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Automatic detection of the REM sleep phase during electrooculography

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Abstract: Sleep is not just a rest; it is a necessary part of the functioning of the cognitive system of people. Studying the role of sleep for effective functioning of the immune system, temperature regulation, memory, emotional regulation, learning and many other physiological and psychological processes is gaining more and more relevance. It attracts the attention of many leading researchers from around the world. The study of sleep by electrooculography (using three electrodes – two on the temples and one on the forehead) to track eye movements has a significant advantage over the more commonly used EEG methods due to its lower cost and the ability to quickly and efficiently collect large databases. A software-implemented algorithm for automatic recognition of the REM sleep phase during sleep is presented. This algorithm is a step of a larger project to create a system for external control of the content of dreams during REM sleep by providing scents and sounds, pre-associated with various stimuli and symbols. This system will allow in the future applying an automatic external influence on the sleeper during the REM phase. The development will have applications at research on the induction of selected elements during dreaming. This can help to people with post-traumatic stress disorder and phobias, as well for a more effective learning.

Keywords: REM SLEEP, AUTOMATIC DETECTION, SLEEP SIMULATION, TARGETED MEMORY ACTIVATION

1. Introduction

Sleep is a crucial mechanism for numerous physiological and psychological functions [1, 2]. Various disorders and deviations from normal sleep patterns can severely affect the immune system, emotional regulation, memory, learning abilities, and other vital functions.

It was first discovered by [3] that sleep is not simply a monotonous state of unconscious rest, but instead, it has a complex structure. Sleep consists of a periodic rotation of stages that differ significantly from each other in terms of brain activity patterns and muscular activities (refer to Fig. 1).

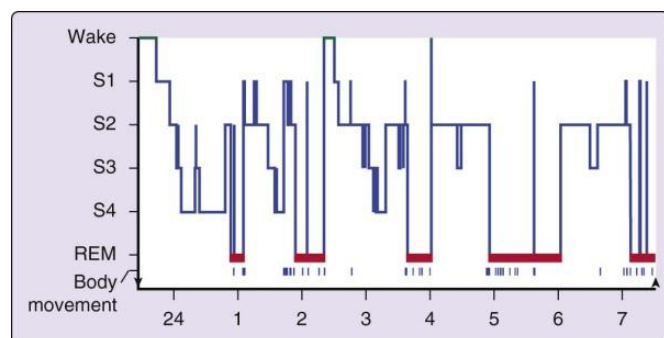


Fig. 1 Typical pattern of one night sleep of a normal 19-years old individual (adapted from [4])

Normal sleep can be broadly classified into two stages: *deep sleep* (NREM), which consists of various sub-stages, and *paradoxical or rapid-eye-movement* (REM) sleep. Empirical data, as reviewed in [1], indicate that during NREM, information from the hippocampus is transmitted to the cortex, leading to the deep encoding of important learnings from the day into long-term memory. This process prepares the hippocampus for further learning, while also erasing redundant information and regulating the sympathetic nervous system. As a result, traumatic information may also be deleted during this stage. Long-term deprivation of NREM sleep can lead to subjects remaining permanently in a "fight or flight" state, which may cause severe psychotic disorders.

The NREM stage of sleep is vital for any type of learning, including the acquisition of new motor skills. For instance, a study by [5] demonstrated that even a short nap can result in smoother and more accurate learned movements.

On the other hand, REM sleep is associated with creativity, remote analogies, and emotional regulation. During this phase,

desynchronized electroencephalographic patterns are observed, which are indistinguishable from those of awake periods. The noradrenaline emotion is blocked, allowing recall of traumatic emotional memories without experiencing the associated emotions. All motor activities are also blocked, with the exception of quick eye movements, which give this stage its name - Rapid Eye-Movements.

One of the most significant empirical findings associated with REM sleep is that dreams occur more frequently during this stage. It is as if the brain prevents the body from possible injuries by blocking the muscles and noradrenaline emotion, leading to a paradoxical psychotic-like stage of dreams. Symptoms like hallucinations, delusions, confused and disturbed thoughts, and disturbed recognition of time, typical of severe psychotic patients, are normal for every healthy individual during paradoxical REM sleep. Adequate and quality REM sleep is essential for healthy emotional activities and is crucial for creativity.

It is not surprising that sleep studies have increased tremendously recently, thanks to the development of better monitoring techniques, and numerous brilliant researchers from all over the world are now focusing on this type of research..

2. Studying the sleep and its stages

Traditionally, electroencephalography ([6], [7]) has been the primary method for detecting the different phases of sleep. However, there are many other methodologies for studying sleep, which vary greatly according to criteria such as objectivity vs. subjectivity, contact vs. contactless devices, and more (see [8] for a review). Additionally, several methods are usually used simultaneously to obtain more reliable results and overcome the limitations of each separate method. The combined use of many different methods for studying sleep is known as polysomnography. Polysomnography may include two or more of the recording devices listed below (taken from [8], p.2):

Electroencephalogram (EEG) — measures and records the brainwave activity to identify sleep stages and detect seizure activity.

Electrooculogram (EOG) — records eye movements. These movements are important for identifying the different sleep stages, especially the REM stage.

Electromyogram (EMG) — records muscle activity (e.g., teeth grinding and face twitches; but also, limb movements using surface EMG monitoring of limb muscles, periodic or other). Chin EMG is necessary to differentiate REM from wakefulness, limb EMG can identify periodic limb movements during sleep (PLMS).

Electrocardiogram (EKG) — records the heart rate and rhythm.

Pulse oximetry — monitors the oxygen saturation (SO₂).

Respiratory monitor — measures the respiratory effort (thoracic and abdominal). It can be of several types, including impedance, inductance, strain gauges, etc.

Capnography — measures and graphically displays the inhaled and exhaled CO₂ concentrations at the airway opening.

Transcutaneous monitors — measure the diffusion of O₂ and CO₂ through the skin.

Microphone — continuously records the snoring volume and kind.

Video camera — continuously records video. It is useful to identify the body motion and position.

Thermometer — records the core body temperature and its changes.

Light intensity tolerance test — determines the influence of light intensity on sleep.

Nocturnal penile tumescence test — is used to identify physiological erectile dysfunctions.

Esophageal tests — includes pressure manometry, to measure pleural pressure; esophageal manometry to assess peristalsis, and esophageal pH monitoring (acidity test).

Nasal and oral airflow sensor — records the airflow and the breathing rate.

Gastroesophageal monitor — is used to detect Gastroesophageal Reflux Disease (GERD).

Blood pressure monitor — measures the blood pressure and its changes.

The list above includes both contact devices (such as EEG, EMG, EKG, etc.) and contactless ones (such as microphone, video camera, etc.). Each of these devices has its own advantages and disadvantages, and they vary in terms of their sensitivity and specificity in detecting different parameters of sleep. The parameters of sleep, in turn, can be numerous, but they are usually measured in terms of various time intervals. For example, the time when the participant goes to bed and when they leave the bed; the time when the first sleep stage begins and when the last sleep stage finishes; the amount of time spent in REM or NREM sleep, and more.

Sleep studies also include subjective methods such as questionnaires and sleep diaries. These methods can measure elements of sleep that objective methods cannot, such as the content of dreams or the precise emotional mood produced by sleep and/or dreams. Introspective methods may also include voluntarily depriving oneself of sleep for a short period of time or living in complete darkness for a couple of days.

In addition, studying animal sleep may provide us with data extracted using more invasive methods (see, for example, [9]).

Certainly, the combined use of several methods has its advantages, including the ability to measure many parameters and increased reliability. However, there are also some disadvantages to consider. One of these is the cost, as some devices, such as EEG, can be quite expensive and require consumables. Another disadvantage is the potential for information overload due to the large amount of data collected. This can increase the degrees of freedom, making it difficult to focus on the most relevant information and leading to false alarms and spurious relationships.

Electrooculography (EOG)

By attaching skin electrodes outside the eye, near the lateral and medial canthus, it is possible to detect a participant's horizontal eye movements. EOG is actually a type of Electromyography (EMG), which measures the electrical potentials that cause muscle contractions responsible for horizontal eye movements.

Construction of an EOG device is cheaper than that of more complex EEG machines, as it only requires three or even two electrodes and hardware for filtering out various types of noise. The signal from the EOG device is usually discretized for additional software processing. See Figure 2 for a diagram of a typical example of EOG output.

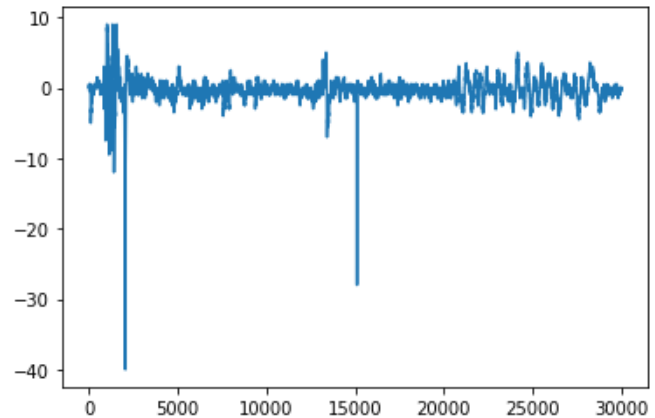


Fig. 2 Example of a 5-minutes record of a dream by EOG. Time is on the horizontal line; the difference of the potential between the two electrodes is on the vertical line.

The typical electrooculography presents the difference in potentials between the two electrodes as a function of time. The interpretation of this difference is a rapid eye movement, either to the left (positive numbers on the vertical axis) or to the right (negative numbers). It is important to note that if the participant moves their eyes to the left and then stops them (maintaining a constant gaze to the left), then the EOG signal will produce a large positive number, which will slowly decrease to zero. Thus, the device measures the initial change in eye position and returns to zero if the eyes remain motionless.

The output of the EOG device is a stream of numbers, which is a discretized version of the potential difference. This output can be visualized through a graph and can be designed with an arbitrary frequency. The work presented in this paper is based on an EOG signal that provides 100 numbers per second.

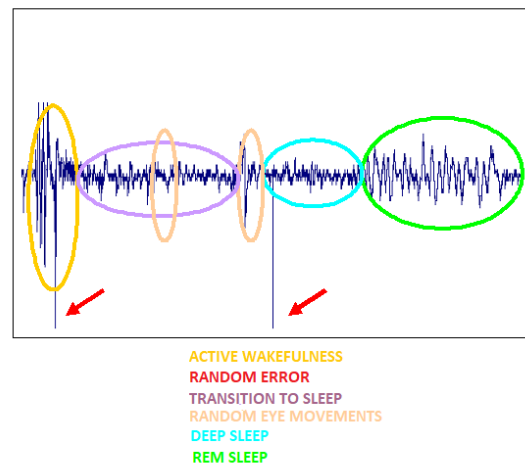


Fig. 3 The different stages of the sleep could be easily recognized visually by looking on the graph but it is a challenge to design an automatic system for their on-line recognition.

Electrooculography has a big advantage over the more frequently used EEG due to its lower cost. However, it is difficult to distinguish the EOG signal during different stages of NREM sleep, but it is reliable enough to detect the REM phase. Several algorithms have been developed for automatic detection of REM sleep using EOG ([10], [11], [12]). The challenge is that while it is

relatively easy to visually detect REM by examining the EOG graph (see Fig. 3), automatic detection is difficult.

3. Algorithm for automatic detection of REM phase

We have developed a Python-based algorithm for automatic online detection of the REM phase of sleep using a continuously incoming stream of numbers. During program execution, the original signal (as shown in Figures 2 and 3) is transformed into an output consisting of a set of time intervals for each sleep stage (as illustrated in Figure 4).

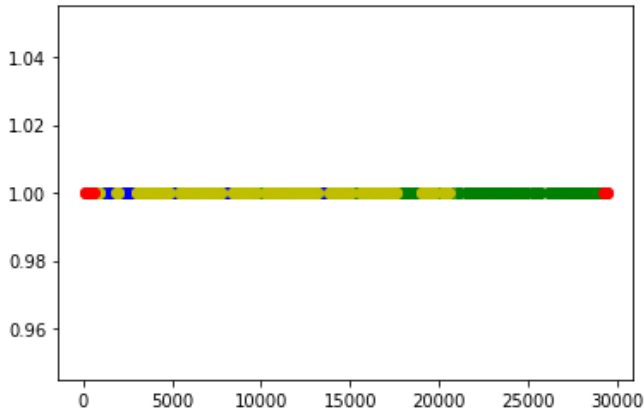


Fig. 4 The output of the algorithm. In green is the most important part of the sleep – REM; in yellow is deep sleep; in blue – awakens; in red – undefined time intervals.

The program relies on two primary parameters, along with some participant-specific ones. The first parameter controls the degree of smoothing applied to the data to eliminate random large fluctuations, while the second parameter controls the width of the time window used to detect the sleep stage. Increasing the smoothness parameter results in more data being removed, increasing specificity but decreasing sensitivity. Conversely, increasing the window width parameter results in higher accuracy but also higher time delay.

The algorithm consists of four main procedures: (1) smoothing the input data, (2) calculating estimates for the first derivative, (3) extracting main single eye movements (EM) and their amplitude, duration, and slope, and (4) generating the output of the program in the form of time intervals for each stage of sleep.

During the first procedure, the program sequentially analyzes the input stream. After reading one number, it returns the median of the set of previously read numbers, depending on the window width parameter. For example, if the window width is set to 5, then at each step, the algorithm returns the median of the last 5 numbers. The final result is a smoothed version of the incoming signal with high peaks removed (see Fig. 5).

The output signal of the first procedure replicates the main form of the original signal but without very high peaks, random errors, or detection of random single eye movements. The output signal has slightly smaller amplitudes of the waveforms than the original signal, but this difference is relatively small (see Fig. 5). The frequent small oscillations are also removed. In summary, after the first procedure, one can clearly see the main waves caused by the eye movements in the output signal.

During the second main procedure, a variant of the first derivative of these waves is calculated.

In the second main procedure, a window of numbers is again created around the focused number. For each element in this

window, its difference from the mean of all numbers in the window is calculated, and this difference is then divided by the length of the time interval between the respective element and the middle of the window. This calculation follows the definition of the first derivative. Finally, the mean of all these ratios is obtained.

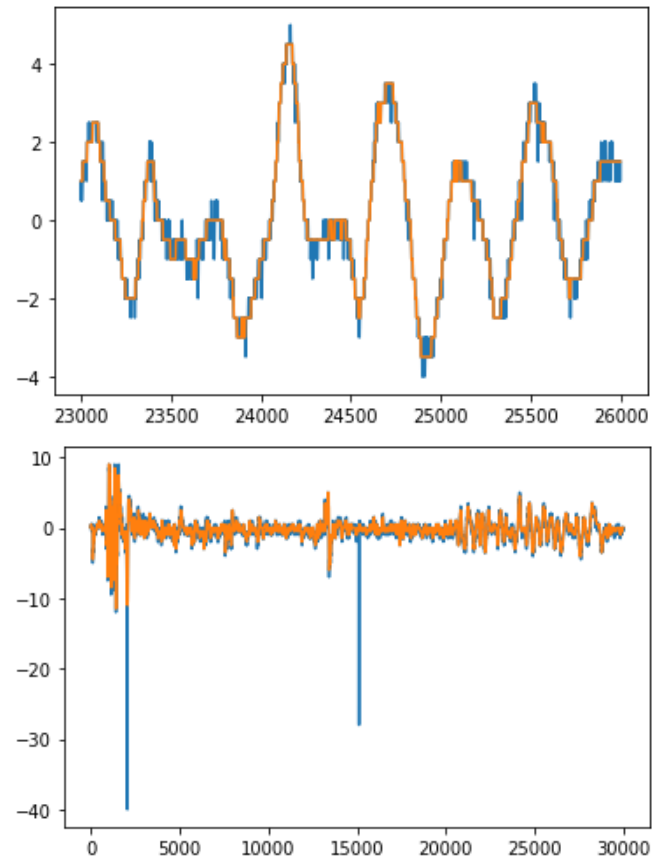


Fig. 5 The original signal (in blue) together with its smoothed version (in orange). On the bottom panel is a small part of the data on the upper panel.

The purpose of this whole procedure is to determine the sign of the derivative, i.e., the slope of the original curve. The output of the procedure is then used as an input for the next procedure, which extracts the separate eye movements (EM). This transformation effectively converts the signal into a set of distinct linear segments (as shown in Fig. 6).

The fourth procedure of the program is responsible for classifying each separate eye movement (EM) into one of four categories: wakefulness, deep sleep, REM, or undefined phase. This classification is based on the slope, duration (abscissa), and amplitude (ordinate) of each line segment representing an EM. The program allows for a certain tolerance level, which depends on a parameter, to avoid quick flipping between sleep phases. In other words, multiple consecutive EMs from the same sleep phase must be detected before the program concludes that the respective phase is present.

4. Conclusion

The conventional polysomnography method, which involves EEG, is typically considered too costly for many sleep research studies. In such cases, using EOG can be advantageous for collecting larger amounts of data. Although EOG may not have the same level of sensitivity as EEG for distinguishing between subtle sub-phases of NREM sleep, it is reliable enough for detecting REM sleep.

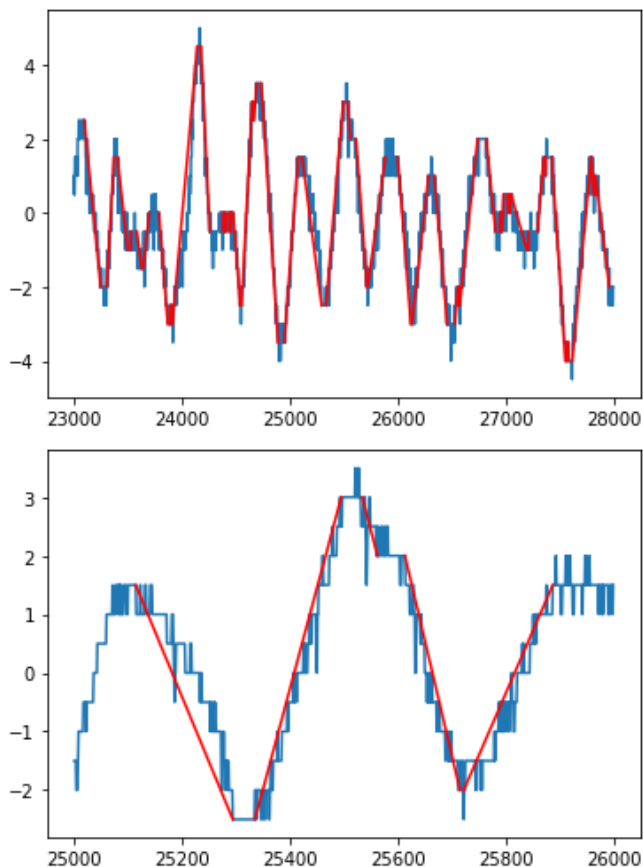


Fig. 6. The data are transformed onto set of separate linear segments, representing the single EMs. The parameters of interest are the slope, the duration, and the amplitude of each segment. On the basis of these three parameters, the segment is classified as a part of a specific phase of the sleep. On the bottom panel is visualized a small part of the data on the upper panel.

The visual detection of the REM phase of sleep by analyzing the EOG signal graph is relatively easy. However, the available algorithms for automatic detection are limited in their capabilities. To address this, we have developed a Python-based program that allows for the automatic on-line detection of the REM phase during data collection. This program has the potential to enable investigations into sleep using larger data sets and also facilitate active manipulation of sleep during the REM phase.

The presented results represent only the first step of a larger project, and there are still many shortcomings that need to be addressed. It is necessary to collect more data and precisely calibrate the parameters, taking into account the specific characteristics of each participant. To achieve this, a larger collection of sleep records should be obtained from different individuals sleeping in different contexts. Therefore, the results presented here can only be interpreted as preliminary steps towards the development of software for sleep analysis, and further calibration of the parameters is required.

Despite these limitations, the proposed algorithm could serve as a useful starting point for the development of future applications in this area.

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Problems of interaction between the manufacturer and the buyer in Iraqi-Russian transactions in the field of welding production

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Abstract: This study presents the process of confirming the conformity of welding production facilities in Iraqi-Russian transactions. The purpose of this work is to simplify the interaction between the manufacturer and the purchaser in Iraqi-Russian transactions when importing/exporting welding equipment and materials. In this study we will: (1) Analysis of international trade in the field of welding production. (2) Analysis of the problems faced by the import and export of welding production facilities. (3) Evaluation of requirements for products in the field of welding production in Russia and Iraq. (4) Preparation of welding products for entering the international market. (5) Development of a draft agreement on the recognition of requirements.

Keywords: WELDING PRODUCTION, CONFIRMATION OF CONFORMITY, INTERNATIONAL TRANSACTIONS, IMPORT, EXPORT, RUSSIA, IRAQ.

1. Introduction

The process of import and export is essential to the existence of countries, since no country has all the resources it needs to survive. Therefore, countries must depend on other countries for the goods and services they lack. As a result, imports together with exports form the basis of international economic relations [1,2].

Trade and economic ties between Russia and Iraq have always remained strong. A number of intergovernmental agreements were signed, including on trade-economic and scientific-technical cooperation, the creation of a Russian-Iraqi commission on trade-economic and scientific-technical cooperation, and cooperation in the development of oil and gas infrastructure [3].

2. Analysis of international trade in the field of welding production

2.1. The problem

Expanding the legal framework, ensuring the safety of Russian specialists on the Iraqi side, lifting restrictions on the import of certain grades of metal products, easing the visa regime, launching direct flights, active participation of business representatives in exhibitions in Russia and Iraq - all these and other measures can help the two countries make better use of its potential for trade and economic cooperation.

Over the past 22 years, Russia's exports to Iraq have increased by 25.9% year-on-year, from \$1.03 million in 1996 to \$164 million in 2018.

Export from Russia to Iraq of goods from the group "Machinery, equipment and apparatus" for the period January 2019 - April 2021 amounted to \$28.9 million, with a total weight of 3.31 thousand tons. [4] shown in the fig.1.

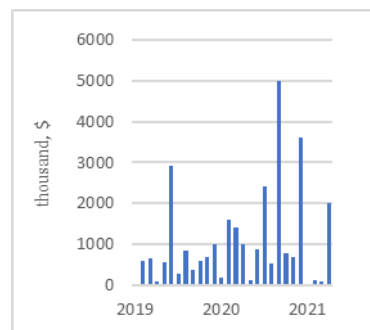


Fig. 1 Export from Russia to Iraq, USA

Import to Russia from Iraq of goods from the group "Machinery, equipment and apparatus" for the period January 2019 - April 2021 amounted to \$28.3 thousand, with a total weight of 0.408 tons. [4] shown in the fig.2.

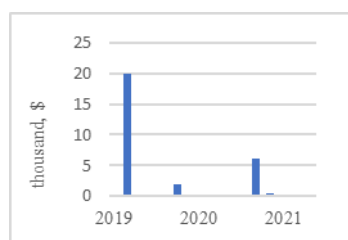


Fig. 2 Import to Russia from Iraq, USA

2.2. Requirements for products in the field of welding production in Russia and Iraq

Stages of entering the international market:

1. Conducting research. Choice of foreign market.
2. Preparation of the product to the requirements of the market and the buyer.
3. Negotiations with the buyer and the conclusion of an international contract.
4. Estimation of own resources and production capacities.
5. Elaboration of customs and logistics issues.
6. Assessment of export risks and study of requirements for foreign currency payments.

The document flow of each country is unique, and Russia is no exception. Documents for the import of products must be issued in accordance with the requirements [5]; otherwise, customs clearance will be difficult as it is shown in Table .1

Table 1: Requirements for import/export.

Russia requirements	Iraq requirements
Documents for import	Documents for import/export
- Contract	- Contract
- Transaction passport	- Certificate of Origin
- Certificate of Origin	- invoice
- invoice	- inspection certificate
- Bill of lading and/or railway bill of lading	
Documents for export	
- Contract	
- Transaction passport	
- Prepayment Information	
- International waybill	
- invoice	
- Packing list	
- Detailed description of the product	

However, there are some common features: Detailed description of the product (instruction manual, technical description, chemical composition, composition).

An inspection certificate is a document certifying the condition of the goods at the time of analysis or inspection or before shipment.

3. Assessment of the difference in requirements for welding production facilities

3.1. Requirements for welding facilities in Russia

Welding consumables can be used if they are accompanied by a certificate or other document in Russian from the supplier of welding consumables containing information about the manufacturer, purpose, quality, brand, and group number of the welding consumable, as well as a certification certificate for welding consumables [6].

Welding equipment is allowed for use if there is certification in accordance with the technical regulations, a manual (instruction) for operation (application) in Russian, as well as a certificate of attestation of welding equipment.

3.2. Requirements for welding facilities in Iraq

Compliance of the characteristics of welding equipment and welding materials with the applied welding technologies, as well as the conformity of the quality of welded joints, must be confirmed by the results of tests performed by independent certification centers and issued in the form of certificate attestation.

Effective January 1, 2020, Exporters/Importers trading with Iraq must comply with the Pre-Inspection, Testing and Certificate of Conformity Program for Goods Imported into Iraq, which requires a Certificate of Conformity to clear goods through customs.

CAP (The Conformity Assessment Program) focuses primarily on safety and quality standards, giving Iraqi consumers the confidence, they need in the quality and safety of imported goods and helping to protect their environment [7].

The Certificate of Conformity confirms that the regulated products comply with the relevant Iraqi Technical Regulations and approved standards. Evidence of conformity such as test reports.

4. Results and Discussion

4.1 Preparation of welding products for entering the international market

Welding equipment, in particular power supplies for arc welding and related processes, are designed and manufactured in accordance with IEC 60974-1 [8] or IEC 60974-6 [9] and tested in accordance with GOST R IEC 60974-4-2014 [10].

Requirements are for:

- qualifications of test specialists.
- test conditions.
- measuring instruments.
- periodic inspection and testing.
- protection against electric shock.
- functional testing.
- documentation.

Compliance testing is carried out by trained engineers qualified to carry out this verification in accordance with the above standard.

The procedure includes:

- detailed visual inspection.
- checking the ground circuit of the primary power source.
- Testing, using a generated voltage of 500 V, for leakage from the primary source to earth, the secondary source to earth, and for leakage between the primary and secondary circuits.
- functional check (when testing the machine after repair).

Thus, it has been established that the list of tests of welding equipment is largely the same, which makes it possible, with an appropriate agreement between countries and market participants, to significantly reduce the time and cost of launching products on the international market.

4.2 Development of a draft test recognition agreement

Product testing is carried out in many countries in the interests of consumers and, first of all, to ensure the safety of life and health of people, as well as to protect the environment. At the same time, each country establishes its own technical standards for products, as

well as methods and means of testing them, and creates a network of testing laboratories and special bodies for their certification.

GATT seeks to minimize the chance that technical requirements become trade barriers by encouraging the recognition of exporter testing results in the importing country.

The General Agreement on Tariffs and Trade (GATT) imposes the following requirements on products:

- imported goods must be checked under the same conditions as goods sold on the local market.
- it is acceptable to take into account test results, certificates or marks of conformity from other countries.

One of the tools to facilitate international trade in regulated products is the conclusion of mutual recognition agreements (MRA) based on Articles 207 and 218 TFEU. This eliminates the need for re-testing, allowing the user to benefit from the product economically.

MRA (Mutual Recognition Agreements) is a type of highly specialized trade agreement that allows trading countries to ensure that the products they buy abroad are equivalent to products produced domestically. These are agreements concluded between the Union and third countries for the purpose of mutual recognition of conformity assessment of regulated products as it is shown in fig.3.

RECOGNITION AGREEMENTS	
C. _____	Nr. _____
« ____ » _____ 20 ____	
(Name of organization) represented by (position, full name) acting based on (charter, regulation, power of attorney), hereinafter referred to as "exporter" on the one hand and (Name of organization) represented by (position, full name) acting based on (charter, regulation, power of attorney), hereinafter referred to as the "importer" on the one hand and collectively referred to as "parties", by signing this act confirm the following:	
1. In accordance with the contract dated (day, month, year) N (____), the following mutual recognition has been achieved between the exporter and the importer: - The parties agree to mutually recognize each other's technical capabilities on an equal basis, i.e., the testing laboratories recognize each other's test results (Testing Laboratories Agreements); - Each party accepts the other party's testing laboratory certification as its own. As a result, the technical competence of laboratories authorized by the parties to the agreement is mutually recognized (Agreements between systems of testing laboratories (systems for accreditation)). - Agreements on mutual recognition of documents certifying the conformity of products to established requirements. - Agreements on mutual recognition of test reports, based on which the importing country can issue its own documents certifying the conformity of products to the established requirements.	
- Agreements on mutual recognition of certificates. - Agreements on mutual recognition of test reports, based on which certificates can be issued.	
2. Materials and equipment are tested according to international standards (IEC 60974-1 or IEC 60974-6) 3. The quality of the work performed complies with the terms of the design and technical documentation. 4. Mutual obligations stipulated by the agreement dated (day, month, year) N (____) were fulfilled by the parties in full. 5. This recognition agreement is drawn up in two copies, having the same legal force, one for each of the parties. 6. This recognition agreement is an integral part of the contract dated (day, month, year) N (____).	
Exporter (Fill in what you want) (Position, signature, initials, surname)	
Importer (Fill in what you want) (Position, signature, initials, surname)	

Fig. 3 Recognition agreement

5. Conclusion

To achieve the primary goal of this article, the following tasks were solved:

1. An analysis was made of the problems faced by the import and export of welding production facilities.
2. An assessment of the requirements for products in the field of welding production in Russia and Iraq was carried out.
3. The preparation of welding products for entering the international market was studied.
4. A draft agreement on the recognition of claims has been developed.

As a result of the work, the requirements for testing welding equipment in Russia and Iraq were analyzed, and a draft agreement was developed on the mutual recognition of part of Russian and Iraqi tests to speed up and facilitate the release of products into the international trade zone.

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Georgia as a logistics node in the international transport corridor

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Abstract. *The article discusses the international transport route that passes through the South Caucasus and is part of the transport-logistics system connecting Europe-Asia. The international transport corridor is considered as a way to strengthen the unity of the country's economic space and develop international cooperation. The importance of the corridor is particularly noteworthy in the current geopolitical situation, when the transit cargo turnover in the South Caucasus region has increased, and the interest of international carriers is growing every year. The current state of the transport corridor is analyzed, as well as the role of Batumi and Poti ports in the development of transit freight. Moving cargo from the Caspian region to Europe is possible only with a developed transport and logistics infrastructure. A number of measures have been analyzed to eliminate obstacles in certain areas of the corridor, which will ensure its proper functioning. This can be achieved by implementing new infrastructure projects, simplifying customs procedures, implementing TradeLens, etc.*

KEY WORDS: INTERNATIONAL TRANSPORT CORRIDOR, PORT, TRANSPORT-LOGISTICS INFRASTRUCTURE, IMPLEMENTATION OF TRADELENS.

1. Introduction

Georgia's economic development largely depends on the efficient use of the country's transit potential. Our country is not distinguished by a variety of strategic natural resources, however it has an advantageous transport and geographical position, which gives it a transit function of strategic importance. Increasing the transit potential is one of the priorities of the country's strategic development, which contributes to trans-economic activities in the future. Georgia's role as part of the Europe-Caucasus-Asia transport corridor has grown significantly since the 1990s. Strengthening the role of transit between East and West involves both the transportation of traditional types and the transfer of energy resources. Such an international function enhances the interest of Western and Eastern states in the stable development of Georgia as a country located on the transport axis. The fulfillment of the transit function requires the development of close economic relations with neighboring states and the deepening of regional cooperation [1 -2]

The location of the country has always imposed on it a great responsibility to occupy an important place in the process of world civilization.[3].

Favorable geographical position gives the country the function of an international logistics node.

After gaining independence, our state began to search for its own identity, which would help it cope with the economic and political crisis and increase its significance for both neighboring and non-neighboring states. After the launch of the Baku-Tbilisi-Ceyhan and TRACECA oil pipeline, the Georgian government declared its transport potential one of the important components that ensure peace and stability in the country.[4].

Historically, the Great Silk Road is a transcontinental trade route that connected China with the coasts of the Mediterranean and Black Seas. It was along this path that trade began to develop as early as the 2nd century BC. Georgia still performs an important transit function in the modern economic space between the countries of Western and Central Asia, actively takes place in the completion and implementation of regional projects. This is confirmed the "Europe-Caucasus-Asia Corridor Program" execution and the construction of the Transcaucasian oil pipeline "Baku-Tbilisi-Ceyhan".

The Baku-Tbilisi-Ceyhan pipeline is one of the greatest engineering achievements of the new millennium. The length of this pipeline is 443 km through the territory of Azerbaijan, 249 km - through the territory of Georgia and 1076 km - through the territory of Turkey to the Ceyhan sea terminal. Baku-Tbilisi-Ceyhan is one of the longest pipelines in the world. Its construction in Georgia was completed in 2005. The BTC pipeline was commissioned in 2006. [5].

Among the development projects of the Caucasus and Central Asia, TRACECA stands out for its versatility; it is an integral part of a large project known as the Silk Road Rehabilitation Project.[6].

This year, there was held a high-level anniversary event dedicated to the 30th anniversary of the establishment of TRACECA and the "International Transport for the Development of the Europe-Caucasus-Asia Corridor". During the session, such important issues as the development of multimodal and maritime transport, facilitation of border crossing procedures and other topical areas related to the development of the TRACECA corridor were discussed. At the meeting, the delegations of the participating countries discussed the results of the implementation of the TRACECA International Road Transport licensing system in 2021, the status of implementation of the decisions of the intergovernmental commission by the parties to the agreement, the information on engagement in international treaties. They also considered the report on the action plan of the TRACECA Intergovernmental Commission for 2018-2021, the purpose of which was the implementation of the strategy for the development of the Europe-Caucasus-Asia international transport system corridor for 2016-2026. Since February 11, 2023, Georgia will have been the chairman of the TRACECA intergovernmental commission for one year.[7].

Due to the current geopolitical situation, traditional transport and logistics routes have undergone significant changes, which affected the supply of energy resources and essential goods around the world. Georgia is a key link between Europe and Central Asia, the shortest transit route for the transportation of oil and gas, as well as dry cargo. The mentioned transit route is also important for the economic interests of Armenia, Azerbaijan and the countries of Central Asia. Thus, the geo-economic significance of Georgia brought it into the sphere of global interests. For the development and effective use of transit corridors by Georgia, it is important to have a developed infrastructure and transport and logistics systems, including railway, land, sea and air transport. Each of them has a corresponding burden of presenting both the transit and logistics potential of the country. The importance of the function of Georgia's transit corridor is additionally emphasized by the three pipelines of international importance, passing through its territory and connecting it with Europe from the Caspian region: two large regional oil pipelines Baku-Tbilisi-Ceyhan, Baku-Supsa, as well as the South Caucasian gas pipeline Baku-Tbilisi-Erzurum (Shah Deniz). The mentioned power units are significant not only for highlighting the transit potential, but also for the regional integration of the country.[8-9].

2. Preconditions and means for resolving the problem

The Baku-Tbilisi-Ceyhan oil pipeline is the shortest way to transport Caspian oil to Europe. The permeability of Azerbaijani oil alone is 50 million tons per year, and if Kazakh and Turkmen oil are added, the value of this pipeline will increase, both at the regional and international levels.

80% of Kazakh oil has been exported through the Caspian Pipeline Consortium (CPC) through the Russian port of

Novorossiysk on the Black Sea. Last year, due to interruptions on the current route from the Russian port, the government of Kazakhstan decided to diversify oil supplies for export and, accordingly, began to search for alternative routes. On the basis of intensive negotiations, an agreement was reached between the Kazakh KazMunayGas and the Azerbaijani SOCAR on the annual supply of 1.5 million tons of Kazakh oil through the Baku-Tbilisi-Ceyhan pipeline. It is planned to increase the transportation of Kazakh oil through the Baku-Tbilisi-Ceyhan pipeline to 6-6.5 million tons in the future, what will further strengthen Georgia's transit capabilities.[10]

In addition, there are two more important gas pipelines on the territory of Georgia: the North-South and Baku-Tbilisi-Erzurum, that is, the Shah Deniz gas pipelines. The Baku-Tbilisi-Erzurum pipeline, also known as the South Caucasus pipeline, exports Azerbaijani gas produced at the Shah Deniz field through Georgia towards Turkey. As for the North-South main gas pipeline, Russian gas is transported through it to Georgia and Armenia.[11].

Georgia has another transport artery of regional importance - the Georgian Railway, which is an important part of the Eurasian transit corridor and the shortest route connecting Europe with Central Asia, and then with China. The total operational length of the railway is 1576.5 km. The rail transportation along the Caucasus corridor has increased significantly recently. According to today's data, the volume of cargo transportation by rail has amounted to 14.8 million tons, which is 21.8% more than last year. Respectively, along with the increase in freight traffic, the importance of the Georgian Railway in the transport corridor Europe-Caucasus-Asia also increases.[12-14].

The Baku-Tbilisi-Kars railway, which connects the Azerbaijan-Georgia railway line with the Turkish one, plays a special role in these processes. The construction of the railway was carried out on the basis of an agreement signed between Azerbaijan, Georgia and Turkey. The length of the Baku-Tbilisi-Kars railway is 826 kilometers, of which 254 kilometers are on the territory of Georgia. The project includes a new Kars-Akhalkalaki highway with a length of 98 km, of which 68 km pass through Turkey, 30 km - through Georgia. Transportation of goods on the specified railway line is carried out from Turkey to Xi'an province of China, the estimated time is 15 days and nights. In this direction, it is planned to increase the throughput to 5 million tons of cargo at the first stage and up to 15 million tons - at the next stage.

Accordingly, the full-load implementation of the Baku-Tbilisi-Kars railway, which is currently operating in test mode, will significantly increase the transit capacity of the Georgian railway. The aforementioned railway line connects Europe with China through Turkey-Georgia-Azerbaijan and Kazakhstan, and thus the country's integration into the international space is increasing, as well as economic and political relations are deepening both with neighboring countries, and with Kazakhstan and China. Based on the current geopolitical situation, the Baku-Tbilisi-Kars railway corridor has a high potential for attracting new cargo and competitiveness with other transit corridors in the region.[15-16].

For the maximum implementation of the function of the logistics node of Georgia, a modern and high-quality automotive infrastructure is needed. Automobile transport occupies a significant place in the transport system of the country. The main task of Georgia, as part of the Europe-Caucasus-Asia transport corridor, is the construction, development and reconstruction of roads and highways of international standard, so that the country's transport system can properly and smoothly cope with the increased volume of goods transported by road. Since 2006, the construction of large-scale highways has begun in Georgia. The foundation stone has been laid for the construction of the key E-60 and E-70 project of a four-lane international expressway. These highways connect the ports of Batumi and Poti with the borders of Azerbaijan and Turkey and at the same time function as a connecting corridor between Europe and Asia. This, in turn, increases the intensity of transit traffic along the route and makes it competitive in comparison with other alternative transit routes.[17-19].

The ports of Batumi, Poti, Kulevi and, in the future, Anaklia play a substantial role in transit cargo transportation. The port of Poti is Georgia's largest port on the Black Sea and has an ideal strategic location. It is the gateway to Europe for international cargo from Georgia, Armenia and Azerbaijan. Port of Poti handles containerized, liquid, dry and bulk cargoes and provides ferry services to Black Sea ports such as those of Ukraine, Russia and Bulgaria. Today it is the most important link of TRACECA. The project capacity of the port is 10 million tons. In total, the port has 15 berths, where all types of cargo transportation are carried out, including ro-ro.

Since 2011, the port of Poti has been operated by Maersk Line, a subsidiary of AP Moeller Terminals, a global container terminal operator. Since its inception, APM Terminals has raised over 80 million US dollars in investments to upgrade aging port infrastructure, customs center, rail and road transport and services.

Also, a plan is being implemented to expand the port of Poti, as the largest logistics center in Georgia, which involves the construction of container and multi-purpose deep-water berths. The multi-purpose berth will be 400m long and 13.5m deep. It will be able to accommodate vessels up to 9,000 TEU, giving the port the ability to handle bulk cargo and an additional 150,000 TEU. As for the container berth, it is planned to build a 300-meter berth, which will accommodate three modern Ship-to-Shore cranes. There should also be carried out the construction of a protective breakwater 1700 meters long, which will protect the harbor from the negative impact of adverse meteorological conditions and debris brought by the Rioni River. The construction of this infrastructure will significantly increase the container capacity of the port of Poti, which may exceed 1 million TEU per year.

The Poti port railway is directly connected to the country's railway network, which is a significant part of the new Baku-Tbilisi-Kars railway line, that allows the port to quickly and reliably transport containers between Poti and Khorgos (Chinese border crossing point on the Kazakh border). Accordingly, the importance of both the port and the port infrastructure for the effective performance of the function of a connecting corridor between Europe and Asia is increasing. Poti is also Georgia's gateway to the European route E60 (which runs from the French Brest to the city of Irkeshti, the border of Kyrgyzstan and China). In Georgia, this route is known as the "East-West Highway", which connects Poti with Boyuk-Kesik (Azerbaijan), passes through the largest cities of Georgia and connects with Turkey. The mentioned highway should strengthen the position of Poti as a port serving transit cargo flows to neighboring Armenia, Azerbaijan and the countries of Central Asia. On the other hand, the highway should activate the development of ro-ro service along the Black Sea via Poti.[20].

The port of Batumi, distinguished by its geostrategic and natural advantages, plays an important role in the transit space of Georgia. For the first time in the world, oil was exported from this port by the Amiurex tanker (within the project one of the authors was Robert Nobel). The port is connected with the countries of the Caucasus and Central Asia, Russia and Turkey by road and railway. It is also used as a major transit port for refining oil from Kazakhstan and Azerbaijan. Batumi Port is connected by sea with all maritime countries of the world. Airspace also plays an important role in Georgia's transit potential. The volume of goods transported by rail is increasing every year, what proves its economic and strategic importance. To perform a transit function, it is necessary to integrate the transport sector into the global transport infrastructure. The automotive industry is one of the main areas. The length of Georgian highways is 901.1 km, of which 1,603 km are of international importance and 5,298.1 km are of national importance. The creation of the "Europe-Caucasus-Asia transport corridor" contributed to the improvement and development of Georgia's infrastructure.

The port of Batumi is also one of the important logistics nodes in the Georgian transport system. This is an important link in the Europe-Caucasus-Asia corridor, the eastern intermodal gateway of the Black Sea, opening the way to Turkey and Europe through the Black Sea in the west, and to the Caucasus and Asia in the east.

The main competitors of the Batumi port on the Black Sea are: the Ukrainian ports of Odessa and Ilyichevsk, the Russian ports of Novorossiysk and Tuapse. The advantage of the Batumi port over the mentioned ports is that Ukrainian waters freeze in winter, and strong winds are frequent in Russian ports in winter. The main indicator of the development of the port was and remains Caspian oil. The port of Batumi, like the port of Poti, handles container and bulk cargoes, but its main specialization is the processing of bulk cargoes, oil and oil products, which can account for 80-90% of the port's total cargo turnover. In February 2008, KazTransOil, the main carrier of Kazakh oil both for export and for the domestic market, received exclusive rights to manage the Batumi Seaport for a period of 49 years, and also acquired the Batumi Oil Terminal. „KazTransOil,, is a subsidiary of the national company „KazMunayGas" of Kazakhstan. More than \$8 million has been invested in the purchase of new equipment, repairs, modernization of hulls and berths, and the development of modern IT systems. The acquisition of the Batumi port is a significant investment for Kazakhstan, the purpose of which is the provision of services for the transshipment of export oil and oil products from Kazakhstan, Azerbaijan, Turkmenistan, Georgia and other countries. The port of Batumi has five terminals: an oil terminal that can simultaneously receive 4 tankers. Its capacity is up to 15 million tons per year. The terminal specializes in processing of crude oil and virtually all types of oil. The mentioned berths have been leased to Batumi Oil Terminal LLC.

The multifunctional container terminal is managed with an investment of \$15 million by Batumi International Container Terminal LLC, which is a subsidiary of International Container Terminal Services Inc (ICTSI). Part of the investment was aimed at acquiring modern equipment needed for container handling and upgrading infrastructure construction. The terminal has an open storage area and transshipment equipment specializing in the direct and warehouse handling of containers. The annual capacity of the container terminal is 200,000 TEU.

The port of Batumi also has a fully automated ferry system. The nominal annual throughput of the terminal is about 700,000 tons.

The dry cargo terminal is capable of handling large-tonnage vessels up to 60,000 tons (Handymax) and specializes in transshipment of bulk, general and retail cargo. The berth management is leased by Wondernet Express, where a new multimodal urea (mineral fertilizer) terminal has been created. The investors of this multimodal terminal are the American corporation Trammo and Wondernet Express Investment Group. Investments in the project amounted to \$25 million, what will allow processing 1,500,000 tons of mineral fertilizers per year.

The implementation of such a large investment as the construction of a multimodal mineral fertilizer terminal in the port of Batumi once again underlines the role and function of Georgia as a regional logistics node.

The fulfillment of this project gives the Batumi port even more strategic importance as another link between European and Asian markets. Cargo from Central Asia through Azerbaijan will be distributed around the world through the port of Batumi.[21].

In total, 12.4 million tons of cargo were handled in the seaports of Poti and Batumi in 2022, which is 12.8% more than last year. Among these indicators, in 2022, the total number of containers handled in the seaports of Poti and Batumi amounted to 477,094 TEU, which is 18.9% more than in 2021. In 2022, the volume of cargo handled in the seaport of Poti amounted to 7.7 million tons, which is 9.0% more than in 2021 (7.1 million tons). Among them, in 2022, the number of containers handled in the seaport of Poti amounted to 357,623 TEU, which is 18.3% more than in 2021. In 2022, the volume of cargo handled at the Batumi

Seaport amounted to 4.7 million tons, which is 19.7% more than in 2021 (3.9 million tons). Among them, in 2022, the number of containers handled at the Batumi Seaport amounted to 119,471 TEU, which is 20.5% more than in 2021 (99,173 TEU).[13-14].

The construction of the deep water port of Anaklia also plays an important role in positioning Georgia as a logistics node. The mentioned project will create favorable conditions for the improvement of logistics services, the development of additional services, and will also lead to the possibility of increasing cargo turnover through the territory of Georgia. In addition, the project will have a significant positive social-economic effect, as it will create thousands of new jobs in the region. The construction of the deep water port of Anaklia is of strategic importance for Georgia and the entire South Caucasus region, both from an economic and strategic point of view. Favorable natural conditions of the deep water port of Anaklia make it possible to receive large-capacity vessels. This will be the first deep-water port in Georgia with a depth of 16 meters. Compared to other ports in the region, this project will have a number of competitive advantages: strategic location, the ability to receive Panamax type vessels, simple and fast procedures, and safe navigation throughout the year.

The construction of the mentioned port will give Georgia the opportunity to become a transport hub both in the Caucasus region and between the continents of Europe and Asia. The port will be equipped with modern technologies and efficient communication infrastructure, which will be connected to existing railways and roads. This will allow fast and efficient handling of various types of cargo, while the depth of the port and the length of the berths will make it possible to receive vessels with a capacity of 65,000 TEU. The total cost of the project is 2.5 billion US dollars, of which about 586 million dollars will be implemented in the first stage. The construction of the port is planned in 9 stages, and the annual capacity of 100 million tons of cargo will be achieved in stages. The port will be spread over an area of more than 3000 hectares, the annual cargo turnover of which will be 60-70 million tons, and in the future it will increase to 180-200 million tons. Accordingly, the mentioned port will be able to handle more cargo than Batumi, Poti and Kulevi combined, which in the future will increase the importance of the Anaklia port in handling increased cargo flows.

The deep water port of Anaklia will strengthen Georgia's potential as a transit country and help turn the Central Asian and Caucasus region into a transport node. The mentioned project has gained particular relevance and significance in connection with Russia's invasion of Ukraine and the imposition of EU and US sanctions on it. These developments have highlighted the importance of an alternative transport "Middle Corridor" connecting Europe-Asia, which competes with the Northern Corridor through Russia, despite the possibility of the fastest transportation of large volumes of goods. As a result of the current geopolitical situation, the Northern Corridor has largely lost its significance today. Consequently, the Middle Corridor and Georgia along with it have the opportunity to become one of the main transit corridors, as well as the main transport node between the two continents.[22].

The digitalization of the transit corridor will help increase the level of the country's logistics, improve competitiveness and contribute to the rapid development of the transit function, which is one of the important criteria for greater activation of our corridor in relation to competing transit routes.

The world's leading shipping lines and logistics companies are actively working on the implementation of TradeLens, which is a single electronic platform designed for all participants in international transportation, such as government agencies (customs), seaports, railways, transport and logistics companies, as well as for cargo owners themselves, so that they can automatically monitor their shipments and get appropriate administrative, operational and tracking information. As part of the UN Global Transport Conference, this site was also presented to high-ranking

representatives of member states. Thus, if the global electronic platform is adapted in the TRACECA member countries, this will certainly help increase the competitiveness of the corridor and, first of all, accelerate the formation of Georgia as a logistics node.[23].

3. Conclusion

The future strengthening of the perspective of Georgia's function as a logistics node will depend on a well-developed transport system, development and modernization of railway, port and road infrastructure and logistics centers of all its links; on improved coordination at Georgia's transport borders, simplification and clarification of customs procedures, and other trade promotion activities; on the economic development of neighboring and Central Asian countries, on the pace of progress of international competitive transit corridors and the improvement of trade relations of all countries participating in the New Silk Road, which means that the issue requires an integrated approach.

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Contribution to general safety measures at the construction site in practice

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Abstract: In this paper, the author will point out the determinants of safety and security at work in the context of the requirements of the HSEQ (Health, Safety, Environment and Quality) standard with practical application on the construction site in the context of maintenance of technical systems. The key determinant in the occupational safety approach in the context of general safety and maintenance of technical systems is prevention. Prevention implies planned and undertaken safety measures in every work procedure at the employer, with the aim of preventing or reducing risks at work. When basic organizational safety measures, i.e. basic rules and equipment for work protection, cannot eliminate or sufficiently limit the risks to the safety and health of workers, the employer is obliged as part of specific security to provide additional appropriate protective equipment and additional work protection measures, and ensure the training of workers in order to use it in a prescribed and correct manner. In this paper, the author will give numerous examples of the practical application of specific safety in specific working conditions. In this paper, the author will give examples of the application of prevention and general work safety with risk assessment on the construction site in the specific case of a renowned company with extensive international experience.

KEYWORDS: HSQE, PREVENTION, GENERAL SAFETY, CONSTRUCTION SITE, TECHNICAL SYSTEMS, MAINTENANCE.

1. Introduction

The author of the paper will point out the determinants of the HSEQ standard (Health, safety, environment and quality). The key determinant in the occupational safety approach in the context of maintenance of technical systems is prevention. Prevention implies planned and undertaken safety measures in every work procedure at the employer, with the aim of preventing or reducing risks at work. The employer and workers are obliged to implement protection at work, based on the general principles of prevention, defined by the European/international law on protection and prevention at work. The general principles of prevention are as follows: risk avoidance; risk assessment; preventing risks at their source; adapting the work to workers in connection with the design of the workplace, the choice of work equipment, and the way of working and work procedures in order to alleviate monotonous work, work with an imposed rhythm, work by performance in a certain time (standardized work) and other efforts with the aim of reducing their harmful effect on health; adapting to technical progress; by replacing dangerous with harmless or less dangerous; development of a consistent comprehensive prevention policy by linking technology, work organization, working conditions, human relations and the impact of the work environment; prioritizing collective protection measures over individual ones; appropriate training and notification of workers, and; free prevention, i.e. measures of protection at work for workers [1].

Risk prevention and assessment is based on the employer's obligation to be actively involved in occupational safety, as well as the worker's obligation to learn and apply the prescribed occupational safety instructions. The prevention program is included in the company's policy, not only to prevent injuries at work, and not to avoid sanctions for neglecting safety at work, but primarily because of the motivation of workers for better and safer work in their accidental so-called. "working" environment [x]. In order for us to accept the security system and the importance of its application as seriously as possible, we will state several facts, which are the result of CITB's analysis and statistics at the world level. Every year, about 80,000 workers fall ill from occupational diseases, that is, diseases that are considered to be caused by the work they perform, or at least worsened by the work they perform. Of these, about 52,000 relate to back diseases, damaged shoulders and similar injuries of the locomotors system. Then, 12,000 cases are related to stress, anxiety, and depression, while about 3,000 cases are related to respiratory and lung diseases. The remaining 13,000 patients are diseases and disorders of hearing, vision, skin, a slightly smaller number of diseases are diseases of the digestive system, toxicities - poisoning, and mechanical and thermal injuries [2].

The main features of HSEQ standard shown by the illustration given in Figure 1 [1].



Fig. 1. HSEQ standard key features.

2. General safety

General safety implies theoretical and practical training of workers to work in a safe manner, which is achieved by making workers aware of all facts and circumstances that could affect their safety and health (organization, risks, ways of performing work, etc.). Training is carried out according to the occupational safety program, which is based on risk assessment in the execution of work, which must include all hazards, harms and efforts according to the nature of the work. The training of workers is carried out through detailed courses, lectures, induction, short conversations, consultations, etc., which represents theoretical training of workers.

In addition to the theoretical part of employee training, which includes the above, practical employee training is also carried out, i.e. training and demonstration with workers; personal protective equipment and methods of using it, as well as additional aids for safe performance of work, then trainings for the performance of general business tasks and trainings for the use of specific protective equipment for the performance of specific jobs. Training of workers is done by professional and experienced persons hired by the employer. Therefore, as part of general safety, the employer is obliged to provide personal protective equipment for workers and train them to use it in the correctly prescribed manner when performing their duties.

In addition to the equipment and training of workers to use it, as part of general safety, the insurance of the work area is also understood, i.e. construction sites, which includes the following: risk assessment, securing the construction site, marking certain zones on the construction site, placing safety signs, fencing places for mechanization, pedestrian zones, rest areas, etc. Also, familiarization with possible unforeseen situations, such as fire, earthquake, natural disasters and the like, and what should be done in case of them, e.g. what type of fire extinguisher to use according to the source of the fire, where is the collection point and how to get to it, etc. Next, familiarization with tools and how to safely perform work with them, how to control the tools we use and what to do with faulty tools, how to handle electric tools and cables, how to

behave and be safe when carrying out transport and lifting loads, familiarization with traffic rules etc.

3. Risk assessment

The risk assessment includes all possible dangers and accidents that could happen during the execution of the works, therefore, according to the risk assessment, the safety regulations for the execution of the works on the appropriate construction site are drawn up, which contain all safety measures for the execution of the works with the aim of avoiding hazards or reducing them to a minimum, therefore it is a strict obligation to work according to that safety regulation, and neglecting it is a serious violation of the law on safety. Risk assessments are made by experienced and professionally trained teams or possibly individuals authorized by the institutions of the legislative system. Assessment of risk or danger is the basic starting point for organizing a work unit or company, and for the development of occupational safety procedures as well as their implementation. The assessment of risks or hazards at work determines the existence of hazards or risks, the types of hazards or risks, and the scope or size of those hazards or risks, and after analyzing the hazards, measures are determined and prescribed to eliminate hazards or reduce them to a minimum, as well as control the implementation of these of those established measures. Hazards determined by the hazard or risk assessment are eliminated in accordance with the prescribed occupational safety rules (basic and special), recognized occupational safety rules and rules of conduct determined in accordance with them, and the application of certain protective measures [3].

This example of risk matrix is shown in figure 3[4].

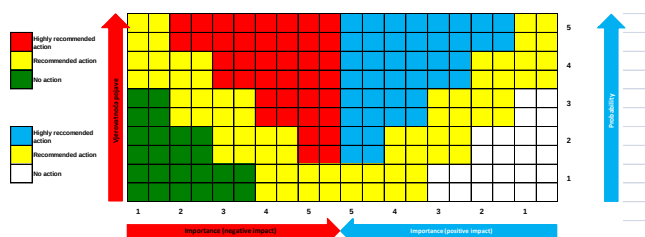


Fig. 2. An example of the risk matrix

The risk prediction and assessment process is a complete and effective risk assessment that includes the following (see figure 3):

- Detailed description of work and identification of possible hazards;
- Prediction and assessment of the client's managerial risk;
- Forecasting and assessing the managerial risk of the contractor;
- Identification and productive resolution of risks in accordance with safety rules;
- Establishing control for performing risky business tasks;
- Approval for performing risky tasks by an authorized security institution;
- Introducing workers to risky tasks;
- Common awareness of work tasks, hazards and control;
- Completion of the appropriate forms for the agreed security rules - "checklist", by the security supervisor, in accordance with the general security rules;
- The contractor must comply with the identified controls;
- Obligatory use of all safety means: fences, signs, tapes, etc., based on the existing dangers, which must be removed when the danger no longer exists;
- Informing supervisors about all changes in work tasks or changes in the way work tasks are performed, changes must be approved;
- All participants should be part of the process, think and make suggestions for possible improvements.

[illegible]

Fig. 3. An example of the risk assessment in case of machinery and equipment [5].

4. The basic safety-technical measures the construction site

One of the employer's obligations is to organize a lecture on the work performed on a given construction site for all workers upon arrival at the construction site, and the obligation of each worker is to attend that lecture before entering the construction site and starting work tasks. That lecture is called induction - introduction to work. Given that each construction site is specific to itself, all workers upon arrival at a new construction site are required to attend a construction site induction, regardless of whether they have previously attended inductions at other construction sites. In addition to induction on construction sites, occasionally, if necessary, the site manager organizes short talks on safety topics, that is, the so-called toolbox talks - short toolbox talks and possible safety training against the situation.

Therefore, you are obliged to attend the induction on each project, where you will be introduced to:

- Safety and technical rules of the construction site;
- Protective equipment and method of use;
- Collection point in case of danger;
- Safety signs on the construction site;
- Social - interpersonal provisions;
- Chronology of responsibilities and responsibilities at the construction site;
- Cooperation with subcontractors on the construction site;
- Traffic management - pedestrian segregation;
- Cleanliness of the construction site - method of disposal of waste materials;
- Hazards at the construction site;
- Work permits for certain jobs at the construction site;
- Fire control during "hot" works;
- Emergency procedures at the construction site;
- By reporting accidents and unsafe conditions at the construction site;
- First aid - where and from whom you should seek first aid;

During work at the site, you must always work safely and respect the environment. These instructions are intended to raise awareness of the responsibilities of workers and the expectations of the group of companies worldwide. Safety and health awareness among workers should produce the following:

- Respect for safety and health care, otherwise you can be liable for fines, as well as your employer, for heavy fines or detention.
- The duty of each individual to take care of himself and others who may be affected by certain work activities, including members of the public - visitors to the construction site;
- Duty to report any error or malfunction that may endanger health and safety;
- Mandatory acceptance and agreement with all safety requirements prescribed by the employer, ie XY FIRM;
- Keeping and not abusing or damaging personal protective equipment as well as other company property;

- Consulting and never arbitrarily performing any work that puts you or others at risk, as well as not using tools and equipment that you are not qualified to use.

Taking into account the general safety and technical measures of the construction site, the following must always be kept in mind:

- It is forbidden to consume alcohol or use narcotics during working hours and being in the field because it can harm your ability to work safely, and it can cost you the loss of your job, prison, and even your life or your colleagues;
- Always work in accordance with the risk assessment and risk assessment statement method;
- Do not use mobile devices while managing plants or machines;
- Make sure you understand the security system, when in doubt ask!
- Do not leave garbage, brick remains, plasterboard, iron or iron pipe remains. After leaving, clean everything;
- Do not obstruct the passage or stairs with tools or material, especially not the evacuation passage;
- Remove all electrical cables out of the way. When possible, leave them above head height;
- Accumulation of waste materials allows a good fire start - don't let that happen!;
- If the tool gets damaged, make sure it is repaired or replaced, report it!;
- When working at a height, secure loose objects, use lanyards for tools, so that they do not fall and injure someone;
- Remove scraps and iron bolts to prevent foot injuries;
- Flammable substances should be left in small quantities in marked containers that can be locked and must never be near the fire exit;
- Check the hazard bulletin board every day;
- Be aware of the form of your tasks!

5. Basic personal protective equipment

XY company mandates as a strict obligation that all workers wear the necessary personal protective equipment while working on the construction site. This includes work pants, work jacket, helmet, protective shoes, and gloves. Sometimes it is necessary to wear protective equipment, e.g. during cutting of an iron profile or a stone block, grinding and drilling, lifting loads, working on roads or working in closed rooms, therefore basic protective equipment includes goggles, earplugs, and a mask. The minimum clothing above the waist when exposed to the sun is a short-sleeved shirt with a vest. Wearing shorts in the workplace is never allowed. Nothing other than long work pants is allowed at the workplace. The helmet should be used correctly and should be in good condition. No cap should be worn under the helmet, except one made for that purpose. Black and white helmets are for supervisory authorities. During work at height, workers are obliged to wear laces on their helmets. If your work activity requires you to wear a special type of safety boots, you are obliged to wear them.

All XY company workers on the construction site are required to wear protective equipment with the company's logo, regardless of subcontractor workers who may not be wearing protective equipment. For a conscientious worker, who wants to return from work healthy and happy for his family, friends and the environment in general, safety rules and personal protective equipment at work - construction sites are a culture of living at work and not a legal obligation. Personal protective equipment must be worn correctly and must not be exchanged between workers. Personal protective equipment is there for a reason, it should not be an obstacle.

Protective jackets exist in different models and colors, depending on the purpose, business policy and marketing of the company. What is important and common is that they meet the requirements for protection at work and that they protect the upper part of the body from climatic and mechanical influences. That it is comfortable, that the set is recognizable and visible, or at least certain parts of the jacket are marked with ultraviolet strips.



Fig. 4. Protective jackets.

Also, t-shirts and hoodies can be of different designs and colors depending on the purpose, business and marketing policy, they must be of good quality, comfortable and meet the requirements for occupational safety.



Fig. 5. An example of t-shirts and hoodies.

Protective pants can be in different designs and colors. They must be elastic, comfortable, made of high-quality, strong material, meet the requirements for safety at work, and protect the lower part of the body from mechanical and thermal influences that could harm human health. Work pants have basic and additional, very practical pockets for carrying basic tools, such as a tape measure, wrench, etc.



Fig. 6. An example of protective pants.

Protective shoes and boots must be made of high-quality waterproof material (leather), protect the entire foot and joints, with a rubber sole to prevent slipping, a metal midsole to prevent punctures and punctures, and with a metal so-called with a cap that protects the fingers from blows, stings, bruises, etc.



Fig. 7. An example of protective shoes and boots.

Protective helmets have the role of protecting the head, they belong to permanent basic personal protective equipment, and they must not be interchanged. According to the purpose and position of the work, for the sake of better organization of the execution of works, they are in different colors depending on the function performed by certain persons, and depending on the client's request, but acc. it is generally accepted; the white helmet is intended for construction site managers, foremen and construction site bosses, black helmet for supervisors, blue, yellow, red and green for workers. Again, in accordance with the company's internal provisions and the client's requirements against the established practice in different countries. In addition to the color, the helmets can have different labels, e.g. "ticket" of the flag of the language the person speaks, "ticket" of the person in charge of first aid at the construction site, etc., therefore it is forbidden to write and paste any tickets without a specific purpose. Helmets have a shock-absorbing part between the head and the plastic armor that is intended to absorb any impact and primarily to enable the space between the head and the plastic armor for air circulation. There is also a flexible part for adjusting the appropriate width. There are places on the helmet for possible accessories, such as laces for working at height, which prevent the helmet from falling, a part for fixing ear protection, a part for fixing a visor. These are basic protective helmets, and there are helmets intended for special work.



Fig. 8. An example of protective helmets.

Gloves belong to everyday personal protective equipment. They protect hands and skin from various harmful effects that can be: mechanical, chemical and thermal, etc. Depending on the purpose and nature of the work being performed, they can be made of different materials; rubber, leather, fabric, nylon, combined, etc. It is important that they meet the occupational safety standard, that they are comfortable and elastic.



Fig. 9. An example of protective gloves.

Glasses serve to protect vision, in no case should they be understood as a fashion detail, and should be worn at your own discretion. Different types of glasses in different colors and models for different purposes are precisely specified. There are working protective glasses for protection from the sun or snow, i.e. its whitewash, or when working with bright white materials (panels) that are tinted black or dark brown, and whose function is vision protection, then glasses in light yellow, light blue for protection against gloomy weather and depressing darkened space, which also have the role of vision protection, as well as transparent glasses for work during cutting, grinding, saving and similar work, which serve exclusively for protection against mechanical factors that could damage vision (e.g. dust, pieces materials, shavings, etc.).



Fig. 10. An example of protective glasses.

Plugs and antiphons are personal protective equipment intended for hearing protection, and they must not be interchanged. There are ordinary foam suppositories for one use, which are thrown away after use, and silicone suppositories for multiple uses, which after use are placed in a box designed to hold them.



Fig. 11. An example of protective plugs.

Antiphons have the appearance of headphones, they can be ordinary antiphons with silicone, foam or sponge pads that cover the ear shell and thus reduce the noise level but also make communication much more difficult, and electronic antiphons that automatically adjust hearing to the existing noise, making communication much easier and extremely protective hearing.



Fig. 12. An example of antiphons.

5. Conclusions

From all the above, we can conclude that what characterizes all the most developed HSEQ management systems are 11 key elements, namely [1]:

- a) Method of controlling and distributing the latest documents
Creating protocols ensures that staff always have access to current and true security information.
- b) Safety checklist
They can reduce the time required to perform controls and provide data on security areas that are improving or declining over time.
- c) Risk assessment
After identifying potential hazards for workers, areas of safety non-compliance can be determined and solutions designed and implemented.
- d) Emergency response plan
It includes how to report emergencies, evacuation procedures and assembly points, procedures for closing down project operations, rescue and medical duties for all workers assigned to perform them, and contact information for individuals with more information. In addition, emergency response plans may include information about local hospitals and medical services and medical evacuation procedures.
- e) Training and archiving systems
Employee safety training programs can include fire, tornado and earthquake drills, accident simulations, first aid and even health and wellness programs. These basic safety training protocols can save lives in an emergency and prevent further safety risks.
- f) Internal audit policy and schedules
Health and safety audits are another great way to ensure compliance with safety legislation, as well as to identify strengths and weaknesses in the HSE management system.
- g) List of legal and health and safety regulations for compliance
OSHA (Occupational Safety and Health Administration) requires many employers to display their occupational safety and health poster in a visible place where employees can see it. This poster informs workers about their rights under the Occupational Safety and Health Act.
- i) Measurable measurement performance
 - Lost time rate (LTR);
 - Total accident rate (TAR);
 - Accident Severity Rate (ASR);
 - Total Recordable Injury Rate (TRIR);
 - Experience Modification Rate (EMR)
 - Working days since the last incident
- j) Regular meetings and communication strategy
- k) Regular management control
By controlling the state of occupational health and safety, the employer determines whether prevention measures and instructions for safe execution of work are followed, whether the prescribed obligations in this regard are met, and whether their implementation met the expected results on the construction site.

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Restoration and Preservation of the written wealth of Bulgaria

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Abstract: The paper aims to present of the problem of the endangerment of the Bulgarian written heritage. The task set for the Bulgarian culture by the present time is urgent, because the preservation of the written cultural legacy is a serious problem which cannot be postponed. We are obliged to look for ways to preserve and make available to the Bulgarian nation and to the international cultural society our rich cultural relics on paper, parchment etc.

Keywords: RESTORATION, CONSERVATION, PRESERVATION, WRITTEN WEALTH, DIGITALIZATION

1. Introduction

Bulgaria is the third country in Europe by total number of cultural and historical documents and one of the important problems is their preservation and restoration. The task set for the Bulgarian culture by the present time is urgent, because the preservation of the cultural legacy is a serious problem which cannot be postponed. We are obliged to look for ways to preserve and make available to the Bulgarian nation and to the international cultural society our rich cultural relics on paper, parchment etc.

Higher education is the key to the long-term preservation of our written inheritance. University students are actively involved in the development and implementation of modern technologies - ecological and non-chemical substances, led by the thought that, even a small part of the past to preserve and pass on to future generations, will preserve our identity.

A large number of manuscripts, old printed books, unique archival documents, the portrait collections, original graphics, periodicals, maps and paintings, have been damages as a result of heavy use in previous years. Some of them cannot be digitized before restoring or applying conservation procedures.

In today's world, when our lives are increasingly dominated by technology, it is wise decision to digitalize, as soon as possible the cultural assets, to enable scholars permanent access to knowledge and documents.



Fig. 1 Restoration and Conservation of the written wealth of Bulgaria

The most valuable written wealth of Bulgaria includes :

- Manuscripts and old printed books – *Enina Apostolos* from the middle of XI century (end of X – beginning of XI century), *Dobreisho Gospels* from the first half of XIII century, *Priest Puncho Miscellany* from 1796, etc.
- Unique archival documents, which are stored in the Bulgarian historical archive – *The private ordinance of Vasil Levski*; *The ordinance of Hristo Botev*; private ordinances of Peyo Yavorov etc. – correspondence of Hristo Botev, Zahari Stoyanov, Peyo Yavorov, Petar Beron, etc.
- In the portrait collection – images of G.S. Rakovski, V. Levski, Hr. Botev, F. Totyu, P. Hitov, Z. Stoyanov, L. Karavelov, etc. it includes also photos related to Bulgarian history.

- Original graphics from Al. Karastoyanov, Vl. Karastoyanov, etc.; it also includes several reproductions.

2. Aims and complex of actions

- Expansion and acceleration of the process of digitalization of valuable and jeopardized documents which have proven scientific, historical and educational value, both in national and European scale, as a manner of their preservation.

- Ensuring wider access to these documents

Activities:

- Restoration of the jeopardized paper documents and their digitalization
 - Digitalization of documents which have already been restored and to which there is limited access for use;
 - Digitalization of documents whose restoration is troublesome due to specific technical reasons.

Complex of actions:

The restoration and conservation of the jeopardized Bulgarian written and cultural legacy include a complex of actions:

- Preliminary exploration of the documents, i.e. examination of the natural content and the qualities of the materials the books are made of; [1]
- Their condition;
- The degree and the character of destructive processes
- Direct restoration intervention, related to the minimum possible interference with the documents structure
- Conservation - the restored materials have to be stored under optimal regime.
- Digitalization – is a method providing high quality copies, guaranteeing at the same time wide access to the collection and their physical protection.

3. Stages of restoration and preservation of a valuable, rare printed book

* Disinfection. Modified atmosphere anoxia with application of oxygen absorbers. The results are dehydration and suffocation of microorganisms and insects. Anoxia method is non-toxic to humans and the environment, and is widespread as a suitable alternative within the concept of protection of collections and cultural heritage. [2]

* Chemical analysis of the paper and the inks.

* Mechanical cleaning with chemical sponge, eraser and ultrasonic device. Surface dirt is removed.

* Stabilization of entries and notes with cyclododecan, before aqueous cleaning. The spray film builds on the surface a water-resistant layer, which disappears after some time.

* Aqueous cleaning of that part of the sheets, that were separated from the book body. Water bath with tap water and

support of polyester web, the so-called float washing. Of the sheets that were not separated from the book body, we made compresses with ethanol and water 1: 3, local application with brush.

* Deacidification- is very important conservation process. Aqueous deacidification with boraxo - phosphate buffer. Concentrated stock solution added to tap water bath, pH adjusted to 8 to 9. Deacidification in combination with aqueous cleaning in a bath or on the suction table. Deacidification with bookkeeper spray of the sheets that were not separated from the book body. [3]

* Drying after aqueous cleaning and deacidification. Air drying on polyester web or on cotton towels. Short air drying followed by drying between blotting papers. The blotting papers are change after 30 min.

* Strengthening of the paper and inks. Strengthening with solution of methylcellulose, with brush or nebulizer.

* Restoration. The restoration materials selected in view to their qualities. We applied two methods of restoration: [4]

- The first is classic way, direct restoration intervention with pure kozo Japanese paper and glue from methylcellulose. Mending of tears and filling of losses.

- We applied too restoration by the method of leaf casting for mending and compensation of bigger losses. The leaf casting machine infill losses with precoloured pulps.

* Humidification. After restoration and before flattening applies humidification with ultrasonic humidifier.

* Flattening. We use a press, limited pressure to preserve surface texture.

* Binding. We try to preserve the original leather binding. Sewing on quires, conservation binding with wooden board. Perfect opening of the book after restoration and conservation and followed by digitization.

4. Results and discussion

The expected results are as follows:

- to build up-to-date and research-based activities to adequately protect our national memory;
- creating conditions for the development of modern environmental technologies that will contribute to overcoming the backwardness of our country, towards the leading scientific and cultural centers at European and world level; 2
- integration of Bulgarian scientific organizations into the European and research space;
- building sustainable partnerships with leading European universities and institutes;
- strengthening the science-business link.

The results implementation will be directly applicable in the practice related to the life cycle of processes in science, education, social sphere and environment, through dissemination and transfer of knowledge. This calls for a completely new approach to teaching. The topics that will be addressed in the management of written heritage conservation will be identified and prioritized.

Digitization underlines the new training needs in addition to the contemporary requirements of the traditional aspects of conservation, because some aspects are taking on new significance in the light of recent events, such as disaster and accident management.

5. Conclusions

Our ambition is the preservation, conservation and restoration of the written cultural heritage of Bulgaria and final goal is the unification of bring together large regional libraries, archives, museums with the appeal of "Protecting the future", because the result is also an assessment of existing concepts, the connection of available networks and competent circles, and proposals for effective solutions. The society will be aware of the problem of the endangerment of the Bulgarian written heritage. The results will be key and aimed at creating a national strategy for preserving the Bulgarian memory. Will also strengthen the sense of responsibility to preserve the documentary heritage in Bulgaria with potential lenders - political organizations, supporting institutions, private business, and ultimately the whole public. We all have a moral responsibility to preserve our national identity.

6. Acknowledgement

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Influence of the social media in the formation of the social identity. Challenges and perspectives

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Abstract: In the era of the growing influence of social media, the processes related to the development and formation of the personality and identity of adolescents are faced with a number of challenges. The current scientific material focuses on the media literacy, considered in the context of contemporary social factors in the formation of social identity in adolescents.

Keywords: SOCIAL IDENTITY, SOCIAL MEDIA, MEDIA LITERACY, CONTEMPORARY CHALLENGES.

1. Introduction

The human personality is the basis of scientific research in a number of directions- anthropological, philosophical, psychological, biological, sociological. The identity is the highest possible manifestation of existence in human civilization. Perceived and analyzed through the humanistic and holistic approach, personal identity is a unifying starting point for its more comprehensive study.

Ideas about social identity find their determination in the social essence of cognitive processes, represented in the conceptual models of cognitive psychology. Influenced by the works of Freud and Adler, in his works "Social Learning and Clinical Psychology" (1954); "Clinical Psychology" (1964); "Development and Application of Social Learning Theory" (1982) and "Interpersonal Trust Scale" (1967), J. Rotter developed one of the first theories of socialization, built on the basis of the assumption that human behavior results from the interaction of the individual with the factors of his environment. Personality can be seen as a relatively stable construct possessing a basic integrity, but its content elements can be modified through the accumulation of new social and cognitive experiences.

Alfred Bandura creates the concept of modeling behavior by replicating socially acceptable behavior. Modeling of the behavior is based on the purposeful use of patterns of social behavior, leading to the interiorization and personification of the relevant qualities in the personality structure. The formation of social identity is primarily a process of self-regulation. "Recognition of self-regulatory capacities provides an incentive to explore the self-regulatory functions in which people serve as primary agents of their personal change." [1].

The stages in the modeling learning process are attention, storage, reproduction, and motivation, expressed in previous reinforcement. Bandura believes that the environment shapes behavior just as behavior shapes the environment. As a creator of the idea of the reciprocal determinism, he emphasized that the behavior of the world towards man and of man towards the world are mutually engendered.

Subsequently, learning have began to be considered as a system of three components - social environment, behavior and psychological characteristics of the personality.

Social identity is considered as an element of the structure of the overall personal identity, formed on the basis of social factors, arising from the influence of modern social reality. The phenomenon of social identity includes a number of components.

The authors Guan, M and So, J. distinguish them as follows:

“(i) a cognitive component – an awareness of one’s group membership, entailing the possibility to distinguish one group from another social categories;

(ii) an evaluative component – a value connotation associated with the group, reflecting the group self-esteem;

and (iii) an emotional component – an attachment to the group, capturing a feeling of affective commitment., [5].

The behavioral goals of the personality in the formation of the social identity can refer to:

“(1) ensuring coherence and favourable self-evaluation,

(2) building and maintaining relationships with others and

(3) accurately assessing external reality. Identity cues play a key role in at least two of these goals, by providing a basis on which to

build and maintain relationships and judge the reliability and validity of the social environment.” [10].

2. Results and discussion

Social identity is usually analyzed in the context of social belonging. A characteristic feature of social belonging is the building of social connectedness.

N. Nikolov indicates a definition of the term "social relationship", which is considered as a key in terms of defining the parameters of the types of social interaction, in its various socio-ontological manifestations: "the specificity of the social relationship in the social group, as an expression of the sociality of society, as well as in community sociality. In the first type, the social relationship is mediated by the phenomena of joint activity, i.e. it is of a "material nature" and entails inequality in the relationships that individuals realize as a result of their different power positioning in the group structure; and in the case of the second type - from the phenomena of community identity (the mental system "we - them"), which "... is precisely the spiritual connection of the individual and joint realization of this belonging, insofar as the individual relationships between the members of community sociality are an expression of their personal realization through their community identification" [8].

Contemporary factors for the formation of social identity have not been thoroughly investigated. The media and communication media are increasingly being seen as part of these factors. Results are already being observed regarding the influence of social networks on identity formation. In practice, the Internet community becomes a dominant social community that influences the formation of group identity among adolescents.

From the point of view of the time perspective, the question arises here - How long does it take for a person to acquire a group social identity? If before the growth of the influence of mass information and communication media, the child's family, school and friend environment were considered as social communities, now the question arises - How many group identities can be included in the personality structure in modern society?

The process of social identity formation in adolescents is exposed to a number of challenges related to social roles and models and social stereotypes that the individual internalizes in his own construction. The social attitudes and influences arising from social media and networks should be the focus of researchers and specialists in the field.

It is considered that „the construction of identity on social networking platforms is so flexible that people can design, hide, or even alter their identity if they want. As a result, people can put their new identity to the test online by posting pertinent items on social media under their real names, adopting a pseudonym and posting as someone who has already come out, or anonymously addressing worries about the coming-out process. In these ways, the student can gather support for challenging intrapsychic and social processes he or she is dealing with.” [6].

The lack of real contacts, the extensive use and the time spent on the Internet create a digital world, often illusory, in which the formation of identity is mainly based on the feedback of users on sites such as Facebook, Instagram, Twitter, etc. The process in this situation is two-way, and the roles are interchangeable. On the one hand, there are those who publish information about themselves. It

is not always analogous to the real "I", although in order to create a profile on such platforms, personal information is also needed, and it is often oriented towards the pursuit of a positive opinion from others.

In this case, many of the traditional identifying markers such as race or gender become less and less significant, resulting in less obligation and desire to adhere to traditional, social and cultural norms [3].

A similar thesis is developed by Madison Ganda (2014), who analyzes the creation of social identity in an online environment through the lens of Erving Goffman's dramaturgical theory. Goffman focuses his attention on the importance of everyday face-to-face communication between people and compares this interaction to the relationship between an actor and an audience. Actors can choose "the type of stage, props and costumes depending on the specifics of their audience." This process is driven by the desire to emphasize positive ideas about oneself in order to achieve the desired impression. At the same time, within this interaction, the role of the audience and the actor are interchangeable, as both actors and audience at the same time. Goffman compares communicative interaction to a performance, which is only a "front stage" aspect of that performance, and considers the idea of a "back stage" in which the individual has a private place where he can stop performing, get rid of his role or social identity and to be one's true self. The author examines self-presentation and social identity from the perspective of behaviorism, social exchange theory, and the social construction of reality, according to which by adhering to a certain role approved by society, individuals are rewarded. [4].

"Digital identity is a part of the immediate social experience of Internet users, obeying the blurring between media (cyber) space and physical reality. This is a world of remix culture, in which media images are perceived as a matrix of non-existent experiences and aspiration for future social affirmation./ At the same time, the mediality of the Internet remains the impression of electronic proximity, of the fullness of virtual communication, which easily grows into the formation of permanent (or not so much) virtual communities...". [9].

Delusions about who we are and what is perceived of us on the Internet, which are formed by constructing idealistic identities, can have a negative impact on the adolescent psyche. In order to avoid serious disabilities related to the shock of the difference between the real and the digital world, media literacy among young people is of utmost importance.

According to the European Union, media literacy is defined as: "the ability to use media, to understand and critically evaluate different aspects of media and media content, and to be able to communicate in a variety of contexts". An emphasis is added to the definition which states that "media literacy can be seen in a broader sense as access to new information technologies and critical, competent handling of their content" [2]. In this aspect, digital media literacy is seen as an opportunity to develop critical thinking, communication and information management competencies, needed by citizens as intelligent consumers and creators. Therefore, it is important for the education of thinking, engaged and informed citizens [7].

In 2020, the Media Literacy Coalition conducted two studies among students and teachers on the development of media literacy in the digital distance learning process, which provide important information about the degree of integration of media literacy in general education subjects. Although the researching sample is not representative of the country, the study found that "only 30% of children in junior high school and high school courses have worked with different sources, after being familiar with the methods and criteria that should apply; four out of ten students were given a task related to finding and evaluating sources of information online. However, only 30% have been done such a task after receiving instructions on the approach and criteria to apply; only 8% of teachers have received training on checking information sources." A key recommendation made in the report is the development and introduction of qualification programs for teachers both to improve their digital skills and to develop and periodically measure their media and information literacy. [2].

Turning the negatives from the increased use of social media into positives can be sought in the direction of the beneficial effects related to personal development, collaboration, digital citizenship, etc. For this purpose, it is necessary for children born in the digital age to form the necessary skills to avoid risks and properly use the possibilities of the Internet.

The proper development of children requires that they not only speak the "digital language", but also use it competently and critically [7]. This would be achieved through targeted educational impact of all participants in this process: teachers, students in all school grades and their parents.

With the development of digital competence in the education of adolescents, emphasis is placed on mastering the following areas of competence:

- Information literacy – correct formulation of the information sought, analysis, comparison and critical evaluation; retrieval and storage of digital content;
 - Communication and cooperation – communicating through digital technologies with an awareness of the diversity of cultures and generations; civic activism; application of behavioral norms of communication in a digital environment; digital identity management;
 - Creation of digital content - creation, editing, synthesis and improvement of digital content; copyright and intellectual property principles;
 - Safety – protection of personal data, devices and content in the digital space, protection of physical and mental health;
- Problem Solving - Identifying and solving problems and problematic situations in a digital environment; using digital means to create original content; self-assessment of digital competence. [7]

3. Conclusion

Acquiring digital literacy among adolescents is of utmost importance for their future development in the era of the technological revolution. The knowledge and skills for safely handle the opportunities that the online world offers will enable young people to improve their competences in searching and critically understanding digital content. And not only this. Dealing with online communication platforms poses a number of risks to children's mental and physical well-being. The role of teachers and parents in the learning and support processes occupies a special place, laying the foundations of a stable value system through educational activities. In this way, children's digital and social identity will tolerate fewer differences, help them to define themselves faster, get to know the world around them and navigate it more easily, and this will contribute to the formation of prepared, educated and successful future individuals.

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Evaluating the effectiveness of public policies in higher education: purpose, standards and practical dimensions

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Abstract: *The aim of the paper is to highlight aspects of public policies that influence the positive development of higher education in Bulgaria and to be on an equal footing within the European Educational and Scientific Research Area, as well as to outline the prospects for future optimization and effectiveness of this activity.*

Keywords: EFFECTIVENESS, PUBLIC POLICIES, HIGH EDUCATION

1. Introduction

The object of the research is public policies in the field of higher education. The subject is their effectiveness. An analysis was made and conclusions and recommendations were outlined.

To achieve the set goals and objectives, the following methods were used: content analysis of literary sources on the topic of the study; monitoring, selection and analysis of environmental factors; analysis of secondary sources. For structuring and summarizing the results, quantitative and qualitative methods were used - description and grouping, analysis and comparison of data from official statistical sources in order to establish the state of public policies in the field of higher education, and the method of comparative analysis was used.

The modern world is full of risks that affect all spheres of society, including the higher education sector. The environment is risky, full of crisis of different nature and requires flexible and effective solutions, which are often situationally adapted to the next changes. The special characteristics of public policies derive from the fact that they are formulated by what David Easton calls "authorities" in the political system, namely "primary managers, legislators, judges, administrators, advisers, and the like." According to him, the main characteristics of public policy are [99]:

1. First, purposeful or result-oriented action rather than random behavior.

2. Second, public policy refers to the actions or pattern of decision-making by public authorities on a particular matter over a period, not to their individual discrete decisions on that matter in an ad hoc manner.

3. Third, policy is what governments actually do and what is subsequently realized, not what they intend to do or say they would do.

4. Fourth, public policy can be both positive and negative in form. Positive – may include a form of management action in relation to some social problems. Negative - May involve a decision by government officials not to act on a matter on which government opinion, attitude or action is required.

5. Fifth, public policy, at least in its positive form, is based on law and is authoritative. Behind it is a legal sanction that is potentially coercive in nature and binding on all citizens. This is the main difference between public policy and the policies of individuals or private business entities.

6. Finally, public policy is an action that requires flexibility to deal with the changing desires of people, shaped according to their socio-cultural environment.

Another group of definitions defines this type of policy as "a system of laws, regulatory measures, methods of action and priorities for financing a given sector, implemented by a government body or its representatives" [97]. Public policy provides guidance to governments and is accomplished through public accountability to citizens. It can also be defined as a purposeful course of action taken to address a problem or public challenge. Public policy is developed by government bodies. It is done through the decision-making process. Politicians must make decisions quickly, often based on their values and judgments, reflecting their convictions.

Public policies are always implemented in certain social, economic and financial conditions.

2. Monitoring and evaluation of the effectiveness of the public policies

Monitoring and evaluation are processes of interrelated activities that provide an opportunity to collect and incorporate information and engage all key partners in the evaluation of the effectiveness of public policies. These are processes that enable public policies and projects to be aligned with key problems of public importance and to carry out effective control and evaluation of their implementation.

Monitoring and evaluations of public policies and projects that are implemented in social practice are extremely diverse. There are different criteria by which they can be typologized, for example territorial scope, objectives, duration, degree of depth, etc. Depending on their territorial scope, there are four main types of monitoring and assessments: international; carried out at the national level; carried out at the regional level (planning district, district); carried out at the local level (municipalities, settlements, settlements)" [144].

Classic comprehensive planning includes the following elements:

1. An initial inventory phase, usually to collect data on the natural geography and environment, on the physical infrastructure, and on the demographic and economic characteristics of the resident population.

2. A search for alternative solutions, which could be described as exhaustive but is in fact highly limited, with significant alternatives eliminated prior to public presentation.

3. Prepare a plan.

4. Unspecified addressee: "public interest".

5. Topic-oriented as opposed to problem-oriented scope.

6. Fairly long time horizon (at least ten years).

7. An apolitical approach to the implementation process.

Policy analysis, on the other hand, includes the following parallel set of characteristics:

1. Description phase, limited in scope and focused on a specific problem.

2. Limited search for alternatives, which are then usually evaluated and shown to the public.

3. Preparation of memoranda, policy documents or draft legislation.

4. A particular addressee, whether a CEO, an elected official, a public interest group, a neighborhood, or a bank, is likely to have a particular perspective on the issue.

5. A problem orientation, alternatively described as a reactive stance.

6. A time horizon often compromised by conditions of frequent elections and uncertainty.

7. Political approach to achieve the goals of monitoring.

The process of comprehensive planning has more to do with research methods, and the process of policy analysis with basic methods. However, a few additional clarifications should be made.

The main goal of the Law on Amendments and Supplements to the Law on Higher Education, adopted in February 2020, is to achieve a "higher education system that is capable of responding to the dynamics of social processes while maintaining the necessary quality of higher education." An instrument for achieving this goal

is the improvement of the model of evaluation and accreditation of higher education institutions" [111].

The research carried out allows the following recommendations to be formulated:

- Implementation of ongoing in-depth research at the national level on the effectiveness of public policies in relation to higher education.
- Use of the research results in the implementation of the goals set in the strategic documents relating to higher education in the period 2021-2030. Building a purposeful strategy for using the potential of Bulgarian universities within the framework of various projects financed by European programs.
- Creating conditions for a systematic critical reflection on the advantages and limitations of effective public policies applicable in the field of higher education.
- Creation of a system for monitoring the practical experience of managers who use in their practice results of monitoring of public policies in the field of higher education. Provision of an academic environment and conditions for the training of specialists working on the evaluation of the effectiveness of public policies in relation to the higher education system.

Analysis of the existing system and development of a model to restructure the higher schools by consolidating the university structures in Bulgaria based on examples such as "Oxford", "Cambridge", "Berkeley", i.e. to go to the so-called national university networks following the example of European universities already in operation.

3. Conclusions

In the conditions of a dynamic and difficult to predict environment (meaning not only current but also future crises of a different nature) full of challenges, it is important to conduct public policies characterized by effectiveness that can be objectively evaluated on the basis of achieved results. The modern erudite and thinker N. Chomsky summarizes that "a realistic assessment of the threats and the announced policies must be followed by concrete proposals, some of which are already being implemented, to control the threats and create a much better and viable society" [46, p. 477].

In this context, the measures identified in the new Strategy for the Development of Higher Education in Bulgaria are also included. It is important to implement: implementation of control mechanisms for the quality of education by the state; improvement of the accreditation model and the Rating system of higher schools; determining funding according to the preparation and realization of graduates, as well as increasing: the effectiveness of the structure of the educational process (it is assumed that the structure of the effective educational process in terms of the quality of education is considered and structured); the preparation of the teaching staff in the aspect of traditional teaching (it is assumed that the trainers are competent, able to transfer knowledge to students and develop the necessary skills and abilities; they have a basic education in the field of the disciplines they teach, formed professional thinking, know the terminology, structure the training, use illustrative materials); the quality of the workload distribution (it is assumed that the workload is distributed taking into account the experience and knowledge of the lecturers, rather than formally; training courses are assigned to the lecturers, there is no annual "shuffling" of courses, it is not allowed, without good reasons for a previously developed and taught course to be "taken away" from one instructor and transferred to another instructor to "adjust" the workload); the appropriateness of the schedule (it is assumed that the schedule is formed taking into account the ability of students to effectively perceive the learning material); the presence of elements of modern productive approaches to learning in the educational process and the effectiveness of teachers in terms of "non-traditional" teaching methods (it is assumed that the contextual approach, project-based learning are widely introduced); the possibility of productive practical assimilation and improvement of acquired knowledge and skills (again, a high level of application of contextual learning

(special seminars, for example) is assumed in real working conditions; well-organized and practically oriented practice in the direction of training as part of the learning process, as the content of this practice is synchronized with the subjects studied by the students; the availability of scientific and educational laboratories that really work and attract students to work extensively in each individual field of study, for each master's program, for example; the presence of other practically oriented events - competitions for student works, scientific and practical student circles); the possibility of students' scientific work (real working clubs, laboratories, availability of the necessary equipment; opportunities for publications and participation in conferences; participation of students in research and development work groups); the availability of effective technologies for the development of students' creativity; periodic monitoring of students' learning difficulties and taking measures to eliminate these difficulties; the effectiveness of the fight against corruption (the absence of bribes; students who do not attend lectures, but are enrolled and then receive diplomas; lack of pressure on teachers from a management point of view regarding grades the effectiveness of the control of the educational process (the control is informal, not only the documents themselves are controlled, but also the teaching activity of each teacher, there are working groups to improve the improvement of education, well-thought-out procedures on how to do this); effectiveness of the control of the knowledge obtained by the students and the skills formed in them; improving the management of the university/faculty/department (the management is objective, fair, logical; subordinated to the goals of maximum efficiency of the educational process; democratic procedures are available when making important decisions, there is no authoritarianism; the management is not based on personal attachment/ convenience for managers, the distribution of financial rewards is logical, fair and honest, according to labor contribution, etc.); the quality of psychological support (help should be provided not only to students, but also to teachers; prevention of professional burnout); opportunities for training people with disabilities (appropriate organization of the university's workspace, availability of sign translation, etc.); realization of the graduates as professionals.

The overall research gives grounds for formulating the following conclusions:

1. Public policies in the field of higher education are not subject to community policies in the European Union (EU). However, a number of documents have been adopted that define the general framework for the development of the sector with a view to the successful realization of the objectives of the strategies in Europe to form competitive, digitally included, innovative and integrated European networks that enable high quality education and teacher mobility and the students.
2. National policies, in turn, are characterized by a combination of traditional and modern higher education, responding to different challenges, cultural specificities and resources.
3. On the basis of the study of various scientific publications and normative documents, it becomes possible to outline a "European standard" for the effectiveness of public policies in the field of higher education in Bulgaria.
4. Policy in higher education is not necessarily reduced to the drafting of specific strategic documents. Rather, it can be seen and understood as a set of practices that collectively determine how government deals with matters directed at academia.
5. Effective policy in the field of higher education takes into account the influence of a number of factors, such as: the promotion of the academic community to realize the triangle of knowledge "education - science - innovation", the cross-sectoral approach, the provision of examples of good practices, national initiatives.

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The impact of anthropogenic activity on the global environment

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Abstract: *The state of the environment is influenced by a series of complex factors as well as by its constituent components. The composition of the components of the environment is undergoing to a variable dynamic process of both proper composition and structure. The anthropogenic activity that has a reference point to ensure the growing demands of the population has a generally negative impact at the current stage upon the state of the climate that comes as a result of the emissions of polluting green house gases as well as polluting particles in the form of aerosols. Consecutive effects with their states in the form of steps are described by a special diagram that can be called the cyclic diagram of anthropogenic activities. This diagram shows the current real representation of the actual state of the Biosphere as well as the measures that could be taken to improve the state of the Biosphere. Human activity creates a stress on the environment. Land, air, and water are inundated with the detrimental effects of industry. Air has received more attention and publicity than land and water in terms of the pollution it suffers. Besides, air pollution at some point affects land and water, either directly or indirectly.*

Keywords: POLLUTANTS, GLOBAL ENVIRONMENT, ANTHROPOGENIC ACTIVITY, GREENHOUSE GASES, FINE PARTICULATE MATTER

1. Introduction

The complexity of the relationships between the humanity and his physical living environment, increasingly artificial or radically imposes, at the beginning of this millennium, more than ever, the necessity of thorough research of the impact of human society's activities on the environment.

Air pollution has reached alarming levels in recent years. Gas emissions and smoke generated by the increasingly frequent large fires are leading to accelerating global warming. Not only the gases emitted by industrial activities are harmful, but also the gases emitted by vehicles that are based on fossil fuel, the smoke produced by the burning of fields, wood, tires, plants, power plants, etc. From the category of greenhouse gas emissions, the largest amount recorded is that of carbon dioxide. The soil is highly exposed to pollution, both through the random dumping of garbage and waste in unauthorized areas, and through the use of fertilizers, pesticides, etc. in agricultural activities.

Toxic residues, waste, detergents, oil spills and oil products, water used in industry for cooling facilities, discharges into running water, faulty sewage systems – all these lead to water contamination. The effects are particularly harmful for flora and fauna, but also for human health.

Plastic is one of the most harmful materials, both for soil and water. It is estimated that it takes between 10 and 1000 years for a plastic bag to degrade naturally, depending on the material.

Anthropogenic impact on nature in the last few hundred years, after industrialization has gained considerable momentum and it is devastating for the long term.

Economic activities generally produce significant amounts of greenhouse gas emissions, hereinafter referred to as GHG emissions. Therefore, especially in the last few decades, there has been a need for entrepreneurs to ensure that their level in their business is reduced. GHG emissions are mainly responsible for climate warming, a phenomenon with multiple consequences.

Since the beginning of industrialization about two centuries ago, carbon dioxide levels have risen by 44% to 441 ppm (in 2019), the highest level in 800,000 years. In 2018, this concentration increased by a record annual percentage of 1.7%. [42]

The main cause of the high level of GHG emissions is the large-scale use of fossil fuels, especially for electricity generation and transport, but also in certain industrial activities and, to a lesser extent, in domestic activities.

Although restoring the planet is possible, it is imperative that all human actions – whether it is companies or ordinary people – are done responsibly and in compliance with the legislation in force. Reducing the consumption of energy, fossil fuels, applying the necessary measures regarding hazardous waste, recycling,

protecting nature and a forestation are among the beneficial and necessary actions.

The global warming and climate change impact entire biota including humans. The climate change is mainly due to global warming and the main cause of global warming is enhanced greenhouse effect due to over anthropogenic activities.

Biodiversity loss can result from a number of human activities, including habitat conversion and destruction; over-exploitation of species; air and water pollution.

The main direct cause of biodiversity loss is land use change (primarily for large-scale food production) which drives an estimated 30% of biodiversity decline globally. Second is overexploitation (overfishing, overhunting and overharvesting, overgrazing) for things like food, medicines and timber which drives around 20%. Climate change is the third most significant direct driver of biodiversity loss, which together with pollution accounts for 14%. [43]

The Environmental Protection Agency has identified six pollutants as "criteria" air pollutants because it regulates them by developing human health-based and/or environmentally-based criteria (science-based guidelines) for setting permissible levels. These six pollutants are carbon monoxide, lead, nitrogen oxides, ground-level ozone, particle pollution (often referred to as particulate matter), and sulphur oxides. [44]

The greatest sources of carbon monoxide are the cars, trucks and other vehicles or machinery that burn fossil fuels.

Ozone at ground level is a harmful air pollutant, because of its effects on Tropospheric, or ground level ozone, is not emitted directly into the air, but is created by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOC). This happens when pollutants emitted by cars, power plants, industrial boilers, refineries, chemical plants, and other sources chemically react in the presence of sunlight.

The largest source of sulfur dioxide (SO₂) in the atmosphere is the burning of fossil fuels by power plants and other industrial facilities. Smaller sources of SO₂ emissions include: industrial processes such as extracting metal from ore; natural sources such as volcanoes; and locomotives, ships and other vehicles and heavy equipment that burn fuel with high sulfur content.

The nitrogen dioxide (NO₂) primarily gets in the air from the burning of fuel, from emissions from cars, trucks and buses, power plants, and off-road equipment. NO₂ and other NOx interact with water, oxygen and other chemicals in the atmosphere to form acid rain. Acid rain harms sensitive ecosystems such as lakes and forests. The nitrate particles that result from NOx make the air hazy and difficult to see though. The fine particles (PM) pollutants also have negative impact on the environment. They could be a mixture of solid particles and liquid droplets found in the air. Some particles, such as dust, dirt, soot, or smoke, are large or dark enough to be

seen with the naked eye. Others are so small they can only be detected using an electron microscope.

Particle pollution includes:

- **PM10** : inhalable particles, with diameters that are generally 10 micrometers and smaller; and
- **PM2.5** : fine inhalable particles, with diameters that are generally 2.5 micrometers and smaller.
- **Sources of PM**
- These particles come in many sizes and shapes and can be made up of hundreds of different chemicals.
- Some are emitted directly from a source, such as construction sites, unpaved roads, fields, smokestacks or fires.
- Most particles form in the atmosphere as a result of complex reactions of chemicals such as sulphur dioxide and nitrogen oxides, which are pollutants emitted from power plants, industries and automobiles.
- Particulate matter contains microscopic solids or liquid droplets that are so small that they can be inhaled and cause serious health problems. Some particles less than 10 micrometers in diameter can get deep into your lungs and some may even get into your bloodstream. Of these, particles less than 2.5 micrometers in diameter, also known as fine particles or PM2.5, pose the greatest risk to health.
- Fine particles are also the main cause of reduced visibility (haze) .

Methane is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices, land use and by the decay of organic waste in municipal solid waste landfills. When methane gas is combined with aerosols (such as dust, sea salt, sulphate and black carbon and other atmospheric particles), the methane has a greater warming potential.

The presence of aerosols will further increase the influence of methane gas on the warming of the atmosphere, thereby increasing the occurrence of wildfires. However, in addition to the above discussion, the influence of methane gas on the frequency of wildfires may be multifactorial, which will require further exploration. [40]

Stop dumping biodegradable waste in landfills is a measure to reduce methane emissions.

2. The actual state of the description of Earth's albedo

Ecological balance is such a state of this complex system when there is interdependence between the components of the Biosphere that ensures stability and long-term existence. [1] Atmospheric pollution leads to the instability and just the displacement of the balance with the change of the physico-chemical parameters at the macroscopic level of the global ecosystem.[2] Anthropogenic activity currently leads to the atmospheric pollution and the displacement from the equilibrium of the global ecosystem that manifests itself through extreme variations in temperature values, droughts, natural cataclysms such as hurricane winds, floods, etc. [3]Anthropogenic activity is of two types: unintentional and intentional. [4] The unintentional ones are related to the production-economic and household activities of the people, and the intentional ones to the technical progress and the desire of the people to manage the atmospheric processes. The following factors apply to intentional ones are:

1) The thermal pollution of the atmospheres and oceans as a result of the elimination in the atmosphere of pollutants greenhouse gases. The warming of the ocean's medium leads to the imbalance of the adaptation to the new fast changeable conditions with the final result of disappears of species of animals, fish and plants. Also the Earth's Biota has the same result of disappear of flora and fauna as the consequence of global warming. [5]

The humans traditionally use during thousands of years the fuels as wood and solid fuels of carbon. Last time the world uses

more frequently the gaseous fuels. Methane is one of the most powerful greenhouse gases. Once in the atmosphere, it can trap 86 times more heat than carbon dioxide. [6] The NASA study is not the first to draw attention to the link between climate and natural gas. A study last year found that gas-fired power plants pollute up to 120 times more methane than previously thought. In 2011, Cornell University researchers warned that switching from coal to natural gas would be a misstep in the fight against climate change.[7]

In addition to rising emissions from natural gas, we can expect rising emissions from wildfires. Climate change is associated with increasingly frequent and severe fires. [8]

2) Aerosol pollution of the atmosphere. They originate from industrial sources, as well as from long-distance transport by means of air currents and definitely affect the regional climate. [9]

3) Changes in physical and chemical characteristics of the soil due to the agricultural intensity and of other types of the activity upon the soil. The albedo of the soil changes with the final result of its increase and connected to that the local climate also changes. [10] This very acute current ecological problem remains one of the most current global problems. The qualitative description of the current critical state of the ecosystems is one of the goals of this paper. Through the qualitative elaboration of the description, the real actual representation of the ecosystems can be analyzed. This graphical representation could be like a method that gives a retrospective of some way to solve the global problem.

The most acute current problem besides the polluting gases is the desertification of soils. The polluting gases and aerosols contribute to the desertification process. Desertification is the process of soil degradation, which lose their productive capacity and is transformed into the state of the desert. Deserts can be defined as a dry ecosystem (hot or cold) with low biomass and productivity. [11], [12], [13] About 45% of the earth's surface is semi-arid, arid or desert, both at low and high temperature, characterized by lack of water. Moreover, it is estimated that 70% of productive dry areas are threatened by some form of desertification. [14] This desertification-susceptible area accounts for about 30 percent of the continental areas of the planet, affecting about one billion people. There is a set of geological, climatic, biological and human factors that cause degradation of the physical, chemical and biological quality of soil in arid and semi-arid areas. As a result, biodiversity and the survival of human communities are at risk. [15] In addition, wetlands are also affected by the phenomenon of desertification, especially tropical forests. This is due to the characteristics of the fragility of the soil and the cycle of nutrients. [16] Therefore, in ecosystems that maintain a delicate balance based on covering vegetation, their drastic alteration is the cause of desertification. When an area of this ecosystem is deforested, the erosive action of rain removes the fragile layer of soil. Therefore, in a short time it decertifies and has a low regenerative capacity.[17]

A quantity of interrelated complex factors intervenes in a complex way for the process of desertification, affecting fertility and soil physics, thereby decreasing productivity. As a result, the vegetation cover is lost and the soil is affected by additional erosion. The process can begin due to deforestation in an area with fragile soil, and therefore it will be reflected in erosion problems. [18] The soil is degraded by the loss of its physical properties, fertility or contamination. Also, the availability of quality water is another relevant element that affects soil productivity. On the other hand, it is important to take into account that the vegetation cover provides protection against the erosive effects of water and wind. [19] The process of deforestation is one of the direct causes of desertification, since the vegetation cover is removed, leaving the soil exposed to the erosive action of water and wind. Deforestation can take place to incorporate new land for agriculture and grazing, for timber extraction or for urbanization or industrialization. It has been estimated that of the 3 billion trees on the planet, about 15 million are cut down annually. [20], [21]

Saline water or water contaminated with heavy metals reduces the amount of biomass. Similarly, the soil is exposed to the process of erosion. When water is polluted by various elements, it can affect

ecosystems. Therefore, when the water sources are contaminated, the vegetable cover disappears and the process of desertification starts. [22] The increase in global temperature contributes directly to the process of desertification due to the increased evaporation and less water is available. In general terms, the climate is changing the rainfalls, prolonging drought or causing heavy rainfall. Therefore, the stability of ecosystems and particularly the soil is affected. Desertification becomes a feedback factor for the heating process. First of all, the loss of vegetable cover affects the fixation of carbon and increases its concentration in the atmosphere. [23] On the other hand, it has been established that albedo is greater for an unprotected soil than for one covered with vegetation. [24] The areas of drylands will expand by 23% (11%) relative to 1961–1990, which means 56% (50%) of the total land surface will be covered in drylands by 2100. [25] It is expected that in the middle of 21st century, the areas that will become drier are mainly distributed in eastern Siberia, northeastern China, western Asia, central Africa, and Canada, which are much larger areas than those that will become wetter. [25] Moreover, 78% of the dryland expansion will occur in developing countries, making the dryland coverage rate in these countries reach 61% by the end of this century. [25]

Beside the carbon dioxide and other gases, there are also particulate matter pollutants in the atmosphere suspended as the dust pollutants in the form of aerosols. The presence of suspended dust can affect the local energy balance and hydrologic cycle over drylands through direct [26], indirect effects [27], and semidirect effects [28], [29] (Fig. 1).

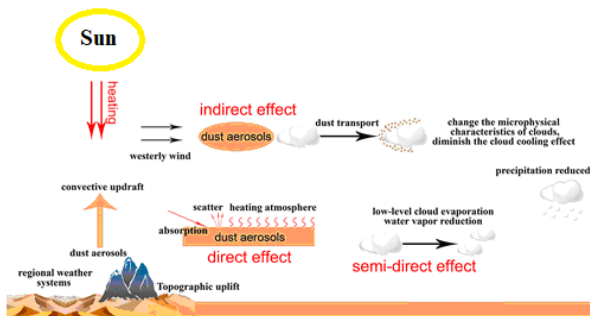


Fig. 1. A schematic diagram summarizing dust-cloud-precipitation interactions in arid/semiarid and downwind (wet) regions [29]

Dust can generate local heating, thereby changing the relative humidity and atmospheric stability and, thus, influencing the cloud lifetime and cloud liquid water content [30].

An increase in the number of dust particles competing for limited water resources in air will result in smaller cloud droplets and higher droplet number concentrations, thereby increasing the total surface area and cloud albedo. [31], [32] A dust-polluted cloud reflects more solar radiation back to space, resulting in a negative radiative force at the Top of atmosphere. [33] More numerous but smaller cloud droplets collide less efficiently with each other, reducing the precipitation efficiency of polluted clouds and presumably prolonging their lifetime. [33] This also implies that more solar radiation will be scattered back to space, thus reinforcing the cooling effect. [34] However, for a warm-based mixed-phase cloud, delaying precipitation would allow more small cloud particles to ascend above the freezing level and begin the initial ice process, releasing more latent heat and, hence, invigorating the vertical development of clouds. [35]

Another big problem that influences negatively on the state of ecosystems is the spreading of spontaneous natural wildfires. Some fuel aerosols and fuel pollutant gases such as methane could generate these natural spontaneous wildfires. Dry vegetation and high temperatures, however, are only one component that determines the spreading of fires. Another key player in the spreading of the fire are wind direction and wind speed. [36] During drought conditions, fuels for wildfire, such as grasses and trees, can

dry out and become more flammable. Drought can also increase the probability of ignition and the rate at which fire spreads. Drought can be intensified by unusually warm temperatures. These conditions create increased potential for extreme wildfires that spread rapidly, burn with more severity and with high rates. [37].

Methane gas emitted into the atmosphere can be a source of ignition of natural fires, which is a global problem.

So, the process of deforestation leads to warmer climate, increasing of surface albedo over time, raising of methane concentrations and of the tropospheric ozone. [45] The paper [46] shows indeed that the increasing of this methane greenhouse gas leads to the increasing of wildfires, especially in the geographical regions such as Siberia of Russia. (Fig. 2)

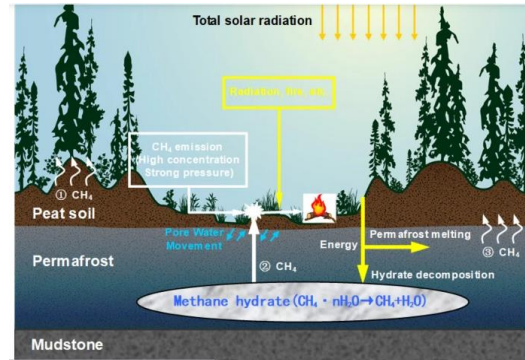


Fig. 2. The mechanism of the start of the fire under the influence of methane [46]

In general, the rising of global average temperature due to the increasing of all types of greenhouse gases from anthropogenic activity leads to the melting of these permafrosts [46]. As the result of the melting the more quantity of methane is released. The presence of Sunlight and some accidental electrical lightning of storm clouds leads to spontaneous wildfires of the forests.

The hot regions like savannas, [47] the reason for the higher methane emissions from head fires, which have higher intensity, is the longer flame lengths that burn green leaves on trees, releasing methane. It can see that high emissions of methane are from Australia, Africa and South Asia where the conditions of high humidity or high temperature or both factors leads to higher concentration of methane. [48]. (Fig. 3) The sources of emissions of methane are the wetlands, wastes, agriculture, etc.

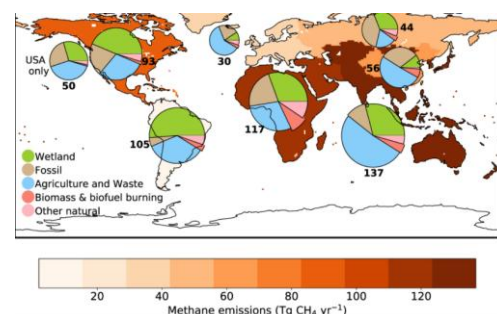


Fig.3. The generalized map of the emission of methane [48]

The respective World map of burned area is represented on the Fig. 4. [49] The correlation between the maps of the Fig. 2, 3 shows that the places with bigger concentrations of methane are referred to that places where the greater are the burnt areas. The burnt areas have the tendency of the evolution of regional climate change with the development of droughts and arid areas and just desertification. The deserts have the higher numerical values of albedo. The respective increasing of Earth's albedo over time is represented on the Fig. 5, 6. [50], [51] The process of desertification is followed by the increasing of surface albedo. [52] The aerosol pollutants lead to smaller precipitated water particles in the atmosphere. They have the role of condensation nuclei of water particles. The smaller the

precipitated particles are the rains are less leading to the development of droughts. These smaller condensation nuclei reflect back more sun radiation meaning the higher albedo.

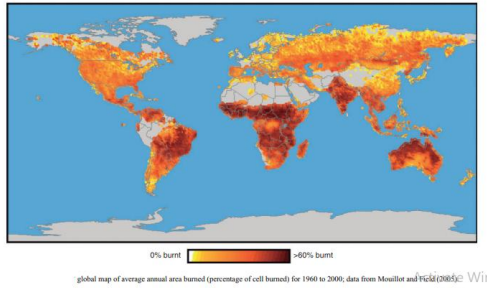


Fig. 4. The average annual area burned [49]

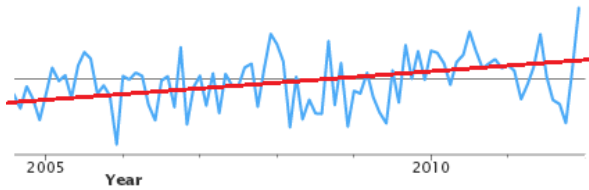


Fig. 5. Measuring Earth's albedo [51]

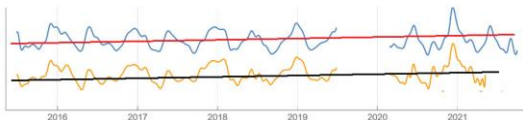


Fig. 6. The daily average albedo values (blue lines), the daily average fraction of clouds over oceans (orange lines) [50]

Results and discussion

By the combination of the complex factors that are described and analyzed above, it would be possible to represent a general diagram that shows the consequent stages of the impact of anthropogenic activities. (Fig. 7) The anthropogenic activity is followed by the rise of green house gases and pollutant aerosols. In its turn, the climate is warmed with the increasing of global temperature. The warming of the atmosphere is followed by the increasing of the concentrations of methane in the atmosphere. Methane is the precursor of the production of ozone. Both methane and ozone have a negative influence on human health, such as the intensification of respiratory diseases. Tropospheric ozone leads to the attenuation of photosynthesis processes with the final result of drying vegetation. These gases also act dangerously on the forests with the high risk of the ignition of fires. The drying of the vegetation turns into combustible material. High atmospheric temperatures contribute to a spontaneous natural fire process in the presence of dried combustible materials. Rises of the frequency of wildfires lead to the risks of disappear of various species of plants and animals. The result of the fires gives the bare soils which are evolved into the soils with higher value of albedo. Fires have a negative impact on human health that can lead to the cases of death. As a result of the fires, forest areas are massively lost. The deforestation of millions of hectares of forest surfaces leads to the variation of the physical-chemicals properties of the soils with the evolution to the soils with higher albedo values than the previous ones. The higher values of albedo lead to more frequent natural cataclysms with the extreme variations of atmospheric temperatures and to the states of the desertification of geographical areas. The values of albedo are increased from 0.14 to 0.35 due to the desertification occurring during the 20th century. [38] The article [39] says about the cataclysms: "Forest fires destroy millions of hectares of forest around the world every year. And as climate change gets worse, other natural disasters are becoming more common and causing deforestation too, including droughts and

floods. This is a vicious circle – fewer trees mean more severe climate change."

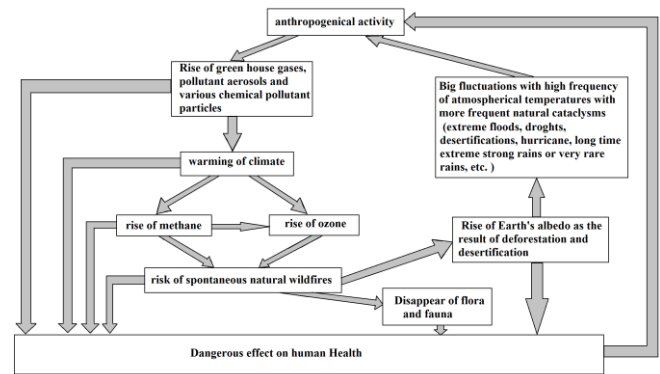


Fig. 7. The consequent cyclical stages of the impact of anthropogenic activity

The change of the physics-chemical properties of the soils and of the atmosphere in general leads to the intensification with high frequency of the temperature variations of the atmosphere just during a day. Temperature variations lead to the more frequent atmospheric pressure variations. These frequent variations can lead to the intensification of the winds and hurricanes. (Fig.8). Last years the frequency of hurricanes is risen that lead to more negative impact on the environment.

Polluting aerosols can reduce the size of raindrops and as a result we can have very rare cases of rain with low frequency, low intensity, and low flow with short rain duration. The low frequency of rains can lead to the drought and deserts. The desertification leads to the additional disappearance of flora and fauna that can have an indirect negative impact on human health. Extreme temperature variations during relatively short intervals of time that comes from high value of albedo of the unique Earth-atmosphere system can have a negative impact on people with arterial hypertension. Higher values of albedo of this unique system Earth-atmosphere on the other hand have the result of smaller temperature at high altitudes at the top of atmosphere.

This decreasing of the temperature at the top of atmosphere contributes to the quicker process of condensation of rain drops with smaller sizes due to of aerosol pollutants. The smaller condensed water particles have the higher capacity of reflection of Sun light (higher albedo). On the other hand, the quick condensation leads to the quick rainfall sometimes and just these rainfalls can be of long period with high intensity with the final result of floods and hurricanes. In order to maintain the growing demands of the population and the evolution of the sphere of modern products, it is even necessary to intensify anthropogenic activities. Maintaining the health of the population, which generally depends on the state of the Biosphere, requires the development of new, more effective substances with therapeutic effect that come either through the intensification of chemical technology or phytotherapy, which requires the use of medicinal plants. Namely, the intensification of chemical technology is a method of intensification of anthropogenic activity. In general, the development of new technologies over time implies an intensification of anthropogenic activity. The development of vaccines for example with the aim of combating the covid-pandemic has the result of overproduction which can be "waste" that requires control from special organs, otherwise it can be a very serious waste with a negative destructive effect on the Biosphere. So, in general, the cycle is closed again with the anthropogenic activity. But the anthropogenic activity has another more deep meaning with every new stage of the cycle. Here the moments are of such character that the things are belonging to more artificial products, through the direct action of Human being, because the Nature itself can very slowly regenerate the initial state of the flora

and fauna by a natural way. That is, reversible processes are almost impossible and the irreversible character prevails over time.

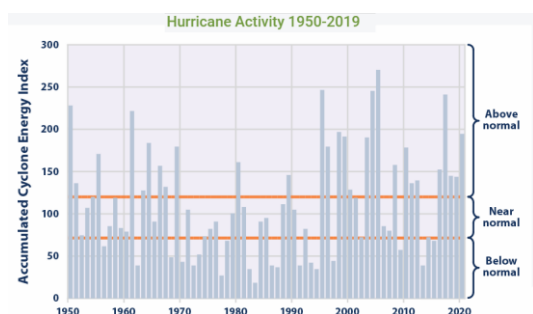


Fig. 8 The diagram of of hurricanes and winds over time [41]

In general the irreversible processes is characterized by disappears of species of animals and plants and their restore becomes almost impossibly. It is then necessary such anthropogenical activity that relies on the work done upon the Biosphere from World's humanity. Characteristically for irreversible processes is that the non-equilibrium states with the large fluctuations of parameters (for example atmospheric temperature) are prevailing. In order to obtain the initial state of the ecosystems as those of hundreds of years ago, it is necessary to perform indeed some work upon the system. That is, the Human being is the driving force that must perform work with the aim of achieving balance both for the atmosphere and for the Biosphere in general. Therefore, the cycle is closed again from the level of natural cataclysms. Depending on the result that is obtained after the work done by human being upon this complex system with the aim of monitoring and control of the ecological state, we can reach the improvement of emissions at lower rates of polluting gases. The enormous mass of carbon dioxide in general can be consumed to the process of photosynthesis with the largest possible increase in forest surfaces. Then we can restore some degree of the normal state of the climate according to this diagram by the improving of the steps of this cyclical diagram.

The emissions can really be reduced if the power plants that use fuels will be stopping. It is necessary to use the solar energy on a large scale, energy of water and of the wind with the development of special efficient technology which is the main motto of the recent time.

Conclusions

The problem of atmospheric pollution is one of the big problems nowadays. Greenhouse gases that have a warming effect of the atmosphere can be the sources of emission of other secondary gases such as methane originated from some complex processes.

It is analytically shown that the consecutive stages depend on the previous states which are represented on the cyclical diagram of the anthropogenic activity which aims to ensure the growing demands of the World. The emissions of anthropogenic activities must be reduced and this task remains as the one of the current acute necessities. Natural sources of energy generation are the means of global problem. Solar, water and wind energy must be used on a large scale as a method of reducing of carbon emissions and the maintaining of the normal state of the World's global ecosystem.

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Comparison of AI-enhanced educational games for students with disabilities

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Abstract: In recent years, artificial intelligence (AI)-enhanced educational games have become powerful tools for people with disabilities. These games use AI algorithms to customize and personalize the learning experience to meet learners' unique needs and abilities. This comparative analysis aims to evaluate and compare different AI-powered educational games specifically developed for people with disabilities. This article attempts to provide insights so that developers, educators, and people with disabilities can use AI to select appropriate educational games. Highlights how AI-powered educational games can improve accessibility, engagement, and learning outcomes for people with disabilities.

Keywords: AI, educational games

1. Introduction

Artificial intelligence (AI)-enhanced educational games have drawn a lot of attention as potential aids for people with impairments. In order to modify and customize the learning experience, this study offers a thorough examination and comparison of numerous educational games made exclusively for people with impairments.

The comparison focuses on important factors including personalization, engagement, accessibility, and learning results. The accessibility elements of each game are evaluated, taking into account movable interfaces, additional input options, and audible prompts to guarantee inclusion. The issue of personalization looks at how AI algorithms assess user data to modify the game's challenges and content to suit different players' preferences and skill levels. The visual appeal, dynamic gameplay, and gripping tales of the games are used to gauge how well they engage and enthrall players. The learning outcomes section evaluates how well each game accomplishes various learning goals, such as enhancing cognitive abilities, language fluency, mathematical prowess, or memory recall. The user experience portion, which comes to a close, evaluates the usability, responsiveness, and intuitiveness of the controls, interfaces, and AI-assisted aspects of the game.

This paper focuses on five games with artificial intelligence (AI) enhancements: Brain Power (Section 2), Cognoa (Section 3), Abilitations AI Playground (Section 4), EMMA's World (Section 5) and Floreo (Section 6).

2. Brain Power

Brain Power, by Brain Power, LLC is an educational game specifically designed for children with Autism Spectrum Disorder (ASD). The game uses advanced AI technology to provide real-time feedback and social-emotional learning support. One of the key capabilities of AI is using computer vision and facial recognition algorithms to analyze facial expressions and provide social interaction prompts.

Accessibility

In terms of accessibility, "Brain Power" includes various elements to meet individual needs. This includes visual and auditory cues to improve understanding and engagement. The game also features customizable settings that allow users to tailor the game's interface, difficulty, and sensory input to their specific needs.

Engagement

Engagement is a key aspect of gaming and Brain Power ensures that through interactive activities, gameplay elements and immersive virtual environments. These features attract children's attention and motivate them to actively participate in the game. By providing an exciting and fun experience, this game promotes the development of social skills in children with ASD.

Learning Outcomes

Brain Power learning outcomes focus on improving multiple areas in children with ASD. Using AI-driven feedback and assistance, the game helps improve social communication skills such as understanding and expressing emotions, interpreting facial expressions, and participating in appropriate social interactions. Additionally, the game aims to develop self-regulation skills, helping children with ASD manage their emotions, behaviors and reactions in social situations.

3. Cognoa

Cognoa, by Cognoa Inc. is an educational game for children with developmental disabilities and autism. One of Cognoa's key AI capabilities is the ability to tailor content and activities to each child's unique strengths, challenges, and learning style. AI algorithms analyze your child's performance, preferences and areas for improvement to customize the learning experience.

Accessibility

Accessibility is a priority of "Cognoa" to meet different needs. The game offers a multimodal learning experience that includes visual support, auditory cues, and other sensory inputs to accommodate different learning styles. It also offers a customizable interface that allows users to customize game settings, interface design, and accessibility options to suit their tastes and needs.

Engagement

Engagement is driven through interactive games, educational content, and rewards on Cognoa. The game features a variety of activities designed to be engaging and fun for children. Through interactive gameplay and challenging experiences, this game motivates children to actively participate and develop targeted skills.

Learning Outcomes

Cognoa's learning outcomes are focused on supporting the cognitive, social and emotional development of children with developmental delays and autism. This game targets specific skills such as communication, problem solving, self-regulation, and other areas of development. By providing personalized interventions and adaptive content, "Cognoa" aims to support the holistic growth and development of children.

4. Abilitations AI Playground

Abilitations AI Playground by Abilitations, Inc. is an educational game specifically designed for students with motor or sensory impairments. The game uses AI algorithms to analyze each student's movements and provide personalized feedback. We tailor activities, assignments and environmental factors to each student's abilities and needs.

Accessibility

Accessibility is the focus of the Abilitations AI Playground, ensuring the inclusion and participation of students with motor or

sensory disabilities. The game includes assistive technologies such as adaptive interfaces and customizable settings to meet different needs. With options to customize controls, visual displays, and input methods, students can engage in games through the interface that works best for them.

Engagement

Engagement is driven through a variety of interactive physical play experiences in the Abilitations AI Playground. The game offers a variety of activities designed to entertain and inspire students. AI guidance is provided to enhance the gameplay experience, providing real-time feedback, suggestions, and prompts to support motor development, sensory integration, and cognitive growth.

Learning Outcomes

The Abilitations AI Playground learning outcomes focus on improving different areas for students with motor or sensory impairments. This game is aimed at motor coordination and helps students improve their motor skills, balance and control. It also supports sensory processing, helping students with sensory integration and conditioning. Additionally, the game improves spatial awareness and helps students better understand their body's position in space. Cognitive skills can also be addressed as the game features challenges and activities that promote problem-solving, critical thinking and decision-making skills.

5. EMMA's World

"EMMA's World" by Mindtech Global Ltd is an educational game specially designed for children with Attention Deficit Hyperactivity Disorder (ADHD). This game uses AI algorithms to monitor your child's attention and performance in real time. Based on this monitoring, the game dynamically adjusts the environment, pacing, and stimuli to keep you engaged and optimize your attention.

Accessibility

Accessibility is an important aspect of EMMA's World to meet the unique needs of children with ADHD. The game offers customizable settings that allow users to tailor their gaming experience to their own tastes and requirements. Also included is an adaptive difficulty level to ensure the game offers the right challenge for every child. Visual aids are integrated to support attention and comprehension during gameplay.

Engagement

Engagement is an important aspect of EMMA's World. The game offers an immersive virtual reality experience, immersing children in an immersive digital world. Interactive tasks, rewards and engaging game mechanics encourage children to actively participate in the game. By providing an exciting and challenging experience, this game aims to improve attention, concentration and executive function skills.

Learning Outcomes

The EMMA World learning outcomes focus on improving attention regulation, concentration, cognitive control and executive function in children with ADHD. Using AI algorithms, the game adapts to the child's attention level and provides interventions to optimize attentional skills. By participating in game activities and challenges, children can practice and improve their ability to maintain attention, manage distractions, and exercise cognitive control.

6. Floreo

"Floreo" by Floreo Inc. is an educational game developed specifically for people with Autism Spectrum Disorder (ASD). One of Floreo's key AI capabilities is its ability to provide dynamic, personalized feedback. The game uses AI-driven feedback to guide individuals in social interactions and provide suggestions, prompts, and enhancements based on their performance. This personalized feedback helps individuals learn and generalize social skills beyond the game, improving their ability to navigate real-world social situations.

Accessibility

Accessibility is Floreo's priority to meet the diverse needs of people with ASD. The game has customizable settings that allow users to customize the difficulty, pace, and sensory input of the game to suit their tastes and requirements. Visual aids such as clear instructions and visual cues are also integrated to aid comprehension and comprehension during gameplay.

Engagement

The use of virtual reality (VR) technology at Floreo drives engagement. The game creates immersive and realistic social situations for individuals to practice their social skills in a simulated environment. Interactive challenges, feedback and rewards are built in to increase engagement and motivation. By providing an immersive and interactive experience, the game encourages individual active participation and develops social communication skills.

Learning Outcomes

Floreo's learning outcomes focus on improving a range of social skills in individuals with ASD. The game covers areas such as conversational skills, taking turns, and social communication such as understanding social cues. It also aims to improve eye contact, perspective acquisition and social interaction skills. By practicing these skills in the 'Floreo' virtual environment, individuals improve their social skills and become more confident in real-world social interactions. **Accessibility**

7. Comparison

This section summarizes game target, AI futures, accessibility, engagement, and learning outcomes and compares games based on those.

Target

The games described in this white paper target specific population groups with disabilities. Brain Power, Cognoa, and Floreo provide customized learning experiences designed for people with Autism Spectrum Disorder (ASD) to improve social communication, cognitive and emotional skills. The Abilitations AI Playground, on the other hand, focuses on students with motor or sensory impairments, offering interactive activities that improve motor coordination and sensory integration. Finally, EMMA's World is aimed at children with Attention Deficit Hyperactivity Disorder (ADHD) and aims to improve attention coordination, concentration and executive function skills. These games address the unique needs of people with disabilities and use AI technology to provide personalized interventions and learning and developmental support.

AI futures

The use of AI algorithms is a feature common to the five games analyzed in this comparison. "Brain Power" uses AI algorithms to provide real-time feedback and social-emotional learning support to enhance children's learning experiences. Similarly, Cognoa uses AI algorithms to assess a child's developmental progress, offer personalized interventions, and track development over time. This personalized approach allows the game to adapt to each child's unique needs and abilities. Abilitations AI Playground uses AI

algorithms to analyze movement and provide personalized feedback, making it an effective tool for improving motor skills and coordination. EMMA's World uses AI algorithms to monitor children's attention levels and performance in real-time, enabling coordinated interventions to improve attention regulation and cognitive control. Finally, Floreo incorporates AI algorithms to create dynamic and adaptive scenarios for social skill training, providing individuals with autism spectrum disorder (ASD) with a safe and controlled virtual environment. to practice and develop your social communication skills. Using AI in these games will make them more effective by providing personalized experiences, real-time feedback, and adaptive learning approaches, ultimately resulting in better outcomes for people with disabilities.

Accessibility

When it comes to accessibility, the five games reviewed in this paper show a strong commitment to addressing different needs. Brain Power includes visual and auditory cues, customizable settings, and adjustable difficulty levels so that people with different abilities can effectively participate in the game. Similarly, Cognoa offers a multimodal learning experience, visual support, and a customizable interface to meet the diverse needs of its users. The Abilitations AI Playground features integration of assistive technologies, adaptive interfaces, and customizable settings to facilitate participation and active participation of people with disabilities. For EMMA's World, the game features customizable settings, adjustable difficulty levels, and visual support specifically tailored to the unique needs of children with Attention Deficit Hyperactivity Disorder (ADHD). I'm here. Finally, Floreo prioritizes accessibility by providing customizable settings, visual support, and clear instructions so that individuals with Autism Spectrum Disorder (ASD) can fully participate in the game. increase. These games demonstrate a commitment to accessibility by leveraging a variety of features and customizable options to meet the diverse needs of audiences and deliver a comprehensive and enjoyable gaming experience.

Engagement

Engagement is a key aspect of educational games, and the five games analyzed in this paper offer unique approaches to engaging and motivating users. Brain Power excels at providing interactive activities, gamification elements, and immersive virtual environments to create immersive experiences that encourage social skill development. Similarly, Cognoa offers interactive games, educational content and rewards to motivate children and encourage active participation in specific skill areas. "Abilitations AI Playground" focuses on interactive physical play experiences complemented by AI guidance to promote motor skills, sensory integration and cognitive development. In "EMMA's World" users can expect an immersive virtual reality experience with interactive tasks, rewards and immersive gameplay. It aims to improve attention, concentration and executive function skills. Finally, "Floreo" uses virtual reality (VR) technology to create and practice immersive and realistic social situations. The game includes interactive challenges, feedback, and rewards to keep you engaged and motivated. Each game employs different strategies to ensure active participation and enjoyment, ultimately contributing to the effectiveness of the learning experience for people with disabilities.

Learning outcomes

The five games examined in this comparison offer unique learning outcomes for people with disabilities. Brain Power focuses on improving the social communication, cognitive and emotional skills of individuals with Autism Spectrum Disorder (ASD). Through real-time feedback and social and emotional learning support, the game encourages the development of these important skills. "Cognoa" aims to assess a child's developmental progress and provide individualized interventions to improve overall development over time. This game targets specific skills such as communication, problem-solving and self-regulation to support the cognitive and social-emotional growth of children with

developmental delays and autism. The Abilitations AI Playground is designed to improve motor coordination, sensory processing, spatial awareness, and cognitive skills in students with motor or sensory impairments. Games that focus on physical gaming experiences help individuals develop these essential skills in an interactive and engaging way. Specifically targeted at attention deficit hyperactivity disorder (ADHD), EMMA's World aims to improve attention regulation, concentration and executive function skills through real-time monitoring and adaptive gameplay. increase. Finally, "Floreo" focuses on improving social her communication, eye her contact, perspective acquisition, and social interaction skills in individuals with ASD. The game's dynamic and adaptive social skill training scenarios create an immersive learning environment that facilitates these specific outcomes. Each game provides a customized experience to address the unique learning needs of people with disabilities and support their cognitive, social and emotional development.

8. Conclusion

Each of the educational games covered in this article is created with specialized objectives in mind, focusing on certain cognitive development areas and tackling particular problems. The main goal of Brain Power is to help kids with autism spectrum disorder (ASD) by offering resources and treatments that improve social and emotional connection. Through the detection of possible delays and the provision of individualized suggestions for intervention, Cognoa strives to enhance early childhood development. Children with impairments are catered to by Abilitations AI Playground, which provides adaptive learning opportunities to support cognitive growth and problem-solving ability. Children with neurodevelopmental impairments can improve their cognitive, physical, and social abilities by participating in EMMA's World in virtual reality. Last but not least, Floreo offers autistic people with a virtual reality-based social skills training platform that enables them to practice and generalize social interactions. These technologies provide customized treatments to maximize cognitive development and enhance overall functioning in children with a variety of requirements by modifying their platforms to address specific cognitive goals. In summary, each game contributes differently to educational games and AI for people with disabilities. These platforms aim to empower people with disabilities by putting an emphasis on accessibility, engagement, learning outcomes, and specialized goals.

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The meaning of financial education for customers rights in Imereti region

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Abstract: Financial of education raising issue Many in country considered as _ Financial of service of customers rights protection Constituent part . of the issue from relevance based on many in country already postponed concrete steps this In the angle , they between in Georgia too . of the article The goal is to review Financial Education as _ of customers protection Constituent basic part existing problems and this problems solution possible ways Imereti in the region .

in the article has been conveyed If what There will be consequences financial to the growth of education In Georgia , Imereti in the region , namely : to increase of the population Financial sustainability level and to improve Their Financial Prosperity _ reduce of poverty level _ to increase savings ; hand to facilitate of customers rights protection .

KEYWORDS : FINANCIAL EDUCATION, FINANCIAL PRODUCTS, CONSUMER RIGHTS.

1. Introduction

In the research „The meaning of financial education for customers rights in Imereti region” an attention was drawn on issues such as :

- Financial of education common level;
- Financial knowledge;
- Financial behaviour as control mechanism ;
- Financial Sustainability , Financial Attitudes and Financial Engagement .

The research analysis allowed us to create an idea about the financial well-being of consumers in the Imereti region, which is as follows:

- Financial education average level in Imereti region is low , in particular vulnerable in groups (pension age , school age , among immigrants and other);
- Financial knowledge regarding respondents views so distributed : skills _ _ improvement which _ is connected financial processes ;
- Financial behavior regarding respondents opinions, these are: They often use financial services through electronic channels to receive salaries, transfers, utility bills, online transactions, etc. But there is a significant portion of customers who do not have access to such services, so they have to pay more in cash transactions;
- Financial sustainability in terms of Yes , 65% of respondents are active Saver , however , from them Only 30% of them long term financial goals . research analysis also He showed us that of respondents most Part amount no keeps on deposit, which indicates Financial institutions towards on trust , which connected various with factors ;
- As for the financial attitude in this regard, the majority of the respondents think that money should be spent because it gives them more pleasure;
- Regarding financial inclusion, it should be noted that 76% of the respondents know about at least 4-5 financial products, and 54% of the respondents expressed mistrust of financial institutions.in the article also attention is focused that on directions which important role will perform posed problems in solving. These are :
 - Providing financial education to the younger generation;
 - Encouraging wise financial behaviors of the population and promoting the formation of attitudes;
 - Increasing use of publicly available, unbiased financial information, resources and channels;
 - Creation and development of cooperation mechanisms with interested parties.

1 . A financial goal

The financial goal can be of many types: buying something, financing education, buying household items, covering unexpected expenses, creating savings, etc. Differentiate financial goals according to their maturity. Short-term goals can be achieved in a

few weeks or months, and they are not associated with large financial costs. Achieving long-term financial goals requires a relatively large amount of time and expense. Such a goal can be, for example, the purchase of real estate or a car, as well as traveling abroad and others. [1]

One of the important aspects is that the time required to collect a particular amount is realistically estimated and it is also necessary that the amount saved is kept safely.

In order to save money, we may need to use different financial products, about which we should have as accurate information as possible, because along with the benefits, possible accompanying risks should also be taken into account. At the modern stage, the simplification of access to financial products and the activation of various international networks have had a negative impact in a certain aspect and have contributed to the development of fraudulent schemes due to which people suffer financially. That's why it's important to have information about the most common forms of financial fraud and practical tips to help you avoid fraud.

2. National strategy of financial education

On the International Day of Education, November 24th, 2022, the new national financial education strategy developed by the National Bank of Georgia was signed in order to protect the rights of consumers. The National Bank carried out activities aimed at increasing the financial education of the population even before the creation of the strategy, however, after the creation of the strategy, these activities took a more organized and systematic form: more interested parties were involved in providing financial education to the population, including representatives of the financial sector and donor organizations of the relevant profile, as well as higher education institutions. and public institutions. [2]

After the creation of the strategy, a number of important steps were taken in the direction of raising financial education: financial education issues were integrated into the national curriculum of the basic level, and appropriate training of teachers was started; Created the first financial education web-portal - "Finedu" (www.finedu.gov.ge) and its supporting pages on social media; Annual awareness raising events, competitions, webinars and trainings etc. were held.

Despite the number of activities implemented in the direction of raising financial education, the main challenge remains to cover all target groups, implement activities tailored to them and ensure the sustainability of these activities.

In 2019, based on the methodology of the International Network of Financial Education of the Organization for Economic Cooperation and Development (OECD/INFE Toolkit), a repeated study of financial education of the population was conducted, which showed that the level of financial education of the population of Georgia is still below the average of OECD countries, as well as the average of 26 countries participating in the international study, and 2016 It does not differ significantly from the indicators of a similar study conducted this year.[3] However, it should be noted that

financial education issues were not yet integrated into the national curriculum and school textbooks at the time of the research.

The National Bank of Georgia has published the results of the study of financial education of micro, small and medium entrepreneurs in 2021. According to the results of the research, the financial education score of Georgia earned 10.3 points out of 17 points scale, which is 60% result. This result is lower than the average of the countries participating in the study.

The indicator of the level of financial education consists of several indicators, the results were distributed as follows: indicator of financial knowledge - 3.1 points out of 5 possible points. Indicator of financial behavior - 5.6 out of 9 possible points, indicator of financial attitude - 1.6 out of 3 possible points.

It should be noted that in all three components and, accordingly, in the case of the overall score of financial education, both the businesses and the population in the capital showed a higher level compared to the regions. [5]

3. Financial education in Imereti

Financial education is a process, as a result of which a person better understands the nature and risks of financial products, based on available information, instructions and objective advice, develops skills and confidence in himself - to make informed choices, knows where to go for help and take other effective actions to improve financial well-being. [4]

A study was conducted to study the level of financial education in the Imereti region, the analysis of the results of which showed the following picture: the students and professors of Akaki Tsereteli State University (115) participated in the study, as the university is the only state higher education institution in the Imereti region. Among the respondents, 22.7% were male and 77.3% were female; According to age, the respondents were distributed as follows: 15-25 years old -65.2%, 26-45 -4.3%, 46-60-26.1%, 60+ -4.3%, according to education, the respondents were distributed as follows: student - 65.2%, with higher education - 34.8%; According to the awareness of financial products, the respondents are as follows: yes-72.7%, partly -22.7%, no-4.5%; Regarding the use of financial products, the respondents' answers were distributed as follows: often - 69.6%, rarely - 26.1%, I do not use at all - 4.3%; Regarding the use of financial products (see diagram 1)

1. Which financial resources do you use?

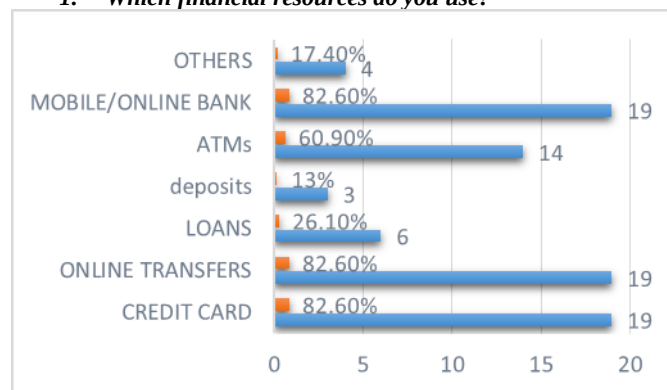


Diagram 1.

69.6% of the surveyed respondents have formal financial education, and 30.4% have informal financial education; Regarding trust in financial institutions, the respondents' answers were distributed as follows: yes - 47.8%, partially - 52.2%; The results regarding the frequency of use of financial services are as follows: (see diagram 2)

2. How often do you use financial services?

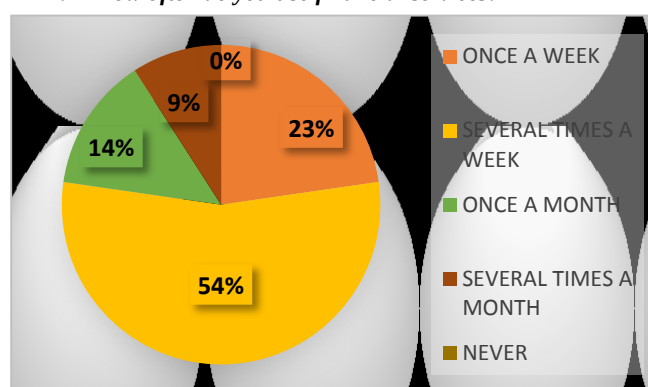


Diagram 2.

To the question - how accessible it is to obtain knowledge about financial services, the answers of the respondents were distributed as follows: sufficiently accessible - 30.4%, accessible - 52.2%, less accessible - 17.4%. Regarding the question, what activities should be carried out in the Imereti region to raise the knowledge of the population in the financial field, the respondents' opinions are as follows:

- to provide the population with transparent and easy-to-understand information about specific financial products;
- public trainings;
- More publicity is needed from the banking sector on this topic;
- In our opinion, public lectures should be held to raise the knowledge of any citizen;
- We think that public trainings should be held, booklets should be distributed to citizens, where certain financial terms and processes are defined. Daily short stories on television with similar financial terms understandable to the population will also be beneficial;
- Community training in financial terms;
- Community training.

Financial education in Georgia, in particular in the Imereti region, can:

- to increase the level of financial stability of the population and improve their financial well-being.
- Reduce the level of poverty, especially among vulnerable groups.
- increase the amount of savings.
- Increase financial inclusion by raising awareness of and providing access to financial products.
- Contribute to the strengthening of the framework for the protection of consumer rights.
- To improve the financial management skills of the younger generation as well as micro and small business owners.
- To increase the awareness of individuals about the importance of long-term savings.
- To ensure equal opportunities for women and men in terms of financial knowledge and confidence.
- Help immigrants and their families manage their shipments.
- to facilitate the distance dissemination of financial education,
- To promote the development of financial skills from an early age.

After acquiring financial knowledge, it is important to apply the acquired knowledge in practice in order to make effective decisions. On the other hand, an effective decision means an informed and responsible decision that meets the needs of the customer at the given moment.

4. Conclusion

Thus, improving knowledge and skills related to money management, budgeting, and short-term savings is expected to help reduce financial stress and overwhelm, and increase individuals' financial confidence. In addition, raising awareness about formal savings and ways to save will be beneficial for the population of Imereti region in the long term, as well as for the development of capital markets in the country.

Financial education will increase the economic and financial capabilities of the young generation in the Imereti region, as well as strengthen their entrepreneurial skills and encourage them to create businesses. This will help them to make such important decisions at an early age, which will help them to be financially prepared to meet the retirement age and to better use their financial and economic opportunities.

Thus, financial education in the Imereti region can contribute to improving the level of financial inclusion, reducing poverty and income inequality, managing financial risks and protecting consumer rights, creating and developing micro, small and medium businesses, as well as preparing the young generation for the future life.

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