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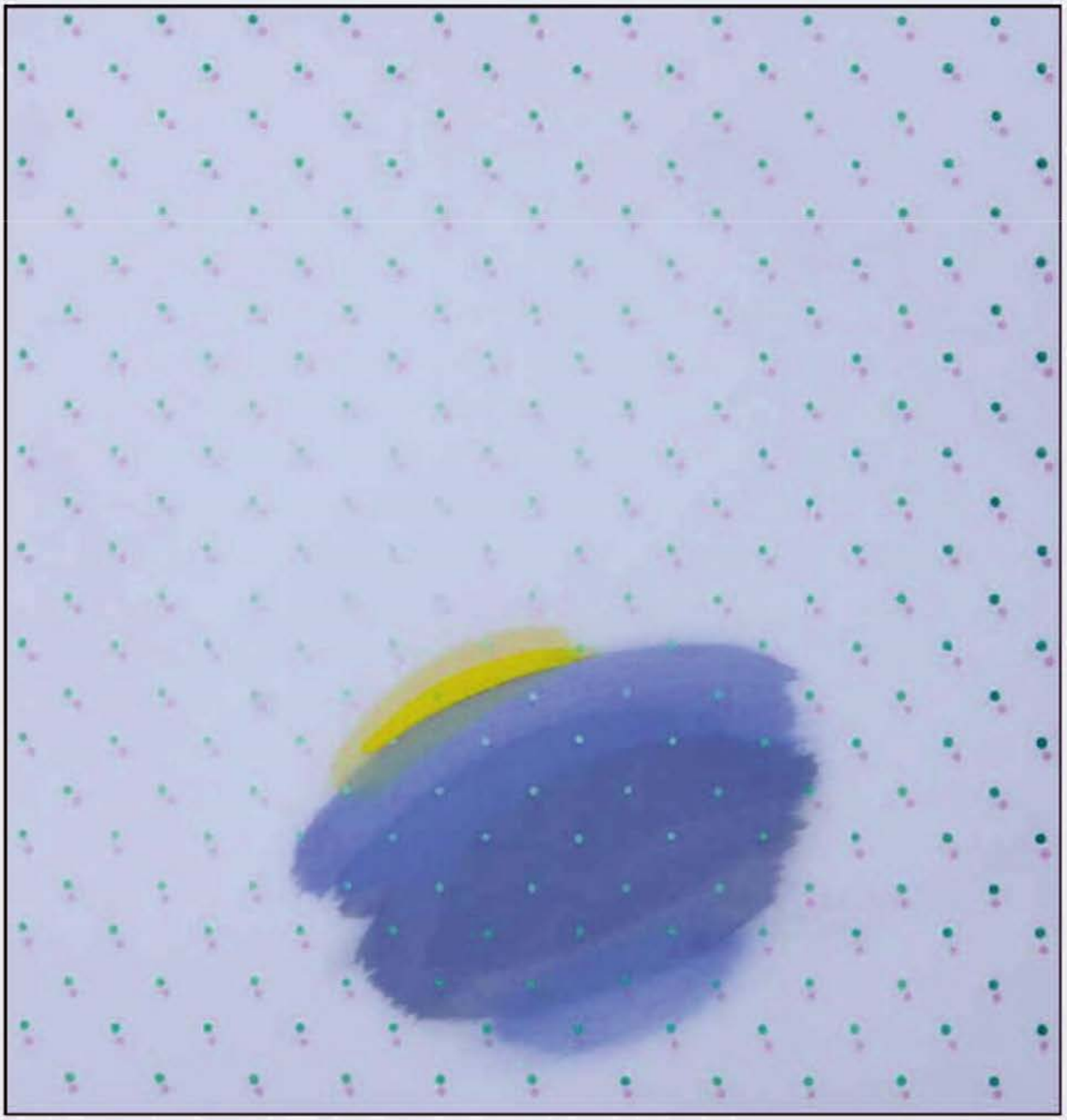

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Editorial

Two main attributes ubiquitous to dedicated researchers are the curiosity to explore novelties and the ability to anticipate changes of circumstance in their field. Over the past year, humanity has been shaken into alert by a historic wake-up call and made to face what has doubtlessly been one of the greatest challenges in its existence. The pandemic caused by the coronavirus has brought about tectonic changes in all segments of daily life and moved the symbolic Doomsday Clock closer than ever to apocalyptic values in its measure of global risk. Moreover, a pervasive speculation is that humankind must brace itself for similar and potentially even more dramatic challenges in the future. As well as the whole world, the Republic of N. Macedonia and its citizens felt on their own skin the unrelenting vehemence of the pandemic through lost human lives, economic collapse, inadequate education, desocialized, isolated and lonely population, and neglected social activities such as science, culture, sports, art and many others.

As with any major global event of little or no precedence throughout history, an enterprise that had to act promptly to deal with this catastrophe was science. Despite all the fascinating advances of science over the past centuries and decades, science's response to the pandemic has, dishearteningly, been neither rapid nor fully effective. On the contrary, the inevitable spotlight on the functioning of the scientific ecosystem has at once shone a light on all the civilization’s imperfections, even in the world’s most developed countries. The lesson we need to learn from this plague is that civilization needs a new concept of life based on solidarity and knowledge. The future will no longer tolerate or sustain improvisations and subterfuges that will return to humanity like a boomerang.

In such circumstances of bridled activity, everyone, including researchers in science and academia, has endeavored to continue to function by contributing to overcoming this global crisis. The impossibility of performing direct research and gaining first-hand experiences in many fields seems to have left more time for scientists to pause, reflect and overview their previous research engagements and to determine new directions for their further action in the field of science. So we, in the Editorial team of SEEJSD, continued to publish new achievements related to sustainable development, a continuity that has seen the Journal celebrate its fifth anniversary of promoting the dissemination of quality research across Southeastern Europe. We are not pausing at this milestone; rather, it gives us additional momentum to work towards the establishment of SEEJSD as an internationally recognized journal indexed in international databases of scientific publications.

I sincerely expect that in the coming period the situation will slowly return to normal and that, with lessons learned from this bitter experience, we will come out stronger and better equipped to overcome any future challenges that our society may face. Finally, allow me, dear authors, editorial board members and followers of SEEJSD, to wish you good health and hope for a better tomorrow.

Cordially,

Dr. Azis Pollozhani, PhD
Editor-in-Chief

Contents

Challenges in ensuring human capital for sustainable development in developing countries: Evidence from North Macedonia

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Abstract

Investment in human capital is fundamental to the resilience and sustainable development of a country. Notwithstanding traditional models of human capital which define it as a stock of knowledge, skills, experience and other attributes embodied in the ability to perform work so as to produce economic value, contemporary views of the concept have shifted their recognition from a purely economic to a more encompassingly humanistic connotation of human capital. This redefinition has resulted in the introduction of more complex and multifaceted global metric tools such as the Human Capital Index and Human Development Index, each envisaged to promote a broader and more holistic understanding of a country's rate of development. Since its thrust into statehood in 1991, North Macedonia's own efforts towards building a progressive economy have been perpetually plagued by the challenge of forming, retaining and sustaining human capital. This paper provides a brief investigative overview of three key driving issues facing the country's human capital development, namely the complex nexus of poor academic standards, labour market supply/demand mismatch, and brain drain. It contends that damaging policies prioritising access over quality in higher education, credentialism, lack of labour market absorption, high youth unemployment and staggering talent flight rates are inextricably linked in a causal chain leading to the country's persistent problems in securing human capital. The paper concludes that future policies need to combine specific and practical implementation scenarios and be unequivocally committed to sustainable human capital development as a fundamental prerequisite to building a prosperous, resilient and flexible society able to adapt to new challenges and to respond by tapping into a sound value system.

Keywords: *human capital, sustainable development, Human Capital Index, Human Development Index, North Macedonia, quality in higher education, labour market, skills mismatch, brain drain*

Introduction

Central to the United Nations' 2030 Agenda for Sustainable Development, the Sustainable Development Goals (SDGs) represent a comprehensive set of actions embodying multiple forms of capital – natural, social, financial, technological and cultural – the maintenance of which is fundamental to growth and improvement (Goodwin, 2003; Slaus & Jacobs, 2011). As the successful implementation of the 2030 Agenda is conditioned by a systemwide rather than a compartmentalized approach, these various dimensions of development must inevitably be targeted within their complex and dynamic interaction. Furthermore, as Slaus and Jacobs suggest, these dimensions "derive their value, utility and application from human mental awareness, creativity and social innovation" (2011). This assigns human capital the role of a central driving force in the sustainable development of a country.

Traditionally, the concept of human capital has been defined as the sum of knowledge, skills, experience and other qualities which contribute to an individual's ability to perform work in a manner that yields higher productivity and economic returns (Goldin, 2016). More recently, however, there has been a notable trend towards a redefinition of human capital aimed beyond what Bourdieu (1986) labels as 'economism' and towards a recognition of both its monetary and non-monetary aspects. These form part of OECD's broad – and broadly accepted - definition of human capital as "the knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being" (OECD, 2001). The thrust towards a more encompassingly humanistic connotation of human capital is also reflected in the departure from the traditional output-cost-income measurement systems to more people-centered methods. The outcome of this shift of focus are the Human Capital Index and Human Development Index.

The two key areas considered in the Human Capital Index (HCI) are a country's health, parametrised as "no stunting and survival up to at least age 60", and education, defined as "14 years of high-quality school by age 18" (World Bank, 2021a). Combining five key indicators in from these areas, namely child and adult survival, healthy growth, years of schooling and quality of learning, the HCI calculates how much human capital a generation can expect to acquire by age 18 (World Bank, 2018b). Ranging between the values of 0 and 1, a country's HCI score reflects its distance to complete education and full health. In its treatment of health as one of the fundamentals of economic development, the HCI has the potential to inspire further conversations about the importance of healthcare and expand them from the ministries of health and to the generally better-funded sectors of government (Stein & Sridhar, 2019).

Envisaged to promote an even broader, more holistic understanding of development, the Human Development Index (HDI) acknowledges the importance of economic growth but maintains that it cannot be the sole criterion for measuring a country's prosperity. Instead, HDI understands the rate of human development as an expression of three key dimensions, namely a long and healthy life (as indicated by *life expectancy*), access to education (measured by *expected years of schooling* of children at school-entry age and *mean years of schooling* of adults), and a decent standard of living (as indicated by *Gross National Income per capita*). However, being an average measure, the HDI tends to obscure any inequalities in the distribution of human development across the population (UNDP, 2020a). To account for this, UNDP has introduced the Inequality-adjusted HDI (IHDI), which discounts for inequalities in

such a way that ultimately "[t]he 'loss' in human development due to inequality is given by the difference between the HDI and the IHDI … As the inequality in a country increases, the loss in human development also increases" (UNDP, 2020a: 4).

While human capital formation remains a pivotal tool in developing countries' efforts towards building sustainable and progressive economies, the unprecedented circumstances created by the COVID-19 pandemic have left many such aspirations in shambles. While, at the time of this paper, the crisis is still ongoing and its effects remain open to full documentation, UNDP reports that it has already taken a significant toll on all constitutive dimensions of human development, namely income (with the largest contraction in economic activity since the Great Depression), health (directly causing a death toll over 300,000 and indirectly leading potentially to an additional 6,000 child deaths every day from preventable causes over the next 6 months) and education (with effective out-of-school rates – meaning, accounting for the inability to access the internet – in primary education expected to drop to the levels of actual rates of the mid-1980s levels)" (2020a: 3). Although globally felt, this phenomenon has doubtlessly been felt particularly harshly in developing countries, where, based on as yet incomplete information, we can see the trend of deterioration across all dimensions.

Challenges in ensuring human capital: The case of North Macedonia

The following discussion focuses on North Macedonia and the challenges it faces in its efforts to form, retain and sustain human capital. Edging from 0.53 in 2010 to 0.56 most recently, North Macedonia's HCI score remains lower than the average for the upper-middle-income group to which the country belongs. This value predicts that a generation born in the country today will achieve 56% of productivity towards the 'frontier' of complete education and full health. At the same time, the latest Human Development Report (UNDP, 2020b) positions North Macedonia in the high human development category, ranking it at 82 out of 189 analyzed countries. The country's overall trajectory is encouraging: between 2000 and 2019, it has seen its HDI score increase by 14.3% from 0.677 to 0.774, with progress noted across all key indicators (Figure 1; UNDP, 2020b).

Year	Life expectancy at birth	Expected years of schooling	Mean years of schooling	GNI per capita (2017 PPP$)	HDI value
1990	71.2	10.3	-	11,202	-
1995	72.1	11.00	-	8,901	-
2000	73.3	11.8	6.5	9,946	0.677
2005	74.0	12.1	8.2	10,837	0.710
2010	74.7	12.9	9.1	13,160	0.743
2015	75.4	13.3	9.6	14,509	0.761
2016	75.5	13.5	9.6	14,760	0.765
2017	75.6	13.5	9.7	14,914	0.767
2018	75.7	13.6	9.7	15,279	0.770
2019	75.8	13.6	9.8	15,865	0.774

Figure 1. Key HDI indicators for North Macedonia, 1990-2019. Adapted from *The Next Frontier: Human Development and the Anthropocene – North Macedonia* by UNDP, 2020.

However, as David Edwards, General Secretary of Education International, observes, one issue with global metrics in general is that "[c]ompetitive ranking of countries according to test results has the potential to lead to policies which focus on gaining quick improvements in standardized tests rather than policies to sustainably improve teaching and learning" (Education International, 2018). The gist of this criticism is applicable to the case of North Macedonia as well: namely, while the increase in years of compulsory schooling contributes to a higher overall HDI score, it is acknowledged that, without a commensurate improvement in education quality, the impact of the sheer number of years spent in schooling on the sustainable formation of human capital is rather fragile. This standpoint might also provide a partial explanation of the discrepancy between the country's promising HDI value and its HCI scorecard, which, factoring in the quality of what children actually learn, estimates the expected years of school at only 7.3 years (North Macedonia: Human Capital Index 2020, 2020).

The principal challenges to ensuring human capital formation in North Macedonia are not unique; rather, the complex nexus of poor academic standards, labour market supply/demand mismatch, and brain drain presents a problem ubiquitous across many developing countries. Nevertheless, a brief context-specific examination of these interlinked factors is worthwhile as it serves to provide some insight into, and meaning behind, the country's index scores. To better illustrate the correlation between education quality and the skills mismatch, this review will focus on quality in the higher education (HE) sector.

Generally, a state's increasing involvement in HE reforms is a result of the consensus on the interrelatedness between desirable, efficient and feasible educational reforms and the nation's economic prosperity (Corrales, 1999). Since the country's independence in 1991, its HE system has undergone extensive reforms; regrettably, these have often had negative implications for academic quality and, broadly, for North Macedonia's human capital formation. The push for marketisation of HE, which began with the opening of the first private university in 2003, has ultimately led to the formation of ten private universities and nine private faculties or higher vocational schools, in addition to the six already existing public HEIs (Drzhaven zavod za statistika, 2020). Further expansion was temporarily promoted through the Government's 2008 Study Dispersal Project, envisaged to open a number of public HEIs' study programmes in smaller towns in the country with the long-term aim of re-enlivening local labour markets (Popovski, 2010). Although the project ultimately failed, coupled with the diversification, it further contributed to increased rates of secondary-to-HE transition. While privatisation of education in general cannot be characterised as either good or bad since it is determined by the state and other relevant stakeholders (Walford, 2001), the mass expansion of HE enrolment more often than not happens at the expense of quality. As OECD (2019) reports, the per-student funding model contributes to the continual unselectiveness and resulting large quotas at HEIs. In turn, weak selection results in high drop-out rates and longer completion times: for example, between 2010 and 2014, Bachelor completion rates in the country averaged 45%, substantially lower than the OECD average of 68% (European Commission, 2016). Furthermore, the HE expansion over a period that has seen a persistently poor country performance in international evaluations (World Inequality Database on Education, n.d.) suggests that many students that successfully enroll in HE programmes are unequipped with the knowledge or skills desired by international standards.

Academic malingering aside, wider HE access inevitably yields more graduates, which leads to another major challenge to ensuring sustainable human capital formation and retention. As Figure 2 suggests, although unemployment among advanced education graduates is presently at its lowest (14.25%), the graduate unemployment rate is still substantially higher than that of Greece (11.6%), the worst-performing OECD country by these parameters (OECD, 2020).

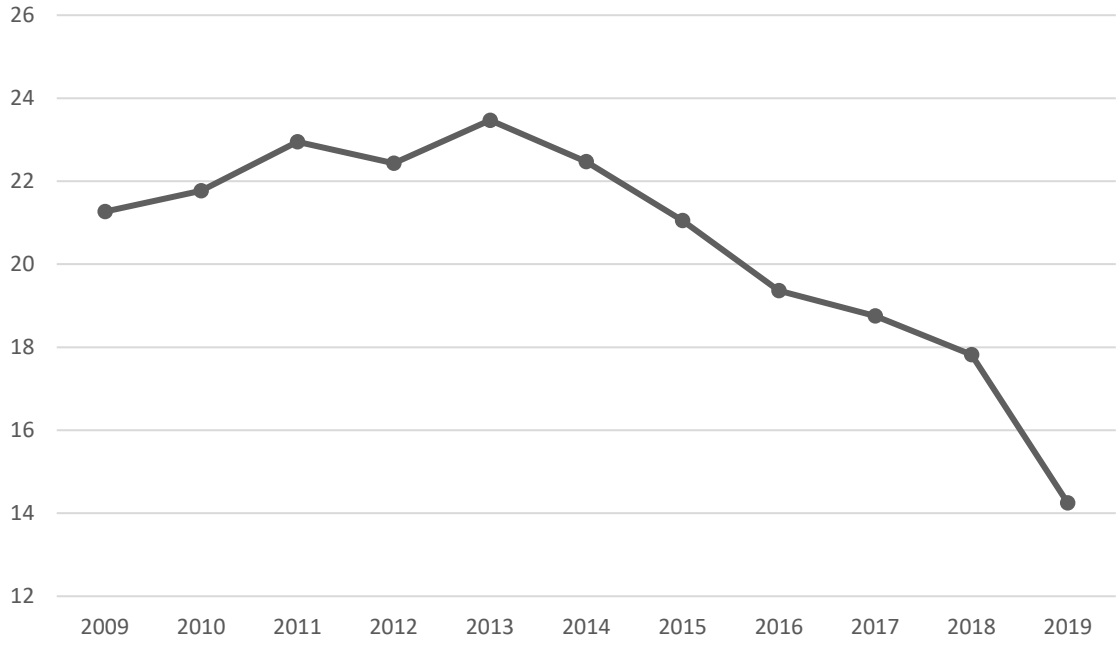

Figure 2. Unemployment with advanced education in North Macedonia, 2009-2019. Adapted from *Unemployment with advanced education (% of total labor force with advanced education) - North Macedonia*, World Bank, 2021b.

Such high levels of graduate unemployment can at least in part be grounded in the overexpansion of access to HE, which has resulted in a continuously swelling pool of highly educated cadres competing for a limited number of employment opportunities, not all of which require tertiary qualifications. As a brief illustration, among the industries with the highest number of job postings in Macedonia over the past several years have been the hospitality and sales sector and elementary/low-skilled occupations (Drzhaven, 2018).

Another cause of youth unemployment in North Macedonia is an existing disbalance between the skills sets with which graduates transition into the labour market and the skills sets that the labour market demands.

Macedonian graduates' educational preferences in the period between 2013 and 2017, presented in Figure 3, indicate a persistently large discrepancy between SS and STEM programmes: in fact, over twice as many SS and Humanities degrees were produced each year as all STEM qualifications combined. When these are compared to the profiles of the available job vacancies over the same five-year span, the majority of which concentrated in the recovering real estate sector, as well as manufacturing, food and accommodation services (World Bank, 2018a), a pattern of a long-standing skills mismatch emerges.

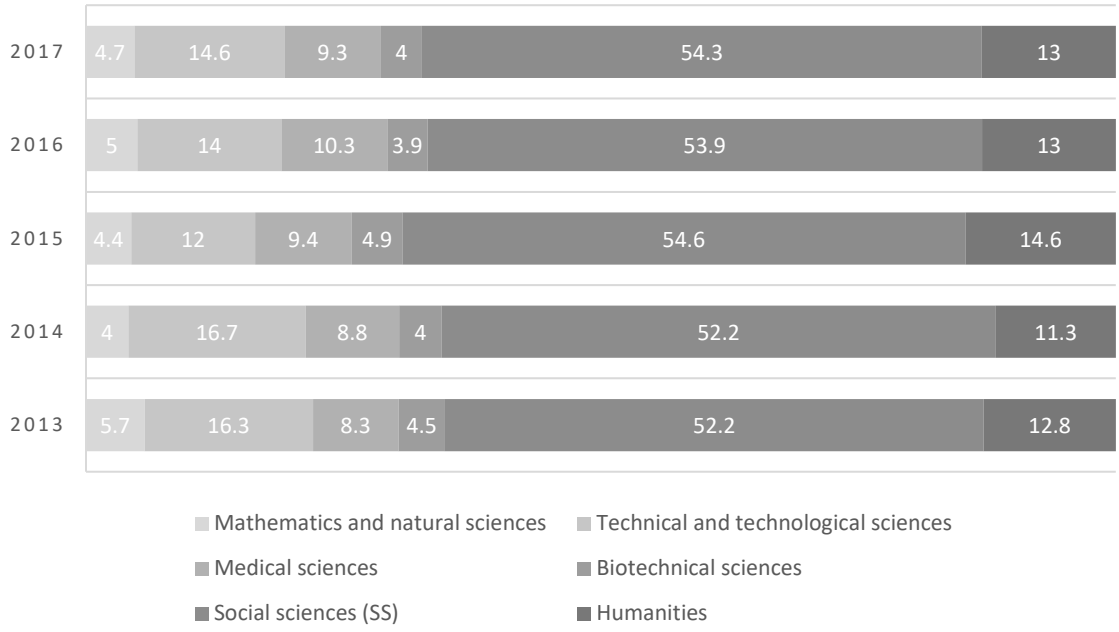

Figure 3. University graduates by field of study from 2013-2017. Data for 2016-2017 from Drzhaven (2018a) and for 2013-2015 from SSO (2014), SSO (2015) and SSO (2016), respectively.

Finally, engaging in a statistical analysis of brain drain – perhaps one of North Macedonia's most widely and longstandingly debated issues since the start of its statehood – is as complex and laden with hurdles as it is riveting. Hard reliable data is difficult to come by since the country has not held a national headcount since 2002. (At the time of this paper, a new push by the Government has – not without its old controversies - resulted in a census set to be launched in April 2021.) The 18-year hiatus has created a lack of demographic statistics and hence no official domestic record of the quantitative and qualitative magnitude of youth emigration from Macedonia, much less so of the emigration of highly educated youth. However, according to available policy documents (Ministerstvo za obrazovanie i nauka, 2013), 30% of the country's highly educated youth live and work abroad, while 80% of graduating STEM students are seriously considering leaving. According to the Global Competitiveness Report (World Economic Forum, 2019), North Macedonia is one of the top ten countries with the highest rates of brain drain globally.

What are the key push factors that influence decisions to emigrate? Both primary and secondary research cited in the National Strategy for Networking, Cooperation and the Prevention of Highly Educated and Skilled Migration 2013-2020 (Ministerstvo, 2013) point to economic instability, lack of employment or career advancement opportunities and poor pay as some of the most prominent determinants pushing highly educated individuals out of the country. It comes as a surprise, however, that amongst the four groups consulted in the creation of the National Strategy of 2013, HE students and graduates are the only group that lists corruption and political pressure as an important factor pushing young people to leave (Ministerstvo, 2013). Corruption in the country is rife across key social sectors, including public services, education, healthcare and the judiciary. The latest Corruption Perceptions Index (CPI) ranks North Macedonia, with a score of 35, as 111th of 180 countries, making it one of the poorest-

performing countries in the region alongside Bosnia and Herzegovina (Transparency International, 2021). Although it can be argued that any ongoing governance problems and structural shortcomings have been exacerbated by COVID-19, the reality is that the pandemic has rather served to expose long-standing unfavourable circumstances that have pushed highly educated cadres to leave the country for many years now.

Concluding remarks

In criticising the HCI, Edwards (2018) focuses on social justice to express the view that the HCI presents people not as holders of the right to education but as bearers of units of productivity, which reverts straight to the very blinkered economism that it sets out to avoid. Also highlighting the HCI's role as a learning metric based on standardised test outcomes, Edwards states that "[q]uality education is achieved when public systems are strengthened through policies based on research, evidence and dialogue with the teaching profession. The HCI is ultimately only a measurement tool, and its impact depends on the action it inspires" (2018).

At the same time, while the development of the HDI drives the narrative away from the ever-clear and practical income-based measurement tools, it has not been immune to severe criticism, chiefly due to the vulnerable methodological format in which it was first launched (Nübler, 1995). In its subsequent editions, however, the HDI has proven relatively nimble and responsive to changing perceptions of development: for instance, taking into consideration accusations that it did not account for factors such as inequality, poverty or gender disparity, UNDP introduced the IHDI to highlight any loss of human development due to inequalities. In sum, both the HCI and HDI recognise, and attempt to measure, development as a function more complicated than that of how much money people have and, notwithstanding their shortcomings, they remain poised to offer comprehensive and multifaceted investigations into global development and inspire developing countries to strive for change and improvement.

In its aspirations towards greater resilience and prosperity and more globalised outlooks in capacity-building, North Macedonia has encountered a variety of challenges, a central one of which has been ensuring sustainable human capital development. Improving the quality of higher education has long received acknowledgement in national policy documents as a key measure in boosting human capital formation and retention. As evident from the discussion, the state's involvement in the HE sector as decision-maker and funder-in-chief has resulted in policies which have prioritised access over quality and has left universities with limited authority over their own matters. Granting autonomy to HEIs, however, must not be misunderstood to signal the perception of a university as an ivory tower where learning is divorced from labour market considerations. As illustrated above, labour market mismatches bear the brunt of culpability for the persistently high rates of youth unemployment, which in turn is one of the main drivers of intellectual migration from the country and is thus directly linked to the depletion of human capital.

The picture is still out of focus, as tolls of both individual and state experiences and losses as a consequence of the ongoing COVID-19 pandemic are still forming. It is clear, nevertheless,

that future policies need to combine specific and practical implementation scenarios and be unequivocally committed to sustainable human capital development as a fundamental prerequisite to building a prosperous, resilient and flexible society able not only to adapt to new challenges but also to respond by tapping into a sound value system guided by good global practices.

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Assessment of the emerging online education technologies and resources for learning during the COVID19 pandemic

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Abstract

The purpose of the research study is analyses and assessment of the emerging online education technologies and resources for learning. As a result of the COVID19 pandemic the entire educational systems have undergone dramatic changes and unforeseen move and shift from classical classroom into digital online education. The research methodology used is triangulation technique which combines qualitative and quantitative methodology. As research method used questionnaire and focus groups. The research aims to approach the analysis of the emerging trends as well as the new online technologies that impacted online education using qualitative method and questionnaire as well as two focus groups. the Web has advantages in providing information quickly and easily. As the materials for guidance introduced on the Web are easily updated based on need or purpose, we can easily achieve maximum efficiency. The issues, findings as well as recommendations are discussed and argumented.

Keywords: *online education technologies, resources for learning, covid19, digital online education, web technologies*

1 Introduction

With the COVID19 the entire educational system has undergone dramatic changes and online education has emerged as new solution to the problem of isolation, quarantine and closure of the schools and Universities. Online education is impacted with the new advancement of Web 2.0 technologies and the recently enjoyed popularity by social networking on the web, educators have started to see a greater momentum of development and evolution in education (Wang et al, 2008). According to [Parker & Chao, 2007], some of the Web 2.0 building blocks, such as wikis, blogs, etc., have been spread in all higher education institutions in recent years, while the use of social networks such as Facebook and Twitter for education purposes are beginning to appear. [Hargadon, 2009] states that educators in education may soon reach a point at which it will be very difficult to imagine education without the use of these tools. Social networking is included as a part of social media. Social media is user-generated Web content that is shared by social interaction (Klopfer et al, 2009). According to [Kaplan and Haenlein, 2010, p.61], social media can be defined as "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of user-generated content". Web 2.0 technologies are growing and enjoying popularity recently. According to [Alexander, 2006], society has undergone significant changes through the available tools and services (Roblyer et al, 2003) that foster innovative new methods of collaboration and social tools. The rapid growth and popularity of Web-based tools such as blogs, wikis, social networking and bookmarking often provide rich user experiences where the process of recognition is a collaborative effort which is based in the community. Examples of social media are: Blogging (i.e., Wordpress, Edublogs, Blogger); Micro-blogging (i.e., Twitter); Public social networking sites (i.e., Facebook, MySpace, Linkedin); Sharing of images (i.e., Flickr); Sharing of presentations (i.e., Slideshare); Sharing of videos (i.e., YouTube); Voice, chat, & video conferencing (i.e., Skype); Wikis (i.e., Wikipedia, GoogleWave), etc.

2 Purpose of the Study

The purpose of the research study is the analyses and assessment of the analysis of the emerging trends as well as the new online technologies that impacted online education using qualitative method and questionnaire as well as two focus groups.

3 Research Methods

The research methodology used is triangulation technique which combines qualitative and quantitative methodology. As research method used quantitative method using questionnaire and focus groups. Hypothesis H1: The proper use of instructional strategy and instructional pedagogy implemented within the new emerging online education technologies can help in proper assessment of its efficiency. Main research questions are: What are the main emerging online technologies? What are the main learning online resources? How can we improve the online learning process? What are the major challenges in online education?

4 Findings and Results

The expected findings and arguments of the work provides sufficient information on the factors that influence the online learning process as well as the best online technologies and their alignment with instructional pedagogies.

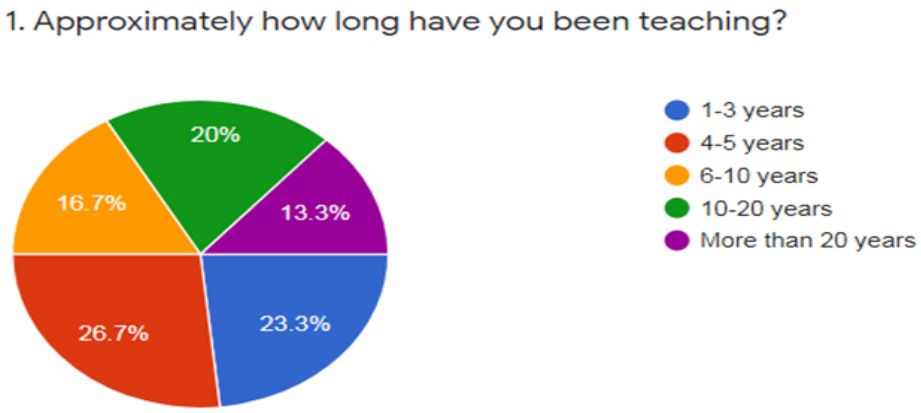

Figure 1. Approximately how long have you been teaching

Regarding the evaluation on how long the educator is involved in teaching? The results show that the higher level of them 26.7% are teaching for 4-5 years, then 23.3% of them are teaching for 1-3 years, 20% of them are teaching for 10-20 years, while 16.7% of the educators participants in the study are teaching for 16.7% and finally 13.3% are teaching for more than 20 years.

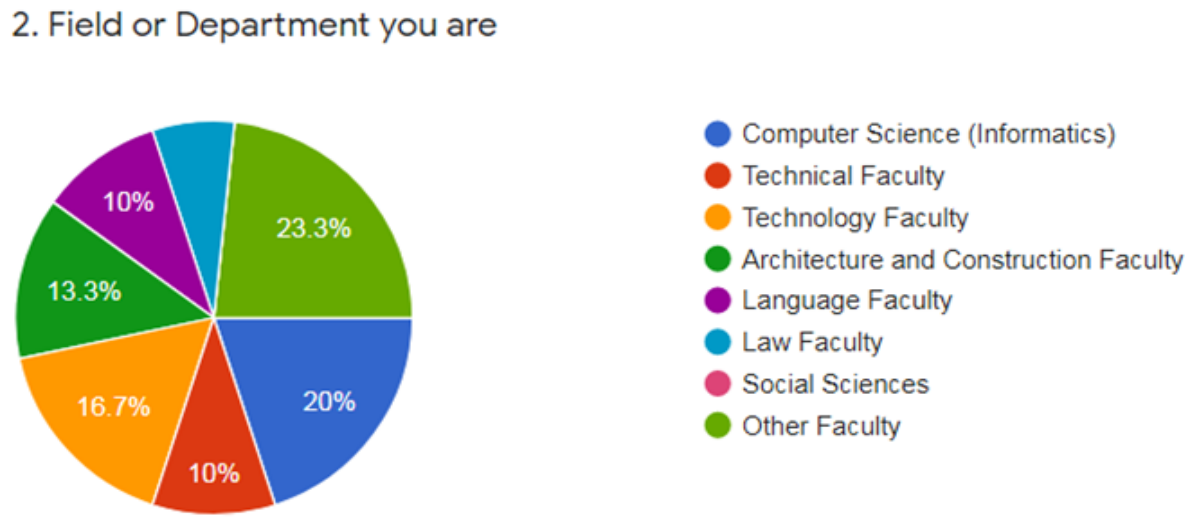

Figure 2. Field or Department

Regarding the evaluation on the field or department they are coming from? The results show that the higher number of them 23.3% are from different faculties, 20% of them are from Informatics/Computer Science, 16.7% are from Technology Faculty, 13.3% are from

Architecture and Construction, 10% are from Technical Faculty, and other 10% are from Social Sciences, and 6.7% are from Law Faculty.

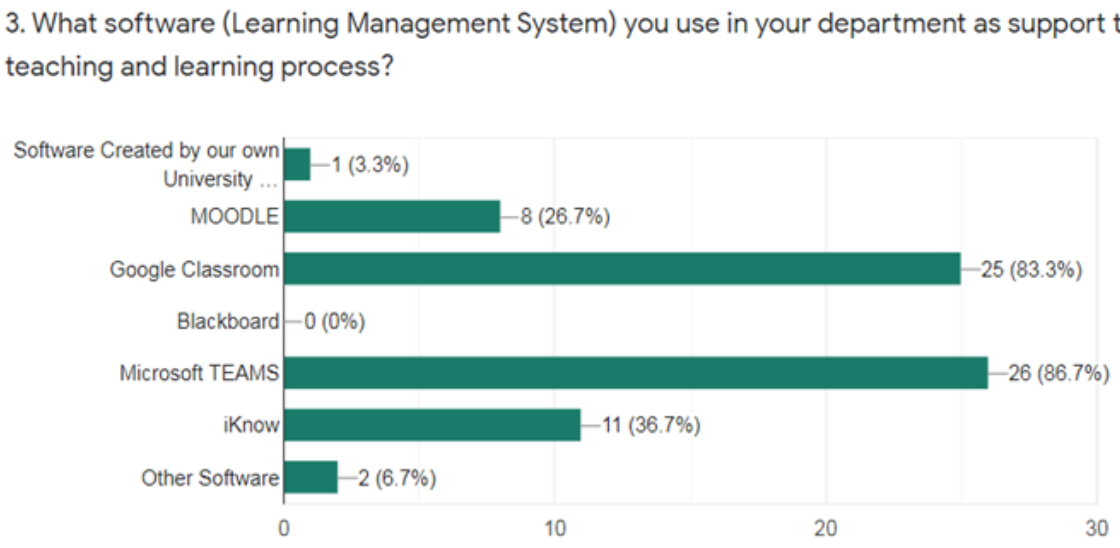

Figure 3. Review of Learning Management Systems

Regarding the evaluation on the Review of Learning Management Systems they use? The results show that the higher number of them 86.7% are using Microsoft Teams, followed by Google Classroom with 83,3% , then IKnow with 36,7% Moodle with 26,7% Software created by their Institution with 3,3% and other software 6,7%

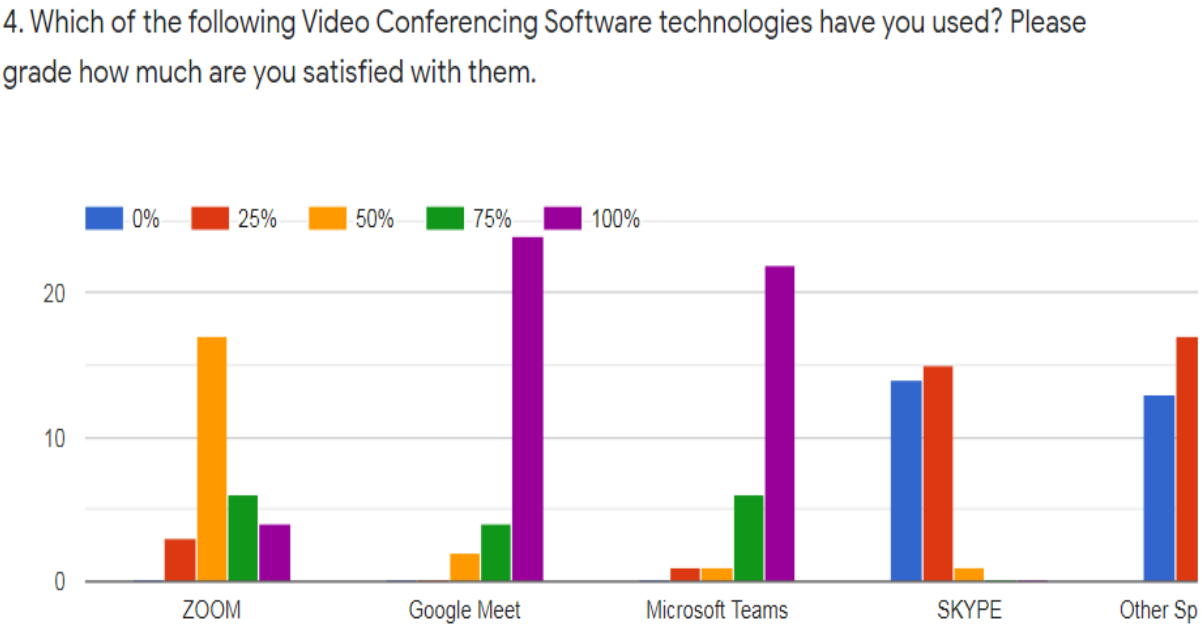

Figure 4. Analyses use of Video Conferencing Technologies

Regarding the evaluation on the Analyses of Video Conferencing Technologies they use? The results show that the higher number of them 39.7% are using Google Meet, followed by Microsoft Teams tools with 35,3% , then ZOOM with 17,9%, SKYPE with 6,5% and with other software 0,6%.

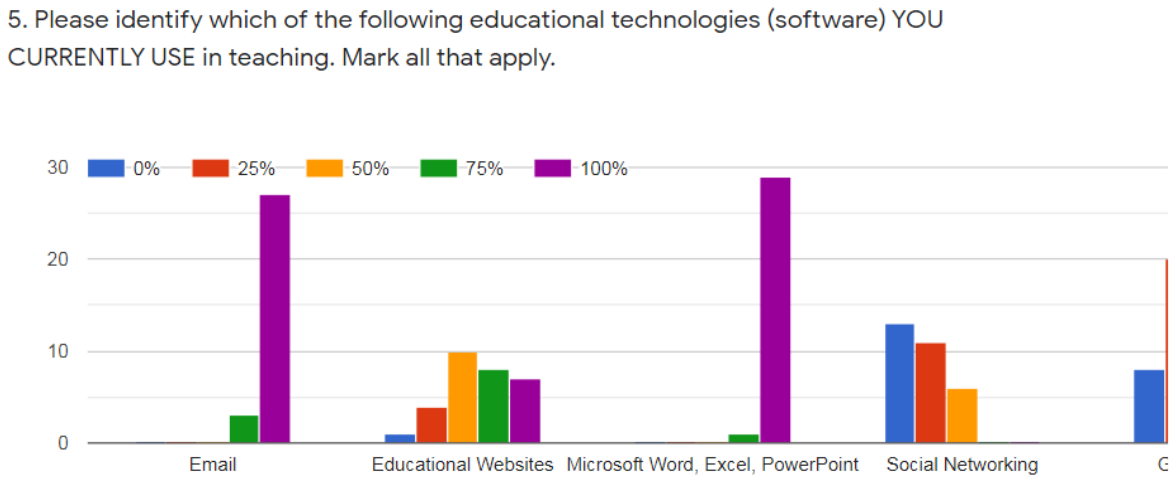

Figure 5. Educational digital technologies in use (Email, Educational websites, MS Office, Social Networking, Google Docs, Multimedia, Other specific subject software)

Regarding the evaluation on the digital technologies, they use? The results show that the higher number of them 41.2% are using Email, followed by PowerPoint and MS Office tools with 37,8%, then educational websites with 11,4%, followed by social networking with 5,7% , other Multimedia with 1,8% ; Google Docs with 1,4% and other software 0,7%.

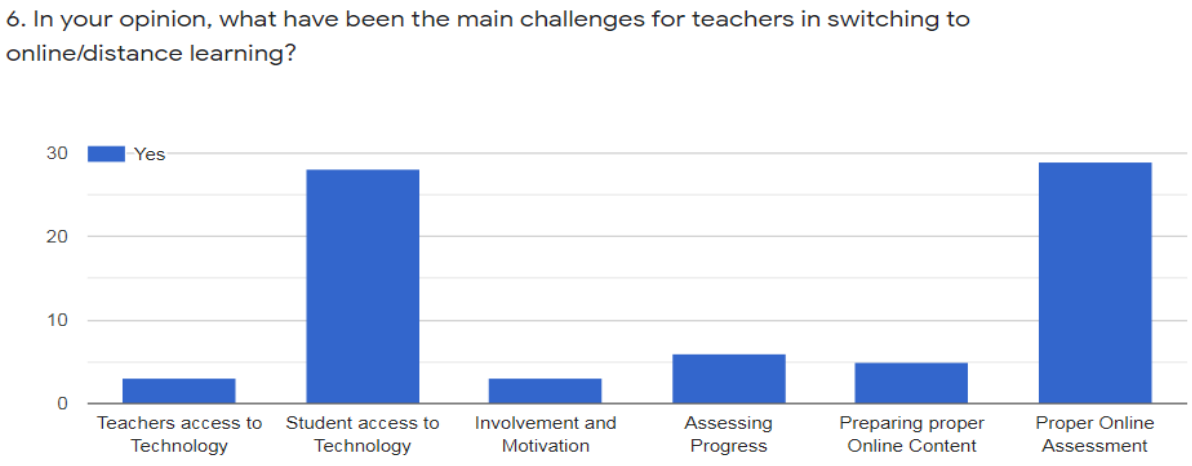

Figure 6. Main challenges for teachers in online education

Regarding the evaluation on the Main challenges for teachers in online education? The results

show that the higher number of them 32,8% are considering student access to technology followed by proper online assessment 34,7%, then followed by 12,5% preparing proper online content and with 15,7% assessing progress, followed by involvement and motivation 2,7% and teachers access to technology with 1,6%

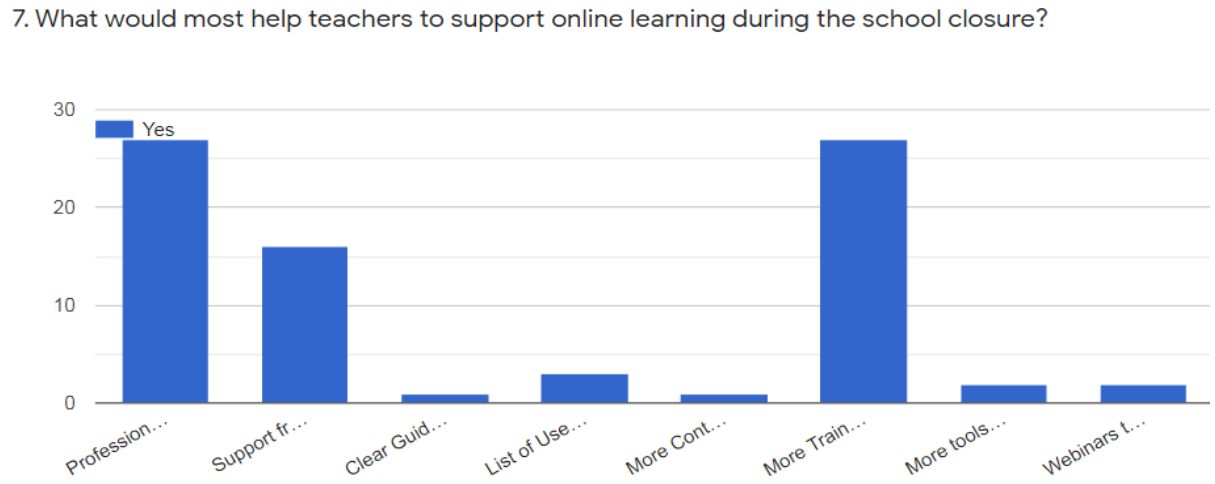

Figure 7. What would help more teachers

Regarding the evaluation on analyses what would help more teachers? The results show that the higher number of them 29.2% More training, followed by 28,3% Professional development, then 19,4% support from IT experts, 8,1% clear guidelines, 7,9% webinars and 6,3% more tools and other resources with 0,8%.

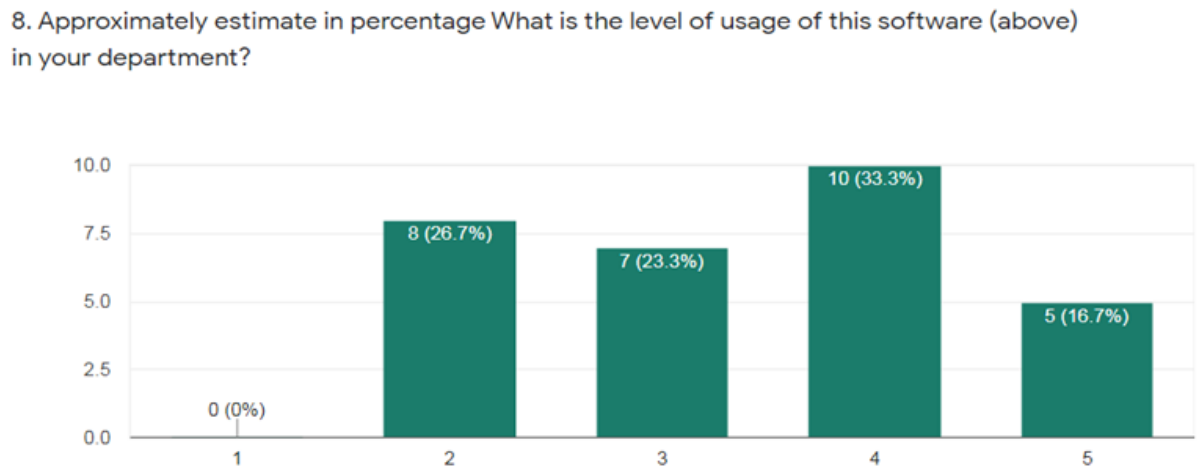

Figure 8. Level of usage of software in your department

Regarding the evaluation on analyses Level of usage of software in your department? The results show that 16.7% totally agree, and the higher number of them 33.3% agree, followed by 23.3% neutral and disagree 26,7%

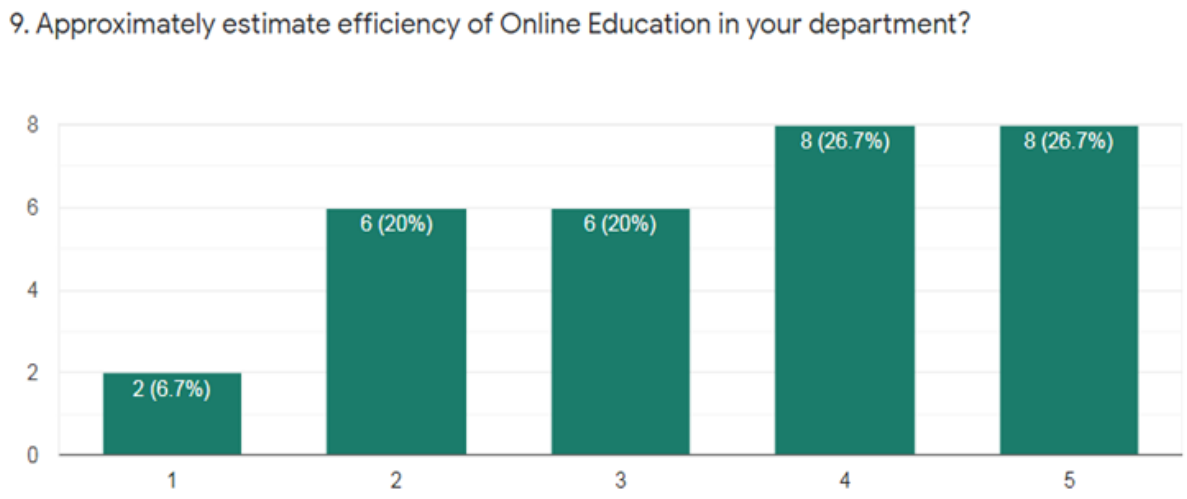

Figure 9. Approximately estimate of efficiency of Online Education

Regarding the evaluation on analyses estimate of efficiency of Online Education? The results show that 26.7% totally agree its efficient, and 26,7% agree, followed by 20% that are neutral and disagree 20% of them and totally disagree 6,7% of the participants.

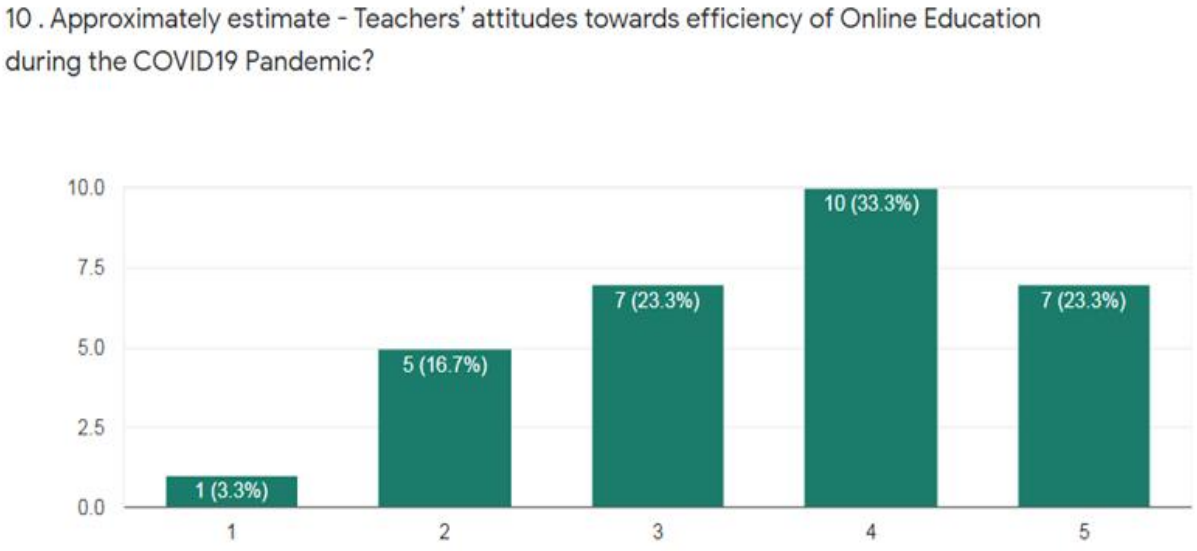

Figure 10. Estimation of teacher's attitude towards efficiency

Regarding the evaluation on Estimation of teacher's attitude towards efficiency? The results show that 23.3% totally agree its efficient, and 33,3% agree, followed by 23.3% that are neutral and disagree 16.7% of them and totally disagree 3,3% of the participants.

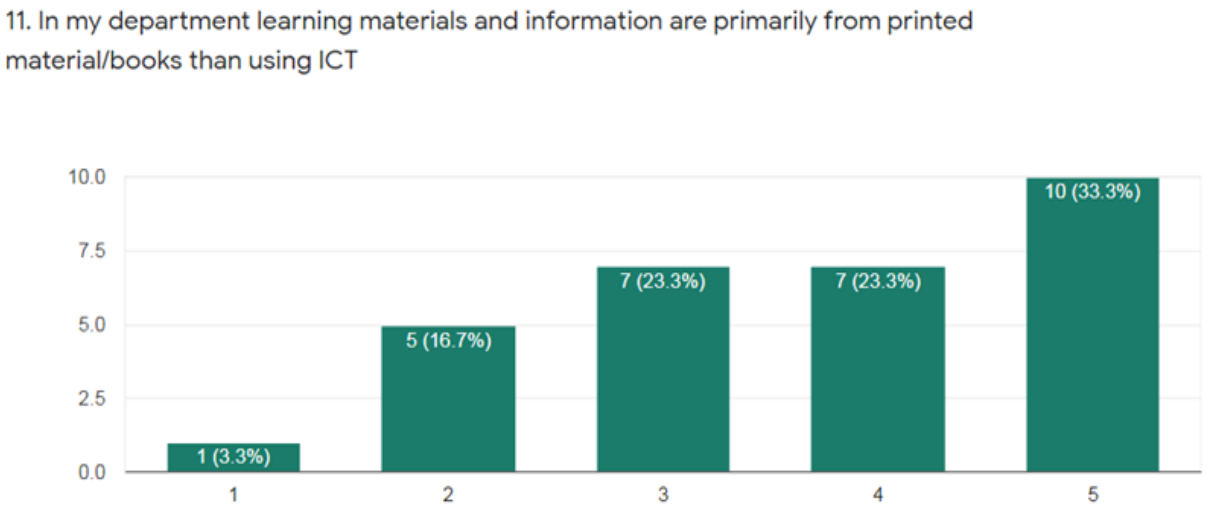

Figure 11. Analyses of learning content as Hard copy materials

Regarding the evaluation on Analyses of learning content as Hard copy materials? The results show that 33.3% totally agree it's hard copy, and 23,3% agree, followed by 23.3% that are neutral and disagree 16.7% of them and totally disagree 3,3% of the participants.

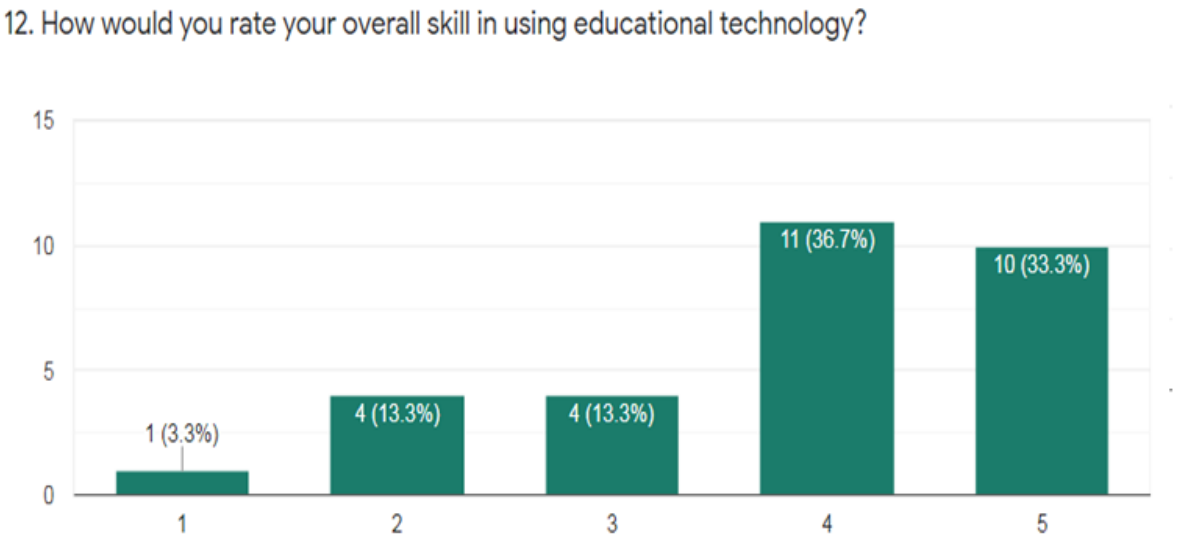

Figure 12. Self-rating of participants skills using educational technologies

Regarding the evaluation on self-Rating of participants skills using educational technologies? The results show that 33.3% totally agree they have very high skills, and 23,3% have moderate skills, followed by 23.3% that are neutral and 13.3% of them do not fill very skillful and 3,3% of the participants rate them self's that do not have any digital skills .

5 Conclusion and Recommendations

The research study provides analyses of the review of the published literature as well as an analysis of the emerging trends as well as the new online technologies that impacted online education during the pandemic of COVID19.

The COVID-19 Pandemic impacts everything, and numerous governments are executing rules and procedures that limit individuals congregating openly. Such measures have disturbed the ordinary working of schools and Universities. Since the span of such measures has been broad – and is probably going to proceed in for a specific time until an immunization opens up – heads of public and private schooling foundations have set up other option techniques for understudies and instructors to proceed with their exercises when going to class is preposterous and are dealing with techniques that will make schools and Universities fit for working in a protected environment.

Based on the literature review, as the most significant steps toward implementing and developing a successful e-learning system are the student's involvement and acceptance of e-learning, deciding which of the multiple features should be implemented, in order to assist specific groups and maintain their satisfaction. Also, identifying the optimal requirements and definitions is considered as a major step in order application to be powerful and reliable.

In spite of the fact that online learning may give adaptability to students and educators, there are difficulties included that can possibly reject students and compel instructors. One test is reproducing the elements of up close and personal guidance. The connection between a student and their educator is vital for student achievement, since instructors encourage how and why students draw in with course content.

Additional problem is the need to encourage courses on the web and the significant expenses related with getting to content. To do as such, students need to approach the correct hardware, regardless of whether it is a cell phone or a PC. They additionally need to buy sufficient hardware and internet connection. In provincial regions where study hall sizes and instructor to-student proportions will in general be higher, there's decreased limit with regards to students to get to content on the web and much less assets to get to it past a cell phone, similar to a web bistro. Cell phone innovation might be more pervasive than it was 10 years prior, however the capacity for students to open its potential remaining parts inconsistent.

While there are difficulties for instructors and students getting to content on the web, there are likewise openings for intuition past the shows of how classes are commonly encouraged to make course content more available. These procedures can be valuable for learning, particularly in huge study halls. Be that as it may, they don't advance availability and don't really instruct students propensities outfitted towards drawing in with course content through thought, connection and conversation.

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Sustainable transport through contribution of different passenger vehicles

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Abstract

Sustainable transport is one of core parts of sustainable development according to UN strategy. In the area of Western Balkan countries there are a number of specifics and similarities in that light. Relying mostly on road transport, fighting with limited capacities and facing serious challenges related to contemporary traffic means, professionals in this region need to try to contribute to the development of sustainable transport. As a part of wider research by using scientific approach, a number of indicators have been identified and structured in different levels. On a basic level five indicators have been identified: Economic, Social, Environmental, Good governance and planning and Cultural. On other hand, in the context of their capacity to contribute to sustainable transport, five transport means have been taken into consideration: Electric, Plug-in Hybrid, Alternative Fueled, Gasoline Fueled and Diesel Fueled vehicles. By using AHP method, a total of 73 experts from Western Balkan region have been asked to express their view on the capacity of different alternatives of vehicles to contribute to the sustainable transport. This paper shows the results of the research performed and offers a possibility to analyze a number of specific aspects in this area. The results are grouped by the country and profession of the interviewed professionals. The results could be used for policy making, or decision taking on different levels.

Keywords: *Sustainability, transport, electric, vehicle, indicators*

1 Introduction

Sustainable development, as a whole, takes more and more attention of modern society. Furthermore, humanity becomes aware that it has meaning of its survival. Basically, number of authors consider that sustainable development is founded on three areas of life: economy, society and environment (fig. 1 left), [2]. As a result, the UN has promoted global strategy of sustainable development defining 17 goals to achieve (fig 1 right), [2].

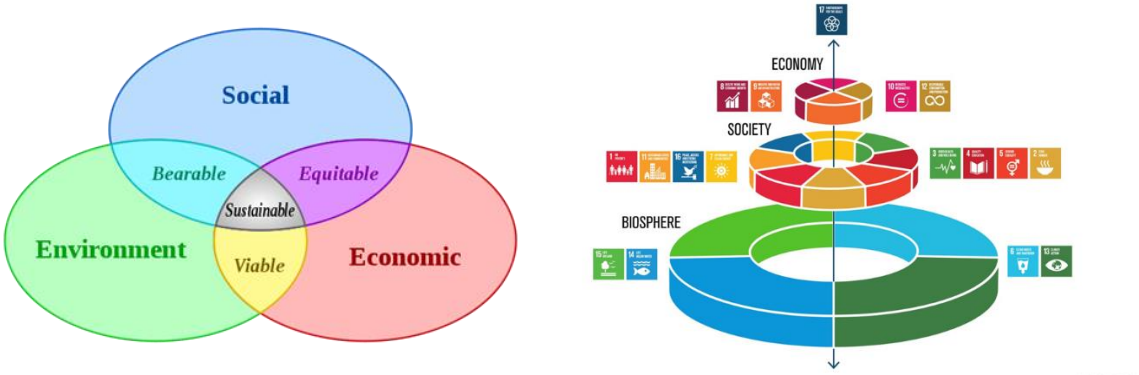

Figure 1: Sustainable development structure (left) and goals (right)

Sustainable transport is one of the significant areas of sustainable development with role to help people transport themselves and goods in a safe, efficient, economic and environmentally friendly way. Due to its nature, transport has impact, and is dependent of all basic groups of indicators: social, economic and environmental, and is related to significant number of UN sustainable development strategy goals, fig. 2, [3], [4], [5].

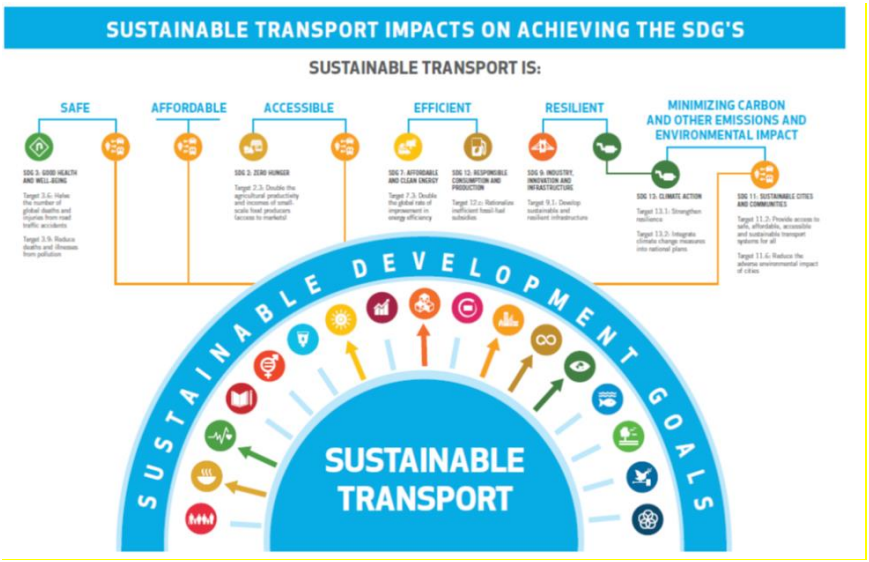

Figure 2: Sustainable transport correlation with goals of sustainable development

2 Research approach

Based on a SWOT analysis for Western Balkan countries, several aspects illustrate the state of the art and challenges regarding the transport area [1], [8], [9], [10]:

- All countries heavily rely on road transport;
- Passenger transport dominates, previously with passenger cars;
- The average age of the transport means is more than 10 years;
- Urban transport is area demanding urgent improvement;
- Low economy potential;
- Almost all bigger towns and some regions face heavy pollution problems;
- There are no consistent policies for developing sustainable transport.

Besides describing the situation in the transport, this research aimed to recognize what could be the direction in which all participants in the process of building sustainable transport could contribute. To achieve that, several activities have been undertaken:

- Choice of research methodology
- Identifying the means of (road) transport which are available with their main characteristics (alternatives);
- Identifying the indicators which define different aspects of sustainable transport and define their hierarchy;
- Performing science based reliable research by which conclusions could be draws regarding the capacity of different means of (road) transport to contribute to the sustainable development of the region.

3 Research methodology

The complex nature of the research which includes exact parameters (emission levels of vehicles), but also hardly measurable indicators (perception of means of transport) extended the importance of carefully choice of research methods. Literature review in such environment pointed to the tools for multi criterion decision making, [4], [5], [6]. The AHP (Analytic Hierarchic Process) methodology has a history of being used in different areas of sustainability, therefore, in the area of sustainable transport, as well, [5], [6].

3.1 Identifying the means of (road) transport which are available with their main characteristics (alternatives)

According to the state of the art in the area of passenger cars, trends, market situation, development and literature sources, [7], six alternatives of passenger vehicles are identified:

A1 – Electric

A2 – Plug-in hybrid
A3 – Hybrid
A4 – Alternative fuel vehicles (gas, bio fuel)
A5 – Petrol fueled
A6 – Diesel fueled

3.2 Identifying the indicators which define different aspects of sustainable transport and defining their hierarchy

Based on AHP approach, literature review, [5], [7], [8], [9], [10], [11] and expert's interviews, 90 indicators are identified divided on 5 hierarchy levels. Five of them belong to basic level (level 1):

- Social;
- Economic;
- Environmental;
- Good governance and planning
- Culture

3.3 orrelation between the alternatives and different indicators

AHP methodology rely on defining the correlation between each pair of alternatives in terms of their contribution in the light of each indicator. Where measurable data is available the correlation between alternatives has been defined based on that data. For the rest of the indicators 73 experts from the Western Balkan countries have been interviewed and their opinion was included in the AHP tool for data processing.

Table 1: Number of experts by country

Country	Macedonia	Serbia	B&H	Montenegro	Albania	Kosovo	Total
Number of experts	31	9	9	6	10	8	73

Table 2: Number of experts by type of background

Experts background	Academic	Business	Government and non-government	Total
	29	27	17	73

4. Results

The results achieved have been tested against consistency, according AHP methodology. They showed very high consistency (coefficient of consistency is 0.01 which is much lower than allowed maximum of 0.1), [1], [6].
The following diagrams show the results achieved by the research (figures 3, 4, 5 and 6), [1].

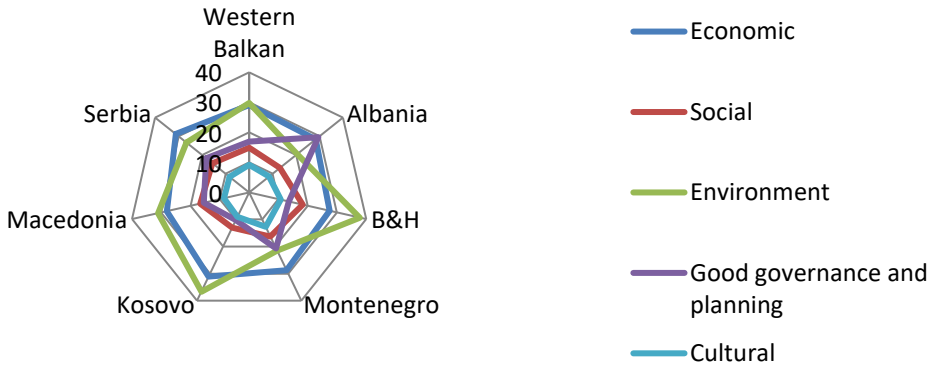

Figure 3: Distribution of importance of first level indicators in the context of sustainable transport for Western Balkan as whole, and different countries

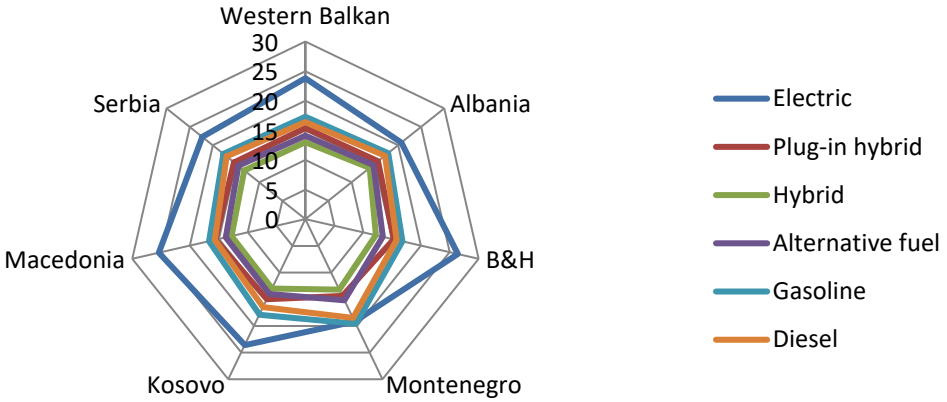

Figure 4: Capacity of separate alternatives to contribute to the sustainable transport for Western Balkan as whole and different countries

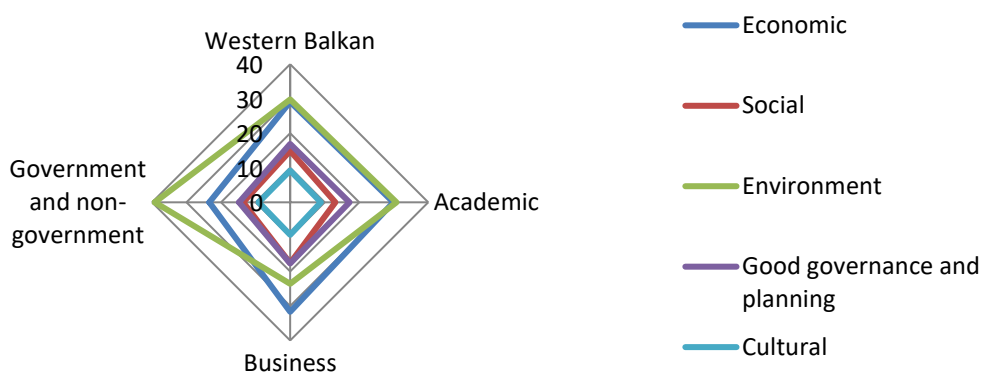

Figure 5: Impact of first level indicators on the sustainable transport (average for Western Balkan and according to experts with different backgrounds)

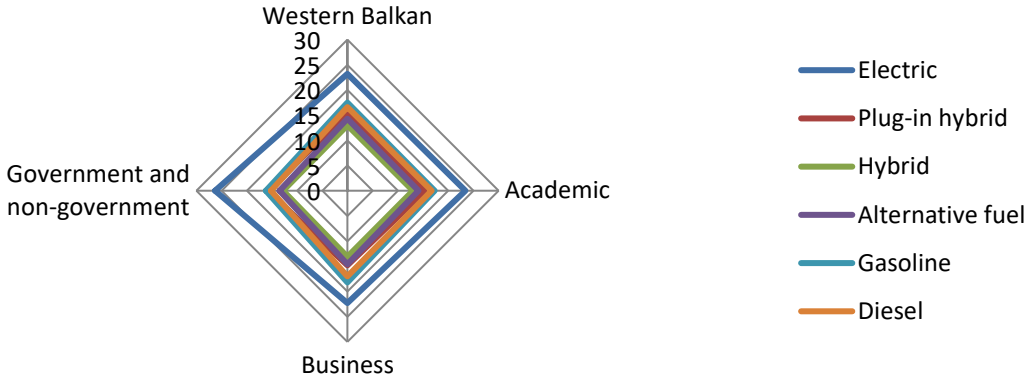

Figure 6: Capacity of contribution to the sustainable transport of different alternatives (average for Western Balkan and according to experts with different background)

Going back to the basic way the sustainable development is introduced (fig.1 left), the results achieved could be shown as in figure 7, [1].

Visual presentation of sustainability zone for different alternatives of vehicles for whole Western Balkan		
A1 - Electric	A2 - Plug-in hybrid	A3 - Hybrid

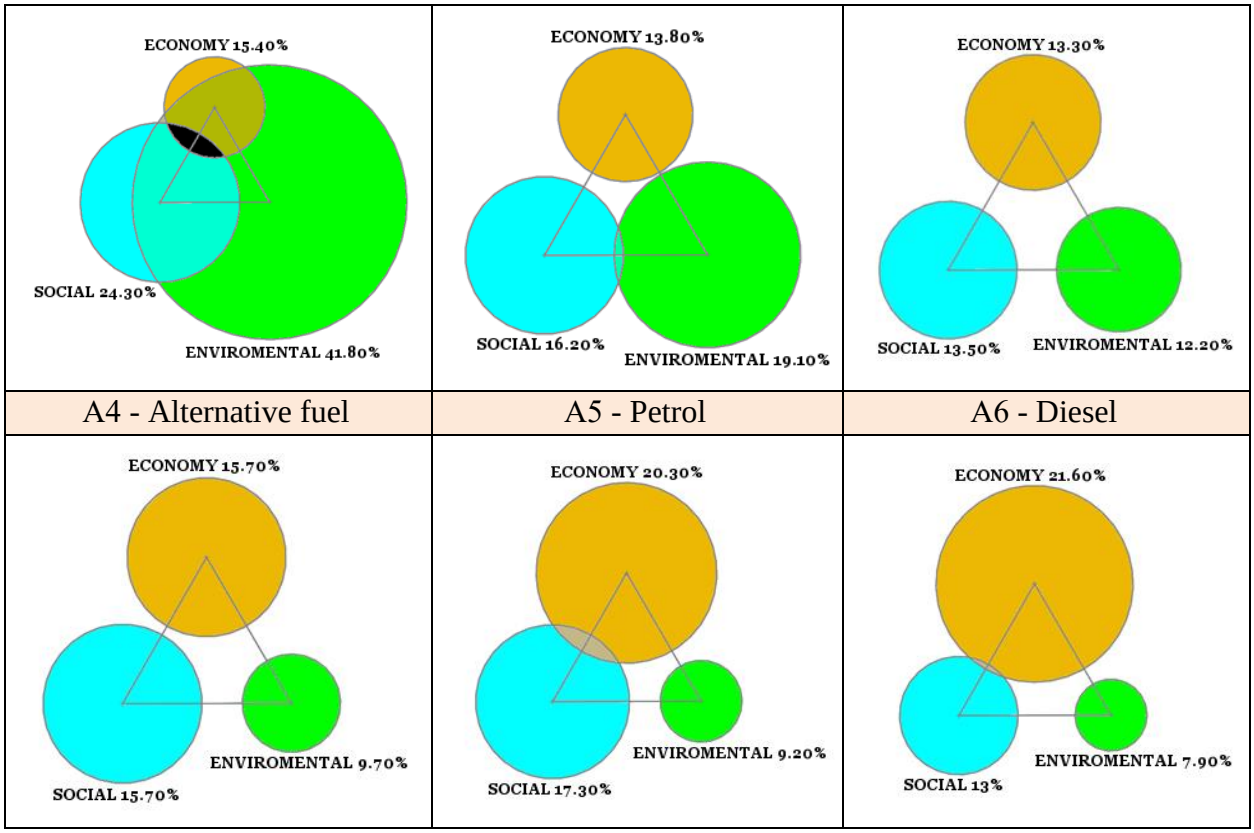

Figure 7: Visual presentation of correlation between three basic indicators of sustainable development: social, economic and environmental, for all vehicle alternatives

5. Conclusion

Several conclusions could be drawn from the results of the research.
The AHP methodology gives consistent and robust results for this kind of research.
Western Balkan countries share similar situation and challenges in regard of sustainable transport and challenges.
There are slight differences in priorities between countries. It is obvious that countries which have lower environmental problems (Albania and Montenegro) do not emphasize environment importance as the other countries. This could be related to the fact that these two countries are seaside countries in contrary to the others. The data for yearly pollution confirm that, as well.
The background of the experts interviewed also have an impact of that view. For instance, business people prioritize economy over environment and social aspects.

When coming to the capacities of different vehicle alternatives to contribute to the sustainable development, the results show the following:

- Electric vehicles (alternative 1) are the only one which show cross section of all three basic indicators of sustainable development. This is mainly result of their ecological superiority. In

the same time, their worst weakness is economy. This comes from the fact that their prices are still higher, and also the replacement of batteries is expensive, too.

- Plug-in hybrids (alternative 2) have relatively balanced circles – contribution in all three basic indicators. It is clear that through further development in their technology, especially by extending of the range on electric power, they could be transitional favorite until fossil fuels are still available. Their importance will be higher as fossil fuels become more expensive.
- Hybrid vehicles (alternative 3) which are now available on the market (excluding plug-in hybrids) rely on different innovations in technology and could reach further improvement in efficiency and environment aspects. Having in mind their full dependence of fuel, in long term they have serious limitations to contribute to sustainable transport.
- Vehicles consuming alternative fuels (alternative 4) are available and used in the regions where such fuels are available. Western Balkan is not such region, and those fuels have to be imported too. The availability and price of such fuels has a crucial importance on the capacity to contribute to sustainable transport, and to the level of their usage.
- Vehicles consuming gasoline (alternative 5), in a situation when the fuel is available and for acceptable price have intersection between economic and social indicators. This is result of the fact that those vehicles are available on the market for acceptable prices, and tradition in the region is on their side. The weaknesses on the area of environment are obvious.
- Vehicles running on diesel fuel (alternative 6) show similar results as alternative 5, but with lower performances regarding environmental and social indicators.

Due to dynamic nature of many indicators taken into account, development of automotive technology, possible new trends in the area of energy and environment, result of this research should be taken as a picture for the region of Western Balkan in this phase of its development. They could be used by policy makers, and also on different levels of decision making.

The research methodology could be used for further analyses according to the point of view and development of the whole system.

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An Overview of 6G Mobile Networks with Artificial Intelligence Towards Sustainable Development

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Abstract

The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015 addresses 17 Sustainable Development Goals in almost every aspects of life which would further bring peace and prosperity for people and the planet. Although most of these goals seem very ambitious, the rapid advancements of mobile networks may play a major role in accomplishing some of these sustainable development goals. 5G mobile network which already offers various broadband applications and services, is already commercially available. However, 5G may not to meet the rapid rising traffic demands. Therefore, the main research and development activities focus on the next 6G mobile network, which is expected to be commercially available around 2030. Machine Learning and in particular the Artificial Intelligence (AI) are becoming necessity for further expansion of the 6G mobile world. AI-assisted IoT services, data collection, analytics and storage should be native in 6G networks. Terahertz, visible light communication and technologies, such as compressed sensing theory, new channel coding, large-scale antenna, flexible spectrum usage, AI-based wireless communication and special features as Space-Air-Ground-Sea integrated communication and wireless tactile network are few of the novelties that are expected to become a common network standard of 6G. This paper gives an overview of the areas in which 6G network would contribute to achieve the UN 2030 sustainable development goals, as well as, a potential architectural design of 6G network which would bring such sustainable development.

Keywords: 5G, 6G, artificial intelligence, mobile networks, mobile technology

1 Introduction

In 2015 all UN members adopted the 2030 UN Agenda for sustainable development goals. According to this agenda there are set of 17 objectives for "shared blueprint for peace and prosperity for the people and the planet," which should be accomplished by 2030 [1].

Although most of these goals may seem very ambitious to be accomplished, the rapid advancements of mobile networks may play a major role in fulfilling some of these sustainable development goals. The current 5G mobile and wireless networks marked the beginning of a true digital society, and achieves significant improvements in terms of latency, data rates, spectral efficiency, mobility and number of connected smart mobile devices [2]. 5G mobile network which offers a broad range of various broadband applications and services, is already commercially available. However, 5G may not be able to meet the rapid rising traffic demands.

As 5G mobile network already begins to be commercially available, the main research and development activities focus on the next 6G mobile networks, which is expected to be commercially available around 2030 [3]. An Increased network traffic volume and an increased number of connected devices, should be supported by 6G. Therefore, Machine Learning and in particular Artificial Intelligence (AI) are becoming necessity for further expansion of the beyond 5G mobile world [4]. AI-assisted IoT services, data collection, analytics and storage should be native in 6G networks. Terahertz, visible light communication and technologies, such as compressed sensing theory, new channel coding, large-scale antenna, flexible spectrum usage, AI-based wireless communication and special features as Space-Air-Ground-Sea integrated communication and wireless tactile network are few of the novelties that are expected to become a common network standard of 6G.

This paper gives an overview of the areas in which 6G network would contribute to achieve the UN 2030 sustainable development goals, as well as, a potential architectural design of 6G network which would bring such sustainable development. In order to determine the areas in which 6G network would contribute a sustainable development to be achieved the following research methodology would be used. Initially a survey analysis about the concept of the future 6G network would be performed in Section 2. This would include the artificial intelligence in 6G, the 6G connected world and the communication technologies and innovation challenges in 6G. In addition, a comparison of the key parameters between 6G and 5G network would be provided, and a 6G network architecture would be proposed. Then in Section 3 the objective goals for sustainable development of the UN 2030 agenda would be stated. Moreover, it would identify the objective goals in which 6G network would contribute sustainable development to be achieved. Section 4 provides the details how these objectives are expected to be accomplished when 6G network would be deployed in 2030. Finally, Section 5 concludes the paper.

2 The Concept of 6G Network

5G standardization as presented at Figure 1, development and implementation are entering their final stage. This advanced network design introduces a giant step forward in the era of digital communication observed by 4G perspective. Beside increased data transfer and communication speed, whole set of new services are already introduced. 5G New Radio (5G NR) access network which is built by using different functions and functionalities in split user and control planes provides basis of network slicing approach. Three novel key service types introduced by 5G, shown at Figure 2 are: Enhanced Mobile Broadband (eMBB), massive Machine Type Communication (mMTC) and Ultra-Reliable Low-Latency Communication (URLLC). They may be provided via separate network slices as logically separated network partitions and represent few of the services assured by this network design.

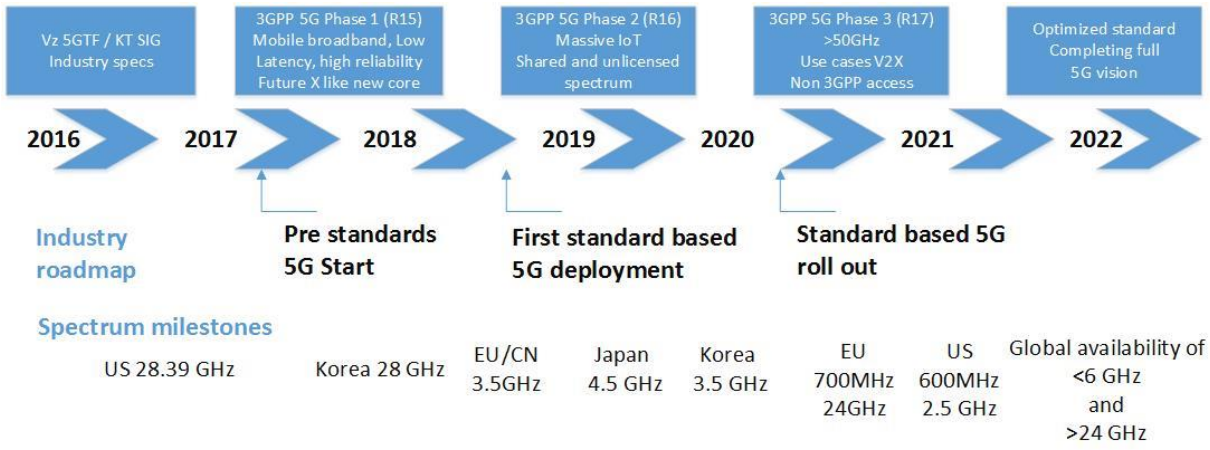

Figure 1: 5G Standards Roadmap.

As a result of the rapid increase of both, the network traffic volume and the number of connected devices, the future use of machine learning and general Artificial Intelligence are necessary for further expansion of future 6G networks and beyond. Therefore, the future concept of 6G network is introduced as a response of the demand of advanced communication assured by next generation networks and services, such as extreme high data rate and capacity, extreme network coverage, extreme low latency and extreme high reliability, that are presented on Figure 3.

The subsection 2.1 discusses the artificial intelligence used in 6G. Subsection 2.2 presents how the world would be connected by 6G. Finally, Subsection 2.3 presents the communication technologies used in 6G, as well as challenges which need to be addressed.

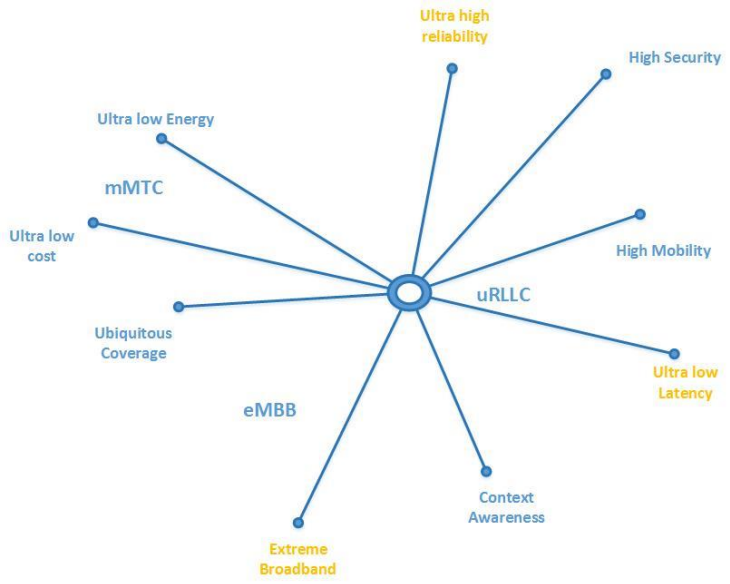

Figure 2: 5G Service Requirements.

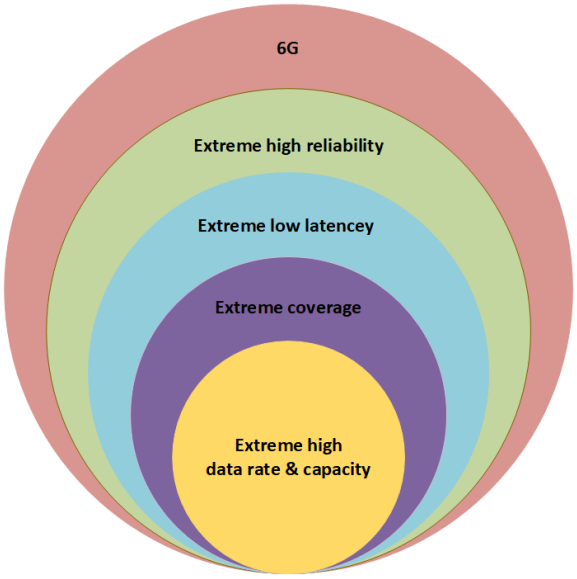

Figure 3: Basic 6G Services.

2.1 Artificial Intelligence in 6G

It is assumed that 6G design will introduce artificial intelligence (AI) analytics. Some proposals define descriptive, diagnostic, predictive and prescriptive data analytics [4-5]. Our scenario proposes following three AI data analytics types: network analytics that analyses collected historical data to get insights of the network status especially of the PHY, MAC, Network and Transport layer, variety of QoS parameters and etc. Actually, it would provide network status and utilization opportunities. Work data which is obtained as an output of the network analytics processes would be used by Core data analytics for detecting and predicting the network anomalies in order to improve reliability and security of the network. The obtained data would

be used to detect future faults based at historical and current information and network behavior.

Resource allocation solutions and notifications are expected to be output of this process. Predictive analytics would use data to forecast future resource availability based at user mobility prediction, traffic patterns and overload. It is expected optimized solutions to be proposed for allocation of the resources, network virtualization and slicing, edge computing, and optimization of virtual devices that consist the network in order to offer ultimate network utilization, data transfer speed and traffic QoS. In some points core and predictive analytics may overlap. Even if this scenario looks naive it isn't, it must consider a huge number of parameters, i.e., big data deep learning mechanisms which need to be optimized if end to end traffic optimization is used.

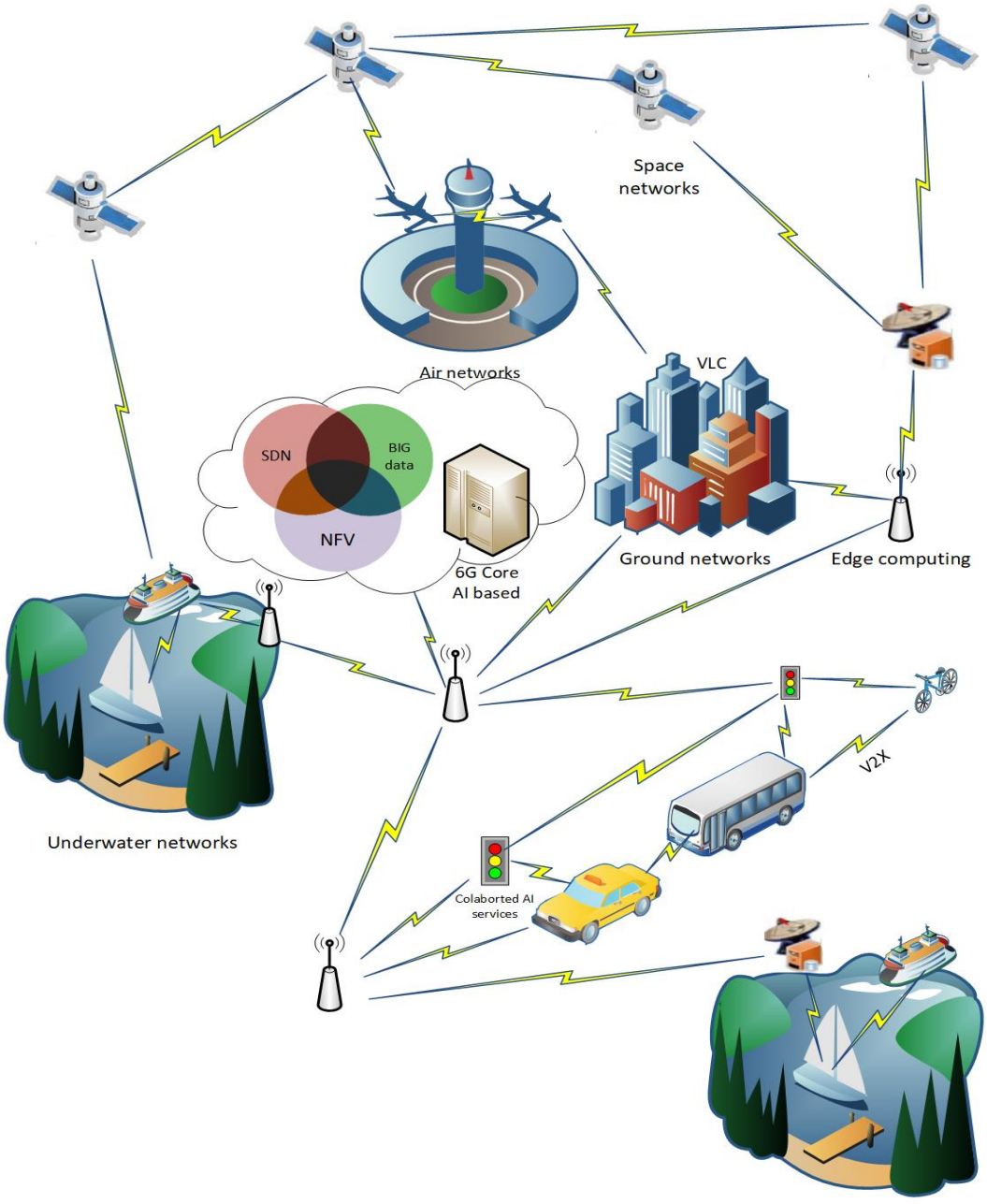

Figure 4: 6G Network Architecture.

All virtual network resources such as network slices, virtual devices, hardware and software components, should be considered for the artificial intelligence optimization. This concept should not stop at this point and intelligent TCP/IP model should be established at each layer with aim these three AI analytics types to be used for optimization at each TCP IP layer. Our scenario introduces intelligent physical layer in which intelligent power harvesting is included, data link, network and transport layer with protocols and application layer which AI could optimize the end user applications performances based on existing network utilization. The network would be able independently to manage all its components and resources starting form base stations, radio controllers, base station controllers and etc., network slices would be self-smart like the cloud core. Most of today's hardware components are expected to be replaced by cloud based or simply said to be virtualized. Imagine to have network that would be capable to self-utilize its resources based at end user application request meaning that QoS and link capacity between the mobile device would oscillate according the application demand that is currently in use.

Our proposed 6G network architecture is presented on Figure 4. It consists of different access networks such as air networks, ground networks, vehicle-to-vehicle communications, undersea networks, etc. connected to a single core processing capacity capable to support cloud computing, network function virtualization (NFV) and software defined networking (SDN). In this network architecture AI is introduced at any horizontal or vertical level, at all TCP/IP layers, at any slice configuration and cloud-based network resource (edge computing). The result would be self-sustainable ultra-smart network that could offer advanced self-managed services.

2.2 Connected World in 6G

Today's 5G is built at exploitation of notarization and virtualization of network functionalities [6]. Millimeter waves are used in radio communication coped with MIMO (massive multiple input/multiple output) links and ultra-dense radio access points deployment. Advanced data transfer speeds are assured so some may ask what is the next goal. Table 1 presents several key parameters that will differ 6G from 5G network [3]. It can be noticed that all parameters such as traffic capacity, data rate, end-to-end delay, processing delay, spectral and energy efficiency, etc. are improved several times over the value provided by 5G. These improvements would naturally introduce advanced 5G services as mobile broadband reliable low latency communication (MBRLLC), massive URLLC (mURLLC), Human centric services (HCS), Multipurpose (3CLS and Energy) Services (MPS). Although these advanced services are integrated with almost all IP based network technologies in 5G, still there is a communication gap, especially over the oceans and in which it is not possible to provide communication services based on ground mobile technologies.

In order to stay connected at any globe location, and at any time, perhaps 6G is the network which would incorporate low orbit satellites [7] as access technology. Integration of VLC (IEEE 802.15.7) as complement of RF access by piggybacking on the wide adoption of Light Emitting Diode (LED) luminaries [8] for indoor communication is estimated to be used by 6G. (as we are approaching visible light spectrum in range of 430 – 770 THz). Collaborative AI

which differs from AI network management which would be in use of advanced services [9]. Imagine to live in City in which any public device is smart starting from traffic signs, electric lights, traffic lights and that a network is established to assure collaboration between smart things.

In this scenario collaborative AI services are introduced and used in order to provide advanced business services. AI will be one of the key gains from 6G which will introduce novel era of mobile terminals that will be all AI optimized and managed.

It is expected 6G to be standardized till 2030 [10]. In this case with all of the mentioned network capabilities advanced AI services will be available [10-11]. Mobile data traffic is expected to reach 5 zettabytes (ZB) per month. This traffic would be enabled by advanced techniques and services like: artificial intelligence, terahertz communications, optical wireless technology (OWC), blockchain, dynamic network slicing, integration of sensing and communication, unmanned aerial vehicle users, holographic telepresence, integration of access-backhaul networks, 3D networking, holographic beamforming, big data analytics, augmented and virtual reality, cell-free communications, quantum communications [3-11].

Rapid development of electromagnetically tunable surfaces (e.g., based on metamaterials), would make 6G capable to control signal reflections and refractions from large intelligent surfaces (LIS). There are open research problems that range from optimized deployment of passive reflectors and metamaterial-coated smart surfaces to AI-powered operation of reconfigurable LIS. Analysis to understand LIS and smart surfaces performances, in terms of the rate, latency, reliability, and coverage are subject of research of scientific community.

An important research direction is environmental AI whereby smart surfaces learn and autonomously reconfigure their material parameters. The main question is how to focus signals with different angles of incidence in large metamaterial surfaces which require controllability of reflection/refraction coefficients. ML-driven smart surfaces in mobile environments may require continuous retraining, in which the access to sufficient training data, high computational capabilities, and guaranteed low training convergence are needed.

Table 1: 5G vs 6G key parameters [3].

KPI	5G	6G
Traffic Capacity	10 Mbps/m2	~ 1-10 Gbps/m3
Data rate	1 up to 100 Gbps	1 Tbps
End-to-End Delay Requirements	5 up to 1 ms	< 1 ms
Uniform user experience	50 Mbps 2D everywhere	10 Gbps 3D everywhere

Localization precision	10 cm on 2D	1 cm on 3D
Application Types	eMBB, URLLC,mMTCP	MBRLLC, mURLLC,HCS,MPS
Spectral and Energy Efficiency Gains with Respect to Today's Networks	10 up to 100x in bps/Hz/m2/Joules	1000x in bps/Hz/m3/Joules (volumetric)
Processing Delay	100 up to 50 ns	10 ns
Frequency Bands	Sub-6 GHz; MmWave for fixed access at 26 GHz and 28GHz.	Sub-6 GHz; MmWave for mobile access; THz band above 300GHz; Non RF

Holographic radio is assumed to be possible with 6G by using LIS and similar structures [12]. Holographic RF allows control of entire physical space and the full closed loop of the electromagnetic field through spatial spectral holography and spatial wave field synthesis. This would greatly improve the spectrum efficiency and network capacity and would help the integration of imaging and wireless communication.

Holographic beamforming represents novel method of beamforming which differs from MIMO systems mainly because of usage of software managed antennas. It is expected to be part of 6G in order to provide efficient and flexible transmission and reception of signals in multi-antenna communication devices. Beamforming is a signal processing procedure by which an array of antennas can be steered to transmit radio signals in a specific direction. It is a subset of smart antennas or advanced antenna systems. Beamforming technique has several advantages, such as a high interference prevention, high signal-to-noise ratio, rejection, and high network efficiency.

Cell-free communications would be based at tight integration of multiple frequencies and heterogeneous communication technologies. Users may move seamlessly from one network to another network without the need of making any manual device configurations. The best network would be automatically selected from the available communication technologies. It is assumed that this shall break the limits of the concept of cells in wireless communications.

Usually, user movement from one to another cell results with too many handovers especially in dense networks, handover delays, data losses, handover failures, and Ping-Pong effect are common. It is expected 6G cell-free communications to overcome all these and to provide improved QoS. Cell-free communication is expected to be achieved through multi-connectivity

and hybrid techniques by implementing different, heterogeneous radios in the devices.

Integration of wireless information and energy transfer (WIET) in communication would be one of the most innovative technologies in 6G. In particular, sensors and smartphones shall be charged by using wireless power transfer during communication. WIET is a technology for lengthening the lifetime of the battery-charging wireless systems. It is expected battery less devices to be supported by 6G communications.

Integration of sensing and communication is also important in order to create autonomous wireless network. The network should be capable continuously to sense the dynamically changing states of the environment and to exchange the information among different nodes. This functionality is expected to be tightly integrated with the communication to support autonomous systems.

Integration of access-backhaul networks would be at advanced level. The density of the access networks in 6G is expected to be rapid. Each access network is connected with backhauls connectivity. To cope with the large number of access networks, there must be tight integration between the access and backhaul networks. Dynamic network slicing would be enabled. This technology allows a network operator to provide dedicated virtual networks in order to support optimal delivery of any service toward a wide range of users, machines, vehicles and industries. It is key management element when a large number of users are connected to a large number of heterogeneous networks in communication systems.

Big data analytics also would be common. Big data analytics is a complex process in which a variety of large data sets are being analyzed. This process uncovers information, such as hidden patterns, unknown correlations, and customer inclinations, to ensure perfect data management. This technology shall be widely used for handling of huge data in 6G systems.

Most of the mentioned mechanisms and technologies considered so far are in research and development phase so it is considered that initial network design to be standardized till 2030. Terahertz communication is introduced in 6G concepts. However in bands between 100GHz and 10 THz, there are many challenges, such as, propagation loss and molecular absorption during adaptation of terahertz links in commercial systems.

2.3 Communication Technologies and Innovation Challenges in 6G

Terahertz communication has many advantages over microwave and wireless optical communication, which determines that terahertz wave has broad application prospects in high-speed short-distance broadband wireless communication, broadband wireless secure access and space communication.

Conventional channel estimation interpolation methods such as linear interpolation, gaussian interpolation, discrete Fourier transformation are not capable for full determination of THz channel. Nonlinear relationship must be taken in consideration. It is stated that the interpolation process is similar to super image resolution or simply said similar to the process of obtaining high resolution image from low resolution one [13]. AI-assisted super resolution interpolation algorithm introduces new potential of channel estimation without affecting the original latency requirements and computational complexity.

Novel channel estimation techniques [14] with all benefits and possible limitations are needed to be designed. Cell less architecture with tight integration of multiple frequencies and technologies is necessity, disaggregation and virtualization of network equipment, energy harvesting strategies for low power consumption operations, heterogenous hardware constraints and AI network management are few of the future network characteristics and techniques to be used.

Exploitation of VLC usage considering its limited coverage range, obligatory illumination source and the short noise form other light emitting devices should be taken in consideration. Deep-sea ocean communication can be established with electromagnetic waves. Knowing that the progress of the electromagnetic waves in resistive conductor depends of its frequency, the common rule is that the higher the frequency is, the higher the attenuation is, so the penetration depth's decreases. When lower frequencies are used attenuation decreases and penetration path is increased. Water is known as a conductor with strong skin effect. Sever attenuation of the commonly used ground frequencies affect their under-water propagation. Today undersea radio is characterized as long distance but small depth communication.

Undersea represents complex multipath transmission channel mainly because of the ambient noise, the narrow bandwidth, low carrier frequency and the transmission delay. In order to improve the bandwidth utilization and to overcome these obstacles novel multi carrier modulation technologies and technology schemes (MIMO etc.) must be studied. It is known that at ultra-close distance, 100 Mbps can be achieved by using blue-green laser (450-530 nm) mainly because it is affected by small attenuation regarding the rest of the optical bands. Scattering effect in this case is caused by plankton and other under water particles, that at shallow water has magnitude three times larger than in air. Background radiation, absorption and the strong sunlight absorption at the water surface are some of the identified problems that request solution. The line of sight shall be established during laser communication.

It is optimistic to say that underwater communication can be for sure part of the future 6G but it is a great challenge that if engaged would assure space air ground and sea connectivity and integration of advanced technologies which would provide ubiquitous connectivity.

It is interesting to notice that today's traditional Internet uses interaction of information content but IEEEP 1918.1 Standard Working Group defines Tactile Internet as network for remote access, operation and control in real time. This actually changes the nature of the traditional Internet mainly because Tactile Internet is not only used for transmission of information content but also for remote control and response. This change shall introduce not just Internet of Things but new Things of Things communication.

Some authors recommend trust communication [15] to be used in 6G too. Intelligent spectrum management is supposed to be part of 6G meaning that spectrum which would be dynamically allocated by AI depending of the type of the service requested by the user (QoS, QoE) based at deep learning AI mechanisms.

Integrated Space and Terrestrial Network (ISTN) [16] is expected to describe 6G in certain way and is expected to support Spacebone (consisted of GEO, MEO, LEO satellites), Airbone (airship, airplanes, unmanned aerial vehicles UAVs, etc.), ground based network with help of

mm-Waves. In our consideration this concept should be upgraded with undersea communication, i.e. Underseabone network in order to achieve total connectivity as presented at Figure 4.

These network modifications require improved TCP protocols optimized with help of AI. Each TCP phase must be optimized starting from flow control and congestion control protocols in case of high bit error and point to multipoint communication established in parallel with help of variety access technologies, case that would introduce virtually increased network data transfer speed.

At this time aeronautical channel model is commonly available, but not for mm-wave links. Some aeronautical channel models are available for satellite-to aircraft as well as air–to-ground links, but they were developed for Very High Frequency (VHF) bands so it will stay in the research focus. In outer space, terahertz can be transmitted without loss and can achieve long-distance communication with very low power. Compared with wireless optical communication, the beam is wider so the receiver is easy to align, the quantum noise is lower, and the antenna terminal can be miniaturized and planar. Therefore, terahertz wave can be widely used in space communication.

3 Sustainable Development Objective Goals in UN 2030 Agenda

Now since our vision about the 6G network was presented it is time to identify in which of the 17 objective goals of UN 2030 agenda, 6G would contribute a sustainable development to be achieved [1]. On the basis of our vision of 6G network presented in Section 2, our belief is that the 6G network would most significantly contribute successfully to be accomplished the objective goal 9, which deals with building the resilient infrastructure, as well as promoting inclusive and sustainable industrialization and fostering innovation. Then 6G would have a significant impact on the objective goal 4 and the objective goal 8. The 4^{th} goal is about providing inclusive and equitable quality education, and promoting lifelong learning opportunities for everyone, while the 8^{th} goal is about promoting sustainable economic growth, as well as, providing decent work, as well as, full and productive employment for everyone.

The next section discusses the ways in which 6G would contribute these objective goals to be achieved.

4 Finding and Results

Since three main objective goals of the UN 2030 agenda were identified in which 6G network would contribute to be accomplished, here it would be discussed how these goals would be accomplished with 6G.

The greatest impact 6G would have on accomplishing the objective goal 9. The 9th goal of the UN 2030 Agenda is about the developing a quality, sustainable, and resilient infrastructure which would support the growing demands of the population. The infrastructure should provide support in different public and private sectors. Since 6G is expected to become a ubiquitous wireless network possible, it would successfully deal with the infrastructure challenges. Firstly,

6G would provide a comprehensive coverage which would help to both developed and developing countries. Secondly due to the requirement of the energy consumption decrease, 6G network is expected be affordable infrastructure because the price for wireless connectivity would decrease. Moreover, 6G would be more energy efficient than 5G, because every next generation of mobile and wireless communication has improved energy efficiency than the previous generations of wireless communication. In addition, the 6G smart mobile devices would have an advanced artificial intelligence which would support new applications and services. The Artificial Intelligence would be used to solve big data analytics problems. Finally, the smart cities which would appear with 5G network, could be interconnected by 6G network, that would provide a fast reliable communication between cities, which would result with the appearance of so called "smart countries," or even "smart world."

The next object goal in which 6G would have a great impact is the 4th goal, i.e. the goal about equitable quality education. This objective goal is very important because, through education people shall become aware of the importance of sustainable development in order the 17 objective goals of UN 2030 agenda to be successfully accomplished. Moreover, at the moment where the world is facing with the challenge to prevent the spread of CORONA virus (COVID-19), the trend of online education is rapidly growing because it provides an access to skills and training much easier, particularly when access to a physical institution or teacher isn't possible especially during the presence of the COVID-19 virus pandemics. As it was shown in Table 1, the key parameters in 6G networks would be improved several times over the value provided by 5G networks. Therefore, 6G network would successfully make the online education to have a QoE level the same as the education in the real physical world through different virtual reality platforms, as well as, holograms.

Finally, the deployment of 6G would stimulate the Industrial growth and the rise of digital economy, i.e. the objective goal 8. Initially, 6G would provide much better QoS and QoE experience than 5G, as would it would provide support for new services and applications that cannot be supported with 5G. The appearance of new services and applications such as autonomous vehicles, computing reality devices, 3D mapping, sensing, augmented and virtual reality, holographic telepresence, Massive IoT Integrated Smart Cities, automation in manufacturing and many more, would result with opening of new business opportunities, new job positions and new career pathways.

5 Conclusion

The exponential increase in broadband multimedia wireless communications, as well as the rapid proliferation of smart mobile devices would shape the creation of the future 6th generation of mobile and wireless communications, also known as 6G. Considering the network management and orchestration, signal processing and coding at the physical layer, manipulation of smart structures, and data mining of the network, service-based context-aware communications managed per device, we can conclude that AI will drive future end to end communication, including smart core, slices, smart edge network, CPE, any network terminal, phones and applications.

AI-enabled intelligent architecture of 6G networks will be implemented to realize knowledge discovery, smart resource management, automatic network adjustment and intelligent service provisioning. Collective AI represents advanced form of current AI techniques that address coexistence of multiple distributed mobile radio learning agents for variety of benefits. 6G deployment is expected to start around 2030. This network would be very much energy and bandwidth efficient.

New dimensions such as quantum communication, satellite integration and possible undersea wireless electromagnetic communication are expected to find place in 6G. In addition, terahertz, visible light communication and technologies, such as, compressed sensing theory, new channel coding, large-scale antenna, flexible spectrum usage, AI-based wireless communication and special features as Space-Air-Ground-Sea integrated communication and wireless tactile network are few of the novelties that are expected to become a common network standard of 6G.

Key 6G driver is expected to be the convergence of all past features as high throughput, network densification, low energy consumption, high reliability and massive connectivity. Future services would include AI, smart wearables, autonomous vehicles, computing reality devices, 3D mapping, sensing, augmented and virtual reality, holographic telepresence, Massive IoT Integrated Smart Cities, automation in manufacturing and many more. Self-evaluation at any level as availability effectiveness, security, efficiency, scalability, portability, flexibility will be driven by AI that will introduce the first self-sustain network.

This network would provide a significant increase of QoS and QoE level compared to 5G, as well as it would contribute for a future sustainable development, by providing a support in some of the goals of 2030 UN agenda for bringing peace in the world and prosperity to all mankind. In particular the main contributions are expected to be in the providing support of the critical infrastructure, such as healthcare and government resources, support of the online education, and support for the industrial growth and rise of the digital economy. This survey may serve as an enlightening guideline for future research works in sustainable green 6G communications.

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The Harmonized European Value Added Tax System and the Case of Kosova

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Abstract

This paper aims to provide an overview of developments in the harmonization of indirect taxes within the European Union (EU) with special emphasis on Value Added Tax and legal changes of VAT in Kosovo.

The process of tax harmonization in the EU is part of global trends, namely tax regulation, cooperation, coordination and harmonization of anti-competitive taxes.

This paper focuses on EU legislation and practices on VAT issues, addresses VAT legal changes in Kosovo and their effects, describes the origin and spread of VAT application, the principles and purpose of VAT , 6th VAT Directive and the concept of harmonization of VAT and national tax systems of aspiring countries as a precondition for European integration.

The basic goal of the EU states was to create a common European market that would guarantee the free movement of goods, services, individuals and capital, known as the four fundamental freedoms of the single European market.

The research methodology, which will be used in this paper is quantitative analysis. Some of the methods that will be used during this paper are: descriptive method, synthesis method and comparative method.

In general, the paper will address the question of what fiscal harmonization really is and what the consequences of a competitive situation for member countries might be.

Following a brief overview of fiscal policy within the EU, the diversity of fiscal systems among member states will be highlighted and future perspectives will be outlined.

The paper illustrates that through the partial harmonization of indirect taxes (value added tax and excises) the EU has achieved a significant degree of fiscal neutrality.

The paper provides an overview of the progress of tax harmonization in the EU and the efforts of the state of Kosovo to harmonize VAT rates.

Keywords: *Harmonization, VAT, European Integrations, Single European Market*

Introduction

Value added tax (VAT) is a major source of revenue for national budgets. Many Member States, including Kosovo as an aspiring country for european integration, have recently increased their VAT rates as part of their consolidation efforts. Consumption taxes are considered, in general, to be a more stable revenue source, and more growth-friendly, than certain other taxes such as profits and income.

In 2015, the Government of Kosovo, facing the increase of the budget deficit mainly due to the increase of salaries in the public sector and expenditures on the construction of the Pristina-Skopje highway, is forced to amend the tax legislation.

As VAT was the first tax to be broadly harmonised at EU level, it was logical to choose VAT as the basis for the EU second kind of own resource, just as customs duties on imports under the common external tariff constituted the first kind of own resource. Council Decision 70/243 of 21 April 1970, gave the EU financial autonomy and for the budget to be entirely financed from own resources. This was done by replacing Member States' financial contributions by the EU own resources system, and with the introduction of a VAT-based resource.

The issue of tax harmonization of tax systems of EU Member States is considered a difficult issue taking into consideration differences of economic, historic, politic and social systems of the Member States, different concepts about taxes in general dealing with direct or indirect counter remuneration report of paid taxes and distribution of state revenues.

Regarding the definition of tax harmonization with the tax system of the Member States (MS), different authors give the different definitions.

According to Bénassy-Quéréa, Trannoyb and Wolf (2014), harmonization is a form of coordination in order to determine the minimum tax base and minimum tax rate.

In the EU, there is a minimum standard VAT rate of 15%, above which Member States are free to set their own national VAT rates. Member States decide how to spend the revenue they receive from VAT receipts, except for a small percentage of this total which is paid towards the EU budget. (MEMO/11/874, 2011)

Dosser (1973) perceives tax harmonization as tax coordination between member states in the process of integration (either currency union or economic union), thus as a consultation procedure in the area of adjustment of tax systems. (Nerudová, 2004)

Hitris (1994) advocates broad angle of perspective, he defines two approaches. First is presented by rapprochement – it results to the situation when all the countries apply the same tax system. Second approach is called fiscal divergence – it enables each country to apply its own tax system as the tool for economic objectives achieving. (Nerudová, 2004)

Hitris (1994) advocates broad angle of perspective, he defines two approaches. First is presented by rapprochement – it results to the situation when all the countries apply the same tax system. Second approach is called fiscal divergence – it enables each country to apply its own tax system as the tool for economic objectives achieving. In the case we perceive tax harmonization in accordance with the definition of Hitris (1994) the present situation in the European Union fully

corresponds to the fiscal divergence – there is no rapprochement, which is defined as the situation in which all the member states apply the same tax system. Even though this in accordance which above mentioned approach we can talk about harmonization. (Nerudová, 2004)

According to Kubátová (1998), Harmonization does not mean the same taxes, the same tax base and rates according the author; due to the political reasons they are only adjusted and converged. Harmonization is very closely connected with common market and its functioning.

Simon (2000) defines the term harmonization as the process of removing obstacles and differences between member states of the European Union. The first part of the definition - the removal of obstacles – is tightly connected with common market. It means that the goods and services entering the common market should not be fiscally discriminated against domestic goods and services. In the second part the term difference says that the importance should lie in convergence and standardization. According the author total harmonization means that each member states applies the same tax system – every state levies the same taxes on the same tax base (goods and services). The above mentioned should also mean that each state applies the same tax rates. The author also analyses the possible definitions of the term tax harmonization, taking into account wide diversity of connections – levied taxes, tax basis, tax rates and the tax administration. Based on these connections the author states that there exist three harmonization levels:

Levels of harmonization:

• different taxes in each country;

• some taxes European, some taxes national;

• the same taxes in every country.

The level where each country applies different taxes can be divided onward:

• there exist no treaties of double taxation elimination, there exist no cooperation in the area of administration – thus it is not called harmonization;

• there exist treaties of double taxation elimination, there exist cooperation in the area of administration – thus this is moderate harmonization;

The situation when member states apply both common provisions and national provisions the term partial harmonization is used.

The case when all the member states apply the same taxes can be divided further on following situations:

• different tax bases and different tax administration

– this situation is called nominal harmonization;

• the same tax bases. Under the situation of same tax bases application we can distinguish further partial situations in which are applied:

• different tax rates – here we talk about:

- tax bases harmonization;

- tax standardization which is not centrally controlled;

• same tax rates – here we talk about:

- total standardization;

- tax standardization which is not centrally controlled;

The above stated definitions shows that it is impossible to find one and only definition of this term. I presume that thorough analysis of factors connected with harmonization and the reasons for harmonization is needed to be done in order to gain more exact definition of this term.
The above stated definitions shows that it is impossible to find one and only definition of this term. It must be presumed that thorough analysis of factors connected with harmonization and the reasons for harmonization is needed to be done in order to gain more exact definition of this term.

Changes in the new VAT law in Kosovo

Value Added Tax (VAT) is the main source of tax revenue in Kosovo. In the first nine months (January 1 - September 30) of 2020, VAT accounted for approximately 47.9% of budget revenues. (Republic of Kosovo, Government, Ministry of Finance, Treasury of Kosovo, 2020).
The new Law on Value Added Tax entered into force on September 1, 2015 and aimed to create a better environment for doing business, encourage new investment and employment, promote the information technology sector and address some social issues. In essence, the changes brought by VAT are based on estimates that aim to bring about certain effects on the economic and social life of Kosovo known as fiscal policy.
Some of the fundamental changes that have been made to the Law on Value Added Tax include:

- The standard VAT rate has been increased from 16% in the previous law to 18%;
- Reduced VAT rate 8% on some products and services that include: utilities (electricity, drinking water, waste collection, heating), cereals, flour, oils, milk, salt for human consumption, textbooks, equipment of information technology, medicines, medical devices, etc. Prior to the entry into force of the law, VAT on medicines was 0%.
- With the new Law on VAT, the threshold for VAT registration has been reduced from € 50,000 to € 30,000 turnover.
- With the approval of TAK, production lines and machinery for use in the production process, raw material used for the production process, information technology equipment are exempt from VAT;
- Newspapers, periodicals, equipment and materials imported for the needs of print and electronic media are automatically exempt from VAT.
- The reformulation of article taxable person; The definition of Taxable Person has been reformulated, canceling the name Kosovo, so now it is a much broader definition, which means that the development of economic activity is considered regardless of where that activity takes place.
- Cancellation of VAT certificate for Import / Export purposes; With the entry into force of the new Law on VAT, the VAT Certificate for small businesses was canceled, which was issued only for the purpose of Import or Export. There will now be only a VAT Certificate for all those taxpayers who reach the VAT registration limit or voluntarily wish to register for VAT. (Assembly of the Republic of Kosovo, Law No. 05/L-037 on Value Added Tax, 2015)

Based on the Annual Report of the Tax Administration of Kosovo, for the period January-December 2019, in the structure of revenues by type of tax, the largest share has VAT with 47.9%. (Tax Administration of Kosovo, 2020)

Table 1: Revenues generated by VAT, January-December / 2017-2019

Type of tax	2017	2018	2019	Structure2019	Comparison by years	
1	2	3	4	5=4/∑	6=4/2	7=4/3
VAT	196,635,189	215,184,335	241,711,051	47.9%	122.9%	112.3%

Source: Tax Administration of Kosovo. (2020). Annual Report of the Tax Administration of Kosovo January-December 2020, pp. 18

From the data presented in the table and graph, we notice the increase of VAT revenues for the period January-December / 2018-2019 by about 26,526,716mil., While January-December / 2017-2019 an increase of about 45,075,862mil.

Table 2: Revenues collected from VAT at Customs

Revenue collection	2017	2018	The change in %
VAT	557.7	585.8	+ 4.79%

Source: Kosovo Customs. (2019). Annual Report 2018, pp. 6

According to the data in table no. 5, we notice an increase in revenues collected from VAT at Customs about + 4.79%. (Kosovo Customs, 2019)

Another change in the Law on VAT was the reduction of the VAT threshold from 50,000 euros as it was in the previous law to 30,000 euros. So, any business that realizes a turnover of over 30,000 euros per year, will be obliged to register for VAT and pay for the part which exceeds this amount. Kosovo's budget will benefit from this reduction of the VAT threshold because a larger number of businesses will be forced to pay VAT, but on the other hand this fiscal policy will weigh on new businesses that need relief fiscal and which potentially create new jobs. (GAP Institute for Advanced Studies, 2015).

Table 3: The number of businesses that pay VAT before and after lowering the VAT threshold

						Projection
Year	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Number of Businesses	8,834	9,605	10,556	12,327	14,560	16,360

Source: GAP Institute for Advanced Studies. (2015). Economic and Budgetary Effects of Fiscal Reforms 2015

Among the THREE VAT changes are: the liberalization of imports of production lines, raw materials and information technology equipment. As a first element, the release of imports of

production lines and machinery, which is included in the package and is very clearly defined. The second mentions the liberalization of the import of raw materials and as a third element mentions the fact that these fiscal policies will help the European integration processes that Kosovo, in all areas, whether as a civil society or as the Government is aiming.
Starting from the practical part, there have been various companies that have come and expressed desire to invest in Kosovo but, in the impossibility of VAT exemption, the import of machinery and raw materials has caused them many problems and consequently a product with a much higher cost than imports has emerged, therefore, we can say that these three points are among the main points of VAT changes.

VAT rates in eu countries and the case of Kosovo

In the EU, the adoption and further harmonization of a common system of VAT is mostly due to the historical objective of promoting full economic integration between the Member States by achieving, initially, a "Common Market" and, since 1993, an "Internal Market" without (internal) frontiers. In addition, because the EU budget since the 1970s is fi nanced entirely on the basis of "own resources" that are partly fi nanced out of Member States' VAT revenues, the adoption of a harmonized VAT system in all Member States also became necessary to ensure Member States' equal budgetary contribution. (Lamensch, M. 2015).

List of VAT rates applied in the Member States (in %)

Member States	Code	Super-reducet Rate	Reducet Rate	Standard Rate	Parking Rate
Belgium	BE	-	6/12	21	12
Bulgaria	BG	-	9	20	-
Czech Republic	CZ	-	10/15	21	-
Denmark	DK	-	-	25	-
Germany	DE	-	7	19	-
Estonia	EE	-	9	20	-
Ireland	IE	4.8	9/13.5	23	13.5
Greece	EL	-	6/13	24	-
Spain	ES	4	10	21	-
France	FR	2.1	5.5/10	20	-
Croatia	HR	-	5/13	25	-
Italy	IT	4	5/10	22	-
Cyprus	CY	-	5/9	19	-
Latvia	LV	-	5/12	21	-
Lithuania	LT	-	5/9	21	-
Luxembourg	LU	3	8	17	14

Hungary	HU	-	5/18	27	-
Malta	MT	-	5/7	18	-
Netherlands	NL	-	9	21	-
Austria	AT	-	10/13	20	13
Poland	PL	-	5/8	23	-
Portugal	PT	-	6/13	23	13
Romania	RO	-	5/9	19	-
Slovenia	SI	-	5/9.5	22	-
Slovakia	SK	-	10	20	-
Finland	FI	-	10/14	24	-
Sweden	SE	-	6/12	25	-
United Kingdon	UK	-	5	20	-

Source: European Commission, TAXUD. (2020). VAT rates applied in the Member States of the European Union Situation at 1st January 2020. Retrived from: https://ec.europa.eu/taxation_customs

EU law requires all EU member states to apply a standard rate of at least 15%. In fact, only two member states – Luxembourg and Cyprus – currently have a standard rate that low. The average standard rate is currently 20.7%, with three countries – Denmark, Hungary and Slovenia – applying a standard rate of 25%. In practice, many goods and services are not subject to VAT at the standard rate. Some are subject to reduced rates, some are zero-rated, and some are exempt. (European Commission, TAXUD, 2011).

Countries claiming the candidate status and full membership in the EU, should certainly harmonize their fiscal policies and fiscal system with the acquis communautaire.

From the above, the tax rate in the Republic of Kosovo is among the lowest in the EU member states and we can say that it is a fiscal policy that Kosovo institutions have applied in accordance with the standard and economic development of the country because it is known that Kosovo is behind these EU countries in terms of sustainability and economic development. The countries of the region which are members of the EU also have a higher rate than our country.

Kosovo, like other countries in the region, has reformed its tax system, reducing rates, redefining the tax base and amending positive laws. Yet much remains to be done. Efforts should be made to fill legal gaps, tax harmonization with the EU and regulate international tax relations.

Conclusion

The Value-Added Tax (VAT) is part of the acquis communautaire, and two directives (1977 and 2006) closely codify the VAT regime in EU Member states, with a minimum standard rate of 15% and a restricted list of reduced rates.

EU tax harmonization aims to eliminate differences between member countries in order to promote the European common market. This paper concludes that despite the efforts of states, including our country as an aspiring country in the European family, the harmonization process is difficult to achieve uniformly as it deserves the discipline of member states and aspiring states and is a long-term process.

Despite many problems, the harmonization of indirect taxes in the EU has been much more successful compared to the harmonization of direct taxes and VAT is mandatory in all EU member states. The current VAT system is relatively vulnerable to fraud and administrative problems.

Given the weaknesses, the VAT system needs to be reviewed to ensure that it is efficient, robust and flexible. A reform of the VAT system can greatly contribute to strengthening the Internal Market and supporting the consolidation of Member States' budgets. Even our country, despite the reforms of tax legislation in order to harmonize with the EU acquis, still remains far from these countries, given the economic development and living standards of citizens.

Tax harmonization may serve alternative goals, such as equity or stabilization. Tax harmonization is an important part of the fiscal integration process.

From the above, tax harmonization is the process by which a heterogeneous group of countries, agree on setting a minimum and maximum level of their tax rates, including also a higher degree of harmonization of tax legislation, in order to attract foreign investors and to encourage local development and investments.

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Sustainable Bioclimatic Strategies Applicable on Buildings on Sloped Terrain in Mountain Touristic Settlements

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Abstract

This research analyses certain bioclimatic sustainable strategies that are in correlation with the thermal, visual and spacial comfort of a touristic complex in the tourist settlement Popova Shapka on the Shar Mountain. More precisely, this research discusses about the possible ways of application of the analyzed bioclimatic sustainable strategies for achieving sustainable solutions regarding urban planning, design of a buildings on a sloped terrain, developing sustainable constructive solutions of the buildings and revitalization of the existing tourist settlement.

This study was conducted in the following steps. At first, the sustainable bioclimatic discourse was analyzed in order to give explanation which of the mentioned sustainable principles can be applied on the analyzed case. Then, different analytical methods and information from various scientific areas were used, which helped in detecting the real problems present on the analyzed location. The results of the conducted analysis enlighten the possible ways of revitalization of the touristic settlement through defining the functions that are missing. Incorporating new functions in the existing settlement is believed to be a solution for attracting more visitors during all year around, improving the social cohesion, creating ecologically designed complex that will give the visitors more possibilities of enjoying the beautiful nature. The possible ways of applying the best constructive solutions of the buildings were analyzed as well. It was concluded that the bioclimatic approach in this field should incorporate active and passive strategies of solar architecture, ecological and natural materials and systems with good energy efficient performances.

Having in mind that this location is situated in sloped terrain the bioclimatic strategies recognized in this research as applicable can assist on finding better, healthier, more sustainable, eco-friendly and people-friendly solutions. These strategies and measures can also be applied in wider urban context in other mountain touristic settlements with similar environmental problems.

Keywords: *Sustainable strategies, Bioclimatic architecture, Environmental urban planning, Solar architecture, Energy efficient materials.*

1. Introduction

As more regions and countries develop their tourism industry, it produces significant impacts on natural resources, consumption patterns, pollution and social systems. The need for sustainable and responsible environmental planning is imperative for the natural and built environment to survive as a whole. Environmental planning is a decision-making process that addresses environmental parameters when creating human designed environments in wider natural context. It is an interdisciplinary field that includes urban planning, landscape architecture, sustainable architecture, engineering, related arts, natural sciences (biology, geography, meteorology, physics…) and social sciences [1]. Touristic settlements and touristic complexes must be carefully planned for their habitants, visitors and for the complete environment (the specific local flora and fauna). In that manner, this research explains the analytical and design methods applied on this chosen location in the touristic settlement Popova Shapka.

The *mixed-use* [2] character of the chosen location will enable revitalization of this touristic settlement by adding a number of new urban contents. Making a mix-used development plan for this location will include a variety of uses within the project. Developing bigger areas in this touristic settlement that promote walking, hiking and bicycling represents imperative regarding the ecologically driven mountain tourism.

2. Purpose of Study

Reviewing the scientific literature on low-carbon cities, green cities [4,5,6,7], healthy cities, the urban development EU documents[1] [2], as well as conducting this research, helped us to come to the conclusion that this location should be designed as: green, compact, walkable, healthy, barrier-free and socially vibrant space that will deliver a high quality life to the people that live and visit in this area. This touristic settlement has a very big economical potential for the state, but is totally neglected. Even some of the existing hotels are not working and haven't been reconstructed. There are no commercial shops for the people that have villas, as well as shops for renting mountain equipment, there is no info tourist biro, there are no lifeguard, police, fire station offices, ect. This location offers wonderful possibilities for developing the tourism in this area during all year around, not only in the winter period. In the present moment even in the winter period the potentials are not enough used. Also, the few new hotels or apartments built in the last decade in this settlement do not respect or develop the sustainable and ecological concept. Revitalization of locations in this touristic settlement that have lost their mining through time by adding new urban contents that enlighten the context of the nature, ecology and social cohesion represents very important sustainable principle [2,7,8].

The touristic settlement Popova Shapka should represent touristic, ecological, natural landmark of the Republic of North Macedonia, because of its exceptional natural beauty. That is the main reason why a great number of people from all over the state are visiting this place. But their number will increase even more, as well as the number of foreign tourists, if we find ways how to show our treasure in the best light. By developing more complex, contemporary designed, healthier, more sustainable, eco-friendly and people-friendly solutions for preserving and promoting this touristic settlement, this goal will be achived.

The purpose of this study was to develop a methodology for designing sustainable bioclimatic architectural projects with a complex project program at a location on a slope terrain. The objectives of the design program are focused on multidisciplinary development of an architectural project:

(1) analysis of the project tasks through the urban aspect and the context of fitting the buildings in an existing location: mountain / rural environment;

(2) using the methods and techniques of design analysis, in-depth definition of project's program and development of an ecological bioclimatic conceptual design,

(3) constructive solutions and materialization of the building according to modern environmental and sustainable norms.

3. Research Methods

As it was explained earlier in the text: *environmental planning* is a decision-making process that addresses environmental parameters when creating human designed environments [2]. "The environmental sustainability focuses on the overall viability and health of ecological systems. Natural resource degradation, pollution, and loss of biodiversity are detrimental because they increase vulnerability, undermine system health, and reduce resilience." [9] Different analytical methods and various scientific findings were used in order to come up with precise answers regarding the real problems at the analyzed location:

- problems that the people gravitating in this area are facing;
- problems that the people visiting in this area are facing;
- ecological problems for preserving this location as natural habitat for the local flora and fauna.

Methodological approaches used in this research that illustrate the present situation at the location, are the following ones:

- Analyses of the natural characteristic of the place
- Analyses of the topography and the soil
- Analyses of the natural habitat of the local flora and fauna
- Analyses of the solar radiation during all year around
- Analyses of the air circulation during all year around
- Analyses of the existing touristic complexes that offer good conditions for a pleasant stay with variety of functions and touristic attractions
- Analyses of the high greenery, low greenery and asphalt surfaces on the location

- Analyses of the pedestrian walking routines on the present location
- Analyses of the traffic routes and the condition of the roads that lead to this settlement
- Interviewing the people that gravitate in this area (the people that live or have villas here)
- Interviewing the people that visit in this area
- Analyzing the presence of public and commercial services present in this settlement: bus station, police, fire station, life guard service, hospital, commercial shops for food and mountain equipment, ect.

4. Findings and Results

The conducted methods helped in detecting the real problems present on the analysed case. Based on these analyses, the following sustainable bioclimatic principles and strategies were found as the most adequate to be implemented on the precise location:

- **Reuse of "brownfield" locations instead of new ones** - Revitalization of locations inside this settlement that have lost their mining through time by adding new urban contents that enlighten the context of the nature and social cohesion - making them multifunctional, greener and socially vibrant spaces.
- **The planning of the settlement should be people centred**, rather than design centred. The settlements are a constantly evolving organisms, so the planning of this settlement must take a broader perspective than the design of individual buildings. Developing bigger areas in the centre of the settlement that promote walking and gathering.
- **Prioritize bicycle networks** - Increase mobility by regulating road use: combining traffic road + bicycle streets + pedestrian paths.
- **Barrier-free access** - Parking, walkways and ramps designed as friendly surfaces for people with disabilities.
- **Increase mobility by regulating parking of cars and bicycles.**
- **Adding playgrounds for children** made of natural materials (wood, rubber, ropes).
- **Adding energy-efficient artificial lighting** in the public space - brings life on the location during the night and makes it interesting and safe for the visitors.
- **Adding amphitheatres and squares** - spaces that fulfil the interests of different groups of people related with: musical and theatrical performances, open-air exhibitions, public gatherings… Designing the public spaces as new landmark of the settlement will represent a new tourist attraction.
- **Designing urban furniture** that will offer the visitors a pleasant accommodation, socialization and in the same time will provide space for throwing and selecting the garbage – recycle bins (for glass, plastic, cardboard/paper)
- **Building and revitalisation of the existing buildings in more ecological, energy efficient and sustainable manner**. Incorporating passive and active solar architecture principles and systems in the buildings. Incorporating energy efficient building materials, equipment and technical systems.

- **Incorporate waste management strategies** during the building or revitalisations of the buildings.
- **Increase the waste management strategies related with the garbage from the whole settlement** by designing a disposal station that will select and transport the garbage from this natural habitat to the nearest disposal centre.

In order to test the possibility of application of the sustainable and bioclimatic strategies defined in this research, the findings of this research were explained to the students taking the course Architectural studio 5 (2019/2020) at Faculty of Architecture and Civil Engineering at University Mother Teresa in Skopje, as guidelines for designing their own solutions regarding a chosen location inside this settlement.


***Figure 1 and 2**. Project 1 by the students Jeta Ajdari and Genci Hani*


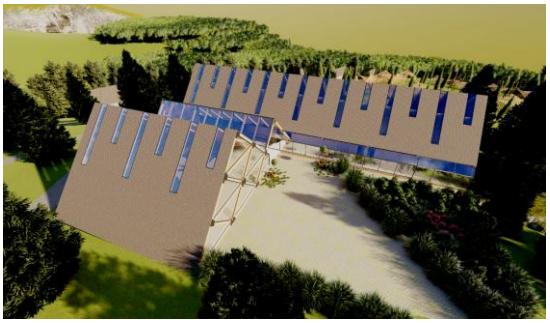

***Figure 3, 4, 5, and 6**. Project 2 by the students Hekuran Musli and Riat Bajrami*

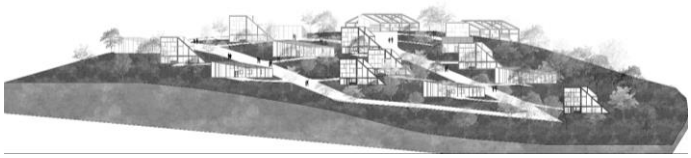

Figure 7 and 8 *Project 3 by the students Vigan Tahiri, Ali Allmala and Enis Beqiri*

Figure 9 and 10*. Project 4 by the students Mirnesa Jusufi and Suhela Zendeli*

Later, a tabular evaluation was conducted by the teaching staff (Table 1), to evaluate the project's sustainability value(s) of all the five student projects. The presence of one or more of these sustainable bioclimatic strategies in the presented students' projects determined the project's sustainability value. All of the students' projects have incorporated at least 9 from the 12 sustainable features. After discussion with the students it was concluded that given guidelines from the mentors helped them to think more about the environmental, social and ecological problems present at the location, rather than just coming up with visually interesting design solutions. The given guidelines helped them brainstorm and find solutions that can be characterized as sustainable concepts (Figures 1-10).

Table 1. Evaluation of sustainable strategies and methods applied on the analyzed student projects

Sustainable strategies and methods	Project 1	Project 2	Project 3	Project 4
Reuse of "brownfield" locations instead of new ones;				
The planning of the settlement should be people centred, rather than design centred;	+	+	+	+
Prioritize bicycle networks		+		+
Increase mobility by regulating road use: combining traffic road + bicycle streets + pedestrian paths;		+	+	+
Barrier-free access;	+	+		+
Increase mobility by regulating parking of cars and bicycles;	+	+	+	+
Adding playgrounds for children made of natural materials;	+		+	+
Adding energy-efficient artificial lighting in the public space;	+	+		+
Designing the public spaces as new landmark of the settlement will represent a new tourist attraction;	+		+	
Designing urban furniture that will offer the visitors a pleasant accommodation, socialization and in the same time will provide recycle bins;	+	+	+	+
Building and revitalisation of the existing building in more ecological, energy efficient and sustainable manner;		+		+
Incorporate waste management strategies during the building or revitalisations of the buildings		+		

5. Conclusions and Recommendations

Sustainable tourism is the tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities. The human settlements should function in harmony with nature rather than in opposition to it. They are potentially environmentally friendly, as they have the capacity to become self-sustaining and energy producing instead of energy consuming. To realize this potential, we must develop the concept of appreciating the nature more and living by the rules of nature, rather than destroying and devastating the natural treasures. We need to create awareness among the young architects, urbanists, but also habitants and tourists to think about resource reduction and motivate them to change their behavior and consumption patterns.

The goal of this research was to show that if good analytical and methodological procedure is done before starting a project, then a solid platform is created for providing good guidelines in the process of designing and making quality urban design projects. The sustainable urban revitalization should be understood as multidisciplinary approach: analyzing all the possible aspects important for certain location in order to achieve quality solutions that will serve well for present and future generations enabling them to live in healthy, ecological, sustainable and socially vibrant environments.

The presented projects have shown that the implemented sustainable design strategies and methods that are in correlation with sustainable urban planning, bioclimatic

principles, passive strategies of heating and cooling, energy efficiency as well waste reduction are being recognized as sustainable principles that should be incorporated into the contemporary building practice and urban planning of the settlement Popova Shapka. The applied sustainable design methods in the presented projects are an integral part of the strategies that imply an energy conservation and material conservation during a pre-building and building phase. In the process of design and the organic perception of architecture, the basic, conceptual foundations of the sustainable bioclimatic architectural design are being followed. Other important sustainable strategy seen in the example of this projects is saving the materials and resources by incorporating the waste produced at the building site in the new, useful construction material. The implemented strategies of passive solar architecture into the developed projects show energy efficient aproach in designing the new structures on this location.

From the presented analyses and conclusions one can assume that good site planning, smart management of the building materials, incorporation of natural materials and energy efficient equipment, incorporation of bioclimatic principles and environmentally conscious design is believed to be the solution for creating good examples of sustainable, or more percisly bioclimatic and ecological architecture that is well ajusted to the locall surroundings.

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Changes in the teaching and learning caused of the COVID-19 pandemic

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Abstract

Educational process, especially higher education was generally based on classical model of learning till 2020. This model includes table and presentations for teaching, and exams conducted in a classroom. This model was also used at "Goce Delcev" University of Shtip, Macedonia. Then, with rapid development of digital and IT tools for testing, e-testing in that classical model was introduced and included partly, only on some level of the educational process. Teaching was performed face to face in classrooms, but the way of testing was changed. Instead of classical exam on paper, students have an e-test on computer using Moodle 2 platform. The testing was performed in a classroom. Now, according to the situation with Coronavirus disease (COVID-19), all the process of teaching and testing are changed and switched to online performing using Microsoft team's platform.

In this paper, in order to determine whether online learning affects students' knowledge, we will statistically analyze the results of the first and second partial exam for the subject Mathematics for the students from first academic year, where: the first exam was taken when the exams were performed in a classroom and the second one when the testing was online (via Microsoft Teams). Tested students were from Faculty of Natural and Technical science at University "Goce Delcev"– Stip.

CCS Concepts

• *Education • Mathematics • Teaching methodology*

Keywords: *e-learning, e-teaching, COVID-19, exams, testing.*

1 Introduction

Education is a powerful agent of change, and improves health and livelihoods, contributes to social stability and drives long-term economic growth. Education is the main development tool in the social chain of each country. Without education, but also with poorly conceived and managed education, there will be no progress and development and also, no bright future for the country. Future and survival of each country greatly depends and relay on education. The better the education is conceived, implemented, and managed, the country development is higher and in the right direction. However, education is living matter, it needs to be changed. Is not something that is defined once, and that can last forever. It's a process that needs to be constantly changed and developed facing of time challenges, the size of human and technical resources in the country itself. Because no country is isolated from the other countries around it, its education should follow and adapt to the educational processes of the neighboring countries, the countries in the region, and globally in the world.

In 2020, the coronavirus COVID-19 outbreak disrupted all aspects of life around the globe. All Governments have followed a common goal of reducing the spread of coronavirus by implementing measures that limit social contact. As in any other sector, the COVID-19 pandemic affected education in many ways and the process of education in the whole world was dramatically changed. COVID-19 had a serious impact on students, teachers, professors, and educational organizations around the world. This pandemic caused schools, colleges, and universities in whole world to shut down their campuses. At the beginning it was thought that it would be short temporary situation and the teaching process was stopped. However, for short time many education institutions, switched from face-to-face to online teaching and quickly moved conventional education to distance and virtual learning. All countries in the world began to look for new ways to implement distance education. Fortunately, there is a huge range of modern tools available to face the challenge of distance learning imposed by the COVID-19 pandemic. Quick and sustainable changes for home learning was required. At the same time, the teaching and learning process had to be equally effective. However, online teaching is not simply adding audio to a PowerPoint presentation: it requires thorough training, adaptation of the content to the tool used, and multi-faceted investment, among other things [1-5].

This kind of sudden and disruptive shift from classical to remote education varied by size, governance models, and disciplinary differences. Computers and other mobile devices were the most used for this type of education and became an indispensable tool in the educational process. The digitalization of education had to happen quickly and immediately. There was no time to delay and test computer platforms remotely [2].

Schools around the world have begun to use different distance learning platforms depending on their rating of good and useful. Even before pandemic, technologies have changed the traditional way of education to the modern way of learning including technology-based learning through websites, learning portals, video conferencing, YouTube, mobile apps, and thousand types of free available websites for blended learning tools. However, the total shift to online mode has raised many queries on the quality of education and the entire education system in each country, during this pandemic was and still is global distance learning test [4].

Each subject, including mathematics, faced the same challenges. Many questions were asked without specific answers related to distance learning mathematics, especially about the success

of the realization of the teaching problems and the acquisition of knowledge by the students. This shift in practice has provided an opportunity to reconsider how technology use in mathematics education can be utilized to improve student engagement. Academics and students were forced to work from home using computers or mobile devices. Good thing was that computers were not a novelty in the learning process of mathematics and were used mostly for geometric visualization in the teaching process, as well as for numerical calculations [6].

Before the pandemic, digital technology use in mathematics classes mainly was generally considered as inconsistent in quality, quantity, and effectiveness (OECD 2016). Although there was some positive experience about digital technology as an educational imperative (Bower 2017), there were still many questions regarding how and when it should be used, and whether its use transformed and improved student experiences of mathematics education. The educational crisis caused by the pandemic resulted in educators being forced to fully rely on digital technology as the prime teaching and learning resource regardless of their existing technology-related beliefs and practices. This situation forced quickly change, which can be viewed as an opportunity for significant shifts to occur in how mathematics educators use technology in future face-to-face, online and blended classroom teaching [6-8].

Mathematical programs such as Mathematica and MatLab were and still are indispensable for learning and practicing mathematics [9-20]. But, also the pandemic COVID - 19 faced mathematics with new challenges that could not be compared to anything previously used [21], [22].

Mathematics had to adapt to new times and new distance learning platforms such as Microsoft Teams, Zoom, Skype... Previous concepts for learning and conducting teaching with all its specifics, especially the basic mathematical goal of solving tasks using a green board and chalk were no longer possible to use. Main advantages in the e-teaching and e-learning were saved time and money for traveling to work and back. One of the main disadvantages was the large access to materials, as well as the possibility of cheating on exams.

Although the adoption of distance learning is key to ensure the continuity of education following the physical closure of schools, students are, on average, likely to experience a learning loss during the lockdown.

Physical school closure and the adoption of distance education may negatively affect students' learning through four main reasons: less time spent in learning, stress symptoms, a change in the way students interact, and lack of learning motivation. However, the remote schooling is fundamental to ensure the continuity of learning in situations where in-person classes are suspended.

Very important task in the learning process is assessment or autonomous learning, that is challenging without the direct supervision of teachers. These tasks arise the questions how to ensure the assessment's adequacy to correctly measure students' progress; how can teachers compare students' results if they differ from previous years? On one hand, if students achieve higher scores than in previous years, this could be linked with cheating in online exams or with changes in the format of the evaluation tools. On the other hand, lower grades could also be caused by the evaluation format change or be attributable to autonomous learning as a less effective teaching method.

In order to determine whether online learning affects students' knowledge, we are making statistically analyze of the results from first and second partial exam for the subject Mathematics. This analysis covers first academic year students, from Faculty of Natural and Technical science at University "Goce Delcev"– Stip.

The tested students took the first exam in in a classroom and the second one when the testing was online (via Microsoft Teams).

2 The response of the West Balkan and Macedonian education systems in pandemic

The influence of the COVID 19 pandemic to the education, mainly comes because of the closed schools and transition of the "normal" learning to the distance learning. The closing of the schools impacts to 91% of the students in the world, especially the students in poor families. Depending on the governance model, faculties and departments at some institutions have had their own approaches. Disciplines that require lab work, practical experience, and external collaboration were more difficult to teach remotely. Similarly, to the other countries in the world, the countries in the West Balkan including our country closed their primary and secondary schools at the beginning of the pandemic, the period 9-13 March 2020. In order to have continuity in the teaching and learning, while the schools are closed, all the countries include different ways for teaching and distance learning in emergency. These new steps and standards for distance learning covers series of mechanisms for teaching: TV and radio presentations, resources at some webpages, online classes etc. Most of the countries choose combination of methods. Most of the countries in the region used TV presentations and lessons and in order to offer more presentations must cut the time for presentation and the number of subjects in schools. The teachers weren't prepared to use the new platforms and to use the resources, successfully, [23]. The countries must make changes in the school calendars, to adapt the holiday days and to provide information technologies for the students. Despite the fast action across the region, school closures and less effective forms of distance learning will inevitably lead to learning losses and increase inequality. The transition to large-scale online learning is very difficult because it is very complex even in the best of circumstances. In a pandemic, the transition to distance learning in an emergency was suddenly done, [24].

Higher education institutions in the region were temporarily closed and more than 600,000 students were suddenly transferred classes online to ease campus closures. In general, the capacity of the education system at the tertiary level is much higher, just like access to technology and skills, as well as student autonomy. Hence, classes are held online. Universities in the Western Balkans to maintain teaching relies mainly on video conferencing tools like which are Zoom, Skype, Google Classroom, Microsoft Teams. Instructions and others have been prepared guidelines to help professors move online teaching.

Similarly, because of the pandemic Goce Delcev University starts with hybrid way of teaching and testing of its students. The transfer from teaching in the faculties to the distance teaching was done very fast. The IT skills of the teachers and students facilitate good realization of the teaching process. The university use Microsoft Teams as a platform for e-teaching and e-testing of the students. Also, from the beginning Goce Delcev university have provided electronic systems for facilitation of the students and teachers tasks and obligations. Most of the materials are in the electronic form at the e-library. The students have possibility to download for free and

have the materials in e-form. Also, the system of e-learning was developed many years before the pandemic. This system offers organization of all the subjects as the courses and the teachers organize all their lessons and exercises at it. The system of e-index offers to students' electronic realizations of all administrative obligations and needs. All these electronic systems help for easily overcoming of all the barriers in the pandemic.

In the teaching process, the teachers prepare presentations of their lectures and exercises. All the classes according to the schedule of the faculty were organized in Microsoft Teams. The students were informed all the time for all activities by their e-mails and Microsoft Teams. The classes in mathematics and other similar subjects which require exercises and laboratory exercises also were organized electronically. The teachers have used digital tables in order to provide adequate way for explanations of the exercises. Also, they used videos and many applications Mathematica, MatLab, etc. for better presentations of the material.

The process of assignments was realized through the e-learning system via e-tests, e-quizzes, and via oral presentations and answering of the given questions.

In the addition of this paper we have analyzed the results of the students who have been tested in normal way, before of the pandemic and by e-test in the pandemic period.

3 The data analysis

In the paper, we are analyzing the students' results in the subject Mathematics 2 from two partial exams. The first partial exam was performed before the pandemic of Covid 19, on classical way, while the second one was performed online via internet.

The statistics of the results is done in Microsoft Excel. From the descriptive statistical analysis and t-Test, we want to determine whether online teaching affects to the students' knowledge and results. The sample consists of 63 students from technical faculty at University "Goce Delcev" - Stip. The minimum point of the test is 0 and the maximum point is 20.

In descriptive statistics are given information about mean (mean represent the mean scores for the students of the partial exams), standard error of the mean, mode (mode is the most frequently occurring score), median (median is the middle score of a students' target group), standard deviation, sample variance, minimum and maximum obtained points, range (range is distance between the largest and the smallest obtained points from students), and count (the number of tested students from technical faculties).

The descriptive statistics for the standard exam (first partial exam) what was performed before the pandemic of Covid 19 (on classical way) is given in Table 1.

Standard exam	
Mean	4,476190476
Standard Error	0,616323915
Median	5
Mode	0
Standard Deviation	4,891919416

Sample Variance	23,93087558
Kurtosis	-0,161898643
Skewness	0,827799968
Range	17
Minimum	0
Maximum	17
Sum	282
Count	63

Table 1 Descriptive statistics for standard exam

The sample consists of 63 students from technical faculty. Each student can get minimum 0 points and maximum 20 points. The mean the obtained results is 4,48 from standard exam. These results are very bad considering that the maximum number of points is 20. We should also emphasize that 28 out of 63 students gained 0 points. That can be seen from the mode of the sample that is equal to 0 and from the value of median that is equal to 5.

The range between a maximum number of points and minimum number of points is 17. But only one student had good result (17 points). This means that there is a big difference between the gained knowledge of the students. Most of the students did not show any knowledge from the material, and only few students show great results.

The standard deviation is 4,89 and the sample variance as average square of the means is 23,93. From standard variance, we can conclude that standard deviation is low and that there is no big deviation from mean number of the obtained points.

Descriptive statistics for the online exam (second partial exam) that was performed online is given in Table 2.

Online exam	
Mean	3,253968254
Standard Error	0,487408402
Median	0
Mode	0
Standard Deviation	3,868684256
Sample Variance	14,96671787
Kurtosis	-0,522987486
Skewness	0,798626544
Range	13
Minimum	0
Maximum	13
Sum	205
Count	63

Table 2 Descriptive statistics for online exam

For online exam, the mean of value of the obtained points is 3,24. This result is worse than the mean result of standard exam (the mean is 4,48). In this case, even 32 out of 63 students gained 0 points. The mode and median in this case are 0.

The range between a maximum number of the obtained points and minimum number of points is 13. But only few students have good result (12 or 13 points). Again, the greatest number of the students showed very poor results. The standard deviation is 3,86 and the sample variance as average square of the mean is 14,96. The standard deviation is very low and that is good because there is no big deviation from the mean number of points. But the mean of the point is only 3.

In addition is given frequency distribution of the results. The frequency distribution displays the number of observations within a given interval. The interval size depends on the data being analyzed and the goals of the analyst, but the intervals must be mutually exclusive and exhaustive. Some of the graphs that can be used with frequency distributions are histograms, line charts, bar charts and pie charts. Frequency distributions are typically used within a statistical context. In our example the frequency distribution as the part of descriptive statistics will be present with table and histogram for the standard partial exam (partial exam 1) and for the online exam (partial exam 2), separately. The frequency distribution table for the standard exam of students from technical faculty is given on the Table 3.

Points from Standard exam	**Frequency**	**Percent**
from 0 to 5	33	52,38%
from 6 to 10	21	33,33%
from 11 to 15	6	9,52%
from 15 to 20	3	4,76%

Table 3 Frequency Distribution for standard exam

In Table 3 are given frequencies and the percent for intervals with length 5. (from 0 to 5 points, from 6 to 10 points, from 11 to 15 points and from 16 to 20 points). From this table is derived the histogram given with Figure 1.

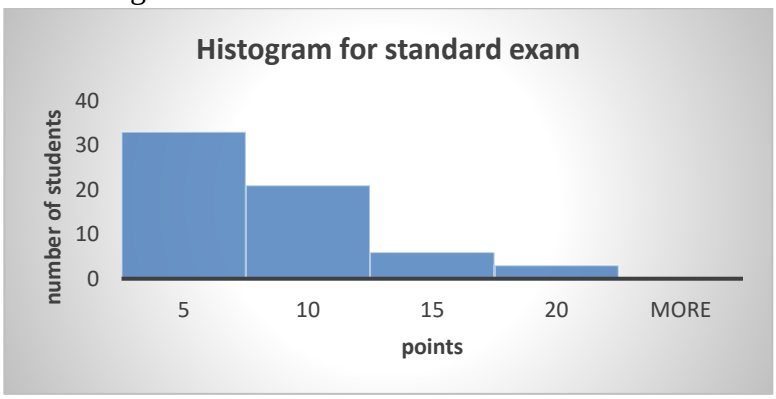

Figure. 1 Histogram for standard exam

The results from Table 3 and Figure 1 shows that the most students obtained the minimum point from 0 to 5 (33 students). 6 to 10 points obtained 21 points. Only, 6 students obtained from 11 to 15 points and 3 students from 16 to 20 points. And from frequency distribution, we can conclude that the result from the first partial exam of the students at technical faculty are very bad.

The frequency distribution table and histogram for the online exam of students from technical faculty are given in Table 4 and Figure 2.

Points for online exam	**Frequency**	**Percent**
from 0 to 5	42	66,67%
from 6 to 10	18	28,57%
from 11 to 15	3	4,76%
from 15 to 20	0	0%

Table 4 Frequency Distribution for online exam

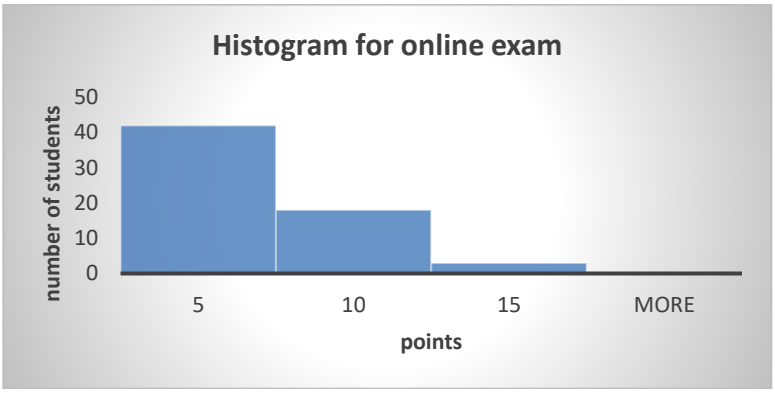

Figure. 2 Histogram for online exam

The results from Table 4 and Figure 2 show that the results from online exam are worse than result from standard exam. And here, the most students obtained the points from 0 to 5 (42 students). 18 students obtained from 6 to 10 points. Only, 3 students obtained from 11 to 15 point and there are no students who obtained from 16 to 20 points.

In order то determine if there is a difference between the average results in the normal test (first partial test) and electronic test (second partial exam), t-Test: Two-Sample Assuming Unequal Variances is performed, like a test that is one of the most widely used and the most widely known statistical test. The first partial exam was performed on classical way and the second partial exam was performed online. For that purpose, we set the following hypotheses:

1. $H_0: \mu_0 = \mu_1$

- Null hypothesis, there is no difference between the average number of points from standard partial exam and from online partial exam.

2. $H_0: \mu_0 \neq \mu_1$

- Alternative hypothesis, there is a difference between the average number of points from standard partial exam and from online partial exam.

We examine the stated hypothesis, t-Test. The obtained results are: - The value t = 1,980272249 with 95% confidence interval. The significance level for the t-test is 0.05 and a degree of freedom is 118. Because t (118) = 0,1225 < 1.9802, we can accept the null hypothesis. This means that is not a significant difference between the average number of points from standard partial exam and from online partial exam.

t-Test: Two-Sample Assuming Unequal Variances		
	Variable 1	*Variable 2*
Mean	4,476190476	3,253968254
Variance	23,93087558	14,96671787
Observations	63	63
Hypothesized Mean Difference	0	
Df	118	
t Stat	1,555460848	
P(T<=t) one-tail	0,0612572	
t Critical one-tail	1,657869522	
P(T<=t) two-tail	0,1225144	
t Critical two-tail	1,980272249	

Table 5 t-Test for number of points from standard partial exam and online partial exam.

4 Conclusion

From the short research we have done for this paper, it can be concluded that the process of teaching and testing during the pandemic is changed very much. All the education process in the world on all levels: primary, secondary and tertiary has undergone major changes. The digital transformation of education systems in all levels has allowed incorporating a new way for performing teaching–learning system. Pandemic situation showed all the strengths and weaknesses of education systems facing the challenge of digitalization. However, the response of the universities also was appropriate to this situation. The use of the all-digital platforms and digital technology facilitates the education process.

The students' results for Mathematics have shown that the students have almost the same results on the test before pandemic using traditional methods compering to online learning during pandemic.

In any way, COVID-19 pandemic has prompted innovation and institutional self-examination. The chance of large-scale, long-term changes in educational process is largely dependent on how institution treat pandemic. If they treat COVID-19 as a short-term crisis, then whatever is done to help extend learning when schools are closed will be only temporary. And after educational institutions are reopened, the status quo will be restored. However, the lesson should be learned from this situation is that more attention should be paid to the digitalization of the education system and digital technology and educational platforms must be more included in education in order to develop opportunities for distance learning.

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The impact of COVID 19 crisis in North Macedonia through analyzing the main macroeconomic indicators

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The impact of Covid 19 on North Macedonian economy through analyzing macroeconomic indicators

Abstract

North Macedonia has been under lockdown since 18 March due to the Covid-19 outbreak. An initial state of emergency was declared on 18 March for the entire territory of North Macedonia, and it was later extended. Since the first recorded case of the coronavirus in February, the number of cases in North Macedonia has raised continually. In view of the current situation a four-phase plan for the reduction of virus prevention measures was adopted by the Macedonian government. Measures to prevent the spread of Covid-19 have slowed economic activity, which in turn has begun to negatively impact the national budget. The aim of this study is to analyze how much this pandemic situation has affected the country's economy through analyzing the main macroeconomic indicators in North Macedonia. In order to analyze the effects of the crisis in this paper is used the linear regression model. The results indicate that Covid 19 crisis has negatives impact on the most macroeconomic indicators in North Macedonia.

Keywords: *Covid 19 crisis, government response, economic sectors, macroeconomic indicators.*

Introduction

The coronavirus pandemic which began as a health crisis, far from Europe and North Macedonia, led rapidly to a global economic crisis.

The spread of this virus, in addition to the millions of deaths it has caused, has affected many businesses around the world and the global economy in general. The economic cost of the pandemic seems to be enormous, and everyone is wondering how economic recovery can be achieved.

North Macedonia is also a part of the global economic family and was also affected by this crisis. Because Macedonian economy is highly dependent on exports to European virus-hit countries has made it vulnerable to the economic side effects of Covid 19. This was followed with severe economic downturn, upward pressure on unemployment and poverty and social and psychological problems.

Measures to prevent the spread of the virus have slowed economic activity, which in turn has begun to negatively impact the economic indicators.

Due to a significant decrease and misbalance both on the supply and the demand side, the economies faced severe shocks, and weakened the resistance of the economic entities.

This article, therefore, will examine the economic impact of this pandemic with the ultimate goal of revealing precisely how the pandemic has affected the North Macedonian economy.

The purpose of this paper is to make a first review on the effects of Covid 19 relates from the beginning. This research focuses on the macroeconomic impacts such as GDP level, Exports, Imports, Inflation, Unemployment level and Bank Credit, analyzing through the regression method.

This pandemic is in progressive status and all these data which are including in our research are under monitoring for further research.

1.Covid 19 and the economy of North Macedonia

1.1.Macroeconomic outlook

By June 2020, it was apparent that the corona-virus pandemic had caused the largest disruption to the economy since the country’s independence in 1991, exceeding the impact of the 2008/2009 global economic crisis.

The COVID-19 pandemic is hitting North Macedonia hard, with lockdowns, disrupted supply chains, and a prolonged, adverse epidemiological situation darkening an already dim economic outlook in the country. As a result, the country is coping with its deepest recession in two decades affecting all sectors of the economy.

IMF predictions was that pandemic will cause a reduction of at least 4.0% of **GDP**, with all components of GDP likely to be negatively affected. Others have described this scenario as too optimistic in light of the more negative forecasts for the economic performance of the neighboring countries and the higher contractions on average across Europe. It was expected that domestic demand will be reduced by 2.7% and net exports by 1.3%, resulting in the cumulative output losses of around 3.7 Billion EUR for 2020 and 2021.

The spread of the pandemic also affected the **labor market.** The unemployment rate in North Macedonia which was projected to reach 16.8% in 2020. Since the pandemic outbreak (between 29 February and 31 May 2020), 16,778 labor layoffs were registered at Employment Service Agency of R. N. Macedonia affected by Covid-19, resulting in a 16.1% increase of the total number of unemployed in only three months. Due to labor layoffs and exceptionally low job creation, it was forecasted that unemployment will increase to 20.4% at end of 2020[1]

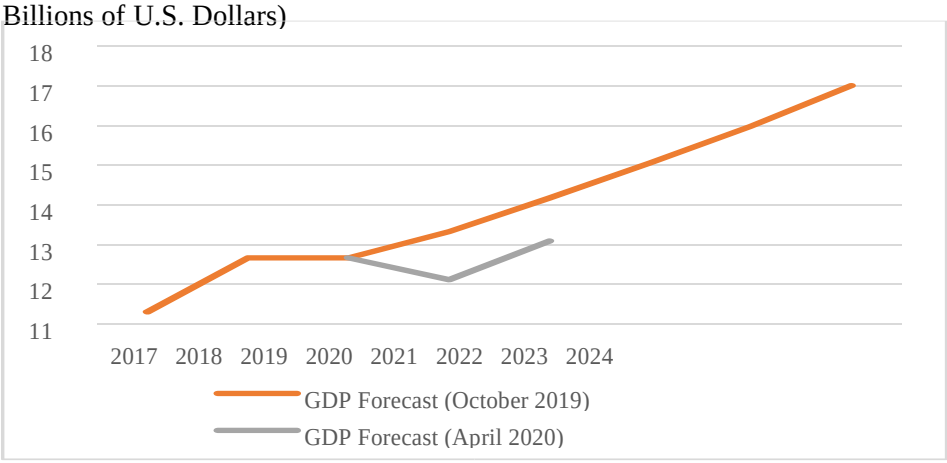
As a country that has a significant dependence on **exports** (with 82 per cent of the country's export intended for European countries), Covid 19 crisis in this European countries affected also this sector of the country. According to IMF the export was expected to fall for 17.1% in real terms.

Imports of goods and services also was negatively affected and according to projections, by the end of 2021 the country will not be able to return the pre-crisis growth trajectory.

Budget deficit-The pandemic is likely to lead to increases in debt and deficits beyond those recorded in the Global Financial Crisis. The projected fall on the revenue side and the limited response on the expenditure side would result in a consolidated central government budget deficit of 6.5% of GDP in 2020.

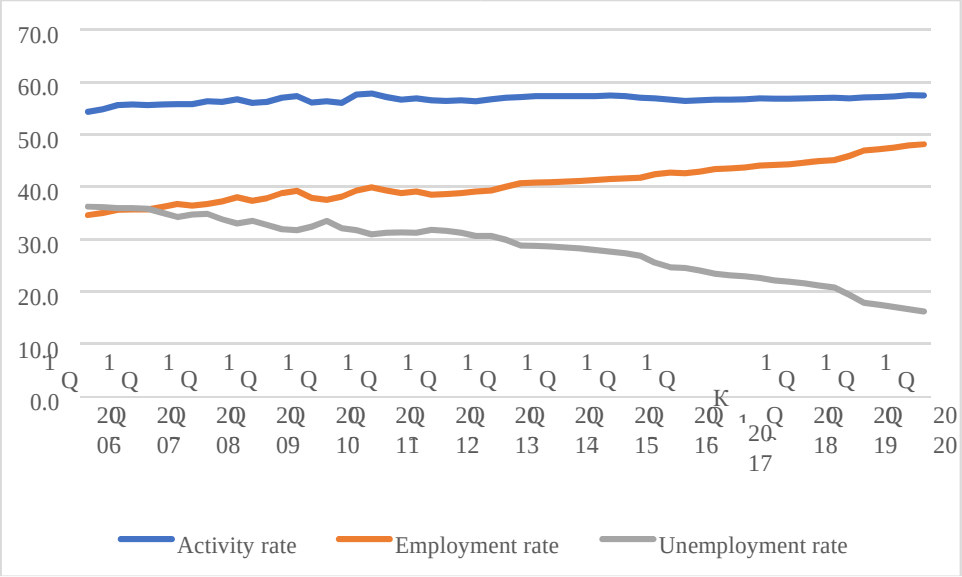
In the graphics billow is presented the variations of GDP from 2007 and its projected value for 2021 and the employment and unemployment level based on quarterly data.

Figure 1. Output losses in 2020 and 2021 (GDP in Billions of U.S. Dollars)



Source: Based on IMF (2020) forecast.

Figure 2. . Activity, employment, and unemployment rates in North Macedonia (2006 Q1-2020 Q1)



Source: State Statistical Office, June 2020

2 .Policy responses

While it is still difficult to assess the effects of the crisis on the economy, it is clear that major government intervention will continue to be necessary to maintain at least a minimum level of economic activity.

The Government of the Republic of North Macedonia has taken anti-crisis measures in response to the shocks to the Macedonian economy and enterprises, focusing on the sectors most immediately and directly affected by the crisis (hospitality, tourism, transport and so on).

In an attempt to mitigate the negative impact, the Government has taken four economic packages, in forms of assistance to citizens and companies. The aim of the first two packages has been to improve the liquidity of firms worst affected by the coronavirus and preventing a sharp rise in unemployment. The third package has been described as “direct assistance to citizens and businesses to offset the consequences of the coronavirus (COVID-19) pandemic”.[2] It was focused on domestically produced goods and services and crisis-hit sectors.[3]

The fourth package of economic measures worth 350 million Euros[4], is a continuation of the third package and was oriented to support and assistance the more affected sectors and citizens, including support for the payments of salaries for the last quarter of the year, payments cards for certain categories of citizens, grants for the most affected sectors, reduction of pre-fiscal obligation etc.

3.Data and methodology

In order to analyze the effects of Covid-19 crisis on Macedonian economy in this study we have used quarterly data from 2017-2020, for some of the most important macroeconomic indicators: GDP, Inflation, Unemployment Rate, Export, Import and Bank Credits.

The method we have used for this purpose is Simple Linear Regression Model with dummy variable in order to estimate the relationship between the variables below which are taken as dependent variable and Covid 19 crisis as a dummy variable like independent variable.

The specification of the econometric model:

$$Y=\alpha+\beta Xi+\varepsilon$$

Where: **Y-dependent variable, α-intercept, ß-regression coefficient, X-independent variable, Ɛ-error term**

3.1.Results from the regression model

GDP/covid 19

Source	SS	df	MS			Number of obs	15
						F(4, 10)	6.4
Model	234.969825	4	58.7424562			Prob > F	0.008
Residual	91.7274967	10	9.17274967			R-squared	0.7192
						Adj R-squared	0.6069
Total	326.697321	14	23.3355229			Root MSE	3.0287
gdp	Coef.	Std. Err.	t	P>t		[95% Conf.	Interval]
covid19	-10	3.709329	-2.70	0.022		-18.2649	-1.735099
viti							
2018	1.675	2.141582	0.78	0.452		-3.096743	6.446743
2019	2	2.141582	0.93	0.372		-2.771743	6.771743
2020	-0.2500001	3.386139	-0.07	0.943		-7.794788	7.294788
_cons	1.15	1.514327	0.76	0.465		-2.224132	4.524132

Authors'calculacion

Coff.=-10%

P-value=0.022

During the period when covid-19 is present, respectively during the second and third quarter of 2020, coefficient of -10% of GDP, means that we have -10% reduction of GDP during the crisis compared to periods when the crisis was not present. The P-value means that this effect is significant.

Inflation/Covid 19

Source	SS	df MS		Number of obs	15
				F(4, 10)	2.86
Model	3.22933346	4 .807333366		Prob > F	0.0808
Residual	2.82000009	10 .282000009		R-squared	0.5338
				Adj R-squared	0.3474
Total	6.04933356	14 .432095254		Root MSE	0.53104
inflation	Coef.	Std. Err. t	P>t	[95% Conf.	Interval]
covid19	1.3	.6503845 2.00	0.074	-0.149147	2.749147
viti					
2018	-0.2	.3754997 -0.53	0.606	-1.036665	0.6366654
2019	-0.95	.3754997 -2.53	0.03	-1.786665	-0.1133346
2020	-1.05	.5937171 -1.77	0.107	-2.372884	0.2728841
_cons	1.55	.2655184 5.84	0	0.9583883	2.141612

Authors'calculacion

Coeff.=1.3%, P-value=0.074

The coefficient of inflation of 1.3%, means that during the Covid-19 crisis period the inflation rate has grown for 1.3% compared to periods when the crisis was not present. P-value=0.074 means that this effect is significant.

Unemployement/Covid 19

Source	SS	df	MS		Number of obs	15
					F(4, 10)	52.63
Model	86.8323232	4	21.7080808		Prob > F	0
Residual	4.12500048	10	.412500048		R-squared	0.9546
					Adj R-squared	0.9365
Total	90.9573237	14	6.49695169		Root MSE	0.64226
unemployment	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
covid19	0.3999996	.7866067	0.51	0.622	-1.352669	2.152669
viti						
2018	-1.65	.4541476	-3.63	0.005	-2.661904	-0.6380962
2019	-5.125	.4541476	-11.28	0	-6.136904	-4.113096
2020	-6.174999	.7180704	-8.60	0	-7.77496	-4.575039

_cons	22.375	.3211308 69.68	0	21.65948	23.09052

Authors'calculacion

Coeff.=0.39%, P-value=0.622

The coefficient of unemployment of 0.39% means that during the Covid 19 crisis period the unemployment rate has grown for 0.39% compared to periods when the crisis was not present.

Exports/Covid 19

Source	SS	df MS		Number of obs	15
				F(4, 10)	2.93
Model	274151.097	4 68537.7743		Prob > F	0.0765
Residual	233919.843	10 23391.9843		R-squared	0.5396
				Adj R-squared	0.3554
Total	508070.941	14 36290.7815		Root MSE	152.94
exports	Coef.	Std. Err. t	P>t	[95% Conf.	Interval]
covid19	-83.29999	187.3178 -0.44	0.666	-500.6702	334.0702
viti					
2018	213.425	108.148 1.97	0.077	-27.54383	454.3937
2019	350.7	108.148 3.24	0.009	109.7312	591.6688
2020	153.0249	170.997 0.89	0.392	-227.9802	534.03
_cons	1254.675	76.47219 16.41	0	1084.284	1425.066

Authors'calculacion

Coeff.=-83% .P-value=0.666

The coefficient of exports of -83% shows huge decline of exports during the Covid-19 crisis period compared to the periods when the crisis was not present.

Imports/Covid 19

Source	SS	df	MS			Number of obs	15
						F(4, 10)	2.94
Model	391954.437	4	97988.6092			Prob > F	0.0758
Residual	333050.507	10	33305.0507			R-squared	0.5406
						Adj R-squared	0.3569
Total	725004.943	14	51786.0674			Root MSE	182.5
imports	Coef.	Std. Err.	t	P>t		[95% Conf.	Interval]
covid19	-208.45	223.5119	-0.93	0.373		-706.4656	289.5656
viti							
2018	210.4	129.0447	1.63	0.134		-77.12944	497.9294
2019	400.375	129.0447	3.10	0.011		112.8455	687.9044
2020	210.1	204.0375	1.03	0.327		-244.5239	664.724
_cons	1708.7	91.24836	18.73	0		1505.386	1912.014

Authors'calculacion

Coeff.=-208.45% , P-value=0.373

The coefficient of imports of -283% means that during the Covid 19 crisis period we have even greater decline in imports of goods and services compared to the periods when the crisis was not present.

Bank credit/Covid 19

Source	SS	df	MS		Number of obs	15
					F(4, 10)	2.94
Model	42.5658347	4	10.6414587		Prob > F	0.0761
Residual	36.2475025	10	3.62475025		R-squared	0.5401
					Adj R-squared	0.3561
Total	78.8133373	14	5.62952409		Root MSE	1.9039
bank_credit	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
covid19	1.15	2.331764	0.49	0.633	-4.045495	6.345495
viti						
2018	3.65	1.346245	2.71	0.022	0.6503796	6.64962
2019	4.05	1.346245	3.01	0.013	1.05038	7.04962
2020	2.675	2.1286	1.26	0.237	-2.067816	7.417817
_cons	3.125	.9519388	3.28	0.008	1.003948	5.246052

Authors'calculacion

Coeff.=1.15, P-value=0.633

The coefficient of Bank Credits of 1.15%, means that bank credits during the Covid-19 crisis mark growth for 1.15% compared to the period when the crisis was not present.

3.2.Conlusion

From the analysis of the above data we conclude that for the period of time when the Covid-19 crisis has been present has had a significant negative impact on North Macedonian economy.

The negative effect can be seen on all indicators considered in this analysis but the greatest decline can be seen on imports and the exports.

This mean that the economic policy makers need to come up with a vision and strategy for this most hited-sectors in order to ensure economic recovery.

4.Policy recommendations

Experiences from previous crises that we have overcome say that the government must save companies, because by doing that they are saving the country.

The government measures should be more focused on the liquidity of the companies. Due to the losses they realized as a result of the crisis they will not be able to pay salaries because they expect to be late with deliveries and thus unable to get cash from them on time.

The government should directly stimulate consumption in order to increase the demand and the country's GDP in general.

Also, banks should take possible changes that would support the hardest-hit sectors in the economy, through changes to some of the monetary instruments and through changes to the regulatory requirements.

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Smart Energy Systems: An Innovative Approach for Sustainable Energy Supply

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Abstract

As a result of climate change, almost the entire world is focused on generating energy from renewable sources. One of the main challenges is how to ensure sustainable energy development, by knowing the fact that, the energy which comes from renewable sources is directly dependent on climatic conditions. One of the most promising solutions for . sustainability is a smart energy system.

This study aims to provide an innovative approach to ensure a sustainable energy supply, a case which can then be implemented in our country. The main purpose of this paper is to show the importance of implementation of Smart Energy System projects, and to analyze current technologies, the transformational solutions of the current traditional system into a smart system, and to enhance their energetic and environmental performance to ensure sustainability. Also, a translation will be given of how these systems work, what are the advantages and challenges. A smart energy system is a 100% renewable energy system, it is cost-effective and does not increase the cost of energy compared to traditional sources. These systems use technologies and resources that are clean, reliable and affordable which will are evaluated based on environmental performance.

***Keywords**: renewable energy, sustainable energy, smart energy system, sustainable supply, integration*

1. Introduction

Energy is the main driver of technological developments, and its sustainability is closely linked to the sustainability of the economy of all countries in the world. Today every process and technological equipment is dependent on energy, which means that the demand will increase, and with the increase of the demand, the production will automatically have to increase. Until the last decade, the main sources of energy in the world were non-renewable ones, while for the next decade plans and strategies are being made on how to switch to renewable energy, thus trying to provide 100% energy production in some countries from renewable sources. From this, it can be said that the world in the future will need more energy to ensure this development trend, and on the other hand, it must be produced from renewable sources which will not pollute the environment.

It is very important to implement systems in the future that will ensure sustainability in electricity production, and at the same time will be 100% renewable. These systems are called smart energy systems which are financially reasonable, efficient and sustainable. A smart energy system is a 100% renewable energy system, it is cost-effective and does not increase the cost of energy compared to traditional sources. These systems use technologies and resources that are clean, reliable and affordable which are evaluated based on environmental performance. To implement Smart Energy System projects, it is very important to analyze current technologies, and to analyze the transformational solutions of the current traditional system into a smart system, and to enhance their energetic and environmental performance to ensure sustainability. Our country has a lot of potential for energy from renewable sources, and it must be used in a smart way by integrating the sources, to ensure sustainability in supply.

One of the most popular definition for Smart Energy System is: ‘’*A smart energy system is a cost-effective, sustainable and secure energy system in which renewable energy production, infrastructures and consumption are integrated and coordinated through energy services, active users and enabling technologies.’’* – Smart Energy Networks [1].

Almost all countries in the world are clear that by 2050 they must switch to renewable energy sources, in order to ensure environmental protection. The energy future until 2050 will certainly not be easy for developed countries in the world, especially for our country where new technologies, new laws for electricity markets, new business models and new taxes will be needed to support these models and their suppliers. This strategy can be implemented through combinations of high flexible energy consumption in buildings, energy efficiencies, integration of the various energy infrastructures and smart system operation. For this purpose, it is very important to implement systems in the future that will ensure sustainability in electricity production, and at the same time will be 100% renewable. These systems are called smart energy systems which are financially reasonable, efficient and sustainable. The research will be carried out by providing data from stationary databases which provide information on meteorological conditions throughout Europe. These systems are the innovation in the energy sector, for that reason the main focus will be to analyze the conditions and opportunities to implement this

model in our country [2].

2. The smart energy system concept

Implementation of projects for renewable energy sources includes as its main goal the independence from fossil fuels and environmental protection. But on the other hand, these resources must be able to meet consumption needs and to be stable. To achieve sustainable supply, these resources must be integrated into a system that will produce energy from renewable sources. One of the concepts of these systems is integrating renewable energy sources, which will use the potential of the sun when we have solar radiation, the potential of the wind , and as an alternative source which will be put in function will be biomass.

Biomass in general has the same characteristics as fossil fuels and will serve as a regulator of production to meet the needs for a stable energy supply [3]. These systems consist of new technologies with new forms of flexibility in the conversion stage of the energy system by combining electricity, thermal and transport sector.

1. Smart electricity grids - A smart electricity grid is an upgraded active electricity network. It can intelligently integrate the actions of users that are connected, creating so-called 'prosumers' who are able to produce electricity as well as consume it [4].

According to International Energy Agency ''The development of smart grids is essential if the global community is to achieve shared goals for energy security, economic development and climate change mitigation. Smart grids enable increased demand response and energy efficiency, integration of variable renewable energy resources and electric vehicle recharging services while reducing peak demand and stabilizing the electricity system.''

2. Smart Thermal Grids – creates synergies between demand and supply in order to generate the highest system efficiency. It includes district heating and cooling with the reason to connect the electricity and heating sectors. The smart thermal grid can include high energy performance buildings, flexible interactive networks, heat storage, integration of local renewable sources, national energy policy, etc [5] [6].

3. Smart Gas Grids – connecting electricity, heating and transport sectors. Smart gas grids can be presented as a digitized gas network supporting new features by integrating innovative and smart sensors based on nanotechnologies. These solutions offer more accurate and sustainable monitoring and supply. It increases the percentage of green gas in the distribution network. It enables integration with electricity, heating and other networks. It incorporates new technologies. It improves the energy efficiency of the gas grid [7].

A smart energy system can be defined as an approach where smart Gas, Electricity and Thermal are combined with storage technologies in order to identify synergies to achieve optimal solutions for the overall energy system. In figure 1 is illustrated the overall SME structure for a 100% clean energy system [2]. According to IDA Energy Vision, a system that will function on 100% renewable energy is technically and economically possible for Denmark as well as feasible compared to the fossil fuel systems.

Their scenario [3] to implement the goal of a 100% renewable energy system by 2050, is mainly as a result of the replacement of non-renewable sources with clean energy, by increasing investments in wind energy and solar energy and relying on biomass energy as an alternative and stabilizing source.

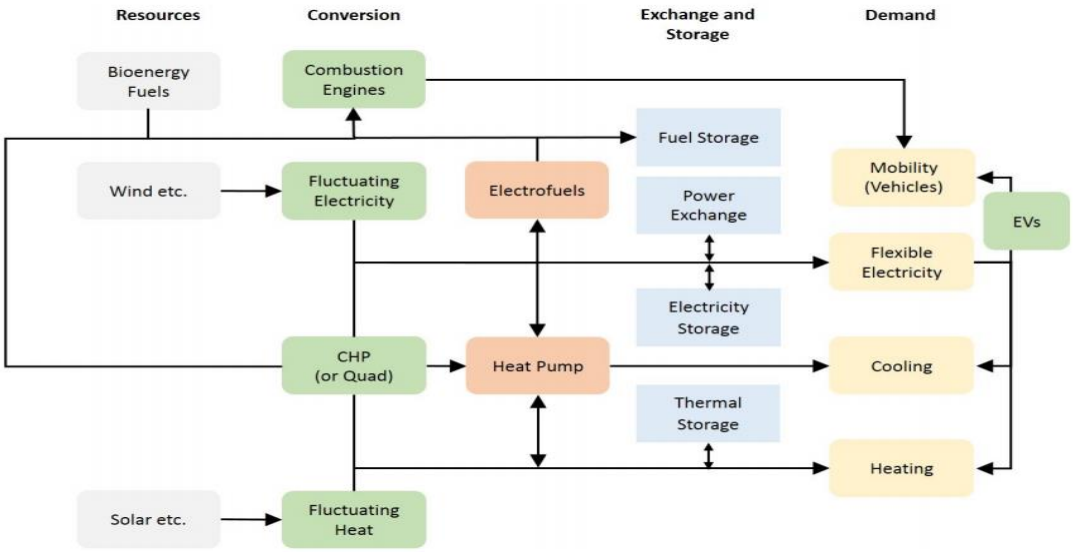

Figure 1. Smart Energy System structure. (EVs: Electric vehicles, Quad: production of four outputs) [3]

Their plan is that by 2050 all primary energy will come from renewable sources, being supplied by smart energy systems that will regulate the balance between consumption and production. It is very important to determine the economic parameters when planning these systems, as they must be reasonable for investment in order to be feasible. [3] Expectations from these systems are numerous, above all Smart energy systems must justify the means of investment in order to be realized. These systems must also meet some of the criteria and expectations which are presented on Figure2.

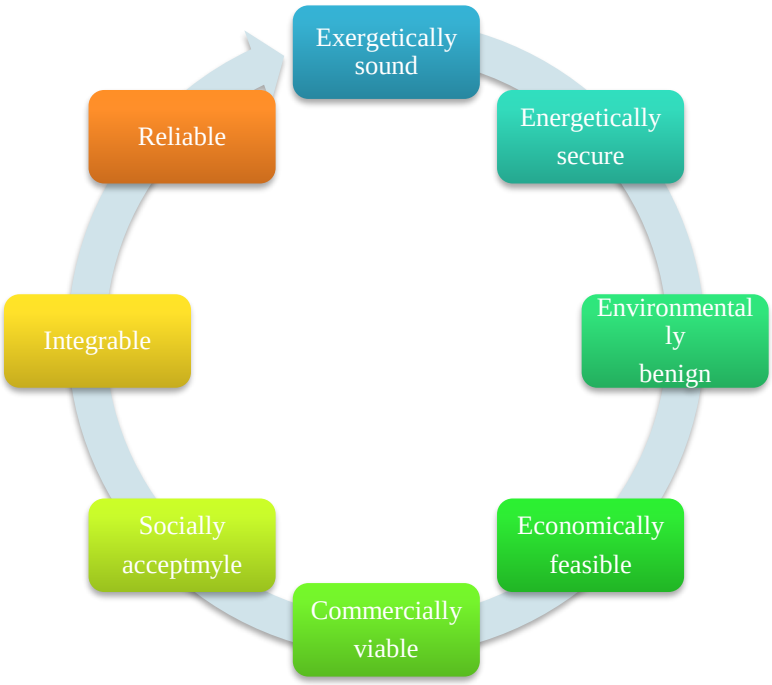

Fig. 2. Expectations from smart energy systems. [8]

- Exergy is a critical indicator that presents the quality of energy. To consider one energy system as smart, it should be exergetically sound. The system should conserve the quality of its energy content and should have minimum exergy destructions.
- Energetically secure step is basically about energy security. These systems should be planned and designed to offer sustainable energy development and energy security.
- Smart energy systems have an environmentally friendly approach. Energy production comes from renewable energy sources. And especially the production of biogas from biomass reduces the emission of methane and carbon dioxide into the atmosphere.
- These systems are also economically reasonable, based on the fact that the development of technology in this area has reduced the cost of investing in renewable resources.
- The commercialization of renewable energy sources in recent years has also managed to increase competition in the private sector, based on tariffs and support provided by government measures in the implementation of these projects.
- Based on the advantages of these systems as social, economic and environmental, society should accept them as part of the future energy by replacing traditional systems
- It would be ideal for these systems to be integrated with the current energy infrastructure. If we had implementations of projects with smaller power generation capacities, then perhaps these systems can be integrated with the current infrastructure, but in the future, such systems will have to be followed by smart energy networks.
- Smart energy system should be reliable from production, processing and end-use of energy. As far as these systems are reliable society will even more easily accept them as part of their future [8].

The transition of today's electricity, heating and gas into smart energy systems will require the implementation of the newest inventions in ICT. The grids should be interconnected through storage, generation, conversion and demand technologies. ICT will play an important role in the planning and management of energy in these systems. ICT should be part of every part of the network in order to better coordinate their management and operation. It is very important to protect and ensure confidentiality, availability and integrity in smart energy systems to guarantee safe operation and non-disclosure of user data [9]. To ensure the most efficient energy management, special attention will have to be paid to the seniors who will be part of a renewable energy system.

The data which will come from the sensors and other data, in general, must be processed in a perfect way in order to make adequate decisions for the management of the whole system. In some cases, these systems may need to operate on the basis of some data fusion algorithm, in order to combine data from different sensors in order to provide more accurate information about the operation of these systems. In the planning and design phase of these systems it is very important to process the data coming from the wind and solar sensors in order to predict the amount of output from wind energy and solar energy and to analyze the amount that should come from biomass energy to ensure a sustainable supply.

3. Smart energy systems as an innovative approach for Macedonia

It is known that energy from the sun and energy from the wind is dependent on climatic conditions, and we do not have solar radiation and wind constantly. For these reasons, renewable energy sources in special cases do not provide the required stability in supply. On the other side, smart energy systems will integrate renewable sources by using biomass energy as a stabilizer of production and consumption in order to meet the criteria to ensure sustainability. In moments when we have the potential to generate energy from the sun and wind, this system will generate energy from the sun and wind, and in cases when we don't have potential as a consequence of climatic condition, then biomass will be used to generate energy whether thermal, or to provide fuels such as biogas, or to produce electricity.

It is very important to generate data on solar radiation and wind speed for a specified location, in order to calculate the output from these two renewable energy sources. We have chosen a specified location in Skopje where we can generate data for solar radiation and wind speed and also generate Typical Meteorological Year in order to design the future energy system. On tab.1 are shown the data *Photovoltaic Geographical Information System (PVGIS)* for a location with coordinates (42.002, 21.341) for solar radiation during 2016 for all 12 months of the year [10].

year	month	H(h)_m	Hb(n)_m
2016	Jan	38.82	46.91
2016	Feb	67.61	78.69
2016	Mar	103.07	97.77
2016	Apr	154.27	135.52
2016	May	161.85	133.5
2016	Jun	192.59	164.37
2016	Jul	211.87	207.37
2016	Aug	179.49	175.33
2016	Sep	121.41	123.47
2016	Oct	78.02	77.78
2016	Nov	53.6	68.82
2016	Dec	53.16	92.7

Tab.1 Solar radiation for a specified location in Skopje in 2016.

Also for this location a TMY can be generated in order to get the data for e typical meteorological year from measurement 2007-2016 for 12 typical months. ‘’*A typical meteorological year (TMY) is a set of meteorological data with data values for every hour in a year for a given geographical location. The data are selected from hourly data in a longer time period (normally 10 years or more). The TMY is generated in PVGIS following the procedure described in ISO 15927-4.[11].*

In the figure 3 are presented the generated data from TMY for a specified location in Skopje. These data are generated using the PVGIS databases (Sarah, Cosmo, Era), and can be used for designing energetic systems with software like EnergyPLAN. It is very important to have accurate data for solar and wind speed for the past 10 years, in order to build a model that can be used to design systems based on previous measurements and new predictions for the future. By knowing the data off solar and wind speed it can be more easily to project a system and to plan the additional resources like biomass for energy production.

time(UTC)	T2m	RH	G(h)	Gb(n)	Gd(h)	IR(h)	WS10m	WD10m	SP
20100501:	16.21	65.59	0	0	0	292.34	1.11	225	98259
20100501:	15.85	67.81	0	0	0	290.38	1.01	222	98262
20100501:	15.48	70.04	0	0	0	288.42	0.9	219	98266
20100501:	15.12	72.26	0	0	0	286.46	0.8	217	98291
20100501:	14.76	74.49	49	102.85	38	284.5	0.69	215	98317
20100501:	14.4	76.71	238	489.59	94	282.54	0.59	213	98343
20100501:	14.03	78.93	439	672.12	121	280.58	0.49	218	98337
20100501:	13.67	81.16	627	777.19	136	278.62	0.38	223	98330
20100501:	21.41	46.22	784	852.21	137	293.95	1.45	228	98324
20100501:	22.02	43.4	892	886.89	141	298.22	1.6	233	98279
20100501:	22.64	40.58	929	851.98	172	302.48	1.75	239	98233
20100501:	23.25	37.76	930	882.51	152	306.75	1.9	245	98188
20100501:	23.2	37.92	862	862.75	149	307.85	2.06	238	98146
20100501:	23.16	38.08	737	806.24	151	308.95	2.22	232	98104
20100501:	23.11	38.24	580	770.06	126	310.05	2.37	226	98062
20100501:	21.59	42.38	386	650.95	110	308.4	2.11	222	98069
20100501:	20.07	46.51	176	368.69	87	306.75	1.85	218	98075
20100501:	18.56	50.65	15	0	15	305.1	1.59	214	98082
20100501:	17.23	57.51	0	0	0	303.13	1.42	214	98130
20100501:	15.9	64.36	0	0	0	301.17	1.25	215	98178
20100501:	14.57	71.22	0	0	0	299.2	1.08	216	98227
20100501:	13.93	74.76	0	0	0	298.03	1.05	214	98233
20100501:	13.3	78.29	0	0	0	296.87	1.02	213	98240

Tab.2 TMY for specified location in Skopje

Once we have the data on solar radiation and wind speed, we can easily design a system that will operate on the basis of three renewable energy sources. In moments when wind and solar energy are enough to supply the grid with the planned capacity then it will not be necessary to include biomass energy. But in moments when we do not have solar and wind energy, then the system will rely on biomass energy in order to ensure a stable supply. Wind and solar resources are distributed differently around Macedonia. It is known that wind and sun sources are much higher in rural than urban areas. It means that some areas can install more solar and wind power than is required for their needs. Therefore, the Smart Energy System enables municipalities to move from being carbon neutral to 100% renewable, since it allows intermittent renewable sources to also replace final consumption locally, such as heating and transport [12]. Depending on climatic conditions and location, these systems may encounter changes in terms of implementation and results. Different locations will probably need a specific approach in designing these systems. As from the preliminary analysis we can see that the solar radiation data differ from location to location, as well as wind potential data. Depending on the data generated by the stationary measurement bases for the potential of renewable energy sources, smart energy systems will be designed with reference to those data.[8]

The whole idea is to offer a system which in the future will provide clean and stable energy. Based on the system [3] to provide sustainable energy from renewable sources in Denmark until 2050, a similar approach can be analyzed in Macedonia. Given that climatic conditions are variable and biomass energy resources are not the same, in Macedonia a smart energy system will have to be designed based on energy from the sun, wind, water and as additional energy to balance the ratio consumption / production will be biomass.

4. Conclusion

This paper provides a theory regarding the implementation of smart energy systems, which presents a cost-effective, sustainable and secure energy system. Sustainable energy development is directly related to the development of technologies and the integration of renewable sources. To ensure sustainable energy for the future, given that fossil fuels will be out of use, it is very important to design smart systems that will produce clean and stable energy from renewable sources.

Smart energy systems as an innovative approach, can be a solution for Macedonia to meet the needs in different regions, and enabling them to provide energy that will come from sun, wind and water, and to balance production using biomass as a potential to be included, when the consumption needs need to be met. The main idea is to generate information and data on solar radiation and wind potential, in order to design the system based on this data, and to analyze the participation of biomass in the final calculations of the production capacity of the system. This is only the initial idea or theory which should be subjected to analysis and design in the future, in order to provide a primary and initial version of the operation of these systems. On the other side different models can be integrated for processing the data generated for this system, in order to implement different algorithm for weather predictions. One of the recommendations for continuing research in this area is also focusing on how to process data obtained from stationary databases as in the case of tabs 1 and 2 in order to analyze implementation of algorithms that will help predict data for the future. And with this information we will have it easier to design the system which will work based on the data that will be generated.

Summarizing, these systems are one of the proposals which in the future could provide us with clean and sustainable energy, and their use can also contribute to a stable supply and in turn to reduce emissions of pollutants and protect the environment.

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[13] [1] ICT - Information and communications technology

[13] [2] EnergyPLAN – Advanced system analysis computer model

Migration of Moodle instance to the cloud - case study at Goce Delchev University

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Abstract

The benefits of cloud technologies for Learning Management Systems (LMS) are enormous. Cloud services can provide a better user experience and greater flexibility. Moodle with about 250 million users is one of the most widely used LMS, which also has a cloud-based version. During this period of the Covid-19 pandemic, the use of this system is intensified. Many universities, schools and organizations have started to conduct most of their learning activities online. This has increased the number of Moodle users. At the Goce Delchev University - Shtip we have been using Moodle for 10 years. In order to be able to serve all the requests of the users, good servers and infrastructure are needed that will provide uninterrupted access. On-premises servers often cannot provide good scalability. Cloud technologies offer huge opportunities in this regard. The scaling they provide is extremely important when systems have an increasing number of users. So, we had to think about migrating to the cloud. This paper presents the possibilities of cloud technologies as well as the procedure for migration of Moodle instance to the cloud.

Keywords: *Moodle, Learning Management Systems, Cloud, Covid-19.*

1 Introduction

Compared to the past, today sharing knowledge and learning is much easier. At this time of Covid-19 pandemic this is very important for the continuation of the educational process. The Internet and the Learning Management Systems (LMS) have the greatest impact on this. The Internet has greatly helped educational systems by introducing the term e-learning. LMS is a software that is used to create, manage and distribute educational content. Basically, a learning management system consists of several components or modules: course management module, student management module, online examination module, online assessment module, online course material management module and feedback management module [1]. Each of these modules has its own function. There are a number of LMS today. Some of them are open source such as Moodle, ATutor, Sakai, MyGuru2, Claroline, while others are commercial such as Blackboard, SumTotal, Litmos and Connect Edu. According to [2] the recommended open source LMS is Moodle. This conclusion is based on the features offered by Moodle. According to [3] where a comparison of 6 open source LMS is made, Moodle and ATutor have the best communication tools with user friendly interface.

Moodle is one of the most used LMS. During this period of pandemic, the usage of Moodle has significantly increased. At the beginning of the pandemic, in March 2020, the number of users was around 190 million, while the number of Moodle sites was 145000[1]. Now Moodle has about 250 million users and 197000 sites[2]. 18104 participants have been trained in Moodle Admin Basics, of which 14174 first accessed it when lockdowns starting taking place. 4263 new educators have joined Learn Moodle Basics program for teachers. There were 4504000 active devices on the Moodle App in the last month, vs 1305000 this time last year. 15 million more new activities are being created on registered Moodle sites in the last month, compared to the previous month. Moodle Cloud has 1.67 million new learners now vs 453000 last year[3].

At Goce Delchev University, we have been using Moodle LMS for about 10 years. The current version of Moodle we use is 3.9.2+. Our LMS has 8336 users, 1620 courses, 16179 resources, 51091 posts and 66977 questions. The E-learning department manages all activities for the platform. All the materials for learning are placed by the teaching staff in the created Moodle courses. Students using the Internet can access them anytime, anywhere. About 5 years ago, our university decided to conduct elective university courses electronically through the Moodle e-learning platform [4]. In the period from 2014-2015, most of the teaching staff participated in the trainings for creating electronic tests [4]. These trainings contributed to the readiness of the teaching staff to conduct e-testing in this period of pandemic. Most of the exams in this period are conducted electronically through our e-learning system.

Our Moodle site was hosted on a on-premise server, which could not provide good scalability. The problems arose due to the increasing number of users, resources and activities. Therefore, to deal with this, we decided to migrate our Moodle instance to the cloud.

[1] Source: https://docs.moodle.org/310/en/History
[2] Source: Official Moodle site, https://stats.moodle.org/
[3] Source: https://moodle.com/news/moodle-in-numbers-during-covid-19/

2 Benefits of cloud services and cloud service providers

Cloud computing is a paradigm that allows on-demand availability of resources such as data storage, computing power, network resources and so on [5]. According to [6] Cloud computing is a model that encompass a subscription-based or pay-per-use paradigm providing services that can be used over the Internet. Large organizations are increasingly using cloud solutions such as Office 365, SalesForce.com, and Google Doc [7].

Many institutions cannot afford the resources needed to implement e-learning systems. This is why the biggest players in the field of e-learning Moodle and Blackboard have now versions of the base applications that are cloud oriented [8]. Cloud based e-learning provisions hardware and software resources to enhance the traditional e-learning infrastructure [9]. According to [10] institutions can significantly reduce the costs for e-learning by using cloud-based solutions.

There are three cloud computing service models: Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). SaaS allows users to connect and use cloud-oriented app over the Internet. Some examples of SaaS are: Google Docs, eCloud Manager, SAP Edition, fluidOps [11]. PaaS is a complete environment in the cloud for development and deployment of applications. Some examples for PaaS are: Google App Engine, EngineYard, AWS Elastic Beanstalk, OpenShift [12]. IaaS enables the use of computing infrastructure over the Internet. Some examples of IaaS are: Azure Virtual Machines, Amazon EC2, AWS S3, Google Compute Engine [13] [14]. We have used the IaaS model for our purposes. IaaS provides the use of cloud-based infrastructure that replaces expensive initial investments in on-premise infrastructure. Maintaining on-premise infrastructure is costly and often requires additional human experts involvement. IaaS solutions provide good vertical and horizontal scalability, all this depending on the needs. With horizontal scaling, new virtual machines are added or existing virtual machines are removed from the pool of resources. Vertical scaling provides the ability to increase or decrease the power (CPU, RAM, Disk space) of existing virtual machines.

Some of the benefits of cloud services are:

- Scalability
- Flexibility
- Work from anywhere
- Cost savings
- Automatic updates
- Disaster Recovery
- Security

Cloud service providers we had in mind were: Microsoft Azure, Amazon Web Services (AWS) and Google Cloud Platform. We used Microsoft Azure for our purposes. Although AWS market share in the worldwide cloud infrastructure is in the first place with 33%, we migrated our Moodle instance to Azure which is in the second place with 18 %[4]. We opted for this platform

[4] Source: https://www.statista.com/chart/18819/worldwide-market-share-of-leading-cloud-infrastructure-service- providers/

because most of the services used at our university are Microsoft services. This facilitated the integration process, especially the user authentication part.

3 Methodology

Figure 1. Flowchart of all activities

The flowchart of all activities is shown in Figure 1. First, we backed up the files from our Moodle instance as well as the database. We used these files and the database backup later in the process of restoring our Moodle instance in Azure. The general architecture and all the services we used from Azure can be seen in Figure 2. We created Virtual Machine Scale Set (VMSS) in Azure. The initial instance in the VMSS is VM with 2 CPU cores, 7GB RAM and Linux Ubuntu 18.04 LTS OS. We transferred the frontend files from our Moodle instance to the initial instance. The good thing about VMSS is that it allows automatic scaling. Next, we created Load Balancer (LB) and connected it to VMSS. LB distributes incoming traffic across instances in the VMSS. This reduces the workload and effectively manages user requests. Using the Azure DB for MySQL Server we created MySQL server (MySQL v.5.7) and restored the database backup from our Moodle instance. This service enables easy database management, scaling, backup and security. The VM of MySQL server has CPU with 4 cores and 20GB RAM. Using the Moodle configuration file, we made a connection to the database. We created a separate Premium SSD disk with a size of 128GB on which we transferred the Moodle files from our Moodle instance. This type of disk provides high availability and scalability. Finally, we attached the disk to the VMSS.

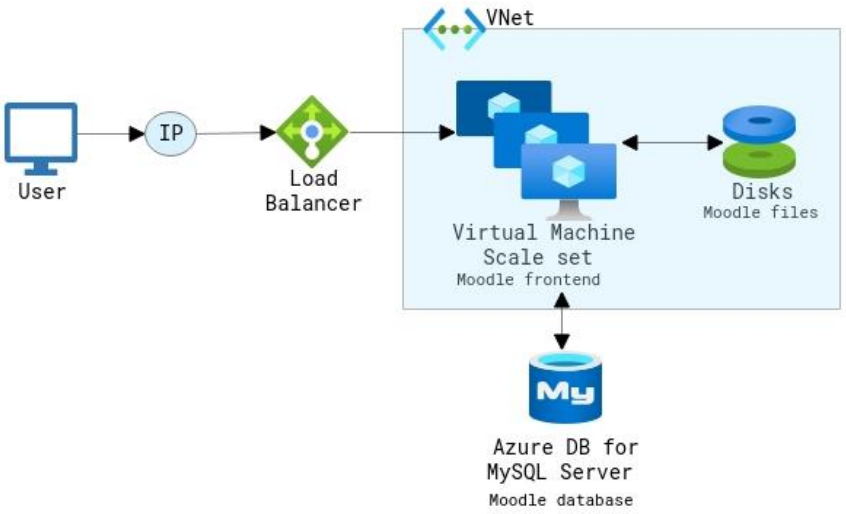


Figure 2. General architecture and used Azure services

In order to avoid high latency and to ensure high availability, it is best all the resources that are created be located in the same Azure region. You can choose the right Azure region according to compliance, data residency, service availability and pricing[5]. For our purposes, we used the West Europe Azure region.

4 Results

The migration of our Moodle instance to Azure has significantly improved its performance. Access to the platform is much faster compared to the instance of the on-premise server. Now we have no problems when a large number of users have electronic testing at the same time. We observed the behavior of the platform during the electronic testing with about 300 concurrent students. The test had 20 multiple choice questions with 1 correct answer. There were 5 questions on each page without the possibility of going back. Testing lasted 20 minutes, with 5 minutes extra time if the students opened the test later. The testing started at 11:05 AM and ended at 11:30 AM. All students completed the test without any problems.

We monitored the usage of resources and here are some of the more important features.

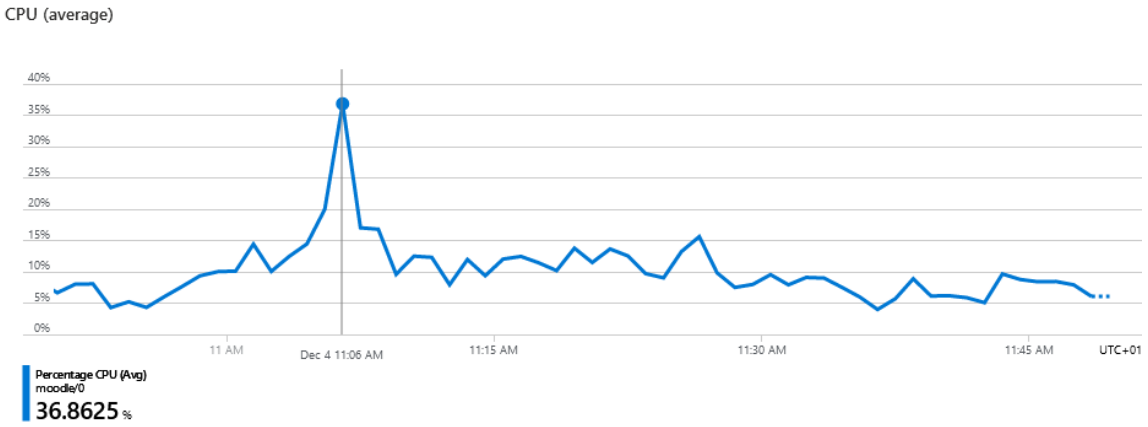
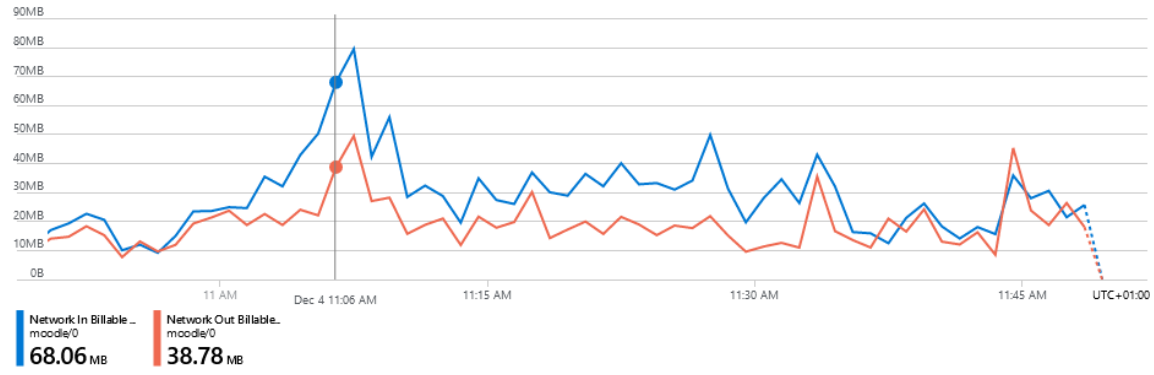


Figure 3. Average CPU usage

In Figure 3, we can see the average CPU usage. The pick is when the students open the test with CPU usage of around 37%. In the rest of the time the CPU usage is below 15%.



[5] Source: https://azure.microsoft.com/en-us/global-infrastructure/geographies/

Figure 4. Outgoing and incoming network traffic

In Figure 4, we can see the total outgoing (Network Out) and the incoming traffic (Network In) of the virtual machine. The peak is after opening the test with value of 80MB for Network In and value of 50MB for Network Out.

In Figure 5, we can see the disk usage during monitoring period. We can see the total amount of bytes read from the disk (Disk Read Bytes) and the total amount of bytes written to disk (Disk Write Bytes). The total sum of Disk Read Bytes is around 61MB while the total sum of Disk Write Bytes is around 156MB. The peak for the Disk Write Bytes is after opening the test with amount of around 6MB while the peak for the Disk Read Bytes is after the end of the test with amount of around 18MB.

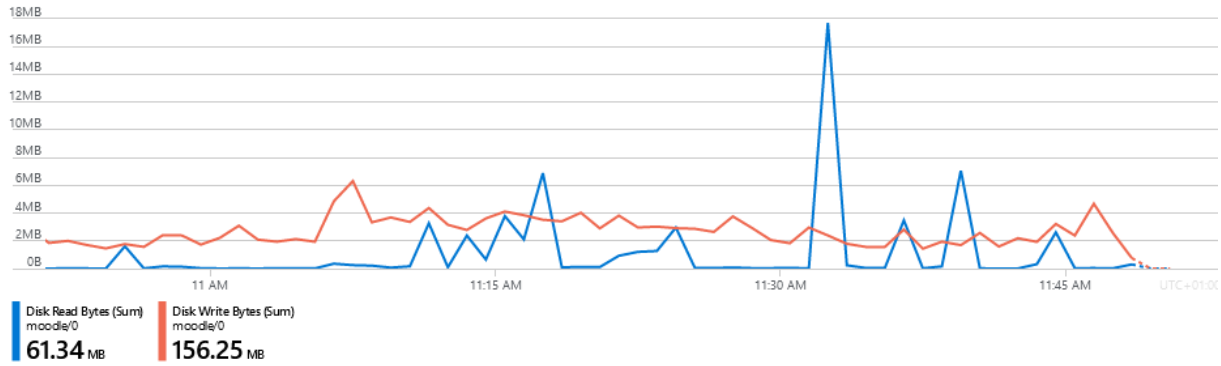


Figure 5. Disk usage during monitoring period

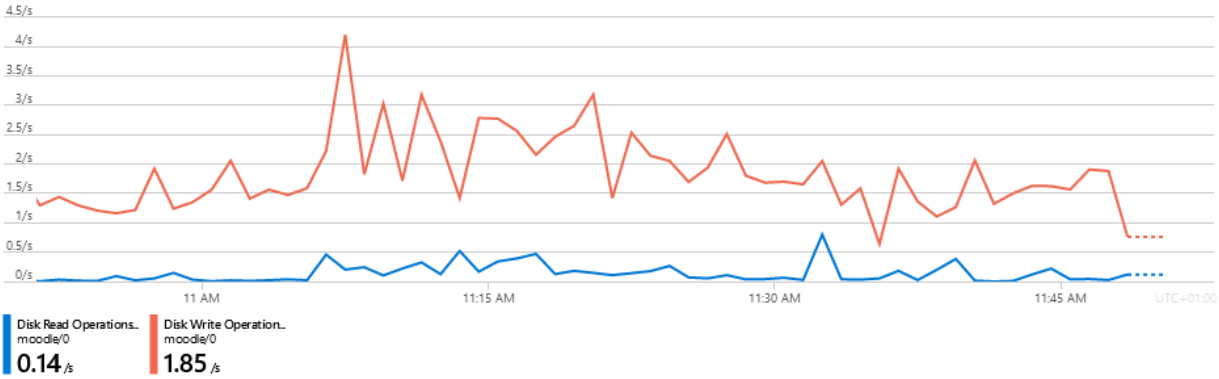


Figure 6. Average disk operations in second

In Figure 6, we can see the average disk operations in second (Disk Read Operations and Disk Write Operations). The peak for Disk Write Operations is after opening the test with value of around 4 operations/s. The peak for Disk Read Operations is after the end of the test with value of around 0.7 operations/s.

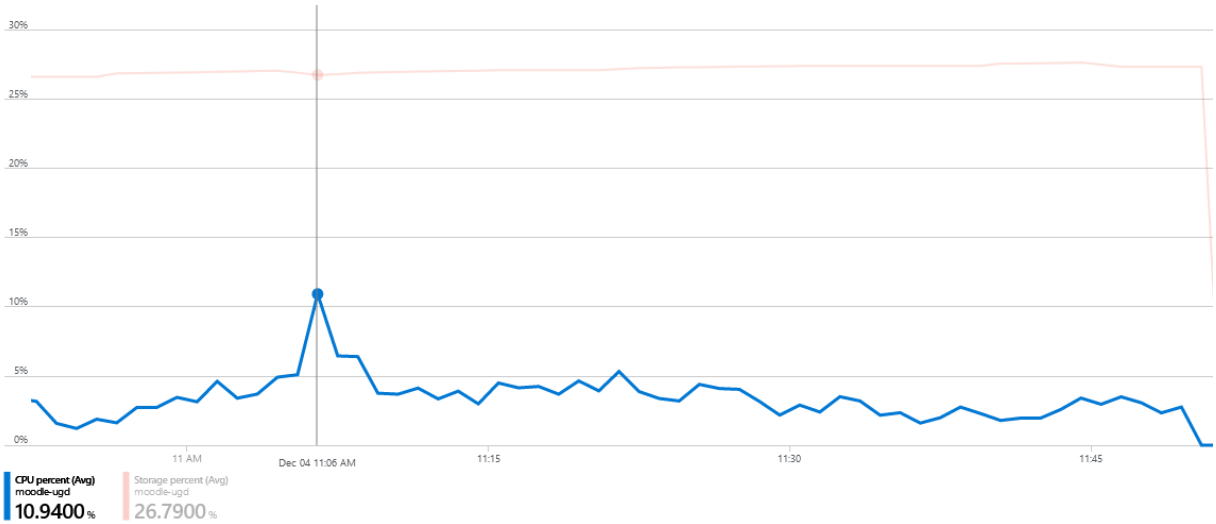


Figure 7. Average CPU usage of MySQL Server

In Figure 7, we can see the average CPU usage of MySQL Server. The peak is also when the students open the test with CPU usage of around 10%. In the rest of the time the CPU usage is below 5%.

The RAM memory usage of the virtual machine is up to 30%.

We can see that resource utilization is low. According to these results for the virtual machine and the MySQL server, we will optimize the performances in order to reduce costs.

5 Conclusion

By migrating to the cloud, we can significantly improve the performance of the Moodle platform. When the number of users is large and we have a lot of user requests we should consider migrating to the cloud. This ensures better scalability, availability and security. The research we made is based on 5 months experience on the cloud. Next, we will try to optimize the usage of resources. In the following period we will be able to say something more about our experience with the cloud.

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Identification of Occupational Hazards in Contemporary Working Environment

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Abstract

The purpose of the research in this study is to analyze the impact of early prediction of hazards to prevent workplace injuries and improve employees' safety. The tremendous advances in technology in recent decades have created new hazards in machine handling, which has led to the development of new techniques for a higher degree of protection that society expects from employers to provide to their employees. The analyses show that regardless of the type of method used for risk assessment, the highest risks for machine operators are generated by mechanical hazards. This research aims to approach the analysis of risks caused by mechanical hazards and propose measures to prevent them before occurrence. A risk assessment for a mechanic was done and all factors that generate a high level of risk were analyzed. The methodology used for risk assessment is a tabular technique that combines qualitative and quantitative methodology. The Kinney method was used as the research method. Raising awareness of occupational safety among employers and encouraging a sense of responsibility for workers' health will be a major benefit that will provide better working conditions in any business, both human and economically.

Keywords: *workplace safety, mechanical hazards, risk assessment*

1 Introduction

The tremendous advances in technology in recent decades have generated new hazards that led to the development of new techniques to provide the protection degree that society expects for the employees to be provided by their employers. As machinery and equipment became more advanced, and safety techniques for operators more sophisticated, a high cost of injury and damage to achieve the desired development and profit was paid for. However, as early as the 19thcentury, great changes in social attitudes and a growing recognition of the value of people working on machines were observed. The benefits of the machines provided with an appropriate level of safeguarding go in addition to the protection of the operator by matching his ability with the operating requirements of the machine but also conforming to the appropriate official standards [1]. Therefore, ensuring that an adequate level of protection is provided can be reached by implementing of an appropriate laws, standards and practices [2]. Despite the complexity and extensive equipment currently available, there is sufficient information to select equipment and test its suitability [1]. Thus, engineers are in a very complex position to choose the most appropriate and effective strategies and equipment, to meet the appropriate level of protection in accordance with the requirements of the process, and also to ensure the avoidance of injury or damage to the machine.

Increasingly today, safety with machinery is going beyond the design and manufacturing aspects and highlighted consideration of the actual use of operating systems and plants. To carry out Occupational Safety and Health (OSH) concept effectively, the employee should have an understanding of basic and of the current safety techniques for reducing the risks associated with the more commonly met industrial processes [3]. However, the process of conducting risk assessment together with hazards identification and proposing of risks reduction measures can be used as a fundament for determining the safety integrity levels [1].

A safe work environment is crucial especially in high-risk industries [4]. While traditional safety management approaches concentrate on how accidents happen or “something went wrong”, modern safety management tools present a successful methodology designed to deal with uncertainty in high-risk work environment and focuses primarily on the working safety, which encompasses how people adjust and perform in expected or unexpected working conditions [5]. Therefore, the uncertain work environment demands a new perspective of safety to respond to the unexpected events, more than accidents preventing [6].

Although the introduction of new materials and manufacturing techniques has extended the basic principles in the design of machines, it seems that the area in which the greatest changes have occurred is exactly in the use of electronics, as well as the development of modern computer and software technologies. However, the basic principles involved in the design of mechanical guards have changed little in recent years, but they stillprovide essential solutions to common hazards [1].

2. Occupational hazards

The employer must ensure that working conditions and all work equipment provided are suitable for the intended work and used only for the intended purpose [7]. In the case of presence of specific hazards involved in operation, servicing or maintenance of the machines, the work must be carried out safely and only by trained and competent persons provided by the employer [3].For this purpose, suitable information and instruction must be provided for every employee in order to ensure protection especially against the hazard parts of machinery originating from specific sources – movements, energy, sharp edges, electricity, materials, physical agents and radiation.Each of these hazards is considered in the table below [1], (Table 1).

Table 1. Occupational hazards in machine handling

		Condition	Hazard
1	Movements	Rotation	entanglement (rotating parts with/without projections)
			nipping/drawing-in (gears, nips of in-running rolls, chains, belts)
			shear (sliding parts, spoked wheels, mowing machine blades, dough mixer blades)
			cutting (rotary knives, abrasive wheels, bacon slicers, circular saws) linear
2		Linear sliding	trapping, crushing (closing platens, feed tables and fixed structures)
			shear (between adjacent machine parts, guillotines)
			puncture (wire stitching, stapling, sewing needles)
			impact
3		Abrasives	friction burns (rotating drums and cylinders)
			abrasions (abrasive wheels, linishers)
4		Ejection	material (grinding debris, leaking steam, air, hydraulic oils, dusts and fumes)
			components (process material, components in manufacture)
			machine parts (overload failure, excessive speed, jam up, broken parts)
5	Stored energy		air, steam or gas under pressure (pressure storage vessels, operating cylinders)
			springs (actuating cylinders, robots, machining centers
			sudden release (relief valves, vessel or pipe failure)
			electrical (short circuits, discharge from capacitors, static discharge)
			weights and heavy parts in an elevated position (counter weights, lift cages)

6	Sharp edges	burrs (newly cut or formed metal, swarf)
		cutting blades (guillotines, loose knives, milling tools, wood and metal tools)
7	Electricity	shock (exposed conductors, insulation failure, no earth connection)
		short circuits (fires, explosions, arc eye, burns)
		overload (fires, burns)
8	Substances	ejection from machine (leaking seals and joints)
		escape (hazardous material, high pressure steam and air, flammable gases and liquids)
9	Radiations	ionizing (nondestructive testing (NDT), X-rays, sterilizing, nuclear)
		non-ionizing (ultra violet, infrared, lasers, radio frequency, induction heating)
10	Physical agents	noise (drumming panels, metal-to-metal contacts, transformer hum)
		vibration (out-of-balance shafts, percussion tools)
		pressure/vacuum (tunneling, diving, working in rarefied atmospheres)
		temperature (high – drying ovens, heat treatment, and low – cold storage)
		asphyxiation (confined spaces, exhaust fumes, gas leakages)
		suffocation (by granular materials, powders, grain, liquids)

It seems that the major challenge of modern technology is to choose the most appropriate and effective strategies and equipment, while meeting the required level of protection and ensuring the avoidance of employee injuries or machine damage. The purpose of this study is to point out the importance of early identification of hazards that are crucial for conducting a risk assessment and taking protective measures to prevent workplace injuries [8]. Thus, a risk assessment with the hazards identification and proposing of risk reduction measures can be used as a fundamental for determining of safety integrity level [3].

3. Materials and methods

Today, importance of the risk assessment is increasing due to rising awareness of occupational health and safety and excessive legal enforcements [9]. Conducting a risk assessment is an obligatory duty of each employer [10]. Risk assessment is primarily an empirical process of making engineering decisions based on knowledge and experience in order to improve occupational safety and health using selected and thus well-known and recognized methods. None of the risk assessment methods prescribes a choice of protective measures to reduce,

eliminate, or prevent the risk. The correct choice of risk assessment method will enable the application of appropriate measures that will achieve a safer workplace and work environment and less probability of occupational diseases and injuries to employees. Depending on the criteria for risk assessment, all methods used in the field of safety and health at work can be divided into qualitative, semi-quantitative (combined), and quantitative methods. There are three approaches to risk assessment in semi-quantitative methods, [11]:

- matrix method of risk assessment (based on a combination of matrices and tables),
- tabular method of risk assessment (based on the formation of tables of all elements for risk assessment), and
- graphical method of risk assessment.

In qualitative methods for risk assessment, subjective criteria measured in qualitative scales are most often used. However, it should be noted that the latest experiences and recommendations from developed EU countries indicate that the application of quantitative risk assessment should be given more important role and should be introduced wherever possible. There are already a number of new forms, recommendations, and tables that indicate how quantitative risk assessment can be performed relatively efficiently and easily.

Thus, by using appropriate tables and instructions, all consequences are uniformly expressed through the number of lost working days. Quantitative risk assessment starts from the basic pattern:

Risk = Probability of event x Consequences of event

In fact, the basic risk matrix considers the relationship between the probability rank and the consequence rank. The risk matrix is a logical connection between the probability and the consequence in assessing the risk for the previously identified hazard/ harmfulness. This is a uniformly defined way of determining the degree or level of individual risk being assessed, (Fig.1).

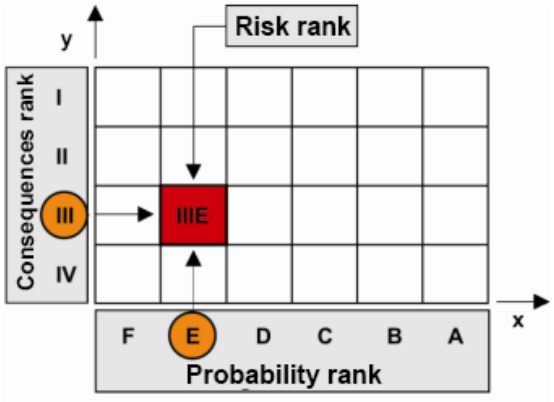

Figure 1: Estimated risk rating matrix

The matrix contains several levels of a qualitative description of the consequences associated with occupational diseases/injuries, lost working hours, and adverse environmental impact. Thereby, several qualitatively described levels of risk can be recognized - increased, medium, or low risk. The risk is considered unacceptable if it is assessed as high, while the risk belonging to the medium or low level of risk is consideredacceptable.

3.1. Kinney method

Among the methods with tabular approach to risk assessment that use existing methods of formed tables with qualitative descriptions combined with quantitative, numerical values of all risk factors required for risk assessment, is the KINNEY method [12]. According to this method, the risk is calculated according to the formula **R = V x U x P**, as a product of the following factors:

- probability of injury / disease (**V**),
- frequency and time of exposure to danger / hazard (**U**)
- consequence, i.e., severity of possible injury or disease (**P**).

This research analyzes the risks caused by mechanical hazards and emphasizes the importance of proposing measures to prevent them before their occurrence.A risk assessment for a mechanical operator was made and all factors that generate a high level of risk were analyzed. The methodology used for risk assessment is a tabular technique that combines qualitative and quantitative methodology, the KINNEY method.

Table 2. Risk assessment for a mechanical operator

Description of the technological process and work tasks: Control and servicing of motor vehicles and construction machinery. Procurement of materials and spare parts needed to repair defects/malfunctions. General control and repair of the vehicle with replacement or repairing of damaged parts. Recording of replaced parts and storing in a warehouse. Repairing of defects on site.					
Mechanical hazards that occur when using work equipment					
	High Risk	Danger / hazard	Probability of injury / disease **(V)**	Frequency and time of exposure to the danger/ hazard **(U)**	Consequence/severity of possible injury or disease **(P)**
1		Insufficient safety due to rotating parts	6	6	10
2		Moving parts - flying particles	6	6	10

3		Overturning /swaying parts	6	6	10
4		Rolling parts/ slips off	6	6	10
5		Parts that fall off or separate			
6		Parts that scatter and fly away			
7		Flying particles			
8		Pressurized media			
9		Free movement of parts or materials			
10		Internal transport/ movable transport device			
11		Working machines or vehicles movement			
12		Work equipment moving			
13		External transport	6	6	6
14		Overturning of a vehicle due to overload			
15		Hazardous equipment/cause of explosion, fire	6	6	6
16		Inability moving from the workplace on time	6	6	6
17		Overlap exposure/ closure			
18		Exposure to mechanical shock	10	6	6
19		Load drop during mechanized transport			
20		Crushing due to falling load from a vehicle			
21		Crimping during manual load handling			

4. Results and discussion

From the conducted risk assessment for the workplace of machine operator with a total of 36 identified risks, only the mechanical hazards were singled out for this study (21 risk, or 58%), because they are assessed as hazards that produce high risk. For the same workplace, a risk assessment was conducted with the PILZ method, also a tabular method, but the ranked risk is obtained as a multiplication of four parameters (probability, frequency of exposure, consequence and number of exposed persons), [11].It has been found that, regardless of the method used to conduct the risk assessment, most of the predicted hazards in the analyzed workplace are hazards of a mechanical nature and, they always pose a high risk of serious

injuries that often lead to permanent disability or death. This clearly determines the need for early identification of hazards but also justifies the prescribing and timely taking of appropriate measures to reduce the risk and prevent accidents at work.

However, taking measures to prevent risks is an obligation of every employer [13], the fulfillment of which undoubtedly leads to economic benefit and growth of every company.Therefore, in the conducted risk assessment, the company is obliged to comply with the following prescribed measures:

- Maintenance of good condition and performing regular and periodic inspections and tests of work equipment and tools;
- Servicing of machines and equipment in accordance with the prescribed maintenance instructions by the machine manufacturer;
- Maintenance and servicing of machines and equipment by competent persons;
- Equipping the machine with control devices for complete and safe shutdown in case of an accident;
- Use of machinery and work equipment exclusively by trained persons;
- Providing the prescribed conditions for safety and health at work in the work environment;
- Occupational safety training upon employment, change of job position, or change of technological process (machine, equipment);
- Previous health examination upon employment, change of job position, or change of technological process (machine, equipment);
- Preventive health examinations in an authorized health institution, in accordance with the regulations - standard minimum every 24 months compulsory;
- Retraining of employees for safe performance of work activities every 3 years (for identified high-risk workplaces);
- Obligatory carrying of personal protective equipment (PPE) at work (Table 3).

Table 3. Personal protective equipment (PPE) at work

	Type of PPE	Standard	Use of PPE
1	High protective shoes with impenetrable and non-slip soles, waterproof and with toe protection	EN 20345	Continuously
2	Protective helmet	EN 397	
3	Goggles / protective visor	EN 166	
4	Protective gloves	EN 388	
5	Welding protective mask	EN 175	
6	Leather protective apron	EN 1611	
7	Two-piece suit with mobile sleeves	EN 13688	

PPE should be used when the risks cannot be avoided or sufficiently limited by technical

equipment, collective protection measures, methods and procedures of work organization [14].Suitable information and instruction must be given to those who use the work equipment but the obligation has been extended to cover foreseeable abnormal use of the equipment [3].

5. Conclusion

Improving productivity to protect workers from the occupational hazards is closely related to the implementation of practical approaches and tools that will help establish, implement and improve occupational health and safety management systems in order to reduce injuries related to work, poor health, illnesses, incidents and deaths. Health and safety is an integration of knowledge and information from a wide spectrum of disciplines, necessarily intertwined with commitment, awareness, learning, and flexibility. The key challenge health and safety now faces are to engage and influence the huge variety of businesses, particularly small businesses, and to help them manage health and safety more effectively. As a result of insufficient implementation of appropriate safety rules or management procedures, as well as lack of training for the employees to carry out these practices, the majority of accidents occurred especially on projects undertaken by small companies.The data from accidents at work can be used for determining the most common types of injuries, identifying economic activities where occupational injuries occur along with their extent and severity, and consequently developing different types of assistance programs in order to indicate important hazards to which attention should be paid. These hazards should be the subject of more detailed analysis, in which more information could be used related to the chain of events leading to accidents and injuries.

New technologies and more advanced techniques in various industries require the highest level of protection, which must be taken to protect the operator from dangerous parts of the machine. So, the access to rotating and translational parts of the machine has to be prevented and measures (means) that dangerous parts of machinery have stopped before contact can be had with them have to be provided. Measures to be taken, including the use of PPE and occupational safety systems, are intended to prevent or minimize the effects of any hazards that may be encountered in the workplace.Therefore, the early identification of hazards and estimation of risks in the workplace allow proposing and taking appropriate measures that will protect the employee and prevent the possibility of accident at work. The risk assessment for each workplace must contain prescribed measures proposed by the OSH expert in order to reduce or eliminate the identified risks, as well as proposed PPE at work that the employee must use continuously. As no method of risk assessment proposes safety measures at work, the expertise and experience of the OSH expert are crucial to the quality of the proposed measures and their contribution to the prevention of accidents at work.

Consequently, creating a rational budget without compromising safety by reducing accidents and raising the level of awareness for occupational health protection at all levels should be the primary goal in each risk management system

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“Reanimation of urban element in the inner green edge”

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Abstract

Nature and architecture are in a constant and unbreakable relationship.

In order to use this relationship positively, we should start by giving equal importance to both entities. With such a balance evaluation of the main creators of space, conditions are obtained for the beginning of creating a common whole.

Architectural space is created as an ontogenetic and phylogenetic need, but it's very conception lies in the relation with the nature and its processes. The recently regained attention for more livable cities and a more balanced modal split might also lead to a big city metamorphosis, a change that would positively affect people's physical and psychological well-being, as well as the quality of the environment. The cities should definitely start to feel and look more human.

People are thirsty for new elements of the city at the level of public places, where you can see other things and people, exchange ideas and carry out various activities, where walking, green and social space will be given top priority. In a technical world, the street no longer participates in the constantly renewed elaboration of the city or in the processes of preserving the human community and their activities.

We see a lot of people every day, but we do not have significant interactions with all of them. In a world where society is becoming more and more urbanized, we must not allow humanity to die out.For this we are met by public, common urban spaces.

The aim is to return the missed public space of our rebuilt cities through its layering depending on different functions. Unfortunately, the city structure is increasingly penetrating urban public spaces and parks, leading to a reduction and almost disappearance of parks and greenery. This development also leads to greater air pollution which then negatively affects the human environment and well-being.

The urban structure in the cities, as is the case with many urban situations around the world, as well as the city of Tetovo (subject of this research) is damaged by the interventions, but this is where the "space" can be found to take appropriate measures in present time, especially through a positive approach to the current urban situation. This will depend on the way in which architects and urban planners are able to "read" carefully and sensitively the current situation from a different perspective and to help others to see and treat the situation from a positive perspective. The relations of the city of Tetovo with nature are still a great advantage in the city, but they are in dynamic balance. Is Tetovo still a "city in the background of nature" or is nature gradually being established in the background of the city? And in the second case, viewed in a positive sense, the city and nature can be considered a symbiosis of the landscape itself. According to this positive approach, it is necessary to guarantee through the "operations" of urban design and landscape, a better fluidity of "nature in the city" and "the city in nature."

Keywords: *public space, reanimation, attractor, elevated structure, layering, sustainable*

1. Problem Statement

The problematic area is the misbalance between architecture and urban space with nature and its open space. Society and space are transforming each other.
Given that space is also a social expression, cities show that social transformations in different periods lead to different forms of arrangement of that space. Society and space are transforming each other. But while this transformation plays a key role in the ongoing maintenance of the city itself, cities today are becoming more "chaotic".
In this regard, the question would be whether in today's cities it is still possible to identify reflections of the basic existential elements on the basis of which the city exists? Are there traces of continuity and is there still a "humane city" within today's chaotic cities?

This is an important psychological moment that requires a convincing force for change, both by professionals and by the authorities. This means that the elements or factors that are problematic at first glance need to be put in a new framework so that they look different. Thus, "chaos" can be seen as a "positive energy", as a "wealth of urban language" and an opportunity to "re-read" it; damage to the urban structure as an opportunity to recreate new spaces; multiethnicity as an opportunity for more diversity , etc.

1.1 Wider location analysis

Today, with the rapid expansion of the city, the increase in the number of inhabitants, the opening of the two universities and the constant migration from the surrounding villages, Tetovo is being built more and more and is losing its connection with the nature that surrounds it. Greenery and park areas are almost extinct, replaced by high-rise buildings, residential and business premises, maximally urbanized for greater profit. This not only affects the well-being of the inhabitants themselves; it suffocates the city but also contributes to greater air pollution along with all the negative consequences.

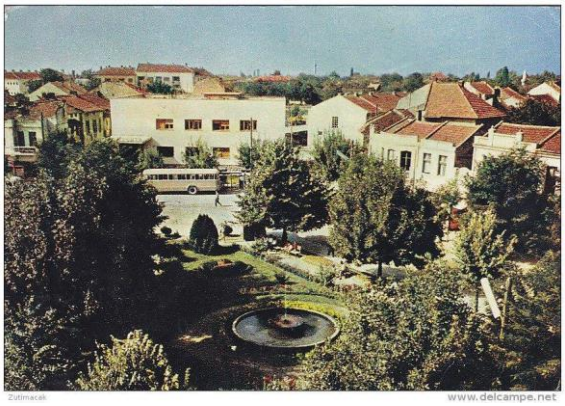

Figure 1: Tetovo Square today

Figure 2: Tetovo Square

1.2. Environmental characteristics and polluted air

The city of Tetovo has incredible environmental potential. The Sharr massif is the origin of life and wealth of Tetovo. This potential should be analyzed, protected and cultivated in function of the needs of the city and beyond.
The city has inherited a natural balance with nature and with itself since its inception, which was affected by planning initiatives during the centralized economy.

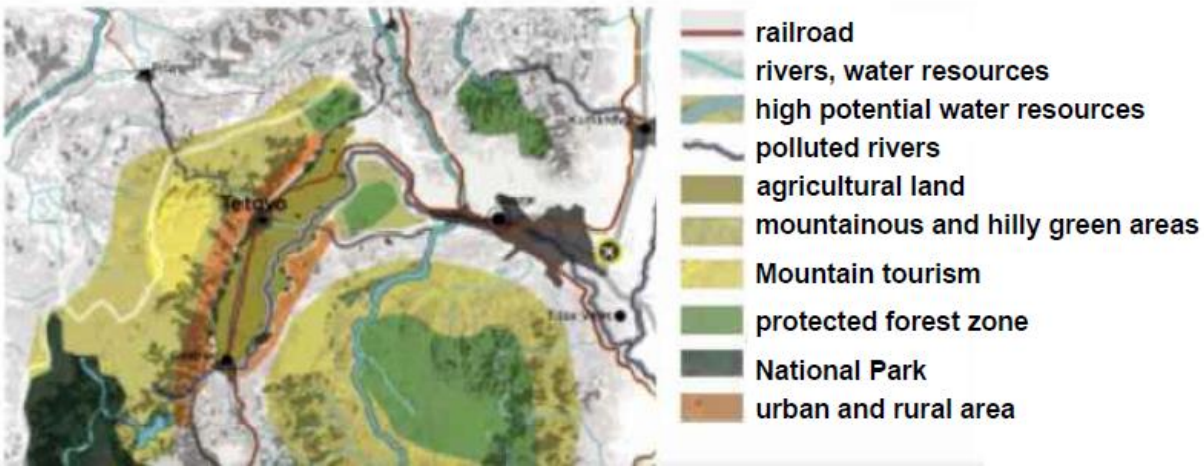

Figure 3: Environmental characteristics and natural resources of Tetovo

In recent years, the air in Tetovo is in a worrying state with high pollution. Highly polluted air causes permanent damage to human well-being and health.

This does not mean that in the past there were no emissions of PM10 particles in the city, but unlike now, then there was a natural flow of air. Now we are in a situation where Tetovo, due to improper urbanization, is suffocating. Also, the traffic in the city is in great need of regulation, but quality measures need to be applied.
For unimpeded movement of vehicles on the main city roads, it is necessary to prohibit parking of vehicles on them. Of course, first a sufficient number of parking lots or multi-story garages is needed.
The responsibility for a healthy environment and reduced climate change is everyone's, which requires a responsible attitude towards the environment of each individual.

1.3. Defining the case study area

The rapid changes after the 90s, the lack of political stability in the country, as well as the difficult social and economic situation left great traces in the cities of Macedonia. Rapid urbanization and wild informality are destroying the urban cell of cities at the expense of the public interest and public spaces. Common public spaces are disappearing and greenery is almost gone. This erroneous urban development should be diagnosed and a solution should be found as soon as possible on how to precede a new development of events with a new vision, plan and modern instruments of urban development.

The city has great human potential thanks to its diversity both in terms of demographics and socio-cultural and ethno-religious terms. This diversity should be seen as a socio-political advantage in the city in order to prove a real Western model of coexistence and development. In this way, not only will Tetovo become a city of all and for all, but it will also encourage the avoidance of prejudices for equal treatment at the national level.

In this context, the concept of the Euro-Western model of coexistence becomes an essential political project for the future of Tetovo and may need to be applied in the urban development of the city. Further encouragement of this spirit can be developed to make a balanced and transparent distribution of investments in the city, by creating common links and public spaces between communities.

This spirit of reconciliation and unification, successfully applied in many other countries around the world, will contribute to building an image of stability and progress, while also fostering local economic development.

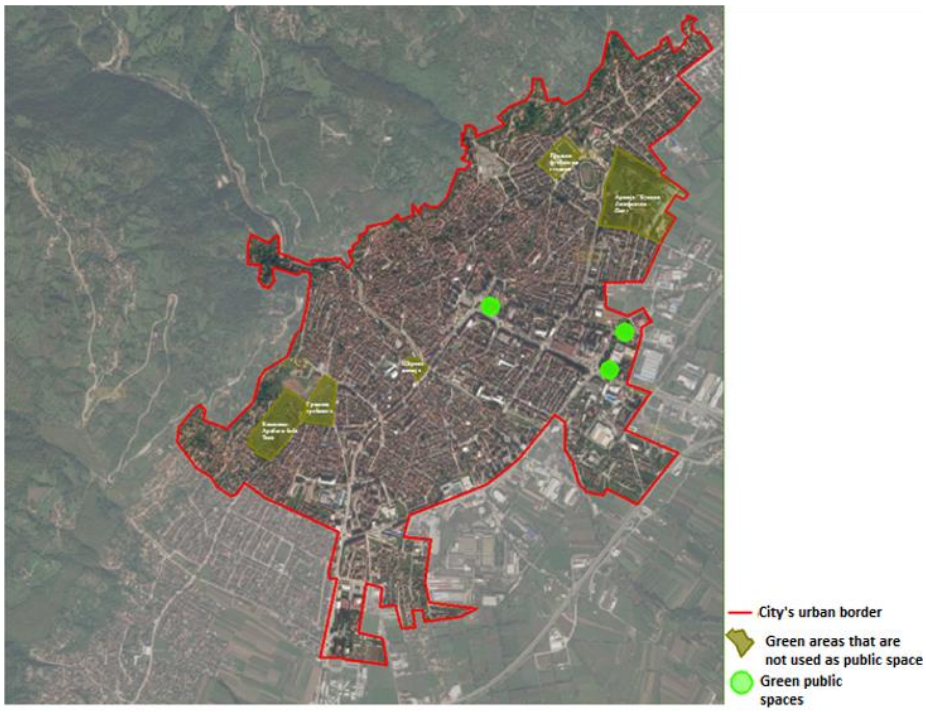

Figure 4: Analysis of greenery in the city of Tetovo

Improving infrastructure and alternative axes of movement without the need to destroy historic areas, no matter how bad they may be, is an alternative to mitigating the effects of a solid postmodern city. However, it should be borne in mind that balancing physical development with increasing local cultural and educational capacity is the only way to sustain urban development.
From a practical point of view, this means that creating facilities in the service system as a whole and especially in pedestrian movement and transport, would transform the city in a positive sense.

The city needs to improve the infrastructure network, try to make the most of the potential of the green space and connect the green areas.

2. Research Methodology

The methodology used applies the tools of urban design and its analysis as research on the undiscovered potential of the city. These themes mark specific catalytic effects for the whole city and territory.

Through the analyzes, Tetovo gives us a new layer that we can read - its essence as an organic city. This will be evident through the reinterpretation of specific elements, such as buildings, trails, greenery, elements of landscape and urban design, etc., that are legible through existing urban spaces.

According to this vision, Tetovo can be seen from a polycentric rural-urban perspective at the city level, because it reveals potential beginnings for new magnetizations in what can be considered a modern city according to the new visions.

The project at this level will guarantee a way out through time and space ", as part of the" therapy "for treating the problems that this city has. Thus, the" interruption "of the time and territory of the former and expected city would transform today This level of thinking provides the "missing space" and shows that the solution cannot come from what we have traditionally learned to call a city.

Research methods of returning the subject of investment in well-designed public spaces, in terms of community, well-being, environment, and resources, have shown that we need to focus on innovating with new types of comprehensive solutions that go beyond standard cycling. paths, trash cans or benches, green areas, etc. to help people have unusual outdoor experiences.

This whole picture leads to the idea of a more dynamic element of the city, in contrast to the previous dull and homogeneous appearance.

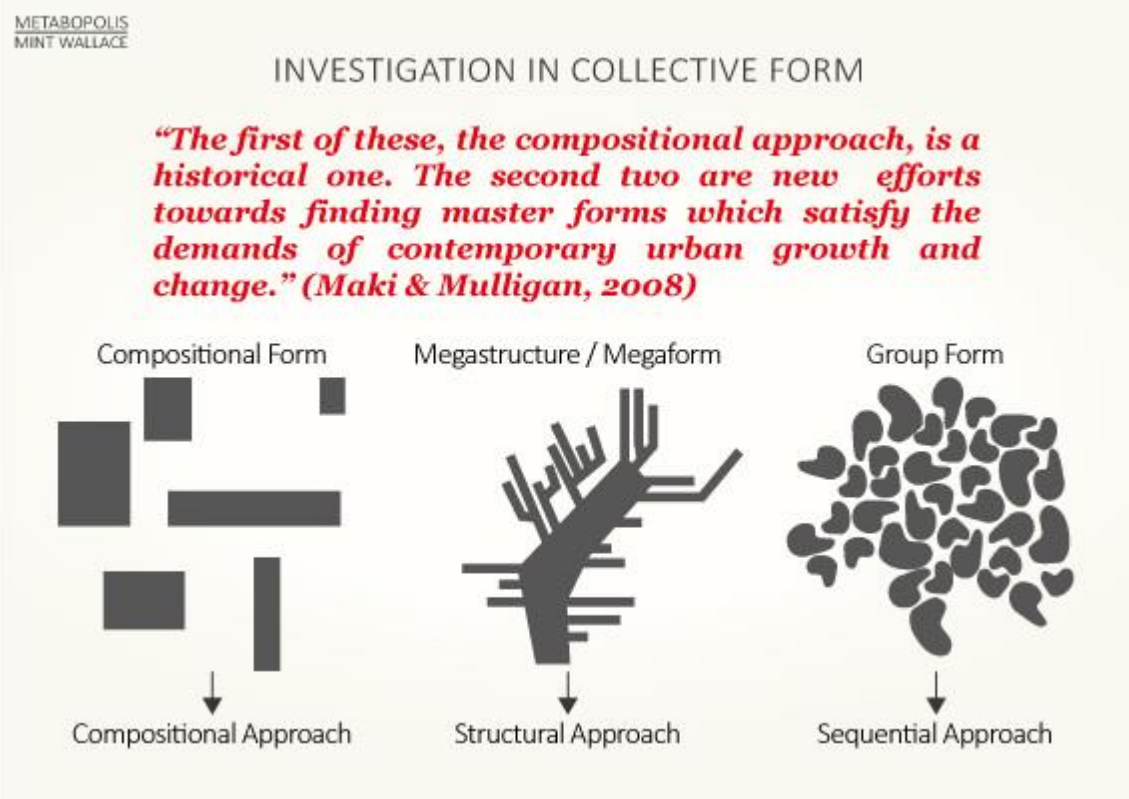

Figure 5: ***Three types of Collective Form, Fuhimiko Maki***

3. Proposed concept solution

The idea is creating an elevated structure with several qualities, which will reanimate the existing space in terms of its connectivity, flow and environmental benefits by creating a self-sustaining unit which will function as a living organism of the city, containing an active relationship with the natural processes and nature itself.

This project aims to make understandable the fact that nowadays the success of urban centers and the guarantee of their future strives in the first place in the deep and uncomplicated understanding of themselves, understanding the language and expressive codes, both in time and in spatial dimension and reinterpretation of the whole material in new situations. Success also lies in exploring the "increased value" that occurs as a result of territorial and temporal positioning, as well as in strategically exploiting the benefits conveyed to the city through this extensive network of relationships.

How can the message that the city conveys to the resident be positively transformed? How to establish a new relationship between space and man in the city?

Addressing these issues is closely linked to the principles of urban design. In this regard, it is important to understand what the current design / designs of Tetovo are and how they affect residents and visitors.

In the fight against pollution, one of the basic measures is the increase of green areas in the cities, together with other environmental measures that need to be taken.
This can raise awareness and promote greater investment in public spaces, which create memories and meaning. We can make a real difference in the urban landscape, because that is our future.

After this transformation we will again have a Tetovo with a "spectrum of colors", as its oldest monument, the colorful mosque, but with a new passion, similar to the time space in which we live, Tetovo that is not afraid of change, the accelerated and even chaotic economic growth, and which openly shows its "metamorphic" resilience. This then turns into even a specific element of the urban design of the city.

The goal is a Tetovo where its created - maybe without rules - space manages to adapt to the transformation processes led by the modern socio-cultural expected changes. A Tetovo where human relations with space are more democratic. A Tetovo that enters the virtuoso cycle, where man and space support each other with positive energy.
This physical space can be recontextualized in a differently experienced space, which contains a treasure, much greater than it seems at first glance.

3.1. Defining the concept

The primary goal of the project is to preserve the city's natural resources such as water and air by integrating the city forest and linear elevated park that would function as a single ecosystem, more resistant to external influences and improve the quality of the environment as a whole. In a broader sense, improving biodiversity improves the physical and mental health of people, which will improve the social interactivity of the place.

Figure 6: The idea of elevated park

Linear elevated parks, such as the High Line, are redefining our understanding of what a park is, and also helping us in the process of creating a new, bolder, richer vision of public space.
It Adds a new layer of the city that decorates the city landscape and improves the quality of the place. The project has an innovative design that encourages people to walk and relax. It offers a pleasant feeling that makes you stay on that elevated park.
It is a useful area that can always be upgraded or modified.

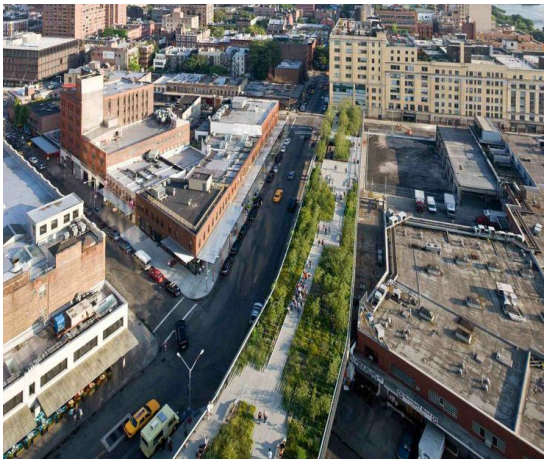
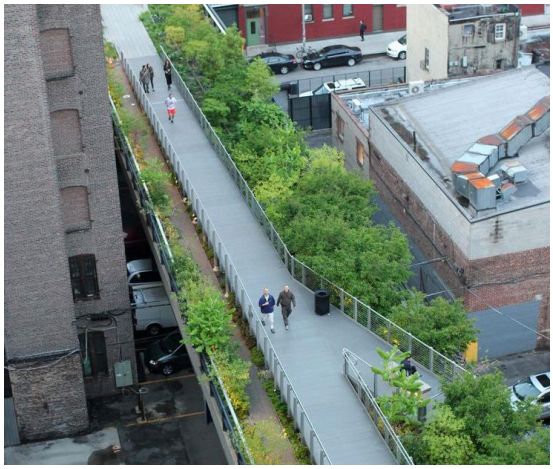

Figure 7 & 8: Areal view of HighLine, New York, NY

Also, the Linear park in Mexico City by Fernando Romero is a project is a perfect example of how to create an "elevated" public space in a way that meets the needs of the community and the well-being of the city at a higher level by placing a variety of content and activities along the avenue. It is a social place for relaxation and meetings of people in the shops on the upper level. It improves the biological condition of the city with air pollution, as well as gives a completely new urban image of the area by greening the corrugated terraces on several levels. In addition to connecting the city with a new layer of paths and crossings, the avenue becomes a safer place to pass, walk, socialize, etc.


Figure 9 & 10: Linear park in Mexico City

3.2. Analysis of the problem area and its needs

The problem area and its surroundings have several important points, which besides the locals are also used by people from all over Tetovo, ie they attract a large number of people at certain times. These objects are reference points through which the place is recognized. Such points are fundamental to the city and its structuring. These are bigger and smaller centers, state institutions, health institutions, facilities for institutions, etc.
A large number of these attractive points are oriented in the immediate vicinity of a specific location on the boulevard. In the immediate vicinity of the boulevard there are numerous schools and faculties that need green areas around them, which contribute to their effective functioning, so the raised structure would offer places for outdoor classrooms or pavilions for various projects and exhibitions.

Figure 11: Conceptual Diagram

The problem area we are striving to improve is the disturbed relationship between architecture and urban space on the one hand and natural space and nature on the other.
The concept we propose aims to achieve more qualities: resuscitation of existing tissue in terms of its connectivity, flowability and environmental benefits by creating a self-sustaining whole that will function as a living organism in the city, which contains an active connection with natural processes. and nature.

This type of open-rise structure rising from an urban forest can be modified by interpolation according to variable and specific programming needs.

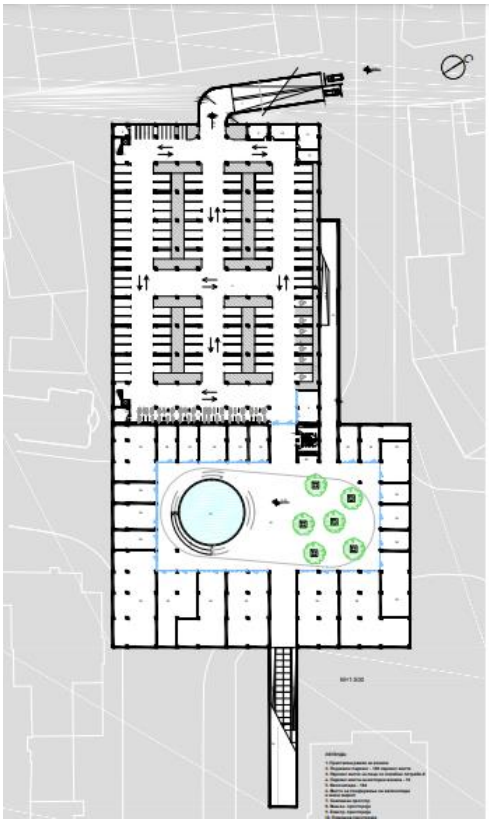

Figure 12: Underground parking plan

Figure 13: Retransformation of the city center

Involvement of a system for strategic management of stormwater as a resource, through an underground water storage tank so-called "artificial rocks" which have a direct connection with the elevated structure and have the function of channels that collect water from the basin into the underground reservoirs and filter it.

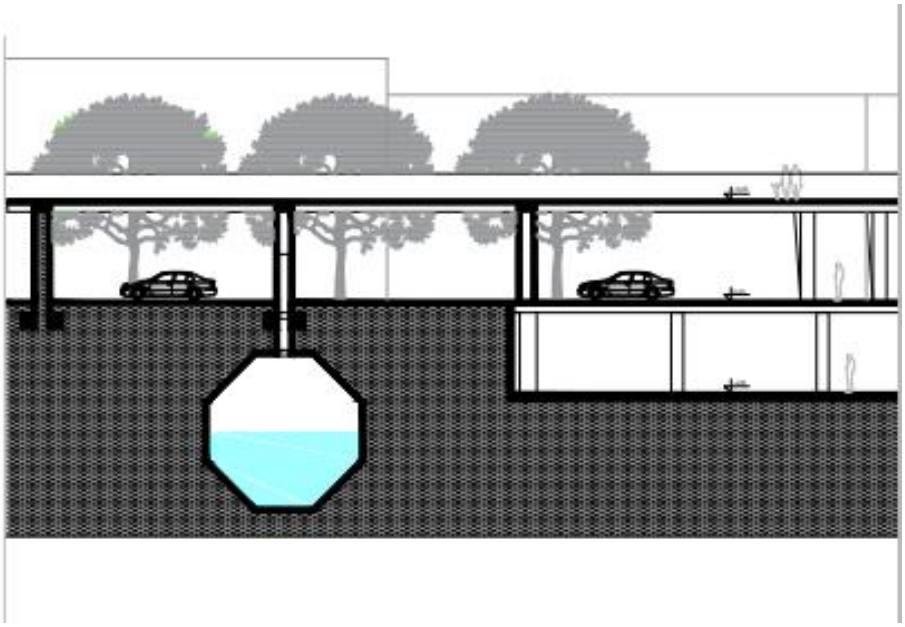

Figure 14: Underground water storage

4. Conclusions and recommendations

Giving up traditional and modernist schemes that fragment the city, as well as promoting a design / development concept based on the "maximum potential of urban space", could help alleviate differences and increase the quality of life in the city. These alternative ideas, related to the reading of space, lead to the redesign of public space with generative projects, or by emphasizing degraded environments by generating their further development.

Apart from being strong urban catalysts, such projects also help as tools for improving the image of the city. Coordination with state heritage institutions should be a guarantee so that new developments do not harm history. Balancing the development of the city center with the sports zone is a necessary step to avoid socio-economic imbalance and generate unnecessary traffic. Using new infrastructure projects, not only in terms of functionality, but also in creating a new image for the city becomes essential.

Use of new analytical and design methodologies at the urban and architectural level… This vision means that the consideration of the regulatory plan must give way to the "alternative projects", and the "Auto-transformation" of the city, which can begin "internally", through the implementation of specific projects with catalytic force at the urban level, as well as "externally", through the implementation of catalytic projects with radius territories.

This requires that the reading of the city and architecture be considered as a continuous whole / unity, as part of a system. With this in mind, the regulatory plan is tasked with exploring the legal space for the use of non-traditional methodologies that can apply this type of transformation.

4.1. Expanding the idea

This urban concept certainly has ambitions to expand the idea of a wider city area by connecting important points in the city in a new layer of urban element

Architecture needs to be conceptually, physically and aesthetically integrated with the natural environment. Strategically speaking, the structure presents principles for planning green infrastructure with the further growth of the city.

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Use of Social Networking Tools in Online Education During the Pandemic from Covid19

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Abstract

The purpose of the research study is analyses and assessment of the use of social networking tools in education during the pandemic from covid19. As a result of the COVID19 pandemic the entire classical educational systems have switched its focus and started to use more social networking tools not only in communication between peers but also in the online education process. There have been evidenced several teachers to use Facebook live to hold their online classes and created Facebook messenger groups with their students to post announcements and their assignments as well as to communicate and hold their consultation hours The research methodology used is triangulation technique which combines qualitative and quantitative methodology. As research method used questionnaire and focus groups. The research aims to approach the analysis of the social networking tools in online education during the pandemic from covid19 using qualitative method and questionnaire as well as two focus groups in assessing the impacting factors as well as the level of knowledge transfer. The issues, findings as well as recommendations are discussed and argumented.

Keywords: *social networking tools, covid19, digital online education, information system, web technologies*

1 Introduction

The social networking tools during the pandemic from Covid19 have changed their role from communication tools primarily for self-promotion and sharing beautiful moments with family and friends and best moments with our families have shifted and used also in online education process. There are several examples were teacher have used use Facebook live to hold their online classes and created Facebook messenger groups with their students to post announcements and their assignments as well as to communicate and hold their consultation hours. By development of new pedagogical and technological methods of teaching and computer-based devices, online education has rapidly emerged over the past few decades as an effective alternative to traditional education. Platforms that have been used for different primary roles have also changed and also have been used in online education. In order to asses this the research study was undertaken..

2 Purpose of the Study

The purpose of the research study is the analyses and assessment of the use of social networking tools not only in communication between peers but also in the online education process using qualitative method and questionnaire as well as a focus group in assessing the impacting factors as well as the level of knowledge transfer.

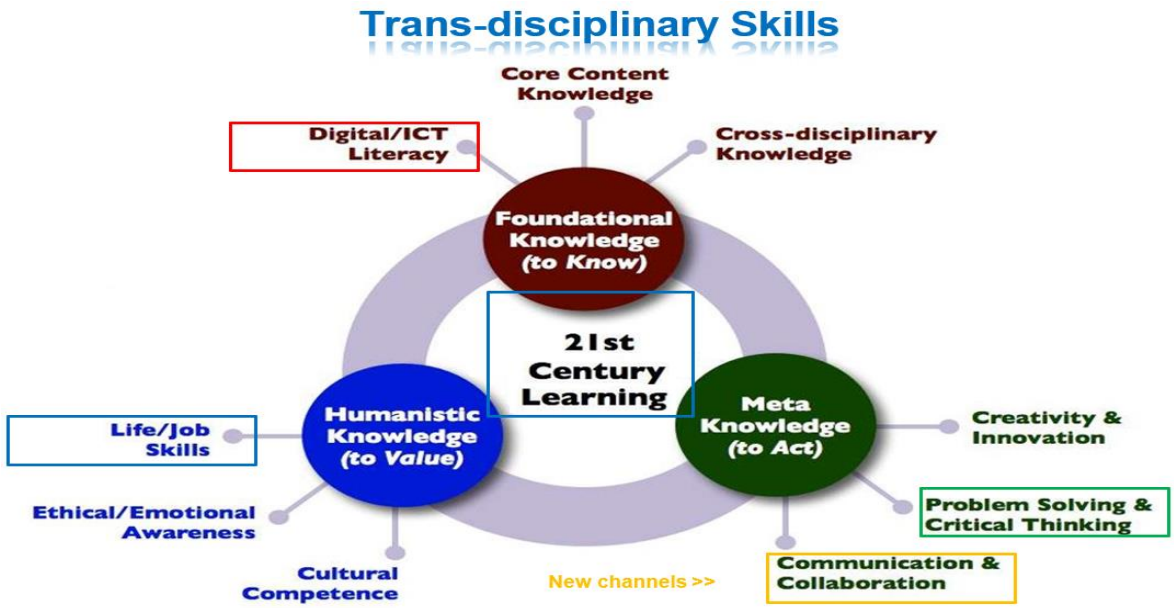

Figure 1. Analyses of the use of social networking tools and the trans-disciplinary skills needed

From the analyses of the trans-disciplinary skills required the social networking tools also respectively the solution for Metaknowledge to act, involving creativity and innovation, Problem solving and critical thinking and Communication and Collaboration. Regarding the is pandemic's level of impact on learning process the student analyses the pandemic and how it influenced the process, the teachers and students, while at the same focusing on social networking opportunities.

3 Research Methods

The research methodology used is triangulation technique which combines qualitative and quantitative methodology. As research method used quantitative method using questionnaire and focus groups. Hypothesis H1: The use of social networking tools can help in online education and increase the transfer of knowledge. Main research questions are: What are the main networking social tools used in online learning? How can we improve the online learning process using social networking tools? What are the major challenges in using social networking tools for online education?

A questionnaire was used in the study to gather data. Questions were distributed to two categories: 1) University Professors, 2) Industry. The respondents were asked to rank and comment on different questions. This was used to determine the weight or the importance of each question towards assessing the usage of social networking tools in the online learning process and assessing the impacting factors as well as the level of knowledge transfer.

4 Findings and Results

The expected findings and arguments of the work provides sufficient information on the factors that influence the use of social networking tools and provide recommendations how to improve the knowledge transfer and proper inclusion of the instructional strategies within the online learning process.

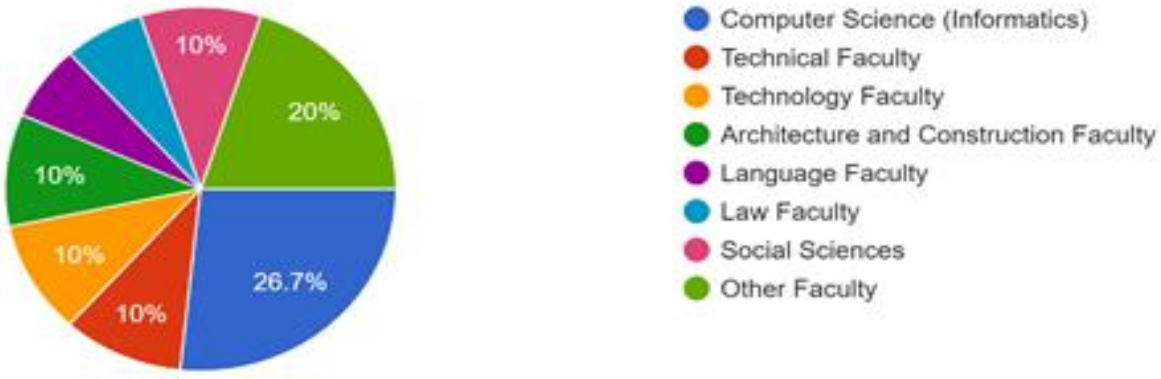

Figure 2. Field and Domain of respondents

Regarding the evaluation of the Field and Domain of respondents? The results show that 26.7% are from Computer Science/Informatics, 20% of respondents are from other faculties and the other 10% are from technical faculty, technology, architecture, language, law, social sciences Faculty.

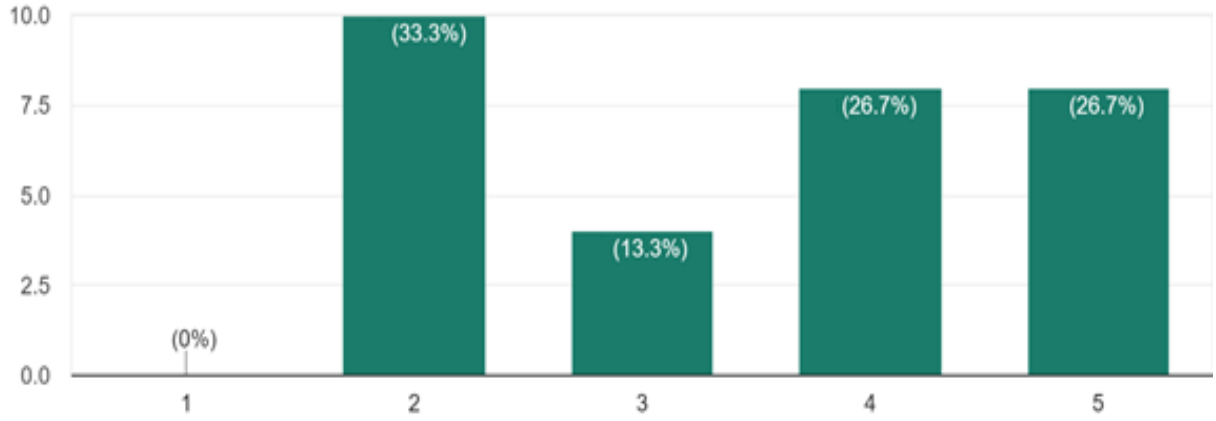

Figure 3 Use social networks for collaborative learning

Regarding the evaluation of the Use social networks for collaborative learning? The results show that 26.7% agree completely that they use social networks for collaborative learning, 26.7% agree, 13.3% of respondents are neutral and 33.3% disagree and are not use much of social networking for learning. In total 53.4% declare they are suing social networking for collaborative learning.

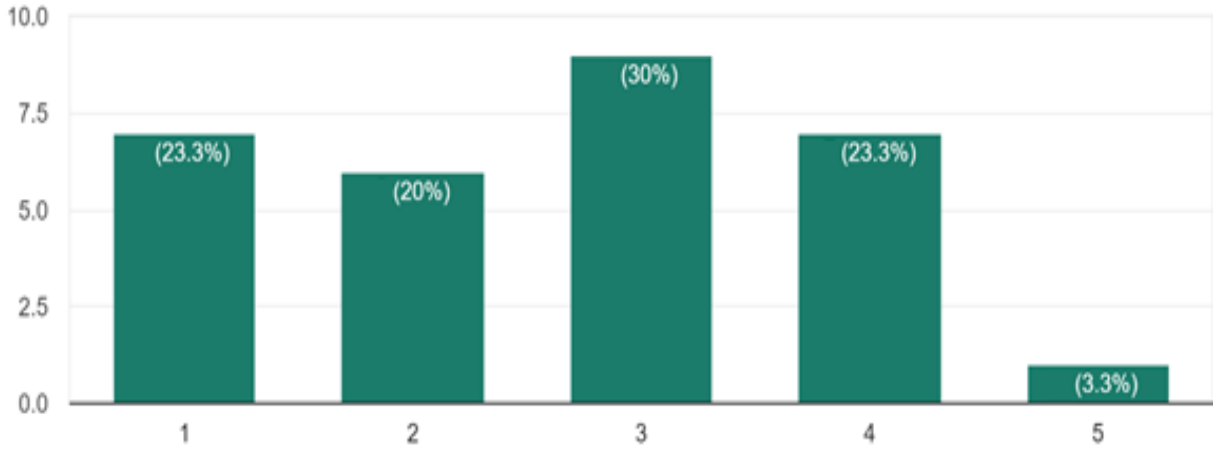

Figure 4. Use social networks to solve my assignments

Regarding the evaluation of the Use social networks to solve my assignments? The results show that 3.3% agree completely that they use social networks to solve their assignment, 23.3% agree, 30% of respondents are neutral and 20% disagree and 23.3% totally disagree and are not using social networking for assignments. In total 73.3% declare they are not using social networking for solving their assignments.

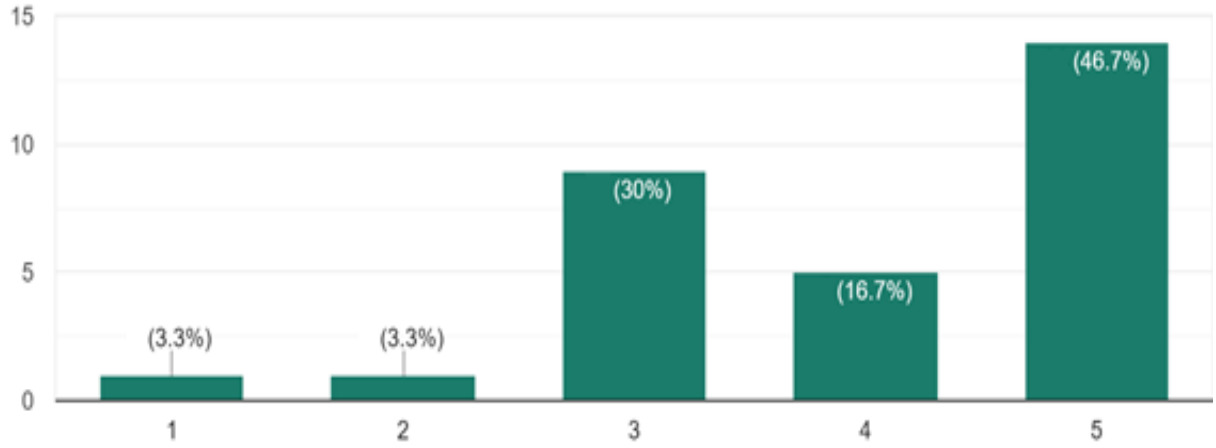

Figure 5. use social networks for online group discussions

Regarding the evaluation of the use social networks for online group discussions? The results show that 46.7% agree completely that they use social networks for online group discussions, 16.7% agree, 30% of respondents are neutral and 3.3% disagree and 3.3% totally disagree and are not using social networking for online group discussions. In total 63.4% declare they are using social networking for online group discussions.

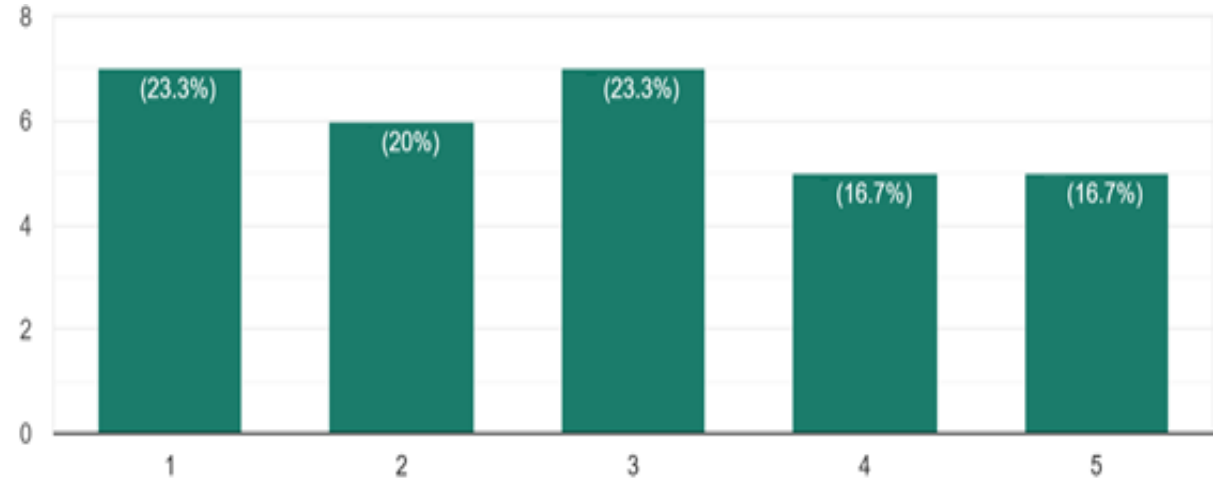

Figure 6. communicate with my friends for preparation of group projects

Regarding the evaluation of the Use social networks communicate with friends for preparation of group projects? The results show that 16.7% agree completely that they use social networks communicate with friends for preparation of group projects, 16.7% agree, 23.3% of respondents are neutral and 20% disagree and 23.3% totally disagree and are not using social networking for preparation of group projects. In total 66.6% declare they are not using social networking for communicate with friends for preparation of group projects.

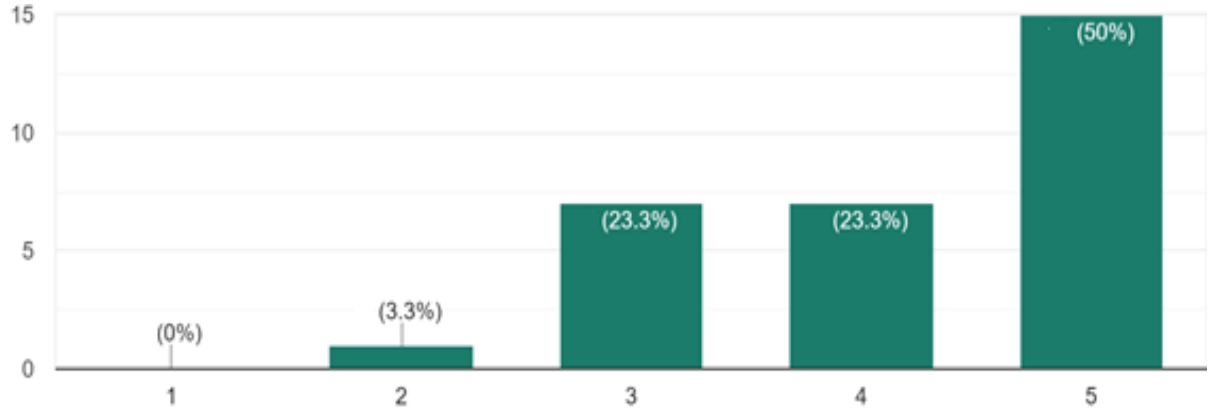

Figure 7. use social networks for sharing ideas and communicate them

Regarding the evaluation of the use social networks for sharing ideas and communicate them? The results show that 50% agree completely that they use social networks use social networks for sharing ideas and communicate them, 23.3% agree, 23.3% of respondents are neutral and 3.3% disagree and are not using social networking for use social networks for sharing ideas and communicate them. In total 73.3% declare they are using social networking use social networks for sharing ideas and communicate them.

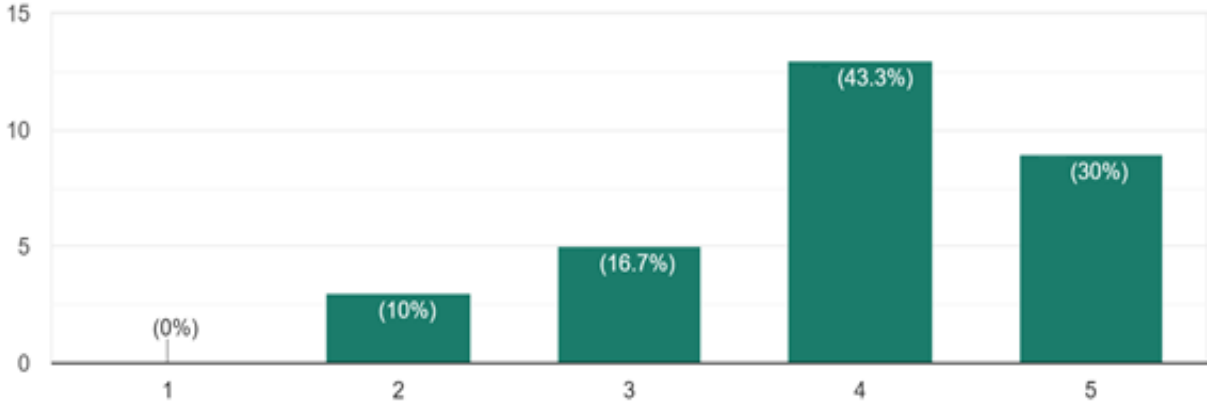

Figure 8. How would you rate your overall skills in using social networks for education?

Regarding the evaluation of the rating highly the overall skills they have in using social networks for education? The results show that 30% agree completely that they rate highly the overall skills in using social networks for education, 43.3% agree, 16.7% of respondents are neutral and 10% disagree and are not rating highly the overall skills they have in using social networks for education. In total 73.3% declare they are rating highly the overall skills they have in using social networks for education.

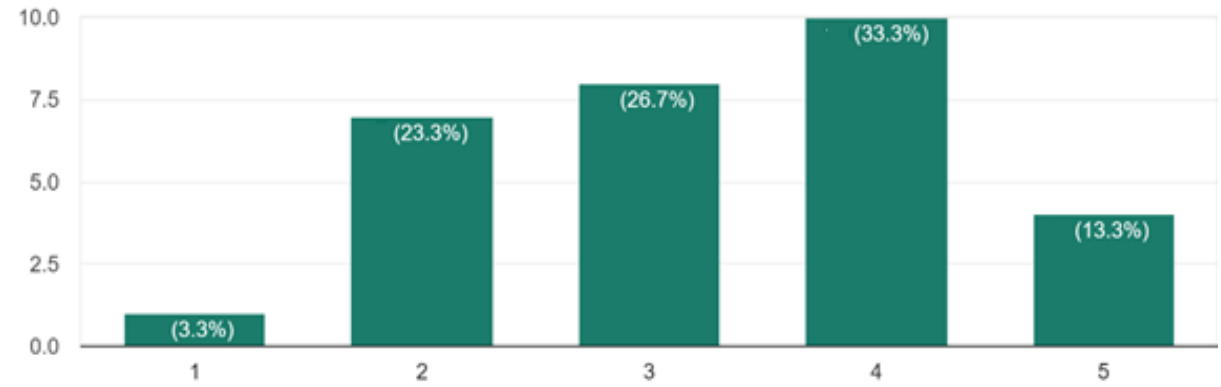

Figure 9. rate your interest in learning using social networks

Regarding the evaluation of the rating their interest in learning using social networks? The results show that 13.3% agree completely that they use social networks interest and rate highly their interest in learning using social networks, 33.3% agree, 26.7% of respondents are neutral and 23.3% disagree and 3.3% totally disagree and are not use social networks interest and rate very low their interest in learning using social networks. In total 46.6% declare they are using social networks interest and rate highly their interest in learning using social networks

The proposed method for improvement

Figure 10. The proposed method for improvement

In order to improve the and rate of interest in learning using social networks the research study proposes the following method. Firstly, 1) to develop confident communication skills, 2) Work collaboratively both synchronously and asynchronously, 3) Develop professional online presence using LinkedIn and other social networking tools, 4) develop creativity.

5 Conclusion and Recommendations

The research study provides a review of the published literature as well as an analysis of the emerging trends in using social networking tools in the online learning process and its assessment using qualitative method.

Based on the literature review, as the most significant steps toward implementing and

developing a successful online learning the student's involvement and acceptance of the technological tools decide upon the level of the knowledge transfer. Also, identifying the optimal requirements and definitions is considered as a major step in order application to be powerful and reliable.

Social networking plays an important role in today's educational system. Social networking promises to be a powerful educational tool that allows students to collaborate and share information as never before. With proper instructional methods that could enhance and expand learning opportunities for students is of great importance in the ever-changing global landscape. Since education is a competitive area now, it is the duty of education management to take necessary steps that are demanded by the time.

The proposed method is thought to increase the level of interest and improve the student involvement in using social networking in the learning process.

Recommendations are

1. Opportunities should be provided to students and teachers to have sufficient knowledge for the positive use of social media and the access to them in the campuses. For this, school leaders should make use of the knowledge and time of the external experts in this field;
2. The use of social media among the staff and students should be assessed by making use of the help of the information technology professionals;
3. Perception of staff and students towards social media should be evaluated by conducting timely research;
4. The fact that social networks have the potential to be both constructive and destructive in the classroom context should be reminded;
5. Teachers should be aware of the fact that there are many social networks that can really help in education. They should know the pros and cons of social networks before they are used as a tool for education.

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Numerical Analysis on Fire Resistance of Rc Beams with Different Cross Section Width

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Abstract

A parametric analysis of two span continuous reinforced concrete beams exposed to standard ISO 834 fire curve is presented in this paper. The influence of the cross section dimensions on the fire resistance of the beams exposed to fire only from three sides is analyzed.

The analysis of the reinforced concrete beams is conducted by using the computer progam FIRE which consists of two modules. The module FIRE-T defines the non-linear and non-stationary temperature field in the cross section of the fire exposed elements, while the structural response to the high temperatures is defined with the FIRE-S module. Temperature dependent mechanical and thermal properties of the structural materials (concrete and steel) are taken according to the recommendations given in Eurocode 2, part 1.2.

The analysis has shown that the width of the cross section has positive effect on the fire resistance of the analyzed RC beams. Due to the wider cross section the temperature penetration is slower. The concrete temperature in the middle of the section and the reinforcement temperatures are slightly lower, consequently a higher fire resistance is achieved.

Based on the results of the conducted analysis the behavior of the reinforced concrete beam exposed to fire has been defined and recommendations for increasing the fire resistance are given.

Keywords: *Continuous RC beam; Standard fire curve; Thermal analysis; Fire resistance.*

1.Introduction

The analysis of fire impact on continuous reinforced concrete beams as building structural elements is presented in this paper. The influence of the cross-section width of continuous reinforced concrete beam on the fire resistance is analyzed. The analyses are carried out on continuous reinforced concrete beams loaded with constant distributed loads and exposed to standard fire ISO 834 from three sides, The following resistance criteria are controlled: R60, R90, R180 and R240.

The main objective of this paper is to define data on impact of analyzed parameters on the fire resistance of continuous reinforced concrete beams. When designing structures for ambient temperature, these data should be taken as appropriate measures for ensuring greater fire resistance and better fire safety of buildings. The parametric analysis of continuous reinforced concrete beams was performed using the computer program FIRE. The analyses were performed for continuous reinforced concrete beams with cross section dimensions 30x40 cm, as well as for continuous reinforced concrete beams with cross section dimensions 40x40 cm. The rise of temperature in the fire sector over time is defined by the standard fire curve ISO 834.

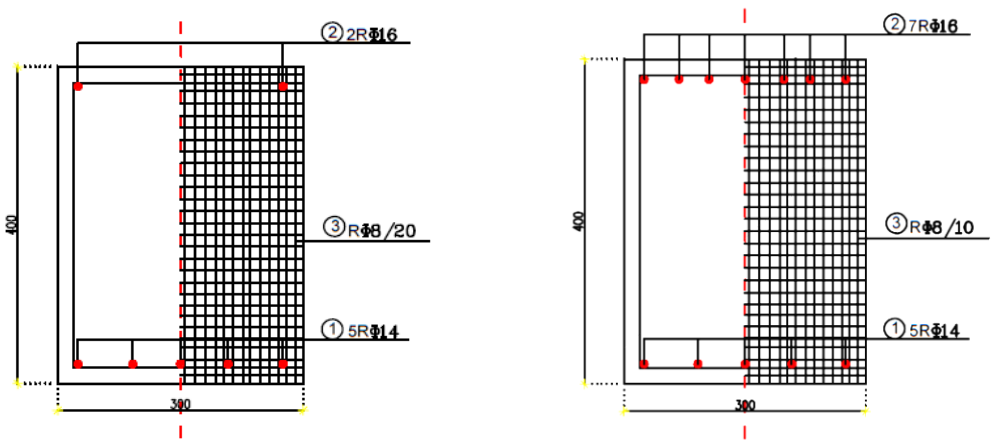
Temperature dependent mechanical and thermal properties of the constitutive materials (concrete and steel) have been adopted in accordance with the recommendations given in Eurocode 2-1-2, which also provides the design procedures for the approximate calculation on fire resistance of structural elements.

2.Numerical analysis on fire resistance of continuous RC beams

The influence of the cross section width on the fire resistance of continuous reinforced concrete beam with spans 2 x 5 = 10 m is analyzed. The first case is when the cross section is 30/40 cm, while the second case is when the cross section is 40/40 cm. In both cases, the beam is exposed to a permanent load of 23 kN / m ' and a variable load of 10 kN / m'.

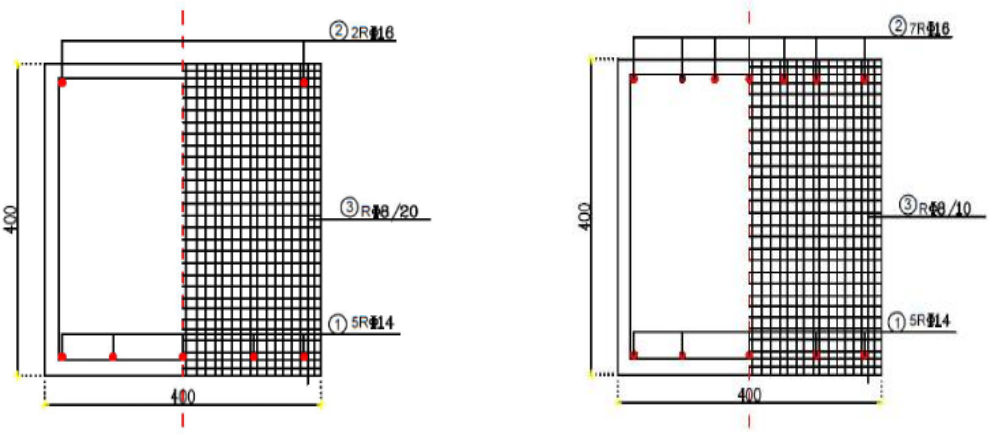
According to the calculations carried out for ambient temperature, in case of a beam with cross section 30/40 cm, 5ϕ14 were adopted as the main positive reinforcement in the bottom part of the cross section, 2ϕ16 were adopted in the top zone along the whole span, while 5ϕ16 bars were added as negative reinforcement above the internal support (Figure 1). According to the recommendations for providing higher fire resistance, 20% of the main reinforcement over the supports should be extended along the span, and for this reason the longitudinal reinforcement in the top zone have been adopted to be 2ϕ16.

According to the calculations for the cross section 40/40 cm, the same number of reinforcing bars were adopted: 5ϕ14 were adopted as main reinforcement in the bottom zone, and 2ϕ16 were adopted as longitudinal reinforcement in the top zone, while 5ϕ6 were added above the support as negative reinforcement (Figure 2).



a) cross section along the span b) cross section above the support

Figure 1: Cross section of continuous reinforced concrete beam along the span and above the support, for cross section dimensions 30/40 cm



a) cross section along the span b) cross section above the support

Figure 2: Cross section of continuous reinforced concrete beam along the span and above the support, for cross section dimensions 40/40 cm

According to the calculations carried out by using the computer program FIRE, for the cross section 30x40 cm, the beam failure is reached after 124 min., while for the cross section 40x40

cm it is achieved after 136 min. The computer program FIRE allows to present the time development of the temperature in each of reinforcing bars. Figure 3 and Figure 4 shows the temperature rise in the reinforcing bars in the beam as function of time, for both of cross sections.

The reinforcing bars marked as element 1, 2 and 3, located in the lower zone of the beam, are significantly hotter than the reinforcing bars located in the upper zone, due to the fact that the lower bars are exposed to direct fire action from the lower side and laterally, while the upper bars are in the zone without action of fire (the beam is incorporated into RC slab).

The temperature values for the steel elements 1, 2 and 3, defined with the program FIRE, are presented in Table 1. The results indicate that the temperature in the steel elements differ due to the different width of the cross sections.

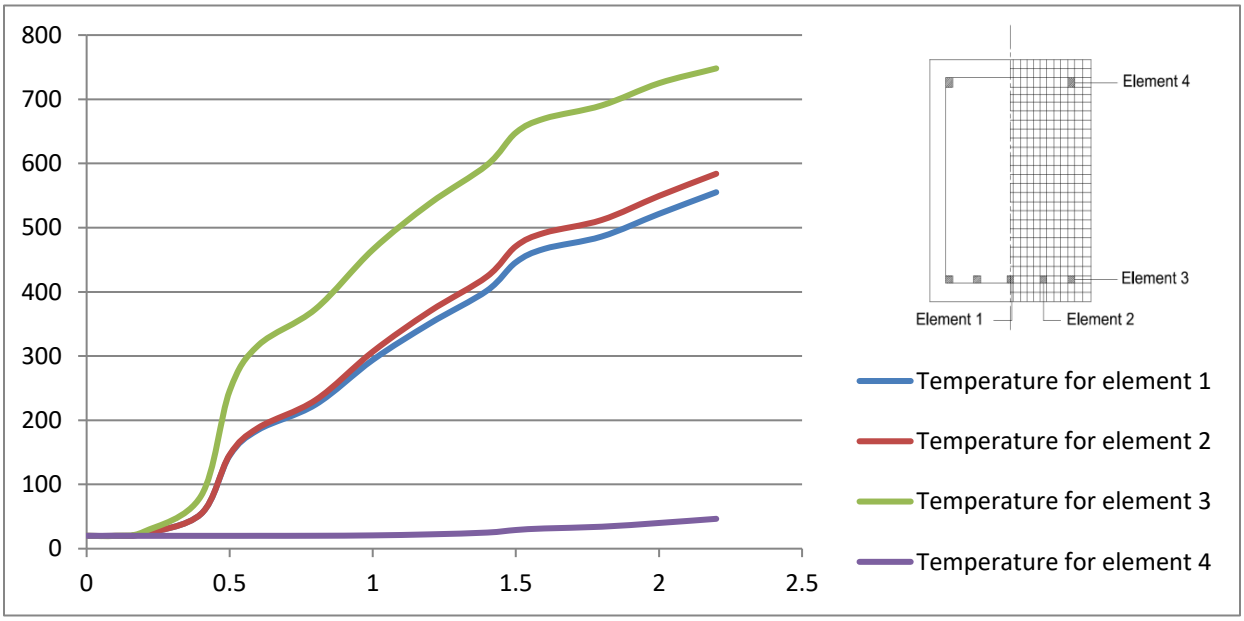


Figure 3. Temperature diagrams for steel elements defined with the program FIRE, for cross section 30/40 cm

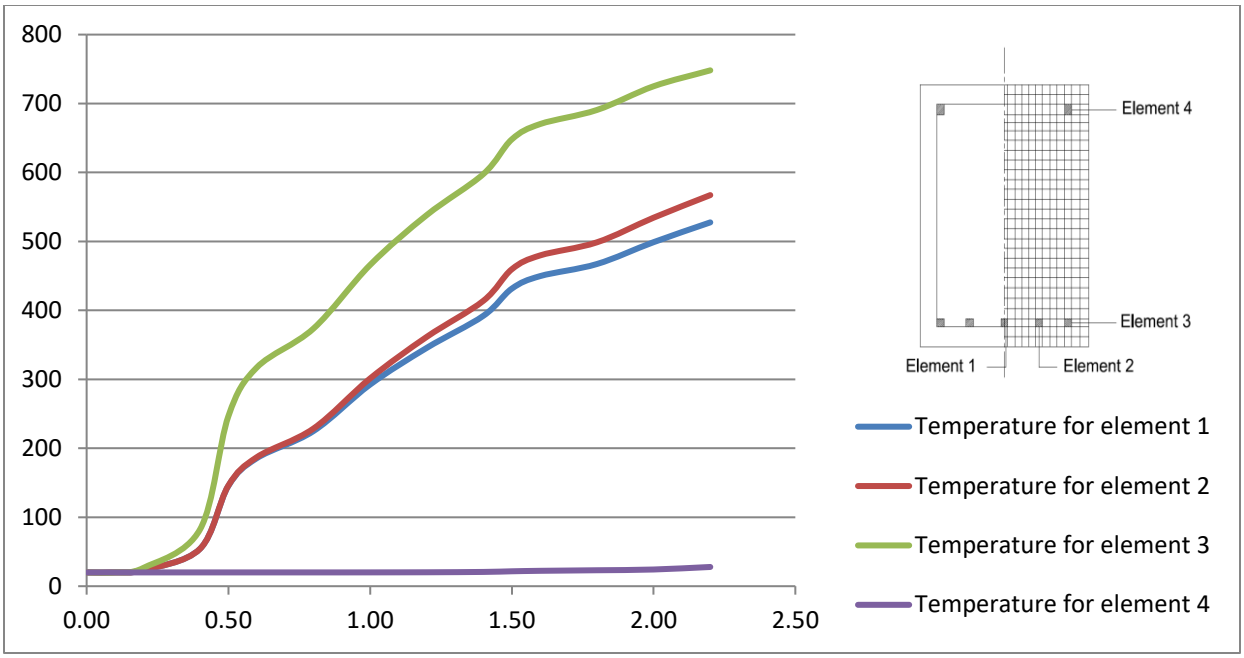


Figure 4. Temperature diagrams for steel elements defined with the program FIRE, for cross section 40/40 cm

Table 1. Temperature of steel elements defined with the program FIRE, for cross section 30/40 cm and cross section 40/40 cm

Cross section 30/40 cm			Cross section 40/40 cm		
Time (min)	Element	Temperature (°C)	Time (min)	Element	Temperature (°C)
60	1	310	60	1	300
	2	310		2	300
	3	465		3	465
90	1	470	90	1	460
	2	470		2	460
	3	650		3	650
120	1	550	120	1	535
	2	550		2	535
	3	725		3	725

According to the results presented in the Table 1, there is a minimal difference in the temperatures of the reinforcing bars for both cross sections. This is due to the different width of the section and the same thickness of the protective concrete layer.

For both cross sections and for given fire resistance: R60, R90, R120 and R180, the values of the bending moment in the mid span and at the support, the values for the stresses in the reinforcing bars and the percentage of their utilization, the fire resistance time and the values of the vertical displacements at different moments of fire action are defined by using the computer program FIRE.

The time redistribution of bending moments at the mid span and at the support, for cross section 30/40 cm and cross section 40/40 cm, are presented in Figure 5 and Figure 6.

The maximum bending moment at the mid span, for cross section 30/40 cm, is reached at the beginning of the fire action and its value is $M_{midspan}$ = 45.77 kNm, while the maximum moment at the support is reached after 1 hour of fire action and the value is $M_{support}$ = - 190.85 kNm. For the cross section 40/40 cm, the values for the bending moments at the mid span and at the support are: $M_{midspan}$ = 45.99 kNm, and $M_{support}$ = - 187.35 kNm, respectively. The small difference in the obtained results is due to the greater width of the cross section 40/40 cm.

By using the computer program FIRE, values for bending moments in the mid span and at the support are obtained and given in Table 2. The small difference is due to the different width of the section.

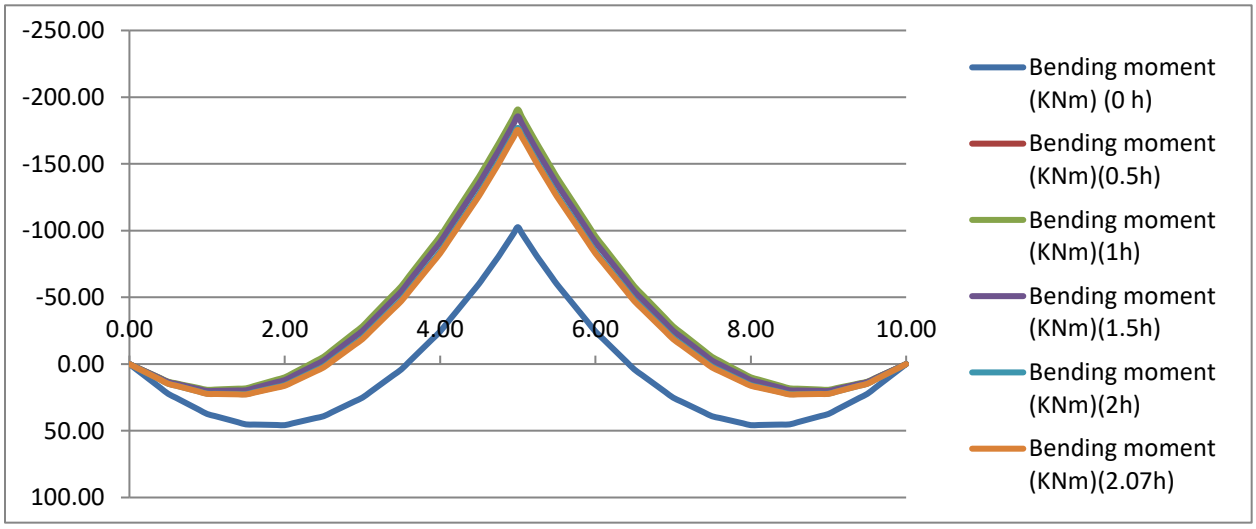


Figure 5. Time redistribution of bending moments for cross section 30/40 cm, in case of ISO 834 standard fire action

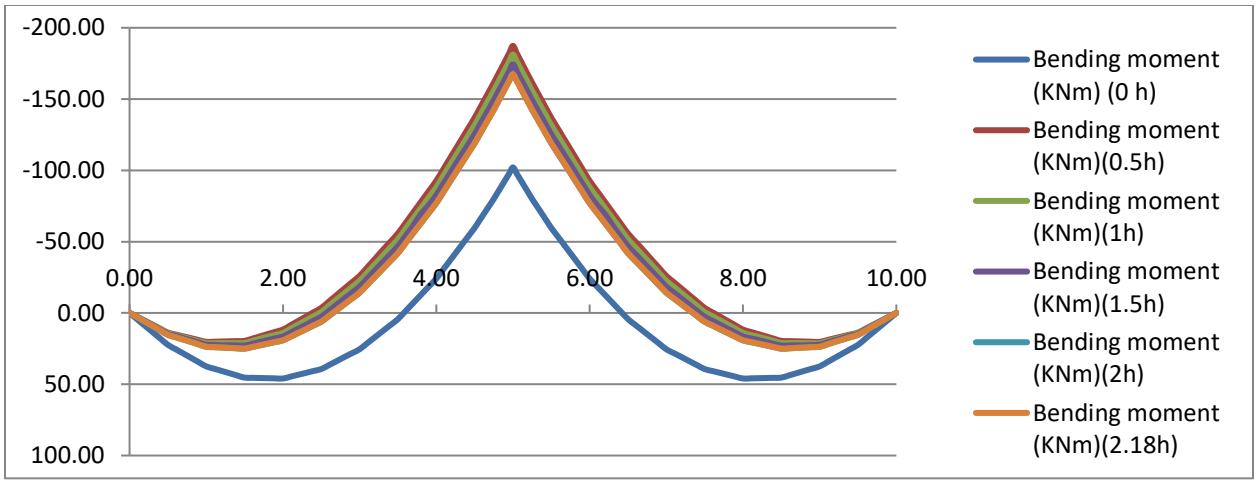


Figure 6. Time redistribution of bending moments for cross section 40/40 cm, in case of ISO 834 standard fire action

Table 2. Bending moment at the mid span and at the support according to computer program

Cross section 30/40 cm			Cross section 40/40 cm		
Time (min)	Bending moment at the mid span (kNm)	Bending moment at the support (kNm)	Time (min)	Bending moment at the mid span (kNm)	Bending moment at the support (kNm)
60	19.1	-185.5	60	19.1	-181.3
90	20.1	-185.7	90	20.1	-174.5
120	22.4	-175.85	120	22.4	-167.5

FIRE, for cross sections 30/40 cm and 40/40 cm

Figure 7 presents the stress diagram for the steel element 3 over time. The element 3 has the highest temperature because it is located in the corner, at the lower zone of the section and has reduced strength characteristics. At the beginning of the fire action, as a result of temperature differences, the hot bottom part of the section (concrete) is in compression while, for reaching the equilibrium of the cross section, the tension stress in this reinforcing bar is increased, but due to the redistribution of the bending moments, it is relieved, and the tension stress even changes the sign.

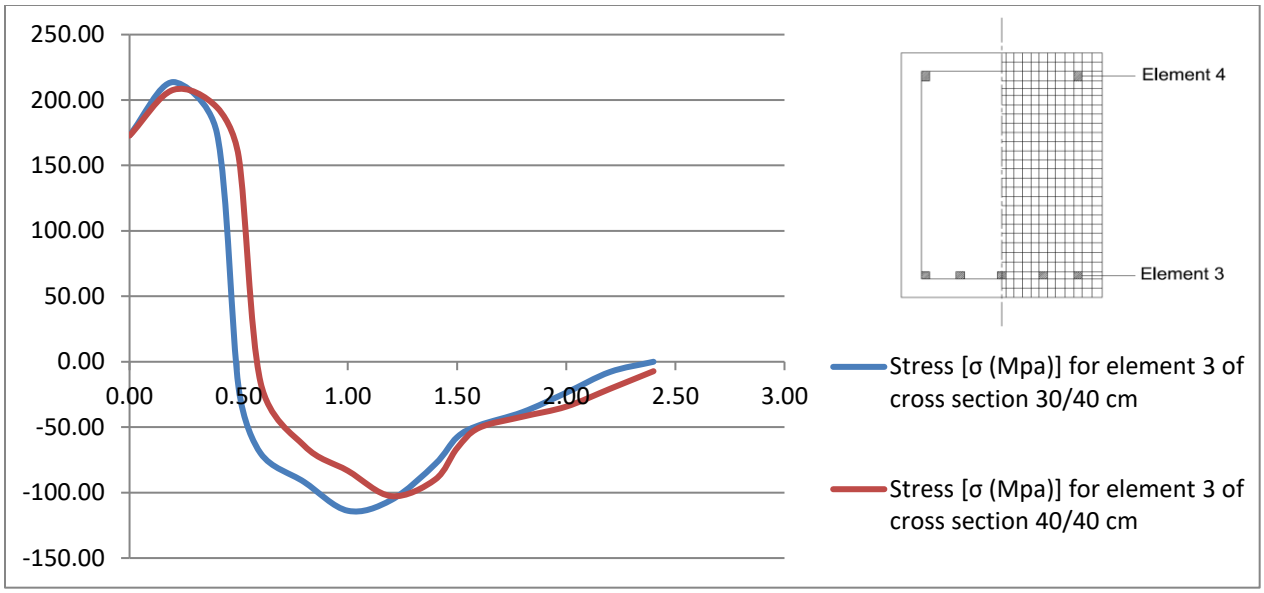


Figure 7. Diagram of maximum and minimum values of stresses for steel element 3 of cross section 30/40 cm and cross section 40/40 cm

Figure 8 presents the stress diagram for the steel element 4 over time. This element is cold for the whole time of the fire action, but due to the redistribution of the bending moments, the stresses quickly increase to 100% of the yielding strength.

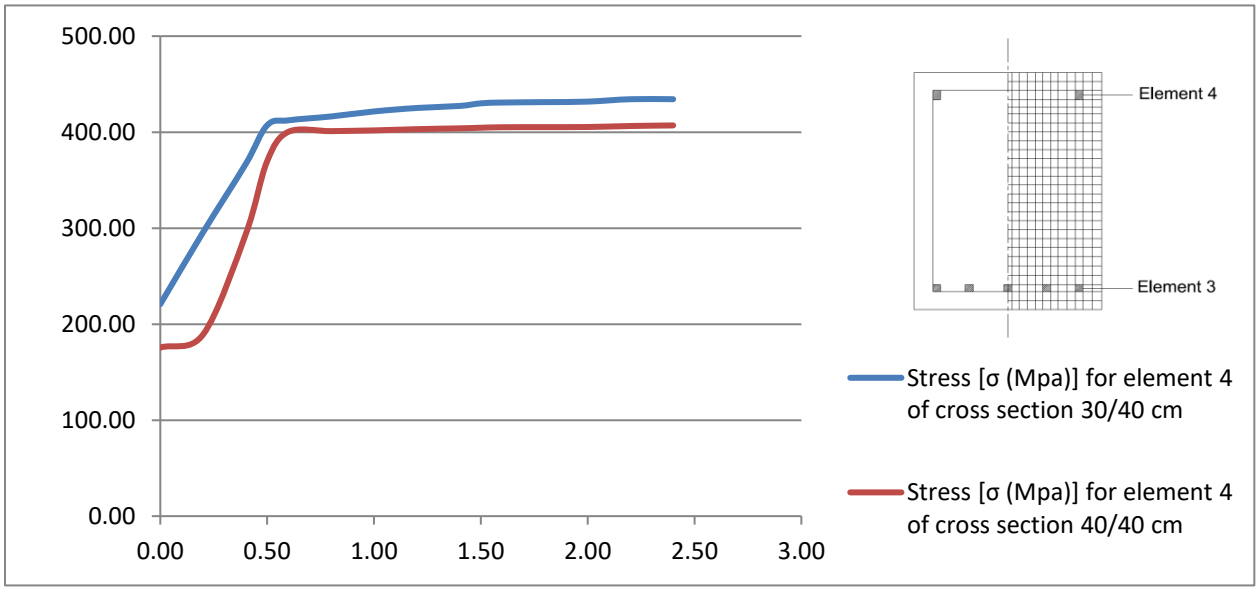


Figure 8. Diagram of maximum and minimum values of stresses for steel element 4 of cross section 30/40 cm and cross section 40/40 cm

The stress values for the corresponding steel elements are given in the Table 3.

Table 3: Maximum and minimum values of stresses for steel elements 3 and 4 of cross section 30/40 cm and cross section 40/40 cm

Cross Section 30/40 cm		Cross Section 40/40 cm	
Element	$\sigma_{max}/\sigma_{min}$ [MPa]	Element	$\sigma_{max}/\sigma_{min}$ [MPa]
3	213.74 / - 113.8	3	223.74 / -102.69
4	434.31 / 220.74	4	407 / 175.65

According to the analysis performed for both cross sections and the results for the time dependent stresses in steel elements it can be concluded that the width of the cross section does not have a significant effect on the stresses in the steel elements and consequently the influence on the fire resistance of the beams is minimal.

Figure 9 and Figure 10 present the diagrams for the time development of the vertical displacements of the continuous RC beams exposed to fire from the bottom side. As a result of the wider cross section, the beam with cross section 40/40 cm is stiffer than the beam with cross section 30/40 cm and this results with lower values for the vertical displacements of the first beam at same moment of fire action. After 2 hours of fire action the vertical displacement of the beam with cross section 30/40 cm is y=5.48 cm, while for the beam with cross section 40/40 cm it is y=4.95 cm. As a result of 12 minutes higher fire resistance of the second beam, the temperatures in the cross section are higher and the vertical displacements at the moment of failure are higher than for the first one. For the continuous RC beam with cross section 30/40 cm the maximal deflection is y=5.7 cm, while for the continuous RC beam with cross section 40/40 cm is y=5.95 cm.

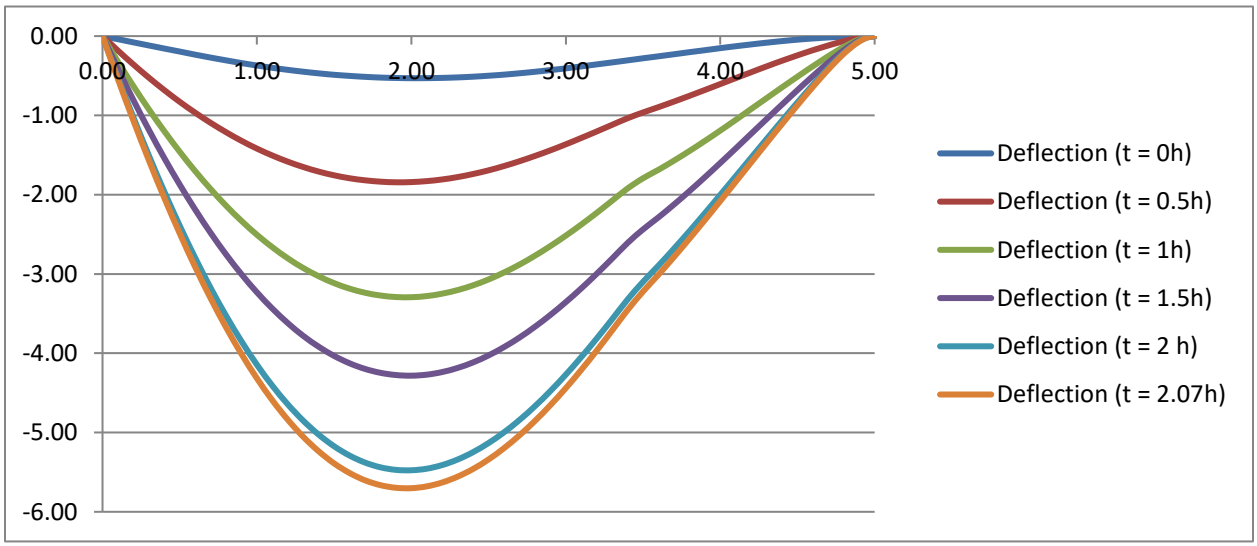


Figure 9. Time development of the vertical displacements of the continuous RC beam with cross section 30x40 cm, exposed to standard fire from the bottom side

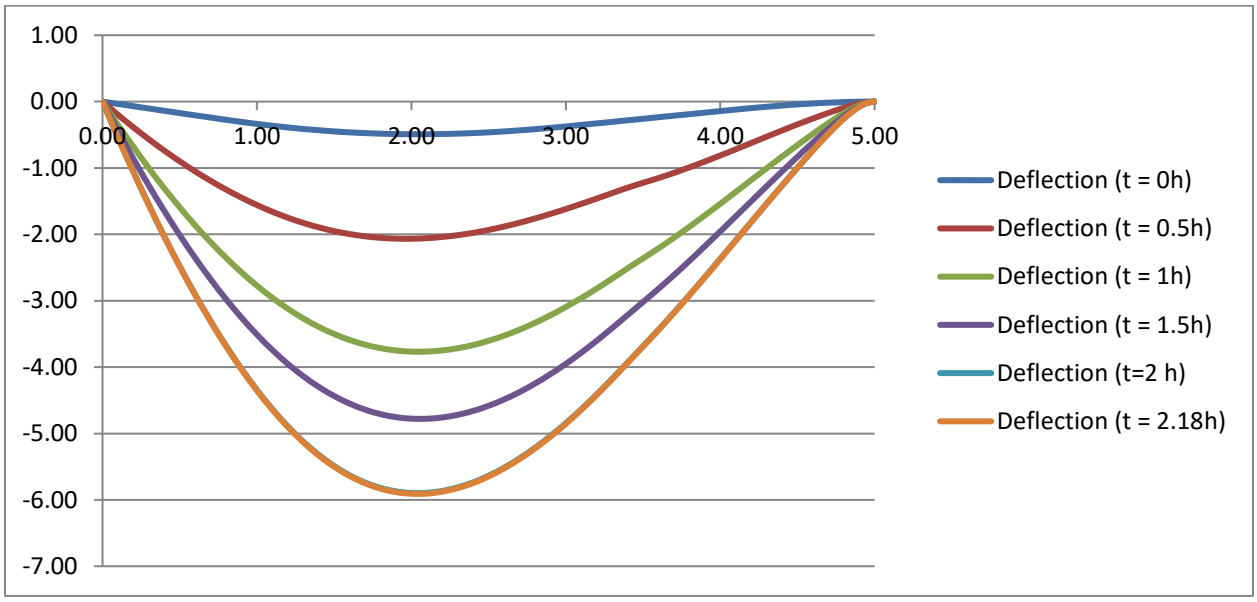


Figure 10. Time development of the vertical displacements of the continuous RC beam with cross section 40x40 cm, exposed to standard fire from the bottom side

Conclusions and recommendations

Fire resistance of continuous reinforced concrete beams depends on: geometrical characteristics of the beams, temperature dependent mechanical and thermal properties of the materials, concrete cover thickness, steel ratio and fire scenario. Dimensions of the cross sections play an important role in determining the fire resistance of the beams.

Two types of continuous reinforced concrete beams, with cross section dimensions 30/40 cm and 40/40 cm, and permanent load "q", are analysed and the fire resistance is defined, using the computer program FIRE.

According to the presented results the conclusion is that the width of the beam cross section has a positive effect on it's fire resistance. In case of wider cross section, the fire resistance is slightly higher due to the slower temperature penetration into the beam cross section. It is expected the width of the beam to have much better effect. This problem will be investigated in future.

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Analyses Of Pollution And Devising Pollution Prevention Strategy using Software Solutions

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Abstract

The purpose of the research study is analyses and preventing pollution that is a compelling strategy for many reasons. The huge dependence on ecosystem management services resulting in depletion of natural resources and biodiversity is one of the major challenges in efforts to mitigate and adapt to climate change and improve the quality of life. The research aims to approach the analysis of the possibilities for reducing pollution as well as its reporting by the citizens themselves. Raising public awareness among citizens and encouraging a sense of responsibility in the protection and promotion of the environment, by animating the young population in taking measures to prevent or reduce environmental pollution. The expected findings and arguments of the work provides sufficient information on sources of pollution and how to address them especially by firstly focusing on increasing the awareness to these factor and damages that pollution is causing to health in general. For the realization of the research, development of a software portal is envisaged. The research methodology used is triangulation technique which combines qualitative and quantitative methodology. As research method used questionnaire and focus groups.

Keywords: *ecology, pollution prevention, biodiversity, information system, rising public awareness*

1 Introduction

Environment pollution is one of the major problems of today's society. Raising public awareness among citizens and encouraging a sense of responsibility in the protection and promotion of the environment, by animating the young population in taking measures to prevent or reduce environmental pollution. This research is important to be undertaken and solved because they pose threat to life and well-being of all citizens and bring different other illnesses.

2 Literature Review

According to (UNECE 2020), (UNEP 2018), and (Karlsson et all 2009) on the global level, overall goals for avoiding dangerous climate change under the UNFCCC (UNEP 2018), for conserving biodiversity under the CBD (Karlsson et al 2009) and for minimizing adverse effects of chemicals, as set out at the World Summit for Sustainable Development (UNEP 2019), are far from met. In the EU, the key objectives in the 7th Environmental Action Programme are out of reach (Freeman et al 2012). On national levels, environmental goals are similarly often not achieved (Horne et al, 2006), for example in the environmental forerunner country Sweden, where only 1 out of 16 national environmental quality objectives set by the parliament is assessed to be reachable by the set target date (SEPA 2019). Considering trends and interim targets, the picture is often more complex as discussed by (UNECE 2020) with plenty of examples of backsliding, but also of progress, not seldom in the short term, meaning that overall goals may be reached in the future, but later than what has been agreed in the democratic political process by (UNECE 2020). Progress is actually taking place in many cases, albeit with delay. Paradoxically, delay is sometimes occurring even when the body of knowledge on problems and solutions is solid, when goals are democratically balanced and agreed, and when mitigating strategies are technologically available and economically feasible or even profitable. This latter situation is observed, for example, in climate policy, where societal co-benefits of instruments and measures are estimated to be significantly larger that mitigation costs (Karlsson 2017). However, while much research in various disciplines has been devoted to science and policy processes in relation to environmental goals, the knowledge on various causes for delay is still incomplete.

3 Purpose of the Study

The purpose of the research study is preventing pollution that is a compelling strategy for many reasons. If no pollution is generated, there are no pollutants to be managed. Thus, contribute in that future problems are avoided, such as the problems which occur when previously accepted land disposal methods are discovered to be major sources of environmental contamination. Preventing pollution before it occurs can also contribute prevents situations that not only might endanger members of the community, but workers involved in the management of pollution as well. The development of two software's is envisaged, namely 1) mobile application through which the citizens will report the pollution by taking a photo with time and coordinates, and it will be sent to the Ministry and they will read about the latest reports and 2) web portal on which all reported pollution by citizens will appear and a forum where ideas for

solutions will be reported by the citizens themselves and by experts. The data from the portal will be used for dynamic analysis of pollution.

Figure 2. Danger levels of pollution (UNECE 2020)

There are three mayor danger levels from pollution that affects the human health and those are allergens & particulates, second level are the toxic compounds, and the third level are the infectious agent's impact.

4 Research Methods

The research methodology used is triangulation technique which combines qualitative and quantitative methodology. As research method used questionnaire and focus groups. Hypothesis H1: The proper reporting of the type and extension of the pollution can help in proper assessment and prevention of pollution. Main research questions are: How can we reduce pollution? What are the main pollution sources? How can we animate the young population in taking measures to prevent or reduce environmental pollution? What are the major challenges in efforts to mitigate and adapt to climate change?

5 Findings and Results

The expected findings and arguments of the work provides sufficient information on sources of pollution and how to address them especially by firstly focusing on increasing the awareness to these factor and damages that pollution is causing to health in general.

As part of this activity, a strategy for ways to raise public awareness was first developed. For the realization of this, a survey was conducted.

The survey contained 9 questions. The purpose of the survey was what is the best approach and what are the best ways to analyze pollution and raise environmental awareness of citizens.

As witnesses of enormous environmental pollution and disturbance of natural habitats and biodiversity, it is normal to look for the reasons for this situation between: disobedience to the law, insufficient education for protection and preservation of the environment in all strata of society, low level of awareness and the insufficient engagement of the citizens in joint initiatives for a cleaner environment.

The surveys were divided and the need for their education to exercise their right to live in a healthy environment in which they also have an obligation to promote and protect it.

The results showed that the best ways to educate and raise public awareness are website development, pamphlets and brochures as well as organizing seminars and workshops with younger students.

Based on the results of the survey, it was decided to make pamphlets and brochures and they were distributed to the students at Mother Teresa University, the Faculty of Informatics and the Faculty of Technology. Also, for their further distribution to other younger people in the city, several students from Mother Teresa University were engaged.

Q1. Are you a high school pupil or a student?

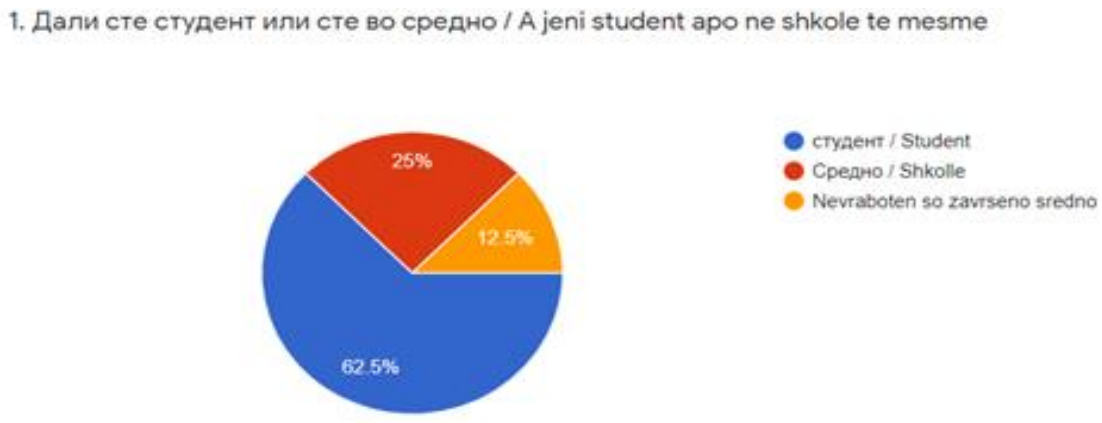

Figure 2. Are you a high school pupil or a student?

Since we are targeting the younger generation for increasing the awareness, than we need to found out about the background of the participants. The results show that 62.5% are students, and 25% are high school pupil, and the other 12.5% have finished high school but are unemployed.

Q2. At which school or University are you?

2. Во кое школо или Универзитет и кој смер сте / Shkolla ose Universiteti dhe Drejtimi ku jeni

MTU Mekatronika
Univerzitet Majka Tereza - Informatika
UNT - Informatike
UNT - Teknologji ushqimore
MArija Kiri - Kimi
sredno uciliste georgi dimitrov skopje
sredno uciliste nikola karev skopje
UNT - Teknik Ekonomi

Figure 3 At which school or University are you?

Regarding the school or institution, the participants are coming from we can see that they are from different high schools and from different Faculties from University Mother Teresa in Skopje.

Q3. Your Gender?

3. Вашиот пол / Gjinia juaj

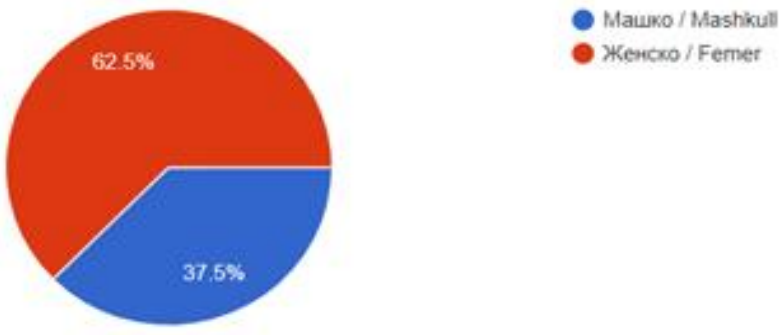

Figure 4. Gender Analyses (Red- Female, Blue - Mail)

Regarding the is pandemic's level of impact on teachers. The results show that 30% totally agree and 50% agree while 20% are neutral. Nobody disagrees. In total larger number 90 % of the respondents agree that the pandemic has highly influenced the teachers, but not as much as did the students.

Q4. How you evaluate the pollution situation at your place? Legend: 1) Very Good – 5) Very bad

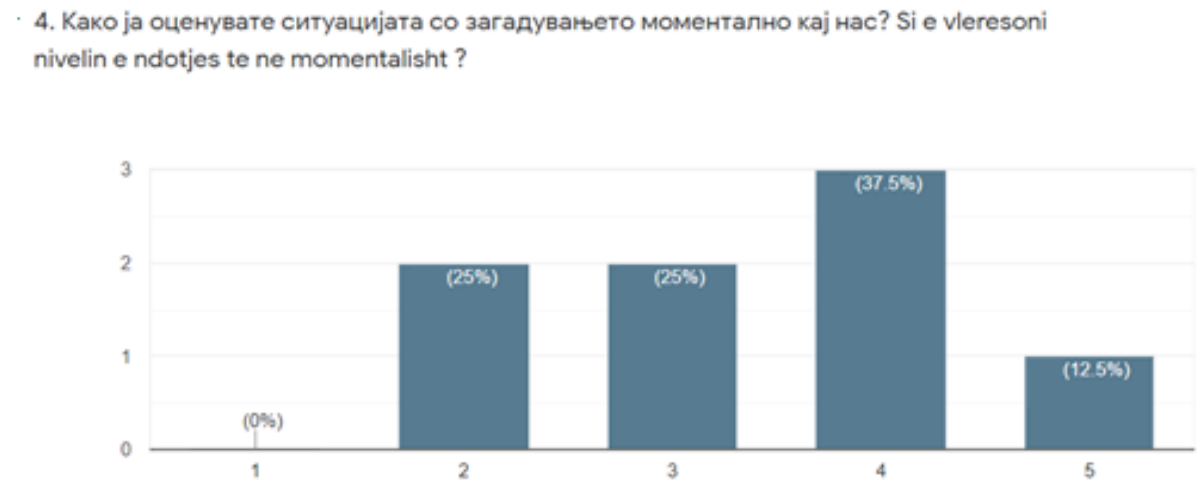

Figure 5. How you evaluate the pollution situation at your place?

Regarding the evaluation of the pollution situation at their place. The results show that 12.5% totally agree it is very bad and 37.5% agree it is bad situation, while 25% are neutral, and 25% think it is so normal situation. Nobody thinks it is very good. In total larger number 50 % of the respondents agree that the pollution is bad in general.

Q5. How you evaluate the overall quality of the air in your city? Legend: 1) Very Good – 5) Very bad

Figure 6. How you evaluate the overall quality of the air in your city?

Regarding the evaluation of the overall quality of the air in your city. The results show that 12.5% totally agree it is very bad and 37.5% agree it is bad situation, while 25% are neutral, and 12.5% think it is so normal situation and 12.5% think it is very good air quality where they live. In total larger number 50 % of the respondents agree that the pollution is bad in general.

Q6. How do you evaluate the overall pollution situation at your city comparing last year?

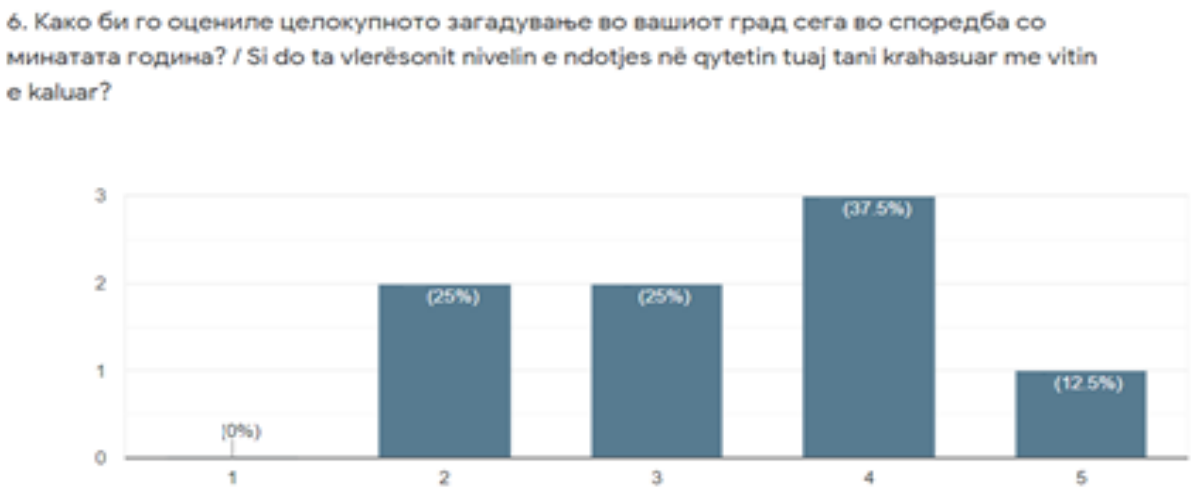

Figure 7. How do you evaluate the overall pollution situation at your city comparing last year?

Regarding the evaluation of the overall pollution situation at their city comparing last year. The results show that 12.5% totally agree it is very bad and 37.5% agree it is bad situation, while 25% are neutral, and 25% think it is normal same situation. In total larger number 50 % of the respondents agree that the pollution is worse than last year in general.

Q7. How much does pollution affect you?

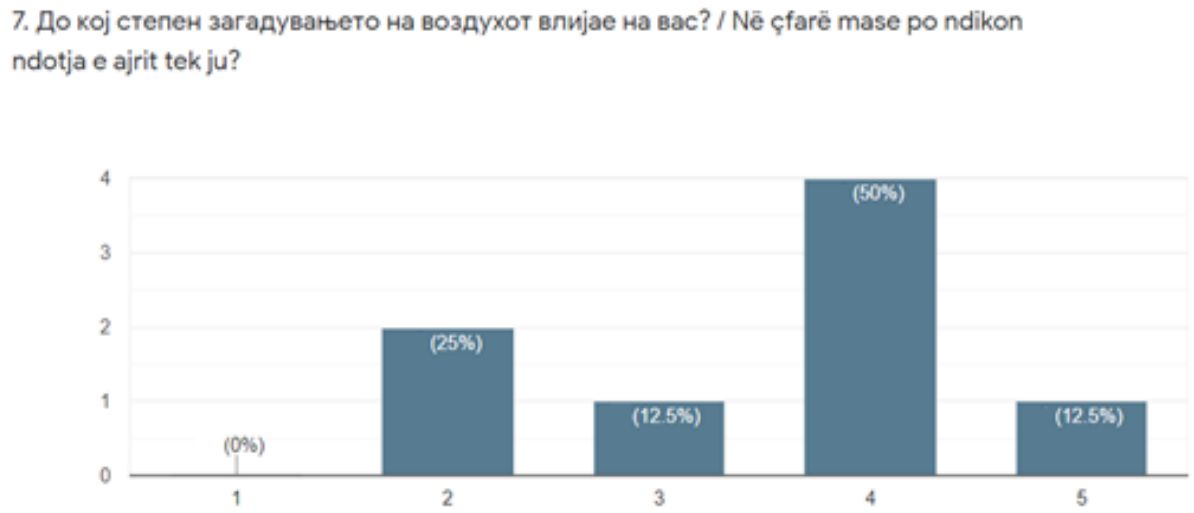

Figure 8. How much does pollution affect you?

Regarding the evaluation how much does pollution affect you. The results show that 12.5% totally agree it is very bad affecting them and 50% agree it is bad situation and affecting them, while 12.5% are neutral, and 25% think it is normal situation and they are not so affected. In total larger number 62.5 % of the respondents agree that the pollution is worse and is affect them.

Q8. What you think are the main reason for air pollution at your city?

Figure 9. What you think are the main reason for air pollution at your city?

Regarding the evaluation of the main reason for air pollution at their city they live in. The results show that at air pollution 12.5% impacts the waste removal, 50% think it is because of burning waste, electro and thermocentral affect air pollution with 87.5%, while 75% among others think that are the households heating and cooking, 62.5% among others responsible are the cars exhaustive gasses, 12.5% think it is affecting the use of home appliances like air conditions and others, also 50% of the respondents think among others also other Industrial sources are responsible for air pollution, and 25% affect the construction of new buildings in general.

Q9. How much do you care about the ecology and pollution issue that affect your health?

Figure 10.1 How much do you care about the ecology and pollution issue that affect your health?

Q9. How much do you care about the ecology and pollution issue that affect your health?

Figure 10.2 How much do you care about the ecology and pollution issue that affect your health?

Regarding the evaluation of care about the ecology and pollution issue that affect your health. The results show that at air pollution with 60 % impacts their health, 60% think it is the pollution of drinking water, because of burning waste, electro and thermocentral affect air pollution with 87.5%, while 20% among others their health is damaged because of waste disposal, 12.5% because of the global climate issue, 12.5% because of the pollution of green areas in cities, 12.5% because of the pollution of river and lakes, and 75% because of the unsafe quality of the food.

6 Expected outcomes

The expected effects of the research are numerous.

All these data will be placed in full to be easily accessible to all later their statistical analysis and comparison through a machine learning algorithm for the possibilities to predict some of the pollution and the pollution factor, ie the environmental footprint in the city of Skopje and after analyzing ours as all that can be reduced.

Given the fact that environmental education is a continuous and complex process that knows no boundaries in terms of age, gender or nation and lasts throughout life, and it should provide the acquisition of basic knowledge to raise awareness and focus on Successful protection and improvement of the environment, it is necessary to first stimulate and implement this type of education among young people, as our future in society.

In order to supplement the current state of environmental quality monitoring which is performed exclusively by measuring air pollution with the help of static measuring stations positioned at certain measuring points, the implementation of this project takes into account and records the nature of pollution and monitoring the dynamics of the movement of pollution over time in various geographical locations.

For the realization of the research, development of two software's is envisaged, namely 1) mobile application through which the citizens will report the pollution by painting with time and coordinates, and it will be sent to the Ministry and they will read about the latest applications and 2) web portal on which All reported pollution by the citizens will appear and a forum where ideas for solutions will be reported by the citizens themselves and by experts.

7 Conclusion and Recommendations

The research study provides an analyses of the pollution sources and strategy ho to tackle this issues. Guided by the basic human right of every citizen to live in a healthy and clean environment, and on the other hand the obligation to take care of environmental protection, inevitably imposes the need to raise public awareness for a cleaner environment and improve quality of living. Sustainability of urban environments is an indicator of the level of socio-economic impact on the environment and environmental awareness, pollution, creation of infrastructure and waste management policies, as well as access to services by citizens, which is a basic tool in planning and management with urban areas.

In this regard, energy and matter supply, followed by building efficient waste management systems, green spaces, energy efficient buildings, environmentally friendly public transport, would be a major driver of growth in the production of goods and services, population growth and management. with pollution.

As witnesses of the enormous pollution of the environment and the disturbance of natural habitats and biodiversity, it is normal to look for the reasons for this situation between: disobedience to the laws, insufficient education for protection and preservation of the environment in all strata of society, low level of awareness and the insufficient engagement of the citizens in joint initiatives for a cleaner environment.

Insufficient care when disposing of municipal waste and the absence of its selection and utilization, illegal landfills and problems due to improper disposal of industrial, construction, agricultural and special hazardous waste, as well as insufficient green areas in cities, unfortunately today in the 21st century, include the Republic of Northern Macedonia in the rank of third world countries.

Therefore, in order to be more committed to meeting the goals of starting EU accession negotiations, we must strive to achieve European standards in all spheres of society and especially in the field of environmental protection as a basic social goal. The research study therefore provides analyses of the pollution sources and strategy ho to tackle these issues.

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Implementation of the Geogebra program in mathematics teaching

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Abstract

This paper is based on the importance and application of GeoGebra as well as how useful this program can be in teaching Mathematics. GeoGebra contains geometry, algebra, statistics and calculation, dedicated to teaching and learning mathematics where this program used starting from primary school to universities. It can be used for active teaching and oriented towards various mathematical problems, it also encourages finding and developing various experiments in the classroom as well as in school. This paper therefore demonstrates the use of the GeoGebra program to construct, solve, and illustrate various mathematical problems.

Keywords: *Geometry, algebra, calculations.*

1 Introduction

Nowadays visualization techniques have a very important role in teaching mathematics. Then in response to these needs, many software programs were created to present various geometric figures as well as solve various analytical and algebraic problems. One of the best programs to build and illustrate various mathematical problems is the GeoGebra program. This program was created by Markus Hohenwarter in 2001/2002 as part of a Master's thesis in education in mathematics and computer science at the University of Salzburg in Austria. Also supported by the Austrian Academy of Sciences he was able to develop his own software as part of his doctoral dissertation in mathematics education. GeoGebra meanwhile received many international awards, and was translated by math teachers and instructors worldwide into more than 25 world languages. Since 2006 also supported by the Austrian Ministry of Education for the free use of this program in schools and universities. In July 2006 it found its way to the US where its development continues at the Atlantic University of Florida in the NSF project [1]. GeoGebra depends on software licensed under the GNU General Public License (GPL) and LGPL, Apache license, etc. The software was licensed under the "GeoGebra Non-Commercial License Agreement" which states that as long as "the source code is licensed under the terms of the GNU General Public License", the translated files, installers are licensed under conditions incompatible with the GPL [2]. GeoGebra is usable on many different platforms such as Windows, Mac IOS and Linux, as well as the tablet application for Android, iPad and Windows as well as its web application based on HTML5 technology.

1.1 The main barrier in teaching mathematics

Today young people are accustomed to a culture through a wide range of access to social media like Facebook, Twitter or Youtube. A multitude of different media forms are involved eg including text, graphics, animations, video and virtual reality. Moreover, the rapid growth and development of the Internet, combined with its growth potential for the public has opened up a whole new digital world. As a result, in the learning process, students are more and more inclined to accept content in this way. Especially in the subject of mathematics, where most of the tasks require imagination to solve them, in which case students are discouraged from learning any topic if it is not given in a more modern and accessible form [4].

The main barriers in learning mathematics are:

1. Concepts without any adequate illustration.

2. Mathematical graphs are static with the classical technique in teaching mathematics i.e. drawing those graphs on a piece of paper.

3. Static objects do not allow generalization of the concept.

The National Council of Mathematics Teachers (NCTM), which is the world’s largest association of mathematics teachers, have declared technology as one of the six principles for the school of mathematics.

Technology is essential in the teaching and learning of mathematics, influences the teaching of mathematics and enhances student learning [3].

1.2 Main features of GeoGebra program

The main idea of using the GeoGebra program every day while explaining or teaching math is to provide opportunities for students with different math skills and different levels of knowledge to better understand the concepts and also to encourage them to learn math in one more attractive route such as the use of GeoGebra.

The following are the main features of GeoGebra:

1. Free use for all.

2. Multiplatform.

3. Clear and easy understanding of graphs.

4. Rich database with ready-made examples.

5. Technical documentation in many languages.

6. Ability to save a project in multiple formats.

7. The program is translated into many foreign languages.

All of this made GeoGebra an excellent tool for teaching and learning mathematics. Since all objects in GeoGebra are dynamic, students can see how a graph or geometric body changes with changing parameters in relation to various mathematical problems. So before maybe the teachers have explained it only in words, while with the help of GeoGebra students can see the change of the result with the change of the respective parameters [9]. In geometric constructions all objects such as points, areas, circles and lines can be moved in any way. Furthermore all constructions can be done from the point and by clicking the technique to be used or by calling it through the command line [6].The GeoGebra program is the combination between the computer algebra system (CAS) which provided visualization capabilities and the dynamic geometry system (DGS) which provided dynamic variability. Using the GeoGebra program, the teacher can experience some changes in teaching and learning mathematics. Therefore, in this study, the GeoGebra Teaching Strategy (GTS) is introduced in order to help students have a better understanding of mathematical concepts in learning [5].

2. Implement the GeoGebra program in certain examples

Below are some examples which show the importance of GeoGebra in the subject of Mathematics and the opportunities it offers us for presenting different graphs, solving various mathematical problems, etc.

Example 1. Graphic representation of two functions $f(x) = 3x^2 + 4x - 5$ and $g(x) = 1 - \ln(x)$.

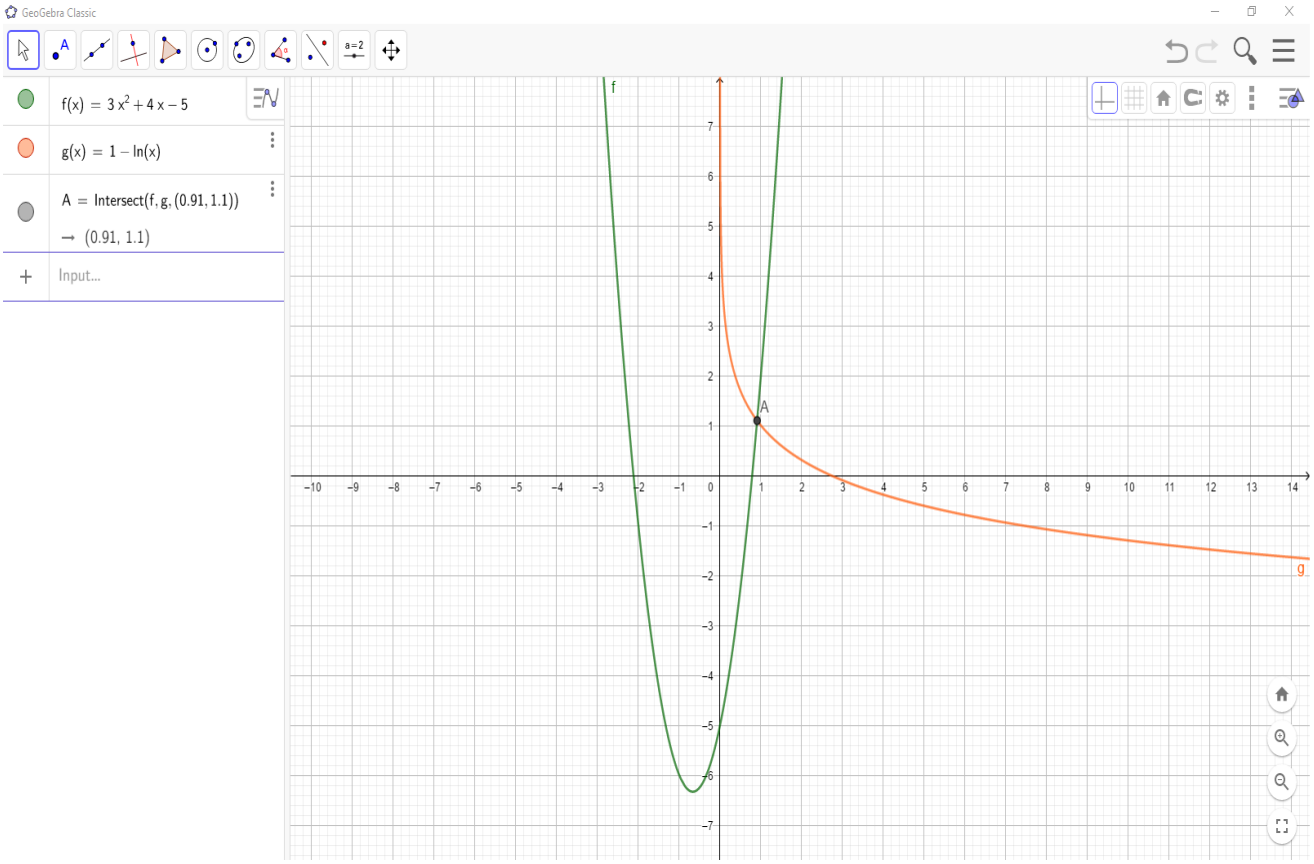

Figure 1: GeoGebra program interface

Example 2. The GeoGebra program is required to specify points which help in the graphical presentation of the function. GeoGebra enables such a thing that some of these points are found only by setting the appropriate commands such as the zeros of the function, vertical and horizontal asymptotes, extremes minimums as well as concavity.

Next we are giving the function $f(x)=x^3+2x^2-3x-2$ and it is required to find all the points needed to represent a function. GeoGebra also helps us to visually see the graph where also from the graph without having to assign points we can see them presented.

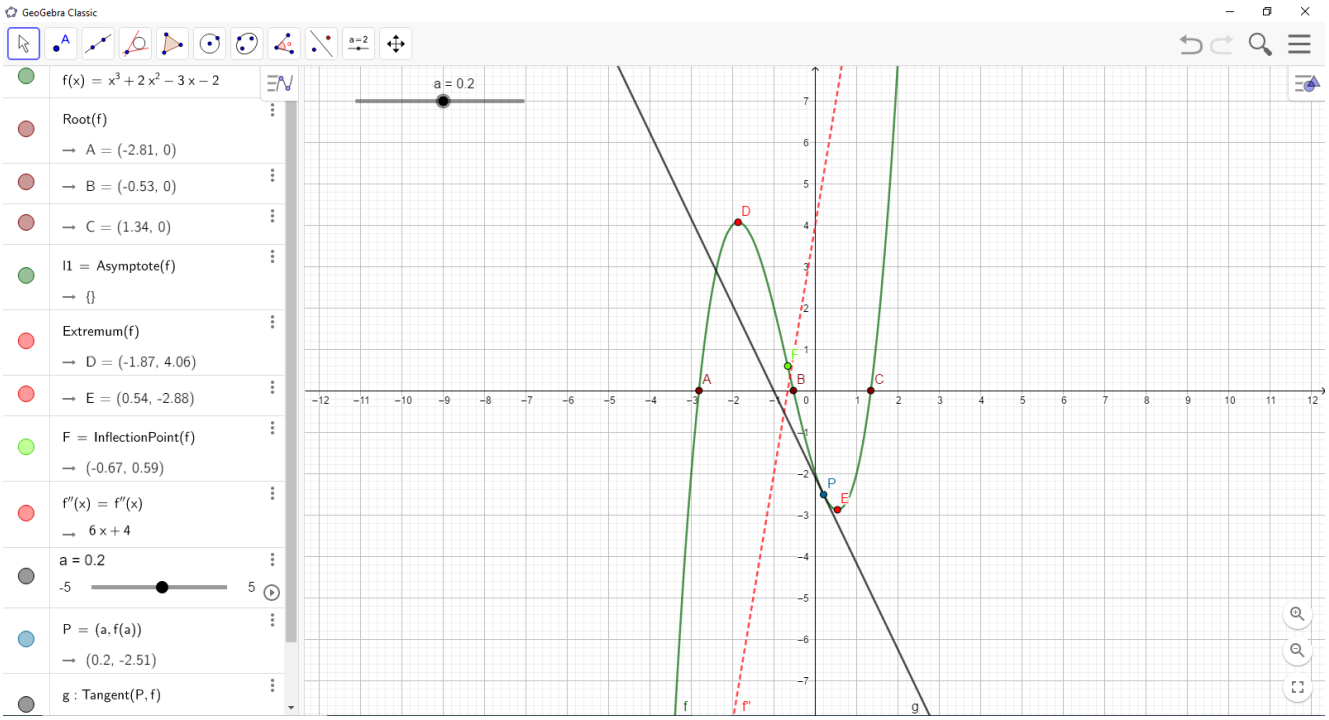

Figure 2: Graphic representation of the function $f(x)=x^3+2x^2-3x-2$

Example 3. The following example shows the construction of a square in a circle based on several steps. A circle is constructed first. Then we get the line which passes through the center of the circle and a point in the circle. Then find the point of intersection of the circle and the line which we denote by C. With (Point On Object) we place a point on the line f. Then using (Compass) we construct the circle d and e. We determine the points of intersection of the two circles and take the line which passes through those two points. The point of intersection of the line with the circle c assigns two more points to the square. Construct the polygon passing through the points GCHB. Eventually the GCHB square is constructed.

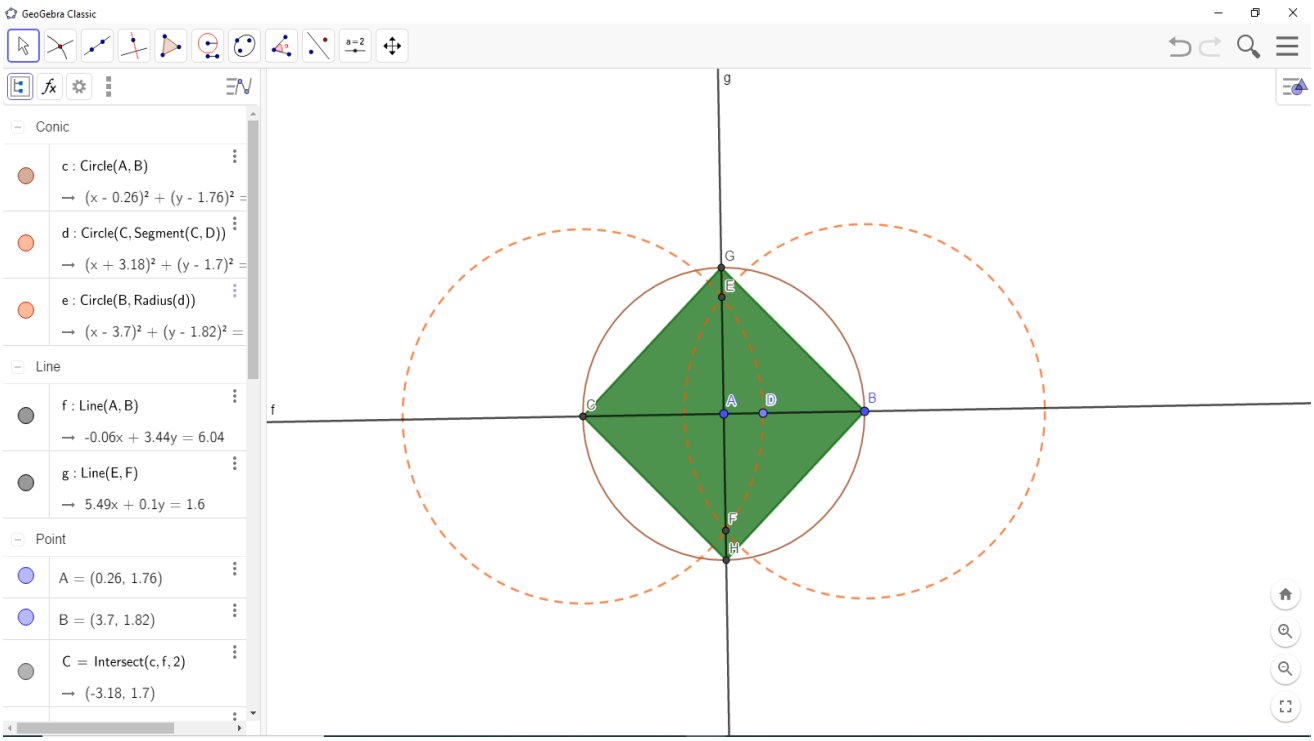

Figure 3: Construct the square in a circle.

Example 4. Assume that the given function $2x^3 - 10x + 5$ is given and it is required to find the derivative of this function. The first step is to define any function, then the second step is to place a slider and then a straight line which is parallel to the y-axis. Find the intersection of the curve and the line and mark that point with A. Then we determine the tangent which passes through the point A and the curve f, the tangent has the so-called slope which is denoted by m. If we set the point $P = (x(A), m)$ and applying the trace on option then along with point A the point P will also move and leave its trace. This example helps students understand the meaning of the derivative of a function. We can also change and set another function and then automatically the points will change so GeoGebra enables this phenomenon to look for different functions.

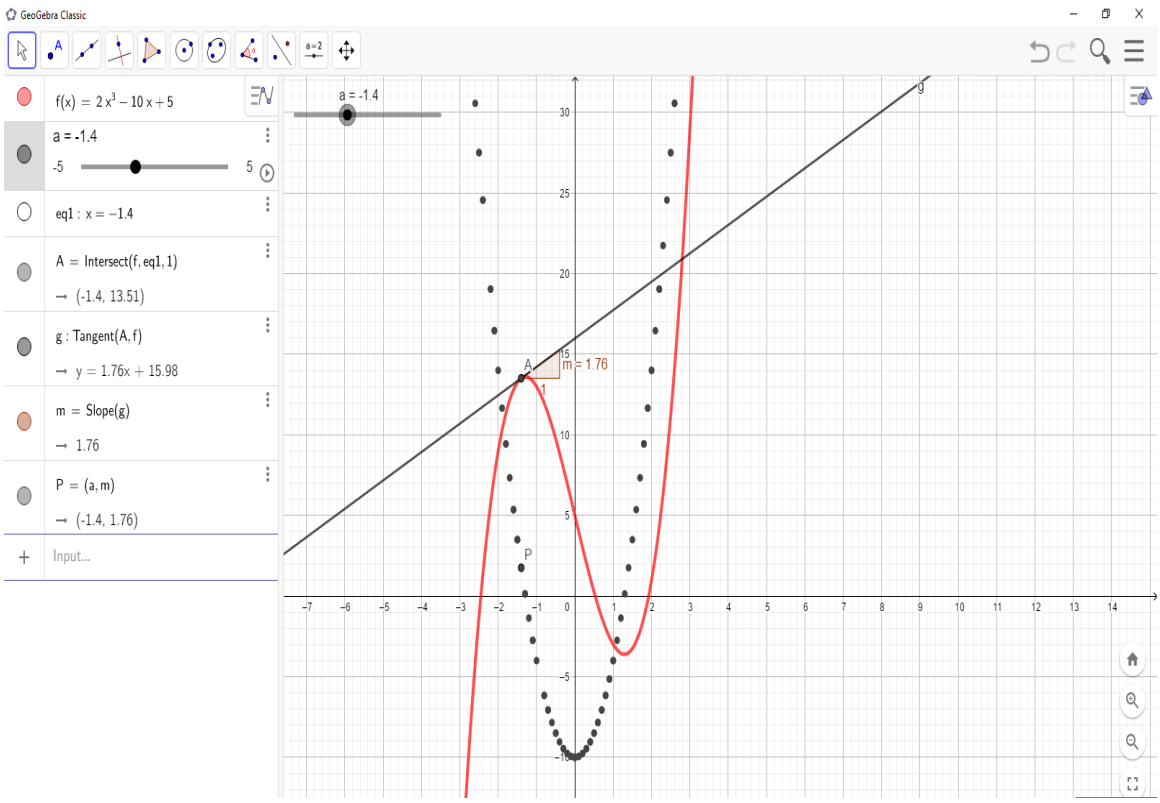

Figure 4: Understanding the derivative of the function

Example 5. This example shows very simply finding the median, mode, geometric mean, etc. By selecting the Spreadsheet in GeoGebra and setting the data we want to analyze we find what I showed above.

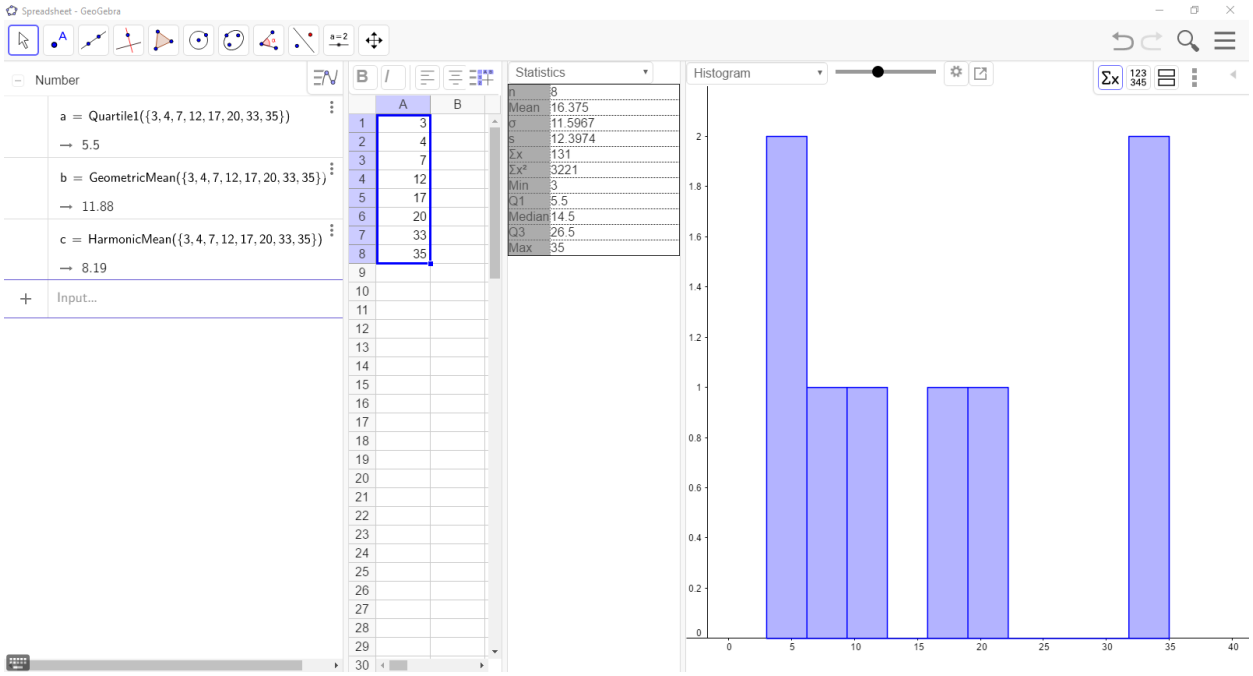

Figure 5: Mode, median, geometric mean, harmonic mean and quartile1.

Conclusions

In conclusion we see that this program is very important in teaching and learning mathematics. With this program we can visually see all the graphs of different functions. All students of all levels are encouraged to study and learn mathematics using GeoGebra programming. Considering that mathematics as a science can be said to be more abstract then this program is quite suitable because we can say that it makes the subject more relaxing. Current trends in science teaching are called for by the use of visualization software, and GeoGebra fits in perfectly with this trend.

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Development of a sustainable urban mobility plan for the city center of Bitola

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Abstract

A Sustainable Urban Mobility Plan (SUMP) is a strategic plan designed to satisfy the mobility needs of people and businesses in cities and their surroundings for a better quality of life. It builds on existing planning practices and takes due consideration of integration, participation and evaluation principles. The development of the Sustainable Urban Mobility Plan (SUMP) is a reflection of the changes in the current practice of traffic planning, in which only experts in the field of traffic planning participated, in the process involving various experts from different fields, associations, institutions, citizens, etc. SUMP contributes to achieving balance of social equity, environmental quality and economic development. It represents a new approach to traffic planning and does not replace, but complements and builds on the existing strategic documents of the city. Consequently, in the process of traffic and urban development, walking, cycling, public transport should be put into the first place, and then the use of private cars in a sustainable way. Achieving the sustainable cities is also focused on the protection of the environment in order to provide a higher quality of life for the population. Therefore, it is considered that by improving the urban transportation planning additional benefits could be provided for both the environment and the sustainable development of the cities. This paper is focused of developing sustainable urban mobility plan in center of city Bitola for safe urban space. In order to protect pedestrian and bicycle traffic, two variant of traffic solutions are envisaged, which envisage closing part of the streets for traffic, connection with a pedestrian street which result with continuous pedestrian street, introduction of a zone of calm traffic, application of a "contra-flow" bicycle lane on streets with one-way traffic regime and "Zone 30".

Keywords: *Sustainable urban mobility, traffic, planning*

1 Introduction

Sustainable Urban Mobility Planning is a strategic and integrated approach for dealing effectively with the complexities of urban transport. Its core goal is to improve accessibility and quality of life by achieving a shift towards sustainable mobility. SUMP advocates fact-based decision making guided by a long-term vision for sustainable mobility. As key components, this requires a thorough assessment of the current situation and future trends, a widely supported common vision with strategic objectives, and an integrated set of regulatory, promotional, financial, technical and infrastructure measures to deliver the objectives – whose implementation should be accompanied by systematic monitoring and evaluation. Sustainable Mobility is a fundamental component for a city that is friendly to humans and the environment. Mobility is considered Sustainable, when all forms of movement participate in it in a balanced way, and in particular sustainable forms of movement, such as walking, cycling and Public Transport, in combination with the supply of the city and the transport of goods. Planning for Sustainable Mobility is a strategic way of tackling transport and transportation problems in the modern way of life. The development and implementation of the Sustainable Urban Mobility Plan (SUMP) aims to reduce the negative impact of transport, improve the accessibility of persons and provide high quality of life, integrated and combined solutions and services for the movement of persons and goods. In contrast to traditional planning approaches, SUMP places particular emphasis on the involvement of citizens and stakeholders, the coordination of policies between sectors (especially transport, land use, environment, economic development, social policy, health, safety, and energy), and broad cooperation across different layers of government and with private actors. The concept also emphasises the need to cover all aspects of mobility (both people and goods), modes and services in an integrated manner, and to plan for the entire "functional urban area", as opposed to a single municipality within its administrative boundaries.

In this paper is presented introduction of beginnings for future development of SUMP in center of the city Bitola for safe urban space.

The subject is proposal of variant traffic solutions for improvement of the overall level of traffic service and increase of the safety of all traffic participants for street network in the central city area in Bitola. The purpose is to assess the operational performance of the existing street network and determine the impact of the planned changes in the traffic regime on the street network in the central city area in Bitola.

2 Scope of research

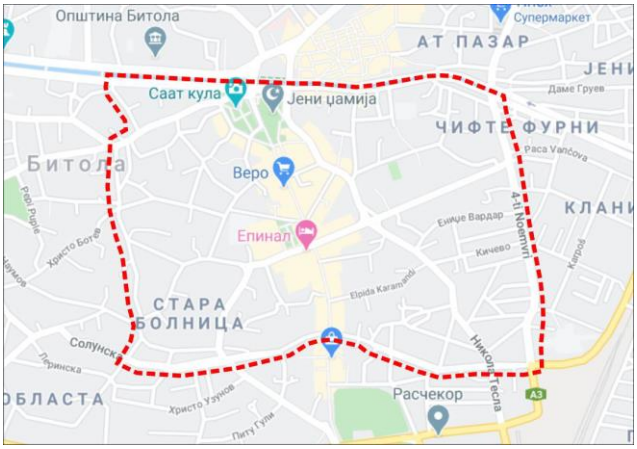
The current situation of traffic in the city center of Bitola result with congestion from the large volume of traffic and parked vehicles in the city center is located the main pedestrian street Sirok Sokak which is intersected by a street for motor traffic. Pedestrians and cyclists do not have their own movement areas, so safety is on low level.

The limits of the research scope are:

- to the north: 1st of May boulevard

- to the west: st. Kuzman Josifovski, st. Borka Levata and st. Stevo Patako
- to the south: st. Solunska and
- to the east: st. 4th November

The spatial scope also includes the approaches to the intersections that are on the border of the spatial scope, in a length of at least 20 meters. The boundary of the spatial scope is shown in Figure 1.



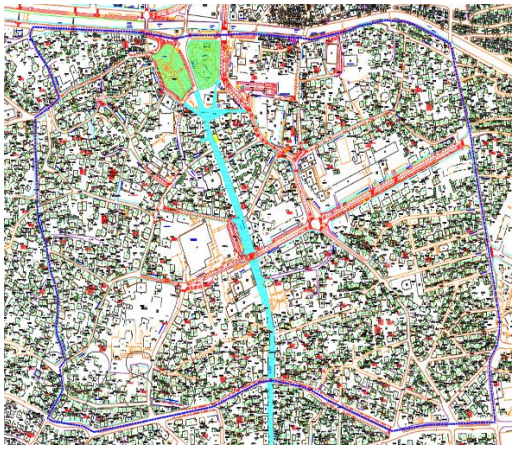


Figure 1: Boundary of the spatial scope **Figure 2: Street network in the area of coverage**

2.1 Research methodology and data collection

In order to make optimal traffic solutions for the central city area in Bitola, activities were undertaken for

data collection from basic documentation and traffic research on terrain which includes:

- Manual counting and classification of vehicles according to the directions of intersections;
- Manual counting of pedestrians at pedestrian crossings;
- Manual recording of vehicle license plates on cordon;
- Manual measurement of time and speed of travel on the route;
- Monitoring the behavior of drivers in conditions of free flow and when standing in a column of vehicles

Locations of terrain researching are presented on Figure 3.

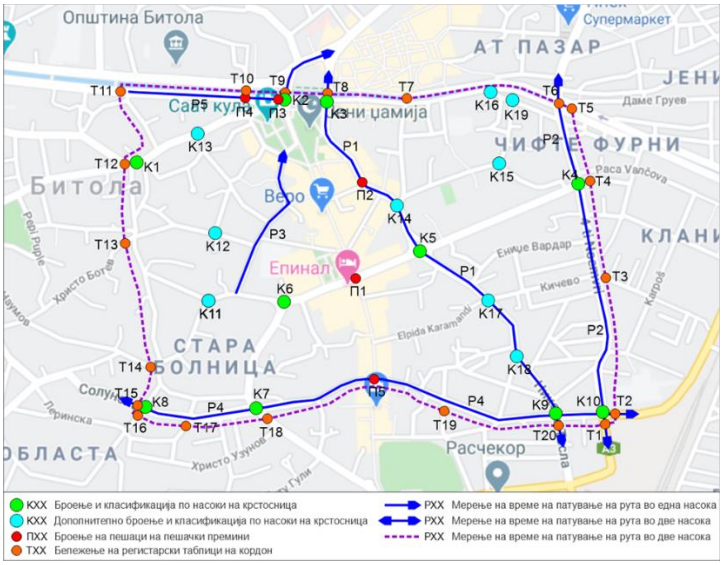


Figure 3: Locations of terrain traffic research

The purpose of terrain research is to obtain information about the total the traffic load at the intersections in order to determine the peak hour in the morning or afternoon period and the relevant hourly traffic load, as well as obtaining information on the distribution of flows by directions of movement and the structure of the flow. The result of data collection are shown in Table 1.

Table 1: Relevant traffic load for characteristic intersections

Intersection	Cycle	Motorcycle	Vehicles	BUS	TV	Total
K1	31	38	354	1	5	429
K2	33	41	1178	11	22	1285
K3	19	24	926	2	35	1006
K4	25	30	986	21	119	1181
K5	56	68	1272	2	72	1470
K6	15	18	748	1	30	812
K7	63	76	908	1	40	1088
K8	18	23	669	0	22	732
K9	10	13	674	13	12	722
K10	23	28	1086	28	117	1264

3 Defining of traffic variants

In defining variants process, respectively proposed measures in them, the concept of planning sustainable urban mobility with a focus on people and places and ensuring accessibility and quality of life in order to deal with problems related to urban transport (traffic congestion and air pollution) and moving to a new one culture of urban mobility. This implies prioritizing spaces for walking, cycling and public city passenger transport (Figure 4).

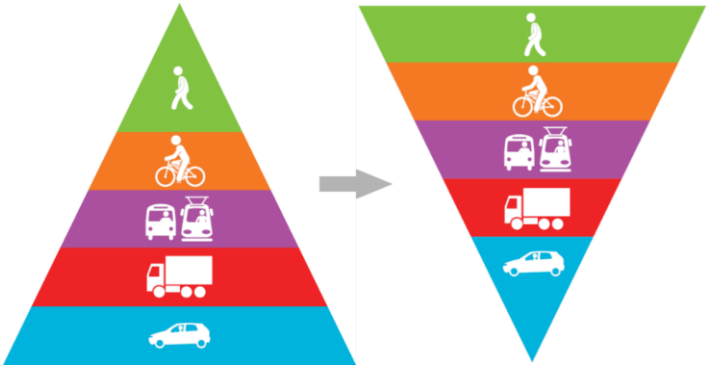


Figure 3: Changing the priority of traffic participants in traffic and urban planning / design

Two variant solutions for phase realization are proposed

Variant 1 which provides for the following major changes in traffic mode:

- transformation of the parking lot at the House of Culture into a public space - square
- establishment of two-way traffic on Vienenska Street only for residents and visitors of accommodation facilities
- closure for traffic of motor vehicles on part of st. Pece Maticevski and Dimitar Ilievski - Murato on the move from entrance / exit in Hotel Epinal to the building of the former JAT and transformation into a pedestrian zone, ie merging with the pedestrian street Shirok Sokak,
- introduction of "Zone 30" on the streets in the area covered by spatial conditions for providing sidewalks with a minimum width for safe pedestrian traffic and
- introduction of "Zone of calm traffic" on streets in the area of coverage where there are no space conditions for providing sidewalks with a minimum width for safe pedestrian traffic with treatment at the entrance to the street

The proposed traffic solution for variant 1 according the above changes in traffic mode is given in Figure 4.

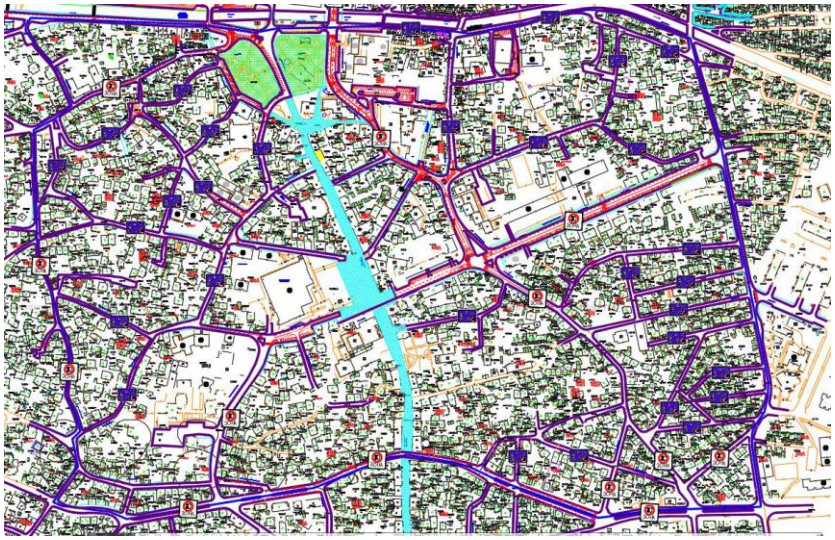


Figure 4: Proposed traffic solution for variant 1

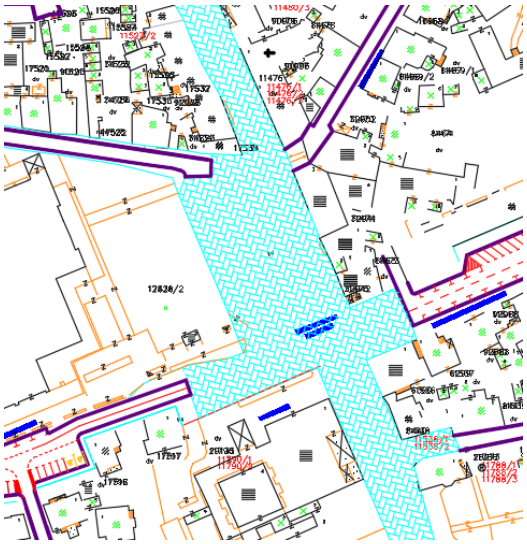


Figure 5: Detail of the traffic solution for variant 1 at the Cultural center

Variant 2 which provides for the following major changes in traffic mode:

- retention of changes from variant 1,
- change of the existing one-way traffic regime and introduction of one-way traffic regime on streets with existing two-way traffic regime,
- application of "counter flow" bicycle lane on the streets with one-way traffic regime and "Zone 30"
- closing for motor vehicle traffic on st. Wide alley of move from st. Jorgo Osmano to Blvd. May 1st and transformation into pedestrian zone, ie junction with pedestrian street Shirok Sokak.
- introduction of two lines for public city passenger transport
- Removal of street zone parking on st. Car Samoil and st. Borka Levata,

- - transformation of part of st. Josif Josifovski in a pedestrian street in accordance with the approved basic traffic project and
- transformation into a pedestrian street on a branch of Blvd. 1st May at the school St. Cyril and Methodius to the intersection with st. Nikola Tesla

  The proposed traffic solution for variant 2 accordingly the above changes in traffic mode is given in Figure 6.

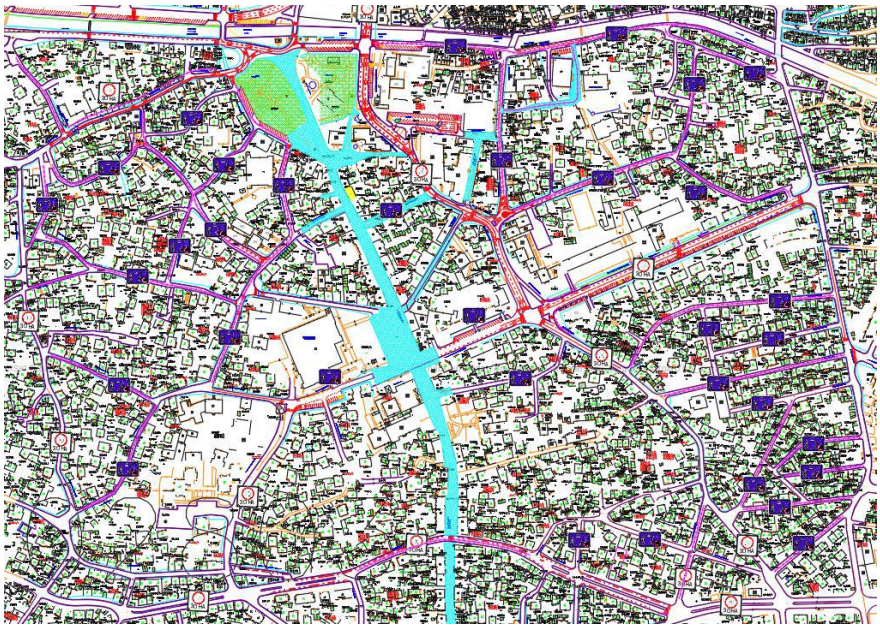


Figure 6: Proposed traffic solution for variant 2

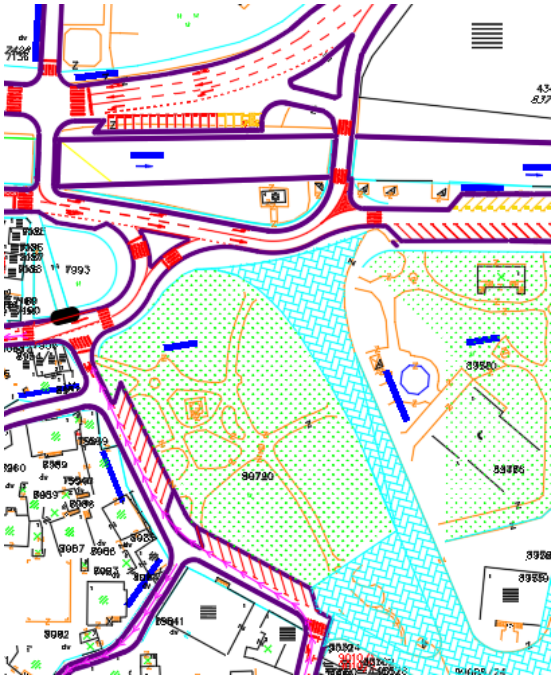


Figure 6: Detail of a traffic solution for variant 2 at the clock tower

4 Conclusion

Planning for Sustainable Mobility is a strategic way of tackling transport and transportation problems in the modern way of life.

The development and implementation of the Sustainable Urban Mobility Plan (SUMP) aims to:

- reduce the negative impact of transport
- improve the accessibility of persons and provide high quality of life
- integrated and combined solutions and services for the movement of persons and goods

Unlike conventional methods of traffic planning which are constituents of all traffic studies done in the previous period, the contemporary method incorporated in SUMP means a significantly wider array of instruments of traffic demand management. The measures proposed in this manner mean a great number of soft measures of the encouragement of greater use of sustainable transport means.

The results for the cross-level effectiveness measures show that variant number 1 offers slightly better performance than variant number 2, but in order to encourage a change in travel habits by creating better conditions for the use of sustainable modes of transport.

The closure of the streets in question does not have a major impact on motor traffic, but it does have a major impact on the development of pedestrian and bicycle traffic.

The development of urban mobility affects the reduction of motor traffic in the downtown area

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Dyes, Colouring, 3D Modeling

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Abstract

In recent years, 3D modeling is rapidly emerging as an additive manufacturing technology which can offer cost efficiency and flexibility in product development and production. This kind of technology has also been adopted in fashion industry, where simulations are being used for virtually assessing new products before they are actually produced. One of the main factors in textile dyeing is the large variety of chemical structures present in the modern fabrics. Cotton and modified cellulose do not give good fastness with simple anionic and cationic dyes. One of the most suitable groups of dyes is azo compounds. Azo dyes are obtained in two types of reactions which include diazotization and coupling. The goal of the research was to introduce 3D modeling in the education process with the comparison to the colouring of the materials. Cotton was bought at the local market and the colouring in microscale was achieved in alkaline medium using a 1M solution α-naphthol followed by applying of azo colour on the material. Visualization tests were conducted at various groups of age. The results can be used in the modern textile technology and education process where the students can learn to prepare the 3D modeling and after that to be able to use on the available material.

***Keywords**:* dyes, 3D modeling, colouring, textile technology.

Introduction

Dyestuffs which are various groups of compounds they have in common the property of producing a permanent colour on cloth, leather or paper (1, 2). The colours are typical aromatic compounds absorbing light at different wavelengths. The most applicable dyes are azo compounds, triarylmethyl cations, and anthraquinones (Fig. 1).

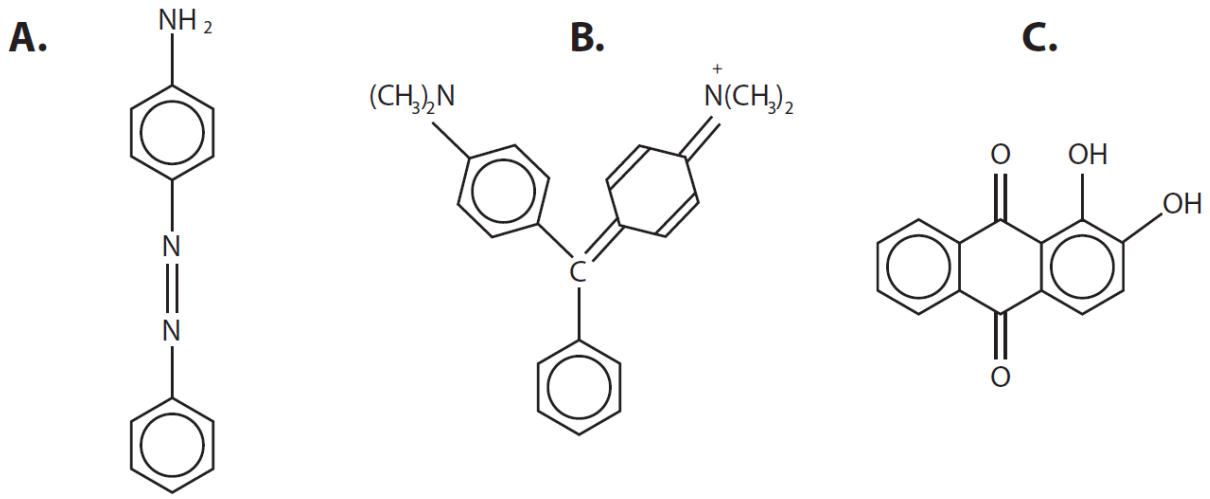

Figure 1. Structural formulae of azo compound (A), triarylmethyl cation (B) and anthraquinone (C)

In general, dyes are used in various industrial fields such as textile, paper, cosmetic, food, pharmaceutical, and leather. The dying process can be considered as a process with the interaction between the dye and the fiber. The final result can be considered as a final combination of the dye-fiber interaction. A beautifully colored substance is not considered as a dye which can not be able to impart its colour irreversibility to the fabric (3-5). The description and prediction of simulation of dyes is a challenge because of the complex behavior of the fabrics which are non-linear viscoelastic materials (6-8). The simulation system and precision of fabric input parameters play an important role for the accuracy of virtual garment simulations. The input parameters are also important and are derived from fabric physical and mechanical fabric properties (8-12). The real touch and fabric can not be replaced with anything, but the simulations are useful in the direction how multiple fabric samples before the materials as candidates have been finally chosen. The process of dying is determined by the type of fabric and the dye, but there are also many factors to obtain satisfactory results. The most important requirements of interaction between fabric and colour are connected with the performances such as permanence to washing, air oxidation, perspiration, and exposure to strong light. Another set of characteristics are related to shade and depth of colour (10). There are an enormous range of dyes for colours and fabrics. The combination and the right choice is a challenge of researchers and designers. The use of the dye in terms of economic point of view should be complete at determined level.

The aim of this work is to connect the practical coloring with 3D visualizing including natural fibers such as wool, silk, and cotton and with several types of polymers. The use of 3D modeling is in order for the production to save more time and recourses. The comparison study was also performed among the people how the precipitation of the colour was varied at different ages.

Colour theory

The colour theory can be considered both as science and art of using colour. The colour theory itself give the explanations how people perceive colour, the effects of mixing the colours, the match and contrast with each colour combination. It also explains how humans perceive colour; and the visual effects of how colours mix, match or contrast with each other. Color theory also involves the messages within the colors communication; and also the methods used to replicate color (3). The organization of colours is on a colour wheel and it is grouped into 3 categories: primary colors, secondary colors and tertiary colors, represent in Figure 2. The CMYK is considered to be the subtractive color mixing model which explains how any colour you see on a physical surface such as paper, signage, packaging et. They all use the subtractive colour mixing model (Fig. 3). People have memories from the earliest stage of their childhood and the colour model is often from that period of time. Adding more colour simply mean that the subtractive colour is obtained. Traditionally, the primary colors used in subtractive process were red, yellow and blue (Fig. 2), as these were the colours where the rest colours and other hues are obtained from.

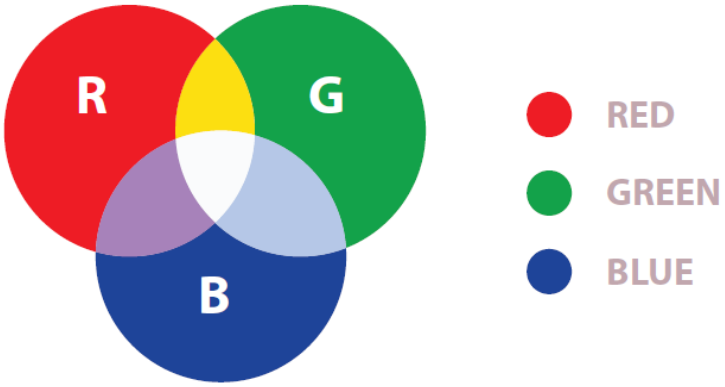

Figure 2. The subtractive color mixing model

In the printing process the colour are recognized as cyan, magenta, yellow and key/black (CMYK), as this colour combination also called colour combo which enables printers to produce a wider variety of colors on paper (4). In the textile practice, dyes have been classified in terms of application of dye on the fiber (1). The categorization of dyes is either as direct which are for cotton and disperse dyes related with suspension dyes. The vat dyes are applied with the use of a soluble, reduced form of the dye in the bath and then oxidizing in to an insoluble, colored form on the fabric. Ionic attraction is typical for the acid and basic dyes which are fixed to the fiber. The groups such as $–SO_3^-Na^-$ and combine in acid solution with a fabric containing $–NH_2$ groups

are characteristic for acid dyes (7). On the other hand, in basic dyes, the dye molecule has a cationic structure and combines with anionic centers in the fiber.

The larger the triangle is, the greater the gamut of colours is produced. It is obvious that the primary colours are more acceptable for the observer. The filters of the colours work with transmission and absorption of particular light. For example, the yellow filters remove the blue colour where the green and red colours are transmitted. The magenta filter removes the green light, transmitting the red and the blue colours. The cyan filter eliminates the red light, where the green and blue lights are transmitted. With the adjustment of the transparency of the filters, the amount of red, green, and blue color can be controlled (10).

The chromaticity diagram will not produce a constant change in hue and saturation (Fig. 3). In the best case, the space can be modified by means of a linear transformation and that is how they obtained representation for the minimum colour which is perceived in a transparent colored body is obtained. One of the disadvantages in the representation of chromaticity diagram is absent of the location of white point.

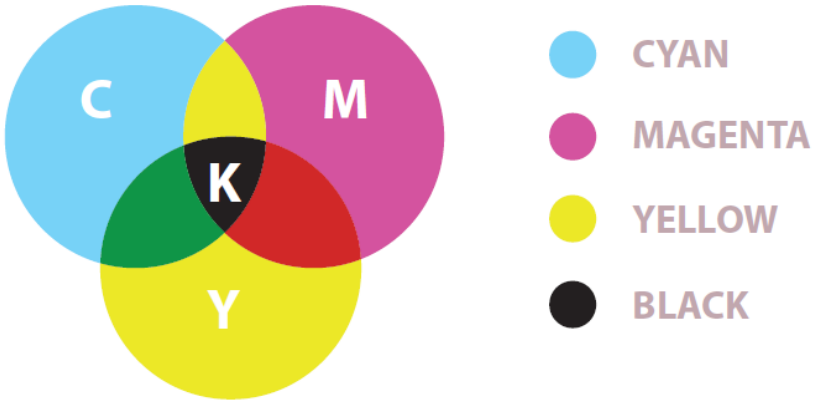

Figure 3. CMYK: the subtractive colour mixing model

The subtractive colour mixing model was associated with CIE which are mainly used in the plastic, textile, and paint industries. In the 3D colour space, the colour of any kind is obtained by points along a straight line passing through the origin of coordinates. From the colour-matching functions was read the origin of three values. Different points on the represent the same colour (hue and saturation) can be recognized but different luminances, according to each point's distance from the origin of the coordinates was also present. The same luminance is complex task and can not be necessarily to have the same value even where two various colours are represented by points on two different lines in the colour space and they have the same distance to the origin (10). The main idea with the chromaticity diagram is to construct a plane where different colours (different hue and saturation) are represented, but the luminance is, in general, different for different points on the diagram. The diagram which represents chromaticity is constructed by the intersection of the lines passing through the origin, defining all colours with any desired plane in the colour space. There are numerous colour spaces which can be used for

different purpose such as printers, colour displays, photographic cameras etc. The ideal colour system is of great practical interest and is a subject of many investigations (10).

The measurement of colour is classified as an important issue where the applications are in various fields such as industry including textile, paper, leather, and graphic arts industries.

The colour wheel

The colour wheel (Fig. 4) consists of three primary colors (red, yellow, blue), three secondary colors (colours which are obtained when primary colors are mixed: green, orange, purple) and six tertiary colors (colours which are obtained from primary and secondary colors, such as blue-green or red-violet). The warm colous including red, orange, and yellow can be separated from the cool colours blue, green, and purple with drawing a line through the center of the wheel.

Figure 4. The representation of the colour wheel

The capture of the realistic drape and at the same time using various types of fabric was one of the biggest challenge and the one of the biggest difficulties with 3D design software. The required design form is depended on a limited fabric library which should be chosen. In order 3D to become easier, the garments use from designers should imitate the fabrics in real life. Designers feel more confident using 3D when the colours and texture of the fabric are in order to capture the soft physics of the fabric and the final product is the creations in the 3D visualization (5,6). Scanning of materials or fabrics for 3D CAD can be divided into two main categories: scans for color and material texture, and another for physical properties that capture how a material will arrange.

Research Methods

Fluka (Switzerland) supplied α-naphthol and sodium hydroxide. All chemicals were with analytical grade. Cotton was bought at local market. Dying of the cotton was achieved with a piece of cotton 2 x 4 cm. The cotton was immersed in 1M solution of α-naphtol (7) and a drop of azo dye solution was added. The preparation of azo dyes involves two reactions-diazotization

and coupling. Both reactions are very simple operations that are carrid out in aqueous solution. Specialized computer program, CAD was used for 3D modeling. The visual results were tested on a group of people of the choice of the colour.

Findings and Results

The groups such as $–NH_3^+$ and $–CO_2^-$ are consisted in silk and wool where side chains and can be dyed with either type of ionic dye. Cationic and anionic dyes do not give good fastness either with cotton or viscose often and in that way another class of dyes are introduced such as azo dyes. Azo groups play an important role for dyeing of the cotton material. Polyester and cellulose fibers can be described for the least affinity for adsorption of dyes from solution. The azo coupling reaction is carried out on the fabric. The cloth was immersed in an alkaline solution of the naphthol where it was applied in a pattern. The formation of particular dye was on the surface of the fiber with the present of diazonium solution.

The final product, the dye how should be look liked depends on many factors such as presence of electrolytes and temperature value. It is noticed that at high temperature values, the dyes can undergo chemical degradation, while at low temperature, incomplete dyeing can be occurred. It was found that the temperature around 40 °C can be considered as satisfactory temperature. The additional value can be achieved with the degree of wetting and swelling of the

fiber. Moreover, the duration of the dyeing and the addition of surface-active compounds are factors which can be improved the whole process.

Figure 5. The process of dying (sheep wool)

The visual results were used to rank colors in order of color preference. The results are given in Figure 6. The top row shows the results obtained from elder group, middle row from younger group and bottom row from all observers. The colour preference is differed in different age groups. Pink colour was chosen as the most preferred colour for the older group of people followed by red, orange, yellow, and blue colors; the gray color was the most disliked color, followed by black, brown, green and white colors. The choice for younger group was something

else. They preferred the white color followed by black, yellow, red, and blue colours; while the brown color was the most disliked colour, followed by purple, green, pink, and gray colours.

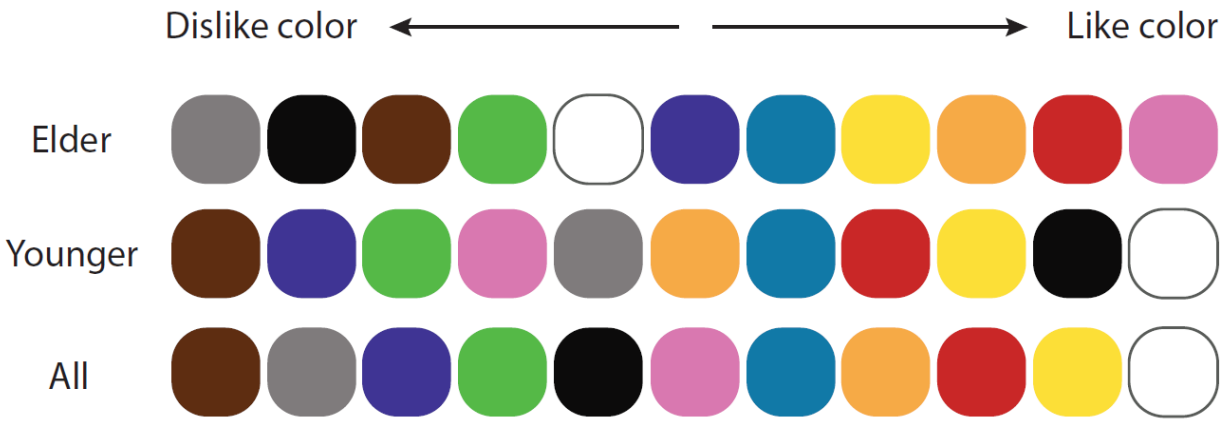

Figure 6. The color preference order for different age groups

One of the references for the colour reference is a set of small discs (10). The reflected light should be the only light to be measured. The test was conducted among many observers at different ages, young and old ones. The chroma attribute is the colour preference for the older people. The lightness attribute was a choice for the younger observers. The results showed that for the colour preference among the old and young observers was a result from the living expense sources how people choose the colour. Furthermore, the relationship between colour preference and elder profile is examined. The choice of colours is related with the moods on events taking into consideration the people at different ages. Both younger and elder observers agree that the dirty colours were the one they disliked the most. This reflected the elder's colour preference order is likely to connect to chroma and lightness attributes. For younger group, the relationship between colour preference and color attributes is insignificant.

Dressing Colour Quick Tips

- Dark blue colour tends to provide a sense of authority and power. People with dark blue clothes can be seen at conferences, meetings or public manifestations. At these particular events, the yellow colour gives the opposite effect.
- Bright yellow is an optimistic and energetic colour and people feel more comfortable at relaxed events wearing something it.
- Dark green is considered to be a colour of wealth and growth. People choose this colour for a job interview.
- Red is the boldest of all colours. Red colour can send various types of emotions from confidence to danger, but in most case is the colour to attract the attention.
- It is very important about the type of message what people like to send with some colours. The main questions are connected with the mood and the definition of colour the people have chosen is also connected for the special event they attend to visit.

In recent years, 3D modeling is rapidly increasing as an additive manufacturing technology. The product development and the final version were satisfactory with the use of 3D modeling where the cost efficiency and flexibility are present especially in textile industry. This kind of technology has also been adopted in fashion industry, where simulations are being used for virtually assessing new products before they are actually produced.

The photographs in Figure 6 below show a representation of how selected materials are simulated in 3D models through a 3D simulation software program. The selected materials are briefly described (1) and then applied to the same model.

Cotton is a organic substance and one of the most commonly used types of fabrics where no additional artificial compounds are found. Some plant seeds obtained the cotton in the nature.

In the nature, one of the strongest materials is silk which is made through natural processes. Fibroin as a protein is a part of silk where types of insects play important role in silk production.

Faux leather, also known as synthetic leather, is a petroleum-based alternative to genuine leather. The typical characteristic of faux leather is softness and it is water-resistant. This behavior makes the faux leather to be cleaned easily. The additional qualitative is that can be used for children and pet because of the resistant of abrasions and cuts.

Velvet is a sleek, soft fabric that is commonly used in intimate garments, upholstery and other textile applications. Velvet is one of the softest man-made materials, although nowadays is made from cheap materials.

The colour in textile materials can be seen as an additive mixing of colours which take place when two or more light beams with different colours are superimposed on a screen or directly to the retina of the observing eye. A good colour is in direction where match occurred under any illumination conditions. It can be obtained if the spectral reflectance curves for the two samples are identical. The same spectral distribution is almost no possible to be the same when a colour image is displayed in a computer or television screen. The rest colours which are considered as approximation of colours are found in nature and daily life (10).

On the other hand, the colourants can be classified either as dyes or pigments (10). One of the main differences between dye and pigment is that dyes are soluble in solvent, for example in water, while the pigments are not (7). They are used to modify the colour of an object by the changing its spectral transmittance or its spectral reflectance.

Purely additive or subtracted colour cannot be considered as a colour obtained of mixing by two or more liquid dyes or paints or their combination (2,10). The idea is that two colours of two side-by-side contiguous colour elements combine at the eye with an addition process. If the two elements are slightly transparent as they nearly are, where one is on top of the other, the two colours of the two particles mix with a subtractive process.

The 3D modeling helps for the geometry approach development. The real geometry and shape of the materials can be determined with the 3D modeling with the whole physical characteristics and tend to improve the obstacles of the real materials.

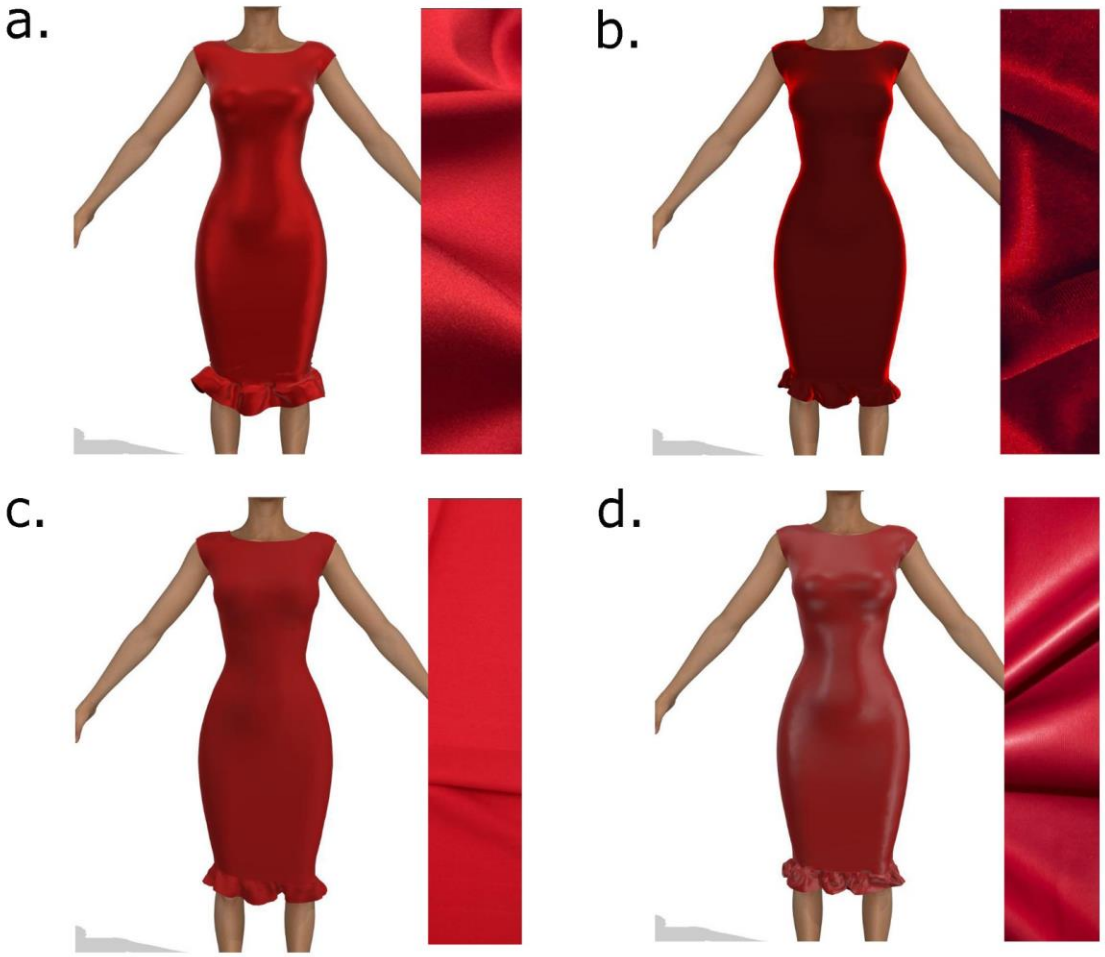

Figure 7. 3D simulation of selected materials: Silk (a), Velvet (b), Cotton (c), Faux leather (d)

In the process of cotton colouration a vast amount of water, salts and fastness in the process is required. The modeling strategies are introduced in order to provide improvement in the prediction of mechanical properties of materials. Along with a theoretical and computer analysis, the approaches of creating models are in the directions to improve the real models. The significant benefit of 3D modeling is that materials can not be destroyed and can be previously optimized. The best fit model can be used in further steps either in the research or in the industry for the preparation of materials. 3D modeling is found to belong to the rapidly emerging technology where the chances are increased recently.

Conclusions and Recommendations

The satisfactory results in textile dyeing can be considered as a long experience. Moreover, the factors can be varied and the complicated interactions between dye and fiber can be occurred. Digital representation of fabrics is becoming a key in communicating with brands and designers

for material suppliers around the whole world. In addition, models with the use of 3D modeling can be prepared before using materials and also the techniques can be learnt online.

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Cities vague places as an opportunity to solve urban problems of publicness

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Abstract

In modern cities, the underlying collective and urban entities are increasingly immersed in the more prominent visual/commercial surface of the urban tissue. In this way, the social and collective structure of the place and its city significance is lost and forgotten. We are talking about several questions:
• How would the city regain and form the public, collective, and city values that had lost during the expansion and the period of privatization and globalization?
• How will the former highway after the loss of its function be connected in a spatial and programmatic sense with the center of the city?
• What's the collective role and how strong is it in the process of reviving and articulating the gaps along the highway making density without architecture?
• How to fulfill the various needs and quantities that are necessary during the summer and the rest of the year without causing uncontrolled construction?
The study aims to achieve a recognizable place through architecture, which will offer identity and order, without being an aggressive instrument of power over the emptiness. The main emphasis will be on the continuity, continuity of the flows, the energies, the rhythms established by the passing of time, and the loss of limits.

***Keywords**: infrastructure, public space, thematic squares, architectural composition, radical context, field, sequences, collective, city, urbanism, events, city street, gate, permanence, flexibility, heterotopia.*

1. Introduction

Modern aspects of urbanity are usually general and vague in terms of architecture because they reflect the cultural, economic, and political but not the spatial determinants of today's society. In the context of defining spatiality, the phenomenon of growth stands out in terms of size, volume, and density, i.e., seemingly generic and intangible aspects of space.

On the other hand, the phenomena of globalization and free-market economy in modern society are reflected in the character of the space that diverges one-way, namely, from public to private or from private to super-private which as a final effect changes the social essence of the city. A period where the multitude of private interests dominates and they become interests that the city deals with, i.e., the only interest of the city becomes the profit instead of building a city for the citizens, who begin to feel alienated in it. [1]

The privatization of public space has led to the disruption of the city's identity and limiting the number of citizens who could enjoy and consume the former city public space that defined the city as such.

In such circumstances, the question arises: do cities already exist? Can we call a 'city' a place that has no public entities and is composed only of private property?

What is urbanity?

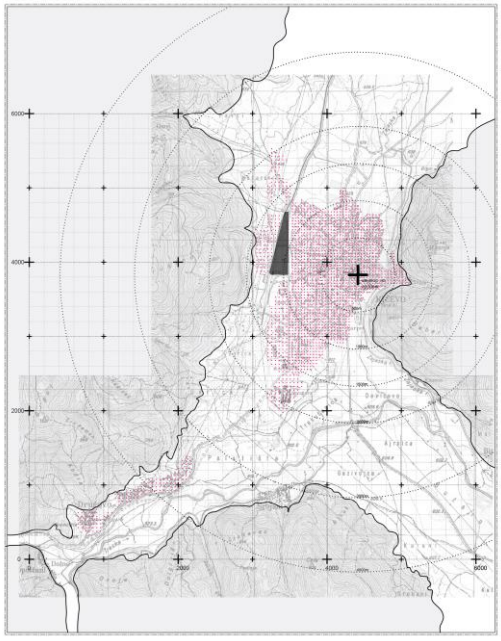
Urbanity is not a certain population, geographic size, or collection of buildings. Nor is it a node, a transshipment point, or a center of production. It's all of these together, and thus any definition must search for the essential quality of all of these aspects.[2]

2. Current situation and tendencies in urban planning

The current situation in Kichevo and the urban tendencies can define the city as a utilitarian one, a city with only individual interests, without a long-term vision. This contributed to the lack of public and collective spaces and usurpation until the disappearance of the town square as a main urban element. Commercial buildings, hospitality, and gambling services on the ground floor took place on the area of the square, whose program, architectural form, and urban layout disparages the square.

The lack of vision planning for the city has led to the uninterrupted sprawl of the city to the south and north axis, destroying free green areas and arable lands, while leaving voids along the west and east axis.

[1] https://www.youtube.com/watch?v=vjyLWMSZ2nY David Harvey: The Right to the City and Urban Resistance
[2] https://www.youtube.com/watch?v=vjyLWMSZ2nY



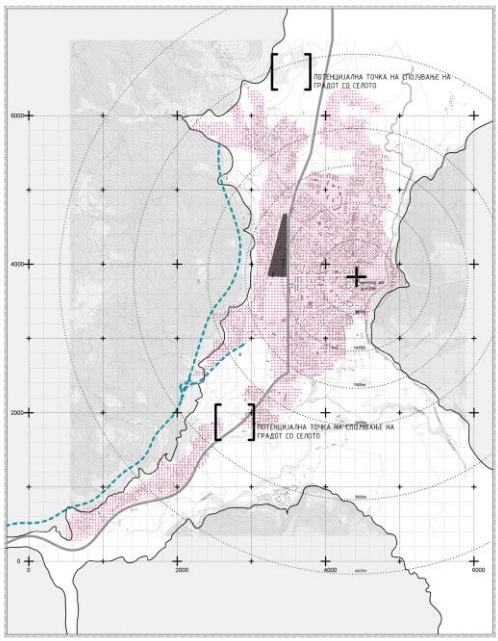


Figure 1: Build boundaries, year 1972 (left), Figure 2: Build boundaries, year 2018

Due to the migrations that occur in the summer period where the number of the population doubles, the city becomes dysfunctional. The traffic streets are overloaded, especially the main boulevard "Osloboduvanje" due to the hospitality contents that trail along the boulevard, which are also the only place for socialization. Hence, the spatial needs during the summer period are higher. We end up with a large number of wedding restaurants, a phenomenon very common in the city, and a large number of individual houses that are empty the remaining eight months of the year. This comes as a result of inflexible planning and construction, which further contributes to the continuous expansion of the city.

According to the General Urban Plan approved in 1999, valid until 2009, in which public facilities are planned such as new green areas, playgrounds designed for different age, amusement park and revitalization of Krushino turning it into a sports park recreation center, they are not realized, while the sports recreation Krushino center is out of function. The construction of the new highway Skopje-Ohrid in Krushino leaves new opportunities for the existing highway that will have the character of a gathering street and would relieve the main boulevard, but on the other side, the construction of the new highway consumes a great amount of Krushino's forest.

Figure 3: New highway Skopje-Ohrid

In the narrower planning scope, there are catering/hospitality facilities, temporary prefabricated buildings and there is an active construction of new facilities which together with the existing buildings do not correspond to the approved Detail Urban Plan, in other words, they are illegal constructions. This location is a large unused space in the city center.

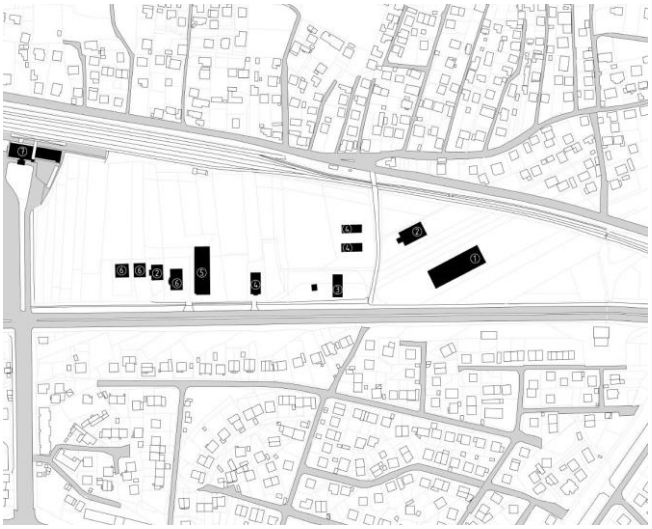


Figure 4: Current situation of the site

3. Historical and theoretical research on the topic

The context of Kichevo is compared to various theoretical references and relevant examples from the current world architectural-urban production, from the conclusions of which models/concepts are formed that carry authentic collective urban spaces. *Terrain Vague* by *Ignasu de Solà-Morales Rubió* was crucial to determine the specific site of this project, while *Points + Lines*, *Field Conditions* by *Stan Allen*, *Investigations in Collective Form* by *F.Maki*, and *Notations: Diagrams and Sequences* by *Bernard Tschumi* are used to examine the models in the field thus creating linkage and space in-between the volumes. Following this, the events/program that takes place in and around the building is defined by the knowledge gained from *Heterotopia and the City: Public space in post-civil society*, by *M.Dehaene and Lieven De Cauter*.

The elements that load the field are distinctive forms from practical examples: they are heterotopic places, forming collective spaces and representing a monument, *Figure 5.*

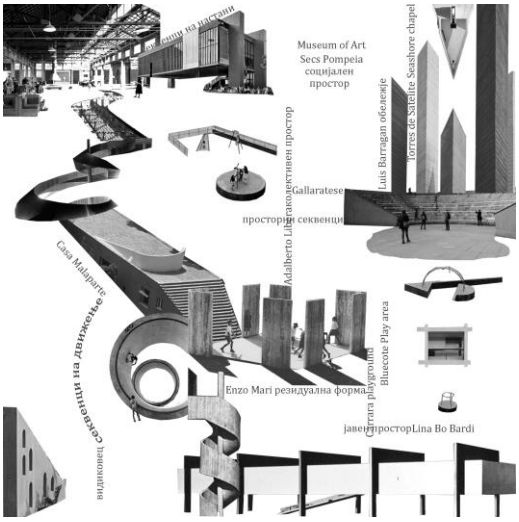


Figure 5: Collage of inspirations

4. Spatial - program observations related to the specific Location - possible models

The scope covered in this paper is located near the industrial zone. It is defined on the south side by the bus, train station, and Osloboduvanje Boulevard, on the southwest side is bordered by the railway and on the east side with the highway E-65. The scope has a triangular shape and everything extends along flat terrain, *Figure 6*.

Figure 6: View of the location

According to the current situation and the conducted analyzes for the city and the narrower location, the proposal goes towards solving the problems, namely, providing contemporary squares, public and collective spaces, activities, and programs that are missing and are needed in the city and allowing for flexibility and relief to the main boulevard, looking for a new identity of the place and relationship with the current highway.

4.1 Comparative analysis of spatial models as a method of work

Various typologies are applied in the comparative analysis and they are evaluated according to the pre-set conditions and problems that the models will answer.

4.1.1 Model type 1- Grid

Starting from the square as a public space which is an empty public area defined or limited on all four or at least three sides by a building, road, etc., this model is set to form squares with a different character. But it has a higher build percentage than free space, and its rigid and repetitive typology becomes unattractive to the site and offers an opportunity for up to 100% build area.

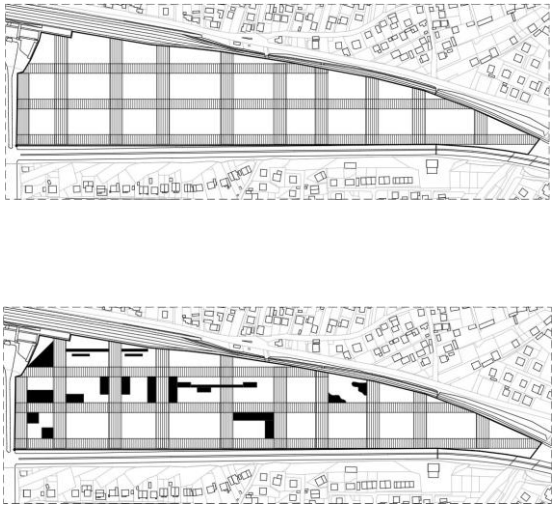


Figure 7: Model Type-Grid

4.2.1 Model type 2- Walls-This model breaks the rigidity of the previous grid model, so, the public space is defined by different shapes of walls while paying attention to formation of a street front. However, keeping in mind that by entering a program in the walls they would change their shape so that the percentage of construction would again dominate.

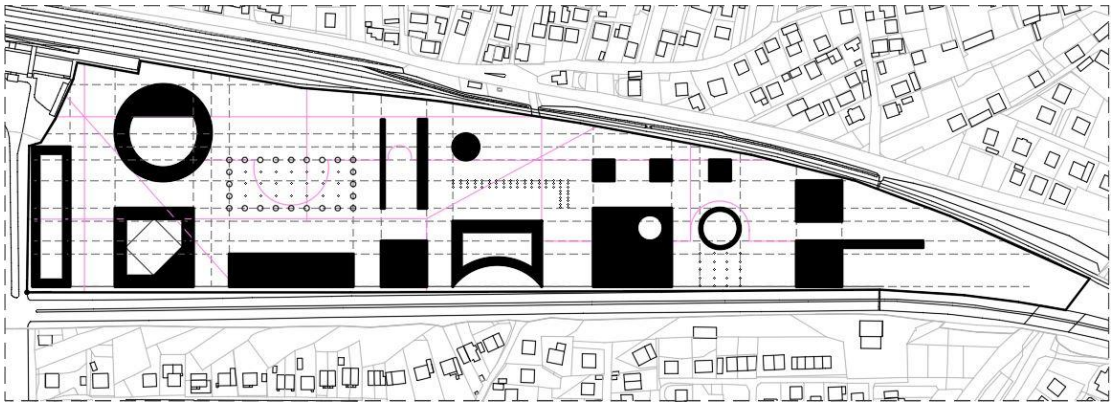


Figure 8: Model Type-Walls

4.3.1 Model type 3- Independent shapes

This model is composed of independent shapes/models that form thematic squares within and street front.

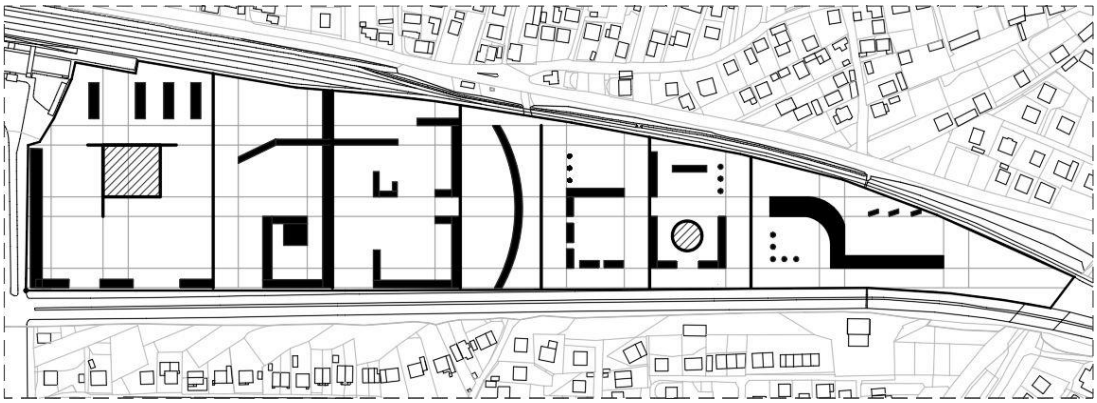


Figure 9: Model Type-Independent shapes

Given the fact that thematic squares to be functional and usable they must be illuminated and that the current needs of the city can be fulfilled with a smaller area, the same model is thickened in order to obtain an area in which it could produce energy to maintain the thematic squares.

This model has been re-examined through the theoretical research and led to a conclusion that the shapes are very independent and their composition does not create an integrity of the site and connection with the surrounding public space, except the interior space formed by the shapes themselves.

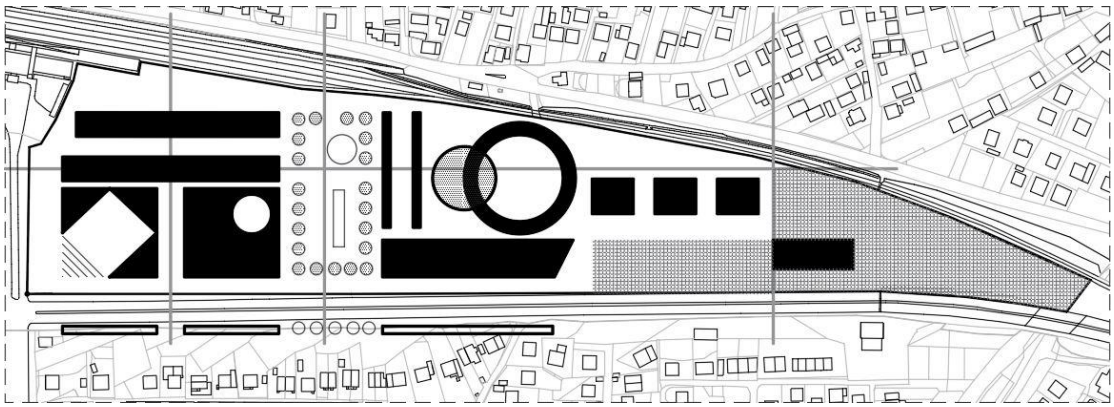


Figure 10: Model Type- Independent shapes

4.4.1 Model type 4- Combined, continuous, and wholeness system

The last model is a combination of all three previous ones, with an emphasis on sequences of experiences in the site, formed by expanded and overlapped sequences.

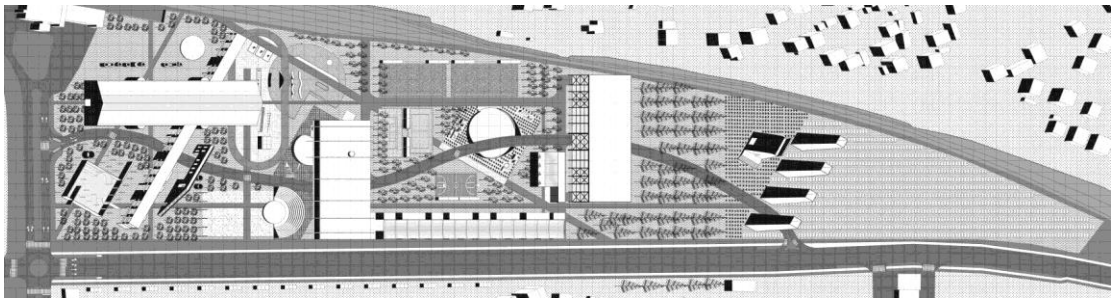


Figure 11: Axonometry

4.2 Conclusion regarding the selected model

The location of this proposal is a "terrain vague", i.e., empty, no occupied, unarticulated space in the city center, which carries the potential to develop a new story about the city.

With the new model, this space is a collective form, where the field itself has a compositional character, but the interventions in it are a group form, namely, they are ambiguous group forms with complex connections. The collective shape is obtained through the use of basic collective components: wall, slab or roof, pillar, unit, and connection/linkage.

The last-mentioned component is crucial for this model, as it has made a connection with the city enabling it to be a recognizable and humanly understood entity using operating categories: mediation, definition, repetition, creation of functional paths, and selection.

The whole scope is a field, where interval, repetition, and seriality are key concepts. It is accessed through the collage technique and the moire figural effect is applied by superimposing different layers and grids.

The field condition implies an architecture that allows change, randomness, and improvisation, architecture that leaves room for the uncertainty of the real, therefore offering flexibility through the entire field.

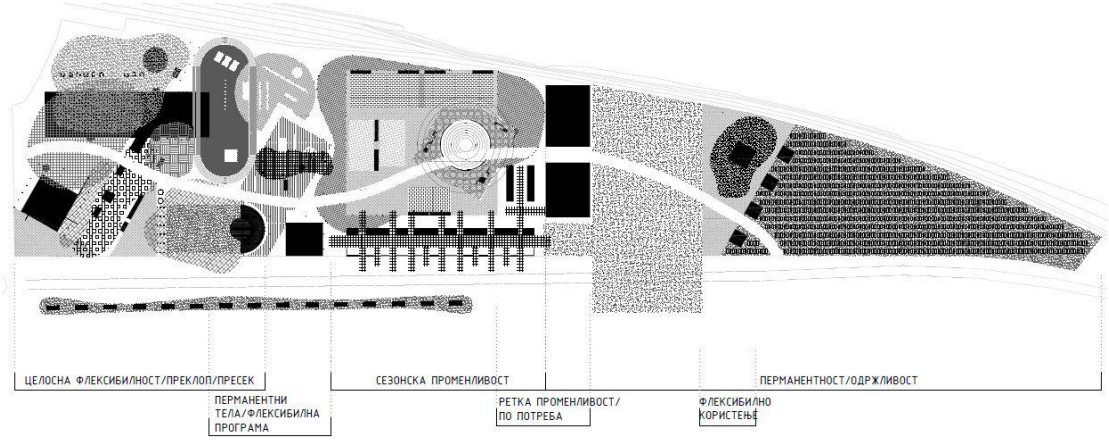


Figure 12: Analytical synthesis

The composition is reinforced through the formed sequences: collage of sequences (collisions, overlapping sequences) in which space flows, montage sequences (progression, extended sequences) where space between acquires its meaning, spatial sequences that are generally structural, meaning that they are often understood or experienced according to the meaning they currently leave in the person and program sequences that are generally based on conclusions drawn directly from the event.
The model is composed by overlapping several layers, as follows:
-Linkage/infrastructure;
-Facilities/buildings- They are a heterotopia that turns the place into a place, they are space between private and public with a chronic opening and closing mode towards the public, allowing flexibility and adaptability depending on needs throughout the year that increase during the summer season;
-Free space/space in-between- *Form matters, but not so much the form of thing as the forms between things*[3]. Public collective space, which is also defined as an absence of a building or space defined by buildings, occupies 70% of the entire location. This layer offers what the city needs most - free quality space for different needs and purposes;
-Points and lines;
-Natural objects- This layer allows the natural open urban space to be legible as a physical density against the suburban environment, with 35% of the field is enriched with trees of four different species. The area provided by the pine forest is a vegetation cluster instead of a complex of buildings, which aims to restore part of the green areas seized from Krushino due to the construction of the new highway Skopje-Ohrid. The pine forest will provide the identity to the place and a green gate will mark the entrance or exit of the city.

Figure 13: Visualizations

[3] ALLEN, Stan. 1985. Points + Lines, Field Conditions. New York: Princeton Architectural Press, page 2

5. Conclusion

The lack of public spaces which was more vivid during the pandemic in this case is solved by transforming this vague place into a new collective public space, which compounds 70% of its area. They are defined by buildings, forming thematic squares, while the buildings themselves are multifunctional serving the different needs the citizens have during the year and different capacities. The state of the field implies an architecture that allows change, coincidence, and improvisation, and architecture that leaves room for the uncertainty of the real, thus giving opportunity for flexibility throughout the field. Accordingly, the new urban design strategies should give identity to vague spaces, making collective public spaces in which morphology can be read as density without or with minimal architecture.

This approach could be used in similar areas of the cities, where vague places will turn into livable places instead of sprawling the city without continuity and flow.

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