scientific organizations about the global average temperature of the planet are completely converging. In the figure, the value "0" is the average temperature of the period 1850–1900. It is considered pre-industrial temperature.

In the latest report of The European Union's Copernicus Climate Change Office, the past year 2023 was the hottest in the history of the planet. [12] The average temperature of the planet was 1.48°C warmer than the pre-industrial period 1850–1900. At this rate of growth, the probability of the worst predictions coming true is very likely. The forecast of global warming trends is shown in Fig. 5.

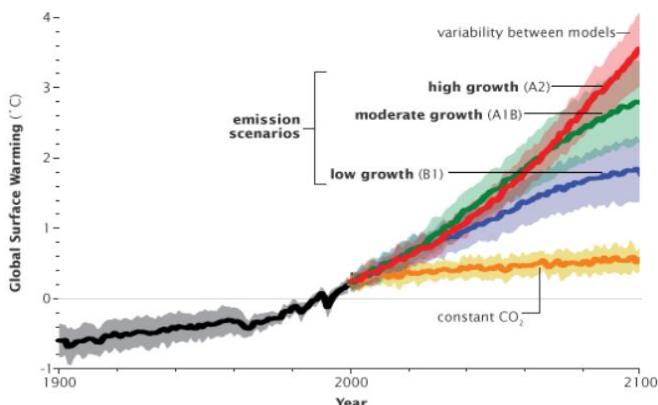


Fig.5. Global warming forecast

Source: <https://earthobservatory.nasa.gov/features/GlobalWarming>

According to the model of Earth observatory NASA, increasing fossil fuel consumption will affect greenhouse gas concentrations and they will continue to rise. As a result, the average surface temperature of the Earth will rise. The model, reflecting a range of likely emissions scenarios, shows that the average surface temperature could rise between 2°C and 6°C by the end of the 21st century. [13]

According to the report by the Joint Research Center (JRC), the European Commission's science and knowledge service in 2022, the country that generated the largest volume of CO_2 emissions is China with 29.2% of global emissions. In second place is the USA with 11.2% followed by India (7.3%), EU 27 (6.7%) and Brazil with 2.4%. [13]

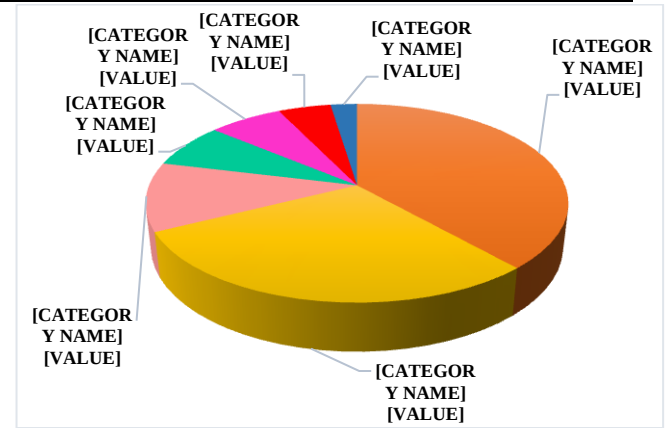


Fig. 6. GHG emissions (%) and contribution of the major emitting economies and the rest of the world in 2022

On 28 June 2021, the EU adopted the European Climate Law as a key element of the European Green Deal aimed at achieving the Union's ambitions to reduce greenhouse gas emissions by 55% by 2030 compared to 1990 levels and to achieve climate carbon neutrality by 2050 to build a zero-emissions society and economy.

Carbon neutrality refers to a state in which greenhouse gas emissions caused by human activity equal the amounts that are captured and released into the atmosphere. [14] In this regard, on 14.03.2023, the EC adopted a law on carbon sinks from the land use and forestry sector. The aim is to increase carbon sinks in the EU by 15% by 2030. All member states set binding national targets, with penalties for non-compliance. For Bulgaria, the value of net greenhouse gas emissions must be reduced by 9.718 million tons of CO_2 equivalent by 2030.

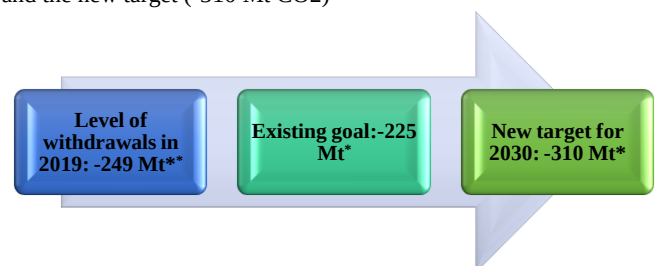
A greenhouse gas sink is any process, activity, or mechanism that results in the removal of a greenhouse gas, precursor, or aerosol from the atmosphere. [19]

Under the current regulation (from 2018), each member state must ensure that emissions from the sector are offset by at least an equivalent amount of removals in the period 2021–2030. The new rules envisage a two-step approach to achieving the new target, containing two phases (2023)

Under Phase 1 - until 2025, the current system remains in force, with each member country obliged to balance emissions and removals.

According to Phase 2 - in the period 2026 – 2030, the new target (at EU level) of net removals of 310 Mt should be reached.

In fig. 7 presents the status of the level of carbon sequestration in the EU in 2019 (at 249 Mt CO_2 , the current target (-225 Mt CO_2) and the new target (-310 Mt CO_2)



*Mt = million tons of CO_2 equivalent

Fig. 7. Status, current target and updated target for CO_2 sinks from the land use and forestry sector

Given that plants and especially trees are natural sinks that absorb CO_2 from the atmosphere and capture it as part of the photosynthesis process, the removal of CO_2 through carbon 'sinks' has become an EU policy priority.

3. Research and discussion

Plant species and especially trees are natural sinks that absorb CO₂ from the atmosphere and capture it as part of the photosynthesis process. Removing CO₂ through 'carbon sinks' has become a priority of EU policy. A greenhouse gas sink is any process, activity, or mechanism that results in the removal of a greenhouse gas, a precursor, or an aerosol from the atmosphere.

The land use and forestry sector absorbs more carbon than it emits into the atmosphere. This defines it as a net carbon sink. Forests in the EU absorb the equivalent of almost 10% of all greenhouse gas emissions generated by the Union. [15] The EU has an area of 4.104 million km², and the total area of forest massifs by 2021 is 159 million hectares, occupying 39% of the territory of the countries in the Community. In five of the countries, more than 50% of the territory is occupied by forests (Fig. 8).

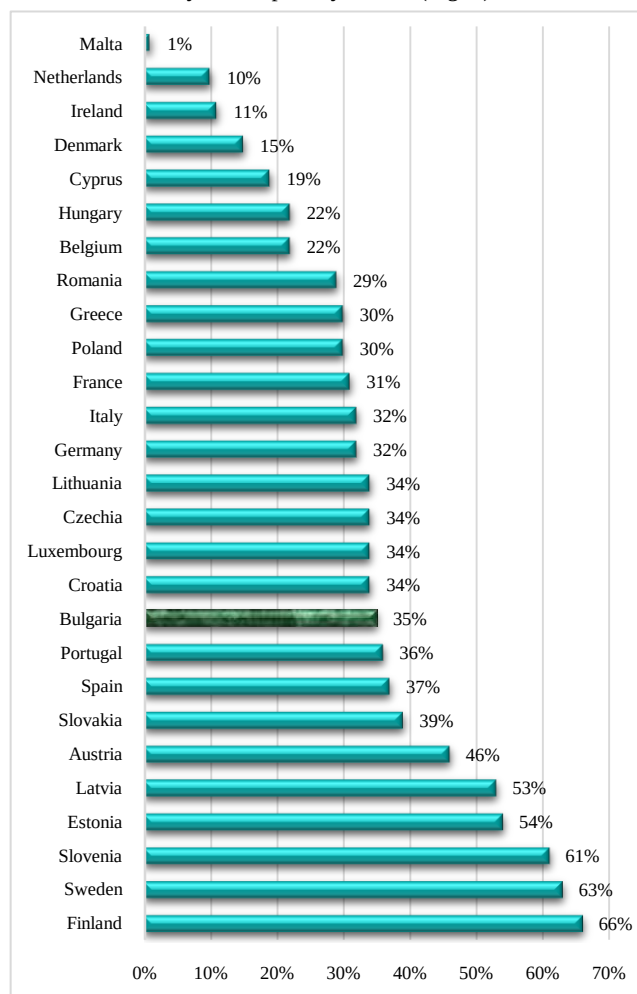


Fig. 8. Areas covered by forests in EU countries, 2020

Source: <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/edn-20210321-1>

Among them are Finland (66%), Sweden (63%), Slovenia (61%), Estonia (54%) and Latvia (53%). There are 14 countries with forested areas in the EU between 30% and 50% of their territory. Bulgaria is among them. Bulgaria is in 10th place with a 35% share of forest massifs compared to the total area of the country. Eight European countries have less than 30% forested areas. Last in the ranking is Malta with 1%. [16]

Forests and the forestry sector are an essential part of Europe's transition to a modern, climate-neutral, resource-efficient and competitive economy. According to statistics, fallow land in the EU-27 in 2019 was approximately 6.1 million hectares, which is equivalent to 6% of the Union's cultivated agricultural land. The share of fallow land varies considerably between Member States. The data from Fig.9 show that Spain owns the most of them. [17]

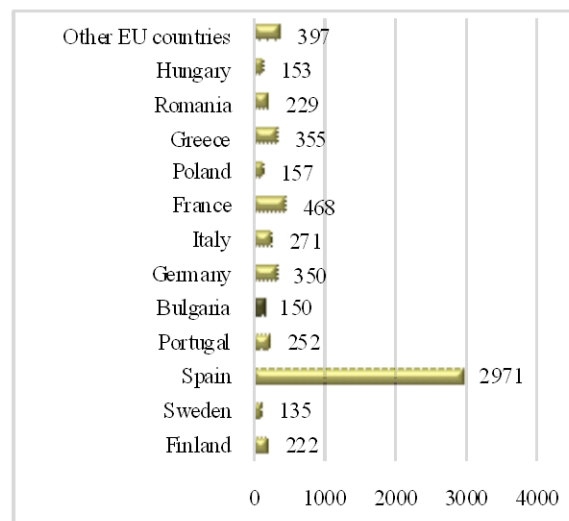


Fig. 9. Wasteland in EU countries, 1000 hectares in 2019

Source: <https://eu.boell.org/sites/default/files/2022-04/E-land.pdf>

Data from the inventory of greenhouse gas (GHG) emissions as of 2020 in Bulgaria show that the total CO₂ emissions in the country are 55,25 gigagrams (Gg) without taking into account the absorption by the "Land use, land use change and forestry" sector (PGMS). Taking into account the absorption by the LULUCF sector, the net emissions are 43.75 Gg. (Fig.10) Compared to 2005 data, the 7.85% decrease from 2005 levels. [18]

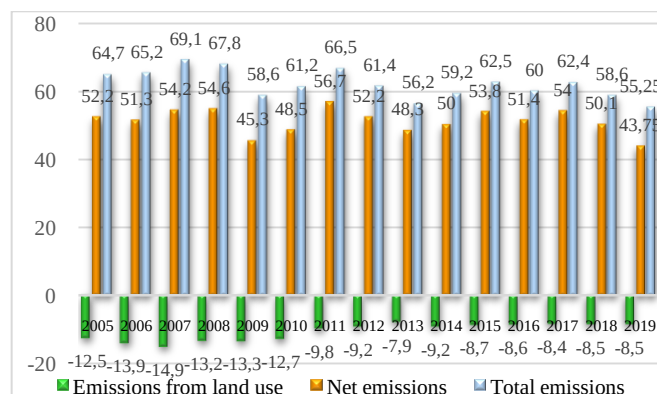


Fig. 10. Total emissions of greenhouse gases in Bulgaria, 2005-2019, million tons

Source: <https://eea.government.bg/soer/2019/climate/climate1>

Sectoral distribution of pollutants with greenhouse gases in Bulgaria is presented in fig. 11. The energy sector (22.66 million tons) accounts for the largest share, followed by the transport sector (9.77 million tons) and agriculture (5.22 million tons), manufacturing (4.6 million tons) and waste (3.89 million tons), industry (2.39 million tons), buildings (1.29 million tons), fugitive emissions (1.00 million tons), aviation and shipping (0.97 million tons) and other fuel combustion (0.46 million tons).

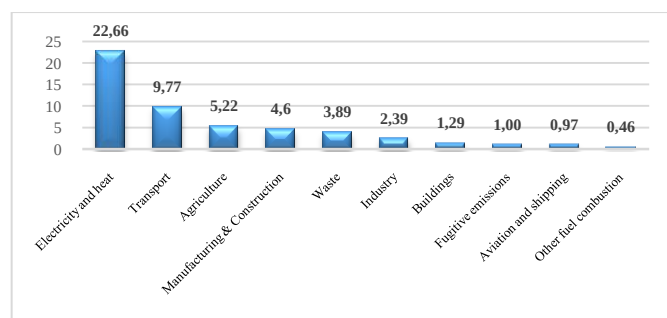


Fig. 11. Distribution of greenhouse gas emissions by sector in Bulgaria, 2022, million t.

Source: <https://ourworldindata.org/ghg-emissions-by-sector/BGR>

By the end of 2023, the Bulgarian forest and timber sector has the opportunity to offset about 20% of CO₂ emissions. If properly managed, the sector can contribute to mitigating the effects of climate change and achieving the EU's low-carbon strategy through - afforestation on larger, vacant and infertile areas. Besides being carbon absorbers, forests serve as reservoirs for biodiversity and a source of woody biomass that replaces fossil materials and further develops a biologically based circular economy, both in Bulgaria and in the EU.

The data on the volume of afforestation activities and the total annual size of the afforested forest areas in the period 2013-2021 is uneven by year: 2013 - 1255.8 ha, 2015 - 2638.2 ha, 2021 - 1793.5 ha. (фиг. 12) [20]

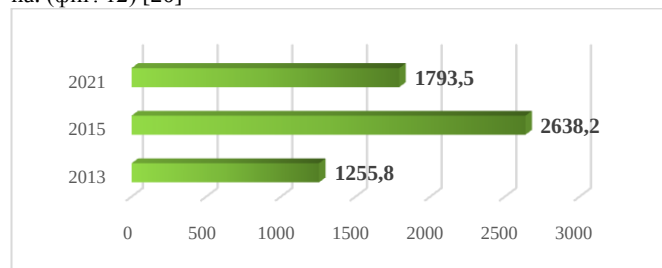


Fig.12. Total annual amount of forested forest areas for the period 2013-2021, in hectares

In fig. 13 shows the distribution of forest territories according to the type of ownership. [21]

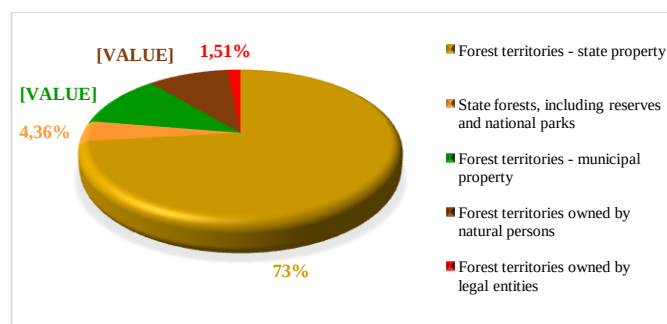


Fig.13. Distribution of forest territories by types of ownership, in %
Source: Forestry Executive Agency, Annual Report, 2021
https://www.iag.bg/data/docs/Doclad_str20_04.pdf

The data show that only 1.51% of the forest territories are owned by legal entities. Considering that the enterprises from the industry and energy sector in the country are the largest generators of carbon emissions, it is striking that they do not commit to acquiring, afforesting and maintaining forest areas to absorb the emissions emitted by their activities.

Conclusion

Forest massifs have a key role in maintaining ecosystems in nature and in balancing the emissions of greenhouse gases formed as a result of human activity. The "polluter pays" principle can be used as the "polluter pays". Achieving carbon neutrality does not mean not generating emissions, but using technical means or natural carbon sinks to clean up CO₂ emissions to achieve carbon neutrality in terms of climate.

Acknowledgments:

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Leadership as an imperative of the motivation: research design

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Abstract: *The paper presents a methodology focused on the leadership style assessment based on exact characteristics of the business environment and their influence on the employees' motivation. The conceptual framework is to explore the correlation between the applied leadership style, the level of uncertainty of the external environment, and the motivational level of the followers. In this regard, the paper aims to find dependencies among the leadership style and its behavioral application towards the level of motivation. Based on this research design, it is possible for the managers to implement a specific approach that will increase the employees' motivational level in a concrete level of uncertainty of the business environment. The application of the methodological conditions in organizations from different industries can be beneficial for managers to smooth out an effective and cohesive team, which together overcomes threats from the external environment and the continuous confrontation with new crisis situations.*

KEYWORDS: LEADERSHIP, MOTIVATION, CRISIS, UNCERTAINTY, TOURISM INDUSTRY

1. Introduction

New realities in business organizations necessitate new forms of communication between leaders and followers. There are numerous leadership and motivation theories in the scientific literature, but the relationship between these aspects of management, particularly how the dominant use of a certain leadership style at a specific level of uncertainty in the external environment affects employee motivation, is unclear. Although many authors have outlined motivational management as one of the leader's primary tools, there are gaps in this area and opportunities to focus research efforts.

The topic's importance is relevant to the Bulgarian economy, given the acceleration of technology, the increasing dynamics of strategic events, and the new labor realities, which have placed a large portion of organizations in a complex situation of competition for managers with appropriate environmental skills. Improving management quality using an optimal leadership style is one approach for companies to invest in human capital, which is a critical factor in increasing competitiveness. **The purpose of this paper** is to present a methodology and a methodological consideration for evaluating the leadership style in specific characteristics of the environment and their influence on employee motivation.

The object of the study is managers of all levels (including linear, middle, and senior management) in accommodation places that are categorized as three, four or five stars, as well as the followers of the formal manager.

The objective is to explore the correlation between the prevailing leadership style applied by the leader, the level of uncertainty of the external environment and the level of motivation in the leader's followers.

The research thesis is that finding a clear relation between the leadership style at different levels of uncertainty of the organization's external environment will affect the level of motivation of followers in the business organization. Finding specific dependencies between the leadership style and accompanying behaviors and the level of motivation, it is possible to adopt such an approach from the manager, which will maximally motivate the employees in the organization at a certain level of uncertainty of the external environment.

The paper is organized as follows: after the introduction, the preliminary considerations about the methodology development are presented in the second part. The latter paves the way for the third section, which focuses on methodological development. The fourth part presents the research instruments. The paper concludes with the potential wider impact of the methodology and recommendations for future research in the field of investigating leadership, motivation, and the impact of the environment.

2. Considerations Regarding the Creation of Research Methodology

2.1. Preliminary Considerations

In creating the Research Design of the study, it is important to adopt the following considerations. The term environmental uncertainty represents an aggregate indicator that is a function of the levels of complexity, dynamism and resource availability of the external environment. The uncertainty of the environment makes it possible to highlight two research periods - crisis and normal (postcrisis) period.

Leadership styles include basic categories of leader behavior. It is accepted that a leader can choose which leadership style to target, changing his behavior according to the specific situation. Based on an in-depth literature review of up-to-date contemporary sources, it is perceived that leadership behavior is determined by a basic, changeable leadership style in the medium term, and not by day-to-day changes of the basic leadership style.

It is considered that different followers of the same leader may evaluate his leadership style differently and may change their motivation towards their unique leadership style. The change in the level of employee satisfaction is a consequence of the change in the correlation of leadership style and the level of uncertainty of the external environment.

2.2. Research Methods

Scientific literature provides a wide range of methodological tools. However, in order to obtain a reasoned answer to the posed research questions, the author's methodological positions include:

1. **Structured interview method**, which includes two separate survey cards. The inquiry card No. 1 is directed to respondents among the middle and lower managers of the organizations in order to establish the degree of motivation. It includes accentuating questions on the level of uncertainty of the external environment, as well as questions whose answer determines the leadership style that characterizes the manager. On the other hand, a second leadership inquiry card No. 2 was created, measuring the level of crisis (uncertainty of the environment), as well as the self-assessment of the leadership style by the manager. In the second leadership survey are included components, which are also focused on distinguishing the followers of the leader from the rest of the employees.

2. **In-depth interview method**, which involves conducting in-depth interviews with middle and linear level of management to confirm through a qualitative research method the data obtained from the quantitative methods. The object of confirmation is the leadership style inherent in the respective person formal leader, and the level of motivation of followers. Interviews are conducted with managers to establish qualitative parameters related to their

leadership style, level of uncertainty, real problems facing the organization and identification of employee followership.

3. A sociometric study that seeks to establish in what environmental characteristics followers will follow specific types of leaders, adapted, field-tested research questionnaires are adopted.

4. Triangulation: combining quantitative and qualitative research methods

The scientific literature presents numerous variants and approaches for combining quantitative and qualitative research methods. When combining, it is critical to address the following questions: whether it is a combination of methods, data, or results [1: 241]; is equal weight attributed to both approaches; will the results of the two approaches be compared or presented separately; and in what sequence will they be used.

The study combines the findings of the quantitative and qualitative methods used, giving them equal weight. The methods are used independently, beginning with the processing of quantitative empirical data, followed by structured interviews, and finally in-depth interviews. Through complementarity and triangulation, combining quantitative and qualitative research allows for a more detailed presentation of the research topic. The principle of triangulation states that the findings of one study can be verified and validated by another [2].

These activities, as well as the subsequent data analysis, were successful in testing the conceptualization and measurement instrument of the Bulgarian construct. This involved using multi-level modeling techniques to analyze data collected at the individual and firm levels.

Methodological positions in the context of the study refer to the paradigm of transactional, transformational leadership and laissez-faire leadership (Laissez-faire leaders allow their followers to have the autonomy to make their own decisions and manage their own desks), related to high and low levels of uncertainty of the external environment. This approach is suitable for developing the logical model in the context of the relationship between applied leadership style and level of motivation. It is possible to measure the level of corporate motivation of the followers in the combination between the different leadership styles exercised by the management under different levels of uncertainty of the external environment.

3. Methodology Development

3.1. Research Design

The Research Design method is proposed to utilize direct interviews and focus groups as tools for investigating the Research Problem. These interviews and focus groups are structured as open-ended question sessions lasting one hour. Questionnaires are distributed online (via LimeSurvey software). The benefits of conducting direct interviews and focus groups include in-depth information, open discussions, and a direct hands-on approach when researching sensitive corporate issues. The information provided by the company will assist in evaluating its internal environment. This identifies the current employees' motivational status and the current positioning of the formal leader.

The research methodology is survey descriptive. To accomplish the objectives and tasks, a variety of research methods are used. The population surveyed consisted of hotel managers and employees aged 20 to 65 from Bulgaria. Only active all-season hotels were included in the study.

Each organization's activities are a series of interconnected processes, ranging from marketing and planning to sales and after-sales. When an activity and its associated resources are managed as a process, the desired outcome is achieved more efficiently. It's because management is a continuous series of interconnected actions or functions presented as processes. The process approach is used to develop methodological conditions, which includes integrating key conditions and processes into respondents' work,

defining leadership competencies (and motivation), and conducting an evaluation of their condition. The application of retrospective analysis over the last nearly three years (the COVID-19 crisis period in Bulgaria began in 2020) of the development of economic and political processes and laws that directly affect the motivational activities of organizations helps to analyze and establish trends and regularities.

It also performs secondary processing of quantitative data on specific economic indicators during the review period. The research method employs a quantitative method, specifically a structured interview - an inquiry card - with the goal of gathering feedback from company managers on motivational and leadership practices in their organizations. The information is processed using specialized software.

3.2. Data Collection

Data Collection is based on interview responses and focus-group statements. They were the primary sources of information. In addition to this, it is used information from the official websites of the companies, which is relevant to the issue investigated. Based on data gathering, analytical information was synthesized and produced for the purposes of the research.

In fact, the research data collection technique was formalized through direct interaction in discussion format with the hotel's top executives and CEOs. As a result, it obtains consistent information about the problem at hand. In addition to the interview and focus group sessions, Desk Research was conducted to counter-check the information against inconsistencies and build a correct and up-to-date logical model of reasoning.

Furthermore, in order to get more insights on the motivational and leadership problems in Bulgaria, the research used relevant secondary, qualitative and quantitative data, as well. The external analysis of the company was done on the basis of the findings from Desk Research.

3.3. Research Goals

To outline the research design, it is necessary to set goals before using the methodological toolkit. Leading in this case are the following highlights:

1) It is necessary to establish the style of the leader within the organization. Style should be measured under high and low levels of environmental uncertainty. Based on a thorough review of the literature on the subject, three leadership styles with the greatest potential for inclusion in the research methodology are highlighted, including transformational, transactional and laissez-faire leadership [3]. Suitable for such research is an author's questionnaire based on an adaptation of Bass, Avolio and Bernard's FRLM model [4] and the MLQ5x to target followers. The questionnaire has been updated by editing and adding new follower questions. Simultaneously, the key for measuring this tool is used, as is the norm, allowing us to compare the level of Bulgarian hotel managers to that of American managers for each leadership style. It is necessary to distinguish between the various dimensions of the study of leadership style from the standpoint of followers. On the one hand, a dominant leadership style will be identified based on the perception of each follower. Conversely, the aggregated ratings of all followers will determine the leader's dominant leadership style at the organizational level.

2) Leadership style should be measured over two periods. The first period should be immediately after the imposition of restrictive administrative measures related to the hotel industry because of the COVID-19 pandemic and should be measured retrospectively. The second period should be in 2023, when it is assumed that the uncertainty of the environment is lower (post-crisis period). Top management (formal leaders) perception of different levels of environmental uncertainty at the two different periods should be validated by adding questions to establish this.

3) It is necessary to assess follower motivation in order to determine how different leadership styles in response to different levels of environmental uncertainty affect individual motivation. This task necessitates measuring motivation in two phases: high uncertainty and low uncertainty. Questions will be used for this purpose, taking ten motivating factors into account.

4) To meet the study's validity and reliability standards, it is necessary to compare the leader's self-assessment of leadership style to followers' assessments of leadership style. And it necessitates the selection of research participants who are perceived as the leader's followers. This would confirm that he is in a leadership role rather than just a formal managerial one. Moreover, it is necessary to identify and study genuine followers of the leader who interact with him directly and have reciprocal influence. And finally, we need to be sure that leaders perceive a crisis as an environment of higher uncertainty, so that we perceive "crisis" as a concept with the same meaning as the concept of "environment of higher uncertainty".

4. Research Instruments

4.1. Structure and Sequence of Survey Questions to the Managers

The survey begins with an introductory section that clearly presents the problem and aims to motivate survey participants to take the time to complete it. This part should not be long, so as not to create a sense of complexity and ambiguity. The name of the hotel to be investigated through the responses to the specific survey should also be established. It should contain questions in several directions:

- *Establishing the subjective feeling of the level of uncertainty of the environment.* Questions were selected to establish the leader's perception of the three factors of environmental uncertainty and to allow them to be measured. An uncertainty scale with four subscales is applied - feeling of lack of information for decision-making, feeling of complexity, feeling of dynamism, feeling of resource security. The aim is to validate the large difference in the feeling of uncertainty in the two periods to ensure the credibility of the questions.

- *Establishing the own leadership style.* In this direction, adapted questions from the MLQ5x multidimensional leadership style questionnaire are used. Questions were selected in the three scales establishing leadership styles. On the other hand, questions are balanced within two to four subscales for each scale. For the transformational leadership scale, these are the subscales of idealizing influence, inspirational motivation, intellectual stimulation, and individual approach. For the transactional leadership scale, the contingent reward and active exception management scales were examined. For the laissez-faire leadership type scale, the passive management of exceptions and avoidance of commitment subscales were included. The questions refer to the two leader-fixed periods with a large difference in the sense of uncertainty. The established leadership style should validate the leadership style measured in the survey to followers in order to meet standards for valid and reliable results.

- *Establishing Followers of the Leader.* A second, independent component of the survey is required. The goal is to have at least three followers of the leader in the company. The minimum quantity is required for two reasons. The first is related to the original version of the MLQ5x, which serves as the foundation for the questions that determine leadership style. This questionnaire recommends completing at least three consecutive surveys. The second reason for the minimum number is to ensure that the results are valid. They must meet the set criteria and be at the level of middle and lower management, have regular communication with the leader, and perform tasks directly set by him while under his control.

4.2. In-depth Interview of Leaders

The in-depth interview, as a qualitative research method, should validate the results of quantitative research and highlight some nuances and details that cannot be measured with qualitative methods. The approach adopted is to ask six open-ended questions, and for each one of them one additional, clarifying question can be asked. Aims to provide leaders with the opportunity to express in depth their attitude toward topics related to the uncertainty of the environment, assessment of their own leadership style, and attitude toward followers.

4.3. Structure and Sequence of Follower Survey Questions

A follower survey should include a variety of questions, accompanied by an introductory section that clearly presents the problem and encourages survey participants to take the time to answer it. In this part, the goal is not to direct the followers through the set instructions to perceive the two periods as negative and positive, so that the measurement of their motivation is not predetermined. The name of the accommodation to be investigated should also be determined based on survey responses. All follower opinions from a specific hotel must be verified with the leader's poll data.

The follower survey provides the necessary data for the main part of the study by collecting data on the manager's leadership style during periods of varying levels of environmental uncertainty and ascertaining the level of motivation of each follower. For this, the presented chronological structure in the order of the questions should be followed:

- *Assertion of leadership style by followers.* In this direction, adapted questions from the MLQ5x multidimensional leadership style questionnaire are used. Questions are included in the three scales establishing leadership styles. In contrast to the questionnaire, whose object of research is the managers, adaptations of a larger number of questions from the multidimensional questionnaire will be used here. For the transformational leadership scale, the subscales of idealizing influence - attributive and behavioral, inspirational motivation, intellectual stimulation, and individual approach - were laid down, and each of them was measured with four items. For the scale of transactional leadership, the contingent reward and active exception management scales were also examined with four items each. For the scale of the laissez-faire type of leadership, the subscales of passive exception management and commitment avoidance were measured, and eight items were presented. The questions refer to the two validated by the supervisor period and with a large difference in the sense of uncertainty. The established leadership style is validated with the dimensions of the leader survey results in order to meet the standards for valid and reliable results.

- *Analysis of follower motivation.* This direction is extremely important given the general concept that follower motivation is a measure of the use of different leadership styles under different levels of environmental uncertainty. Despite the widely used and validated tools for measuring motivation (MSQ, JDI, JSS and others) offered in the literature, the specificity of the methodology requires an individual approach in developing the questions. First, it must be ensured by the questions and their presentation that the motivation assessment largely measures satisfaction with the leadership approach and the circumstances directly arising from it, and no other circumstances unrelated to it. The aforementioned questionnaires would give more serious weight to factors such as pay, rewards, conditions, time off, and others that are relevant to the current development, only refracted through the way the leader models them. For this, an approach is taken to adapt various questions from the MSQ, JDS, JSS questionnaires, as well as questions of Bulgarian researchers such as Iliev [5] and Angelova [6]. The goal is to create several main scales and subscales [7], primarily focused on attitudes toward leadership and the

environment. The methodology is primarily concerned with the questions' suitability for studying different periods with different environmental characteristics.

4.4. In-depth Follower Interview

The in-depth follower interview should validate the results of the quantitative follower research conducted through the follower survey. Nuances and details that cannot be measured by qualitative methods must be highlighted. An approach is adopted in which seven open questions are asked, and for each of them one additional, clarifying question can be included. Aims to enable followers to express in depth their attitudes towards topics related to the demonstration of leadership styles by their leaders and qualitative representation of their own motivation in the two different periods characterized by different levels of environmental uncertainty.

5. Conclusion

Global crises are events that present a huge challenge to managers in their attempt to maximize benefits for their business organizations. The transformation of the formal manager into a manager-leader is a basis for researching the relation between leadership styles, the level of uncertainty of the environment and the level of employee motivation. The detection of dependencies is a prerequisite for the creation of a valuable model for management practice for the selection and use of a specific, dominating over the others, leadership style at different levels of uncertainty of the external environment.

The uncertainty of the external environment is a main characteristic describing the crisis environment in which the business organization has to function during a global crisis. This characteristic is measurable at a qualitative level and makes it possible to construct a model for the relationship between the crisis of the environment, the leadership style and the motivation of the followers. Follower motivation is a key characteristic that can determine the success of implementing a leadership style under different levels of uncertainty in the external environment. The motivation of the followers is a factor of fundamental importance for the results of the business organization as a prerequisite for the competitive growth of companies thanks to their employees.

This paper provides a unique methodology for establishing the relationship between applied leadership style, level of motivation, and the influence of uncertainty in the external environment. The implementation of the methodical issues package to businesses from various industries can be beneficial for managers to smooth out an effective and cohesive team, which together overcome threats from the external environment and the constant confrontation with new crisis situations - global, national, branch, and company.

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Fire safety during electric vehicles transportation by sea

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Abstract: More than 80% of world trade is transported by sea. Ships are the primary means of transporting cars around the world as well. Most often, this is done with specialized ships called Ro-Ro (Roll on-Roll off), and sometimes, when it comes to individual units, in containers. One of the main concerns during such transportation is the fire safety of the ships. At the same time automotive technology is changing, electric powered vehicles are increasingly displacing internal combustion engines. In the last decade, the production of electric and hybrid cars has grown significantly, which has also led to an increase in the volume of their transportation. However, this also brought a new challenge - the risk of fire caused by their batteries malfunctioning. The danger of fire associated with lithium-ion batteries is well known and there have been quite a few such cases in recent years. The idea of this study is to highlight the conditions of carriage, the fire safety measures on board the ships, as well as the ways of fighting a possible fire.

Keywords: ELECTRIC VEHICLES, RO-RO SHIPS, TRANSPORTATION, FIRE SAFETY, FIRE-FIGHTING

1. Introduction

The global electric vehicle market worldwide was valued at USD 388.1 billion in 2023 and is expected to reach USD 951.9 billion by 2030 [1]. Most of these vehicles are shipped by sea. The increasing popularity of electric vehicles (EVs) has transformed the automotive industry and, consequently, the logistics of transporting these vehicles across the seas. Roll-on/Roll-off (Ro-Ro) ships are a common choice for shipping large numbers of vehicles, including electric ones [3].

Transporting battery-powered electric vehicles (BEVs) by Ro-Ro ships requires careful consideration of fire safety measures due to the presence of lithium-ion batteries. These batteries are commonly used in EVs due to their high energy density, but they can pose unique fire safety challenges and safety concerns if mishandled or damaged.

Basically the likelihood of fires for BEV, as well as the combustion temperatures or the heat release rate are not higher than for conventional vehicles with internal combustion engines, however, the consequences of a BEV fire can be higher. There are some risks associated with BEVs fires onboard: high voltage shocks, direct jet flames, fires develop in intensity quickly and rapidly reach their maximum intensity (typically within 2-3 minutes), gas explosion (if the released gas accumulates for a while before being ignited), once established fires are difficult to stop/extinguish [2]. Unfortunately such fires lead to very serious consequences and even to total loss of ship (Fig. 1).

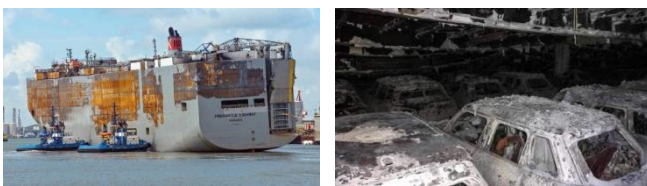


Fig. 1 Fire on m/v "Fremantle Highway"

One of the main risks of breaking out a fire is when a battery cell goes into thermal runaway. This is a phenomenon that can occur in certain types of batteries, including lithium-ion batteries, and refers to an uncontrolled, self-accelerating increase in temperature within the battery cell or pack. It is a highly critical condition that can lead to overheating, release of flammable gases, and, in extreme cases, fire or explosion. Thermal runaway typically begins with a localized thermal event, such as a short circuit or a failure within the battery cell which can be caused by physical damage, manufacturing defects, overcharging, over-discharging, exposure to high temperatures, or other factors that disrupt the normal operation of the battery.

2. Fire precautions when transporting EVs

Pre-loading inspection: Inspection of intended cargo at port should begin preferably before the loading process because vehicles in movement represent a hazard. The total identification of all fire

hazards is not possible at this stage. Electric vehicles which are damaged in any way that may impact on the battery system should not be accepted for loading. Where a lithium battery installed in a vehicle is damaged or defective, the battery shall be removed. If the battery is not removed, the vehicle should not be accepted for transport.

Stowing and securing: EVs are expected to be on average 25% heavier than conventional vehicles, therefore appropriate considerations should be made in relation to loading limitations and stability calculations [4]. Some battery powered vehicles have a lower ground clearance than internal combustion engine vehicles. This means they are more susceptible to damage from ramps during boarding. Care should be taken in identifying these vehicles before boarding to ensure damage is not sustained to the battery. Physical damage of the battery can lead to thermal runaway; a damaged high-voltage battery can create rapid heating of the battery cells as well. BEVs which have been damaged should not be loaded. [2]

Stowage of BEVs should ensure that electric vehicles are securely stored and properly contained to prevent movement and collisions during transport, allowing the crews direct access to the vehicles so they can respond quickly and effectively in an emergency. Extreme temperatures can affect the performance and safety of lithium-ion batteries. During transportation, efforts should be made to avoid exposing BEVs to temperature extremes. The cars should be stowed in designated areas that are away from machinery spaces, emergency equipment, dangerous goods, and passengers including escape routes and muster points for passengers.

The intended cargo areas shall be with fire containment features to prevent the spread of a fire from one vehicle to another with installed fire-resistant barriers and materials to isolate potential fire hazards. In enclosed or partially enclosed vehicle decks should consider stowage of BEVs taking into account the risks of toxic and potentially explosive gases released during fires.

Charging (DC or AC) of BEVs on board: Charging the battery while onboard a vessel can increase the likelihood of a thermal runaway fire, therefore charging of BEVs while onboard should be avoided, unless a comprehensive risk assessment is carried out and the relevant risk control measures are implemented. Appropriate control measures should be in place, charging stations for BEVs while enroute should be installed in compliance with the SOLAS regulations II-1/45 and II-2/20.3. [5] There are further guidance and detailed recommendations for charging stations on board ships in different international documents [6,7].

Fixed fire-detection system: Fixed fire detection systems provide continuous monitoring of the vehicle deck and play a crucial role in mitigating the risks of fires. By providing early and accurate detection of potential fire threats, these systems contribute to the overall safety of maritime operations. The control panel of these systems is positioned on the ship's Bridge and is integrated with automated alert systems (Fig. 2).



Fig. 2 Bridge Fire alarm control panel

There are different types of sensors fitted to fixed fire detection systems:

- Infrared (thermal):** Infrared sensors detect changes in temperature that may indicate a thermal anomaly. These sensors provide early warning signs of potential fires before they become visible.
- Smoke:** Advanced smoke detection systems use sensitive detectors to identify smoke particles associated with smoldering fires. These systems are effective in enclosed spaces where traditional smoke detection may be challenging.
- Flame:** based on UV detectors that can quickly detect a flame's weak UV emission from a distance. Flame detectors utilize optical technologies to detect flames as they emit electromagnetic radiation in the infrared (IR), visible light, and ultraviolet (UV) wavelengths depending on the fuel source.
- Gas:** Gas detection systems can identify gases released during a thermal runaway event. Early detection of specific gases associated with battery fires enables rapid response.

Some of sensors are connected to suppression fire fighting systems to automatically activate them.

When transporting BEVs, the fixed detection systems have some drawbacks: smoke detectors on the vehicle decks may take some time to activate as the smoke flow from the thermal runaway can be prevented from reaching detectors due to the physical design of the vehicle decks and the airflow created by ventilation systems; flame detectors are designed to detect the infrared radiation of fires, so they are activated by the presence of flames.

A principle of utmost importance is all fire-detection system alarms to be treated seriously and assumed to be real until they are verified as false.

Fire patrols: The fire patrols frequency and procedures can vary significantly from one shipping operator procedure to another. First fire patrol has to be executed preferably directly after departure, then every hour for a RoPax ship (transporting passengers as well) or every watch for RoRo ships. More frequent patrols shall be carried out on decks loaded with more potential hazardous cargo as EVs. Crew members who conduct safety patrols of the vehicle decks should be made familiar with the early signs of thermal runaway and if possible equipped with thermal handheld detectors. They have to wear proper personal safety equipment and “press to talk” type of portable VHF/UHF radios that leaves both hands free. The established permanent radio communication between the patrolling team and the officer of the watch on the ship's bridge is of utmost importance for the early detection of a fire hazard and taking appropriate timely measures.

Fire patrols should pay special attention and look for evidence of battery coolant leakage, smoke or heat from the areas of vehicles where a battery is normally located, for example, the underside. They should also listen for “popping sounds” which may be indicative of a potential thermal runaway event. On periodically intervals, specified by company regulations, the crew shall inspect the cargo for lashing arrangements failure (especially with bad weather forecast) and take corrective measures, if necessary.

3. Fire-fighting EVs fire

Establishing a comprehensive emergency response plan is essential in the event of an incident involving thermal runaway during transportation. Emergency responders should be equipped with the knowledge and tools to handle potential battery-related incidents, including fires or overheating.

Once the fire has spread to the battery, the fire becomes difficult to extinguish because it is sealed, generates oxygen on its own and also it is difficult to direct extinguishing agent to the generated flame as it is the underside of the car. An adequate step would be breaking the burning vehicle glass and spraying water onto its floor and same for the adjacent vehicles (to prevent spreading the fire). At same time practice has shown that allowing the battery to burn itself out has shown to be an effective means to handle the situation. Due to the longer duration of the fire and, especially when round cells are used in the battery modules causing risk of burning battery parts flying away, there is a higher risk of the fire spreading.

Common means for fire fighting on ships are:

Fire extinguishers – for BEV fire it is preferably using dry chemical powder or CO₂ types.

Fire Blankets or Shields: large sizes fire-resistant blankets, designed to be placed above vehicles in order to limit the oxygen supply to a fire. Deployment fire-resistant blankets or shields to contain and isolate the affected BEV can help prevent the spread of flames and protect nearby vehicles or equipment from heat exposure. These fire blankets may be best suited as a precautionary measure deployed where a vehicle has been identified as being at increased fire risk e.g., if battery coolant is found leaking during routine fire patrol. While vehicle fire blankets will contain flame, the thermal runaway event will continue. [8].

Main fire system (Low pressure system) – The system is using sea water and consists of fire pump, fire lines with hydrants, hoses and nozzles. When fighting a lithium-ion battery vehicle fire with water, substantially higher quantities of water are required in comparison to an internal combustion vehicle fire and the water must also be applied for a longer period. It is not possible to stop a thermal runaway in a single battery cell, but with a large amount of water it is possible to stop the propagation to adjacent cells [9]. Without intervention (cooling) the internal battery temperature will continue to rise and with this the potential for a fire to spread and an explosion to occur if the resultant gases are allowed to build-up in the space. The only way to cool the battery is to use large amounts of water, sprinkler systems can help to contain the spread of fire, but have no cooling effect on the battery, which is usually installed in the underbody of the vehicle. In the event that a BEV connected to charging station becomes involved in fire, the incident shall be treated as an energized electrical fire; therefore the electrical supply of charging unit shall be turned off before attacking with water.

When using a copious amount of water for extinguishing BEVs fire or for cooling-down a special attention should be paid to ship's stability affected by additional weight and free surface influence. The stability needs to be continuously assessed, especially taking in consideration the amount of water on lower decks, where there are no drainage facilities to allow the free flow of water off the hull.

Fixed fire systems: Typically Ro-Ro ships rely on carbon dioxide (CO₂) systems to extinguish fires on their vehicle decks, but with the significantly increased risk of re-ignition with BEV fires, the CO₂ systems do not remove the heat generated from a fire nor extract the highly flammable gasses emitted from a BEV fire. Therefore for transportation of BEVs the ships should be fitted with different fixed systems, such as **Fire suppression systems**. Upon detection of a potential fire, these systems can trigger appropriate suppression measures, such as water mist or specialized agents. Water mist systems can be effective in cooling overheated batteries and suppressing fires. These systems release a fine mist of water, which evaporates quickly and absorbs heat, helping to cool the

battery and prevent further thermal runaway. As specialized agents suppression systems use high-fog system, high-expansion foam, Nitrogen, exhaust gases (inert gas system), Halon, Freon, HFC-227ea, FM 200 (HFC 227), Novec 1230, aerosols. Fire suppression extinguishing systems if applied quickly after the detection and verification/confirmation of a fire have worked successfully to fight fires on board Ro-Ro ships. Upon discovery of fire in a cargo deck, immediate preparation for using ready the fixed fire extinguishing system must be. If the fire has already spread upon discovery and/or cannot be contained or controlled with continuous cooling, then this system must be immediately activated (released).

Water mist: can be used to scrub smoke and fire gases and reduce the amount of toxic substance in the air either through an overhead discharge (mist sprinkler) or portable devices that can be connected to fire hoses (“mist nail”). It can also lower the temperature, thus improving accessibility to the fire. (Fig. 3)



Fig. 3 Water mist in action;

“Mist nail” (Lance)

Very important point in initial firefighting is ventilation control and creating a “Positive Pressure Ventilation”. Control of air supply (intake of outside air) and exhaust (discharge of combustion products to overboard) has some major advantages – will clear toxic gases, protect emergency team from heat and smoke, etc. In order ventilation to be properly managed, team leader should inform the Bridge about accumulated smoke escape direction. [10]. The master should maneuver the vessel to control the flow of smoke and gases from the BEV fire away from passengers and crew as the smoke and gases are both toxic and potentially flammable.

In BEVs fires there is also an elevated risk of re-ignition until the chemical chain reaction exhausts itself, even hours after apparently put out of the fire. A fully-equipped fire-fighting team should be monitoring the fire site and be able to respond immediately until the vehicle is removed from the ship.

Carriage of Electric Vehicles (EVs) in Containers: The growing trend to prevent global warming has led to carriage of BEVs in containers as well, which may present additional risks to the vessel. These risks should always be properly identified, evaluated, and mitigated to being as low as reasonably possible. The current IMO regulations do not specify any additional requirements for the carriage of EVs in containers, treating them as a general IMDG cargo (the International Maritime Dangerous Goods (IMDG) Code classifies an EV under battery powered vehicles or battery powered equipment as Class 9, UN no. 3171). As the BEVs are loaded as general cargo, this may propose serious threats if they are placed next to IMDG cargo. A key concern with the containerized shipment of EVs is the inability of the ship’s crew to verify the condition of the EVs within the containers. This issue arises from the shipper being responsible for loading and securing the EVs in the containers, an activity over which the “carrier” (ship-owner) has no control. The ship’s crews are also unable to monitor the EV unit itself during the voyage. The carriage of second hand EVs has a potentially higher risk as the quality of the vehicle itself and safety checks on its condition may not be of a standard equivalent to those applied to the shipment of new vehicles. Stowage and segregation should meet the requirements of the IMDG Code and the vessels Document of Compliance (DoC) for the Carriage of Dangerous Goods. Additionally, where possible, consideration should be given to the following: stowing containers carrying EVs away from the accommodation block, so that toxic gasses, if released, do not enter crew accommodation; on easily accessible lower tiers on deck and at easily accessible outboard slots. A fire onboard a container ship can have catastrophic outcomes, endangering safety of life, causing

serious environmental pollution and resulting in significant financial losses. Therefore the crew need to additional precautions: **Physical monitoring** patrols (weather permitting) of containers carrying BEVs, and additional and special equipment such as hydro pen, thermal imaging cameras and water lancing equipment. [11]

Crew training: It is very important the crews are aware that fighting a BEV fire requires a different technique to that employed in fighting a conventional fire onboard. Directly attacking the fire with water hoses and breaking open the battery requires extensive training and practice. Additionally to common fire-fighting trainings and drills, for transporting BEVs all responsible personnel on board should receive specialized training on handling electric vehicles, with a focus on the safe transport of lithium-ion batteries. Training should cover which hazards are connected with these cars, proper loading and unloading procedures, securing the vehicle during transport, and responding to emergencies. One of the scenarios should be joint actions with a coastal fire brigade. Well planned drills and training exercises that cover a full range of scenarios and situations are valuable in ensuring crew members are aware of their responsibilities and will ensure familiarity with all equipment on board. Drills should be as realistic as possible and various scenarios should be allowed to play out from detection onwards and cover both successful outcomes and non-successful scenarios (abandoning the ship) (Fig. 4).

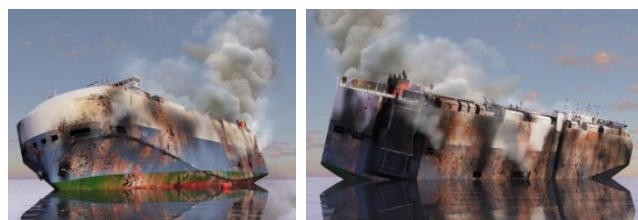


Fig. 4 Fire and sinking of m/v “Felicity Ace”

4. Conclusions

Currently there are no requirements from the International Maritime Organization (IMO) for transportation of electric vehicles on Ro-Ro vessels. It is expected that IMO will announce new safety standards for transporting electric vehicles in 2024. The guidelines could include specifications on how fully a battery can be charged. The IMO said that chemicals for extinguishing fires, special fire blankets, equipment such as battery-penetrating jet extinguishers and bigger gaps left between electric vehicles on ships could also become mandatory.

Overall, ensuring the safe transport of electric vehicles involves a combination of engineering safeguards, compliance with regulations, proper training, and effective emergency response planning. By implementing proper fire safety measures, Ro-Ro ship operators can enhance the safety of transporting electric vehicles and mitigate the risks associated with lithium-ion battery fires.

In the case of an accident or damage to an EV during transport, it is crucial to follow proper procedures for handling damaged vehicles. This may involve isolating the damaged vehicle, consulting with emergency responders, and taking measures to prevent further damage to the battery.

After any fire incident a thorough analysis shall be conducted to understand the root causes, evaluate the effectiveness of the fire extinguishing activities and identify opportunities for improvement in both fire systems design and emergency response procedures.

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Situational analysis of rail freight transport sector in the Republic of Bulgaria and the potential of implementing methods and good practices for overall operational improvement

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Abstract: Situational awareness is of fundamental importance when one is faced with the need to make adequate decisions regarding increasing performance or to make structural reforms in a certain field. Rail cargo transport is of paramount importance for both the increasing demand for intermodal transport and greener inland transportation. The Republic of Bulgaria has a unique geographical location which offers certain opportunities and limitations regarding the development and maintaining a strong and efficient transport sector. The purpose of this paper is to give the reader a snapshot of the current situation in the sector and to outline some good practices implemented by some world leaders in the rail transport sector which can be applied domestically to increase overall performance.

KEYWORDS: RAIL TRANSPORT, LOGISTICS, TRANSPORT INFRASTRUCTURE, CARGO TRANSPORT

1. Introduction:

In a world in which humanity is gaining a deeper understanding of its effect on the process of climate change, rail transportation will be at the forefront in our attempts at mitigating the negative effects of our society on the environment. Being the most cost effective and environmentally friendly means of land freight transportation, attempts are being made worldwide in widening the use of rail transport.

One such effort has manifested in the increasing demand for combined freight transport. Combined freight transport is a case of intermodal transport in which one Intermodal Transport Unit (ITU), is transported by multiple means of transport, before reaching its destination, without changing its packaging. ITU's can be Intermodal freight containers, semi-trucks, and rail wagons. This mode of transport, however, relies heavily on rail and inland water transport routes.

The geographical location of the Republic of Bulgaria offers great opportunities in the transit and distribution of rail cargo thru its territory between Central Europe, East Asia, West Asia, and the Middle East. Passing thru the territory of Bulgaria are 2 Trans-European and 5 Pan-European transport corridors. In addition to those there are several international transport corridors not initiated by the EU whose transport routes pass through Bulgaria, most notably these are: TRACECA, the Three Seas Initiative and The New Silk Road also known as One Belt One Road initiative.

Maximizing this potential, however, must pass through major structural, infrastructure, legislation, and management reforms. Reforms which must be based on a proper analysis of the rail transport sector in Bulgaria, and good basic knowledge on the good practices in rail transport worldwide. Good practices which if deemed adequate will increase overall performance of the rail transport network.

2. Analysis of the main infrastructure components

Infrastructure is the basis on which all transport is operated. Every mode of transport without exception relies on and operates according to the opportunities and limitations set for it by its infrastructure. Rail infrastructure is a very complex matter but at its most basic it is comprised of railway lines, train stations and muster yards.

Rail infrastructure in Bulgaria is well developed. The overall availability of infrastructure is high, but there are quite a few problems in the network. The total length of rail lines is 6455 kilometers. There are nine main rail lines each with branching lines bringing the total number of individual rail lines to 29 in 2023. The most widely used rail gauge is 1435mm (accounting for nearly 90% of the total), but there are also narrow-gauge lines (750mm) and wide gauge lines (1520mm). More than 70% of the total track line length is electrified (one of the highest percentages in the world) [1]. The density of rail infrastructure is quite high at 58,9km per

1000sq/km, but still falls slightly below the EU average. There are currently no high-speed rail lines in Bulgaria, and none are planned in the foreseeable future. The total number of train stations is 296 of which 252 have the necessary infrastructure to carry out cargo operations. Of these 106 are equipped with track scales. There are 6 muster yards in Bulgaria of which only 2 are operational to some degree. The lack of good quality muster yards forces rail carriers to sort wagons by using locomotives in regular train yards which is more expensive and time consuming than using a muster yard. This increases time spent in train stations, reduces efficiency, and reduces the competitiveness of rail freight transport as a whole.

Most lines have been built, to allow operating speeds of 120 km/h for passenger and 80 km/h for freight traffic, however in 2023 this is not the case. Operating speeds for passenger traffic are rarely reduced and generally the median speed is around 80-100 km/h, the maximum speeds for freight traffic are periodically being reduced in some parts of the network. In 2020 the median speed for internal freight traffic was 51 km/h and for international traffic the same was 43 km/h. In some freight lines like main line №9 which is a single-track line the median speed for freight traffic is 67,5 km/h in 2023, but in some instances the traffic speed is further reduced to 15-20 km/h. Consequently, the median transit speeds in Bulgaria are among the lowest in the EU and they are a consequence of lack of maintenance and deteriorating quality of infrastructure. The poor state of muster yards is the main reason why only 2 of 6 are partially operational [2].

In Bulgaria rail infrastructure is owned, maintained, and developed by one public company the "National Rail Infrastructure Company." This company was created in an effort to liberalize the railway sector in the early 21-st century, when it was split from the national railway carrier. In the years since the split, the quality of rail infrastructure has rapidly declined. This effect was mainly due to the technological time needed to complete the restructuring process of the rail sector. Another contributing factor was the turmoil caused by the restructuring of the national economy, which led to even more instability in the sector.

Eight of the nine main rail lines are part of the core TEN-T network, and one of the main and all of the secondary ones are part of the comprehensive TEN-T network. One of the biggest threats to further integration of the national rail network in the short term is not reaching the interoperability requirements of the TEN-T network. These requirements state that all rail lines comprising the core network must have a minimum medium transit speed of 140 km/h for passenger and 100 km/h for freight traffic, and fully integrated ERTMS safety systems by 2030 for the main and 2040 for the comprehensive network[3]. Since joining the EU in 2007 only around 11% [2] of the total track length has reached interoperability requirements in regard to the speed factor. Regarding the safety systems only about 7% of rail lines in Bulgaria are equipped with ERTMS systems in some degree [2]. The interoperability requirements are currently being revised and it is

expected that operational speeds will be further increased to a minimum of 160 km/h for passenger and 100 km/h for freight traffic [3],[4].

The other factor hindering wider use of rail services in international exchanges is the dwelling time in border crossings. Interoperability requirements state that the maximum dwelling time for freight traffic should not exceed 30 min [3]. In 2020 the median dwelling time in border crossings across Bulgaria was 5 hours with the longest being at the border crossing with Greece with more than 11 hours [2]. And while some border crossings do not require so much time to cross, it is safe to say that there is much room for improvement in this area. However, this problem is not only a problem of rail infrastructure but also a problem needed to be addressed by customs authorities as well.

Another type of transport service which relies heavily on rail infrastructure is combined transport. This type of transport service requires the construction of dedicated intermodal freight terminals (IFT) for the handling of intermodal freight units (ITU) which are comprised mainly of intermodal freight containers and semitrucks. In 2023 of the planned 7 IFT's only two are operational and neither of them fully meet the interoperability requirements of the EU. Another factor further hindering the use of this type of service is the height gauge. Around 50% of rail lines in the country have the highest height gauge of 4.65m., and 48,7% have the lower gauge of 4.32m requiring the use of specialized wagons (of which there are a few) for the transport of high cube freight containers and semi-trucks. From the tree mountain passes thru the Stara Planina Mountain range only one is with a continuous height gauge of GB, the remaining two have the lowest height gauge GA which prohibits the transport of all ITU's except the standard 20' and 40' equivalent units. The connectivity in the East-West direction is better both in the median speed of transit and height gauge restrictions.[2]

However regardless of the overall poor condition of the majority of rail infrastructure there is currently a huge reserve of capacity in the network. In 1990 the total cargo transported by rail in Bulgaria was roughly 63.250 million tons and in 2020 it was 16.374 million tons [9][10]. In the years since 1990 there was little change to the overall rail infrastructure. This implies that the current infrastructure can manage even a fourfold increase in total cargo traffic after some refurbishment.

3. Freight transport market from the viewpoint of rail transport.

Demand for rail freight services has been on a rapid decline in the years since the changes in 1989 and the shift from a planned to a market economy. Most inland freight traffic is transported by truck with rail transport accounting for roughly 8 % of the yearly total. In 1989 total cargo transported by rail was 63.25 million tons and in 2020 it was 16.34 million tons, a nearly 4-fold decrease. This decrease can be attributed to the closure of major industrial complexes, who were the main users of rail freight services. Another factor complementing the decrease in total freight carried was the rapid decline in the quality of rail infrastructure, partially due to the major reforms carried out in the sector.

The market for rail freight transport in Bulgaria is one of the most liberal markets in the EU. In 2022 there were seventeen licensed carriers with the main competitors of the main carrier realizing 41% market share. While domestic rail cargo traffic has a modest increase of roughly 0.5 to 1.5 % annually, transit cargo by rail has increased by nearly 76% the past 10 years, and currently it accounts for nearly 40% of total freight carried throughout Bulgaria.

Competitiveness of cargo train services is low when compared to road cargo transport. The main reason for this is the quality of infrastructure, however the quality of rolling stock is another big factor contributing to this effect. In 2017 there were a total of 282 diesel and 285 electric locomotives in Bulgaria [11]. While this

figure seems reasonable at first, around 50% of these locomotives are nonoperational, this in turn leads to inadequacies in the transport process in some regions of the country. For example, in the past 2 years most of the time there was only one locomotive for shunting services in the whole of northeastern Bulgaria. The median age of locomotives in the country is roughly 45 years and as should be expected, unexpected breakdowns happen on a regular basis. Rail operators, faced with the uncertainty of the current rail market, do not invest in new locomotives, instead relying on the refurbishment of old locomotives.

There is a large variety of rail wagons specialized for the transport of almost every type of cargo handled by the railways in Bulgaria. The total number of rail wagons in the country is currently unknown, but the main rail cargo operator has in its inventory 4480 wagons in 2020 [5] of which roughly 55 % or 2490 are active, the rest need refurbishment. Other licensed operators operate around 1000 wagons, and roughly around 50 locomotives. The exact total of rail wagons property of Bulgarian rail operators is unknown. This is due mainly to the period after the changes in 1989. In that time a large number of rail wagons were left abroad and were never recovered. The current median age of rail wagons is the same as with the locomotives or roughly 45 years. As a result of the old age breakdowns are commonplace. Currently there are more than enough wagons to accommodate day to day operations. However, there are deficiencies in some wagon types. One such type is the so called "well car", this type of rail wagon is specialized for the transport of intermodal freight containers and semi-trucks. With the rise in demand for combined transport services the need for these wagons will only increase. Currently the bulk of wagons of this type are on lease from other rail carriers.

The most important aspect hindering the competitiveness of rail carriers is the fact that they do not own or operate their own rail infrastructure. The reason why this is a poor decision from the vantage point of freight transport is because rail carriers cannot increase operating speeds on rail lines or cargo handling in rail terminals. This is a problem because in order to compete with road freight carriers, rail carriers need to increase the above mentioned aspects of the transport process. This is impossible without renting or owning the infrastructure. Operating speeds are dictated by the quality of the infrastructure. Currently if a certain rail line is important for a rail carrier it is unlikely that the „National Railway Infrastructure Company" will purposely refurbish that line in order for a certain rail carrier to be more competitive. In fact, such actions are prohibited by law. The situation with rail terminals is similar. Again, the National Railway Infrastructure Company owns them. The only way for a rail operator to increase cargo handling capacity and efficiency is to rent the terminal. Most of the time such actions are illogical due to the fact that there is a high probability that rail infrastructure to and from the rented terminal will not be refurbished soon.

Traditional cargo groups in which rail cargo transport is more widely used are dry, solid, and liquid bulk cargoes. Generally, the cost of these cargoes is relatively low which forces forwarders to look for the cheapest means of transport and rail transport is the obvious choice. Currently there are other groups of cargoes, specifically ITU's, that can be and are cost-effectively transported by rail. Other perspective cargo groups are agricultural products transported over distances near to or above 200 kilometers. However, all of these types of cargoes require specific cargo handling equipment, and some require specialized cargo storage areas. As stated earlier, even if the rolling stock is capable of operating at 100% capacity the infrastructure is the limiting factor. And with the lack of adequate infrastructure for potential cargoes, combined with the slow speed of transport makes rail cargo transport in Bulgaria increasingly unattractive.

In summary rail freight transport in Bulgaria struggles to stay competitive on the market for the transport of cargo. The rolling stock is comprised of old and difficult to maintain wagons and locomotives. The overall poor condition and management system of the existing infrastructure combined with the disappearance of most large industrial entities has hindered rail competitiveness.

4. Good practices in some world leaders in rail freight transport.

There are a lot of examples that can be given but, in my research, I have stopped at 3: The United States of America, China, and Russia.

In the USA rail carriers are not only rail line operators but also infrastructure managers. The rail network in the USA, including some train yards, are both privately owned or leased by way of license to rail carriers or yard operators. In this way the carrier refurbishes and maintains rail infrastructure, optimizing performance wherever needed and in addition collects infrastructure charges from other carriers using his rail lines. A license can be for one or for several years, the most common being the 10-year license. By renting or constructing infrastructure, rail operators are obliged by law to maintain their infrastructure in accordance with the legislative and other federal or state requirements.

However, this system of ownership and management of rail infrastructure has some disadvantages. Overall reliability of rail infrastructure is declining and as a result the total length of US railways shrunk from nearly 204 000 km in 1996 to 148 000 km in 2021 [6]. As is the case in the UK, currently there are calls in the US Congress for the nationalization of rail transport in order to fix infrastructure and operation problems.

A good practice in the experience of the USA is the licensing principle of dividing national rail infrastructure amongst private rail companies. This method ensures that, given proper management from competent rail authorities, the rail operator will maintain and modernize the rented rail infrastructure in order to conduct business.

In China rail infrastructure in its majority is publicly owned by the national government. However, there are some areas that allow for direct foreign investment. One such area is rail freight terminals and shunting yards. An investor can invest in a railyard by purchasing shares in the public company which is created to operate that terminal. This is allowed for several reasons, one being the rapid integration of foreign know-how. Another reason is to test out various cutting-edge configurations and iterations of cargo handling equipment. However only rail terminals of medium or small importance can be jointly owned and operated under a public-private partnership. Major terminals can only be state owned and operated.

Rail operators in China are also publicly owned and some also allow for direct foreign investment in the form of stock purchasing or similar forms of public-private partnership. There are more than 20 rail cargo carriers in China each serving a specific region of the country. Chinese railways are the busiest in the world but there is much room for improvement. Overall reliability of train services is high. However due to the inability of major ports to handle large volumes of cargo shipped by rail most of the non-bulk cargoes gets transshipped on to trucks for final delivery. The Chinese government is investing heavily in increasing rail-port connectivity and inland rail terminal efficiencies. This is done in an effort to decrease the time of final delivery by decreasing the time for cargo operations.

A good practice that can be derived from the experience of the Chinese can be the ownership and management of different tiers of rail yards. Each train yard is managed by a separate government owned company. If the rail yard is of national importance, then no public-private partnerships are allowed. But if the rail yard is of

regional or municipal importance, then investment from foreign investors is allowed [7].

The case with railways in the Russian Federation is quite interesting and, in some ways, similar to the Bulgarian Railways. In the years since the dissolution of the USSR there was a rapid decline in the overall quality of rail services and therefore a lessening demand for rail freight transport. In 2003 there was a major restructuring of the sector, which saw the dissolution of the Russian Ministry of Rail Transport and the creation of one publicly owned corporation called "Russian Railways". This new company owns, maintains, and develops the publicly owned rail infrastructure. In addition, this company is the largest rail freight carrier in Russia. But all this aside the main innovation was in the fact that the Russian government removed all forms of government funding to the newly formed company which was profit oriented.

This forced "Russian Railways" to begin a process of rapid optimization of both personnel, operational efficiency, rolling stock and track refurbishment and modernization. The effect of this restructuring of the rail sector was almost instantaneous. The modal share of rail freight transport rose from 37.7% in 2000 to 47.2 % in 2020 [8]. In addition to the main public carrier there are more than 200 other rail carriers in Russia divided in three categories: 1- In the first category are rail operators, who own their own infrastructure rail terminals and rolling stock, 2- In the second category there are rail carriers who own and operate their own rolling stock but who do not have their own infrastructure network, 3- In the third category are rail operators who only own rail wagons and do business by renting wagons to other carriers of a higher tier. Regardless of the tier all rail carriers pay infrastructure fees to "Russian Railways" when they use the public rail network.

The good practice from the Russian Federation can be the restructuring of the main rail carrier and the tier system of rail carriers.

5. Expected results after integration of some good practices.

Firstly, one thing that is common in two of the three examples is the ownership of infrastructure. While in Russia and China there is a monopoly over rail infrastructure by the government, in the USA the system is different and, in this aspect, somewhat better than in the two others. However, there are some disadvantages in the system of ownership in the USA. The main disadvantage is the need for the maintenance of a large government body to oversee the quality of the infrastructure. Even an economy as strong as that of the US is struggling in this regard, evidence for this is the rapid increase in derailments due to various infrastructure reasons in recent years.

The opinion to which I have arrived in the analysis of the rail sectors of the beforementioned countries is that a hybrid approach is optimal for the case in Bulgaria. All rail lines must remain government owned, however a leasing system must be implemented on some of the main and branching lines. The expected result is that there will be a rise in private investment in the modernization and maintenance of rail line infrastructure. And thus, the burden for maintaining and developing the rail network will be shared by the private and public sectors alike, thus lessening the need for direct government investments in the sector.

The second good practice is that of China in the area of rail freight terminal management. Again, a hybrid approach is optimal for the situation in Bulgaria. The turnover of some freight terminals is inadequate for their continued existence. However due to the fragile nature of the sector closures in some areas is out of the question. So, I propose that rail terminals be grouped by regions and public regional operators be established. The other good practice is that these companies or rail terminal operators be allowed to join in public-private partnerships while remaining majority government

owned. This will allow for the rapid implementation of new and more efficient cargo handling equipment in rail terminals and direct private investments. This will intern raise overall efficiency of the network reducing time spent in cargo terminals.

The good practice that can be taken from the Russian Federation is that the main rail carrier must own and maintain the bulk of the rail infrastructure, while be profit oriented and not be on direct budget support, with the argument that he be mostly publicly owned. Other private rail operators must be allowed the option to develop their own infrastructure but under the supervision of the relevant government authorities. The effects on the main rail carrier after implementing this new management strategy will be the same as those seen in the “Russian Railways”.

6. Conclusion

There are a lot of problems in the rail sector of Bulgaria, however there is a huge reserve of capacity both in the rail infrastructure network and in the rolling stock. However, mismanagement of both rail infrastructure, terminal management, and operations hinders the competitiveness of the sector compared to freight transport by road.

However, we must look for answers to these problems in other countries with long traditions in rail freight transport, in order to find out how they handled similar problems in the past. Due to the significant differences in land area, demographics and market size, there is no universal fix for problems in the rail sector worldwide. Every one of the beforementioned good practices needs to be adapted to our national reality and current situation.

The development of transport is a nonstop process which is constantly evolving and implementing new more cost-efficient ways of transporting cargo. Healing the rail sector is of paramount importance for the Republic of Bulgaria in order to achieve both carbon neutrality and a greener future for us and for our children.

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Solving or Stagnating a Decades Long Problem? U.S. policy towards the Israeli – Palestinian conflict under President Biden.

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Abstract: *The Middle East has been of primary interest for the following American presidents and administrations since the mid-20th Century. The Israeli Palestinian conflict is an indisputable element of the Middle East and is nearly as long as American strategic interest in the region. Shaping American policy towards the Israeli Palestinian conflict has been of different importance to U.S. Presidents, but the two-state solution has predominantly dominated as a viable solution, despite the fact that Israel has been favored. Donald Trump had a different approach towards the actors of the conflict and the possible solution, in action, discontinuing efforts towards the two-state solution. The current U.S. President, Joe Biden, in his approach towards Israel and Palestine is loyal towards the more traditional American stance. This paper, based on the study of key documents, presents a comparative analysis of the former and present U.S. Presidents, showing how a contemporary, more even-handed, approach, building civil societies, and engaging regional players, might result in future peace between Israel and Palestine.*

KEY WORDS: THE USA, DONALD TRUMP, JOE BIDEN, ISRAEL, PALESTINE, JERUSALEM, THE MIDDLE EAST CONFLICT, TWO-STATE SOLUTION.

The Israeli – Palestinian conflict has been raging in the Middle East for over seven decades now since the establishment of Israel as a new state in 1948. At first it was an Israeli Arab conflict of Israel with neighboring Arab states, but over the years it has constricted, defining Israel and Palestine as the key actors of the conflict. The passing decade has proven that Israel and Palestine are incapable of finding a satisfying settlement for both sides of the conflict bilaterally. Because the Israeli Palestinian conflict is complex, negotiating a peace treaty has been historically difficult. Because of this complexity, third party actors and non-regional actors have had to act as intermediaries. The country that, historically, has had the resources and most potential to foster Middle East peace has been the USA. There are a few factors that make the United States possibly the most effective and potent broker of the Middle East peace process. For a long time, the United States had the strongest soft power which attracted other actors. Because of a strong economy, the USA could be a sponsor of peace deals. And, among other reasons, it had (and still has) leverage over Israel.

American interference with the Middle East conflict has a long history. Actions taken by the following presidents and administrations at times were peace-oriented and periodically, not directly, fueled the conflict. Among initiatives aiming at finding solutions to the Israeli Palestinian conflict, possibly the most spectacular, was bringing both sides of the conflict to the negotiation table by President Bill Clinton at Camp David in 2000. While the bilateral talks between Israeli prime minister Ehud Barak and Palestinian leader Yasser Arafat at Camp David ended with a failure, the measures taken by Clinton were momentous. While at a declarative level the U.S. presents itself as an impartial broker, it is more pro-Israeli. As further discussed in this paper, American support for Israel which hinders the peace process has been delivered at many levels – military, diplomatic and economic. Yet, with its support for Israel, finding a solution to the conflict is high on the American agenda and the following presidents attempted to solve it.

The pivotal issues at stake between Israel and Palestine are three main ones: the city of Jerusalem, Israeli settlements on occupied territories, and the future of Palestinian refugees (Bojko 30-37). These three main problems can be treated as discrete, especially in negotiations, but are strongly interdependent. Jewish settlements are being built on annexed Palestinian territories further impeding the challenge of future of Palestinian refugees. And Jerusalem, being home to the three main monotheistic religions, including the Jewish and Arab ones, is at the heart of both conflicted parties, both seeing it as holy and diplomatically vital. The above enumerated crucial points of conflict, along with few other ones, are addressed by the following American presidents including Donald Trump and Joe Biden.

Before, during and after his term in the office Trump has on many occasions stated that he would be, and was, the most pro-Israel president ever. In social media, he posted that that no president has

done more for Israel than him (Miller, “Trump...”). Undoubtedly, Trump’s policies, decisions and actions have been supportive of Israel. Trump, when entering the White House, had a vision for peace, prosperity and a brighter future for the Israelis and Palestinians. In his early months as president, Trump met with both Israeli Prime Minister Netanyahu and, on a separate occasion, with the Palestinian leader Abbas, and declared America’s commitment to helping both parties in reaching peace and reassured the latter one: ‘We will get it done’ (Lee, “Trump...”). Trump believed that the Israeli-Palestinian conflict is not as difficult to solve as it has been thought and that he by nature is an optimist and is optimistic about a solution. The solution to the Israeli Palestinian conflict lies in finding a satisfactory (and acceptable for both parties) compromise on land and identity issues. The identity one is embodied by the city of Jerusalem. A city sacred for Jews, Muslims and Christians alike. And the conflict over land is represented by the Jewish settlements being built on what was once Palestinian territory and the Palestinian’s claimed right to return to their homes, fields and farms annexed in 1967 by Israel. Trump’s vision, both implemented and declared, treats identity and land matters as well.

As mentioned earlier, Jerusalem is one of the focal points of the Israeli Palestinian conflict. Jerusalem, for both Israelis and Palestinians, exemplifies both land and identity. Since the establishment of Israel in 1948, Jerusalem was to be a city shared and cherished by many religions, cultures, and both nations. Over time, the Israeli presence and activity in Jerusalem has been suppressive towards the Palestinians but just recently (2017) it attracted international attention and caused a local disturbance. This was caused by the then current American President Donald Trump’s declaration recognizing Jerusalem as the capital of Israel and the announcement of plans to move the U.S. embassy from Tel Aviv to Jerusalem.

The UN and the international community regard Jerusalem (East Jerusalem, including the entire Old City, West and East Jerusalem) as an international city, neither the territory of Israel nor the State of Palestine (Góra 31-44). After the 1967 war, Israel extended its jurisdiction over East Jerusalem. Since then, Israel acted according to the *facts on the ground* policy with new Israeli settlements mushrooming and the further annexation of Palestinian land. This annexing was met with international criticism. Nevertheless, both sides of the conflict claim Jerusalem as their capital, Palestine’s in East Jerusalem, and Israel’s in West Jerusalem, which is contradictory to the UN’s stance. Jerusalem is home only to foreign consulates with most countries having their embassies in Tel Aviv. This rule was violated by Donald Trump, who on December 6, 2017, officially recognized Jerusalem as the capital of Israel and declared readiness to move the U.S. Embassy from Tel Aviv to Jerusalem (this act was skillfully delayed by former American presidents) (Huczko 330). This action was merely executing the 1997 Jerusalem Embassy Act, the act that recognized Jerusalem as the capital of Israel. But Donald Trump also asserted, that the final

Israeli Palestinian border will be a subject of negotiation between the sides, which at the same time confirmed American support for the two-state solution.

Trump's action was widely criticized, yet the UN was not able to pass a resolution condemning the USA due to their veto right (Wojnarowicz, "Konsekwencje..."). Yet, this decision should be assessed a great success of Israeli Prime Minister Benjamin Netanyahu's policy, and also the pro-Israeli lobby in Washington. Palestinians declared the decision as disqualifying the U.S. as a future peace broker and radical Palestinian politicians called for a third intifada. While Trump did not exclude the creation of a Palestinian state in the future, his decision concerning Jerusalem imparts the American vision of the future of the conflict. A vision which is shaped by Israel with American assistance despite international law.

The turning point, which shaped today's Middle East and is a vocal point in the conflict, was the year 1967 and the Six-Day War between Israel and the neighboring Arab countries. The aftermath of the war was Arab land loss on behalf of Israel. Since that time, Israeli settlements continuously keep on growing and by *rule of land* expanded, further annexing Palestinian land, and continuing the Palestinian exodus. While on different occasions, American governments were critical of such practices, in practice, Israel was not stopped. At the same time, the international institutions and public opinion was highly critical of Israel and, softly, supported the Palestinian's right to return. While Palestine's *right to return* is not regulated by any formal body, it is widely understood as crucial for peace based on a two-state solution framework. On different occasions land swaps between the actors have been considered, as for the Palestinian side, it is crucial, but Israel is reluctant of any concessions, and insists on further settlement expansion. In this matter, Donald Trump has also proven not to be impartial. Israel's 1981 annexation of the Golan Heights (under Israeli control since the 1967 war) has never been recognized internationally, and for decades Washington shared this official line supported by the UN. Donald Trump, following his Jerusalem decision, also took an unprecedented stance on the Golan Heights problem, and in March 2019 recognized Israel's sovereignty over this territory (Huczko 332). Trump justified his decision by the danger posed to Israel from pro-Iranian Hezbollah launching rocket attacks on Israel from the Golan Heights. This decision was praised as historic by Israel; Syria saw it as a blatant attack of its sovereignty, and the Palestinians as a clear signal what to expect from Trump and how close are the ties between Washington and Tel Aviv. Following Trump's decision, Netanyahu announced construction of a new settlement in the Golan Heights named 'Trump Heights' in order to honor the new American policy for the region (Liebermann, Schwartz and Picheta, "Israel..."). While Trump's recognition of the Golan Heights as Israeli sovereignty is not directly linked to the Palestinians in the region, it exemplifies the direction of American foreign policy towards the region and especially is proof of an American pro-Israeli stance under Trump. Further evidence of such narration was expected and did arrive in early 2020 in the form of Trump's Peace Plan, also so-called the 'Deal of the Century' or, officially, "Peace for Prosperity".

Donald Trump's and his administration's proposal for peace between Israel and Palestine was long awaited. As mentioned above, Trump, promised to find a solution to the conflict just at the very beginning of his presidency. President Trump put his son-in-law, Jared Kushner, in charge of negotiating peace between Israel and Palestine. This choice was controversial, since Kushner, a well-established businessman, is of Jewish origin with deep ties to Israel, who has both a personal and business connection with Israeli PM Netanyahu. Therefore, Kushner, as an advisor was distrusted by the Palestinian side. Kushner travelled to the Middle East on numerous occasions and held talks with both the Israeli and the Palestinian partners. Following the *Jerusalem decision*, and also Trump's recognition of Israel's sovereignty over the Golan Heights, the talks were more difficult, and the Palestinian side questioned the U.S. as a trusted broker of peace. *Peace to Prosperity: A Vision to Improve the Lives of the Palestinian and Israeli People*, the full name of the

plan, was released in January 2020. The full project consists of an economic section and a political one. The economic one was issued in mid-2019. The plan was released in Washington at a joint press conference held by Trump and Netanyahu. Absent at the event was the Palestinian side, also not participating in shaping the proposal and any talks since 2017, when Jerusalem was declared Israel's capital by Trump. Further unfavorable circumstances for any peace talks were, consequently to the Palestinian withdrawal position, Trump's freeze of Palestinian aid, funding UNRWA (the UN agencies aiding Palestine) and also closing the Palestinian diplomatic office in Washington. A further obstacle for a successful peace plan were the negotiators and the authors of the proposal. Mentioned above, Jared Kushner, but also Avi Berkowitz, a young lawyer working for Kushner, and also raised in an Orthodox Jewish family, David Friedman, U.S. ambassador to Israel, and also the deputy national security adviser Dina Powell, who has little background in international affairs.

In January 2020 Trump's administration outlined a strategy called *Peace to Prosperity*. The plan consists of two sections: a political framework and an economic one. One of the key assumptions of the team that shaped the plan was to omit the *two-state* phrase. As Kushner claimed, it is differently understood by the Israeli and the Palestinian side. Yet, creation of two states is the final goal of the proposal. When it comes to the land, the plan puts little pressure on Israel to discontinue annexation of the West Bank. Yet, it recognizes Palestinian right to about 70% of the West Bank, part of the Negev Desert would be joined to Palestine, together with 10 towns, today in the Israel Triangle Zone (Peace to Prosperity 2022). This proposal gives Palestinians less territory than previous proposals and parts of the territories offered would be disconnected from other parts of the Palestinian state joined only by tunnels and highways. The plan, as seen on the map below, recognizes Israeli right to the entire Jordan Valley (Peace to Prosperity 2022). The Jordan Valley is considered by Israel as militarily strategic and by the Palestinians, as their access to water and is of high agricultural importance to them.

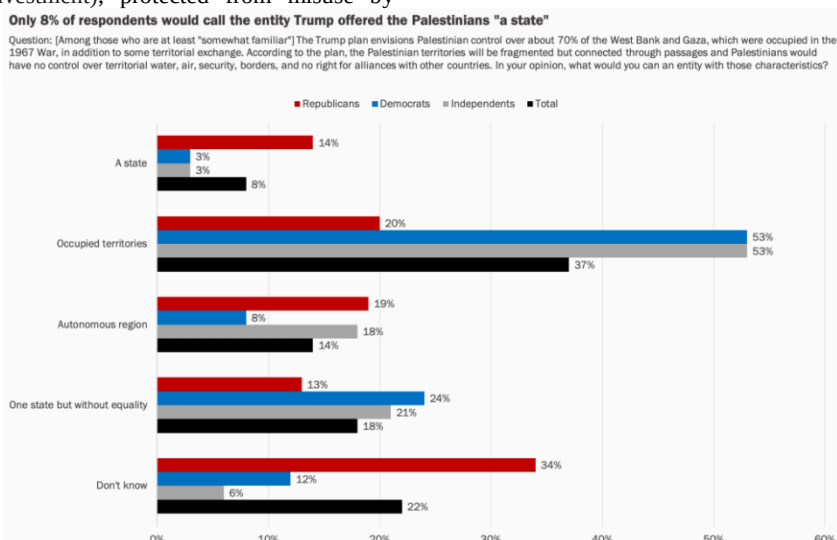


The *Peace to Prosperity* plan addresses the future Palestinian statehood with its capital on the outskirts of East Jerusalem, puts Palestine on probation, and puts the following conditions to be met by the Palestinians: 1) disarm Hamas and other Jihad movements, 2) recognize Israel as a Jewish State, 3) withhold from joining any international organization without Israeli consent, 4) withhold from criticizing Israel and the United States in any international organizations, just to name the most vital ones (Peace to Prosperity 2022). Again, compared to past American peace proposals, the Trump one strongly favors Israel and, while talks about a future Palestinian state, offers difficult conditions for the Palestinians to accept. Another controversial condition refers to the future recognition of Palestinian state. Not only will the condition, described below, be difficult to meet, but also, ones who are in power of assessing the implementation are the USA and Israel, who are in power of freezing the agreement. Above others, the main conditions for Palestinians to meet in order to gain recognitions are: 1) implementation of a governing system, rule of law, fair elections and a trias political principle, 2) creation of credit-worthy financial system and institutions, 3) the end of all programs at schools and in religious institutions that promote hatred and antagonism, 4) demilitarization of the population and full control over Palestinian territory (Peace to Prosperity 2022). And while some of the expectations directed at Palestinians on their path must be seen as essential in order to establish a modern and lawful state, others, in a future state which is scattered over a large area might be difficult to reach without sufficient resources. This aspect has been addressed by Trump's plan. The *Peace to Prosperity* plan proposes \$50 billion investment fund (\$26 billion in loans, \$13.5 billion in grants, and \$11 billion in private investment), protected from misuse by

different mechanisms and gathered from different Arab states and wealthy private investors (Peace to Prosperity, 2020). The list of specific projects to be completed for the funds include travel corridors with highways and rail lines, hospitals and health clinics, power plant upgrades, an upgraded water supply system, and also different projects aiming at attracting tourists. The authors in the plan address the issue of poverty, unemployment, and equal opportunity.

The two main issues that the plan also addresses are the refugees and the future of Jerusalem. Under the new plan there would be no *right of return* of Palestinian refugees who decided or were forced to relocate after the 1948 and 1967 wars. Jerusalem would affirm Israeli right to an entire, undivided Jerusalem. In the future, the Palestinian capital could be established on the outskirts of Jerusalem. The plans give Israel the task of safeguarding the Holy Sites and guaranteeing freedom of worship as they will be under Israeli sovereignty, with the exclusion of Haram al-Sharif/Temple Mount which will be kept under Jordanian custodianship.

After leaving the White House, Trump's vision of peace between Israel and Palestine has not materialized. The *Peace to Prosperity* initiative, as presented above, heavily favored Israel. These terms were unacceptable for the Palestinians who perceived the U.S., again, not as an honest broker but as an interfering actor promoting interests of one side of the conflict, the Israeli one. Not only did Trump's policy towards the conflict not prove to be successful, according to University of Maryland Critical Issues Poll (Telhami, "What..."), it was also perceived by Americans as not leading to a two-state solution, which is a longstanding agreed aim.



Thus, shaping new, possibly more acceptable terms for all parties, frames for Israeli Palestinian talks leading to peace in the region became a challenge for Joe Biden who replaced Donald Trump in the White House. The new president was given a chance to win the ultimate prize in diplomacy: a resolution to the Israeli-Palestinian conflict.

Yet, Biden, unlike Barack Obama who made a clear stance in his *A New Beginning* at Cairo University declaring his interest in the conflict (Sasnal 129), did not declare his assistance in negotiation of Israel and Palestine. Joe Biden did not name a special envoy to Middle East like his predecessors did, nor did he organize a conference or a peace summit for the conflicted parties. Restoring moderate aid to the Palestinians through U.N. agencies (Spetalnick and Farrell, "U.S....") which was withheld by Trump, and resuming contact with Palestinian leaders was the only initial action the new president took. The immediate reasons Biden was reluctant to wade into the peace process were that the election results in Israel were seen as unclear, upcoming elections in Palestine and the continuing belligerent relations which China, which were treated with priority. Also, to the Americans, at this stage, neither Israel nor Palestine appeared as ready for serious dealing.

This approach had to be modified by the White House in early May 2021, when the Israeli Palestinian crises escalated. This event once again forced the conflict into the forefront of international and American attention. The crises which lasted 11 days had its flashpoint in Gaza but also at holy sites in Jerusalem. During this short, yet violent crises, Biden talked on numerous occasions with Prime Minister Netanyahu. In one of them, he condemned the attacks by Hamas and reaffirmed Netanyahu of American support for Israel to defend itself and underlined the importance of a two-state solution (Readout of President Joseph R. Biden, Jr. Call with Prime Minister Benjamin Netanyahu of Israel 2021). Yet over the following days Biden's rhetoric's became stiffer towards Israel. In the next talk with Netanyahu, Biden signaled that he expects a significant de-escalation allowing for a ceasefire (Readout of President Joseph R. Biden, Jr. Call with Prime Minister Benjamin Netanyahu of Israel 2021). This signaled a reversal from the Trump administration's approach towards Israel and indicated that American patience was running out.

As stated earlier in this paper, Jerusalem with its holy sites is among the most pivotal issues in the Israeli Palestinian conflict. Any party engaging itself as a mediator must first find a solution to the future

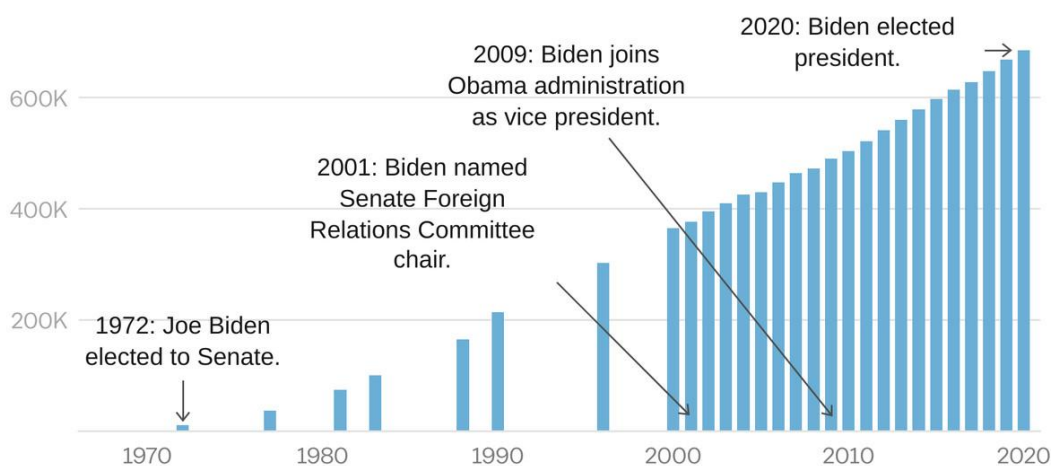
of this city that is acceptable to both Israel and Palestine. Biden, in his rhetoric, managed to avoid any specifications of Jerusalem's final status, which also meant that he does not fully support Trump's vision. Trump clearly believed that Jerusalem would remain the capital of Israel in an undivided city (Carter 170). While the White House plans to upgrade Palestinian ties by reopening the Jerusalem consulate (closed by Trump when he moved the U.S embassy to Jerusalem) in the East part of the city, but this action has not taken place yet. At the same time Biden, sent a clear message to Israeli officials, that further evicting of Palestinian families from East Jerusalem will spark tension and possibly a war with the Palestinians consequently, undermining viable peace under the two-state principle (Hesham, "10 Things..."). Reversing Trump's actions, even if wished by Biden, might be difficult or even impossible. Therefore, if future peace talks between Israel and Palestine were the Biden's administration goal, guarantee of some kind to the Palestinians should be considered.

While Biden's administration, like Trump's, firmly believes that Israel has every right to protect its security, the new administration

does not understand this backing of Israel in every action in the Middle East. Israel sees building new settlements as a need for new territory needed to satisfy growing housing needs, but also as a security measure understood as stripping the terrorists from their land. Even though Israel argues that new settlements are necessary because of population pressure, Biden, sees it as an obstacle for a two-state solution, condemned Israeli plans (Abrams, "Blasting..."). What Israel needs, and to a certain degree they execute with avoidance from the public eye, the Palestinians fear this means displacement for them. These actions might bring both parties to clashes, excluding any kind of peace talks. Biden sees any unilateral steps on the settlement issue must be avoided. Yet, officially, Trump's policy towards growing settlements has not been undone and as can be seen on the graph below, the construction process is still ongoing (Guyer, "Biden..."). Growing settlements, eviction of Palestinians, and home demolition, in Biden's perspective hinder possible peace talks. His administrations refrained from calling the new settlements illegal, as discussed further, as part of his small step approach.

Israeli settlements have ballooned since 1967

Israel-Palestine is different than the place Biden first visited as a young senator.



Israeli settlement population in East Jerusalem and the West Bank for available years.

Source: Israel Central Bureau of Statistics via Peace Now

Vox

While Biden rhetoric concerning the territorial growth of Israel is significantly different than his predecessor's, on the grounds that the settlement construction is still an ongoing process, just like the process of evicting Palestinians from their homes to make space for new Jewish real estate. This process which is one of the cornerstones of the conflict is still to be more decisively approached by the White House. As can be seen from the graph above, Jewish settlements are growing and seem to be unstoppable by the following American administrations despite the fact that they are among the most crucial obstacles for a two-state solution.

Biden, with his administration, decided to approach the Israeli Palestinian conflict in a different, new way. The *small step* approach, also known as the baby step approach, instead of giving a holistic solution, stresses small, insignificant actions in order to win trust and then possibly advance in a more decisive manner. This small step approach concerns the style of communication. Biden not only decided to apply public pressure but also activate a more *back door* strategy and address sides of the conflict directly. Inflicting pressure through a public microphone, understood as public and open lecturing, had failed George W. Bush, Barack Obama and Donald Trump as well, in both times of peace and war (Makovsky, "Why..."). By shifting from a strong and imperative tone, preferred by Trump, to a more assisting voice, Biden decided to address the conflicted parties from a more impartial actor. A *small step*

necessary to lay a positive groundwork for future negotiations. In a joint press statement following Biden's visit to the region, both Biden and Abbas, underlined the legitimacy of the two-state solution along the 1967 border, with necessary land swaps, and Biden highlighted making Jerusalem a city for all people, improving the lives of Palestinians and, while declaring America a partner, expressed good momentum for reinvigorating the peace process (Remarks by President Biden and President Abbas of the Palestinian National Authority in a Joint Press Statement 2022). Unlike Trump, Biden presents an approach of understanding, that Israel and Palestine are alike as parties with rights and interests. That both deserve equal measures and guarantees of security, freedom, opportunity, and dignity. These are not the aspirations of both, but rights.

The *small step* approach of Biden is in line with his political experience gathered since 1973, the beginning of Biden's activity for the American government. As a senator (among others he was a member of the Senate Foreign Relation Committee), vice-president, and as president, Biden was and is known for his realpolitik approach. He has applied this approach to the Israeli-Palestinian conflict. Biden well understands that putting extensive pressure on the actors (or favoring any) of the conflict, like his predecessors did, is not likely to succeed in finding peace. Instead, Biden, together with his administration, divided future American steps towards the

conflict into three clear phases. According to Blinken's speech they are: 1) focusing on humanitarian and reconstruction needs in Gaza, 2) address Israeli and Palestinian actions in order to reduce tension and prevent violence, 3) over time to improve people's lives and add a sense of dignity and hope (Secretary Antony J. Blinken at a Press Availability 2021). Such an approach is much different from what was the official policy of Trump's administration. This bottom-up approach, addressing the basic needs of people is a new idea towards the conflict. Yet it must be underlined, that this idea is rather a long-term strategy, since this is the characteristic of *small step* actions.

Interestingly, not all of Trump's policies towards the Israeli-Palestinian have been discontinued. Biden is declaring support for Israeli Arab countries' normalization agreements signed or negotiated under Trump. Continuing the legitimization process of Israel in the eyes of Arab countries of the region. The number of countries that have recognized Israel and its right to exist (or at least establishing any kind of positive relation) in the region is gradually growing, starting with Egypt back in 1979. Donald Trump also committed himself to build relationships in the region through the Abraham Accords Declaration in 2020. The Abraham Accords initiative was a joint normalization statement, initially between Israel and the United Arab Emirates and Bahrain aimed at cultural exchange, environment, and also economic cooperation (The Abraham Accord Declaration 2020). Other Arab countries like Saudi Arabia, Sudan, Indonesia, Nigeria and possibly other are expected to engage in the talks. The process of rooting Israel in the region by signing normalization agreements with neighboring Arab countries, which have long refused to accept Israel's existence in the region, has two main goals. The economic dimensions, that is enhancing bilateral and multilateral contacts for mutual economic benefits. And (or) promoting normalization to arrive at a peaceful existence of Israel and Arab countries of the region including Palestine. The Biden administration shows support for the normalization agreements of Israel and the Arab states of the region signed under Trump. Further normalizing Israel's position in the region through establishing diplomatic and economic ties was touched upon by President Biden on his trip to Israel. In a joint statement, Biden and Israel's PM Lapid, underlined the importance of these efforts and underlined the importance of a regional stakeholder in bridging Israel and Palestine especially by improving the quality of life of the latter (The Jerusalem U.S.-Israel Strategic Partnership Joint Declaration 2023). The importance of including the needs and expectations of the Palestinians was kept high in American priorities in this initiative. Yet, it must be underlined that Palestinians view these efforts with deep suspicion or even hostility, since, from their perspective, brother Arab states are betraying them. It is up to Biden to find some dividend for the Palestinians, both in the West Bank and in Gaza, which as a consequence, might result in improving the living condition of the Palestinians but also repair the Palestinian leaders' reputation in the region and globally. While Trump concentrated only on Israel, Biden believes in recognizing the needs, and aspirations of the Palestinians. By investing in Palestine, he strongly believes in building a civil society that might start playing an important role by influencing the decision makers. Building relations between Israelis and Palestinians, stressing cooperation, and aiming at a *bottom-up* approach. A simple yet original strategy of addressing less the politicians, and more the societies. Biden made this point by allocating \$7 million in grants under the MEPPA (The Jerusalem U.S.-Israel Strategic Partnership Joint Declaration 2022), an initiative dedicated to peacebuilding in the region and the two-state solution (Lincoln, "Middle..."). These grants in the field of medical and technological cooperation are insignificant in both MEPPA funds and also as far as needs are concerned, but they signal an American presence. They signal that the United States under Biden retrocede from Trump's path and show commitment to both sides of the conflict. Biden's announcement has a far more valuable message than the financial one, it reveals that the civil society on both sides of the conflict are a new actor. Collaborating with this new actor signals a new, more practical approach from the White

House. While engaging with both communities, the Israeli and the Palestinian ones, seems to be a long-term and time-consuming strategy, it also appears to be new and practical. After decades of struggling with the policymakers on both sides, targeting the societies, promoting practical economic, social, technical, and educational cooperation is beneficial for both parties. This is an attempt to normalize the existence of neighboring countries.

This new approach, possibly the most important and innovative change in the American stance is vital, especially currently, when both Palestine and Israel are undergoing domestic turmoil. As mentioned above, President Trump was reluctant about initiating a peace process directly with the leaders of the conflicted states. Shaping an artificial negotiation frame which is distrusted by both Israeli and Palestinian leaders had been proposed a number of times before and had always failed. Without clear signals from the region that leaders of both parties are ready to open another negotiation round, the Trump administration declined from any decisive action. Yet, lack of negotiation proposals from Biden, does not mean American passiveness. The Biden administration has signaled clear expectations towards Israel and Palestine, explicitly stating what actions must be avoided and at the same time, building stronger civil societies and improving the quality of life. Therefore, this new approach is neither solving nor stagnating. It is laying the groundwork of a civil society for future bottom-up peace initiatives.

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Social capital and its association with good local governance in Republic of North Macedonia

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Abstract: Numerous studies show that high levels of social capital are associated with higher level of good governance in societies around the world. However, because of different definitions and approaches for measurement of social capital, a lot of papers have included only one variable of measure or not in-depth measurement of social capital. Also, there is a huge deficiency of research for social capital and its relation with good governance in North Macedonia. Therefore, it is very important to make national analysis, also because of the cultural differences between the countries that can produce different conclusions. Also, it is not known which indicators of the broad concept of social capital are associated with good governance.

Social capital is a complex multidimensional concept without unified definition. One easy way to explain the social capital is through benefits that arise from social activity of one individual, or social capital is related to the types and the quality of human networks. Among many distinctions of social capital are distinctions of structural, relational and cognitive social capital and distinction based on relationships such as strong, weak, vertical, horizontal, bonding, bridging or linking. In this paper, we will take the distinction of structural and cognitive social capital on individual level. This paper will examine the association between different types of individual structural social capital and individual cognitive social capital with level of perceived effectiveness of good local governance variables on municipalities level. Thus, paper hypothesis is: structural and cognitive dimensions of social capital are positively associated with good local governance. Data will be gathered through a questionnaire that will be delivered online (e-mail, social platforms, etc.) to residents of minimum 20% of the municipalities in Republic of North Macedonia. Analysis of the data will be through Ordinary Least Square regression to model good governance measures as a function of different proxies of structural and cognitive social capital, and controlling variables. The goal of the paper will be to show the association of good local governance and different dimensions of individual social capital.

Keywords: SOCIAL CAPITAL, GOOD GOVERNANCE, LOCAL DEVELOPMENT, CIVIL SOCIETY, EFFECTIVE LOCAL GOVERNMENT.

1. Introduction

Good governance is very much needed from the countries in order to achieve economic, social and ecological goals of the SDG's. The governments of all countries have to perform many key functions for prosperity of their societies. Among these key functions are ensuring social services like health, education, infrastructure, eradicating crime, promotion of science and technology and implementation of regulations for protection of environment [1].

Theorists in the field of social capital (like Putnam, Rice, Knack), advocate the thesis that countries with higher level of social capital, have in return higher quality of governance. More accurate, social capital is considered to be one of the leading factors of modern societies, from the emergence of governance paradigm. Because of the decentralized and horizontal model of the paradigm of governance, based on negotiation, cooperation, participation of the people in civil society, learning and exploring of the social capital gain importance in the discussions of the quality of governments in the paradigm of governance.

Social capital is multidimensional concept consisted of different types and dimensions. These dimensions can have different influence of good governance, some of them even negative influence. Therefore, it is necessary to explore the effect of different types of social capital on good governance. This paper will explore the concepts of good governance and different types of the concept of social capital and their connection on local level in republic of North Macedonia, as a case study.

2. Good Governance

According to United Nations, governance is defined as a structure and processes by which social organizations – from family to corporations and international institutions – are self-governed in range of centralized control to self-regulation. Governance is a process of decision making and process by which decision are implemented or not [2]. In other words, governance is related to ways of management of people in power, formal or informal, it describes the way of work of institutions and how states and their bodies connect to society [3]. The term governance is used in different contexts such as corporate governance, international governance, national governance, local governance [2].

The global recognition of the need for good governance begins in the 1990s. In today's time, good governance is often used from national and international organizations who are focused on development issues. However, the meaning and the scope of this term is not always clear. In some cases, due to the lack of a specific definition, good governance refers to a term that covers everything related to governance [4]. In 1996, the International Monetary Fund (IMF) has declared that promoting good governance in all its aspects, including the rule of law, improving the efficiency and accountability of the public sector and fighting corruption, are essential elements of the framework in which economies prosper. The World Bank defines good governance by the traditions and institutions through which authority in a particular country is exercised. This includes: the processes by which the government is elected; the government's capacity to effectively formulate and implement good policies; the respect of the citizens and the state for the institutions that lead the economic and social relations between them. This definition of the World Bank is the basis for the formation of the World Governance Indicators, which include 6 dimensions: voice and accountability; political stability and absence of violence/terrorism; effectiveness; quality of regulations; the rule of law; control of corruption [5]. The United Nations defines 8 main characteristics of good governance: involvement, consensus orientation, accountability, transparency, responsiveness, effectiveness and efficiency, fairness and inclusiveness, rule of law [2].

3. Social Capital

There is no unified definition for social capital. Coleman defines social capital as a variety of different entities, with two elements in common: they all consist of some aspect of social structures and they facilitate certain action of actors within the structure [6]. Putnam defines social capital as features of social organization such as networks, norms and social trust that can facilitate coordination and cooperation for mutual benefit [7]. Nahapiet and Ghoshal define social capital as the sum of the actual and potential resources embedded within, available through and derived from the relationships possessed by an individual or social unit [8]. From these definitions, one can see the multidimensionality of the social capital concept. Hence the problem with unified definition and measurement of social capital.

Researchers in this field, often make distinction based on relationships. Hence, the social relationships can be strong, weak,

vertical, horizontal, bonding, bridging or linking. Most common used distinction is of bonding, bridging and linking social capital. Bonding social capital are ties between individuals within the same social group or with others who are primarily like them. Bridging social capital are ties that link people together with others across a cleavage that typically divides society (like race, or class, or religion), and linking social capital are social ties (often a bridging social ties) to those with power that provides one with the capacity to gain access to resources, ideas and information from formal institutions beyond the community.

There are other distinctions of social capital such as distinction of structural and cognitive social capital [9], and structural, relational and cognitive social capital [8]. In this paper, we took the Uphoff distinction of structural and cognitive social capital. In this distinction, the cognitive social capital includes the relational social capital. Structural social capital is related to different forms of social organization such as roles, rules and procedures and different types of networks. This type of social capital is related to features and type of networks that one has developed, or the people that individual knows and can use them for benefits such as information, material or non-material support. Typically, this capital on individual level is measured as structure and position of social network, number of network memberships, types of social networks, frequency of social relationships.

Cognitive social capital derives from mental processes and resulting ideas, reinforced by culture and ideology, specifically norms, values attitudes and beliefs. This type of social capital is related to characteristics and quality of social relationships and networks. It is associated with trust, obligations, mutual respect and empathy. On individual level, it is measured by quality of social interactions, social relationships, social networks, social support, social cohesion, mutual care, helping, trust, trustworthiness, norms, obligations, expectations, identity, vision and values. Because cognitive and relational social capital are derived from mental and not material world, researchers usually are summing these two aspects into one dimension: cognitive social capital

Table 1: Distinction of social capital on individual level

Structural SC	Relational SC	Cognitive SC
<u>Social structure:</u>	<u>Nature and quality of relationships:</u>	<u>Shared understandings:</u>
- Social networks and relationships	- Trust and trustworthiness	- Shared language, codes, and narratives
- Membership in organizations and clubs	- Norms and sanctions	- Shared values, attitudes and beliefs
- Bonding, Bridging and Linking social networks and ties	- Obligations and expectations	- Shared goals, purpose and vision
	- Identity and identification	

Source: <https://www.socialcapitalresearch.com/relational-social-capital/>, Claridge Tristan, What is Relational Social Capital?, 10.02.2022.

4. Methodology

Main purpose of this paper is to contribute to scientific evidence of association between different types of individual structural social capital and individual cognitive social capital with level of perceived effectiveness of good local governance variables on municipality level in Republic of North Macedonia. Thus, paper hypothesis is: structural and cognitive dimensions of social capital are positively associated with good local governance. Also, it is not known which indicators of the broad concept of social capital are associated with good governance. Therefore, another goal of the paper is to conclude which variable of the social capital concept is related to good local governance and how.

In order to gather data, questionnaire was developed in google forms and distributed to people that live in different municipalities in North Macedonia via e-mail, social media, platforms for communications. The questionnaire was consisted of 29 questions regarding demographics, structural social capital, cognitive social capital and effectiveness of good local governance. The research was conducted in the period of 20th December 2023 till 20th January 2024. Total of 1453 participants, citizen of North Macedonia that are living in different kind of municipalities across the country, fulfilled the survey and gave relevant answers.

Data will be used to perform linear regression analysis. As control variables for the linear regression analysis, are used demographic variables: age (number), education (scale 1-5), income (scale 1-6) and gender (0-1). Effective good local governance is measured by proxy measure using the question "How would you rate the quality of municipal public administration in your place of residence?", on a scale from 1 (very bad) to 10 (excellent). This measure is the dependent variable in the regression analysis.

As independent variables are used measures for structural and cognitive social capital. Structural social capital is measured by: number of close friends (scale 1-5), number of other friends (scale 1-5), type of friends related to income (scale 1-5 where 5 means nearly all friends are from same income category), type of friends related to education (scale 1-5 where 5 means nearly all friends are from same education category), frequency of spent time with friends (scale 1 – few times a year; to 5 – every day), and personal action (scale 1 not included in activities, to 5 – once a week included in activities for enhancing community life). Cognitive social capital is measured by: different types of trust such as generalized, personalized and neighbourhood trust (scale 0-10), norms of cooperation (scale 1-5) and reciprocity (scale 1-10), sense of belonging and togetherness (scale 1-5), solidarity, help from others in community, personal participation in solving community problems and action of others in community (all on a scale 1-5).

5. Results of discussion

In order to analyse the association of different levels of individual social capital and good local governance, linear regression analysis was developed:

$$Y = \beta_0 + \beta_p X_{ip} + \epsilon \quad (1)$$

Multiple linear regression model contains one dependent variable – perceived effectiveness of local public administration. As independent variables are different measures of individual structural and cognitive social capital, and controlling demographics variables. From table 2, we can see that the multiple linear regression model has coefficient of determination $R^2 = 0,2306$ which mean that 23.06% of the variation in perceived effectiveness of local public administration can be explained by the variation in independent variables. This model, also has statistically significant F-test, suggesting that at least one independent variable is associated with the dependent variable. Analysis shows that after conducting t-test, only one of the demographic variables (income) is statistically significant (on 5% level) in association with perceived effectiveness of local public administration, but have a very low effect due to coefficient of -0.068. Regarding individual structural social capital, analysis show that none of the selected variables is statistically significant in association with the dependent variable. Regarding individual cognitive social capital, the t-test shows that variables personalized trust, neighbourhood trust, norms of cooperation and community action has statistically significant positive association with perceived effectiveness of local public administration on 1% level. For one level increase on the scale of personalized trust, perceived effectiveness of local public administration is increasing for 0.11 on the scale of measurement. For one level increase on the scale of neighbourhood trust, perceived effectiveness of local public administration is increasing for 0.138 on the scale of measurement. For one level increase on the scale of norms cooperation, perceived effectiveness of local public administration is increasing for 0.394 on the scale of measurement.

For one level increase on the scale of community action, perceived effectiveness of local public administration is increasing for 0.231 on the scale of measurement. These results are shown with the regression model equation:

$$\begin{aligned} \text{Governance public admin} = & -0.1607 + 0.0022 \cdot \text{Age} + \\ & 0.0483 \cdot \text{Education} - 0.0680 \cdot \text{Income} + 0.0513 \cdot \text{Gender} - \\ & 0.0270 \cdot \text{Number of close friends} + 0.0090 \cdot \text{Number of other friends} \\ & - 0.0035 \cdot \text{Type of friends by income} - 0.0162 \cdot \text{Type of friends by} \\ & \text{education} - 0.0037 \cdot \text{Frequency of time spent with friends} - \\ & 0.0340 \cdot \text{Personal action} - 0.0088 \cdot \text{Generalized trust} + \\ & 0.1140 \cdot \text{Personalized trust} + 0.1382 \cdot \text{Neighbourhood trust} + \\ & 0.3940 \cdot \text{Norms of cooperation} + 0.0233 \cdot \text{Norms of reciprocity} + \\ & 0.0607 \cdot \text{Sense of belonging} + 0.0715 \cdot \text{Sense of togetherness} + \\ & 0.0084 \cdot \text{Solidarity} - 0.0291 \cdot \text{Help of others} - 0.0035 \cdot \text{Personal} \\ & \text{participation} + 0.2317 \cdot \text{Action of others.} \end{aligned} \quad (2)$$

Table 2: Multiple linear regression analysis

Dependent Variable: GOVERNANCE_PUBLIC_ADMIN				
Method: Least Squares				
Sample: 1 1453				
Included observations: 1453				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.1607	0.4280	-0.3755	0.7074
AGE	0.0022	0.0042	0.5306	0.5957
EDUCATION	0.0483	0.0641	0.7533	0.4514
INCOME	-0.0680	0.0336	-2.0229	0.0433
GENDER	0.0513	0.1001	0.5126	0.6083
CL_FRIENDS	-0.0270	0.0525	-0.5153	0.6065
OT_FRIENDS	0.0090	0.0387	0.2321	0.8165
TYPE_FR_INC	-0.0035	0.0475	-0.0743	0.9408
TYP_FR_ED	-0.0162	0.0445	-0.3646	0.7154
FREQUENCY_FR	-0.0037	0.0433	-0.0858	0.9316
PERSONAL_ACTION	-0.0340	0.0331	-1.0268	0.3047
GEN_TRUST	-0.0088	0.0235	-0.3739	0.7085
PERSONALIZED_TRUST	0.1140	0.0223	5.1159	0.0000
NEIGHBOURHOOD_TRUST	0.1382	0.0335	4.1278	0.0000
NORMS_COOPERATION	0.3940	0.0682	5.7756	0.0000
NORMS_RECIPROCITY	0.0233	0.0201	1.1613	0.2457
BELONGING	0.0607	0.0425	1.4268	0.1539
TOGETHERNESS	0.0715	0.0566	1.2650	0.2061
SOLIDARITY	0.0084	0.0383	0.2184	0.8272
COMMUNITY_HELPING	-0.0291	0.0529	-0.5498	0.5825
PERSONAL_PARTICIPATION	-0.0035	0.0428	-0.0821	0.9346
COMMUNITY_ACTION	0.2317	0.0591	3.9218	0.0001
R-squared	0.2306	Mean dependent var	2.4728	
Adjusted R-squared	0.2193	S.D. dependent var	1.9597	
S.E. of regression	1.7315	Akaike info criterion	3.9509	
Sum squared resid	4290.4870	Schwarz criterion	4.0309	
Log likelihood	-2848.3500	Hannan-Quinn criter.	3.9808	
F-statistic	20.4197	Durbin-Watson stat	2.0045	
Prob(F-statistic)	0.0000			

Source: Author's analysis

Results indicate that individual structural social capital is not associated with perceived effectiveness of local public administration on municipal level in North Macedonia. Neither one of the variables of structural capital have statistical significance and positive association with the dependent variable. This means that number and structure of friends and more spent time with them is not related to good local governance and effectiveness of the public authorities. One explanation for this is that in North Macedonia, people don't use their networks of friends and acquaintances to make some positive change in their place of living, they don't organize in a way that they can influence the public authorities to make better policies and implement better practices. Or just the number, structure and frequency of spent time with friends is not important to influence the local government quality. The variable community action is belonging to cognitive social capital due to norms of action, but is related also to structural social capital because in order the people to act on a problem in a community, they have to participate in some groups (formal or informal) and have developed networks of people. Therefore, we can say that participation in groups is needed to have positive influence on good governance. On the other hand, individual cognitive social capital is associated with perceived effectiveness of local public administration on municipal level in North Macedonia. From 11 variables that are consisted in cognitive social capital, 4 variables

are statistically significant in positive association with perceived effectiveness of local public administration. The highest coefficient variable which is in positive association with the dependent variable is norms of cooperation variable. This indicate that in the places or communities where people think that they can easily get help from others in solving some community problem if asked, is associated with effectiveness in local public administration. This supports the narrative that the more people in some municipalities are cooperative and give support and contribute to solving community problems, the more effective public authorities will be, because they are putting more pressure on government official to be more effective, they communicate more with them and push more for their expectations to be met, with their demand for change and example in community. Also with the norms of cooperation is developing a culture of doing something that is beneficial for others and the community, which in return makes the local government authorities more effective. Another variable that is positively associated with the dependent variable is community action measured by one's perception of dedication of time and money of other citizens, for solving community problems. This show us that action and dedication of the people are important features in making good local governance. If the people are more dedicated to spent time and money to solve community problems, this will motivate and influence the local governments to become more effective, since they will be more observed and questioned from local citizens about their policies and activities. Also, we can say through action, local citizen will collaborate with their local governments and push them to be more effective. Trust in the people that one individual personally know is also positively influencing the effectiveness of local public administration. Without trust, people cannot communicate and collaborate so it is important factor that can make contribution in getting people together. This is also relatable to trust in people from the same place of living as in trust in people that one knows personally.

From the results we can see that only individual cognitive social capital is associated with perceived effectiveness of local public administration. But we cannot exclude individual structural social capital, since in order to have norms of cooperation, community action and trust, one's must have developed formal or informal networks of people. The analysis shows that type of friends, number and frequency of time spent is not significant, but in order to have functional cognitive variables, some form of structure of networks have to take place.

Because of possible correlation between the variables, multicollinearity test was developed. The Variance inflation factor test shows that none of the variable have value of more than 10. Hence, the conclusion of no multicollinearity presence. Additionally, the correlation matrix shows relatively low correlation between the variables. Only variables personalized trust and neighborhood trust have high coefficient of correlation (0.790) which means that this to variables are supporting each other. This correlation is expected especially in smaller towns or villages, where closest friends of people are one's from the place of living. Other correlation that is worth mentioning is between variables of sense of belonging and sense of togetherness with a coefficient of 0.554.

This analysis has problems and limitations that need to be addressed in the next papers. First, measuring social capital is really a challenge. In this paper a lot of variables are being measured by proxies. For better measurement, maybe in the next papers it should be used more questions to measure one variable and through factor analysis to produce latent variables. Also, measures combining structural and cognitive social capital may be of use. Second limitation is the cross-sectional analysis which cannot show causality of the variables. Other papers should use panel data to address this limitation. Also, combine qualitative and quantitative methods for analysis.

6. Conclusion

Social capital is complex concept that is hard to measure and is in the category of so-called umbrella concepts. As such, this type of capital is multidimensional and each dimension have different influence on specific variable of interest.

This paper showed theoretical concepts of good governance and social capital on individual level through two dimensions: structural and cognitive social capital. The association of these concepts was analyzed with data from citizens that are residents in more than 25 municipalities out of 80 from Republic of North Macedonia. To analyze the data, multiple linear regression model was developed.

With the developed regression model, I come to the conclusion that four variables from cognitive social capital (personalized trust, neighborhood trust, norms of cooperation and community action) are positively associated with the proxy variable for good local governance – perceived effectiveness of local public administration, and are statistically significant. One variable from demographics (income) is negatively associated with perceived effectiveness of local public administration.

Results of this paper show that in order to increase effectiveness of local public administration, it should be worked on increasing the level of neighborhood trust and personalized trust, increasing the level of norms of cooperation between people from the same place of living and increasing the level of action and dedication of the people to contribute to solving community problems. From the results we can see that individual cognitive social capital is better explaining good governance than individual structural social capital.

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