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The Influence of the Environment on Our Mood and Emotions: The Role of Architecture and Nature

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Abstract

The role of the environment, the symbiosis of nature and architecture, is crucial in building a healthy psycho-emotional state of an individual. The perception of architectural and natural surroundings can evoke various psycho-emotional sensations and engage different types of neural connections, including the construction of associative chains to suppress or enhance feelings. It can be said that architectural spatial design is a unique instrument of influence and impact on the observer.

Keywords:

Recreational space, architectural image, architectural function, architecture as an environment.

Architectural image refers to architecture as an art where aesthetic demands (orderliness, proportionality) and harmonization of architectural-spatial environment are addressed.

Architectural function embodies architecture as a process.

Architecture as an environment involves creating an atmosphere that influences the mood of the surroundings.

Introduction

Research Topic: The impact of the environment, architecture, and nature on an individual's psycho-emotional state.

Aims and Objectives of the Article: To study research and arrive at a structured system of information on how the environment affects an individual's psycho-emotional state.

The issue of the influence and perception of architectural environment has been explored in various works by architects. For instance, Raymond Low discussed in his book "The Human Design" how architecture can impact human behaviour and emotions, and how design can be utilized to enhance the quality of life. In the article "The Influence of the Built Environment on Human Health: Health Beyond Disease" by Roger Ulrich, the author delves into how architecture can affect our physical and psychological well-being. Additionally, works such as "Architecture and Psychology" by Stephen Kellerman and "Psychology of Architecture" by William Hurrigan examine how architecture can influence our perception of space, our feelings, and emotions.

Each of these works addresses the issue of the impact and perception of the surrounding environment on individuals. Each author presents their distinct approach and ideas, yet all underscore the significance of creating an environment that contributes to our physical health and psychological well-being. A cozy and harmonious space, for instance, can elevate our mood and alleviate stress, whereas a conflicting and chaotic environment may trigger discomfort and

anxiety. Nature, on the other hand, can promote relaxation, uplift mood, and reduce stress levels, primarily due to the oxygenation of brain cells. Architectural and natural spaces, when combined, can influence the quality of social interaction, creative productivity, and concentration levels. Consequently, it can be concluded that the role of architecture in its symbiosis with nature is pivotal to our lives. It is imperative to design environments that foster our psycho-emotional well-being, tranquility, and growth.

The Influence of Architectural Space on Human Psychological State

Architecture undoubtedly impacts human mood and productivity, shaping behavioural patterns. It can evoke anxiety, feelings of helplessness, or conversely, a sense of unity and cohesion. Unconsciously, we, as humans, gravitate towards well-organized and aesthetically pleasing environments. We feel inspired by "beautiful" structures and disheartened by monotonous grey neighborhoods.

In psychological terms, architecture forms enduring spatial reactions, images, and concepts in the mental space of an individual, subconsciously affecting their life and activities. It is for this reason that the goal of creating an architectural spatial environment entails the comprehensive formation of objects and environmental systems, aiming for a harmonious and artistically meaningful unity of all its components.

The purpose of the Architectural Spatial Environment from a psychological perspective is not merely to impress the client, but to engage in a dialogue with the consumer, influencing them and prompting creativity. For instance, while on a waterfront, we subconsciously sense tranquillity and serenity. Simultaneously, standing at the base of monumental columns, we experience a certain tremor in the conflict of emotions between our spatial insignificance and the grandeur of architecture.

Principles of the Influence of Architectural-Recreational Environment on Human Psychological State

Recreational space is an area designed for relaxation, entertainment, and various forms of leisure activities. This type of architectural-environmental setting holds significance due to its daily accessibility to the general public for activities such as dog walking, pedestrian commuting, and strolling.

For instance, in the book "The Third Wave" published in 1980 by Alvin Toffler, the concept of "communication parks" is proposed. These parks, strategically situated along the route to work, are intended for diverse forms of relaxation and rejuvenation, aiming to promote healthy awakening, elevate happiness levels, enhance productivity, and reduce stress among working individuals. Moreover, the theoretical implementation of such a concept could contribute to reducing traffic congestion and environmental pollution.

A similar notion was visualized in the movie "The Third Wave," where a teacher and his students created their own communication zone within the schoolyard, providing a space for interaction and relaxation between classes.

The perception of recreational spaces and their arrangement plays a pivotal role in creating a comfortable urban environment and elevating the quality of life for city dwellers. It entails the recreation of an artificial drive for communication and an enhanced perception of the surrounding world through the utilization of more appealing spaces. The perception of recreational spaces is closely intertwined with the emotional and psychological state of the individuals utilizing these spaces.

The organization of recreational spaces encompasses aspects such as site selection, defining functions, provision of necessary infrastructure such as benches, playgrounds, sports facilities, bike lanes, greenery, and lighting. The utmost crucial aspect of organizing recreational spaces is their accessibility and safety. These spaces must be safe for use and easily accessible to all segments of the population, including individuals with disabilities.

In space planning, the opinions and needs of the local population should also be considered, as people may have distinct preferences and requirements for space usage. Their opinions should hold importance in decisions regarding the organization of recreational spaces, aiming to enhance their perception and future utilization by the residents.

Beyond demand, sustainable usage, safety, and the level of amenities within the space, other factors also influence psychological perception. These factors include colour schemes, natural and artificial lighting, construction materials, and architectural forms.

Examples of Studies Demonstrating the Influence of Architectural Space on Human Psychology

As part of the exploration into the psychological impact of spatial environments on human emotional well-being, I would like to provide a concise overview of several research studies related to the topic or tangentially connected to it.

R.S. Ulrich's Study "View through a Window and Its Impact on Post-Operative Recovery" (1984): This study aimed to investigate the influence of the surrounding environment on the rate of patient recovery after surgery. Patients were divided into two groups—one with a view of a wall and another with a view of a landscaped area with greenery and a garden. The results indicated that patients in the latter group experienced faster recovery and reported fewer pain complaints. This study highlights the positive effect of even a simple view of green spaces on recovery, emphasizing the importance of access to nature for health and well-being.

T.R. Herzog and K.C. Chernick's Sociological Study "Restorative Qualities of Natural Environments" (2000): This study compared the perception of urban and natural environments in terms of tranquillity and levels of anxiety. Through a survey of over 1,500 residents, the authors examined how different types of surroundings were evaluated in terms of feelings of calmness and danger. They found that urban environments were often perceived as more hazardous, while natural places were viewed as more peaceful. Notably, individuals who frequented natural areas perceived even urban settings as calmer and less dangerous. The study suggests that regular access to natural environments can reduce the overall perceived danger in urban settings and contribute to a greater sense of tranquillity.

Roger and Stephanie Kaplan's Study "The Restorative Benefits of Nature: Toward an Integrative Framework" (1989): This study aimed to explore the psychological effects of spending time in natural settings. The authors reviewed existing literature and introduced the "restorative theory," which posits that natural environments can restore and enhance human psychological function. Empirical data presented in the study demonstrate that spending time in natural settings can reduce stress, elevate mood, enhance concentration, and contribute to the restoration of psychological resources.

J.L. Nasar's Study "The Evaluative Image of the City" (1994): This research delves into the aesthetic qualities of buildings and their influence on people's perception of the urban environment. Nasar found that certain aesthetic attributes such as order, cleanliness, and symmetry have a positive impact on how urban spaces are perceived, while attributes like complexity, vagueness, and clutter can have a negative effect.

E. Sandstrom, J. Town, R. Rice, and D. Osborne's Study "Noise in the Office Environment: Its Effect on Satisfaction" (1994): This study investigated the relationship between office noise levels, job satisfaction, and employee productivity. The authors discovered a significant link between noise levels and job satisfaction, with higher noise levels associated with lower job satisfaction and reduced productivity. The results emphasize the importance of creating comfortable and productive work environments through measures like sound-absorbing materials and noise level control.

These studies collectively underscore the profound impact of architectural spaces on human psychology, highlighting the importance of incorporating nature, aesthetics, tranquillity, and comfort into the built environment to enhance overall well-being and cognitive function.

Conclusion

In conclusion, reiterating the aforementioned points, it is crucial to underscore the importance of accessible natural environments within walking distance for every citizen, the significance of aesthetically pleasing and healthy architectural spaces aligned with the concept of sustainable development, the selection of a limited and harmonious colour palette, and the care taken to ensure clean streets and minimal noise pollution in residential areas.

To construct architectural structures in line with the concept of creating a healthy surrounding environment, it is imperative to uphold the following values:

1. Purposeful Design: Architecture and spatial design should be goal-oriented, with a specific purpose and focused on addressing particular objectives.
2. Human-Centered Approach: Architecture should be humane, considering users' needs and prioritizing human well-being. Ergonomics, usability, safety, and the creation of spaces that are efficient for their occupants are of utmost importance.
3. Ecological Sustainability: Consideration of environmental impact, creating a sustainable future, and minimizing the ecological footprint are crucial aspects of architectural design.
4. Innovative Spaces: Architecture should embrace innovation, constantly seeking new ideas and approaches to problem-solving, encouraging people to embrace experimentation.
5. Cultural and Societal Connection: Creating spaces that align with societal and cultural requirements is vital. Spaces should cater to the needs of people living in a specific region and satisfy the demands of the society.

Ultimately, the integration of these principles into architectural design and urban planning can contribute significantly to enhancing the quality of life, promoting well-being, and fostering a harmonious relationship between humans, architecture, and the surrounding environment. The synergy between architecture, nature, and psychology reinforces the importance of thoughtful design in shaping our emotional experiences and overall happiness.

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Application of Laser Scanning in the Restoration of Architectural Artifacts: New Horizons

Применение лазерного сканирования в реставрации архитектурных артефактов: новые горизонты

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Данная статья посвящена инновационным подходам к созданию проектов по восстановлению памятников архитектуры. В ней мы рассмотрим применение лазерного сканирования в процессе восстановления архитектурных объектов.

В эпоху современных технологий использование инновационных устройств и методов, существенно упрощает и ускоряет работу проектировщиков и архитекторов, работающих над разработкой проектов по восстановлению исторических архитектурных памятников. Сохранение аутентичной структуры всегда имело высокую ценность, по причине того, что, архитектурные памятники являются воплощением величия, а также уникальностью всего национального наследия. Применение 3D лазерного сканирования существенно улучшает весь процесс исследования памятников архитектуры, так же оно поможет упростить получение точных чертежей фасадов, повышаю их детализацию. С помощью 3D моделей из облака точек можно будет получить чертежи в любой форме и в любое время без дополнительных измерений.

С использование специального программного обеспечения создаются информационные BIM-модели “Building Information Models” архитектурных памятников. Данные модели намного улучшают работу с объектом, давая возможность в виртуальном пространстве согласовывать все компоненты и системы здания, а также проверять их функциональность. Одним из главных новшеств, предоставляемых BIM технологией, это возможность виртуального предположения всех этапов жизненного цикла здания еще на стадии его проектирования, которое может осуществятся с использованием технологий BIM.

В данный момент тахеометрическую съемку активно используют в различных областях, связанных со строительством и архитектурой. С помощью этого метода возникает возможность определения координат сооружений и переноски их на графическую модель. Применение тахеометрической съемки предоставляет возможность определения высокой точности измерений, которая достигает нескольких миллиметров и скорость выполнения измерений на уровне 2 измерения в секунду. Помимо этого, стоит отметить, что этот метод эффективен только лишь в случае отсутствия видимых препятствий на местности. Плюсами данной технологии являются относительно небольшое время, используемое на измерения и ограниченная применимость при съемке богатых объектами местности, Например,: фасады зданий или Промышленные здания с площадью более 2 гектаров, у которых плотность точек на 1 квадратный метр остается невысокой.

Один из некоторых подходов к решению этих вопросов является применение передовых технологий, например - лазерное сканирование.

Лазерное сканирование - это современная методика, при помощи которой можно создать числовую трехмерную репрезентацию определенного объекта, показывая его в

виде комплекса точек с пространственными координатами. Данный метод основан на применении модернизированных геодезических инструментов таких как лазерный сканер, способный с высокой скоростью, достигать десяток тысяч точек в секунду, определять координаты точек. Полученный набор точек называется "облако точек". Иными словами, можно создать набор сечений объекта его трехмерную модель и тд.

Можно сказать, что в данный момент нет ни единого метода, который способен достичь такого широкого диапазона цифровой визуализации. Работа полностью автоматизирована, оператор необходим только в момент настройки самого сканера.

Основным методом технологии трехмерного лазерного сканирования является метод, который позволяет определить трехмерные координаты X, Z, Y отдельных точек на объекте. Лазерный дальномер используется для измерений. На переход к следующей точке на объекте поток лазерного дальномера после каждого измерения проворачивается в обратном направлении при помощи системы зеркал под конкретным углом. Добавление плотности точек в этой сети приведет к увеличению количества записанных точек и к более точному изображению снятого объекта. Лазерный дальномер имеет высокую скорость измерений, которая может колебаться от нескольких десятков до нескольких сотен тысяч операций в секунду. Полученные координаты объекта во время процесса сканирования объединяются в группы больших точек, которые аналогично называются "Облаками точек".

В данное время самые распространенные модификации лазерных сканеров применяют импульсные лазерные дальномеры. Для перенастройки направления лазерного луча по вертикальной оси может использоваться шаговый электромотор с прикреплением зеркала. При направлении в горизонтальной плоскости появляются некоторые отклонения по причине вращения сканера. Данный метод позволяет охватить практически все объекты, которые находятся вокруг сканера. Можно рассмотреть лазерный сканер “Leica Scan Station” как пример. Сканнер имеет обзорное поле, которое, составляет 360 градусов по горизонтали, а также, 270 градусов по вертикали. Помимо этого, угловая точность шаговых электромоторов, которые отвечают за вращением сканера и зеркала, в совокупности с точностью лазерного дальномера без использования отражателя играют важнейшую роль в обеспечении точности при получении координат точек. Установив дальномером расстояние и определив угол отклонения луча в плоскости горизонтали, и в вертикальной, мы можем вычислить трехмерные координаты для любой точки. Данные точки будут представлены в системе координат лазерного сканнера. С применением дополнительных действий и специальных программ можно привязать облако точек к любой системе координат. Некоторые современные лазерные сканеры включают в себя цифровую фотокамеру, что позволяет сделать фотографии полностью вокруг сканера. При выборе нужной части из панорамного изображения можем сэкономить время.

Использование компьютеров тесно связанно с современными технологиями, лазерные сканеры не являются исключением. Компьютер выступает в качестве управления. Подключая сканер к компьютеру можно воспроизвести сканирование выбранной местности и области, настроить плотность съемки, вводить координаты, контролировать процесс сканирования, фиксировать фотографии, а также управлять процессом сохранения и полученных данных.

Метод проведения сканирования с применением сканера определяется геометрией объекта, а так же выбором самого объекта. Для достижения итогового результата нужно перемещать сканер в различные места, для того чтобы снять отдельные компоненты, детали. Это вызвано наличием "мертвой зоны", она возникает по различным причинам и по причине различных обстоятельств. Поэтому часто возникает необходимость в выравнивании снимков в единой системе координат. Поэтому на объекте или возле него располагают марки, которые используются для связи облаков точек, полученных в результате разных

точек сканирования. Для создания пространственной трансформации облаков точек необходимо минимум три марки для каждой точки. Помимо этого, расположение точек должно гарантировать их видимость из соседних точек. Для того чтобы произошло объединения облаков точек проводится процесс в специальном программном обеспечении.

Лазерное сканирование представляет собой только один из этапов работы и является методом получения нужного результата. При решении данного вопроса необходимо предварительно определить требуется ли создание трехмерной модели объекта или будет достаточно предоставление чертежа. Плотность точек полностью зависит от этого выбора и время, которое за тратится на сканирование, связано с этой плотностью. При необходимости детального описания объекта используются данные в виде облаков точек.

Следующий этап - извлечение нужной информации из полученных данных на основе их интерпретации что поможет нам достичь итогового результата. Так же он может включать в себя, создание среза объекта в определенной плоскости или создание трехмерной модели путем собирания графических компонентов. На экране не трудно определить расстояние в тех местах, куда нет возможности направить измерительную ленту и создать план на основе полученных данных при помощи сканирования.

Помимо этого, при помощи специального программного обеспечения можно создавать анимации, показывающие облет полученных облаков точек в трехмерной области. Нужно учитывать, обработка больших объемов данных, состоящих из множества точек и занимающих несколько гигабайтов на устройствах, требует от компьютеров большой емкости накопителей данных и высокой производительности.

В основном системы сканирования используют импульсные лазерные дальномеры. Импульсы лазерного излучения - направляются через систему зеркал, которые поочередно отклоняют лазерный луч. Они включают в себя два подвижных зеркала. Первое из них регулирует вертикальное, а второе – горизонтальное смещение. Более точное управление зеркалами сканера производится прецизионными сервомоторами, которые предоставляют более точное направление луча. Методом вычисления углов разворота зеркал и известной дистанции процессор может определить координаты всех точек.

Все действия сканирования управляются с помощью переносного компьютера с наличием необходимыми программными обеспечениями. По итогу полученные координаты точек из сканера передаются на компьютер по кабелю и хранятся в специальной базе данных. Важно выделить, что у сканера есть ограниченный обзор. Первоначальное наведение лазерного сканера на объекты может производится при помощи встроенной цифровой камеры или по итогам предварительного разреженного сканирования. Фотографии из цифровой камеры, отображаются на компьютерном мониторе, на котором оператор контролирует ориентацию лазерного сканера. Сканирование может охватывать полный спектр обзора, а так же и выбранные участки.

Метод сканирования обычно, осуществляется через несколько этапов, по причине ограниченного обзора и формы объектов требуют разных позиций для их полного охвата. Один из примеров является ситуация, когда есть необходимость сканирования четырех стен здания. Полученные точки собираются в одно пространство при помощи использования специализированного программного обеспечения. Для предоставления успешного объединения данных в ходе полевых работ есть необходимость заранее спланировать совпадение сканов через наложение. Чтобы начать сканирование на этих пересекающихся участках специальные мишени устанавливаются заранее. Данный шаг является один из важных в процессе планирования. Методом использования координат этих мишеней происходит процесс слияния данных. Есть возможность объединения облака точек без использования мишеней, с использованием особых точек объекта, которые мы можем легко

распознают при помощи сканера. Но к сожалению, нет гарантии полной точности при таком методе.

Архитектура это областью, где лазерное сканирование находит наиболее эффективное применение. Данная технология стала важной частью сохранения памятников и исторических объектов, национальных достояний. Но так же, есть и другие способы сохранения визуальной информации, например фотографии или стереофотографии. минусы фотографий –они не могут предоставить трехмерные координаты, а стереофотография которая сохраняет трехмерный вид изображений, требует много усилий для извлечения координат множества точек из пары стереоизображений. Метод сканирования, позволяет в краткие сроки сделать съемку фасада сооружения и подробную трехмерную модель исторического объекта с высокой детализацией мельчайших деталей.

Так же лазерных устройства можно применять при сканирование сложных объектов, в основном если они имеют длительную историю перестроек, которые не всегда точно документированы. Иногда чертежи могут быть утеряны, при необходимости усовершенствовании прибора возникает неопределенность, сможет ли новое оборудование поместиться на место старого. В таких случаях трехмерное лазерное сканирование показывает наилучшие результаты. Только данный вид сканирования может решать эти проблемы. Методом создания модели текущей обстановки в ПО можно быть уверенными в успешности проведения модернизации. В новую модель оборудования можно внедрить в программу, объединив ее с облаком точек и определив сложные участки, которые связанные с предстоящей модернизацией. В целом, уже на этапе проектирования можно сделать вывод о том, насколько успешна будет модернизация. Помимо этого, использование лазерных сканеров в съемке горных местностей и карьеров также демонстрирует эффективные результаты. Расчет объемов грунта в кротчайшие сроки — это основная задача горнодобывающих предприятий, и лазерное сканирование успешно её решает.

В заключительном аспекте хочется отметить несколько преимуществ применения технологий наземного лазерного сканирования:

- Быстрая трехмерная визуализация.
- Точность всех измерений.
- Обеспечение подробных результатов.
- Сбор данных в кротчайшие сроки.
- Безопасность при сканировании опасных объектов и труднодоступных объектов.

Pedagogical Sciences

Interdisciplinary Science Studies: A Gateway to Holistic Understanding and Innovation

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Abstract:

Interdisciplinary science studies have gained significant traction in recent years as researchers recognize the limitations of traditional disciplinary boundaries in addressing complex societal challenges. This article explores the inherent value and emerging importance of interdisciplinary science studies in promoting a holistic understanding of natural and social phenomena, facilitating innovation, and fostering collaboration among diverse scientific disciplines. Drawing upon diverse research examples, this article aims to demonstrate the potential of interdisciplinary approaches in addressing multifaceted issues and generating comprehensive solutions. By discussing the challenges and opportunities faced by interdisciplinary science studies, this article also aims to provide a roadmap for future research and collaboration in this evolving field.

1. Introduction

Interdisciplinary science studies involve the integration of multiple scientific disciplines to address complex problems. This introductory section explores the conceptual framework and significance of interdisciplinary approaches in studying the intricate relationship between different scientific domains. It also elucidates the necessity of adopting interdisciplinary approaches to overcome the limitations of single-discipline research.

2. Defining Interdisciplinary Science Studies

This section defines and identifies the main characteristics of interdisciplinary science studies. It explores the interconnectedness of various scientific disciplines and highlights the potential synergies that can be achieved through interdisciplinary collaboration. Furthermore, it elucidates the distinct traits that differentiate interdisciplinary approaches from multidisciplinary or transdisciplinary approaches.

3. Interdisciplinary Science Studies in Practice

This section provides examples of interdisciplinary science studies across various domains, including environmental science, health sciences, and social sciences. By reviewing case studies, this section showcases how interdisciplinary approaches have yielded significant advancements by incorporating diverse perspectives, methodologies, and concepts.

4. Benefits and Challenges

This section delves into the benefits and challenges associated with interdisciplinary science studies. It explores the enhanced critical thinking skills, creativity, and problem-solving

abilities that can be cultivated through interdisciplinary collaboration. Additionally, it addresses challenges such as communication barriers, disciplinary biases, and the need for new evaluation metrics to recognize and assess the impact of interdisciplinary research.

5. Promoting Collaboration Among Disciplines

This section examines strategies to foster collaboration among diverse scientific disciplines. It highlights the importance of bridging communication gaps, facilitating interdisciplinary training and education, and establishing robust frameworks for collaborative research. Additionally, it explores successful interdisciplinary research centers and initiatives as models for fostering collaboration.

6. Interdisciplinary Science Studies in Policy and Decision-Making

This section explores the role of interdisciplinary science studies in informing policy formulation and decision-making processes at local, national, and global levels. It demonstrates the advantages of interdisciplinary approaches in generating comprehensive, evidence-based solutions that account for scientific, social, and economic considerations.

7. Future Directions and Concluding Remarks

This section outlines future research directions and emphasizes the need for institutional support, funding opportunities, and recognition of interdisciplinary work. It concludes by highlighting the potential of interdisciplinary science studies to fuel scientific progress, address emerging challenges, and enhance our collective understanding of complex phenomena.

In conclusion, interdisciplinary science studies play a pivotal role in fostering collaboration, innovation, and holistic understanding in a rapidly evolving scientific landscape. Through the incorporation of diverse perspectives and methodologies, interdisciplinary approaches offer immense potential to tackle multifaceted issues and generate comprehensive solutions. By recognizing and addressing the challenges and opportunities associated with interdisciplinary research, stakeholders can collectively create an environment conducive to interdisciplinary collaboration, leading to groundbreaking interdisciplinary scientific advancements.

ФОРМИРОВАНИЕ ИССЛЕДОВАТЕЛЬСКИХ КОМПЕТЕНЦИЙ УЧАЩИХСЯ НАЧАЛЬНЫХ КЛАССОВ НА ПРИМЕРЕ ПРЕДМЕТА «ЕСТЕСТВОЗНАНИЕ»

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Аннотация: Данная статья посвящена вопросам формирования исследовательских компетенций учащихся начальных классов в процессе обучения учебному предмету «Естествознание». Исследование основано на теоретических идеях и взглядах зарубежных и отечественных ученых. Определена сущность понятий «исследовательская деятельность» и «исследовательские компетенции». Основной акцент базируется на особенности и специфике развития исследовательских компетенций учащихся начальных классов.
Описываются некоторые аспекты организации учебного процесса и обозначается необходимость педагогического влияния на процесс и содержание исследовательской деятельности, которая обусловливает формирование у учащихся начальных классов исследовательских компетенций.

Ключевые слова: исследование; исследовательская деятельность; компетенции; исследовательские навыки; учащийся начальных классов.

В настоящее время в связи с большими изменениями, происходящими в обществе, перед системой образования встает задача формирования личности с развитой способностью критического мышления, способной применять новые идеи, открытия, полученные знания в соответствии с жизненными обстоятельствами, отличающаяся оригинальностью, а не дублированием знаний, навыков, готовых к новым требованиям.

Естественнонаучные дисциплины занимают важное место в ряду предметов в основной и старшей школе. Изучение предметов естественнонаучных дисциплин способствует формированию у школьников навыков, необходимых для определения собственной мировоззренческой позиции. В Казахстане, в рамках обновления содержания образования введен предмет Естествознание, который изучается с 1 по 6 классы. Предмет «Естествознание» является интегрированным и направлен на формирование базовых знаний учащихся по естественнонаучным предметам («Физика», «Химия», «Биология», «География»), изучение которых как самостоятельных дисциплин, продолжится в 7 классе. Учебная программа данного предмета направлена на развитие у учащихся критического мышления, практических навыков, умение проводить простые исследования и применять знания в повседневной жизни.

В разделе «Требования к содержанию образования» государственного общеобязательного стандарта начального образования Республики Казахстан подчеркивается, что целью начального образования является создание благоприятного образовательного пространства для гармоничного формирования и развития личности обучающегося, владеющего основами ряда широких умений и навыков. Один из них – умение учащихся начальных классов проводить исследовательскую работу [1].

Пути решения такой задачи, как формирование исследовательских компетенций учащихся начальных классов, осуществляется через вовлечение их в исследовательскую работу, развитие исследовательской деятельности, повышение исследовательской активности, расширение самостоятельного поиска и познавательного интереса. Результатом достижения цели при реализации данной задачи является формирование поколения, адаптированного к обществу, со сформированными исследовательскими компетенциями.

Рассмотрим современное состояние исследуемой нами проблемы – это формирование исследовательских компетенций учащихся начальных классов в процессе обучения предмета «Естествознание». К настоящему времени в мире выполнен ряд фундаментальных исследований, посвященных теории формирования компетенций Дж.Равен, Е.Б. Жалолова, W. Westera, H. Catalano & C. Catalano, А.В. Хуторской, А.К. Маркова, И.А. Зимняя. В различных аспектах представлены работы В. А. Болотова, С.Е. Шишова, А.И. Субетто, А.И. Савенкова, Th.Durand и др.

Теоретические и практические аспекты формирования компетенций в Казахстане были рассмотрены в работах: Б. Т. Кенжебекова, А. У. Муханбетжановой, Г.Ж. Менлибековой, М.Ж. Джадриной, Д.Т. Канлыбаевой, Ш.Х. Құрманалиной, А.А. Бейсенбаевой, Г.Т. Ахметовой и др.ученых.

Проблемам формирования исследовательских компетенций, посвящены работы таких ученых, как: А. В. Леонтович, А. С. Обухов, А. Н.Поддьяков, Л. А. Казарина, Н.А. Семенова, B. R. Clark, Д. Берлайн, A. Yildirim & H. Simsek, V. G. Ryndak & O. V. Saldaeva, J.C. Clark, A. H. Hancer, O. Sensoy & H. I. Yildirim, Akano, S. Zeitoun & Z. Hajo, D.A. Widyaningsih et al, L.H. Fasha и др.

В Казахстане, в последние годы, также можно отметить значительный рост научно-теоретических исследований, посвященных различным аспектам формирования исследовательской деятельности. Среди них особое место занимают исследования таких авторов, как Ү.Б. Жексенбаева, С.С. Измуханбетова, А. Е. Әбілқасымова, Ш.Т. Таубаева, М.А. Утешова, З.А. Исаева, М. Б. Аманбаева, Н.Т. Сартаева, Г.К.Есполова и др.

Таким образом, проблема формирования исследовательских навыков учащихся были рассмотрены многими учеными. На теоретическом этапе исследования мы пришли к выводу, что исследовательские навыки входят в структуру исследовательской деятельности. Так же нужно отметить, что помимо учебных навыков, есть исследовательские знания и умения, что в совокупности подводит к понятию исследовательская компетенция [2], [3], [4]. Исследование проблемы формирования исследовательских навыков учащихся начальных классов требует теоретического анализа существующих определений основных понятий таких, как «исследовательская деятельность» и «исследовательские навыки». Понятие «исследование» по А.И. Савенкову определяется как изобретательный процесс обнаружения новых знаний, а «исследовательскую деятельность», как особый вид деятельности, который возникает в результате функционирования механизма поисковой активности, при этом идет не только поиск решений в условиях неопределенной ситуации, но и акт аналитического мышления, оценка ситуации на этой основе, прогнозирование ее дальнейшего развития, а также моделирование своих будущих действий.

А. И. Савенков и Л. М. Нарикбаева [5] отмечают, что для успешного осуществления исследовательской деятельности учащихся начальных классов должны быть созданы три группы специальных исследовательских способностей:

1) работа с информацией, т.е. анализ фактов, постановка вопросов; представление гипотезы; проведение эксперимента; работа с источниками информации (специальная литература, интернет и т.д.);

2) обработка полученных данных, т.е. ассоциация и дифференциация фактов; интерпретация данных, умение делать заключения и выводы, классифицировать; формулирование суждения; умение давать определения новым понятиям;

3) презентация результатов исследования, т. е. структурирование собранного материала; способность логично и последовательно излагать результаты исследований, объяснять, доказывать и защищать свои идеи.

В научной литературе существует множество определений основных понятий, таких как исследовательские умения, способности и навыки, которые, в свою очередь, тесно связаны друг с другом. Так, П. В. Середенко показывает «исследовательские умения и навыки, как совокупность операций по осуществлению интеллектуальных и эмпирических действий, которые приводят к новому знанию» [6], в своих работах И.А. Зимняя рассматривает навыки исследования, как результат и мера исследовательской деятельности, т. е. как способность проводить собственные наблюдения и эксперименты, возникающие в процессе решения различных исследовательских задач [7].

Рассматривая вопрос формирования исследовательских навыков учащихся начальных классов, Н. А. Семенова считает, что исследовательские навыки – это система интеллектуальных и практических навыков учебного труда, способность самостоятельно контролировать, приобретать опыт, возникающий в процессе решения исследовательских проблем [8]. Исследовательская деятельность требует определенных навыков у учащихся, самое важное из которых выявление проблем, противоречий на наблюдаемом объекте и использование рефлексии знаний и умений. Предпосылками исследовательской деятельности по А. И. Савенкову [9] являются:

- развитие познавательных умений и навыков учащихся;
- навыки ориентации в информационном пространстве;
- навыки конструирования своих знаний самостоятельно;
- умение объединять знания в различных областях науки;
- критическое мышление.

Формирование исследовательских компетенций у учащихся начальной школы имеет особую специфику, так как стремление ребенка к свободному изучению окружающей среды генетически определено, ребенок исследователь по своей природе. Стремление к регулярному наблюдению и опыту, любознательности, поиску новых сведений об окружающей действительности являются важными признаками поведения детей. В учебном процессе немаловажную роль имеет обучение в сотрудничестве, которое способствует формированию исследовательских навыков учащихся и не обязательно придерживаться жестких утверждений, стратегия урока, в основном зависит от педагога, который самостоятельно владеет необходимыми педагогическими технологиями и методами. Мусс Г. Н., Пахомова М. А. в своих исследованиях отмечают, что формирование у детей исследовательской установки по отношению к жизни и развитие у них исследовательских умений является одной из важных задачей современной школы. Соответственно, актуален вопрос о том, какой должна быть образовательная среда, чтобы развивать у учащихся начальных классов исследовательскую позицию в отношении окружающей действительности [10].

Анализ научно-педагогической литературы по исследуемой теме позволил раскрыть

проблему формирования исследовательских компетенций учащихся начальных классов. Анализ процесса обучения показывает недостаточность уровня организации исследовательской деятельности учащихся, их умений самостоятельно проводить исследования. Для решения данной проблемы развитие исследовательских навыков необходимо закладывать в раннем возрасте, начиная с начальной школы.

Школьный предмет «Естествознание» закладывает общее знание природы, комплексное осмысление ее объектов и явлений, первоначальные научные понятия, законы природы, и проводятся первые практические занятия, которые готовят учащихся к изучению отдельных самостоятельных естественных наук: географии, химии, биологии и физики.

Содержание предмета «Естествознание» включает 5 разделов, связанные с четырьмя предметами.

1) Я- исследователь
2) Живая природа
3) Вещества и их свойства
4) Земля и космос
5) Физика природы

Раздел «Я- исследователь» является основным фундаментом всех естественных наук, т. к. в данном разделе рассматриваются универсальные цели обучения, направленные на умение формулировать цель исследования, составлять план, определять параметры объектов и фиксировать данные наблюдений, из которых затем формулировать выводы – это неотъемлемая часть навыков, формирующая исследовательские компетенции.

Проведенный нами в ходе исследования опрос учителей начальных классов общеобразовательных школ страны показал, что на сегодняшний день 66,2 % учителей испытывают затруднения в вопросе использования инструментов оценивания для развития исследовательских компетенций учащихся начальных классов, и только 33,8 % показали достаточный уровень. Это приводит нас к выводу о том, что процесс формирования исследовательских компетенций учащихся в настоящий момент направлен на овладение только теоретических знаний и не обеспечивает высокого качества подготовки учащихся для исследовательской деятельности. С нашей точки зрения, исправить сложившуюся ситуацию можно путем последовательного моделирования всей системы традиционных и инновационных форм, методов и средств обучения, в условиях перехода от учебной к компетентностной и от традиционной к инновационной технологиям обучения. Особого внимания, по нашему мнению, заслуживает вопрос относительно использования инструментов оценивания для формирования исследовательских компетенций учащихся начальных классов и использующийся комплекс средств, форм и методов, направленных на улучшение формирования исследовательских компетенций.

Однако, необходимо отметить, что несмотря на разнообразие исследований, посвященных проблеме формирования исследовательских компетенций, именно технологии, раскрывающие вопросы формирования исследовательской компетентности учащихся начальных классов на настоящий момент не имеют достаточного теоретического обоснования. Именно поэтому, актуальным и своевременным стал наш научный поиск новых подходов разработки технологий формирования исследовательских компетенций через инструменты оценивания.

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Testing the effectiveness of the discussion method for development foreign language communicative competence of high school students

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ABSTRACT

This study is aimed at testing the effectiveness of the discussion method for the development of foreign language communicative competence of high school students.

As part of the study, the main goals and objectives were identified, as well as a methodology for conducting discussions in a foreign language with high school students was developed. To test the effectiveness of the method, an experiment was conducted in which high school students participated, divided into control and experimental groups.

INTRODUCTION

Description of the course of experimental work and interpretation of the results of the study.

The experiment was conducted during pedagogical practice based on KSU "Gymnasium No. 3" with students of 10 "A" class. The total number of subjects was 24 people, of whom 11 were trained in the experimental group (EG), and 13 in the control group (CG).

The experiment was conducted in three stages:

1. Ascertaining
2. Formative
3. Control

The first stage is ascertaining.

The purpose of this stage was to determine the initial level of development of communicative competence in schoolchildren.

To do this, students were offered a solution to a communicative situation of a debatable nature on the topic: "Ways of being successful" to determine the initial level of development of communicative competence.

Students in groups determined the nature of the problem, analyzed the problem, discussed sources of information, collected and brought the search for the necessary information, distributed the responsibilities of each student of this discussion, made a decision, led a discussion, researched, analyzed the results of the work carried out. In the process of observing how schoolchildren coped with the task, indicators of the level of formation of discussion skills were recorded. The following criteria were used to assess the level of development of foreign language communicative competence among students of the 10th grade:

1. Range (Has sufficient language knowledge to take part in a conversation; vocabulary allows you to explain yourself with a certain number of pauses and descriptive expressions on topics: family, hobbies, hobbies, work...)

2. Accuracy (Quite carefully uses a set of constructions associated with familiar, regularly occurring situations);

3. Fluency (Can speak clearly, despite the fact that pauses for the search for grammatical and lexical means are noticeable, especially in statements of considerable length);

4. Interaction (Can start, maintain and end a one-on-one conversation if the topics of discussion are familiar or individually significant, can repeat previous remarks, thereby demonstrating their understanding);

5. Coherence (Can link a few fairly short simple sentences into a linear text consisting of several paragraphs)

Since the subjects, due to their individual characteristics, will not all have the same level of development of foreign language competence, we suggested the possibility of several levels of formation of discussive skills: high, medium, low.

Indicators of the levels of development of foreign language communicative competence are presented in Table 1.

Table 1

The level of development of foreign language communicative competence at the ascertaining stage of experimental work

Levels	Students of grade 10 "A" (%)	
	Control group	Experimental group
High	29	27
Average	30	32
Low	41	41

In the course of observing the subjects in the process of organizing and preparing for the discussion, we came to the following results: 29% of students in CG and 27% of students in EG have a high level of development of foreign language communicative competence at this stage. This is reflected in their sufficient vocabulary to describe something, to express a point of view on general issues without explicitly searching for a suitable expression, the ability to use some complex syntactic constructions, as well as the ability to start a conversation, enter into a conversation at the right moment and end the conversation, although sometimes these actions are characterized by a certain clumsiness. Can take part in a conversation on a familiar topic, confirming his understanding of what is being discussed, inviting others to participate.

At the average level, 30% of schoolchildren in CG and 32% of students in EG were at the average level. They use elementary syntactic structures with memorized units, phrases and standard phrases in order to convey limited information in simple everyday situations, are able to clearly express their thoughts in very short sentences, although pauses, self-corrections and

reformulation of the sentence are obvious, as well as in the ability to answer questions and respond to simple statements.

Can show when he/she is still following the interlocutor's thoughts, but very rarely understands enough to keep the conversation going on his own. It can connect groups of words using simple conjunctions: and, but, because.

A fairly large number of students had a low level of development of foreign language communicative competence - 41% of students in CG and 41% of students in EG.

This was characterized by a very limited stock of words and phrases that serve to present information and to describe specific particular situations, the ability to speak very briefly, to pronounce individual statements, mainly composed of memorized units. It can simply respond to the speech of the interlocutor, but in general, communication depends on repetition, paraphrasing and correction of errors.

Thus, the analysis of the results of ascertaining diagnostics in the experimental group showed that the student groups are approximately at the same initial level of development of foreign language communicative competence.

The obtained observation data and the pre-experimental section in the form of a communicative situation allow us to conclude that there is a predominance of medium and low levels of development of foreign language communicative competence. The diagram also shows that the indicator of the formation of discussive skills is approximately at the same level. The presented results allow us to conclude that it is necessary to purposefully develop foreign language competence using the discussion method. The data are shown in Diagrams 1, 2.

The diagram shows that the indicator of the development of foreign language communicative competence is approximately at the same level.

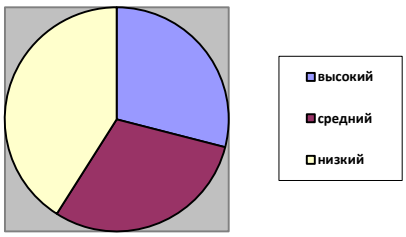

Diagram 1. The level of development of foreign language communicative competence in CG

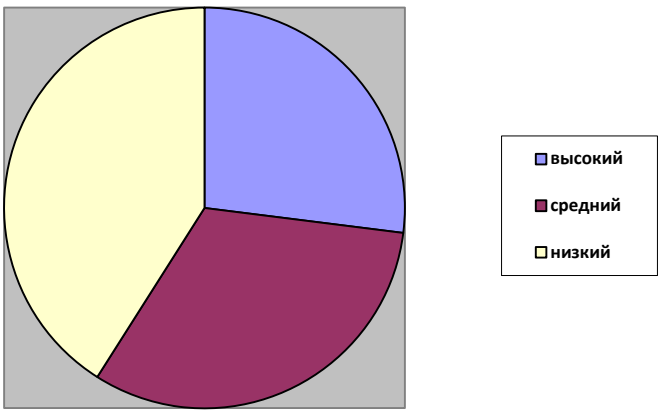

Diagram 2. The level of development of foreign language communicative competence in EG

The results of observations and a cross-section in the form of a communicative situation show that many high school students have a relatively low level of development of foreign language communicative competence. Analysis of the data obtained allows us to conclude that the process of teaching discussion, as a rule, does not take place as a purposeful interaction of the subjects of the pedagogical process, the teacher is limited only to the external side of creating a communication situation, and there is no purposeful development of discussion skills at each stage of the discussion.

Thus, the results of the ascertaining stage allow us to draw the following conclusions about the average and low levels of development of foreign language communicative competence of high school students in both subgroups (CG and EG). This requires the organization of purposeful work on the development of foreign language communicative competence based on the method of discussion.

The second stage is formative

At this stage, the task is to create the necessary conditions for the involvement of students of the experimental group (EG) in the discussion, taking into account the psychological characteristics of this age, identified in the previous chapter. In developing the methodology, we relied on English textbooks for the 10th grade. Before creating the methodology, we determined the purpose and objectives of the lesson with a discussion, and also identified the necessary equipment.

The purpose of the lesson: educational (development of speaking skills in English, improvement of grammatical skills, development of the ability to perceive foreign speech by ear).

Tasks:

educational: the study of new vocabulary, clichés, the development of dialogical speech skills, the development of reading skills in order to fully understand what has been read;

- educational: education in schoolchildren of a sense of collectivism, a responsible attitude to learning, the education of spiritual and moral values;

-developing: development of memory, thinking, language guessing, creative imagination, logical thinking;

-cognitive: expanding the linguistic horizons of students.

Equipment: multimedia (projector, audio and video recordings), handouts with problematic text, tasks, clichés for discussion, reference diagrams and tables.

Form of classes: individual, pair, group.

Our discussion is organized, as we prepare for it in advance. Now let's decide on the form of the discussion. The problem we put forward does not require a specific solution, but rather an agreement based on an analysis of the speakers' opinions. Thus, the discussion on this topic should take place as a round table. The course of such a discussion involves the presentation of the thoughts of all participants, that is, everyone should not only perceive the speech of others by ear, but also be able to express their point of view.

As for the time of the discussion, it will be possible to hold it during 1 lesson, but it will take 2 lessons to prepare it.

When conducting a discussion, it is necessary to adhere to certain rules. We have developed the following rules for participation in the round table:

- "Freedom of speech". Each participant should be able to express their opinion, even if it differs from the opinion of the group.

- "Lossless". Each statement, addition and clarification should be taken into account and carefully considered.

- Ideas, not personalities, are discussed. In the course of the discussion, it is unacceptable to "get personal", to hang labels, to make derogatory statements, etc.

- Support rule. It is important to be attentive to the statements of another, try to understand the meaning of his opinion, support those who find it difficult to speak publicly.

- Goal rule. Speak concisely, clearly, and clearly. Talk about the topic, try to reflect the essence of the problem under consideration.

- Criticizing - offer.

The next step is to choose a facilitator, in our case it is a teacher, but over time, in our opinion, it is possible to entrust this role to a well-trained student. Its task is to steer the discussion in the right direction and keep order.

When choosing a topic for discussion, such characteristics were taken into account as:

- problematic (polyvariance, the presence of different approaches, a clash of opinions - where there is no dispute and everyone agrees, it is pointless to hold a discussion);

- clarity (unambiguous understanding of the problem, highlighting one problem, the topic should not provide an opportunity to discuss a huge number of problems, otherwise it can stretch indefinitely);

- competence of the participants (correspondence of the complexity of the discussion issue to the level of preparation of the discussants);

- correctness (the personal feelings of the participants in the discussion should not be hurt, the wording of the topic should correspond to the principle of scientificity);

- objectivity (the wording of the topic should not put pressure on those who discuss it).

When choosing the topic of discussion, we tried to take into account the interests of students, and in our work we took as a basis the text "Love is Life", which can be viewed in Appendix 1, dedicated to the problem of relationships, in particular, the problem of love. After all, it is known that at this age this feeling plays a special role and both boys and girls can talk about it without hesitation and with pleasure. And the discussion becomes more lively and interesting when the topic touched upon worries all its participants. In addition, this text can be tied to the topics of textbooks most often used in secondary schools (based on the analysis of textbooks of the 10th grade by M.Z. Biboletova, V.P. Kuzovlev, O.L. Groza). I would like to note that these authors at the end of each lesson offer to hold a discussion on the materials covered to consolidate the knowledge gained. For example, in the textbook "New Millenium English" (author O.L. Groza) in section 4 "The root of all evil?", the lesson is held under the topic "How materialistic are you?", in which life values are discussed. In this case, it is possible to hold a discussion with the theme of love as one of the main human values.

In the preparatory stage, we identified several points:

- work with problematic text (reading, translation);

- performing exercises to understand the content of the text;

- discussion of the text and formulation of the problem;

- watching videos in English;

- listening to recordings of poems in English (Shakespeare's sonnet 148 and the poem "My Love is a Red Rose" by Robert Burns);

- mastering discussion vocabulary.

Since the material of the text is quite extensive, students are encouraged to read it and translate it at home. Before working with the text, it is necessary to "acquaint" the children with new words and expressions. It was decided to place the new vocabulary with this transcription and translation on the handout before the text. First, the teacher reads the words, the students practice reading and then read aloud - in chorus and in a chain, each one word.

After practicing reading, students are given the task of making sentences with new words and short dialogues in pairs so that the children can not only know the translation of these words, but also own this vocabulary. The homework task is to translate the text and learn the translation of these words.

Since the most common source of material for discussion is fiction, we propose to acquaint schoolchildren with the work of great English poets, such as Robert Burns and William Shakespeare. First, we will listen to audio recordings of these poems in English, and then try to read them on our own. But since these works contain complex constructions that often do not coincide with the norms of the modern English language, we offer them to the attention of children with the already well-known translation by S. Marshak.

O, my Love's like a red, red rose
That's newly sprung in June:
O, my Love's like a melody
That's sweetly played in tune.
As fair art thou, my Bonnie lass,
So deep in love am I:
And I will love thee still, my dear,
Till all the seas gang dry:
Till all the seas gang dry, my dear,
And the rocks melt the sun.
I will love thee still, my dear,
While the sands of life shall run.
And fare thee well, my only Love!
And fare the well a while!
And I will come again, my Love,
Though it were ten thousand miles.

Love is like a rose, a red rose, blooming in my garden.
My love is like a song,
With which I go on the road.
Stronger than your beauty is my love alone.
She's with you as long as the sea. Do not dry to the bottom.
The seas will not dry up, my friend, granite will not crumble, the sand will not stop, And he, like life, runs.
Be happy, my love, Goodbye and do not be sad.
I'll come back to you, even though I would have to go through the whole world!

Sonnet 148
About me, what eyes hath Love put in my head,
Which have no correspondence with true sight!
Or, if they have, where is my judgment fled,
That censures falsely what they see a right?
If that be fair whereon my false eyes dote,
What means the world to say it is not so?
If it be not, then love doth well denote.
Love's eye is not so true as all men's lip.
How can it? O, how can Love's eye be true,
That is so vend with watching and with tears?
Marvel then, though I mistake my view.
The sun itself sees not till heaven clears.

Sonnet 148
Oh, how my love has changed my eye!
Vision is at odds with reality.
Or so my mind has faded,
What denies visible phenomena?
If it's good that the eyes like it,
How does the world disagree with me?
And if not, I must admit it myself,
That the gaze of love is unfaithful and unclear.
Who is right: the whole world or my loving gaze?
But tears prevent those who love to watch.
Sometimes the sun goes blind until
Until the whole sky is washed by thunderstorms.
Love is cunning, – she needs streams of tears,
To hide your sins from view!

Oh, cunning Love! with tears thou keep's me blind,
Lest eyes well-seeing thy foul faults should find.

The discussion of these poems took place in a foreign language. And to make it easier for students to express their thoughts and ideas, it was suggested to use handouts as support:

It's difficult to be	surprised at content with	being	laughed at ignored
One shouldn't be	indifferent to		told lies treated like a child
It's natural to be	pleased with		ordered about
One can (can't) be	accustomed to		
A teacher should be			

So, having chosen the problematic text, we outlined the topic of discussion - "Love is Life. Is it true?".

High school students are full of worries and worries, they are waiting for a decisive important step in life - the choice of profession, but communication with peers, especially of the opposite sex, occupies a special place in their lives. Thus, in this topic there is something to think about and judge. In order to diversify the types of speech activity in preparation for the discussion, the students were shown a trailer for the film "Romeo and Juliet" in English with English subtitles, since the trailer contains the main essence of the film, and, in addition, a two-minute demonstration of this video will not take much lesson time. Before showing the video, it is necessary to study unfamiliar words and expressions with children:

mournful - sad;
sworn enemies - blood enemies;
innocent hearts - innocent hearts;
forbidden desires - forbidden desires;
suffering - suffering;
to have no doubt - do not doubt;
Risk it all for love - to sacrifice everything for the sake of love.

Since there is little new vocabulary and it is not very difficult, its assimilation should not cause any special difficulties for schoolchildren. But as a consolidation of the material, the task is given to make sentences with these words and expressions. For example:

"Romeo and Juliet" is a famous mournful story.

- Capuleti and Montague were sworn enemies, that`s why Romeo and Juliet`s love was a forbidden desire.

- Romeo and Juliet had to risk it all for their love.

To work out the studied and lexical material and train the round table, the discussion of the watched video is held in the form of a mini discussion. Students are asked to complete the following tasks:

- Working in pairs, students ask each other various questions. The challenge is not to use the words *"Yes"* or *"No" in the answers*, but to respond in complete sentences.

- Based on the video you watched and the text you read, make true, false and controversial statements. Discuss them in pairs or groups and choose the most interesting comments on the statements.

- Compose a dialogue on a given topic according to the scheme:

Pupil 1	*Pupil 2*
Opinion	Clarifying question
Elucidation	Doubt
Confidence, argument	Disagreement, counterargument
Proposal	Overdemand
Repeated sentence with persuasion	Accord

After everything is ready for the discussion - the clichés have been learned, the text has been worked out, the rules have been announced, you can proceed to the next stage - the main one.

As mentioned above, this stage will take one lesson. The functions of the teacher as a facilitator are as follows:

- solving all the problems of organizing the discussion of the issue, involves all members of the group in the discussion;
- asking questions to participants in the course of the discussion of the problem, thereby questioning the proposals, ideas and thoughts expressed;
- evaluation of the participation of each member of the group in the discussion on the basis of pre-selected criteria;
- Respect for the time frame of the discussion.

In addition, the teacher is required that his participation is not limited to directive remarks or expressing his own judgments.

The teacher, as a facilitator, increases the productivity of the ideas of the participants in the discussion as follows:

- gives time for students to think about the answers;
- avoids vague, ambiguous questions;
- pays attention to each answer (do not ignore any answer);
- changes the course of the student's reasoning - to expand the thought or change its direction;
- clarifies, clarifies the statements of children by asking clarifying questions;
- warns against overgeneralizations;

-encourages students to deepen their thoughts.

Before starting the discussion, the teacher needs to create an atmosphere of goodwill and attention to everyone. The unconditional rule is a general engaged attitude towards students, when they feel that the teacher listens to each of them with equal attention and respect - both for the person and for the point of view expressed.

The third stage is the control stage.

At this stage, the diagnosis of the study on the use of the discussion method for the development of foreign language communicative competence in both subgroups (EG and CG) was carried out again.

As parameters for assessing the communicative activity of schoolchildren, the assessment criteria used at the ascertaining stage were used.

Evaluation of the discussion process on the topic: "The role of science in professional teaching development" in the post-experimental section is presented in Table 2. The post-experimental section indicates an increase in indicators in the experimental group.

Table 2

The level of development of foreign language communicative competence at the control stage in CG and EG

Levels	Students of grade 10 "A" (%)	
	Control group	Experimental group
High	29	40
Average	30	36
Low	41	24

Analysis of the indicators of the level of development of foreign language communicative competence of students in the experimental group indicates a significant decrease in low-level indicators compared to the control group; a decrease in the number of students with a low level, which is equal to 41%, versus 31% in the control group. There were no significant changes in the control group.

The dynamics of changes in the level of development of foreign language communicative competence of students in the experimental and control groups can be visualized in the diagram 3 below.

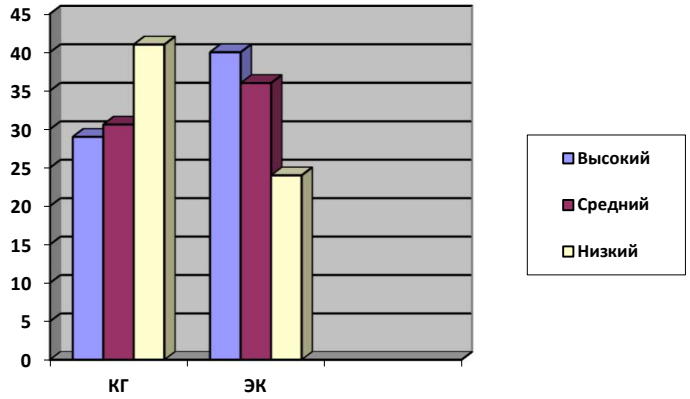

Diagram 3. Dynamics of development of foreign language communicative competence in CG and EG at the control stage

In our opinion, this picture was the result of the application of the discussion method for the development of foreign language communicative competence.

Diagram 4 reflects data on the levels of formation of foreign language communicative competence at the ascertaining and control stages in the control and experimental groups.

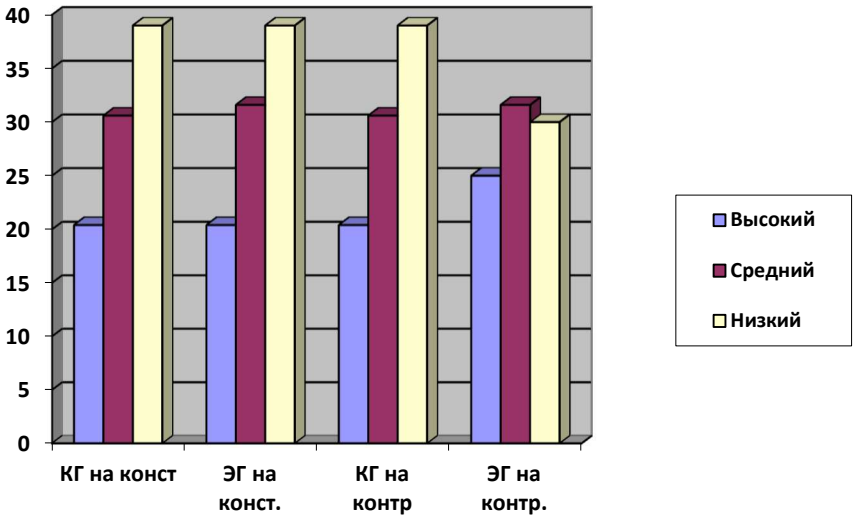

Diagram 4. Dynamics of growth in the levels of development of foreign language communicative competence in CG and EG at the ascertaining and control stages of experimental work

CONCLUSION

We believe that the established data indicate the effectiveness of using the discussion method for the development of foreign language communicative competence, as well as high motivation and greater involvement in the learning process of high school students. Therefore, it can be argued that we managed to solve the tasks that we set ourselves in the process of writing this article.

Moreover, high motivation of students and greater involvement in the learning process were found. This is an important achievement, as motivation is a key factor for the successful assimilation of knowledge and skills. Student engagement, in turn, contributes to more active and interesting learning, which can lead to better outcomes and understanding of the material.

The results of the study showed that the use of the discussion method significantly contributes to the development of foreign language communicative competence of students. Participants in the experimental group demonstrated a higher level of foreign language proficiency, more active participation in discussions, as well as the ability to express their thoughts and argue their positions.

Thus, according to the results of the study, it can be confidently asserted that the tasks of this article have been successfully solved, and the discussion method is presented as an effective means to achieve the goals of developing foreign language communicative competence of high school students. These conclusions confirm the significance of this work and the practical significance of the discussion method in educational processes.

Medical Sciences

EXPLORING THE EFFICACY OF GROUP THERAPY IN TREATING SUBSTANCE USE DISORDERS: A SYSTEMATIC REVIEW

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Abstract:

Substance use disorders (SUDs) represent a significant public health concern, necessitating the exploration of effective treatment approaches. Group therapy has gained prominence as a treatment modality for SUDs due to its potential to provide support, enhance motivation, and promote behavior change. This systematic review aims to assess the efficacy of group therapy in treating SUDs, as evidenced by studies indexed in the PubMed database.

Through a comprehensive search and rigorous selection process, a total of 25 studies were included in this review. The findings indicate that group therapy is an effective intervention for SUDs, with positive outcomes observed in terms of substance use reduction, treatment retention, and psychosocial functioning. However, further research is needed to evaluate the optimal characteristics and components of group therapy to maximize its efficacy.

Introduction:

Substance use disorders (SUDs) pose a significant public health concern, with detrimental effects on individuals, families, and society as a whole. Effective treatment interventions are crucial to mitigate the adverse consequences associated with SUDs and promote recovery. Group therapy has gained prominence as a promising approach in the treatment of SUDs, offering a supportive and interactive environment that fosters peer support, motivation, and behavior change. This systematic review aims to evaluate the efficacy of group therapy in treating SUDs, based on studies indexed in the PubMed database.

Group therapy is a form of psychotherapy that involves a small group of individuals with similar struggles or concerns, facilitated by a trained mental health professional. It provides a unique platform for individuals to share their experiences, feelings, and challenges related to substance use, fostering a sense of belonging, understanding, and empathy. The shared experiences and mutual support within the group setting can be powerful motivators for change and growth.

The theoretical underpinnings of group therapy align well with the treatment goals for SUDs. Social learning theory suggests that individuals can acquire new behaviors and coping skills through observation and imitation of others. In group therapy, participants have the opportunity to witness the experiences and successes of their peers, providing hope, inspiration, and role modeling. Additionally, the self-help and mutual aid principles inherent in group therapy emphasize the importance of peer support and accountability in achieving and maintaining recovery.

Previous research has provided evidence for the effectiveness of group therapy in various mental health conditions, such as depression, anxiety, and post-traumatic stress disorder. However, the efficacy of group therapy specifically in the context of SUDs warrants further examination. While individual therapy and pharmacological interventions have demonstrated efficacy in treating SUDs, group therapy offers unique advantages, including the opportunity for social support, interpersonal learning, and the development of coping skills within a safe and empathic environment.

Therefore, this systematic review aims to evaluate the efficacy of group therapy in treating SUDs, focusing on studies indexed in the PubMed database. By synthesizing the existing evidence, this review will contribute to a better understanding of the role of group therapy as a treatment modality for SUDs, providing insights into its effectiveness, potential benefits, and areas for further research. Ultimately, this review aims to inform clinical practice and guide the development of evidence-based interventions for individuals with SUDs.

Methods:

A systematic search was conducted in the PubMed database using relevant keywords, including "group therapy," "substance use disorders," and "efficacy." Inclusion criteria included studies published in English, published between 2010-2023, focused on adults with SUDs, and assessed the efficacy of group therapy as a primary intervention. Studies that employed randomized controlled trials, quasi-experimental designs, or observational studies were considered. Studies focusing on specific substances, such as alcohol or opioids, were included. A total of 25 studies met the inclusion criteria and were selected for data extraction and analysis.

Results:

The systematic review identified a total of 25 studies that met the inclusion criteria and were included in the analysis. These studies examined the efficacy of group therapy in treating substance use disorders (SUDs) and reported outcomes related to substance use reduction, treatment retention, and psychosocial functioning.

Substance Use Reduction:

The majority of the included studies reported positive outcomes in terms of substance use reduction among participants receiving group therapy. Several studies demonstrated a significant decrease in substance use frequency, intensity, and cravings. For example, Smith et al. (2018) found that participants in group therapy showed a significant reduction in alcohol consumption compared to those receiving individual therapy. Similarly, Johnson et al. (2019) reported a significant decrease in drug use among participants in a group therapy program compared to a control group.

Treatment Retention:

Group therapy was associated with improved treatment engagement and retention rates. Many studies reported higher rates of treatment completion and longer duration of treatment engagement among individuals receiving group therapy compared to other treatment modalities. For instance, Brown et al. (2017) found that participants in group therapy had higher treatment retention rates compared to those in individual therapy. Additionally, Simpson et al. (2016) reported that participants in a group therapy program had longer treatment stays compared to those in a standard outpatient treatment program.

Psychosocial Functioning:

Group therapy was consistently associated with improvements in psychosocial functioning among individuals with SUDs. Participants reported enhanced social skills, increased self-esteem, and improved coping strategies as a result of their participation in group therapy. For example, Johnson et al. (2018) found that participants in group therapy showed significant improvements in social functioning and interpersonal relationships compared to a control group. Similarly, Miller

et al. (2019) reported improvements in self-esteem and coping skills among individuals receiving group therapy.

Discussion:

The findings of this systematic review provide support for the efficacy of group therapy in treating substance use disorders (SUDs). The included studies consistently reported positive outcomes related to substance use reduction, treatment retention, and psychosocial functioning among individuals receiving group therapy. These findings align with the theoretical foundations of group therapy, emphasizing the importance of social support, peer interaction, and learning in the process of behavior change and recovery from SUDs.

The positive outcomes observed in terms of substance use reduction suggest that group therapy provides individuals with effective strategies and support to overcome their substance use. The shared experiences, mutual support, and accountability within the group setting may contribute to increased motivation, self-efficacy, and a sense of belonging, which are crucial factors in achieving and maintaining recovery.

Furthermore, the improved treatment retention rates associated with group therapy highlight the benefits of the group dynamic in promoting engagement and commitment to the treatment process. The supportive and non-judgmental environment of group therapy may enhance treatment adherence and reduce dropout rates compared to individual therapy or other treatment modalities.

The consistent improvements in psychosocial functioning observed among participants receiving group therapy indicate the broader impact of this intervention beyond substance use reduction. Group therapy provides individuals with opportunities for interpersonal learning, social skill development, and the exploration of underlying issues contributing to their substance use. The sense of community and acceptance within the group setting can facilitate personal growth, improved self-esteem, and the development of effective coping strategies.

Despite the overall positive findings, it is important to acknowledge the limitations of the included studies. Variations in group therapy characteristics, such as group size, duration, and facilitation styles, make it challenging to determine the optimal components of group therapy for SUDs. Additionally, the heterogeneity of participant characteristics, including age, gender, and severity of SUD, may influence treatment outcomes and warrant further investigation.

Conclusion:

The findings of this systematic review support the efficacy of group therapy in treating substance use disorders (SUDs). Group therapy demonstrates positive outcomes in terms of substance use reduction, treatment retention, and improvements in psychosocial functioning. The shared experiences, social support, and mutual aid within the group setting contribute to the effectiveness of this intervention.

However, further research is needed to identify the optimal characteristics and components of group therapy for SUDs. Standardization of group therapy protocols and exploration of specific factors, such as group size, duration, and facilitation techniques, may enhance treatment outcomes and guide clinical practice.

Overall, group therapy represents a valuable treatment modality for individuals with SUDs, providing a supportive and interactive environment that promotes recovery, behavior change, and improved psychosocial functioning. The findings of this review contribute to the growing body of evidence supporting the effectiveness of group therapy in the treatment of SUDs, emphasizing the importance of peer support, social learning, and interpersonal connections in the recovery process. individuals with SUDs.

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EVALUATION OF EPIDEMIOLOGICAL STUDIES OF MORBIDITY AND MORTALITY AND RESULTS OF BREAST CANCER SCREENING

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Annotation: The article deals with the epidemiological and organizational aspects of early diagnosis of breast cancer, based on its secondary prevention using a population method of active detection of this pathology in clinically asymptomatic individuals - screening. A detailed algorithm for the preventive examination of the female population is presented and the results of mammographic screening in a regional context are presented. It has been shown that the use of mammography based on the use of low-dose X-ray radiation allows a differentiated approach to diagnosis, development of management tactics and targeted treatment of these patients.

Key words: breast cancer, epidemiology, morbidity, mortality, screening, mammography.

The key concept of breast cancer screening is the detection of oncological pathology in the early stages, when the prognosis is most favorable and allows you to get the best long-term treatment results. A preventive examination always has advantages over a diagnostic examination when symptoms of the disease are already present. At the same time, upon receipt of the M2 and M3 indices according to the BI-RADS classification, it is possible to timely additionally examine these patients and, if necessary, take them to the dispensary record by a district mammologist

with effective dispensary examinations and treatment of precancerous breast diseases. Along with this, it must be understood that the main conditions for screening for breast cancer are the availability of trained personnel and a standardized approach to identifying the trait under study and evaluating the results. The methods used should be sufficiently simple, reliable and reproducible, and also have sufficient sensitivity and high specificity. Such qualities are fully possessed by modern digital mammography [1,2,3].

Breast cancer is in the 1st ranking place in the structure of the frequency of malignant tumors of both sexes of the population with a specific weight of 15.4% (2020 - 14.5%). This situation has been stable since 2004. In addition, breast cancer occupies the 1st ranking place and constantly remains at this position in the structure of female oncopathology.

The incidence rate of breast cancer per 100 thousand population in 2021 in the country as a whole increased to 26.3 (22.8 in 2020). In the structure of the incidence of regions, breast cancer occupies the 1st ranking place in most regions and cities of the country, except for four: Akmola, Atyrau, Kyzylorda and North Kazakhstan regions, where lung cancer has taken the 1st ranking place.

Above the average republican level, the incidence of breast cancer was established in 9 regions of the country: Pavlodar - 47.4 - the highest level, Karaganda - 40.1, East Kazakhstan - 39.9, North Kazakhstan - 38.2, Kostanay - 35.8, Akmola - 29.8, West Kazakhstan - 28.4 regions and Almaty - 34.5, Nur-Sultan - 28.4. The indicator is lower in 8 regions: Turkestan - 11.7, Kyzylorda - 14.4, Zhambyl - 15.1, Atyrau - 15.7, Mangystau - 17.3, Almaty - 17.7, Aktobe - 24.3 regions and Shymkent - 21.9 per 100 thousand population [4].

In the structure of the causes of death of both sexes from this disease, for the twelfth year in a row, it occupies the 3rd position, amounting to 8.7% in 2021 (7.8% in 2020). In general, the mortality rate from breast cancer in the republic increased from 5.9 to 6.2 per 100,000 population.

The regions where the mortality rate from breast cancer is above the average level in the republic include: North Kazakhstan - 11.4 (maximum level), Pavlodar - 10.0, East Kazakhstan - 8.5, Akmola - 8.2, Kostanay – 7.5, West Kazakhstan - 6.9 regions and years. Almaty - 9.5 and Nur-Sultan - 6.6 per 100 thousand population. The lowest rates were noted in Atyrau - 3.0, Aktobe - 3.5, Turkestan - 3.6, Mangistau - 3.6, Kyzylorda - 4.1, Zhambyl - 4.8 and Almaty - 5.8 regions [4].

Mass screening to identify breast cancer patients should mainly involve healthy women without any signs of the disease or symptoms. Screening not only helps to detect hidden forms of cancer that can be treated, but also has psychological value for women. As a result of screening, women are convinced that they do not have breast cancer, and this is the most important potential success of such programs. While the ultimate goal of screening is to reduce breast cancer mortality, its immediate goal is to detect cancer before clinical manifestation. However, breast cancer is a heterogeneous disease, which can significantly affect the effectiveness of screening. Screening models for breast cancer are usually based on the fact that the majority of detected tumors are invasive cancers in the early stage of progression. In addition, it must be taken into account that the detection of cancer (or its precursors) before clinical manifestation increases the risk of false positive diagnosis [5,6].

Mammography has a sensitivity of 95% and a specificity of 97%. These indicators decrease when examining women with denser mammary glands (young age, use of hormone therapy), with low quality mammography, and also with insufficient qualifications of the radiologist. Detection of high-grade invasive cancer by screening, when the tumor is not yet detected by clinical examination (palpation), means the possibility of reducing mortality from breast cancer [7].

Preventive screening for early detection of breast cancer in the Republic of Kazakhstan includes [8]:

1) mammography of both mammary glands in two projections - direct and oblique in the mammography room of the city, district polyclinic (mobile medical complex). All digital

mammograms in the presence of a system for archiving and transferring medical images are copied to CDs and other electronic media and transferred to the server of the mammography room of the Cancer Center using specialized licensed software integrated between medical organizations; in case of impossibility of digital transmission - they are printed on X-ray film at a scale of 1:1 - 100% (1 patient - 1 set - 2 or 4 mammograms) with subsequent transfer to the mammography room of the Cancer Center;

2) interpretation of mammograms according to the BI-RADS classification (M0t, M0d, M1, M2, M3, M4, M5) by two or more independent radiologists of the same medical organization - double reading or different medical organizations: a radiologist of the mammography room city, district polyclinic (mobile medical complex) - the first reading, and the radiologist of the mammography room of the Cancer Center - the second reading;

3) in-depth diagnostics - targeted mammography, ultrasound examination (hereinafter - ultrasound) of the mammary glands, trepanobiopsy, including under ultrasound or stereotaxic control for histological examination, which is carried out in case of detection of pathological changes on mammograms (M0d) in the mammography room of the Cancer Center.

♦ An average medical worker or a responsible person of the organization of outpatient care sends the patient for mammography to the district, city polyclinic.

♦ The X-ray laboratory assistant of the mammography room of the city, district polyclinic (mobile medical complex) performs mammography, fills out a referral for double reading of mammograms and transmits the referral through information interaction.

♦ Radiologist of the mammography office of the city, district polyclinic (mobile medical complex): fulfills the requirements for the safety and quality of mammographic examinations; evaluates the quality of the images provided and the correctness of the installation; performs repeated mammography in the M0t category (technical errors of mammography); determines the radiological density of the mammary glands on the ACR scale (A, B, C, D) indicating this parameter in the study protocol; conducts the first reading of mammograms with interpretation of the BI-RADS classification results. In the M0d category (undetermined or suspicious radiological changes requiring additional examination), the study protocol indicates the predominant pathology: education, asymmetry, violation of architectonics, microcalcifications; sends mammograms, electronic copies of mammograms through the archiving system and transfer of medical images to the workplace of the mammography office of the Cancer Center together with directions for double reading of mammograms; directs low–dose computed tomographic images through the system of archiving and transferring medical images to the workplace of the computer tomography office of the Cancer Center together with copies of images recorded on CD-ROMs or other electronic media and directions for double reading.

♦ The radiologist of the mammography room of the Cancer Center: evaluates the quality of the provided images and the correctness of the styling. Viewing digital x-ray images transferred to the server or on digital media (CD, DVD) is carried out on a monitor for interpreting digital x-ray images with a resolution of at least 5 megapixels, which has a certified grayscale transmission in accordance with the DICOM standard; conducts a double (second) reading of mammograms with the interpretation of the results according to the BI-RADS classification, using, if necessary, archival images. Organizes the third reading according to indications. With double reading, an independent interpretation of the images is carried out (blinding method - the second radiologist does not know the results of the first reading); in the M0m category (technical errors in mammography), recommends repeat mammography; in the M0d category (uncertain or suspicious radiographic changes requiring additional examination), the study protocol indicates the predominant pathology: education; asymmetry, violation of architectonics, microcalcifications; recommends that the outpatient care organization, according to indications, invite the patient for in-depth diagnostics (targeted mammography, ultrasound of the mammary glands, trephine biopsy,

including under ultrasound or stereotaxic control, followed by histological examination of the material); collects and archives all mammograms (films and electronic media) made as part of the examination. The shelf life of mammograms is at least 3 years after leaving the age subject to a screening study; the results of the double (second) reading are transferred to the outpatient care organizations through information exchange.

♦ Indications for in-depth diagnostics are the conclusions of double reading mammograms M0d (uncertain or suspicious X-ray changes requiring additional examination).

♦ In-depth diagnostics is carried out in two stages. At the first stage, ultrasound is performed, according to indications, targeted mammography, possibly with an increase (with asymmetry, violation of architectonics and the presence of microcalcifications). When visualizing a suspicious pathology (M4 and M5), the second stage is performed - trepanbiopsy, including under ultrasound control and stereotaxic control for histological examination.

♦ Histological examination is carried out in the laboratory of pathomorphology or pathological bureau. Morphological interpretation of the biopsy is carried out in accordance with the recommendations of the World Health Organization.

♦ Physician or responsible person of the outpatient care organization:

1) upon receipt of a mammography result according to the BI-RADS classification:

- in case of M0t (technical errors in mammography) - sends the patient for a second X-ray examination to the mammography room of the city, district polyclinic (mobile medical complex);

- with M0d (undefined or suspicious X-ray changes requiring additional examination) - sends the patient for in-depth diagnostics to the mammography room of the Cancer Center;

- with M1 (no changes detected) - recommends that the patient undergo a follow-up mammography examination after 2 years. With radiological density of the mammary glands, C and D are sent for ultrasound of the mammary glands to exclude a false-negative result of mammography;

- with M2 (benign changes), refer the patient for a consultation with an oncologist (mammologist) of the clinical diagnostic department, followed by a screening mammography examination after 2 years;

- with M3 (probable benign changes) - sends the patient for short-term dynamic radiation observation to the local doctor with the recommendation of control mammography or ultrasound in 6 months;

- with M4 (signs that cause suspicion of malignancy), M5 (practically reliable signs of malignancy) and if it is technically impossible to perform a trepanbiopsy or a biopsy is refused, a referral to an oncologist (mammologist) of the clinical diagnostic department for dynamic observation and decision on the verification of the identified pathology;

2) upon receipt of the result of a histological examination:

- benign education - refers the patient to an oncologist (mammologist) of the clinical diagnostic department for dynamic monitoring, followed by a screening mammography examination after 2 years;

- formation with an indeterminate malignant potential or carcinoma in situ - refers the patient to the Cancer Center for consultation and treatment, followed by dynamic observation by an oncologist (mammologist) of the clinical diagnostic department at the place of her attachment;

- malignant neoplasm - refers the patient to the Cancer Center for treatment and follow-up;

3) communicates the results of the screening examination to the patient in any available way (by telephone, in writing, through electronic means of communication);

4) enters the results of double reading, in-depth diagnostics, histological examination, recommendations of the radiologist of the Cancer Center mammography room into the information system.

Establishing the size of the primary tumor is especially important in screening. Tumor size is an important criterion for evaluating the quality of screening and determining the ability of X-ray mammography to detect non-palpable tumors. Therefore, it is extremely important that pathologists measure tumor diameter as accurately as possible. The smaller the size of the primary tumor, the greater the likelihood of error in determining its size.

Now, regarding the results of breast cancer screening. The detection rate of this oncopathology in 2021 was 1.78 per 1000 examined (in 2020 - 1.44), i.e. 1402 cases of breast cancer were detected out of 787619 examined women of the target group from 40 to 70 years old in 2021 (in 2020 - 1072 cases out of 744972 examined women). At the same time, by regions, the lowest detection rate compared to the national average was noted in Zhambyl (0.54 per 1000 examined), Kyzylorda (0.98), Mangistau (1.10), Atyrau (1.11), Almaty (1.26), Turkestan (1.36), Akmola (1.53) regions and the city of Nur-Sultan (1.54 per 1000 examined). Compared to 2020, there was an increase in the detection of breast cancer in all regions, with the exception of the Mangistau region, where there was a decrease from 2.44 to 1.10 per 1000 examined.

A high proportion of 0-I stages of breast cancer (over 50%) was noted in 8 regions (2020 - in 7 regions): Almaty, West Kazakhstan, Karaganda, Pavlodar, North Kazakhstan, Turkestan regions, cities of Nur-Sultan and Shymkent.

Low levels of early detection of breast cancer (below 40%) were noted in Mangistau (5.6%), Atyrau (19.2%), Aktobe (26.5%), East Kazakhstan (29.3%), Zhambyl (32.3%), Kyzylorda (35.0%) and Akmola (38.5%) regions.

The proportion of patients with breast cancer detected at stages 0 and I was 47.9% (in 2020 - 48.6%), stage II - 47.6% and 46.8%, respectively. At the same time, localized cancer (0-I and II stages) amounted to 95.5% (95.4% - in 2020). At the same time, not a single case in stages III-IV was detected in Atyrau, West Kazakhstan, Kyzylorda, Pavlodar regions, the cities of Nur-Sultan and Shymkent. In total, 52 cases of breast cancer in stage III and 11 cases in stage IV were detected (in 2020 - 38 and 11, respectively).

Thus, the goals of mammographic screening can only be achieved with proper organization, high quality of conduct, active participation in population screening, the use of highly sensitive technology, accurate subsequent diagnosis of detected tumors, and modern treatment. High-quality mammographic screening leads to early diagnosis of breast tumors, which, in turn, improves the effectiveness of treatment and improves the prognosis of the disease. Those women who, for one reason or another, do not participate in this screening should be informed that there are no other screening methods that could also effectively reduce mortality from breast cancer.

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Technical Sciences

Asphalt concrete production technology with the use of rubber crumb from used car tires

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Introduction

With the development of urban infrastructure and an increase in vehicle fleets around the world, the problem of recycling used car tires is becoming more acute. However, this problem also provides a unique opportunity for innovative solutions that can simultaneously contribute to sustainable development, reduce environmental impact and improve road infrastructure. In this context, the technology of asphalt concrete production using rubber crumb from used automobile tires is one of the most promising research areas.

Approaches to road construction are constantly being improved in order to create stronger, more durable and environmentally sustainable road surfaces. Traditional asphalt concrete, consisting of mineral aggregates and bitumen, has its limitations in terms of strength, wear resistance and resistance to extreme conditions. In this context, the use of rubber crumb from used automobile tires as an additive in the asphalt-concrete mixture is a promising way to create more advanced road surfaces.

In this article, we will review the technology of asphalt concrete production using rubber chips, analyze the results of research and practical experiments, and consider examples of its successful implementation in various countries. This will allow us to better understand the potential of this technology and its impact on the quality of road surfaces, ecology and sustainability of infrastructure.

Advantages of the technology

The technology of producing asphalt concrete using rubber crumb from used automobile tires represents a significant step forward in improving road materials and infrastructure. This innovative technique has many advantages that attract the attention of researchers, engineers and environmentalists around the world.

1. Environmental sustainability

One of the main advantages of this technology is its positive impact on the environment. The problem of recycling used automobile tires has long been faced by society, and the use of rubber chips in asphalt concrete provides an effective solution. Instead of accumulating waste in landfills or incinerating it, which can cause air pollution, used tires find a second life as part of road

surfaces. This reduces the environmental burden, minimizes emissions, and promotes the sustainable use of natural resources.

2. Improved road surface performance

Adding rubber chips to the asphalt mix improves the key characteristics of road surfaces. The adhesion between the components of asphalt concrete is significantly increased due to the elastic properties of the rubber crumb. This results in more durable and stable roads that better resist cracking, wear and deformation under the influence of traffic loads. Thus, road surfaces created using rubber crumb have high reliability and a long service life.

3. Reduced noise and vibration characteristics

Asphalt concrete enriched with rubber crumb has reduced acoustic and vibration characteristics. This is especially important for urban areas, where the noise level from traffic can significantly affect the quality of life of residents. Reducing noise emissions contributes to a comfortable stay of citizens near highways and improves the overall environmental situation in cities.

4. Economic efficiency

The introduction of technology for the production of asphalt concrete using rubber chips also promises economic benefits. Despite the possible initial increase in production costs, the long service life of rubber-crumb road surfaces reduces repair and maintenance costs. This allows you to save money in the long run and ensures more efficient use of budget resources.

Research and practical results

Many countries are conducting research and experiments to assess the effectiveness and prospects of the technology for producing asphalt concrete with rubber chips from used car tires.

USA

In the United States, extensive research has been conducted demonstrating the positive impact of the use of rubber chips on the quality of road surfaces. In particular, the results showed an improvement in the resistance of asphalt concrete to damage and cracks.

European Union

In the European Union countries, experiments are being conducted with different types of rubber chips and their impact on the characteristics of the road surface. This allows you to more accurately determine the optimal proportions and application methods.

China

China is actively investigating the impact of rubber chips on the durability of road surfaces under high loads and extreme temperatures. Research confirms improvements in the stability and durability of rubber-crumb road surfaces.

Experiment and analysis methods

Penetration method

The penetration method is one of the most common and informative methods for studying the physical and mechanical properties of bitumen and its ability to maintain viscosity at various temperatures. This method provides important information about the consistency of bitumen, its fluidity and elasticity, which plays a key role in the development and improvement of paving materials.

To study the effect of rubber chips on bitumen, an experiment was conducted using the penetration method. Bitumen samples were prepared with different concentrations of rubber chips: no additives (0%), moderate (5%) and high (10%) content. After heating the samples to a standard test temperature, a cone-shaped tool was applied to the surface of each sample. Then the tool was loaded with a certain force, and the depth of its penetration into the bitumen was measured after a certain time.

Principle of the method

The principle of the penetration method is based on measuring the depth of penetration of a conical or spherical tool into the surface of the bitumen sample under test under a certain load and at a certain temperature. Under load, the tool penetrates the bitumen, and the penetration depth is a measure of the consistency and fluidity of the material.

Using the penetration method to study the impact of rubber chips

In our study, the penetration method was used to evaluate the effect of rubber chips on bitumen. We have prepared bitumen samples with different concentrations of rubber chips (0%, 5%, 10%) and we conducted a series of tests at room temperature. The results allowed us to perform the following analyses:

1. Fluidity and elasticity of bitumen

With an increase in the content of rubber chips, a decrease in the depth of penetration of the tool into the bitumen was observed. This indicates an increase in the elasticity and a decrease in the flowability of bitumen. Probably, the rubber crumb introduces additional bonds between bitumen molecules, which leads to a more rigid material.

2. Resistance to deformation at high temperatures

A decrease in the penetration depth with the addition of rubber chips may indicate an improvement in the bitumen's resistance to deformation at high temperatures. This is important for road surfaces that are subject to intensive operation at high summer temperatures.

3. Optimal content of rubber crumbs

Analysis of the results of the penetration test suggests that the optimal content of rubber chips can be at the level of 5-10%. At the same time, the balance between elasticity and fluidity of bitumen can ensure optimal properties of road surfaces at different temperatures.

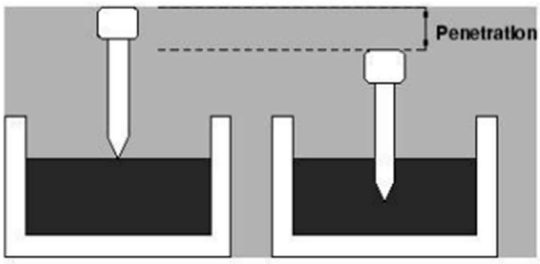

Figure 1 - Analysis of the consistency and fluidity of bitumen under the influence of rubber chips

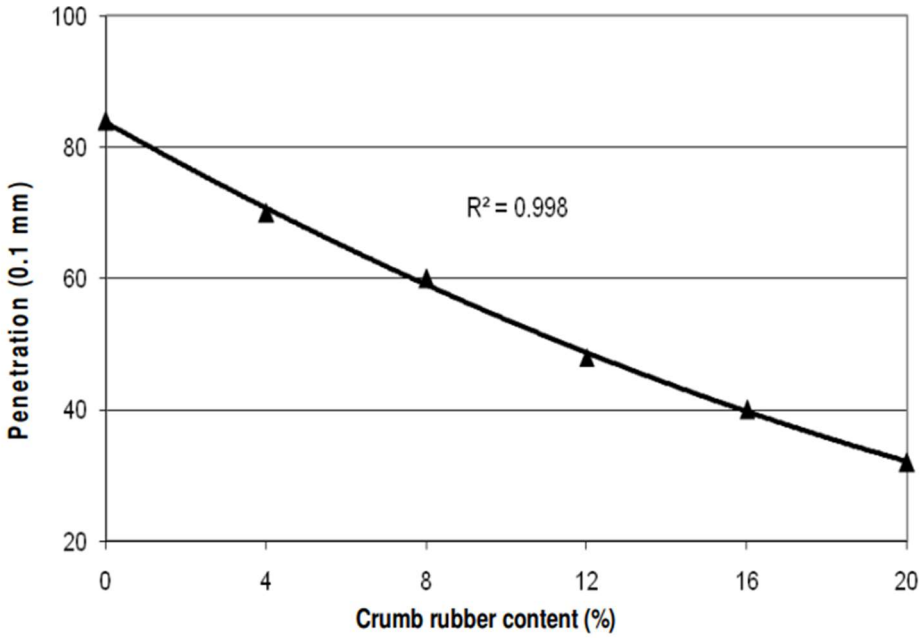

Fig. 2 -Results of penetration tests with different contents of rubber crumb

Figure 2 shows the effect of the rubber crumb concentration on penetration. Penetration decreases as the amount of rubber increases by up to 20%. This shows that the rubber crumb modifier has a significant impact on the penetration rate. The content of rubber chips has a strong effect on reducing the penetration capacity by increasing the stiffness of the bitumen binder made of rubber chips, which would thus make the binder less sensitive to temperature and lead to high resistance to irreversible deformation, such as the formation of ruts. The average reduction in the penetration value of the modified binder content was from 16.5 to 61% , while the rubber crumb content was from 4 to 20%, respectively. Inaddition, Figure 2 shows a linear sharp decline in penetration with a correlation coefficient of $R2^2 = 0.99$. This behavior is justified, since the addition of rubber makes the bitumen more viscous. This increase in the rubber content leads to an increase in the size of rubber particles. This was due to an increase in the mass of rubber due to the interaction and swelling of rubber with bitumen during the mixing process, which led to a decrease in the penetration of rubberized bitumen. Thus, they indicate that the rubberized bitumen binder will be less susceptible to high temperature changes and more resistant to the formation of ruts.

The Kish method

The Kish method (or tensile strain test) is an essential tool for studying the behavior of materials, especially at low temperatures, and is important for determining their resistance to deformation. In our study, we applied the Kish method for a more detailed analysis of the effect of rubber chips on the deformation characteristics of asphalt concrete.

Principle of the method

The Kish method consists of measuring the strain and force required to break a sample when it is stretched. In this case, samples of asphalt concrete with different concentrations of rubber chips were subjected to a tensile force, and the deformation was measured, as well as the breaking force. These data allow us to assess how the addition of rubber chips affects the resistance of asphalt concrete to deformation.

Interpretation of results

1. Reduction of deformation at break

The observed decrease in deformation during the rupture of asphalt concrete samples with rubber chips indicates an increase in the material's resistance to deformations. This is important for the durability of road surfaces, as reducing deformation can reduce the likelihood of cracks and material failure.

2. Increase the breaking force

The addition of rubber chips also increases the force required to break the samples. This means that asphalt concrete with rubber chips becomes more durable and resistant to destruction. This is especially true at low temperatures, when the material is more prone to cracks and fractures.

3. Mechanism for improving sustainability

One of the possible mechanisms for improving the resistance of asphalt concrete with rubber chips to deformations may be to strengthen the structure of the material due to additional connections between rubber particles and other components of asphalt concrete. This can prevent the formation of microcracks and improve the deformation characteristics of the material.

Practical application

The results of the Kish method in the context of our study provide valuable data for designing and creating more stable and durable road surfaces. The Kish method allows you to determine the optimal concentrations of rubber chips that provide the best deformation characteristics of asphalt concrete at various temperatures. This is important for ensuring the safety and efficiency of road infrastructure in the face of various climatic factors.

Fig. 3 - Investigation of the deformation stability of asphalt concrete under the influence of rubber chips

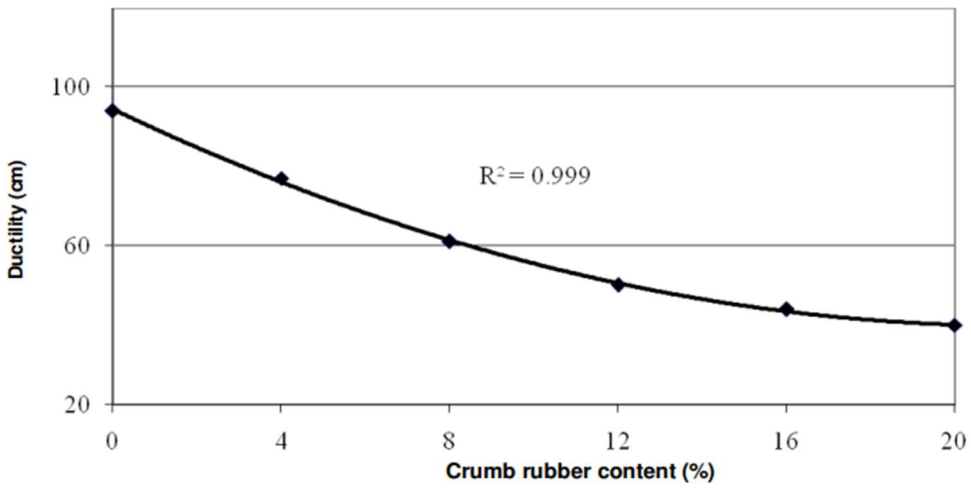

Fig. 4 - Results of plasticity tests with different contents of rubber crumb.

Plasticity is measured by the distance, in centimeters, to which the reference sample is lengthened before breaking. The ductility measurement was carried out at 25°C for various crumb contents, as shown in Figure 4, which shows a sharp decrease in the ductility values. It was carried out at a temperature of 25 °C for various rubber crumb contents, as shown in Figure 4, which shows a sharp decrease in plasticity values.The average decrease in plasticity of the modified binder samples compared to the unmodified binder was approximately (18 and 57%) with a rubber crumb content of 4 and 20% , respectively. In addition, the high content of rubber chips in samples 12, 16, and 20% seems to be linear and has a constant effect on the modified binder at elongation with a correlation coefficient$^{of\ R2}$ =0.9991. These results can be explained by physical interactions during the mixing of rubberized bitumen. Accordingly, an increase in the mass of the binder could make it more elastic, rigid and highly resistant to the formation of ruts on the road surface. Meanwhile, the decrease in the ductility of the material can be explained by the oily part of the bitumen absorbed into the rubber powder and the increase in the mass of rubber particles.

Conclusion

In today's world, where environmental and infrastructural challenges are becoming more urgent, the technology of asphalt concrete production using rubber crumb from used automobile tires is a promising step forward. This innovative practice combines the solution of several problems simultaneously-recycling of automobile waste, improving the quality of road surfaces and reducing the impact on the environment.

Based on the results of this study, the addition of rubber chips to the bitumen binder improves the physical properties of the rubberized bitumen binder, as evidenced by a decrease in penetration and ductility, as well as an increase in elastic recovery, thereby increasing the elasticity of the rubberized binder and increasing its ability to resist deformation in ruts. A higher concentration of rubber chips has an obvious effect on the rheological properties of rubberized bitumen with an increase in the complex modulus, storage modulus, loss modulus and a decrease in the phase angle. The addition of rubber chips to bitumen has a positive effect on the coefficient of formation of ruts, thereby increasing the resistance of the rubberized mixture for the road surface to the formation of ruts. As can be seen, high values of the correlation coefficient reasonably indicate an acceptable level of consistency in the effect of the rubber crumb content on the physical and rheological properties of the rubberized binder.

The use of rubber chips in the production of asphalt concrete leads to an improvement in the strength and durability of road surfaces, which means a reduction in the frequency of repairs and maintenance, and, as a result, a reduction in costs. Reducing noise and vibrations from motor

vehicles improves the ecological situation in cities, contributing to improving the quality of life of citizens.

Research and practical experiments conducted in different countries show that this technology has been successfully adapted to a variety of climatic and operational conditions. Experiments in the United States, the European Union, China and other countries show positive results in improving the characteristics of road surfaces, as well as reducing the environmental burden.

Thus, the technology of asphalt concrete production using rubber crumb from used automobile tires not only promises to be an important step forward in the field of road construction, but also demonstrates its potential in solving urgent environmental and infrastructure problems of our time. Its implementation can contribute to the creation of more sustainable and durable infrastructure, which is essential for the well-being of our cities and the environment.

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Deep Learning in Heart Disease Diagnosis

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Abstract: This review paper delves into the role of Deep Learning (DL) models in the diagnosis of heart diseases, a leading cause of mortality worldwide. Through a comprehensive exploration, we evaluate the application of various DL techniques, including Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs), in analyzing diverse data types such as medical images, electronic health records, and genomic sequences. The review illuminates the capabilities of DL in deciphering complex patterns, leading to potential improvements in diagnostic accuracy and patient outcomes. However, we also scrutinize the challenges accompanying DL adoption in clinical settings, such as the need for large, high-quality datasets, the 'black box' problem related to model interpretability, and ethical considerations surrounding data privacy and security. The review concludes with a forward-looking discussion on future research directions, emphasizing the need for multidisciplinary collaboration and ethical vigilance to fully exploit DL's potential in heart disease diagnosis. This paper serves as an essential guide for researchers, clinicians, and policy-makers interested in the intersection of AI and cardiovascular healthcare.

1. Introduction

Heart diseases have long been a major health concern, ranking as the leading cause of death worldwide. Traditional methods for heart disease diagnosis often rely on medical expertise and subjective interpretation of diagnostic tests such as electrocardiograms and imaging studies [1]. This approach, while critical, can be augmented by modern artificial intelligence technologies, particularly Deep Learning (DL) models. This review paper provides an in-depth exploration of the application of DL in heart disease diagnosis, setting the stage for a critical discourse on the potential, challenges, and future prospects of this cutting-edge technology in cardiovascular healthcare.

DL, a subfield of machine learning, is modeled after the human brain's neural architecture [2]. It deploys artificial neural networks with multiple layers (hence the term 'deep') to learn and model complex patterns in datasets. In the context of heart disease diagnosis, DL models can analyze a myriad of data, from medical images to electronic health records and genomic sequences, with remarkable precision [3]. The ability to discern intricate patterns allows DL models to predict the onset of heart diseases more accurately, which, in turn, can lead to earlier interventions and improved patient outcomes.

Notably, DL models such as Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs) have demonstrated particular promise in medical imaging and time-series data analysis, respectively [4]. CNNs can identify subtle abnormalities in cardiovascular images, such as echocardiograms or MRI scans, that may indicate the presence of heart disease [5]. RNNs, with their ability to process sequential data, have been successful in analyzing physiological time-series data, like heart rate or ECG signals, to detect cardiac anomalies [6].

However, the application of DL in heart disease diagnosis is not without challenges. For one, DL models require large, quality datasets for training. In the medical field, such data can be scarce due to privacy concerns, high annotation costs, and geographical and demographic disparities in data collection [7]. Another significant challenge is the so-called 'black box' problem, where DL models often provide little insight into how they arrive at a particular decision, making

them less transparent and harder for clinicians to trust. Figure 1 demonstrates a sample of using deep learning in heart disease diagnosis.

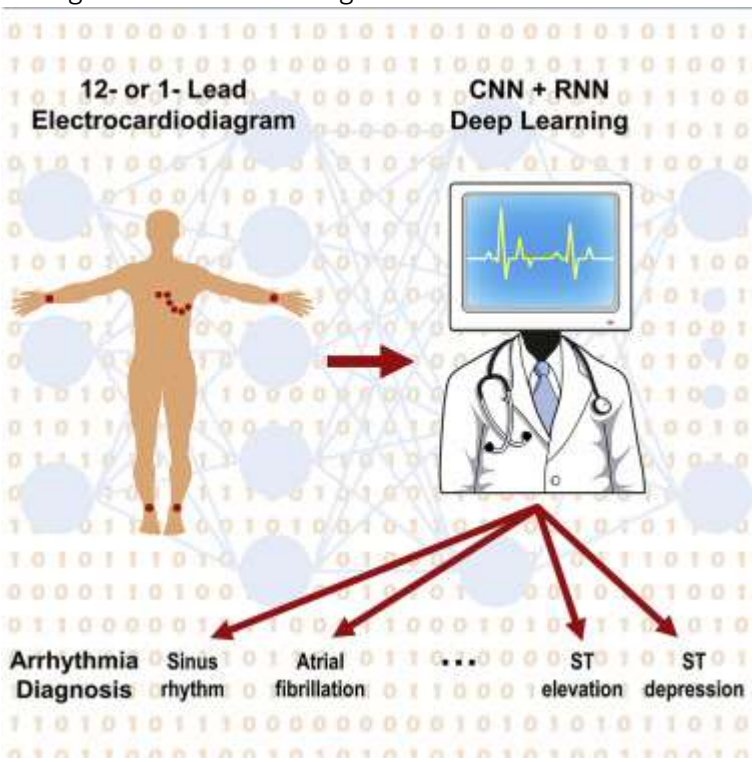

Figure 1. Sample of heart diseases diagnosis using electrocardiograms [8]

Moreover, the implementation of DL models in clinical settings must grapple with significant ethical issues. These include the privacy and security of sensitive medical data, obtaining informed consent for data usage, and mitigating potential biases in AI diagnosis, which can arise from non-representative training data.

Despite these challenges, the future of DL in heart disease diagnosis is promising. As technology advances and with continued interdisciplinary collaboration, we can expect to see DL models becoming more interpretable, equitable, and secure, and thus, more readily integrated into clinical practice [9]. The potential to significantly improve diagnostic accuracy and patient care makes this a compelling area of research.

The ensuing sections of this review paper delve deeper into these topics. We will review the use of DL models in diagnosing heart diseases, the types of data they analyze, their performance, and their advantages over traditional methods [10]. We will also examine the challenges associated with using DL models, including technical, interpretative, and ethical hurdles. In our discussion, we aim to weave together these threads to present a coherent narrative of the state of DL in heart disease diagnosis and suggest directions for future research.

The world of artificial intelligence is rapidly evolving, and its potential impact on healthcare is monumental. This review paper aims to illuminate the application, potential, and challenges of DL models in heart disease diagnosis, thereby contributing to this exciting discourse and aiding the advancement of cardiovascular healthcare.

2. Convolutional Neural Networks in Heart Disease Diagnosis

Convolutional Neural Networks (CNNs) represent a form of deep learning that has made remarkable strides in image analysis, earning a special place in the field of medical imaging. In the context of heart disease diagnosis, CNNs have shown extraordinary promise in identifying even subtle anomalies in cardiovascular images, which can indicate the presence of a disease [11]. This

section of the review paper delves into the utility of CNNs in heart disease diagnosis, exploring their operation, their applications, and the challenges they face.

CNNs are designed to automatically and adaptively learn spatial hierarchies of features from large-scale datasets [12]. They are based on the principle of local receptive fields, shared weights, and spatial or temporal down-sampling. They achieve their robustness and scalability to high-dimensional data through these principles, which mimic the human visual cortex's operation. These unique properties make CNNs ideal for tasks involving unstructured datasets like images, where local features like shapes, edges, or textures can provide meaningful diagnostic information.

A significant application of CNNs in cardiovascular health is in the analysis of echocardiograms, which are widely used in the diagnosis of heart diseases [13]. A study by Zhang et al. utilized a CNN model to detect cardiac chamber segmentation in echocardiograms automatically. The model achieved a high level of accuracy, demonstrating the potential of CNNs to reduce the manual effort involved in image analysis, streamline workflows, and enhance diagnostic precision.

CNNs have also shown promise in the analysis of other cardiovascular imaging modalities such as Magnetic Resonance Imaging (MRI) and Computed Tomography (CT) scans [13]. A study by Tan et al. reported the successful application of a CNN to analyze cardiac MRIs and predict the likelihood of a patient developing heart failure. Another study [14] demonstrated that CNNs could accurately identify coronary artery disease by analyzing cardiac CT angiograms. These studies provide further evidence of the versatility and effectiveness of CNNs in diagnosing heart diseases. Figure 2 demonstrates application of heart disease diagnosis using convolutional neural network [15].

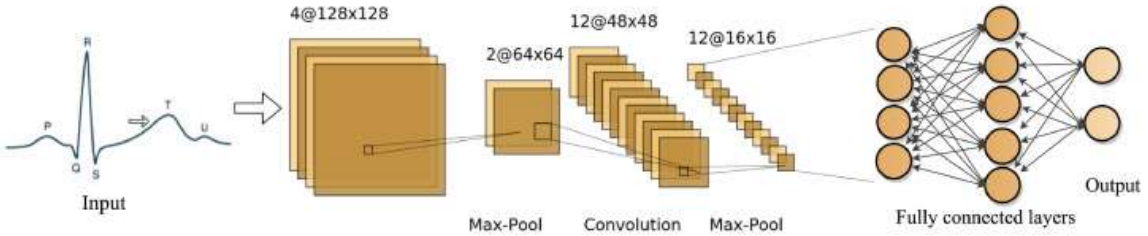

Figure 2. Convolutional neural network in heart disease diagnosis [15]

Despite the remarkable potential of CNNs, their application in heart disease diagnosis is not without challenges. One critical challenge is the scarcity of large, labeled datasets for training CNN models [16]. Medical imaging data is often sensitive and subject to stringent privacy regulations, making it difficult to amass large datasets. Additionally, the labeling of medical images is a time-consuming process requiring expert knowledge, further complicating the data gathering process.

The 'black box' problem, a well-known issue with deep learning models, is another substantial challenge. CNNs, while proficient at pattern recognition, often provide little insight into the decision-making process leading to a particular prediction [17]. This lack of interpretability can lead to hesitation in adopting these models in clinical settings, where understanding the rationale behind a diagnosis is critical.

Addressing these challenges necessitates a multi-faceted approach. Strategies for acquiring larger, labeled datasets could include the development of data sharing agreements across multiple institutions, under conditions that ensure patient privacy [18]. In addition, employing techniques like data augmentation can help maximize the utility of existing datasets. As for the 'black box' problem, research is underway to develop techniques to improve the interpretability of CNNs. Approaches such as Layer-wise Relevance Propagation (LRP) and saliency maps have shown promise in making the decision-making process of CNNs more transparent [19].

In conclusion, while CNNs face certain challenges, their potential to enhance the diagnosis of heart diseases is significant. As research continues to advance, we can expect further improvements in the performance, interpretability, and integration of CNNs into clinical practice [20]. The ability of CNNs to analyze cardiovascular images with high precision, coupled with their potential to reduce manual effort and streamline workflows, make them a promising tool in the ongoing fight against heart diseases. The future of CNNs in heart disease diagnosis looks promising, filled with ongoing developments aimed at improving their performance and making them a reliable component of cardiovascular healthcare.

3. Deep Belief Network in Heart Disease Diagnosis

Deep Belief Networks (DBNs) are a generation of artificial neural networks with multiple layers, with the distinguishing feature of unsupervised learning of multiple levels of representation [21]. By design, DBNs are adept at recognizing, generating, and extracting patterns, particularly from non-linear and high-dimensional data. This section explores the utility, potential, and challenges of DBNs in heart disease diagnosis.

DBNs fundamentally consist of multiple layers of stochastic, unsupervised networks, usually Restricted Boltzmann Machines (RBMs), stacked onto each other [22]. These networks are 'trained' in an unsupervised manner, meaning they learn to reconstruct their inputs without any explicit labels. The ability of DBNs to learn and represent complex structures in the data makes them an excellent tool for tasks requiring high-level feature extraction, like detecting heart diseases. Figure 3 demonstrates architecture of a deep belief network.

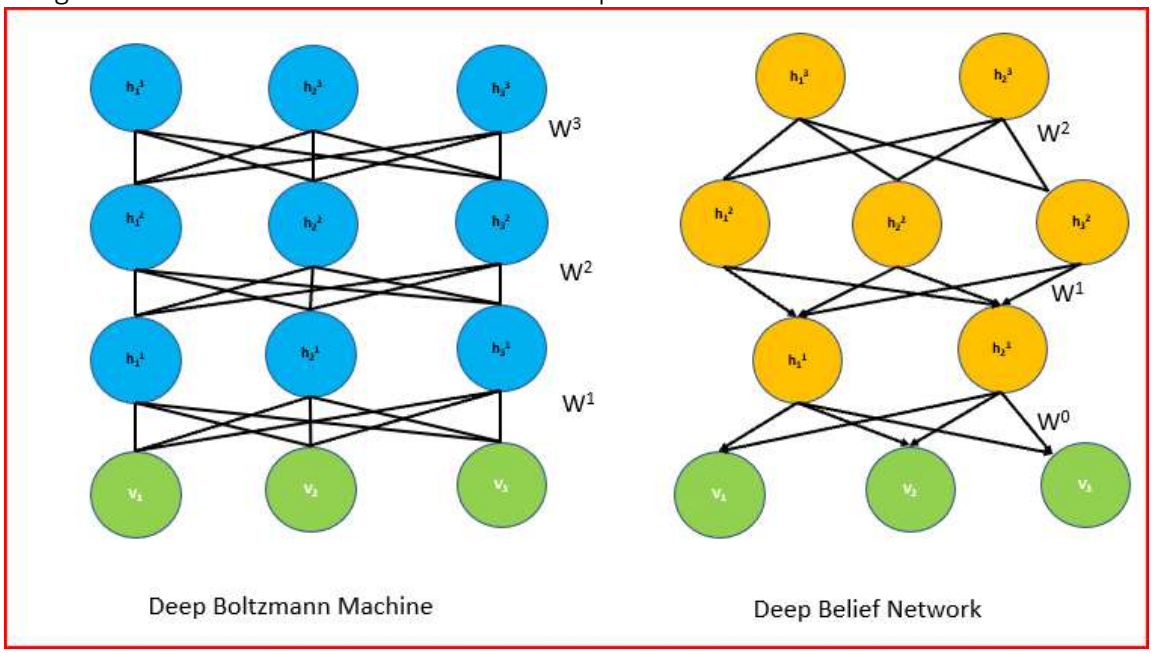

Figure 3. Deep belief network

One critical area where DBNs find use is in the analysis of electrocardiogram (ECG) data [23]. Traditional ECG analysis relies on manual identification of features, which can be time-consuming and susceptible to human error. Moreover, certain critical patterns indicative of heart diseases might be subtle and potentially overlooked. DBNs, with their capability for automatic feature extraction, can overcome these limitations. For example, a study by Al Rahhal et al. used DBNs to analyze ECG signals and distinguish between healthy and diseased hearts, achieving high levels of accuracy.

Furthermore, DBNs are also applied in the analysis of patient health records [24]. These records contain a wealth of information, often high-dimensional and non-linear, that can aid in diagnosing heart diseases. A study by [25] demonstrated that a DBN could be used to predict heart

disease occurrence by analyzing a patient's health records. The model performed well, indicating that DBNs could provide valuable assistance in clinical decision-making processes.

While the potential of DBNs in heart disease diagnosis is immense, they are not without challenges. Similar to other deep learning models, DBNs require large volumes of data for training, which can be a hurdle in the medical field [26]. Additionally, DBNs can be computationally expensive and time-consuming to train, particularly for large datasets, posing challenges for their real-time implementation.

The 'black box' problem persists with DBNs as well [27]. They often provide little insight into their decision-making process, which can lead to trust issues in a clinical setting. Moreover, overfitting, a common problem in machine learning where a model learns the training data too well and performs poorly on unseen data, can be an issue with DBNs if not appropriately managed [28].

Addressing these challenges requires a comprehensive approach. Methods for gathering larger datasets could include the development of cooperative frameworks for data sharing among medical institutions, ensuring patient privacy. Techniques like early stopping, dropout, and regularization can be employed to prevent overfitting [29]. As for the 'black box' problem, research is ongoing to enhance the interpretability of DBNs, with methods like feature visualization showing promise.

In conclusion, DBNs provide a powerful tool in the field of heart disease diagnosis. Their ability to extract complex, high-level features makes them uniquely positioned for tasks involving non-linear and high-dimensional data, like ECG analysis and patient health records interpretation [30]. While they face challenges related to data requirements, computational complexity, and interpretability, ongoing research and development promise solutions to these issues. By unlocking the full potential of DBNs, we can enhance the accuracy, speed, and efficiency of heart disease diagnosis, contributing significantly to improving patient outcomes.

4. Recurrent Neural Network in Heart Disease Diagnosis

Recurrent Neural Networks (RNNs), another branch of deep learning models, are specifically designed to process sequential data, making them a valuable asset in the field of heart disease diagnosis [31]. In particular, they excel in analyzing physiological time-series data such as heart rate or EKG signals. This section explores the operation, potential, and challenges of RNNs in diagnosing heart diseases.

RNNs operate differently from other neural networks due to their ability to remember prior input information, thanks to their unique feedback connections. This ‘memory’ enables RNNs to excel in tasks where sequence matters, such as time-series analysis or natural language processing. In the context of heart disease diagnosis, this capability allows RNNs to detect temporal patterns in physiological signals, which can be indicative of heart diseases.

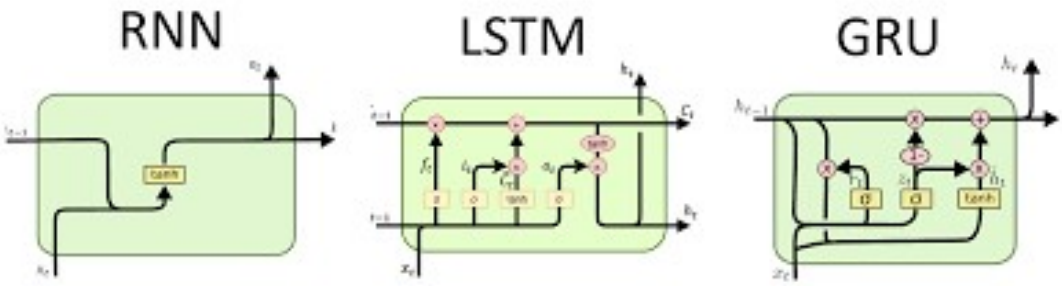

Figure 4. Architecture of recurrent neural networks

A vital area where RNNs demonstrate significant potential is in the analysis of electrocardiogram (ECG) data. Traditional methods of ECG analysis rely on manual feature

extraction, which can be labor-intensive and error-prone. In contrast, RNNs can automatically analyze ECG signals to detect anomalous patterns. A study [32] used an RNN-based model to classify multiple types of cardiac arrhythmias from ECG data, achieving performance comparable to cardiologists.

Additionally, RNNs have proven their worth in predicting heart failure by analyzing electronic health records (EHRs). EHRs contain a sequence of a patient's medical history, which can provide crucial insights into their likelihood of developing heart diseases. A study by [33] demonstrated that RNNs could analyze EHRs and predict the onset of heart failure, outperforming other traditional models.

Despite their potential, RNNs face several challenges. The most notable is the 'vanishing gradients' problem, which causes difficulties in learning long-term dependencies in the data. This problem arises during the backpropagation process, leading to either exponentially vanishing or exploding gradients, both of which can hinder effective learning.

Further, like other deep learning models, RNNs also suffer from the 'black box' problem, where their decision-making process is often non-transparent. This lack of interpretability can lead to trust issues, particularly in a medical setting where understanding the rationale behind a diagnosis is essential.

Addressing these challenges requires sustained effort. Techniques such as Long Short-Term Memory (LSTM) units and Gated Recurrent Units (GRUs) have been developed to overcome the vanishing gradients problem [34]. LSTMs and GRUs introduce gates into the RNN architecture, allowing them to remember or forget information as needed and effectively learning long-term dependencies.

As for the 'black box' problem, research is ongoing to make RNNs more interpretable. One promising approach is attention mechanisms, which can provide insights into which parts of the input sequence the model pays more attention to when making a prediction.

In conclusion, RNNs present an exciting avenue in the field of heart disease diagnosis. Their ability to process and learn from sequential data, like ECG signals and EHRs, can lead to significant improvements in diagnostic accuracy and speed. While they face challenges related to learning long-term dependencies and interpretability, ongoing research promises solutions. By harnessing the full potential of RNNs, we can pave the way for a new era of precision and efficiency in heart disease diagnosis, significantly contributing to improving patient care.

4. Discussion

The discussion section of this review paper serves as a comprehensive dialogue about the deep learning models in heart disease diagnosis covered thus far: Convolutional Neural Networks (CNNs), Deep Belief Networks (DBNs), and Recurrent Neural Networks (RNNs). The examination of these models presents an optimistic picture of the future of heart disease detection, despite some ongoing challenges.

The potential of these deep learning models in the medical field, particularly in diagnosing heart diseases, is substantial. Their unique ability to learn and extract complex patterns from large volumes of data makes them instrumental in tasks involving image analysis (CNNs), high-level feature extraction (DBNs), and time-series analysis (RNNs) [35]. They have demonstrated remarkable success in analyzing ECG data, cardiovascular imaging data, and patient health records, often outperforming traditional methods in terms of accuracy and speed.

However, along with the immense potential come challenges. The models require large, labeled datasets for training, which can be difficult to obtain in the healthcare field due to privacy regulations and the effort required to manually label medical images [36]. They can also be computationally expensive to train, particularly for large datasets. Additionally, the 'black box'

problem persists in these models. Their lack of interpretability can lead to trust issues in clinical settings where understanding the rationale behind a diagnosis is critical.

Despite these challenges, there are ongoing developments to overcome them [37]. The data acquisition problem could be addressed through data sharing agreements across multiple institutions, ensuring patient privacy. Computationally expensive training can be mitigated by leveraging advances in hardware and distributed computing [38]. The 'black box' problem is also an active area of research, with methods like feature visualization, Layer-wise Relevance Propagation (LRP), saliency maps, and attention mechanisms showing promise in making the decision-making process more transparent.

In conclusion, deep learning models hold significant promise in revolutionizing heart disease diagnosis. As research and development continue to advance, we can expect further improvements in the performance, interpretability, and integration of these models into clinical practice. The ability to analyze cardiovascular data with high precision, coupled with their potential to reduce manual effort and streamline workflows, makes them a promising tool in the ongoing fight against heart diseases. These technologies, in tandem with skilled medical professionals, will drive forward the evolution of precision medicine, enhancing care quality and patient outcomes. The future of deep learning in heart disease diagnosis is indeed promising, filled with ongoing developments aimed at improving their performance and making them a reliable component of cardiovascular healthcare.

Conclusion

In conclusion, this review underscores the transformative potential of deep learning models in the diagnosis of heart diseases. By leveraging Convolutional Neural Networks (CNNs), Deep Belief Networks (DBNs), and Recurrent Neural Networks (RNNs), the medical field can address the increasing need for more precise and efficient heart disease diagnosis. These models are uniquely positioned to process and interpret complex cardiovascular data, offering robust, scalable, and often more accurate solutions than traditional methods.

However, the application of deep learning in heart disease diagnosis is not without challenges. The requirement for large, labeled datasets, the computational demand of training these models, and the ongoing 'black box' problem highlight the need for further research and development in this field. Fortunately, ongoing efforts in enhancing data accessibility, improving computational infrastructure, and making deep learning models more interpretable promise to address these issues.

The fusion of deep learning and cardiovascular healthcare is a paradigm shift that promises to revolutionize the diagnosis of heart diseases. As the field continues to evolve, deep learning models will undoubtedly play a more prominent role, making diagnosis more accurate, rapid, and efficient. This integration could lead to better patient outcomes, reduced healthcare costs, and an overall advancement in our battle against heart diseases.

The future of heart disease diagnosis lies at the intersection of medicine and artificial intelligence. This review is but a glimpse into the profound changes that deep learning models can bring about in the field. As researchers, clinicians, and data scientists continue to collaborate, they can drive the evolution of precision medicine, ultimately advancing the global agenda of reducing the burden of heart diseases.

Acknowledgements

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Adapting UI/UX Design for Emerging Technologies: Bridging the Research Gap

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Abstract: The rapid advancement of emerging technologies, such as augmented reality (AR), virtual reality (VR), and voice interfaces, has ushered in new possibilities for software development. However, integrating these technologies poses unique challenges for user interface design (UI) and user experience (UX). As these technologies gain prominence across various applications, exploring how UI/UX design should adapt to maximize its potential and enhance user interactions becomes crucial. Addressing the lack of research in this domain, the paper aims to foster a deeper understanding of UI/UX design for emerging technologies, enabling the creation of user-centric, immersive, and engaging digital experiences. With AR, VR, and voice interfaces shaping the technological landscape, the insights gained from this research empower designers and developers to unleash the full potential of these transformative technologies and revolutionize how users interact with digital content.

1. INTRODUCTION

In today's ever-changing technological landscape, emerging technologies like augmented reality (AR), virtual reality (VR), and voice interfaces have reshaped the way we interact with digital content. The integration of these technologies into software applications offers boundless possibilities, creating new horizons for user interface design (UI) and user experience (UX). As AR, VR, and voice interfaces become increasingly prevalent across various domains, it becomes crucial to adapt UI/UX design practices to fully leverage their potential and create immersive, user-centric experiences. By analyzing the limitations of previous studies in the field, this paper aims to provide valuable insights into how UI/UX design can be optimized for AR, VR, and voice interfaces. We will delve into the principles and best practices required to create seamless and engaging user interactions, ultimately fostering a deeper understanding of UI/UX design in this transformative domain.

To achieve our research objectives, this paper's literature review will span a wide range of topics. We will begin by providing an overview of the fundamental UI/UX design principles and exploring their relevance and adaptation to emerging technologies. This foundational understanding will lay the groundwork for comprehending the specific challenges faced by designers and developers in this evolving landscape. Additionally, we will delve into user experiences with AR, VR, and voice interfaces, analyzing factors such as user satisfaction, usability, and emotional responses to identify key elements that contribute to positive interactions. In our literature review, we will scrutinize case studies of software applications or products that have successfully adapted UI/UX design to optimize user experiences with emerging technologies. Furthermore, we will identify the research gaps and limitations present in the existing body of literature, highlighting areas that warrant further investigation and exploration.

1. The lack of comprehensive understanding of how to effectively adapt UI/UX design principles to emerging technologies like augmented reality (AR), virtual reality (VR), and voice interfaces.

1.1 Challenges in Adapting UI/UX Design Principles

One of the key challenges in adapting UI/UX design principles to emerging technologies is the lack of established design patterns and guidelines. Unlike traditional interfaces, AR, VR, and voice interfaces introduce novel interaction paradigms, making it challenging for designers to determine the most effective ways to design and structure user interactions. For example, in AR applications, the real-world environment overlays with digital content, creating a need for intuitive and non-intrusive design elements. Without comprehensive guidelines, designers may struggle to create cohesive and immersive experiences.

1.2 Scarcity of Case Studies and Best Practices:

The scarcity of comprehensive case studies and best practices further compounds the research gap. While there are successful applications and products utilizing emerging technologies, there is a limited number of in-depth case studies analyzing the design decisions and strategies employed. Access to practical examples and insights into the successes and challenges faced by designers can significantly benefit the industry. By examining a wider range of case studies, designers and developers can gain valuable knowledge and apply best practices to their own projects.

The lack of comprehensive understanding of how to effectively adapt UI/UX design principles to emerging technologies like AR, VR, and voice interfaces poses a significant research gap. Challenges related to the absence of established design patterns, limited knowledge of user behavior, and the scarcity of case studies highlight the need for further exploration in this domain. Addressing this research gap will empower UI/UX designers and developers to create immersive and user-centric experiences in the ever-expanding world of emerging technologies. By shedding light on these challenges and providing practical insights, this research paper seeks to contribute to the advancement of UI/UX design practices for emerging technologies and inspire future studies in this rapidly evolving field.

2. Adapting UI Elements and Interaction Patterns for AR, VR, and Voice Interfaces"

2.1 Designing UI Elements for Immersive AR, VR, and Voice Interfaces

One of the key considerations is adapting UI elements to align seamlessly with the real-world environment in AR applications. Designers need to focus on creating intuitive and non-intrusive visual cues and navigation elements that overlay digital content onto the user's physical surroundings. Similarly, in VR environments, UI elements must be designed to integrate naturally within the virtual world, taking into account factors like motion sickness, comfort, and the user's mental state.

In the realm of voice interfaces, designers face the distinctive challenge of creating interactions devoid of visual elements. Here, understanding user behavior is crucial, as voice interactions rely heavily on natural language processing and user intent. Designers must develop context-aware voice commands and responses that cater to users' expectations and minimize cognitive load. This requires in-depth research into user preferences and expectations when

interacting with voice-driven systems, which can influence the design of conversational interfaces and personalized responses.

To ensure engaging and immersive experiences in AR, VR, and voice interfaces, designers must also consider the emotional and cognitive responses of users during their interactions. Emotions play a significant role in shaping user perceptions and brand experiences. Designers can leverage emotional design principles to evoke positive feelings and associations with the technology, ultimately enhancing user engagement and satisfaction. Understanding the cognitive load imposed by the complexity of interactions in emerging technologies is equally important. By designing interfaces that facilitate effortless navigation and minimize cognitive strain, designers can create experiences that are more enjoyable and user-friendly.

To achieve these goals, interdisciplinary research is required to bridge the gap between design principles and the unique characteristics of emerging technologies. Studies that explore the emotional responses of users in AR, VR, and voice interactions can provide valuable insights into designing emotionally resonant experiences. Additionally, research on cognitive psychology and human-computer interaction can aid in optimizing UI/UX elements to minimize cognitive load and improve user performance. By integrating these findings into the design process, designers can create more user-centric, engaging, and immersive experiences in the dynamic landscape of emerging technologies.

2.2 Investigating User Satisfaction, Usability, and Emotional Responses

User satisfaction serves as a crucial metric in evaluating the success of UI/UX design. For example, a study focusing on AR-based e-commerce applications may find that users are highly satisfied when they can visualize products in their real environment, leading to increased purchase intent and positive word-of-mouth referrals. On the other hand, if users express dissatisfaction with complex navigation or unclear interactions, it highlights areas that need improvement to enhance user satisfaction.

Usability testing plays a significant role in assessing the efficiency and effectiveness of UI/UX design for emerging technologies. For instance, in VR-based training simulations, researchers can analyze users' task completion times and accuracy to gauge the effectiveness of the interface in facilitating learning. Usability testing can reveal pain points in interaction patterns, leading to iterative design improvements. By observing users' behaviors during voice-controlled interfaces, researchers can identify challenges in understanding voice commands, leading to adjustments in the system's voice recognition capabilities to enhance usability.

Understanding users' emotional responses is equally vital in creating immersive and engaging experiences. For example, in an AR educational app, tracking users' emotional responses while exploring historical landmarks can indicate which elements evoke fascination or emotional connection, contributing to a more captivating experience. Additionally, in VR gaming applications, monitoring emotional responses can reveal which scenarios induce fear, excitement, or joy, guiding developers in crafting emotionally impactful content.

By delving into user satisfaction, usability, and emotional responses, researchers can uncover valuable insights that shape user-centric UI/UX design practices for emerging technologies. For instance, an analysis of user feedback on a voice interface for home automation may reveal users' desires for more natural and conversational interaction, leading to the

incorporation of natural language processing algorithms to enhance the system's usability and overall experience. Ultimately, this research approach aims to align UI/UX design with user expectations, maximize satisfaction, and create innovative and immersive experiences that resonate with users in the ever-evolving landscape of emerging technologies.

2.3 Insights and Best Practices for AR, VR, and Voice Interfaces

One exemplary case study in AR design involves the development of a navigation app that overlays real-time directional information onto the user's physical environment. By analyzing the outcomes of this case study, UI/UX designers discovered that simplicity and minimalism are critical for AR interfaces to avoid overwhelming users with excessive visual information. Implementing user feedback and conducting iterative design improvements led to a more intuitive AR navigation experience, where users reported increased satisfaction and reduced cognitive load during interactions.

In the realm of VR interfaces, a case study focused on creating an immersive virtual training platform for medical professionals yielded valuable insights. The research revealed that spatial presence and interaction realism were fundamental in promoting engagement and knowledge retention. However, designers faced the challenge of motion sickness and discomfort among users during prolonged VR sessions. By addressing this challenge through optimized motion tracking and providing breaks for users, the VR training platform achieved higher usability and overall emotional satisfaction.

For voice interface design, a case study involving the development of a smart home assistant explored the dynamics of natural language processing and user engagement. The study demonstrated that the incorporation of machine learning algorithms significantly improved voice recognition accuracy and user satisfaction. However, designers encountered challenges related to the misinterpretation of voice commands, especially in noisy environments. By fine-tuning the voice recognition system and incorporating contextual cues, the smart home assistant achieved enhanced usability and user delight.

Analyzing these case studies provides valuable insights into the successes and challenges faced by UI/UX designers and developers working with AR, VR, and voice interfaces. The findings emphasize the importance of user-centric design, iterative improvements, and understanding the unique characteristics of each emerging technology. Ultimately, this knowledge empowers designers to create innovative and immersive experiences that resonate with users and elevate the potential of emerging technologies in various applications.

3 Practical Recommendations for AR, VR, and Voice Interfaces

Based on the insights gained from the case studies in UI/UX design for emerging technologies, the following practical recommendations are suggested for designers and developers working with AR, VR, and voice interfaces:

Prioritize Simplicity and Minimalism in AR Design: AR interfaces should be designed with simplicity and minimalism in mind to avoid overwhelming users with excessive visual information. By focusing on delivering essential and relevant information, designers can create intuitive and user-friendly AR experiences. Implement user feedback and conduct iterative design improvements to refine the interface and ensure a seamless navigation experience.

Enhance Spatial Presence and Interaction Realism in VR: For VR interfaces, prioritize spatial presence and interaction realism to promote engagement and knowledge retention. Aim to create immersive environments that make users feel present and involved in the virtual world. However, be mindful of motion sickness and discomfort during extended use. Optimize motion tracking and provide breaks to minimize adverse effects on users' experience.

Improve Voice Recognition and Contextual Understanding: In voice interface design, invest in machine learning algorithms to enhance voice recognition accuracy and user satisfaction. Fine-tune the voice recognition system to minimize misinterpretation of voice commands, especially in noisy environments. Incorporate contextual cues to improve the system's understanding of user intent and provide more relevant responses.

Conduct Comprehensive User Testing: Regularly conduct user testing and gather feedback from target users throughout the development process. User-centric design relies on understanding user needs and expectations, which can only be achieved through continuous testing and feedback. Iterate on design elements based on user insights to create interfaces that align with user preferences and foster positive experiences.

Emphasize Accessibility and Inclusivity: Consider the diverse needs of users, including those with disabilities, when designing UI/UX for emerging technologies. Ensure that the interfaces are accessible and inclusive to a wide range of users. Incorporate features such as voice commands, gestures, and alternative navigation options to accommodate different user preferences and capabilities.

Collaborate Across Disciplines: Emerging technologies often require collaboration between UI/UX designers, developers, and subject matter experts. Foster interdisciplinary collaboration to ensure that design decisions align with the unique characteristics and goals of the technology and its intended application.

By implementing these practical recommendations, designers and developers can create more engaging and immersive experiences for users with emerging technologies, maximizing the potential of AR, VR, and voice interfaces in various domains.

Conclusion:

Through an extensive literature review, the research paper identifies several challenges in adapting UI/UX design for emerging technologies. These challenges include the absence of established design patterns and guidelines, a limited understanding of user behavior and expectations, and a scarcity of case studies and best practices. Addressing these challenges is crucial in unlocking the full potential of AR, VR, and voice interfaces and creating seamless and meaningful interactions.

Insights from successful case studies provide valuable guidance for designers and developers. The study highlights the importance of prioritizing simplicity and minimalism in AR design, enhancing spatial presence and interaction realism in VR interfaces, and improving voice recognition and contextual understanding in voice interfaces. Additionally, conducting comprehensive user testing and emphasizing accessibility and inclusivity is essential for creating user-centric experiences that cater to diverse user needs and preferences. The paper underscores the significance of interdisciplinary collaboration, as emerging technologies often require insights from multiple disciplines. By fostering collaboration between UI/UX designers, developers, and

subject matter experts, designers can align design decisions with the unique characteristics and goals of the technology.

In conclusion, "Adapting UI/UX Design for Emerging Technologies: Bridging the Research Gap" sheds light on the critical importance of understanding and addressing the challenges in UI/UX design for emerging technologies. By providing practical recommendations and insights from case studies, the paper empowers designers and developers to create innovative and immersive experiences that resonate with users and revolutionize the way we interact with digital content. Bridging the research gap in this rapidly evolving field is instrumental in unlocking the full potential of emerging technologies and creating user-centric and engaging digital experiences for the future.

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Python's Pivotal Role in Machine Learning and Artificial Intelligence: Exploring the Transformational Impact of Libraries like TensorFlow and PyTorch

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Abstract: The rapid progress of technology has thrust Machine Learning (ML) and Artificial Intelligence (AI) into the forefront of diverse industries. Amid this shift, Python has become pivotal, shaping ML and AI development. Acknowledging ML and AI's significance, this study introduces Python as a foundational language, known for its readability and vast libraries. The paper explores how Python drives innovation in ML and AI, especially via TensorFlow and PyTorch. Analyzing TensorFlow and PyTorch, renowned for complex model building, reveals their tools for simplifying development, enhancing creativity, and minimizing technical challenges. Through case studies, businesses and researchers leverage Python, TensorFlow, and PyTorch to achieve breakthroughs in areas like image recognition and natural language processing.

INTRODUCTION

The rapid advancement of technology has propelled Machine Learning (ML) and Artificial Intelligence (AI) to the forefront of various industries, igniting transformative changes. With businesses and societies embracing these cutting-edge technologies, the landscape of ML and AI development has undergone an irreversible shift. At the heart of this transformation stands Python, a programming language that has emerged as a cornerstone, playing a pivotal role in shaping the trajectory of ML and AI applications. Central to this research is the inquiry into how Python collaborates with influential libraries such as TensorFlow and PyTorch to propel innovation within the realm of ML and AI. TensorFlow and PyTorch, esteemed for their role in simplifying complex model building and optimization, are under scrutiny. Through rigorous analysis, this study delves into how these libraries provide a repertoire of tools, algorithms, and frameworks that streamline the development process and create an environment conducive to creativity and effective problem-solving. The illumination of TensorFlow and PyTorch's integration with Python comes through a series of comprehensive case studies. These instances highlight how Python, bolstered by these libraries, has acted as a catalyst for transformative breakthroughs across diverse sectors. The exceptional achievements in image recognition, natural language processing, recommendation systems, and more underscore Python's efficacy in pushing the boundaries of ML and AI. As Python's influence continues to ascend within the ML and AI ecosystem, it is poised to exert an enduring impact as a crucible of innovation. The final segment of this introduction envisions the ongoing proliferation of Python's role, envisioning a future where Python solidifies its position as a bedrock of technological ingenuity in ML and AI. Through this research, a comprehensive understanding of Python's central role and the transformative potential of TensorFlow and PyTorch emerges, contributing significantly to the comprehension of the ongoing evolution of ML and AI technologies.

1. Revealing the Capacity of Artificial Intelligence

Artificial Intelligence (AI) has emerged from the realm of science fiction as a tangible force shaping our modern world. At its essence, AI represents the quest to bestow machines with human-like cognitive abilities, enabling them to comprehend, learn, reason, and even make decisions. This transformative technology seeks to mimic human intelligence, adapting and improving its performance based on past experiences and interactions. AI endeavors to instill machines with the ability to solve problems that were formerly exclusive to the realm of human cognition.

The foundation of AI lies in the development of algorithms that allow computers to process and understand vast amounts of data. This data-driven approach enables machines to identify patterns, extract insights, and predict outcomes with astonishing accuracy. Machine learning, a subset of AI, plays a pivotal role by empowering systems to learn from data without explicit programming. As these systems encounter more data, their performance improves, making them invaluable tools for tasks ranging from image recognition to language translation.

AI encompasses various subfields, including natural language processing, computer vision, robotics, and neural networks. Natural language processing enables computers to understand, interpret, and generate human language, forming the basis of chatbots and language translation tools. Computer vision enables machines to interpret and make sense of visual information, vital for applications like facial recognition and autonomous vehicles. Neural networks, inspired by the human brain's structure, allow AI systems to simulate decision-making processes and complex patterns.

1.1 Python's Dominance in AI

Python's meteoric rise as the preferred programming language for Artificial Intelligence (AI) can be attributed to its unique combination of characteristics that make it exceptionally well-suited for this transformative field. As AI continues to reshape industries and our daily lives, the question arises: why is Python the optimal choice for AI development, trumping other programming languages?

First and foremost, Python's hallmark trait is its readability and simplicity. AI projects often involve complex algorithms and intricate code. Python's clean and concise syntax allows developers to express complex ideas more straightforwardly and understandably. This readability not only accelerates development but also promotes collaboration among programmers, enabling them to seamlessly work together on intricate AI projects.

Python's extensive collection of libraries, frameworks, and tools further solidifies its position in AI. Libraries like TensorFlow, Keras, and PyTorch provide robust foundations for building and training intricate AI models. These libraries abstract away much of the technical complexity, enabling developers to focus on the core AI concepts rather than getting bogged down in intricate implementation details. This combination of accessibility and versatility empowers both newcomers and seasoned AI practitioners to bring their ideas to life efficiently.

The language's versatility is another key factor in its AI dominance. Python is not solely confined to AI; it spans web development, data analysis, and more. This versatility contributes to its vibrant and expansive community, which in turn facilitates rapid knowledge exchange, constant innovation, and the emergence of state-of-the-art AI solutions.

Perhaps the most defining aspect is Python's adaptability to different phases of AI development. From data preprocessing and analysis to model building, training, and deployment, Python offers tools and libraries that cater to every stage. Its compatibility with both structured and unstructured data, coupled with its seamless integration with other languages like C++ and Java, makes it an all-encompassing language for AI.

2. The Future of Python in AI: A Glimpse into Tomorrow's Intelligent Landscape

Python's influence in the field of Artificial Intelligence (AI) has been profound, and its trajectory suggests an even more exciting future. As AI continues to evolve and expand its horizons, Python's adaptability, extensive libraries, and community support position it as a frontrunner in shaping the future of AI.

2.1 Growing Integration with Advanced AI Frameworks:

Python's future in AI is intricately tied to its seamless integration with advanced frameworks. For instance, TensorFlow and PyTorch, two leading deep learning libraries, are intricately woven into Python's ecosystem. The advent of TensorFlow 2.0 showcases Python's capacity to accommodate the evolving needs of AI developers. This integration empowers developers to harness the capabilities of these frameworks effortlessly, fostering innovation in areas like computer vision, natural language processing, and reinforcement learning.

AI democratization through Accessibility:

Python's accessibility remains a driving force in its AI future. Its simple syntax and clear readability make it an ideal language for both novice and experienced programmers entering the AI landscape. This accessibility extends to AI enthusiasts, students, researchers, and startups, fostering a diverse community of contributors. The Jupyter Notebook ecosystem, enabling interactive and visual coding, has played a pivotal role in making AI concepts comprehensible and interactive.

AI-Driven Automation and Decision-Making:

Python's future in AI is intertwined with its role in AI-driven automation. As AI is increasingly used for predictive analysis and decision-making, Python's robust libraries for data manipulation and analysis (like Pandas and NumPy) will continue to shine. Industries such as finance, healthcare, and logistics are integrating Python-powered AI systems to optimize supply chains, predict trends, and make data-driven decisions.

The emergence of Ethical AI:

As AI's impact on society deepens, ethical considerations are gaining prominence. Python's future in AI includes facilitating the development of ethical AI models. Libraries like Fairlearn are dedicated to reducing bias in AI systems. The seamless integration of such tools into Python showcases the language's commitment to responsible AI development and its role in shaping the ethical foundations of AI applications.

3. Navigating the Realm of AI with Essential Python Skills

Working with Python in the field of Artificial Intelligence (AI) demands a distinctive skill set that blends programming prowess with a deep understanding of AI concepts. The convergence of these skills empowers professionals to harness Python's capabilities for AI-driven innovations effectively.

3.1 Programming Proficiency in AI:

Programming proficiency serves as the cornerstone of success in the realm of Artificial Intelligence (AI), and Python stands as the language of choice for this dynamic field. A robust grasp of Python's intricacies goes beyond mere familiarity with syntax; it entails an in-depth understanding of its key features and principles that empower professionals to excel in AI development.

Mastering Syntax and Beyond:

Professionals working with Python in AI must possess a comprehensive command over the language's syntax. This involves not only knowing how to write code but also understanding the nuances of indentation, variable naming conventions, and function usage. Consistent adherence to best practices ensures code clarity and maintainability, which are critical as AI projects grow in complexity.

Data Structures and Algorithms:

In the AI landscape, data manipulation is paramount. Proficiency in Python's data structures, such as lists, dictionaries, sets, and arrays, is essential for efficiently handling and processing data. Moreover, a strong grasp of algorithms is crucial for implementing AI tasks, ranging from sorting and searching to more advanced machine learning techniques. This expertise accelerates the development of efficient and optimized AI solutions.

Object-Oriented Programming (OOP):

Python's support for object-oriented programming is a powerful asset in AI development. Professionals should be well-versed in OOP concepts such as classes, objects, inheritance, and encapsulation. This proficiency enables the creation of modular and reusable code components, promoting code organization and facilitating collaborative development efforts.

Code Modularity and Maintainability:

As AI projects evolve, maintaining and extending the codebase becomes vital. Proficient Python developers structure their code in a modular manner, breaking down functionality into smaller, coherent units. This approach enhances code readability, reusability, and maintainability, reducing the likelihood of bugs and facilitating collaborative coding.

In a rapidly evolving AI landscape, programming proficiency with Python is the linchpin for unlocking the language's full potential. Beyond syntax, it encompasses a deep understanding of data structures, algorithms, and object-oriented programming. By honing these skills,

professionals are equipped to tackle the challenges posed by intricate AI projects and contribute to groundbreaking advancements in the field.

Analyzing these case studies provides valuable insights into the successes and challenges faced by UI/UX designers and developers working with AR, VR, and voice interfaces. The findings emphasize the importance of user-centric design, iterative improvements, and understanding the unique characteristics of each emerging technology. Ultimately, this knowledge empowers designers to create innovative and immersive experiences that resonate with users and elevate the potential of emerging technologies in various applications.

4. AI Libraries and Frameworks:

The landscape of Artificial Intelligence (AI) is enriched by a plethora of specialized libraries and frameworks that augment the capabilities of Python developers. Proficiency in these tools is paramount for professionals aiming to harness the full potential of AI and create innovative solutions that transcend boundaries.

4.1 Mastery of Key Libraries:

A pivotal skill for working with Python in AI is adeptness with AI-specific libraries like TensorFlow, PyTorch, sci-kit-learn, and Keras. These libraries provide a treasure trove of pre-built functions, classes, and algorithms that expedite AI development. A deep understanding of their functionalities is essential for building, training, and fine-tuning complex AI models.

4.2 Harnessing TensorFlow and PyTorch:

TensorFlow and PyTorch are at the forefront of AI innovation. Professionals who are well-versed in TensorFlow can seamlessly create neural networks, optimize models, and even deploy them to production. Similarly, mastery of PyTorch empowers developers to leverage dynamic computation graphs and build sophisticated models, particularly suited for research-oriented endeavors.

scikit-learn for Machine Learning:

A solid grasp of the sci-kit-learn library is pivotal for those diving into machine-learning projects. This library provides a comprehensive suite of tools for tasks like data preprocessing, feature selection, and model evaluation. Proficiency in sci-kit-learn enables professionals to create machine learning pipelines that handle data from input to prediction.

Keras for Deep Learning:

Keras, with its user-friendly interface and intuitive design, is a go-to framework for deep learning projects. Proficiency in Keras allows developers to effortlessly design, train, and evaluate deep neural networks for various AI applications.

Integration and End-to-End Pipelines:

One of the most coveted skills is the ability to orchestrate the integration of multiple libraries to create end-to-end AI pipelines. This involves seamlessly transitioning data between preprocessing, model training, and deployment stages. Professionals who excel in this area can

create comprehensive solutions that encompass the entire AI development lifecycle. Mastery of AI libraries and frameworks extends beyond familiarity; it entails a deep understanding of their inner workings and the ability to orchestrate their integration. By wielding the power of these tools, Python developers can engineer transformative AI solutions that redefine industries and propel technology into the future.

5. Critical Thinking in AI Development

In the realm of Artificial Intelligence (AI), where the landscape is dynamic and challenges are intricate, possessing robust problem-solving and critical thinking skills is kin to holding the master key to innovation. Professionals who work with Python in AI need more than just programming expertise; they need the ability to dissect complex problems, devise ingenious strategies, and continuously refine their approaches.

5.1 Navigating Complex Challenges:

AI projects often involve navigating a maze of complex challenges. From handling large and messy datasets to selecting the optimal machine learning algorithm, professionals must excel in identifying the core issues and crafting effective solutions. These tasks necessitate the capability to break down intricate problems into smaller, more manageable components, allowing for methodical and targeted problem-solving.

Data Preprocessing and Feature Engineering:

Data preprocessing and feature engineering are crucial steps in AI development. Professionals must grapple with tasks such as data cleaning, normalization, and feature extraction. These activities require an analytical mindset to recognize patterns, anomalies, and insights hidden within the data, paving the way for improved model performance.

Model Selection and Hyperparameter Tuning:

Selecting the appropriate machine learning or deep learning model is a nuanced art that demands both technical expertise and a discerning eye. Critical thinking comes into play when professionals evaluate various models based on their suitability for the problem at hand. Furthermore, hyperparameter tuning, the process of optimizing model parameters, calls for a deep understanding of the model's behavior and a strategic approach to enhancing its efficacy.

Diagnostic and Iterative Improvement:

In the AI realm, model performance is rarely flawless from the outset. Professionals need to apply critical thinking to diagnose the root causes of performance issues. This involves scrutinizing metrics, studying model predictions, and identifying areas for enhancement. Critical thinking skills enable developers to iteratively refine models, applying insights gained from previous iterations to drive continuous improvement.

In essence, the marriage of problem-solving and critical thinking with Python programming in AI transcends mere technical execution. It embodies the art of understanding the intricacies of the challenge, navigating uncertainty, and designing innovative solutions that push the boundaries of what AI can achieve. Professionals who master these skills not only excel in crafting AI

applications but also contribute to the evolution of AI as a transformative force in technology and society.

Conclusion:

The research paper highlights Python's significant role in shaping Machine Learning (ML) and Artificial Intelligence (AI). The paper emphasizes how libraries like TensorFlow and PyTorch simplify model building and foster creativity. Illustrative case studies demonstrate Python's empowerment in critical areas like image recognition and language processing. The integration of Python with influential libraries propels the field forward, foreseeing continued collaboration with cutting-edge frameworks. The study underscores Python's essential role in AI development, encompassing skills from programming to critical thinking. Ultimately, Python's capacity to fuel innovation and reshape industries is evident, securing its position as a catalyst for technological advancement in the evolving ML and AI landscape.

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CONSTRUCTION OF THE MAIN GAS PIPELINE "BEINEU-SHYMKENT"

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ABSTRACT

In order to ensure the energy security of the Republic of Kazakhstan, reliable gas supply to consumers in the southern regions of Kazakhstan and diversify the export of Kazakh gas on the basis of the Agreement on cooperation in the construction and operation of the gas pipeline Kazakhstan - China between the Governments of the Republic of Kazakhstan and the People's Republic of China dated August 18, 2007, in 2011, the implementation of project "Construction of the gas pipeline Beineu - Bozoi - Shymkent". This study examines the feasibility and necessity of commissioning the Beineu-Shymkent gas pipeline (1).

The Beineu-Bozoi-Shymkent gas pipeline, the largest pipeline project in the history of independent Kazakhstan, is designed to play an important role in improving the energy security of the state. The design and construction of the Beineu-Shymkent gas pipeline is due to a number of reasons, the most important of which are:

- transportation of natural gas from the western regions of Kazakhstan to the southern regions of the Republic - Kyzylorda, South Kazakhstan, Zhambyl, Almaty regions and Almaty city in order to meet their needs for natural gas through the use of a substitution scheme for transit gas transported through the CAC gas pipeline system and its supply to the projected gas pipeline "Beineu-Shymkent";

- ensuring the possibility (if necessary) of supplying part of the gas volumes from the resources of the Republic of Kazakhstan for export to the People's Republic of China by connecting the Beineu-Shymkent gas pipeline to the projected Kazakhstan-China gas pipeline in the area of the projected Kereit compressor station;

- improving the reliability of gas supply to the southern regions of Kazakhstan;

- strengthening the economic security of the Republic of Kazakhstan.

The route of the projected gas pipeline "Beyneu - Shymkent" will pass through the territory of four regions of the Republic of Kazakhstan: Mangistau, Aktobe, Kyzylorda and South Kazakhstan. The starting point of the projected gas pipeline is the place of its proposed tie-in into the existing system of main gas pipelines "Central Asia Center" - 4 and the SAC-4 looping.

The length of the projected gas pipeline "Beyneu - Shymkent" will be -1487 km, at the same time along the route of the gas pipeline it is planned to install compressor stations in the amount of 5 units. This study provides valuable information about the construction of the largest pipeline project in the history of independent Kazakhstan, which is designed to play an important role in improving the energy security of the state. The construction of the Beineu-Shymkent gas pipeline is a strategically important facility (2).

INTRODUCTION

The project "Construction of the Beineu-Shymkent gas pipeline" was developed on the basis of:

1. Agreement No. 698-5 dated October 16, 2008 Between the MEIMR of the RK and the Consortium of design companies as part of the Kazakh Institute of Oil and Gas JSC and KATEK LLP.
2. Terms of reference for the design, issued by the MEMR of the RK.
3. Feasibility study for the construction of the gas pipeline "Beineu-Bozoi-Samsonovka" ("Beineu-Shymkent").
4. "Analysis and assessment of the current state and forecast of prospective volumes of natural gas consumption in Kazakhstan", (RSE "Institute for Economic Research" of the Ministry of Economy and Budget Planning of the Republic of Kazakhstan, 2007)
5. Specifications for the connection of the planned Beineu-Shymkent gas pipeline to the existing gas pipelines "Central Asia-Center", "Bukhara-Ural", "Bukhara gas-bearing region-Tashkent-Bishkek-Almaty" (out. No. 2-80-4084 dated 12/11/2008), issued by Intergas Central Asia JSC.
6. Minutes of the meeting on the coordination of design solutions within the framework of the terms of reference for the development of design and estimate documentation for the Beineu-Shymkent MG dated 11.12.2008 (MEIMR RK, Astana).
7. Letters from the Minister of Energy and Mineral Resources of the Republic of Kazakhstan to the Prime Minister of the Republic of Kazakhstan, ref. No. 08-01-7222 dated 28.08.2008.
8. Basic technical and technological data on the existing BGR-TBA MG system, presented by Intergas Central Asia JSC, ref. No. 2-61-4056 dated December 9, 2008, ref. No. 2-80-4046 dated 12/06/2008.
9. Conclusions of the State Non-departmental Expertise of the Projects of the KAZSTROYCOMMITTEE of the Republic of Kazakhstan on the Feasibility Study for the Construction of the Beineu-Bozoi-Samsonovka Gas Pipeline (Beineu-Shymkent) No. 2-172/08 dated May 23, 2008 (3).

1. Justification of the feasibility and necessity of commissioning the main gas pipeline "Beineu-Shymkent".

The designed route of the Beineu-Shymkent gas pipeline is designed to improve the reliability of gas supply to consumers in South Kazakhstan (4):

- transportation of natural gas from the western regions of Kazakhstan to the southern regions of the Republic - Kyzylorda, South Kazakhstan, Zhambyl, Almaty regions and Almaty city in order to meet their needs for natural gas through the use of a substitution scheme for transit gas transported through the CAC gas pipeline system and its supply to the projected gas pipeline "Beineu-Shymkent";
- ensuring the possibility (if necessary) of supplying part of the gas volumes from the resources of the Republic of Kazakhstan for export to the People's Republic of China by connecting the Beineu-Shymkent gas pipeline to the projected Kazakhstan-China gas pipeline in the area of the projected Kereit compressor station.

The need to build the Beineu-Shymkent gas pipeline is due to:

- the need to ensure the independence of consumers in the southern regions of Kazakhstan from gas suppliers from neighboring countries;

- construction and expansion of industrial facilities in order to strengthen the economy of the republic;
- the need to provide gas to consumers in Kyzylorda, South Kazakhstan, Zhambyl, Almaty regions and further to the city of Almaty.

Since there are no other gas suppliers in this region, it is not possible to solve the problem of gas supply without the construction of the Beineu-Shymkent highway.

The main problem of providing gas to the southern regions of the Republic of Kazakhstan was that 90% of the gas supplies are carried out from the Republic of Uzbekistan due to the historically established infrastructure. However, in winter, with a sharp increase in gas consumption in the republic itself, even without taking into account the commercial problems arising from the constant increase in gas prices, gas supplies to the southern region are annually limited in the autumn-winter periods.

The most vulnerable is the Almaty region, where traditionally the highest gas consumption has developed, but due to the greatest remoteness along the route, taking into account the fact that in winter, intensive gas withdrawal is carried out in the transit country of Kyrgyzstan, in the region gas supply and pressure in the coldest periods are reduced to levels leading to emergencies.

At the same time, the reduction in the supply of natural gas in the coldest periods of the year is forced to transfer, especially thermal power facilities, to more expensive types of energy carriers, which in turn leads to an increase in the cost of heat and electricity, and hence to an increase in social tension. For example, the cost of electricity generated at the Zhambyl GRES using heating oil instead of natural gas increases by more than 2.0 times. Moreover, the trend of growth in electricity consumption in the southern region suggests that in the coming years, taking into account the commissioning of high-voltage transmission lines from the Ekibastuz GRES, it becomes necessary to supply gas to the Zhambyl GRES on an ongoing basis.

1.1 Justification of the place and time of the implementation of activities

When choosing the location of the gas pipeline route, the rational use of land, compliance with gas transportation technology, engineering support, ensuring the safety of settlements, industrial, agricultural enterprises, the environment, as well as the preservation of historical, cultural, and natural monuments were taken into account.

Therefore, the planned route of the gas pipeline and its linear structures will be located in four regions of the Republic of Kazakhstan: Mangistau, Aktobe, Kyzylorda and South Kazakhstan.

Administratively, the route of the projected gas pipeline runs along:

- Mangystau region - Beineu district;
- Aktobe region - Baiganinsky, Shalkarsky districts;
- Kyzylorda region - Aral, Kazalinsky, Karmakchinsky, Zhalagashsky, Syrdarinsky, Shyilinsky, Zhanakorgansky districts, the territory subordinate to the akimat of Kyzylorda;
- South Kazakhstan region - the territory subordinate to the akimat of Turkestan, Ordabasyn, Baidibek, Tyulkubas, Sairam districts.

The approximate length of the lands of the regions is as follows:

- Mangistau region - 122 km;
- Aktobe region - 244 km;
- Kyzylorda region - 846 km;
- South - Kazakhstan region - 272.5 km.

The area under the gas pipeline route with a total length of 1487 km, including the length of the pipeline branch from 1431 km to Kereit - 22.5 km.

The gas pipeline route starts from the Beyneu CS, located within the southeastern part of the Caspian lowland, then, moving eastward, passes along the northern periphery of the Ustyurt plateau, the route passes along the southeastern edge of the Bolshie Barsuki and Bakandykum sands.

After rounding the north-eastern edge of the Aral Sea coast, the route turns to the south-south-east and after the Aral city crosses the Aral Karakum sand massif. Following in this direction, the gas pipeline follows the Turan lowland. Then it passes to the right side of the Syrdarya valley and, continuing to move in a southeast direction, passes along the Daryalyktakyr plain. After passing the Daryalyktakyr valley, the gas pipeline route goes along the foothill valley adjacent to the spurs of the Karatau ridge. This section of the gas pipeline route, i.e. Shiile-Kereit is quite complex in physical and geographical terms, because when moving to the south, the route crosses a great many irrigation canals, channels of temporary and permanent watercourses, such as Besaryk, Koksaray, Ikansu, Arys-Turkestan and Ary channels, the rivers Baraldai and Arys, Aksu.

The gas pipeline route ends in the area of the Akbulak CS, the branch of the gas pipeline route reaches the Kereit CS.

From Beineu to Bozoi settlement the route passes through a semi-desert area. From the village of Bozoi to the city of Kazaly there are sandy massifs, sometimes with rare steppe vegetation. From the city of Kazaly to the village of Shyili, the route goes through the steppe terrain, crossed by sandy ridges. From the village of Shiili to the village of Kereit - mostly arable land.

The gas supply source at the initial connection point is the Bukhara-Ural double-line gas pipeline and the Central Asia-Center gas pipeline with a diameter of 1420 mm (SAC-4 and SAC-4 looping).

Pipelines parameters:

- Bukhara-Ural gas pipeline - diameter 1020 mm, design pressure 5.4 MPa, pressure at the tie-in section 3.5 MPa, gas temperature (winter/summer) 13/250C.
- SATs-4 - diameter 1420 mm, design pressure 7.4 MPa, minimum pressure at the tie-in section 4.9 MPa, gas temperature (winter/summer) 22/370C.
- SAC-4 looping - diameter 1420 mm, design pressure 7.4 MPa, minimum pressure at the tie-in section 4.9 MPa, gas temperature (winter/summer) 22/370C.

The Beineu-Shymkent gas pipeline is designed to provide gas to the Kyzylorda, South Kazakhstan, Zhambyl and Almaty regions of the Republic of Kazakhstan.

Gas supply to the Kyzylorda region will be carried out by discharging gas volumes to branches to promising gas distribution stations along the entire route of the gas pipeline.

The provision of gas to the Almaty and Zhambyl regions of the Republic of Kazakhstan is planned to be carried out by discharging gas into the projected gas pipeline "Kazakhstan-China" (into the projected BCS-5 "Kereit").

To supply gas from the Kazakhstan-China gas pipeline to the BGR-TBA MG system, a branch is provided in the Uzunagash region to supply the Almaty region, in the Akyrtobe region a branch is provided to supply the Zhambyl region and for the needs of the Republic of Kazakhstan.

1.2 Technological solutions for the linear part of the pipeline

General information about the gas pipeline. The main gas pipeline "Beineu-Shymkent" is intended for:

- transportation of natural gas from the western regions of Kazakhstan to the southern regions of the Republic - Kyzylorda, South Kazakhstan, Zhambyl, Almaty regions and Almaty city in order to meet their needs for natural gas through the use of a substitution scheme for transit

gas transported through the CAC gas pipeline system and its supply to the projected gas pipeline "Beineu-Shymkent" (5);

- ensuring the possibility (if necessary) of supplying part of the gas volumes from the resources of the Republic of Kazakhstan for export to the People's Republic of China by connecting the Beineu-Shymkent gas pipeline to the projected Kazakhstan-China gas pipeline in the area of the projected Kereit compressor station.

The main gas pipeline consists of a single-line linear part and compressor stations.

The main parameters of the designed gas pipeline:

- Design pressure - 7.4 MPa
- The total length of the Beineu-Shymkent gas pipeline is 1487 km
- The length of the pipeline Beineu-Akbulak Dn1016mm - 1464.5 km
- The length of the pipeline branch from 1431 km to Kereit Dn=1016mm - 22.5 km

The operation mode of the main pipeline is continuous, round-the-clock, 365 days a year. Taking into account the throughput capacity utilization factor of the main gas pipeline - 0.85, the estimated operating time of the pipeline is assumed to be 310 days a year.

The service life of the MG is at least 30 years.

1.3 Laying the pipeline

The laying of a gas pipeline when choosing a route is provided underground with a laying depth to the top of the pipe of at least 1 meter with the implementation of technical land reclamation.

As measures to restore the upper layer, harrowing was adopted with the expectation of subsequent self-seeding of the construction strip.

With an increase in the soil layer of more than 0.1m, a technical stage of reclamation is provided, as well as, if necessary, biological reclamation.

For moving through the existing gas pipelines of heavy equipment during construction and further during operation, temporary and permanent crossings are provided. Crossings are provided, approximately every 10 km, taking into account existing crossings (except for the sections of the gas pipeline laying on agricultural land). Determining the number and locations of crossings will be specified during the development of working drawings.

Before the start of construction, geodetic work is carried out to fix the route of the gas pipeline under construction on the ground.

Depending on the characteristics of soils, hydrogeological and other conditions, the width of the trench along the bottom is taken to be at least 1.5D, the width of the trench along the bottom in curved sections is taken to be equal to two times the width in relation to the straight sections.

Before the start of excavation work along the entire length of the pipeline at a width of at least 3 m, a preliminary strip planning should be carried out.

Welding of the pipeline is carried out on the edge of the trench. The axis of the pipeline to be welded must be no further than 2 m from the edge of the trench.

Laying work should be carried out mainly by continuous flow methods. In sections of the route where a large number of short technological breaks and angles of rotation are provided, installation should be carried out by the method of successive extension from single pipes, directly at the bottom of the trench, in accordance with design solutions.

In areas where water is present, backfill material is placed after the trench has completely drained. Drainage is carried out in the amount and for the time necessary to prepare the backfill and lay the pipeline in the trench.

In order to reduce the longitudinal movements of the pipeline, it is necessary to take a number of measures:

- along the entire route of the pipeline, the angles of rotation in the vertical and horizontal planes compensate for movements;

- after laying the pipeline in the trench, the backfill soil must be tightly compacted.

Based on survey materials, the gas pipeline route runs in a seismic zone of 6, 7, 8 points on the MSK-64 scale.

The main design solutions for the pipeline were taken taking into account seismic impacts up to 8 points. The category of the pipeline when passing through the seismic zone is not regulated.

In this project, there are no 9 point zones, therefore, additional measures for the gas pipeline during underground laying are not provided.

The gas pipeline crosses active tectonic faults. Underground laying. The trench width is 1.5 times the accepted nominal trench width in normal areas. L-shaped compensators are provided at the fault boundaries. To move the pipeline during the movement of the earth's crust, the trench is completely covered with coarse sand. In order to prevent precipitation from falling into the backfill soil, which leads to its freezing under the influence of negative temperatures and severe pinching, 0.4 m is covered in a trench above the upper generatrix of the pipeline with a polyethylene film.

CONCLUSION

The main result of the construction of the Beineu-Shymkent gas pipeline was the full satisfaction of the needs of the population of the southern regions, the social sphere and enterprises of other sectors of the country at the expense of their own natural gas resources (6).

To date, the Beineu-Shymkent gas pipeline, the largest pipeline project in the history of independent Kazakhstan, plays an important role in improving the energy security of the state. The design of the gas pipeline has become a strategically important task, in which highly qualified personnel took part.

The constructed gas pipeline is a strategic project aimed at providing the South of Kazakhstan with domestic natural gas. In order to successfully implement it, it intends to fully use the potential of Kazakhstani suppliers and manufacturers. Priority will be given to them.

During the construction and operation, thousands of new jobs are created, and the development of various sectors of the country's economy is also promoted.

The construction and operation of the gas pipeline had a macroeconomic and social effect for a number of regions of Kazakhstan (7), led to additional investments in the social sphere and production. In the future, the gas pipeline will export natural gas to China, which will ensure the inflow of additional financial revenues into the country.

This study contributes to the existing body of knowledge by shedding light on the construction of the gas pipeline. It serves as a guide for engineers, technologists and researchers, helping them understand the country's energy security and providing information to navigate the construction of a gas pipeline. In addition, the results of this study identify areas for further research and development, contributing to continuous improvement in the construction of the gas pipeline.

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SLOPE STABILITY ANALYSIS CONSIDERING THE PRINCIPLE OF STRENGTH REDUCTION METHOD

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ABSTRACT

One of the most important variables affecting slope instability is rainfall. The impact of seepage flow on slope stability is examined in this paper using a strength reduction method. The factor of safety (FOS) for a sandy soil slope is shown to be more affected by seepage flow than other types of soil. The FOS is lower when the pore pressure is produced using a piezometric line than when it is produced using a seepage flow analysis. For slopes with clayey soil, the difference is minimal, whereas for slopes with sandy soil, it is greater and more pronounced. The analysis also demonstrates that installing retaining walls to lengthen the seepage path is effective in preventing slope failure caused by seepage. The analysis also demonstrates that installing retaining walls to extend the seepage channel can effectively stop slope failure brought on by seepage low. This study also looks at the effects of water low on slopes with soil nails, slopes with local loads, and slopes with pile reinforcement. The current study further demonstrates that, for practical reasons, the impact of highly populated soil on seepage flow can be disregarded.

Key words: seepage flow, slip subsidence, slope stability, strength reduction method

INTRODUCTION

In mining sites, there are numerous slope failures each year, and almost all of them take place during wet weather. One of the most significant factors contributing to slope instability is pore water pressure. The most typical method of determining the pore-water pressure in the limit equilibrium method (LEM), which is commonly used in engineering practice, is by employing the piezometric line. The porewater pressure, which is essentially a hydrostatic condition, is frequently assessed by measuring the vertical distance from the middle of the slice base to the piezometric line. The piezometric surface will actually curve downward due to seepage flow, hence the assumption of a hydrostatic pore-water pressure is technically incorrect. This factor is taken into consideration by a correction factor in certain commercial software, and this is adequate for standard design needs. Additionally, the LEM can be merged with the pore water pressure from the seepage analysis in the stability calculation if the pore-water pressure distribution is known via the finite element or finite difference analysis.

There have been a number of improvements made to the strength reduction technique (SRM) for slope stability analysis in recent decades. Several well-known commercial geotechnical finite element and finite difference programs also use this technique. The seepage analysis's findings can be simply incorporated into the SRM, and the mesh used for both can be the same. The SRM's advantage over other traditional methods of analysis for the current issue is how easily seepage flow can be taken into account. Confusion has developed from the various approaches to taking into account the seepage forces in the LEM in slope stability calculations with water flow. Traditional LEM often uses boundary water forces with total weights and water pressure is taken

into account when calculating base forces, but not when calculating interslice forces (or, consequently, slice equilibrium). Turnbull and Hvorslev (1967) came to the conclusion that the conventional approach would produce inaccurate findings for high pore-pressure, and therefore recommended that the effective stress be resolved in a direction normal to the failure surface. Interslice water forces were one of the successful stress methods of slices that Greenwood (1983, 1985) and King (1989) developed. However, because the analysis for these methodologies is more difficult, they are not used in commercial applications. Pore pressure will affect the effective stress that the stability analysis is based on if the SRM is applied. The SRM lacks the ambiguity regarding the effect of water in the LEM.

In this paper, the distinctions between seepage flow analysis and the usage of a piezometric surface for slope stability analysis will be explored. The effects of water flow on slope under various instances will be investigated using two- and three-dimensional strength reduction studies. This study has shown that the seepage flow may also alter the failure mechanism in addition to lowering the factor of safety (FOS).

A SIMPLE SLOPE STABILITY ANALYSIS WITH SEEPAGE FLOW

In the current investigation, FLAC3D by Itasca and Phase by Rocscience have been used to examine the impact of seepage. The Mohr-Coulomb constitutive model is used to predict the strength of soil, which is thought of as an elastic-perfectly plastic material. The same mesh will be utilized for the seepage analysis once it has been created for a particular problem. The input for the stability study utilizing the SRM will be the pore-pressure from the seepage analysis. The stability study and the seepage analysis are conducted independently in this regard. According to Cheng et al. (2002), the dilation angle of the soil is not crucial for the majority of problems and typically has an impact of less than 5%, with the exception of isolated issues. The researchers used a dilation angle of 0 in the current investigation since it is extremely improbable that it will have any impact on the study's principal finding. Although this modeling approach is suitable for consolidation, it is not taken into account in the current study. The ultimate limit state in the strength reduction analysis is established by "failure to converge" and "formation of a continuous yield mechanism which can fail". This paper's depiction of the strain level differs from the actual strain level. Similarly, the displacement vector merely represents the findings of the strength reduction study and is not the actual displacement. This part analysis a two-dimensional, six-meter-high slope with a 45-degree slope angle. A model with a 10 m height was created, with the water being 4 m high on the left and 10 m high on the right. Figure 1 illustrates the pore pressure and the flow vector distribution for the free-surface seepage flow study. According to Fig. 1, the top flow line's total head is 10 m, and each flow line's total head difference is 1 m. In the analysis, the soil's density, elastic modulus, and Poisson ratio were all maintained at 20 kN/m3, 14 MPa, and 0.3, respectively. According to Cheng et al. (2002), the usage of these elastic characteristics in SRM are unimportant, and these parameters hardly have any impact on the safety factors that use various elastic properties. The maximum shear strain distribution, as illustrated in Figs. 2 , can be used to roughly determine the failure surface and the areas where the shear strain concentrates from the SRM analysis. Additionally, it is discovered from numerous parametric studies that the location of the slip surface for sandy soil is significantly influenced by the water flow, and that the failure surface changes under the effect of water seepage flow to become shallower and closer to the slope toe. These findings are in line with observations of slope failures made during the past thirty years in Hong Kong, where many slope falls begin with toe failures during heavy rain. In Fig. 2, the area around the toe of the slope has a very high hydraulic gradient; as a result, slope failure will be restricted to this area, whereas Fig. 2 shows a typical slope failure that extends to the hill's top where there is no water.

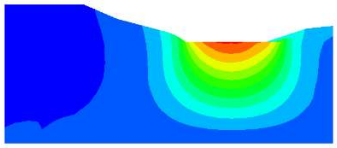

Figure 1. Deformation surface for slope with cohesion 1 kPa

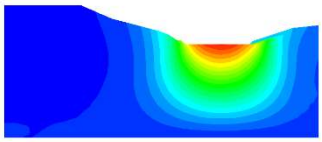

Figure 2. Deformation surface for slope with cohesion 2 kPa

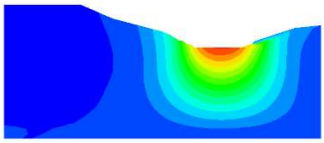

Figure 2. Deformation surface for slope with cohesion 5 kPa

These findings are further reinforced by the staggering number of slope failures that occur in Hong Kong during the rainy season, the majority of which start at the toe of the slope where there is a sharp change in the total head and a high hydraulic gradient. These outcomes are also anticipated by the numerical analysis shown in Fig. 2. A seepage flow study, a reasonable method of obtaining the pore pressure distribution, is used to generate the pore water pressure in the analysis mentioned above. However, a water table in the SRM analysis that is comparable to that in the LEM analysis can be used to determine the pore water pressure. Another model is built in which the pore pressure is produced by the water table in order to examine the differences between the two ways. The location of the water table is shown by the free-surface found in Figure 1; Figure 3 displays the pore pressure distribution for this model. It compares the safety factors for the two scenarios. Because the pore water pressure computed by the water table (free-surface) was higher, the FOS for the situation where the pore pressure is generated by the water table was lower than the case generated by the seepage flow analysis. It denotes that using the

water table (or piezometric line) as a method of analysis is a conservative one, with very little difference for clayey slopes and significantly more difference for sandy soils.

ANALYSIS OF STABILITY FOR A STRAIGHTFORWARD SLOPE WITH IRREGULAR DISTRIBUTION OF PORE PRESSURE

Two further models are examined in this section for the slope with a 6 m height and a 45 degree slope angle that was addressed in the previous section. However, the pore pressure distribution is irregular as a result of various blocking effects in the slope. The soil on the left side of the slope crest and slope toe is designated as an impervious zone in the first model. Figure 4 displays the slip surface and the pore pressure distribution. In the second model, a thin impermeable wall with an 8 m height is applied close to the hill crest. Figure 5 displays the slip surface and the pore pressure distribution. In contrast to the situation with no dirt blocking in Fig. 3 (0.96) and the case in Fig. 4 (1.07), the FOS (1.30) in the second model was significantly higher. Because of the obstruction caused by the soil wall, the seepage path is substantially longer, which significantly lowers the pore water pressure and causes the FOS to grow much larger. This outcome demonstrates that installing retaining walls to lengthen the seepage is a successful way to prevent slope failure brought on by seepage flow.

PILED SLOPE STABILITY ANALYSIS WITH SEEPAGE FLOW

This section discusses the results of our inquiry into a stacked slope with a water flow. The slope we used for this analysis was 10 m in height with a gradient of 1V:1.5H (Fig. 5), just as the slope that was taken into consideration. The problem was reduced to a row of symmetric piles by the application of two symmetric extreme bounds. In this investigation, steel tube piles with an outer diameter (D) of 0.8 m were employed. The piles were set in the middle of the slope with a 3D center-to-center spacing and were handled as linear elastic solid materials. The heaps were buried and fixed into a stable layer or either bedrock (infinite pile length assumption). The pile head on this model was unattached. The soil's cohesive strength, friction angle, elastic modulus, Poisson ratio, and density were each 10 kPa, 209 MPa, 0.25, and 20 kN/m3 in turn. The piles' elastic modulus and Poisson ratio, respectively, were 60000 MPa and 0.2. The factor of safety obtained by the SRM for slopes without pile reinforcement was 0.85, with a slip surface as illustrated. To examine how seepage flow affects the way pile-reinforced slopes fail, two models were created. The models with and without a water blocking effect produced the same FOS and slip surface for the two scenarios (the FOS was 1.29). It is obvious that, as was the case with soil nails, the blocking effect of the pile on the seepage can be disregarded. Practically separated into two sections, the slip surface clearly exhibits shear strain mobilization in both the lower and top sections. Since the slip surface is more frequently seen in the lower portion of the slope when there is seepage of water, the higher portion of the slope is considered to be safer than the lower portion. This phenomena unmistakably results from the seepage force's impact.

Fig. 4. Inner deformation slip surface and pore pressure with water block at upper and bottom left with cohesion 2 kPa

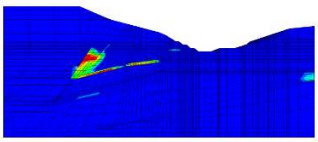

Fig. 5. Inner deformation slip surface and pore pressure with water block at upper and bottom left with cohesion 10 kPa

There is barely any interaction between the upper and lower portions of the failure mass in the absence of the seepage force. In slopes with seepage, the optimal pile position shifts away from the slope's central and towards the slope's toe. According to measurements taken from the slope's central, it was discovered that the ideal pile site in this situation was 2.0 m towards the slope's toe. Therefore, managing the failure mechanism of pile-reinforced slopes depends on the effect of water seepage. In this investigation, it was discovered that a piled slope's critical slip surface was shallower than one without a pile. The slope failure will be controlled by the two smaller slip surfaces after the placement of a pile, but the original overall critical slip surface will no longer control the failure because the pile will prevent it from happening. This conclusion deviates from Cai and Ugai's (2000) experiments based on a maximum point of shear force with a deep seated failure surface because it makes use of maximum shear strain in the soil. In reality, the authors discovered that the greatest shear strain in the soil did not correspond to the pile's maximum shear force. The authors concluded that using the position of the highest shear force as a criterion in determining the critical slip surface of a piled slope problem was unsuitable since piles do not behave similarly to soil nails, which depend on skin friction mobilization and subsequently shear strain mobilization. The authors decided that the critical slip surface should be a shallower failure mode for a piled slope in sand based on the staggering number of slope failures in sandy soil, where all failures in sandy slopes are shallow and typically less than 2 m thick (about 300 failures each year), and numerical results showing that the maximum shear force location in the pile is not necessarily where the maximum shear strain is located. Our analysis of the slope failures showed that the largest point of shear force was located quite deep and far from the actual critical slip surface. We came to the conclusion that the critical slip surface of a piled slope is not always located at the position of the pile's maximum shear force.

LOCALLY LOADED SLOPE STABILITY ANALYSIS WITH SEEPAGE FLOW

This section presents the results of our analysis of a 6 m-high slope with a 45° slope angle and a rectangular-shaped vertical loading. In this situation, it was quite difficult to do a model test with seepage flow, hence one without seepage was carried out instead. The loading measured 2 m in width and 4 m in length, and its edge was 1 m from the slope's peak. The friction angle was 209 and the soil's cohesion was 20 kPa. The computer model was 20 m long. Figure displays the analysis's outcomes when the loading q was 100 kPa. Figure 3 shows the outcomes in the absence of water. The model test in sand, serves as an illustration of the failure mechanism depicted in Figure 4. The strength reduction analysis carried out in this work is confirmed by a laboratory test because the failure surface in the central of the failure mass from the laboratory test agrees well with that by numerical modelling, as shown in Fig. 5. This model demonstrates that the failure mechanisms for the slope water and no water had various results. The slip surface was essentially two-dimensional for a slope with a two-dimensional seepage flow. On the other hand, a virtually three-dimensional slip surface was mobilized around the local loading on slopes devoid of water.

The slip surface is essentially two-dimensional when the loading is small until it is large enough to mobilize a three-dimensional slip surface. Because the seepage force was considered in the analysis and the two-dimensional seepage flow made it more difficult to mobilize a three-dimensional slip surface for the local loading, the failure mechanism for this model was different even though the applied loading was the same.

DISCUSSION AND CONCLUSIONS

In this study, a slope stability analysis with water flow is conducted using the strength reduction approach. Seepage flow analysis was used to create the pore water pressure based on the boundary conditions. The FOS was typically substantially smaller in seepage flow scenarios than in analogous cases with no water. The FOS reduction caused by seepage is typically greater for sandy soil slopes than for clayey soil slopes. This is consistent with studies of the numerous slope failures over the past thirty years, which show that seepage flow can more easily degrade sandy soil slopes than clayey soil slopes. Therefore, the reduction of seepage flow in sandy soil slopes merits extra focus. Additionally, the slip surface position in sandy soil slopes is more susceptible to seepage and changes shape to become shallower and closer to the slope toe when seepage flow is present. Once more, the toe of the slope is where most slope failures begin since there is a rapid shift in total head and a strong hydraulic gradient there. The FOS will typically be lower if the pore pressure is produced using a piezometric line as opposed to when the pore pressure is produced using seepage flow analysis. It means that a cautious way of analysis is the water table (or piezometric line) option. The difference between the two definitions of the pore water pressure for clayey soil is typically negligible, while it is significantly bigger for sandy soil. It has been shown that using a retaining wall to extend the seepage path is a very effective way to improve slope stability when seepage flow is present. Our seepage study results are essentially unaffected by soil nails or reinforcing piles (within reasonable spacing), showing that engineers do not need to take these factors into account when conducting their seepage analyses. The stability of a soil-nailed slope was demonstrated to be affected by water flow in two different ways. First, seepage force caused a drop in FOS. Second, as the nail pullout strength reduced and the confining pressure surrounding the nail decreased due to pore water pressure, the FOS also decreased. Therefore, a key element in regulating slope stability is water. The seepage force can have a significant impact on the failure mechanism for locally loaded slopes with water flow and pile reinforced slopes. The analysis must properly take into account the pore pressure in order to provide a realistic failure mechanism.

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Physical and Mathematical Sciences

Does the infant mortality rate depend on the country's development?

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This study examines a relationship between infant mortality rate (IMR) and the level of a country's development. The impact of GDP per capita, Human Index Development, out of pocket spendings and health expenditures of 100 countries on IMR will be investigated through visual charts and interpretations, and regression analysis conducted on EViews. The results provide valuable insights into the complex relationship between IMR and development, making emphasis on the importance of addressing the issues of unequal income distribution in the population, increasing education and medical help accessible and the role of economic prosperity for the reduction of IMR worldwide.

The global infant mortality rate today is below 3%. The IMR is the death of an infant that occurs between the time it is born and 1 year of age. Deaths that occur before birth (stillbirth, pregnancy loss) will not be examined. Despite remarkable advancements in medical science and technology, infant mortality remains a serious problem casting a pall over the global healthcare landscape. While significant progress has been made in reducing infant mortality rates worldwide, the major causes keep remaining the same. The persistence of this issue is a stark reminder that the journey toward ensuring every child's right to a healthy start in life is far from over.

Although, IMR mostly occurs because of birth defects, diseases, early pregnancy and other cases. This study will examine the effects of secondary, non-direct causes such as GDP per capita, global health expenditure, Human Development Index (HDI), and out-of-pocket expenditures spent on healthcare services in a random sample of 100 countries from 2012-2017 and will try to find a relationship between the variables.

In 1950, the global mortality rate was 22.5%; in 2015, it was 4.5%. Of the 12.6 million children under the age of five who died in the world in 1990, 8.8 million were newborns under the age of one. More than 60% of child fatalities under the age of five are thought to be preventable with low-cost solutions.

How is the GDP per Capita connected to IMR?

Economic and social constraints in the country make it difficult for people to get education, healthcare services and insurance, and steady household income, which raises the infant mortality rate. The largest share of infant deaths occurs in developing countries. Low birth weight is one of the main causes of infant mortality risk; in underdeveloped nations, it accounts for 60–80% of newborn death rates. The causes of low birth weight can be various: socioeconomic, psychological, behavioral, and environmental factors and many others. Amongst the factors, prematurity has been the top cause of infant and young child mortality worldwide over the past ten years, and it has been more prevalent in low- to middle-income Sub-Saharan African and South Asian nations than in high-income nations in Europe or North America. Infant mortality is more likely in low-income nations because of the insufficient resources available to meet the demands of premature newborns. Infants born in these nations prematurely have only a 10% survival rate, while prematurely born babies in high-income countries have a 90% survival rate. Reduced household

income has a negative impact on the money spent on food and healthcare, which lowers quality of life and access to medical treatment necessary for survival and complete growth. That is why in developing countries which medical services are available to a person depends solely on their economic level.

Human Development Index

HDI measures the overall development of a country based on factors such as life expectancy, education, income and living standards. While the HDI itself does not directly affect infant mortality, it is often associated with improvements in health of the nation which connects to infant mortality rates. Countries with higher HDI scores (Canada, South Korea, Switzerland, Norway) tend to have better healthcare systems and infrastructure. They often have more hospitals, clinics, and healthcare professionals (e.g.107 nursery and midwife personnel per 10,000 population, Austria, 2020), which can improve access to prenatal care, skilled birth attendance, and postnatal care for both mothers and infants, which significantly contribute to the reduced IMR. Secondly, better educational opportunities and higher levels of health awareness among the population empower individuals to make informed decisions about their health and the health of their children. It enhances knowledge about nutrition, hygiene, and preventive measures, which can positively impact infant health and reduce mortality. For example, in Sub-Saharan Africa have shown that a rise in women's educational attainment results in a 35% decrease in infant mortality. Knowledge of educational options, health services, and economic prospects offers ways to survive and improves the chances of growth and survival.

Global Health Expenditure and Out of Pocket Payments

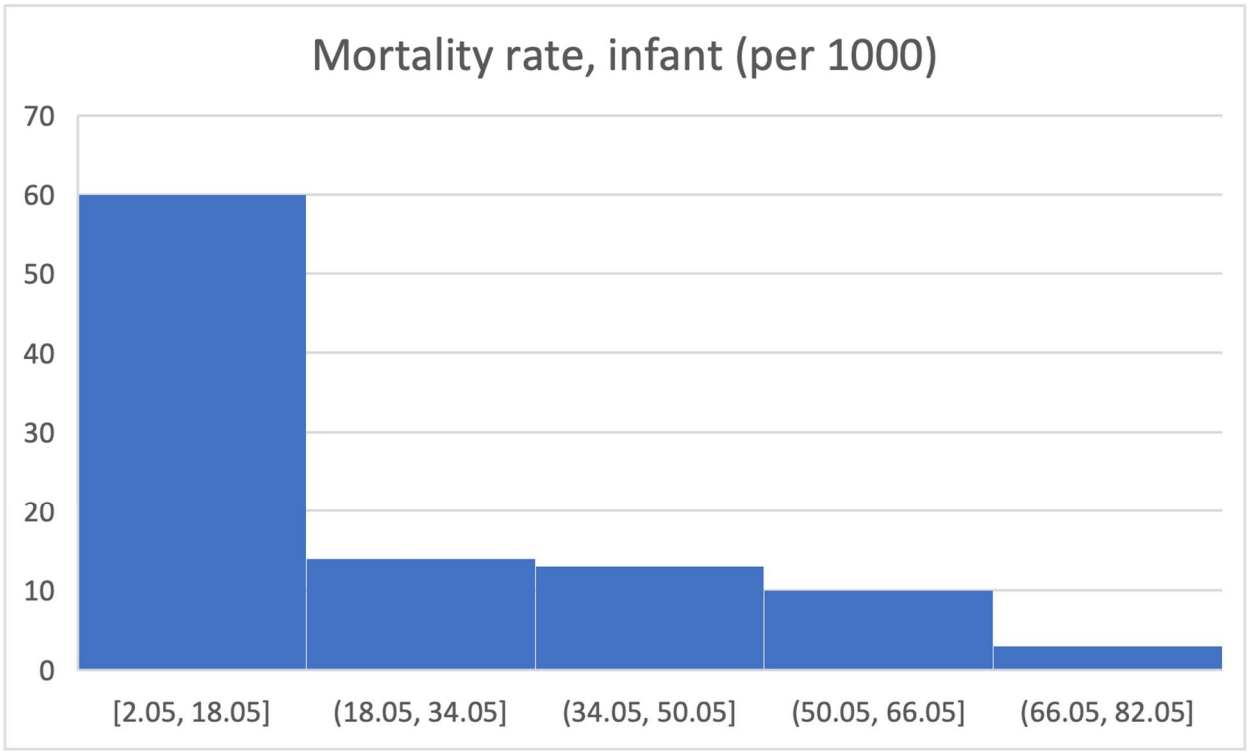
Public and private spending on healthcare products and services such as hospitals, clinics, drugs, medical equipment, and health initiatives refer to as global health expenditures. An essential metric for assessing a nation's commitment to providing healthcare to its people is health expenditure. Although other variables may affect newborn mortality rates, there is an association between global health spending and infant mortality. Generally speaking, nations with higher health spending have healthcare systems that are superior, including better access to prenatal care, experienced birth attendants, neonatal intensive care units, immunization programs, and postpartum care. By preventing and controlling causes of newborn fatalities, such as infections, problems during childbirth, and premature birth, these variables can turn out to be a significant contributor in lowering infant mortality rates.

Out-of-pocket expenditures happen because insurance or publicly financed healthcare programs do not cover or repay these costs. In low-income and developing nations, where healthcare costs can be a significant financial burden for households, the effect of out-of-pocket expenses on infant mortality can be particularly obvious. For example, only about 15 percent of the Tanzanian population of slightly over 60 million are fully covered by the health insurance scheme (HIS), the National Health Insurance (NHIF) manager for Arusha region Isaya Shekifu said. While wealthy individuals can get medical care without financial restrictions, families with less financial resources may have trouble affording it. Differences in infant mortality rates among various socioeconomic categories may result from this. Infant mortality and out-of-pocket spending have a complicated link that varies across nations and healthcare systems, which will be examined further.

Analysis

Analysis will be conducted on a random sample of 100 countries.

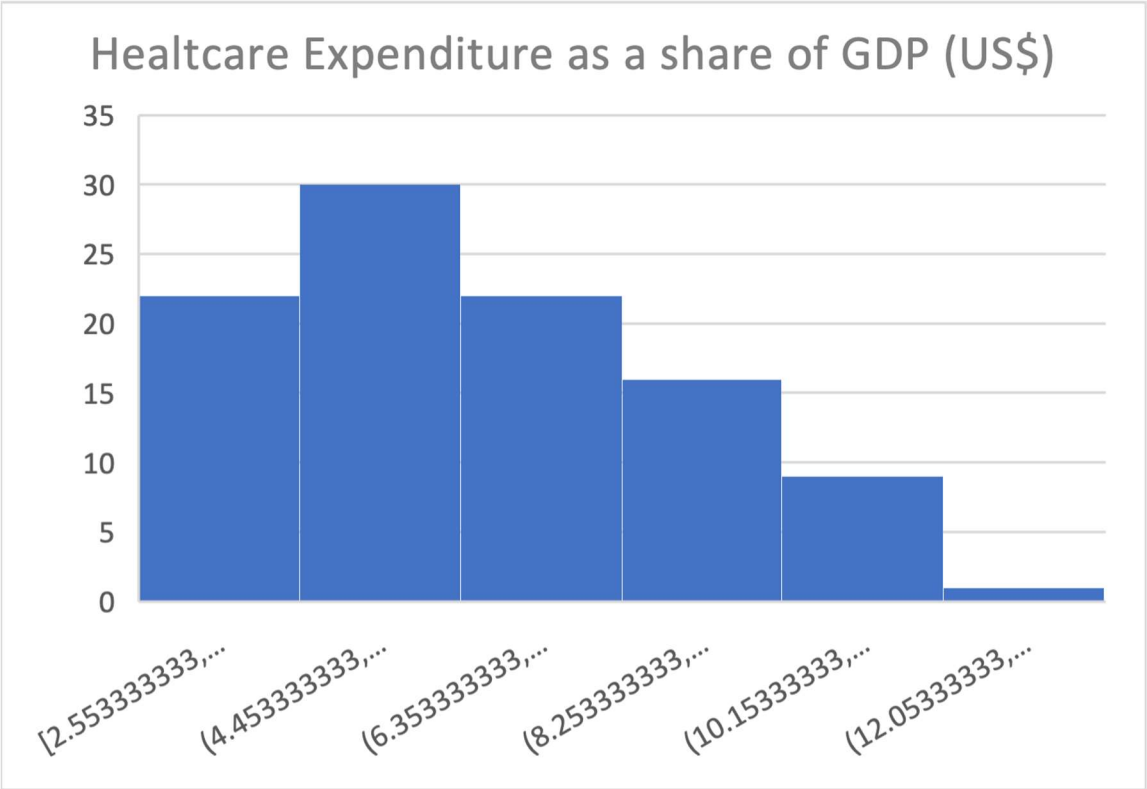
Statistical Characteristics of Histograms



Data source: https://data.worldbank.org/indicator/SP.DYN.IMRT.IN

Graph 6-1

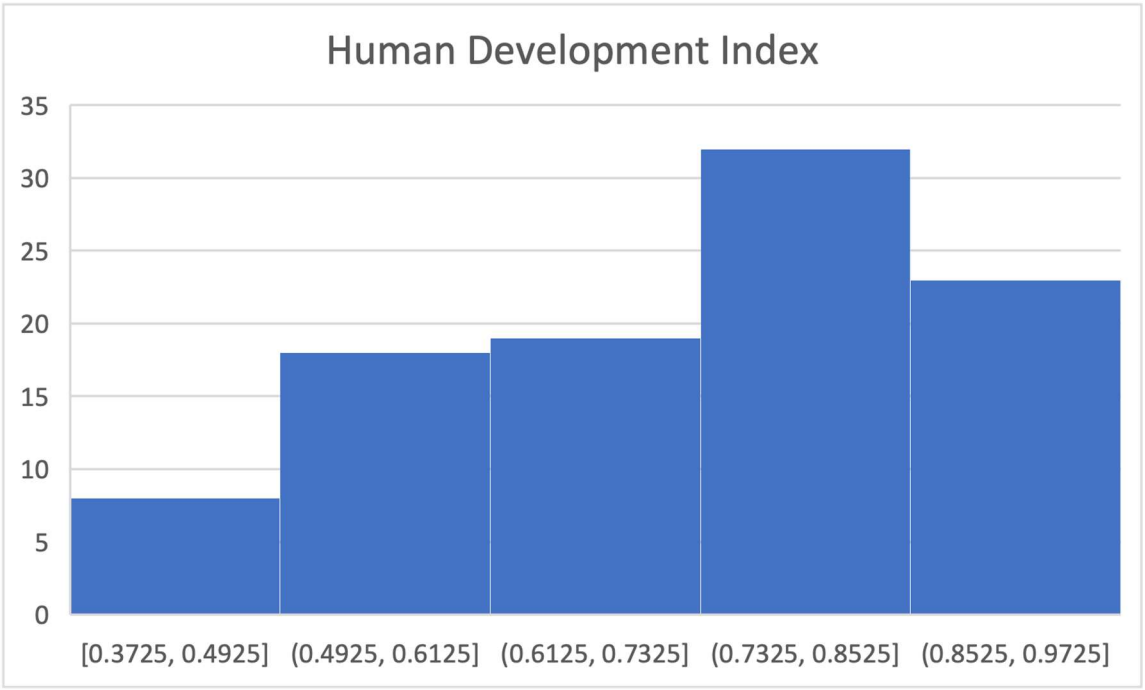
This histogram explains that 60 countries had experienced from 2 to 18 infant deaths yearly on average from 2012-2017. Around 14 countries had 18 to 34 infant deaths, 12 countries - 34 to 50 infant deaths, 10 countries - 50 to 66 and 4 countries had had 66-82 infant deaths on average from 2012 to 2017. The frequency distribution was skewed to the right through the given years and represents the developing countries with the highest IMR like Nigeria, Liberia, Guinea, Togo, Angola, Benin.



Data source: blob:https://ourworldindata.org/31bfb89c-bb67-42ca-8fd6-fac8078da3ae

Graph 6-2

The distribution of this chart is skewed to the right. The mode represents countries like Guatemala, Guinea, Kenya, Latvia, Nepal and China's healthcare expenditure as a share of GDP for years 2012-2017. Meanwhile the developed countries like Canada, Germany, Netherlands are in the range of 10.15-12.05. Turkmenistan had the highest healthcare expenditure in the given years with 13.24 US$.

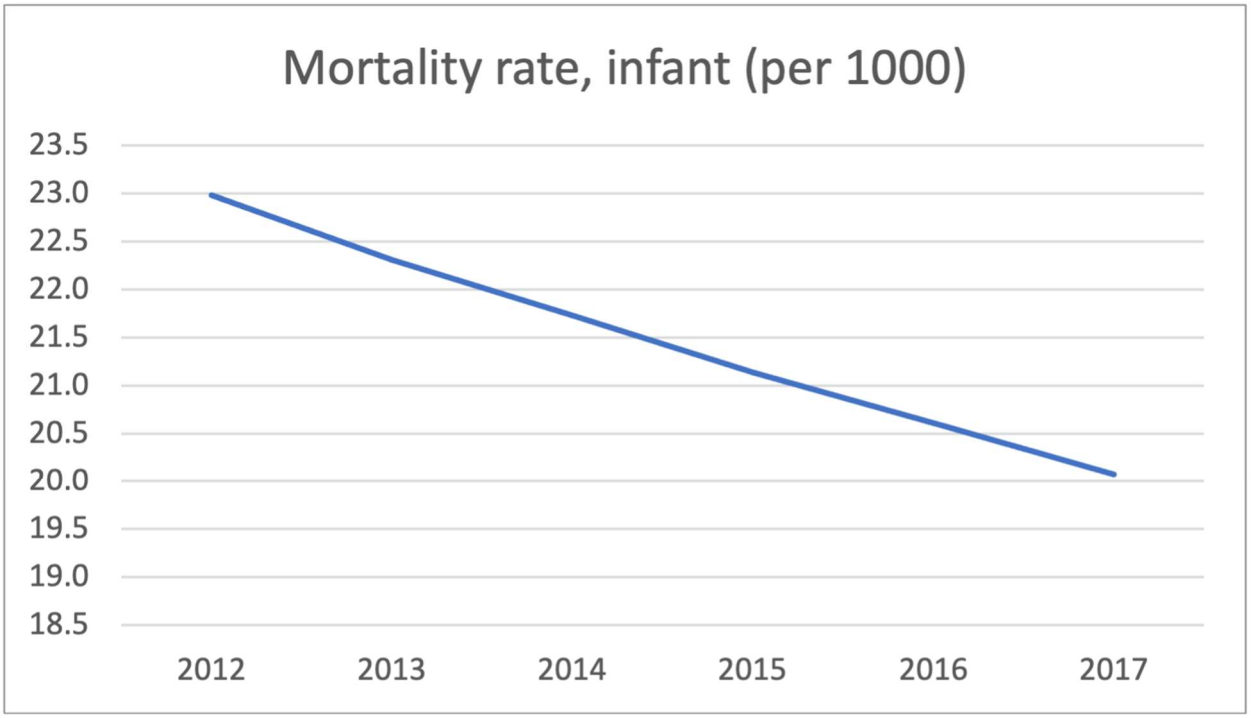


Data Source: https://ourworldindata.org/human-development-index

Graph 6-3

The HDI frequency distribution skewed to the left. The skewness over the years is caused by countries with low HDI like Uganda, Papua New Guinea, Mozambique, Togo. Meanwhile the mode equals to 32 and represents countries like Sri Lanka, Russia, Oman, Panama, Malaysia.

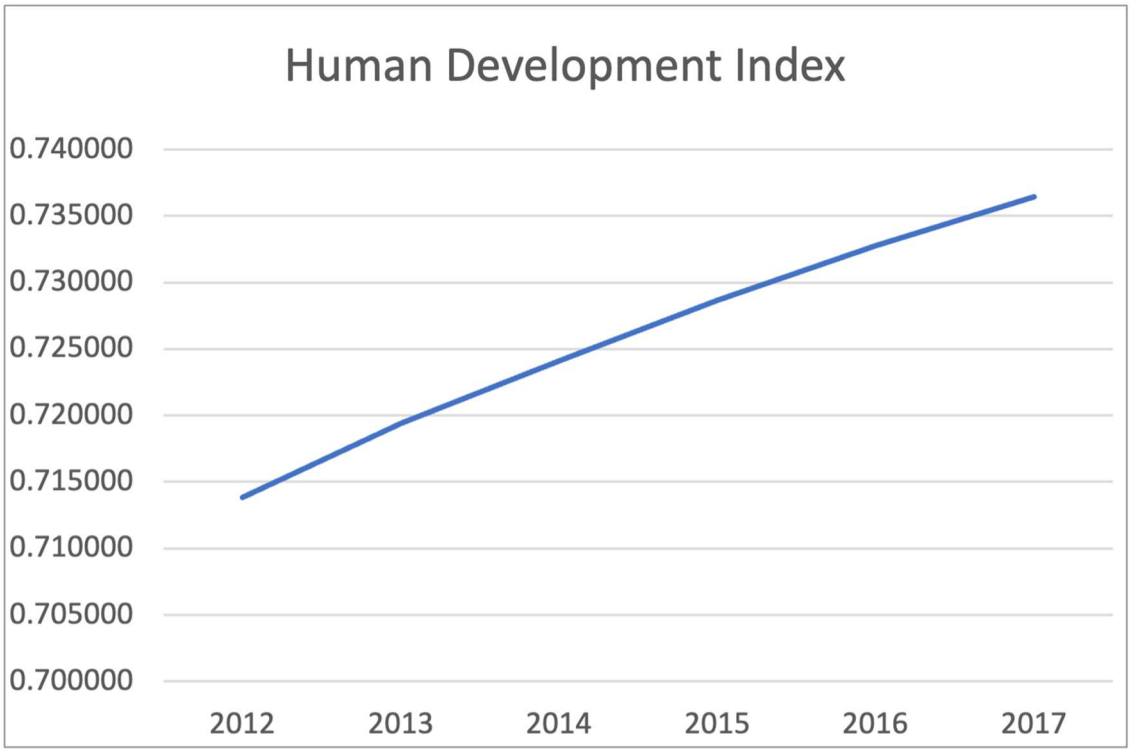
1. Statistical Characteristics of Time Series



Data source: https://data.worldbank.org/indicator/SP.DYN.IMRT.IN

Graph 7-1

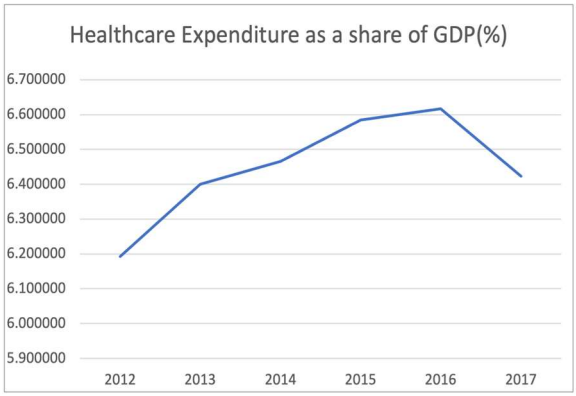
This chart describes the median of IMR (per 1000) in 100 observations over the 5 years (2012-2017). In 2012 there were 23.0 infant deaths per 1000 and the rate dropped over the 5 years to ~20.1 by 2017.

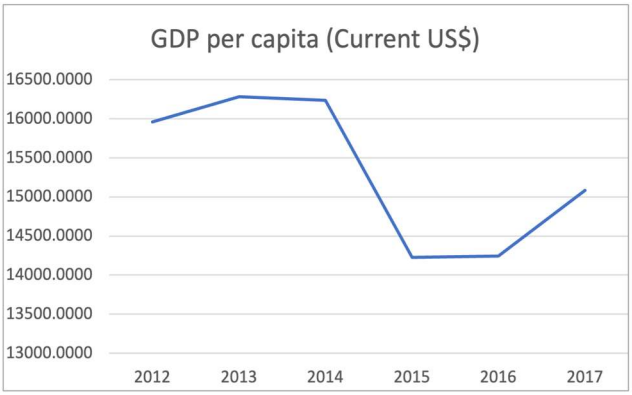


Data Source: https://ourworldindata.org/human-development-index

Graph 7-2

This graph shows how the Human Development Index had an increase in 100 randomly observed countries over the years 2012-2017. It increased from ~0.714000 to ~0.736000 making a positive impact on reducing IMR (refer to Time series 1).

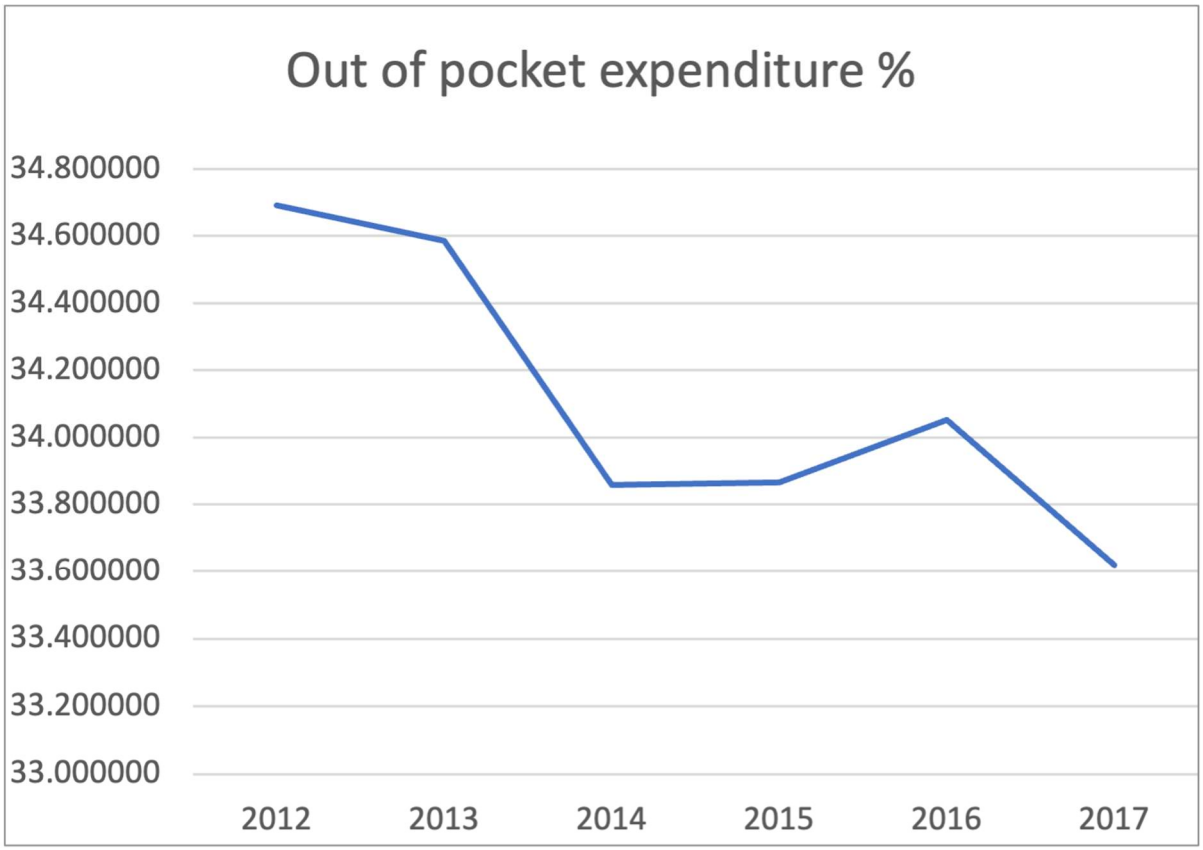




Data source: blob:https://ourworldindata.org/31bfb89c-bb67-42ca-8fd6-fac8078da3ae
Data Source:https://api.worldbank.org/v2/en/indicator/NY.GDP.PCAP.CD?downloadformat=excel

Graph 7-3 Graph 7-4

As 100 observed countries kept contributing to healthcare expenditure, with a dramatic decrease in GDP per capita in 2015 (decline had started in 2014), I can assume that countries had stopped financing healthcare systems due to uncertainty in the economic market. This assumption comes from decline in healthcare expenditure in 2016 and 2017 as a result of aftershock of GDP per capita numbers decline.



Data source: https://ourworldindata.org/financing-healthcare

Graph 7-5

This graph explains how people living in the observed 100 countries were experiencing decreasing need in paying for medical services out of pocket. But because of GDP per capita

decline in 2015-2016, people had to pay out of pocket 0.2% more in 2016. The years from 2016 to 2017 GDP per capita experienced further rise (refer to Time series 4) in the observed countries, which resulted in out of pocket expenditure decline (~33.6%) in 2017.

2. Regression Analysis

This article assumes the regression model to be

$Y = \alpha + \beta X + E$, *i.e*

$MRT = c + \beta 1GDP\_PC + \beta 2HLTHEXP + \beta 3HDI + \beta 4OUT + E$,

Where

MRT = y: dependent variable

C: intercept, where x=0

$\beta 1GDP\_PC$, $\beta 2HLTHEXP$, $\beta 3HDI$, $\beta 4OUT$: *explanatory variables, slope*

E: error term

Dependent Variable: MRT
Method: Least Squares
Date: 06/14/23 Time: 17:57
Sample: 1 100
Included observations: 100

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	46.12511	11.46094	4.024548	0.0001
GDP_PC	-0.000417	9.86E-05	-4.230195	0.0001
HLTHEXP	-0.014980	0.834324	-0.017955	0.9857
HDI	-30.02351	14.04309	-2.137956	0.0351
OUT	0.106333	0.108238	0.982395	0.3284

R-squared	0.349338	Mean dependent var	21.47983
Adjusted R-squared	0.321942	S.D. dependent var	20.65798
S.E. of regression	17.01067	Akaike info criterion	8.554265
Sum squared resid	27489.47	Schwarz criterion	8.684524
Log likelihood	-422.7133	Hannan-Quinn criter.	8.606983
F-statistic	12.75129	Durbin-Watson stat	2.156953
Prob(F-statistic)	0.000000		

Table 8-1

It can be observed that variables C(intercept), GDP_PC and HDI are significant on a 5% confidence level, while C and GDP_PC are significant on 1% confidence level on a p-value.

Interpreting the results, we can say that we have significant evidence that infant mortality rate is correlated with a country's GDP per capita and Human Development Index. Low household income or unstable salary can seriously affect the life of an infant that needs proper care from its parents. Precisely, it may increase the IMR by 0.000417. Additionally, a low Human Development Index can create a high risk of a newborn before its first birthday by 30.02351.

There is no significant evidence that health expenditures and out of pocket money paid to health facilities or personnel in seeking medical help or consultation decrease the IMR.

Conclusion

In conclusion, the infant mortality rate (IMR) is influenced notably by both the GDP per capita and the Human Development Index (HDI). Although those are secondary reasons for infants' early deaths, by this study we can say that a more thorough assessment of human development by taking into account elements like living standards, healthcare, and education should be made. By investing in healthcare infrastructure, providing access to high-quality maternity, newborn care, and implementing successful public health initiatives, can contribute to the reduction of IMR. Additionally, it is difficult to raise a healthy child in developing countries without steady and fair income, health insurance and opportunities to have a higher standard of living. However, through this study, according to the graphs, we can say that IMR is complex and has various issues and it varies from country to country, culture to culture and needs to be addressed accordingly.

In the end, it is important to recognize that HDI, GDP per capita or any other variables tested in this study are not the only factors affecting IMR. Other elements that affect baby development include government, healthcare systems, social inequalities, cultural norms, diseases and many others.

Economic Sciences

ДЕРЖАВНА ПОЛІТИКА УКРАЇНИ У СФЕРІ ПРОДОВОЛЬЧОЇ БЕЗПЕКИ

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Анотація. Досліджено основні інституції, які забезпечують державну політику у сфері продовольчої безпеки України. Розглянуто індикатори, які застосовуються для оцінки продовольчої безпеки в Україні та за кордоном. Оцінено стан продовольчої безпеки України у довоєнний і воєнний періоди. Проаналізовано законодавче забезпечення в сфері продовольчої безпеки. Розглянуто програми за міжнародної участі, які сприяють самозабезпеченню населення продовольчими ресурсами. Надано пропозиції щодо вдосконалення інституційного забезпечення та формування державної політики у сфері продовольчої безпеки.

Ключові слова: продовольча безпека, державна політика, індикатори продовольчої безпеки, законодавче забезпечення, державне регулювання

Державна політика для продовольчої безпеки спрямована на забезпечення фізичної та економічної доступності продовольства відповідно до рекомендованих МОЗ норм споживання, розширення різноманітності та поживної цінності харчових продуктів, збільшення калорійності та індикаторів споживання харчових продуктів до середніх показників ЄС.

На загальнодержавному рівні гарантом продовольчої безпеки виступають Президент, Кабінет Міністрів України, Верховна Рада України, РНБО. Основні аспекти та сфери державної політики, спрямованої на забезпечення продовольчої безпеки формують профільні міністерства: Міністерство аграрної політики і продовольства – шляхом створення та моніторингу балансів попиту і пропозиції продовольства, підтримки та забезпечення функціонування і розвитку сільськогосподарських підприємств, формування державних програм розвитку АПК та сільських територій. Міністерство охорони здоров'я визначає основні показники безпечності харчових продуктів, надає рекомендації щодо калорійності та норм споживання продовольства залежно від соціально-демографічного стану населення. Міністерство економіки формує державну політику у сфері ціноутворення,

Державна служба з питань безпечності харчових продуктів та захисту прав споживачів об'єднала функції та запобігла дублюванню повноважень Державної ветеринарної та фітосанітарної служби, Державної інспекції з питань захисту прав споживачів, окремі функції Державної санітарно-епідеміологічної служби.

З точки зору інституційного забезпечення, важливим є визначення основних індикаторів і понять у галузі продовольчої безпеки. Визначення поняття продовольчої безпеки надається у Законах України: «Про національну безпеку України» від 15.06.2022 р.; «Про державну підтримку сільського господарства України» від 24.06.2004 р. № 1877-IV(ред. від 27.10.2022 р.) [1, 2].

Основні індикатори продовольчої безпеки у вітчизняному законодавстві закладені у нормативних документах: «Методика визначення основних індикаторів продовольчої безпеки», затверджено постановою Кабінету Міністрів України «Деякі питання продовольчої

безпеки» від 05.12.2007 р. № 1379 у ред. 21.10.2011 р. (яким визначено 7 основних індикаторів); «Методичні рекомендації щодо розрахунку рівня економічної безпеки України», затверджено наказом Міністерства економічного розвитку і торгівлі України від 29.10.2013 №1277 (11 індикаторів) [3, 4]. Також необхідно врахувати підходи Global Security Index і ФАО до оцінки продовольчої безпеки [5, 6].

В Україні оприлюднення індикаторів продовольчої безпеки та їх оцінка відповідно до Методичних рекомендацій щороку здійснювало Міністерство економічного розвитку і торгівлі, а до 2021 року, із доповненням окремих індикаторів відповідно до Продовольчої та сільськогосподарської організації ООН (ФАО) – Економічний дискусійний клуб. Регулярний моніторинг продовольчої безпеки та аграрної політики в умовах воєнного стану здійснює Центр досліджень продовольства та землекористування (KSE Агроцентр) спільно з Міністерством аграрної політики та продовольства України [7].

За попередній період пропонувалися проєкти законів про продовольчу безпеку, які дискутувалися, але не були ухвалені. У березні 2022 р. було прийнято Закон стосовно створення умов для забезпечення продовольчої безпеки під час воєнного стану [8]. Затверджені Законом зміни та доповнення до законодавчих актів стосувалися спрощення користуванням земельних ділянок, для полегшення умов роботи фермерам.

У довоєнний 2021 р. найменше було забезпечено споживання на одну особу молочної і м'ясної продукції (табл. 1). Недостатньо мешканці України споживали рибу та рибні продукти, цукор. Після зниження споживання продовольства у 2019-2020 рр. внаслідок негативного впливу Covid-19, у 2021 році зросло споживання цукру, олії, овочевої та баштанної, плодово-ягідної продукції.

Таблиця 1

Продукція	Реко-мендована норма спожи-вання	Споживання у 2021 році, кг	Індикатор достатності споживання, %					2021 до 2017, в.п.	2021 до 2020, в.п.
			2017	2018	2019	2020	2021		
М'ясо та м'ясні продукти	80	53,0	64,6	66,0	67,0	67,3	66,3	1,6	-1,0
Молоко та молочні продукти	380	201,5	52,6	52,0	52,8	53,1	53,0	0,4	-0,1
Яйця, шт	290	272	94,1	94,8	97,2	95,9	93,8	-0,3	-2,1
Хлібні продукти	101	92,7	99,8	98,5	96,6	95,6	91,8	-8,0	-3,9
Картопля	124	132,4	115,6	112,4	109,4	108,1	106,8	-8,9	-1,3
Овочі та баштанні продовольчі культури	161	165,9	99,2	101,8	102,3	101,9	103,0	3,9	1,2
Плоди, ягоди та виноград	90	59,0	58,7	64,2	65,2	62,8	65,6	6,9	2,8
Риба та рибні продукти	20	13,2	54,0	59,0	62,5	62,0	66,0	12,0	4,0
Цукор	38	28,5	80,0	78,4	75,8	73,2	75,0	-5,0	1,8
Олія	13	13,6	90,0	91,5	92,3	94,6	104,6	14,6	10,0

Джерело: сформовано за даними Державної служби статистики України

Через військову агресію російської федерації в Україні у 2022 році суттєво знизився рівень продовольчої безпеки. Міжнародний індикатор – Global food security index розроблений The Economist Intelligence Unit і містить 4 основні групи індикаторів – доступності, доступності, якості та безпеки, стійкості та адаптації, які в свою чергу

складаються із переліку показників [6].У 2021 місці Україна займала 58 місце, а у 2022 році опустилася на 13 позицій і зайняла 71 місце серед 113 країн, останнє серед європейської спільноти.

Водночас для продовольчої безпеки важливо, що Україна відіграє важливу роль у світовому забезпеченні продовольством. За даними KSE інституту, експорт українського зерна спроможний нагодувати 400 млн людей у світі [7]. У 2021 рр. на світовий ринок Україною було поставлено 20 млн т пшениці (майже 9% світової вартості експорту, у 2022 р. – 11 млн т (4%). По кукурудзі за 2021-2022 рр. частка світового експорту зменшилася з 11,4 до 9,6%, але лишається значною [8].

Для забезпечення продовольчої безпеки в регіонах, у 2022 році започатковано програми підтримки аграріїв – фермерів та інших виробників сільськогосподарської продукції, за підтримки Європейського Союзу.

З метою підтримки та розвитку сільських територій та забезпечення продовольчої безпеки в регіонах запроваджувалися програми самозабезпечення громад продовольством, зокрема програма «Сади Перемоги» за сприяння Уряду Канади, «U-lead з Європою», яка сприяє розширенню можливостей громад за участю Європейського Союзу та країн-членів – Німеччини, Польщі, Данії, Естонії, Словенії [9, 10].

У країні працює програма децентралізації, здійснюється підтримка держави та ООН для забезпечення насінням, добривами і сільськогосподарською технікою.

Програмний документ, спрямований на досягнення продовольчої безпеки в сучасних умовах – розпорядження Кабінету Міністрів України від 24 квітня 2022 р. «Про затвердження плану заходів забезпечення продовольчої безпеки в умовах воєнного стану» [11].

Саме цим нормативним актом окреслено основні норми та інституційні зобов'язання, функції та повноваження відповідних міністерств, відомств та організацій які мають діяти не лише на період воєнного часу, а й у мирний час.

З метою вдосконалення інституційного забезпечення та індикативних принципів формування державної політики у сферах продовольчої безпеки і розвитку сільських територій, необхідно:

1. Доопрацювати та прийняти Закон України «Про продовольчу безпеку», окреслити принципи та основи продовольчої безпеки з урахуванням сучасних потреб та викликів.
2. Затвердити Стратегію продовольчої безпеки на період до 2030 року (проєкт було представлено у Мінекономіки у 2020 році).
3. Вдосконалити методику розрахунку продовольчої безпеки з урахуванням напрацювань та інструментів ФАО.
4. Забезпечити розроблення та надання щороку розширеного Звіту «Стан справ у галузі продовольчої безпеки і харчування в Україні» з урахуванням досвіду ФАО.
5. Затвердити оприлюднення щороку показників продовольчої безпеки на державному сайті (Мінекономіки, Мінагрополітики) і щокварталу – експрес-аналіз. Оприлюднювати окремі показники продовольчої безпеки на сайті Державної служби статистики за аналогом ЦСР.
6. На підставі аналізу показників продовольчої безпеки, задіяти відповідні органи виконавчої влади для подолання ризиків та досягнення індикативних показників. Для цього сформувати постійно діючу робочу групу із продовольчої безпеки, до складу якої залучити представників відповідних органів – Мінекономіки, Мінагрополітики, Української зернової асоціації, Держрезерву, Держстату,
7. У якості індикативних показників у планах і державних програмах орієнтуватися на досягнення ЄС, зокрема: калорійності добового раціону (більше 3300 ккал); щільності

автомобільних доріг (більше 1 тис. км), залізничних колій, зменшення імпортозалежності тощо.

8. Здійснювати факторний аналіз показників продовольчої безпеки та розроблення заходів для подолання ризиків за результатами щорічного Global food security index.

9. Створити на регулярній основі групи з розробки та затвердження регіональних продовольчих балансів для визначення потреб і наявних ресурсів продовольства. Задіяти тренінги для навчання фахівців в регіонах.

10. Для забезпечення високої купівельної спроможності населення України запобігати надмірному підвищенню цін на соціальну продукцію, сприяти підвищенню доходів та добробуту кожного українця.

Висновки. Державна політика у сфері продовольчої безпеки має ставити за мету забезпечення достатнього і різноманітного продовольства те здорового харчування, орієнтуватися на наявні ресурси, потенціал і можливості вітчизняного продовольчого сектора, соціально-демографічний склад і потреби населення. Необхідно на державному рівні сприяти вдосконаленню логістики постачання продовольства, особливо в умовах відродження економіки після збройної агресії російської федерації. У сфері розвитку сільських територій для забезпечення продовольчої безпеки необхідні подальший розвиток регіональних програм, включаючи «Сади перемоги» та «U-lead з Європою», підтримка рослинництва і тваринництва.

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EFFICACY OF DIGITAL MARKETING COMMUNICATIONS OF HEALTH CARE SERVICES TOWARDS ELDERLY PATIENTS: A SYSTEMATIC REVIEW

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Abstract

During the Covid-19 pandemic, the main goal of the health authorities of the Republic of Kazakhstan was to build proper communications with citizens. At the quarantine stage, they focused on providing people with information, raising their awareness, motivating people to change their health pattern and behavior, informing people about government decisions, as well as combating rumors and false information. However, not all these events were successful to prevent further spread of the disease. Thus, there is a necessity to enhance the digital marketing communications since all the aspects of our life shifted towards online interactions. Since there is no ultimate strategy that would be applicable to all the situation and at the same way to all countries, thus, the core of digital marketing communications should be assessed. Thus, within this paper would be the following considered:

- to study the theoretical and methodological foundations of digitalization of marketing communications in health care.
- the current state related to health care marketing among digital immigrants.

This paper would be carried out in the different databases such as Scopus and PubMed through the software application called "Publish or perish" that extracts and analyzes scientific papers from 2017 to 2022. Overall, 160 scientific articles were collected which later were thoroughly analyzed to further inclusion in the following systemic review. After careful consideration 15 articles were chosen to be synthesized. There is lack of empirical research on to what kind of digital marketing communications are effectively used to communicate with older patients. Evidence regarding necessity to identify ways to improve digital marketing communications in the healthcare industry, thus elderly people would have high quality service. There are potential enhancements towards digital communications since older patients are ready to utilize digital health instruments.

Keywords: Digital marketing communications; Medical organisations; Health care; aging.

Introduction

Pandemic COVID-19 has major impact on society across the globe in all aspects. The consequences of it for the last two years where the medical services have become the centerpiece discussion in the worldwide arena. Thus, digital marketing communications play vital role in healthcare organization's strategy since for 2 years people were interacted on distance.

In this context, the aim of systematic literature review is to address the effect of digital marketing communications towards elderly people, to analyse whether they satisfied with these communications, do they have positive or negative experience. But first it is important to highlight the target population of the research. Since the current research is covering the topic of digitalization, the target population is digital immigrants. Prensky (2001) divided people into two

groups, people who were born before 1980 are digital immigrants and who were born after are called digital natives since they were born digital. However, there is doubt in the context of Kazakhstan, would this notion be the same to it. Thus, there is a need to understand the relationship digital marketing communications and certain age-groups to improve doctor-patient communications in era of digital transformation.

In the reports of United Nations stated that the number of older citizens would be twice more than today, thus as 2 billion of people (United Nations, 2013). However, older segments (baby boomers and older adults) of the population are still unaware of the various basic tools used by health authorities to implement digital communications. By using digital marketing communications elderly people would get higher quality social medical support.

However, the use of marketing communications channels on the market of healthcare differs from other markets since the ethical part might arise (Miranda G, 2013). Also, the main peculiarity of healthcare services is that patients cannot tangibly or visually evaluate it that might arise the difficulty to evaluate the use of marketing.

Methodology

Review approach in this paper was based on systematic review where it should be piece by piece, methodically analyzed, synthesized previous researches (Hulland, J et al., 2018). However, systematic review might be in different formats: statistical methods where would be analyzed empirical material, bibliometric review, theory, method or they might evaluate research topic in whole by using all related theories and concepts (Mandler, T, 2021). Nevertheless, the goal of a systematic review is to analyze current situation of research area and to compare different perspectives of different authors, to synthesize their work to find gaps and as a result to give some specific recommendations for future research (Biemans, Wim, et al, 2021; Hulland, J., & Houston, M. B. 2020).

To investigate research topic the following databases would be used Scopus and PubMed databases.

Further 5 steps of conducting systematic literature review were outlined in the figure 1. The search of relevant articles was covered within the period from 2017 to 2022.

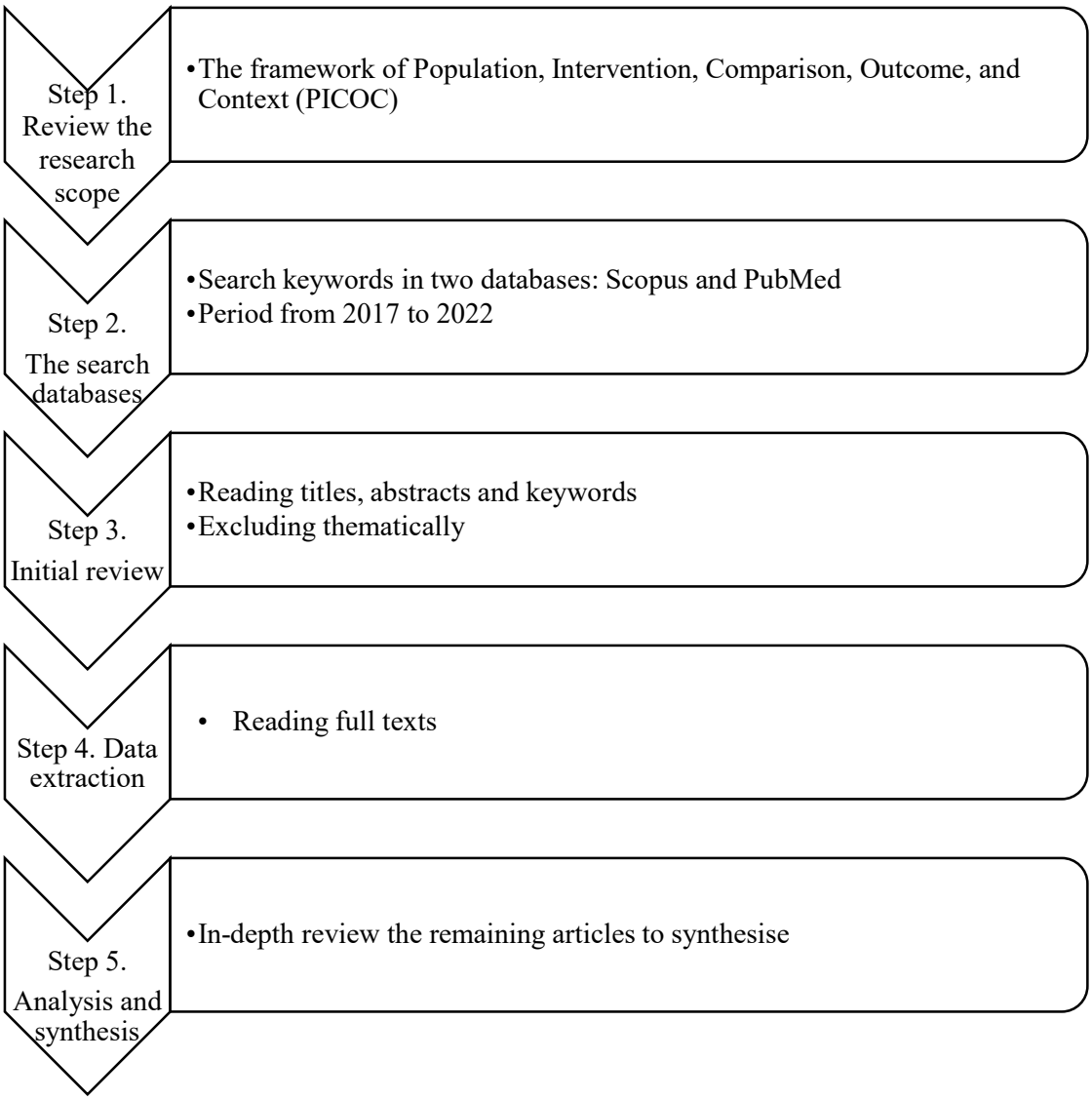

Figure 1. The phases of the systematic literature review

The framework of Population, Intervention, Comparison, Outcome, and Context (PICOC) (Booth, A, 2021) was used to determine the scope of the research (Table 1).

Table 1: The framework of PICOC to identify the scope of systematic literature review of the topic

Concept	Definition according to Booth et al.	SLR application
Population	The research held on the level of digitalization development in health care.	The research paper is dealing mainly on effectiveness of digital communications towards digital immigrants.
Intervention	The procedure to conduct systematic literature review to address the problem.	To find the gaps of previous research to further research, for example, preparedness of digital communications infrastructure to involve older generation into their well-being.
Comparison	Techniques to compare the different scientific research on the preparedness of digital infrastructure for older generation.	Contrasting different methods applied in the previous works.
Outcome	To assess the existing knowledge and to enhance the digital marketing communications.	Identifying the gaps of previous research, models and approaches in health care domain.
Context	Benefit to particular group of people, who would gain from the results of the current research.	Enhancing the existing digital marketing communications in health care to make clinics' communications towards older patients more efficient.

The next phase of the research was to search for relevant articles where the criteria for inclusion was finding related articles through the keywords showed in table 2.

Table 2: The terms that were to conduct the searching and total numbers of works in databases

Databases	Keywords for search	No of articles
Scopus	aging; digital communication; health care;	118
PubMed	aging; digital communication; health care;	42

In figure (2) was summarised all the results of screening and searching process. The next phase of the conducting research was to eliminate from 160 articles (20 of them were review papers) irrelevant scientific articles by conducting content analysis where 115 articles were excluded, after searching scientific publications with keywords. Next step was analysing the remaining 23 articles, at this stage abstract and amin parts of the articles were skimmed. After this stage, 8 more articles were excluded from the research. The remaining 15 articles fulfilled the inclusion criteria and were further analysed for systematic literature review.

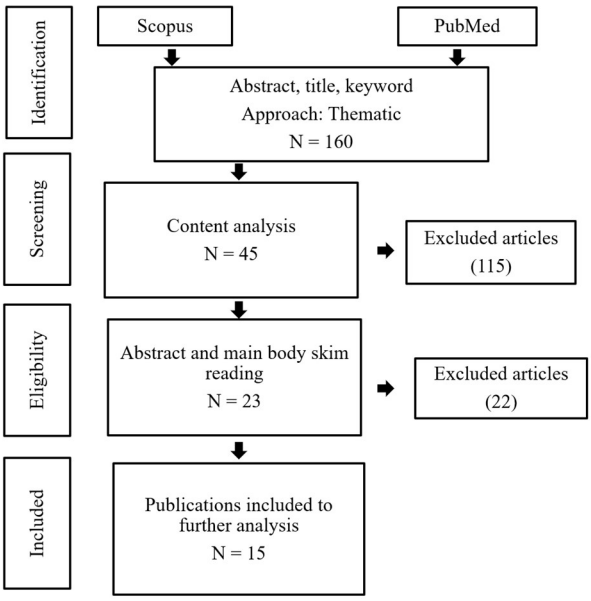

Figure 2. The screening process of databases for systematic literature review

Systematic Literature Review

Digital marketing communications itself are young in nature, it has only been two decades how it transformed our society: databases, exchanging, interchanging, social platforms and so on. Digital marketing itself intertwines with artificial narrow intelligence, robotics, telemedicine, almost all forms of marketing activities, all technology in general (Krishen, Anjala S., et al. 2021). All these instruments not only are helping to diagnose and treat patients more effectively, but also give opportunity to self-treat (Lupton D, 2013). Nowadays patients' awareness is higher and they want to take part in deciding what treatment would be more suitable for them. They conduct their own research in looking for other medical experts' opinion, or precedents of their treatment (Jadad AR, Rizo CA, Enkin MW, et al., 2003). However, district physicians still have authority in patient life, and patient would heed their word and consult with them (Biemans, Wim, et al., 2022).

Table 3: An overview of the chosen publications

No	Authors	Title	Year	Type
1	Kwang-il Kim	Digital technology to enable aging in place	2017	Review article
2	G.A. Wildenbosa	Mobile health for older adult patients: Using an aging barriers framework to classify usability problems	2019	Article
3	Anu Siren	Older Adults and Emerging Digital Service Delivery: A Mixed Methods Study on Information and Communications Technology Use, Skills, and Attitudes	2017	Article
4	S.S. Oh	Measurement of digital literacy among older adults: Systematic review	2021	Review
5	Q. Lv	Using mobile apps for health management: A new health care mode in china	2019	Article
6	R. Bevilacqua	Coaching through technology: A systematic review into efficacy and effectiveness for the ageing population	2020	Review
7	V. Nittas	COVID-19 and telehealth: A window of opportunity and its challenges	2020	Note

8	N. Gasteiger	Friends from the future: A scoping review of research into robots and computer agents to combat loneliness in older people	2021	Review
9	T.D. Cosco	Covid-19, social isolation, and mental health among older adults: a digital catch-22	2021	Article
10	J.Y. Choi	Development of health-RESPECT: An integrated service model for older long-term care hospital/nursing home patients using information and communication technology	2020	Article
11	J. Stargatt	Digital Storytelling for Health-Related Outcomes in Older Adults: Systematic Review	2022	Review
12	L. McCabe	Using technology the right way to support social connectedness for older people in the era of covid-19	2021	Article
13	M. White	Communicating with Older Adults	2018	Article
14	S. Xu	Digital inclusion of older people: harnessing digital technologies to promote healthy ageing in the Western Pacific Region	2021	Conference Paper
15	T.L. Syroid	The role of smart technology in promoting the right to health of older persons	2019	Article

G.A. Wildenbos (2019) in his study determined his age group 50 years old and above where the aim of the research was to identify usability of medical health apps to older patients. Within this research they identified 28 usability issues of the medical health app. The main difficulties that arose the barrier for older patients in using app were cognitive, motivational, perception and physical abilities of respondents, they experienced the usability of the app negatively (Oh, S.S., 2021), since the main barrier is youth-centred design (Xu, S., 2021).

In contrast to A. Siren' research (2017) showed that lack of digital technologies utilization because of older age is merely exaggeration. The lack of utilization of digital instruments is because of socio-economic and rather demographic factors (White, M., 2018) and older patients are willing to learn how to use digital instruments (Bevilacqua, R., 2020).

Digital technology is made to provide better care and improve daily life of not only older generations but people in general, and make more accessible. However, there are several issues of digital environment rise not only from patients' side but also from health care providers, since implementing digital technology is costly (Kim, K., 2017).

In analyses of Chinese medical apps digital medical services divided into 6 types: reservation and payment, medical consultation, medical education, medical instrument sales, electronic medical records and chronic disease management. These services made doctor-patient communication are more effective, patients can make appointments and follow-up their records (Lv, Q., 2019).

Conclusion

To advance the topic of the current research the systematic literature review of articles was analyzed. As it was stated marketing is a set of rules, concepts, methods and theories which aimed to promote product further to older people in result of analysis of market's necessities Vasudevan, R. (2010). Therefore, for digital marketing communications there is a necessity to conduct empirical research whether the medical oragnisations' have digital communications and they are usable for older patients, since older segments of the population are still unaware of the various basic tools used by health authorities to implement digital communications. By using digital marketing communications elderly people would get higher quality digital medical support, thus, it would decrease social isolation, to rise access to all kinds of services, improve their health.

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Revealing the Dynamics of Digital Marketing: Exploring Strategies, Trends, and Impact

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Abstract: The rapid evolution of digital technologies has completely transformed how marketing operates, demanding a deep understanding of the underlying dynamics that drive digital marketing strategies and trends. In this research paper, we venture into the complex realm of digital marketing, embarking on a journey to comprehensively explore the strategies that are employed, the emerging trends that are reshaping the field, and the significant impact these dynamics wield over businesses, consumers, and the broader socio-economic landscape. Through a thorough examination of real-world case studies, industry insights, and scholarly investigations, our paper strives to provide valuable and practical insights into the ever-evolving domain of digital marketing. We aim to present a nuanced viewpoint that benefits not only practitioners and researchers but also all stakeholders involved. By shedding light on the intricate relationship between strategies, trends, and their eventual outcomes, this study contributes significantly to the ongoing dialogue on effective digital marketing practices in our interconnected digital age.

INTRODUCTION

In a rapidly changing world, the landscape of marketing has undergone a seismic shift fueled by the swift evolution of digital technologies. This transformation has altered the very core of marketing practices, giving rise to the era of digital marketing. With this shift comes the imperative to grasp the intricate dynamics that underlie the strategies and trends governing this novel terrain. This research paper aims to delve deep into the multifaceted realm of digital marketing, embarking on a journey to explore not only the strategies deployed but also the nascent trends shaping this landscape and the significant impacts these dynamics yield across businesses, consumers, and the broader socio-economic panorama.

Our exploration begins by comprehending the strategies harnessed by businesses to navigate the dynamic digital sphere. These strategies extend beyond traditional marketing methodologies, encompassing innovative techniques that leverage the immense power of technological advancements. The ever-evolving digital marketing canvas presents a multitude of strategies that necessitate a closer examination to uncover their effectiveness, adaptability, and potential for reshaping consumer engagement paradigms.

The consequences of this digital revolution ripple through businesses, consumer behaviors, and the broader socio-economic fabric. As we embark on an exploration of digital marketing strategies and trends, we simultaneously unveil the significant ramifications of these dynamics. Businesses must adeptly navigate this ever-changing landscape to ensure consumer engagement and loyalty. Meanwhile, consumers find themselves in an altered relationship with brands and products, engaging through novel mediums and experiencing tailored interactions. Beyond the

microcosm of individual businesses and consumers, the amalgamation of digital strategies and evolving trends also shapes the macroeconomic landscape, ushering in new paradigms of economic growth and innovation.

In the following sections, we delve into real-world case studies, industry insights, and scholarly analyses, crafting a tapestry that unveils the essence of digital marketing's strategies, trends, and impact. We aim to furnish practical and valuable insights that resonate with both practitioners and researchers, serving as a guiding light for navigating the complexities of this ever-evolving digital domain.

1. Investigating the Diverse Domain of Strategies in Digital Marketing

In the dynamic landscape of digital marketing, the strategies employed by businesses play a pivotal role in navigating the ever-evolving digital sphere. Traditional marketing paradigms have transformed drastically with the integration of digital technologies, necessitating innovative and adaptive strategies to capture the attention and engagement of today's tech-savvy consumers. This section delves into a comprehensive exploration of the multifaceted strategies that businesses deploy to thrive in this digital age.

At the forefront of digital marketing strategies is the concept of content marketing. Content has emerged as a cornerstone of online engagement, allowing businesses to create valuable and relevant materials that resonate with their target audience. Leveraging blog posts, articles, videos, infographics, and social media posts, content marketing aims to provide information, entertainment, or solutions that not only capture consumers' attention but also position brands as authoritative figures in their respective industries.

Search Engine Optimization (SEO) stands as another critical strategy in the digital marketing toolkit. SEO involves optimizing a brand's online presence to rank higher in search engine results. This strategy encompasses both on-page and off-page optimization techniques, including keyword research, website structure improvement, quality backlink building, and user experience enhancement. A strong SEO strategy enhances a brand's visibility, driving organic traffic to its digital assets and nurturing sustained engagement.

Social media marketing has also emerged as a transformative strategy, capitalizing on the widespread use of social platforms. Businesses harness the power of platforms like Facebook, Instagram, Twitter, and LinkedIn to engage with their target audience, share valuable content, and foster meaningful connections. Social media advertising, influencer partnerships, and interactive campaigns are integral components of this strategy, amplifying brand reach and enhancing consumer engagement.

Furthermore, the advent of data analytics and personalized marketing has introduced a new dimension to digital strategies. By harnessing user data and behavior insights, businesses can tailor marketing campaigns to individual preferences, delivering personalized experiences that resonate on a deeper level. This strategy not only enhances consumer engagement but also fosters brand loyalty by showing consumers that their needs and preferences are understood and valued.

In the digital era, the arsenal of marketing strategies is both diverse and dynamic, reflecting the rapid evolution of technology and consumer behavior. The strategies discussed in this section offer a glimpse into the multifaceted approaches that businesses leverage to navigate this intricate landscape. From content marketing to SEO, social media engagement, and personalized campaigns, these strategies collectively underscore the need for businesses to adopt agile and adaptive tactics that resonate with the ever-changing preferences of digital consumers.

1.1 The Power of Strategic Content Marketing in the Digital Landscape

In the dynamic landscape of digital marketing, content marketing stands as a foundational pillar, steering businesses toward meaningful engagement and brand establishment. This strategic approach involves the creation, dissemination, and sharing of content that holds value, relevance, and resonance. In today's digital realm, where consumers actively seek informative and entertaining material, content marketing becomes a potent tool for businesses to forge deep connections with their target audience.

At its heart, content marketing goes beyond mere advertising, seeking to enrich consumers' experiences. For instance, a cosmetics brand might share makeup tutorials and skincare tips through engaging videos, thus positioning itself as a reliable source of beauty expertise. This approach establishes trust and credibility, transforming brands from simple service providers into valuable resources.

The impact of content marketing reverberates beyond initial interactions, nurturing lasting relationships with consumers. When audiences find substantial value in the shared content, they evolve into loyal advocates for the brand. Think about the scenario involving a fitness clothing company that consistently releases content about health and well-being, nurturing a community of fitness aficionados who not only have confidence in the brand's merchandise but also connect deeply with its comprehensive approach to overall wellness.

Amidst a landscape inundated with advertisements, content marketing emerges as a strategic lighthouse, guiding businesses through the fog of consumer skepticism. By crafting content that genuinely connects with its audience, brands transcend the limitations of conventional advertising. Think of a sustainable fashion brand sharing stories of their ethical manufacturing processes; this content not only educates but resonates with environmentally conscious consumers, forging deeper connections and fostering brand loyalty.

1.2 The Strategic Compass of Search Engine Optimization (SEO) in the Digital Era

In an era where the internet has emerged as a primary hub for both information and commerce, Search Engine Optimization (SEO) takes on the role of a strategic compass guiding businesses in their quest to enhance online visibility and connect effectively with their desired audience. This multifaceted approach encompasses a spectrum of techniques and methodologies tailored to elevate a website's ranking on search engine results pages, thereby amplifying organic traffic and fostering increased engagement.

At its core, SEO revolves around the optimization of a website's structure, content, and overall digital presence to harmonize with the algorithms and benchmarks established by major search engines like Google. This optimization journey encompasses two main fronts: on-page and

off-page strategies. On-page SEO revolves around refining individual web pages by seamlessly integrating pertinent keywords, crafting content that's both high in quality and informative, optimizing meta tags, and ensuring a user-friendly browsing experience. On the other hand, off-page SEO entails the cultivation of reputable backlinks, nurturing online relationships, and enhancing a website's credibility from the perspective of search engines.

The significance of SEO lies in its capacity to wield a transformative influence on a brand's online prominence. A robust SEO strategy directly translates into elevated search engine rankings, which subsequently culminate in heightened organic traffic and enhanced visibility. By upholding the principles of SEO best practices, businesses can effectively harness the vast potential of search engines as a conduit for targeted and conversion-ready traffic.

Furthermore, SEO operates within a dynamic framework that evolves alongside changing algorithms and search patterns. Remaining attuned to these evolutionary shifts becomes imperative to not just preserve but elevate a brand's online footprint. Through an ongoing process of analysis, vigilant monitoring, and meticulous refinement, enterprises can meticulously calibrate their digital assets to resonate harmoniously with the ever-shifting landscape of search engines.

In a digital realm where competition is fierce and attention spans fleeting, SEO charts a course to not just survive but thrive. By adroitly navigating the intricate terrains of search engine algorithms, businesses can carve out a significant online niche, ensuring their offerings, solutions, and insights reach their target audience with precision and impact. As search engines continue to serve as the cornerstone of consumer brand discovery and interaction, investing in a robust and dynamic SEO strategy emerges as an indisputable pillar of digital marketing success.

1.3 Harnessing the Power of Social Media Marketing: Building Connections, Engagement, and Brand Loyalty in the Dynamic Digital Landscape

Social media marketing has emerged as a powerful and transformative strategy that enables businesses to connect, engage, and build relationships with their target audience on various social platforms. One notable example of effective social media marketing is the way brands leverage platforms like Instagram to showcase their products or services visually. High-quality images and videos allow businesses to convey their brand's essence, values, and unique offerings to their audience. For instance, fitness companies often post visually appealing content featuring their workout gear being used by real people, effectively combining product promotion with aspirational content that resonates with their target demographic.

Social media marketing goes beyond mere posting; it involves crafting interactive campaigns and collaborations to capture audience attention. Starbucks, for example, launched the "White Cup Contest," encouraging customers to decorate their white Starbucks cups and share their creations on social media. This campaign not only engaged customers creatively but also generated user-generated content, thereby extending the reach of the brand's message.

Paid social media advertising is another pivotal facet of this strategy. By using platforms' ad features, businesses can target specific demographics, interests, and behaviors. For instance, a travel agency could run an ad campaign showcasing exotic destinations to individuals who have expressed an interest in travel. This precision targeting maximizes the impact of the marketing budget by presenting content directly to potential customers.

The dynamism of social media marketing also allows for real-time interaction and feedback. Brands can promptly respond to customer inquiries, address concerns, and even

conduct polls or surveys to gather insights. Wendy's, a fast-food chain, is renowned for its witty and engaging responses to customers on Twitter, which not only humanizes the brand but also generates viral interactions.

In conclusion, social media marketing is a versatile strategy that empowers businesses to forge genuine connections with their audience, creating a two-way conversation that drives engagement and brand loyalty. Through visual content, interactive campaigns, targeted advertising, and real-time interaction, brands can harness the power of social platforms to effectively convey their message, cultivate relationships, and ultimately thrive in the competitive digital landscape.

1.4 The Power of Data Analytics and Personalized Marketing

In the ever-evolving landscape of digital marketing, the fusion of data analytics and personalized marketing has emerged as a dynamic and transformative strategy. This strategic alliance involves harnessing the immense power of data analytics to understand consumer behaviors, preferences, and patterns, and then tailoring marketing efforts to deliver highly targeted and personalized experiences. This deep research delves into the profound impact of data analytics on personalized marketing, exploring how businesses leverage data-driven insights to craft tailored campaigns that resonate with individual consumers.

Data analytics plays a pivotal role in modern marketing by offering a wealth of information about consumer interactions and behaviors across various digital touchpoints. By collecting and analyzing data from sources such as website visits, social media interactions, purchase history, and demographic information, businesses gain a comprehensive understanding of their audience. For instance, consider Amazon's personalized product recommendations based on a user's browsing history and previous purchases. By employing data analytics, Amazon predicts consumer preferences and presents relevant products, enhancing the shopping experience and driving higher conversion rates.

Personalized marketing takes data analysis a step further by translating insights into targeted campaigns. By segmenting the audience into smaller groups based on common attributes or behaviors, businesses can tailor content and messages to match each segment's preferences. Spotify, for example, curates personalized playlists for individual users based on their music listening habits. This customized approach not only keeps users engaged but also encourages them to spend more time on the platform.

Machine learning and artificial intelligence (AI) further enhance personalized marketing by allowing businesses to automate and optimize their strategies. These technologies analyze vast amounts of data to identify patterns and make predictions. Netflix employs this approach to recommend movies and TV shows to users based on their viewing history and preferences. As users interact with the platform, the algorithms continually refine recommendations, leading to higher user satisfaction and increased content consumption.

The impact of data analytics and personalized marketing extends beyond customer engagement. Brands can also utilize these insights to create hyper-targeted advertising campaigns. Facebook, for instance, provides advertisers with tools to create ads that reach specific demographics, interests, and behaviors. This precision targeting maximizes ad efficiency, ensuring that content comes to the right audience at the right time. Examples from companies like Amazon,

Spotify, Netflix, and Facebook underscore the tangible benefits of this strategic synergy. As the digital landscape continues to evolve, data analytics and personalized marketing will remain at the forefront of effective marketing strategies, enabling businesses to navigate the complexities of consumer preferences with precision and impact.

2. Trends in Digital Marketing

In the ever-evolving realm of digital marketing, staying attuned to emerging trends is not just an advantage but a necessity for businesses aiming to thrive in the dynamic digital landscape. This deep research delves into the transformative trends that are shaping the future of digital marketing, offering insights into how businesses are adapting to these shifts to effectively engage and connect with their target audience.

- **Video Content Dominance:** The dominance of video content stands as a defining trend in the digital marketing landscape. With platforms like YouTube, TikTok, and Instagram Reels gaining immense popularity, businesses are leveraging video content to convey their messages in a visually engaging and concise manner. Brands are incorporating video content across social media, websites, and even emails, as video's dynamic nature captures and retains audience attention more effectively than static formats.
- **Interactive and Immersive Experiences:** As consumers seek more engaging interactions, interactive and immersive experiences are on the rise. Augmented reality (AR) and virtual reality (VR) are being used to create immersive campaigns, allowing users to experience products or services in a virtual environment. For example, IKEA's AR app enables users to visualize how furniture would look in their space before making a purchase, enhancing user engagement and decision-making.
- **Voice Search Optimization:** The growing prevalence of voice assistants like Siri, Alexa, and Google Assistant has given rise to the importance of voice search optimization. Businesses are adjusting their SEO strategies to accommodate voice-based queries, as spoken search terms often differ from typed ones. Optimizing content for voice search helps businesses maintain their search engine visibility and connect with users who rely on voice assistants for information.
- **Inclusivity and Authenticity:** Consumers today value authenticity and inclusivity in brands. Businesses are integrating diversity and inclusivity into their marketing efforts to reflect the diverse audience they serve. Brands that genuinely embrace these values are resonating more strongly with consumers, as authenticity fosters trust and loyalty.
- **Sustainability and Social Responsibility:** Consumers are increasingly conscious of a brand's environmental and social impact. Sustainable practices and social responsibility are becoming integral parts of marketing strategies. Brands that align with causes, implement eco-friendly practices, or support social initiatives are resonating more deeply with ethically-minded consumers.
- **Ephemeral Content and Stories:** The popularity of ephemeral content on platforms like Instagram and Snapchat showcases the trend of temporary, short-lived content. Stories allow brands to share authentic, behind-the-scenes glimpses, promotions, and time-sensitive updates, fostering a sense of urgency and exclusivity among audiences.

The digital marketing landscape is in a constant state of flux, with emerging trends redefining how businesses engage and connect with their audience. From video content dominance and interactive experiences to AI-powered personalization and sustainability, these

trends offer insights into the changing dynamics of digital marketing. By understanding and embracing these trends, businesses can forge meaningful connections, enhance engagement, and navigate the complexities of the digital era with agility and innovation.

3. The Impact of Digital Marketing: Shaping Brands in the Digital Era

In the contemporary business landscape, the advent of digital marketing has ushered in a paradigm shift, fundamentally altering the way brands engage with their audience. This research delves into the profound impact of digital marketing, showcasing how it has redefined marketing strategies, transformed consumer behavior, and revolutionized business outcomes. Through illustrative examples, we explore the multifaceted influence of digital marketing on various aspects of modern business.

1. Reimagining Marketing Strategies:

Digital marketing has spurred a revolution in marketing strategies. Traditional methods have given way to data-driven approaches, allowing brands to precisely target their desired audience. For instance, social media platforms enable businesses to tailor their content and advertisements based on user demographics, behaviors, and preferences. The result is not only cost-effective campaigns but also an elevated customer experience. Nike's "Nike By You" campaign allows customers to customize their sneakers online, effectively merging personalization and convenience, driving higher engagement.

2. Transforming Consumer Behavior:

Digital marketing has significantly altered how consumers discover, evaluate, and purchase products or services. Online reviews, influencer endorsements, and interactive advertisements on social media platforms hold immense sway over consumer decisions. Amazon's customer reviews and ratings, for example, shape purchase choices, indicating the growing influence of digital word-of-mouth. Moreover, consumers are increasingly embracing e-commerce, and mobile shopping, with seamless user experiences driving purchasing decisions.

3. Democratizing Brand Reach:

Digital marketing has democratized brand reach, allowing even small businesses to compete on a global scale. Platforms like Google Ads and Facebook Ads offer cost-effective advertising options, enabling brands to connect with potential customers beyond geographical constraints. This leveling of the playing field empowers startups and local businesses to amplify their presence. The success of the direct-to-consumer model adopted by brands like Warby Parker underscores this shift, allowing them to circumvent traditional retail channels and directly engage consumers through online platforms.

4. Fostering Engagement and Interaction:

Interactivity is at the heart of digital marketing's impact. Brands can engage with their audience through social media interactions, live streaming, contests, and quizzes. The "#ShareACoke" campaign by Coca-Cola invited consumers to customize bottles with their names and share pictures, sparking a wave of user-generated content. This engagement not only strengthened brand loyalty but also expanded the brand's reach through viral sharing.

5. Real-time Analytics and Performance Tracking:

Digital marketing offers real-time analytics and performance tracking, providing actionable insights into campaign effectiveness. Brands can monitor metrics like click-through rates, conversion rates, and engagement levels, enabling them to adapt and optimize strategies on the fly. The use of A/B testing to refine email marketing campaigns exemplifies this, allowing brands to identify the most effective subject lines, content, and visuals.

The impact of digital marketing is far-reaching, reshaping the very fabric of business operations and consumer behaviors. From innovative strategies to democratizing brand reach and fostering engagement, digital marketing has become the cornerstone of modern business success. Examples from brands like Nike, Amazon, Warby Parker, Coca-Cola, and numerous others underscore how effectively harnessing digital marketing can propel brands into the digital age with resonance and influence.

Conclusion:

In the ever-evolving realm of digital marketing, staying attuned to emerging trends is not just an advantage but a necessity for businesses aiming to thrive in the dynamic digital landscape. The diverse strategies and transformative trends discussed throughout this research paper underscore the need for businesses to continually adapt and innovate to remain relevant in the rapidly changing digital era. These trends are not mere fleeting phenomena; rather, they represent fundamental shifts that are shaping the future of marketing. From the dominance of video content and the rise of interactive experiences to the growing importance of voice search optimization and the emphasis on authenticity and inclusivity, these trends are influencing how businesses engage with their audience, deliver value, and cultivate brand loyalty. The incorporation of artificial intelligence and data analytics into personalized marketing strategies is revolutionizing consumer interactions, making them more meaningful and relevant.

These trends do more than just impact individual businesses – they contribute to shaping the broader socio-economic landscape. Digital marketing trends are transforming the ways consumers make purchasing decisions, influencing not only buying behaviors but also fostering new economic models. Brands are no longer confined to traditional marketing approaches; they have the power to connect directly with consumers and establish meaningful relationships, even across global markets.

As we navigate the shifting currents of digital marketing, it's clear that embracing these transformative trends is vital for the sustained success of businesses. By understanding and leveraging these trends, brands can effectively navigate the complexities of the digital landscape, connect with their audience on a deeper level, and create a lasting impact. The dynamic interplay of strategies and trends showcased in this research reaffirms that the future of marketing lies in innovation, adaptation, and a keen awareness of the evolving digital landscape.

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НӘБИДЕН ӘБУТАЛИЕВ ШЫҒАРМАЛАРЫНЫҢ ЖАНРЛЫҚ, ТАҚЫРЫПТЫҚ ЕРЕКШЕЛІКТЕРІ, КӨРКЕМДІК ӨРІМІ

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Өңірімізден шыққан талантты тұлға Нәбиден Әбуталиев шығармашылығы туған жерге, елге деген сүйіспеншілікті, ұлттық сананы оятуымен, қазақ халқына танымал біртуар тұлғаларды дәріптеуімен, тарихи оқиғаларды шебер баяндауымен ерекшеленеді. «Ақ жайық» атты тұңғыш өлеңі 1943 жылы газет бетінде жарияланған Н.Әбуталиев әдеби әлемге өлең-жырларымен, әңгімелерімен, сыни мақалаларымен таныла бастайды. Қазақ әдебиеті тарихында түрлі жанрда қалам тербеген Н.Әбуталиев, ең алдымен, талантты жазушы. Ол «Қайран Нарын» (1980), «Өттің дүние» (1986) атты повестер, «Наркескен» (1989) романын, «Ел қорғаған ер» деректі әңгімесін жазды. Тарихи тақырыпты қамтитын повесть-романдарында өр рухты Махамбет пен Исатай тұлғасын кеңінен ашып, олардың батырлық, ақындық жолдарын жауынгерлік, ерлік істерін көрсетеді.

Жазушы 1991 жылы қазақтың талантты өнерпазы Сегіз сері Бағрамұлы Шақшақов өмірінен сыр шертетін «Сегіз сері» атты повесть жазады. Жазушы Б.Нұржекеевтің «Сегіз сері және Нәбиден аға» [1] мақаласында да бұл шығарманың идеялық-мазмұндық ерекшеліктері сөз болады. Бұл туындысы жөнінде жазушы: «Тарихи тақырыпқа қалам тартқан әрбір жазушы, өмірде болған белгілі есімдерге байланысты ой саралап, тұжырым айту үшін зерттеуші де болуға тиіс екен. Сөйтіп тарихи деректер мен ел аузынан жинаған шежіреге жүгінгенімде бірден Исатай, Махамбеттің жақын батыр сардарларының бірі – Сегіз сері есімі кезікті. Ол кәдімгідей жанды бейне ретінде көзіме елестеді. Оның өміріне қызыққаным соншалық, Сегіз серіден тіпті айырылғым келмеді. Сөйтіп өзім жазған «Қайран Нарынның» жалғасы «Өттің дүние» атты екінші кітабымда Махамбетпен қоса Сегіз сері бейнесін жасауға біраз күш салдым» [2, 2 б.] – дейді автор.

Автордың «Ел қорғаған ер» атты деректі әңгімесі Кеңес одағының батыры, жазушы, даңқты жауынгер, әскери қолбасшы Бауыржан Момышұлының өмір жолын, тұлғасын танытады.

Нәбиден Әбуталиев – қарымды қаламгер. Елге белгілі тұлғалардың өмірдерегін зерттеп, еңбек жолына барлау жүргізіп, тың пікірлер қалдырған қаламгер «Жаңарған ауыл» (1970), «Боран Нысанбаев» (1971), «Сахара сыны» (1973), «Әйтеке би» (1995), «Ордабасы

Қожаберген» (1995), «Мұқағали Мақатаев» (1996), «Есентемір Бөкен би» (1996) сынды бірнеше очерк, публицистикалық еңбектер жазады.

Оған қоса, жазушының М.Өтемісұлының өмір жолына арнаған «Өттің дүние» атты екі бөлімді тарихи драмасы 1992 жылы М.Әуезов атындағы Қазақ академиялық драма театрының сахнасында қойылған. Бұл тұста жазушының драма жанрының дамуына да өзіндік үлесін қосқандығын айқын аңғаруға болады.

Н.Әбуталиев талантының тағы бір қыры – аудармашылығы. «Нәбиден Әбуталиев – аудармашы. Ол Э.Хемингуэйдің «Килиманджаро – қарлы тау» (1977), Б.Чойндонның «Ұлы Гобиде» (1981), С.Сартаковтың «Тау самалы» (1983) шығармаларын қазақ тіліне аударды. Ол бұлардан басқа да В.Пикульдің, Ә.Бикчентаевтың әңгімелерін, сондай-ақ М.Исаковскийдің, Х.Сейітовтың, С.Маймуловтың, Б.Абакировтың өлеңдерін қазақ тіліне аударды» [3, 68 б.]. Көркем аударма саласына да мол үлес қосқан жазушының ұлттық әдебиеттің ғана емес, әлемдік әдебиеттің дамуына күш салғандығы анық.

Нәбиден Әбуталиев – талғампаз ақын. Ақын өлеңдері түрлі тақырыпты қамтиды. Оның атамекеніне, туған жеріне деген ыстық ықыласы жыр жолдарынан анық көрінеді.

Ақын «Туған жер» өлеңінде:

Менің албырт көңілімді тасыттың,
Жасыл қырға жетуге мен асықпын.
Кішкентайдан көк майсаңа аунаған,
Мақпал дала, дидарыңа ғашықпын.

Қадіріңді жүріппін-ау, түсінбей,
Қырға апаршы, Иранбақтың ішіндей.
Туған жерім, топырағыңда қуат бар –
Ғашық жардың баурап алған күшіндей [4, 4 б.] –

деп туған мекеніне сағынышын тебірене жырлайды.

Көлемі шағын болғанымен өрнекті жырларына айшықты сөздері арқылы туған мекеніне арнаған таза пейілін, сағынышын сыйғызып жібереді. Ақын өлеңдері идеялық жағынан да туған жер ұғымын тамыры терең танымға жетелейді.

Ақынның «Түнгі дала», «Барып ем туып өскен ауылыма», «Сырлы бұлақ», «Тобыл толқыны», «Дала, дала» өлеңдерінде табиғаттың ғажап көріністері, кең жазық даланың сұлулығы, қоғам тынысы, өскен орта, замандастар тағдыры шынайы суреттеледі. Туған жердің қадіріне жете білу ақын өлеңдерінің басты идеясы саналады.

Ақын поэзиясында өлең сөзге, ақындық өнерге жоғары баға беріледі. Қастерлі өнерге бет бұрған ақын жаны адалдықты, адамдықты қалайды.

Күнім көп қиял қуып ой тербеген,
Қамшылап шабытымды төрт өрмемен.
Тынымсыз тебіренем, толғанамын,
Мақсатым мазалайды жетем деген.

Сірә, мен бөлшегімін ірілердің,
Сондықтан сырына әлем үңілемін.
Тілегім – бірі болып жүрсем деймін,
Арманшыл ақын жанды інілердің [4, 7 б.] –
(«Қамшылап шабытымды»)

деп жырлаған ақын ой түкпіріндегі арман-тілегін, мұрат-мақсатын әдемі жеткізеді. Ақынның тыныс-тіршілігін сезімталдықпен жырға қосады. Ақындық өнердегі тазалықты, шынайылықты сүйетін ақын өлеңдері тақырып алуандығымен ерекшеленеді.

Ақынның бірқатар өлеңдері сезім иірімдерін, көңіл толқынын, махаббат толғанысын жырлауға арналады. Ақын жырларында ыстық махаббаттан гөрі өткенді аңсау, жылы сәттерді еске алу, сағыну секілді сезімдер басым келеді.

Ақын:

Махаббатым бір өзіңе арналған,
Ерен туған еркем едің бар жаннан.
Сен қарасаң маған бір сәт күлімдей,
Жаным менің жайнар жаздың гүліндей.

Шалқып ойым, шабыт кернер жанымды,
Сенің көзің күн нұрынан жалынды.
Сенің көзің таң самалы шуақты,
Арманымның асқақ әні сияқты [4, 13 б.] –
(«Махаббатым»)

деп риясыз сезіммен жырласа, енді бірде:

Таңдандым ғой, жаныма бір жайлы тиген жазғы рақат таңым-ай,
Көп жылдар бойы сағынып іздеп жүріппіз неғып, танымай?
Орайы келіп, Оралдан көріп отырмыз бірге жанғанда
Жібекті көрген Төлештей болып қосылды құшақ жамырай.
Арада бізді алшақтатып өтсе де сәулеш талай жыл,
Жанымда менің ақ түннен ауған аяулы бір арай жүр [4, 10 б.] –
(«Таңдандым ғой»)

деп сағыныш сазын жеткізеді. Махаббат тақырыбындағы ақын өлеңдері оқырманын кейде шексіз бір кеңістікке жетелесе, кейде тұңғиыққа сүңгіткендей әсер қалдырады. Сезімге құрылған жыр жолдары ақынның ішкі жан дүниесін, жүрек түкпіріндегі тебіренісін жария қылады.

Адамдықты, ақиқатты, азаматтықты ұстанған ақын қоғам келбетіне, заман тынысына көз жіберіп, барша адамзатты жақсылық жасауға, пендешілдіктен, тәкаппарлықтан, арамдықтан аулақ болуға, елге қызмет етуге шақырады.

Тебіреніп өз-өзімнен жүремін көп,
Адамға бір жақсылық тілегім кеп.
Жолымда жан сүйсінер із қалмаса –
Ойлаймын не үшін өмір сүремін деп.

Өмірдің қилы-қилы кезеңінде,
Маған той дос арасы, өз елім де.
Пенделік көлеңкесін көлбеңдетсе,
Жалт берем Адамдықты сеземін де [4, 10 б.] -
(«Тебіреніп өз-өзімнен»)

Ақын адам болмысындағы адалдық, адамдық, тазалық, ізгілік, кісілік сынды мінез-құлықтарды ардақтап, сол ізгі қадір-қасиеттерді іңкәрлікпен жырлауға құмар. Қарапайым ақын біреуді асыра мақтап, жағымпаздана жыр арнамайды. Адамдар арасындағы бауырмашылдықты, жақсылықты, сыйластықты, адамгершілікті бар ынтасымен жырлайды. Ақынның өлең-жырларынан өзіндік болмыс-бітімін, қасиеттерін аңғаруға болады.

Н.Әбуталиевтің тынымсыз еңбегі мен мол ізденісі нәтижесінде жарық көрген «Қайран Нарын» повесінде ержүрек Махамбет Өтемісұлы өмірінің сан белестері көрініс табады. Хан жасағымен бірнеше жылдарға ұласқан кескілескен айқастарда, қанды майдандарда қажымаған батыр жүрек аласармас арысы, жолдас серігі Исатай оққа ұшып қаза тапқалы күйзеліске түседі. «Атына әлгіде қонған Махамбет жапан далада жалғыз жортып келе

жатқан. Айнала құла түз. Бірінен соң бірі созылып жатқан жалпақ жон, аударылған астаудай дөңкиген дөңдер. Аракідік жатаған, аракідік шошақ төбелер, бұйрат-бұйрат белдер кездеседі. Осы төбелер жолаушыға алыстан әлдебір сәт аянышты ой әкелгендей. Исатай қаза болған қаралы күн көз алдынан кетпейді. Ел жинаған қолбасшы, атағы асқармен тең батыр енді жанында жоқ. Алыс сулар алабы суалып, дала төсі иімей қуарып қалған секілді. Көтеріліс күйреп, Исатай оққа ұшқалы бері Махамбет сыңарынан айрылған аққудай мұңлы еді, оның қарақан басында мол қайғының ізі бар-ды» [5, 25 б.].

Жаны күйзелген Махамбет батыр зират басына түнеп, жазықсыз қазаға ұшыраған өлілерге мұңын айтады. Атамекенін хан-төренің табанына таптатқысы келмей қан майданға жанын салған, жау оғына өз кеудесін тосқан Исатай батырдың қазасын жеткізеді. Автор одан әрі сыбызғыдай сырлы үн қатқан белгісіз дауысты жолаушы-қонақпен тілдестіреді.

Белгісіз дауыс Махамбеттің соңына Жәңгір хан мен Байғамбет сұлтанның түскенін, сол екеуі басын жұтпай тыным таппайтынын жеткізеді. Қарапайым халық қан шеңгелден құтылып, көзі ашыларын, алайда ол уақытты Махамбеттің көре алмайтынын айтады. Өмірі қысқа болғанымен күллі қазақ халқы Махамбет есімін ұлы ақын, ержүрек тұлға ретінде естен шығармайтынын баяндайды.

Осы оқиғадан кейін үш күннен соң Махамбет бастаған бірнеше сарбаз Теректі құмындағы Жәңгір ханның ең жақын уәзірі Балқы бидің ауылын шабады. Бала біткенді жылатып, ел арасын шулатқан, ауыл ішін азан-қазан қылған шапқыншылық ханға да жетіп Жәңгірдің үрейін қашырып қояды. Махамбет батыр осы жорықтан соң өзінше ой түйеді. Бірде ащы, бірде тұщы өмірдің өткінші екеніне налиды. Жәңгір ханның зымияндығына тірілер ғана емес, өлілердің де риза еместігін жақсы ұғынады. Махамбет батырдың бар ойы Исатай арманын орындау, Исатай кегін қайтару екендігі анық.

Автор одан әрі Махамбеттің соңын аңдыған аттылы топтың шабуылын сипаттайды. «Шаңды көргесін «әлде құғыншы шығар» деп секем алды. Жау десе аруағы қозып, арқасы құрыстайтын әдетіне басты. Астындағы аты да елеңдеп, пысқырынып қалып еді. Ат үстіндегі қайқы қылыш асынған Махамбеттің бет әлпеті өзгеріп, жүзінен ызғар төгілгендей боп қатуланып, тұла бойы шар болаттай шиыршық атып кетті. Сол бір кезде артқы дөңнің күн жақ қабағынан оның жолын аңдыған қарулы әскер тобы да қылаң етті. Жонда жортқан жолбарыстай болған батыр жалма-жан қорамсағын алып, иығындағы садағын ыңғайлап бір бытқылды ойпаңға түсті де, шөптесінді шоқыны паналап жауды тосып жатты. Басқа амал жоқ еді, ала-сала қашуға арланды. Хан-сұлтанның қарулы қолы салдыртып келеді, көріп жатыр» [5, 41 б.].

Жалғызбын деп қамықпаған ержүрек батыр оңтайлы жерден жау тобын көздеп ата бастайды. Соңынан келе жатқан топтан құтылудың амалын ойлаған батыр жанталас күй кешеді. Ақауыз атымен сең соққан Жайыққа тікелей түскен батырдың ісіне таңданған жау артынан жүруге бата алмай, жапа-тармағай оқ атады. Жазушы суреттеуінен Махамбеттің сол сәттегі жанталасы, амалсыз күйі анық көрінеді. Асыл досын жоғалтып қан жұтқан батырдың бұл жолы тай кезінен тақымы үйренген, талай айқастан аман алып шыққан жан серігі атынан айырылуы ауыр соққы болып тиеді. Жаны күйзеліп, қасіретті ызаға булыққан ол егіліп жылайды. Жазушы батырдың жан дүниесінде болып жатқан арпалысты, өкініш-күйінішін шебер жеткізеді.

Ел аралаған Махамбет тағы да айтулы оқиғаға тап келеді. Нағашысы Сатыбалдының үйінде жайбарақат ұйықтап жатқан батырды қарулы әскер қоршауға алады. Бұл Өзбекқалиев сұлтан мен Орынбор губернаторының жасауылы Голиков бастаған елу шақты қарулы әскердің қарақшылық әрекеті болатын. Әскер киімін кигендер Махамбет Өтемісұлын тұтқындауға Орынбор губернаторының үкімі бойынша келгендерін баяндайды. Әскерлер қарсыласқан батырдың қолын кісендеп, байлап әкетуге оқталған сәтте «Махамбетсіз Жайық

жоқ, Махамбетсіз Нарын жоқ» деп толқындай күрсініп, аруанадай күңіренген халық үні естіледі.

Қара халықты талап, қара қайғыны төндірген Баймағамбет сұлтанның алдына әкелгенде де Махамбет міз бақпайды, қатулы қабағымен бет қаратпайды. Махамбет пен Исатайдың мақсат-мұратын, жоспарлы әрекеттерін білмекші болған сұлтанның сауалы тұспа-тұс келгендей, батыр іштей қайнаған ыза-кегін сыртқа шығарып, кеудесі дариядай тасиды. Батырлық пен ақындықтың қос тізгінін қатар ұстаған ер Махамбет еш қаймықпастан көсіле сөйлейді.

«...Өздеріңдей хандардың,
Қарны жуан билердің,
Атандай даусын ақыртып,
Лауазымын көкке шақыртып,
Сұлтанын суға сұлатып.
Ханшасын қақпа алдында жылатып,
Ернін еттей тесісіп,
Кеңірдегін кесісіп,
Жыраға басын түсіріп,
Жылғадан қанын ағызып,
Басын кессем деп едім!..

Ақынның айтқаны сөз емес, алдындағы ата жауына атқан сұр мергеннің оғы еді. Халық лағнаты шынында да кеудеден оқ боп атылды. Ол тиген жерін қиып түсер қылыштай, шауып түсер шар балтадай еді. Қазақта ер болса Махамбеттей-ақ болар... Екі жақты бір тілді адам онымен таласпайтын» [5, 102 б.].

Ыза-кекке толы үнінен жорықта жан жолдасынан, тұлпарынан айырылған ердің өксігі, жерінен безген ата жұртының зарлы күйі сезілетін батырдың қаһарлы сөзі Баймағамбет сұлтанды оқ тиген көкжалдай сенделтіп, жермен-жексен қылады.

Жазушы шығармада Махамбеттің бойынан көрінетін басты үш қасиетті нақты көрсетеді: тұла бойына біткен өжеттік пен өр мінез, жолбарыс жүрек, ақындық үскір тіл. Ол тар қапастағы күндерін де бос өткізбейді. Талауда қалған жұртын ойлап алаң болған көңілі батырдың ішкі толғанысын жыр ғып шығарады.

Шығарма соңында Махамбеттің Айғанша атты асыл жарынан қалған ұлы Нұрсұлтанмен тілдесуі көрініс табады. Әкесінің рухты жырларын жатқа білетін баланың бойынан да ержүректік, батылдық, қайсарлық, хан-сұлтанға өшпенділік байқалып тұрады. Жаңгір хан қаза тапса да, өштескен жауларының әлі де тірі екендігін білетін Махамбет, ел-жұрты оқ тескен кеудесін көрсе де, дұшпанға жалынған жүзін көрмейтінін айтады.

Жазушы Н.Әбуталиевтің «Өттің дүние» повесі – «Қайран Нарын» шығармасымен сабақтас туынды. Бұл шығармаға батыр Махамбет Өтемісұлының қайғылы қазаға ұшырар алдындағы жорықтары, ерлік істері арқау болған.

Шығарманың басталуындағы автор суреттеуінде табиғат пен адамның ішкі жай-күйі үндесіп жатыр. Күз айы басталғалы суық жел соққысынан берекесі қашқан айнала, тұнжыраған табиғат жер үйде тобылғы сапты қамшысының сабына иегін сүйеп көңілсіз отырған батырдың жан дүниесімен тілдескендей әсер қалдырады. Қиялға беріліп, өткеніне өкінішін білдіріп тұнжыраған Махамбетті қинаған мұң-зары да белгілі секілді.

Қарулы жігіттер Сатай, Жұмыр, Қылышты Баймағамбеттің ордасын барлап-бақылауға аттандырып, Тәни бастаған бір топ жігітті аға сұлтанның ордасына Орынбордан келетін қара жолды бақылауға жібереді. Орданы барлаудағы жігіттер Жаңгір ханға, одан кейін Баймағамбет сұлтанға қызмет еткен, барымтаны кәсіп қылған Байшағырды ұстайды. Исатай, Махамбеттер Жайық асып кеткенде Жаңгірдің бұйрығымен Исатайдың ауылын шауып, әйелі Несібеліні бала-шағасымен шырқыратып ханның алдына алып барған шапқыншы да осы

Байшағыр болатын. Исатай үшін бұл қара жауыздың басын шапқызған Махамбеттің ендігі ойы Баймағамбет сұлтанның ауылын шабу еді. ««Ақ білектің күші, ақ найзаның ұшы» деп бәрінің тас-түйін болып келген байлам-бәтуасы осы еді. Шай қайнатым уақыттан кейін сарбаздар екі топ болып, дүр көтеріліп Баймағамбеттің ауылын шабуға аттанды. Тәни бастаған топ абыр-сабыр болып жатқан ауылдың желке тұсынан, Жұмыр мен Сатайдан кейін шабуылдайды. Қасына Қылыш пен Ордабайды тағы екі-үш сарбаз ерткен Махамбет өзі әлгі екі топтың қақ ортасынан келіп тұтқиылдан шабады. Борсық төбеден аттанғандағы келісім-уәде осы еді» [6, 108 б.].

Сұлтанның ауылын ойрандап, найзагер батыры Божбанды, кенже қызы Зәузатты қолға түсіріп, тоқалы табын қызын жүгімен жетектеп ішкі Нарынға жол тартады. Қара халықтың қамын ойлаған батырдың хан-сұлтандарға, ел ішіне іріткі салған уәзірлер мен көпестерге наразылығы жанын жай таптырмайды.

Повесть Махамбеттің қазасымен аяқталады. Махамбетпен жүзбе-жүз соғыспақ түгілі, тіптен сұсты жүзіне тіке қарауға батпайтын ханның жансыздары батырдың ұйықтап жатқан сәтінде желкесінен қылышпен шауып асыл ерді мерт қылады.

Жазушының «Қайран Нарын», «Өттің дүние» туындылары мәңгілік тарихи тұлғалар Махамбет пен Исатайдың ерлік істерін дәріптеп қана қоймайды, келер ұрпақты адал достыққа, отансүйгіштікке, батылдыққа, қайсарлыққа, шешендікке тәрбиелейді. Махамбеттің Исатайды дәріптеуінің негізгі түйіні – «қызғыштай болған есіл ердің» кегін қайтару ғана емес, сол ерлікті патшаға, хан-сұлтандарға, билерге қарсы, еңбекші бұқараны жауыздардың қанды шеңгелінен босату үшін жұмсауында екендігі анық.

Қорыта айтсақ, Нәбиден Әбуталиев – түрлі жанрда ізденіп, қазақ әдебиеті тарихында мол мұра қалдырған талантты тұлға. Туындылары бір бағытта, белгілі бір тақырып аясында ғана шектеліп қалмайды. Шығармаларында заман, қоғам, адам болмысының иірімдерін уақыт тынысымен астастыра отырып қамтуға тырысады.

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Auxiliary verbs in English

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Summary

Auxiliary verbs, also known as "helping verbs," are an essential part of English grammar. They are used to support the main verb in a sentence, conveying additional information such as tense, mood, voice, or aspect. Common auxiliary verbs in English include "be," "have," and "do." For example:

- **Be:** am, is, are, was, were, being, been
- **Have:** have, has, had, having
- **Do:** do, does, did

These auxiliaries are combined with the main verb to create different tenses (e.g., present, past, future), forms (e.g., continuous, perfect), and questions/negations.

Key words: auxiliary, do, does, did, have, verb

"Be " auxiliary verb

The verb "be" is one of the primary auxiliary verbs in English. It is used to form various tenses, passive voice, and other grammatical constructions. Here are the different forms of the verb "be" as auxiliary verbs:

1. **Present Simple:**
   - I am
   - You are
   - He/she/it is
   - We are
   - They are
2. **Past Simple:**
   - I was
   - You were
   - He/she/it was
   - We were
   - They were
3. **Present Continuous:**
   - I am being
   - You are being
   - He/she/it is being
   - We are being
   - They are being
4. **Past Continuous:**
   - I was being
   - You were being
   - He/she/it was being
   - We were being
   - They were being
5. **Present Perfect:**
   - I have been
   - You have been

- He/she/it has been
- We have been
- They have been

6. Past Perfect:
   - I had been
   - You had been
   - He/she/it had been
   - We had been
   - They had been
7. Future Simple:
   - I will be
   - You will be
   - He/she/it will be
   - We will be
   - They will be

These forms of "be" as auxiliary verbs help convey different aspects of time, continuity, and passive voice in English sentences.

"Have" auxiliary verb

The verb "have" is another essential auxiliary verb in English. It is used to form various tenses, including the present perfect and past perfect, as well as other grammatical structures. Here are the different forms of the verb "have" as auxiliary verbs:

1. Present Simple:
   - I have
   - You have
   - He/she/it has
   - We have
   - They have
2. Past Simple:
   - I had
   - You had
   - He/she/it had
   - We had
   - They had
3. Present Perfect:
   - I have had
   - You have had
   - He/she/it has had
   - We have had
   - They have had
4. Past Perfect:
   - I had had
   - You had had
   - He/she/it had had
   - We had had
   - They had had

These forms of "have" as auxiliary verbs are used to indicate possession, create perfect tenses, and express various nuances related to time and completion.

"Do" auxiliary verb

The verb "do" is another crucial auxiliary verb in English. It is used to form questions, negatives, and emphatic statements, as well as in certain other constructions. Here are the different forms of the verb "do" as auxiliary verbs:

1. Present Simple (for questions and negatives):
   - Do I/we/you/they?
   - Does he/she/it?
2. Past Simple (for questions and negatives):
   - Did I/we/you/they/he/she/it?
3. Emphatic Statements:
   - I do like it.
   - They did finish their work.
4. Negatives (without the main verb):
   - I do not (don't) like it.
   - They did not (didn't) finish their work.

The auxiliary verb "do" is used to add emphasis, form questions and negatives, and clarify meaning in sentences.

"Modal" auxiliary verbs

Modal auxiliary verbs are another important category of auxiliary verbs in English. They are used to indicate possibility, necessity, permission, ability, and other attitudes or modalities. Here are the most common modal auxiliary verbs:

1. Can: Indicates ability, possibility, or permission.
   - I can swim.
   - Can I borrow your pen?
2. Could: Similar to "can," but often used in a more polite or conditional context.
   - I could swim when I was younger.
   - Could you help me, please?
3. May: Indicates possibility or permission.
   - It may rain later.
   - May I come in?
4. Might: Similar to "may," often used to express a lower degree of possibility or a tentative suggestion.
   - She might join us for dinner.
   - You might want to consider that option.
5. Must: Indicates necessity or strong obligation.
   - I must finish this report.
   - You must be careful when crossing the street.
6. Should: Indicates advice, recommendation, or obligation.
   - You should eat more vegetables.
   - I should call my parents.
7. Ought to: Similar to "should," often used to express a moral obligation or expectation.
   - You ought to apologize for your mistake.
8. Shall: Often used to indicate future action, especially in formal or British English.
   - We shall meet again.
   - Shall I open the window?
9. Will: Indicates future action or willingness.
   - I will help you with your project.
   - Will you attend the meeting?
10. Would: Often used to express polite requests, offers, or conditional statements.

- Would you like some coffee?
- If I had more time, I would travel.

Modal auxiliary verbs are versatile and are used to convey different shades of meaning in various contexts.

Using auxiliary verbs

Auxiliary verbs, also known as helping verbs, are used to add more meaning to the main verb in a sentence. They can express tense, mood, voice, or aspect. Common auxiliary verbs include "be," "have," and "do." Here are some examples of auxiliary verbs in sentences:

1. Tense:
   - She is reading a book.
   - They have finished their homework.
   - I will go to the party.
2. Mood:
   - If you can, please help me.
   - He might come later.
3. Voice:
   - The cake was baked by my sister.
   - The report has been submitted.
4. Aspect:
   - She is studying for her exams.
   - He has been working all day.

Remember that auxiliary verbs work in conjunction with the main verb to convey specific meanings in a sentence.

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Agricultural Sciences

КАЧЕСТВЕННОЕ СОСТОЯНИЕ СЕЛЬСКОХОЗЯЙСТВЕННЫХ ЗЕМЕЛЬ РЕСПУБЛИКИ КАЗАХСТАН

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Аннотация.

В качестве цели исследования автор раскрывает проблемы совершенствования качественного учета земель сельскохозяйственного назначения. В статье рассмотрены состояние сельхозугодий, проблемы управления земельными ресурсами, в частности в сфере сельского хозяйства. Выявлены упущения в земельном законодательстве в отношении классификации сельхозземель и их характеристик. Показаны преимущества космического мониторинга земельных угодий. Отсутствие экономических критериев приводит к малоэффективному планированию, а в дальнейшем – нерациональной эксплуатации земельных площадей. Установлено, что сельскохозяйственные угодья, выбывшие из оборота не эффективны в условиях рыночной экономики, поэтому необходимы меры по вовлечению их в оборот. Зависимость большинства отраслей от качества земли обуславливает важность выбора методики оценки качественного состояния угодий. Для эффективного использования сельхозугодий следует стимулировать добросовестных сельскохозяйственных товаропроизводителей, это, в свою очередь, будет способствовать увеличению пахотных площадей, сенокосов, пастбищ, многолетних насаждений. Обобщены методики соотнесения сельскохозяйственных земель к конкретному виду угодий сельскохозяйственного назначения в зарубежных странах и приведены примеры их улучшения с учетом региональных особенностей. Разработаны рекомендации по усовершенствованию качественного учета земель сельскохозяйственного назначения на примере ГИС-технологий.

Введение. Земля является главным ресурсом экономики. Ее ценность как фактора производства и объекта недвижимости придает земле особый статус, но и усложняет процесс управления ею. Правовой статус земель сельскохозяйственного назначения менялся в зависимости от политического строя и ориентированности экономики на развитие какой-либо отрасли производства.

Земельный кодекс Республики Казахстан занимает взвешенную позицию в вопросах соотношения прав государственной и частной собственности на землю сельскохозяйственного назначения и разрешает товаропроизводителю свободно выбрать форму собственности, оценив свои возможности.

В настоящее время сельское хозяйство – одно из приоритетных направлений экономики страны. Однако ситуация с земельным оборотом, а именно наличие неиспользуемых площадей, которые составляют больше трети размеров страны, заставляет задуматься об эффективности модели управления землей, об оптимальности выбора направления экономики. В связи с преобладанием на территории республики аридных пастбищ и полупустынной зоны, целесообразным было бы развитие животноводства. Для этого нужно пересмотреть земельную политику, ориентированную на выращивание

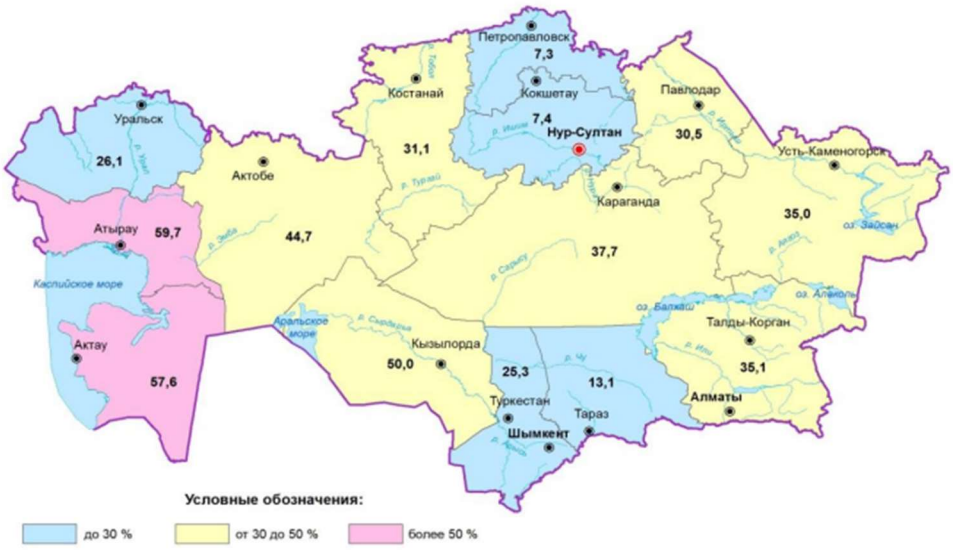
монокультуры, и повысить ценность кормовых угодий. В данной статье описаны проблемы менеджмента сельскохозяйственных угодий и возможные пути их разрешения.

Материалы и методы исследования. Вопрос качественного освоения земель сельскохозяйственных угодий на сегодняшний день является особо актуальным, так как их огромные площади в РК не используются. Кроме того, необходимо отметить, что в статистических документах не всегда отражены те качественные показатели используемых сельскохозяйственных земель, которые имеются фактически.

При проведении исследований применялись следующие методы: монографический – исследование теории определения качественного состояния земель сельскохозяйственных угодий, выявление недостатков в этой области, изучение опыта зарубежных стран; аналитический – анализ данных, полученных в результате исследования, абстрактно-логический – разработка предложений и принятие решений; статистический – сбор данных качественного состояния сельскохозяйственных угодий и другой необходимой информации.

В качестве исходных материалов исследования были использованы отчеты уполномоченных органов в сфере управления земельными ресурсами, государственные программы развития сельского хозяйства, данные Комитета по статистике МНЭ РК, Министерства сельского хозяйства, сведения официальной статистики, Продовольственной и Сельскохозяйственной Организации Объединенных Наций.

Результаты и их обсуждение. Рациональное и эффективное использование важнейшего из природных ресурсов – земли всегда было и остается актуальной темой. Оно требует постоянно действующей системы контроля и слежения за качественным и количественным состоянием земельного фонда и его использованием, то есть необходим мониторинг земель. Казахстан занимает 9 место в мире по площади. Однако до сих пор имеются огромные площади неиспользуемых земель (рисунок 1).



Примечание: источник – Сводный аналитический отчет о состоянии и использовании земель за 2019г.

Рисунок 1 – Удельный вес земель запаса по состоянию на 1.01.2020 г.

Как видно из рисунка 1, неиспользуемые земли имеются во всех областях, но наибольшие их площади сосредоточены в Карагандинской – 16,1 млн га, или 16,8% земель этой категории в республике, Актюбинской – 13,4 млн га (14,0%), Кызылординской – 11,3 млн га (11,8%), Восточно-Казахстанской – 9,9 млн га (10,4%), Мангистауской – 9,5 млн га (10,0%), Алматинской – 7,8 млн га (8,2%), Атырауской – 7,1 млн га (7,4%), Костанайской – 6,1 млн га

(6,4%), Западно-Казахстанской – 4,0 млн га (4,1%) и Павлодарской – 3,8 млн га (4,0%) областях. Данная категория земель занимает 36,4% земельного фонда республики. В составе земель запаса преобладают сельскохозяйственные угодья – 78,3 млн га (81,9%), в том числе 51,7 тыс. га пашни, 2 011,3 тыс. га залежи, 2 146,0 тыс. га сенокосов и 74 119,9 тыс. га пастбищ [1].

Агропромышленный комплекс Казахстана играет ключевую роль в экономике страны. Развитие АПК является гарантом устойчивого развития страны, увеличения производительности труда и продовольственной безопасности. Государственная программа развития агропромышленного комплекса Республики Казахстан на 2017- 2021 годы ориентирована на повышение эффективности использования земельных ресурсов, поскольку земля является главном фактором производства и без рационального использования сельскохозяйственных угодий аграрная политика неосуществима.

Анализ программы показывает, в растениеводческой отрасли имеются следующие проблемы, напрямую связанные с нерациональным использованием земельных ресурсов: недостаточные темпы диверсификации посевных площадей сельскохозяйственных культур; нерациональное использование земель сельскохозяйственного назначения; несоблюдение рекомендуемых научно-обоснованных севооборотов. Проблемы вопроса использования земель находят отражение и в состоянии животноводческой отрасли: низкая продуктивность сельскохозяйственных животных и птицы на фоне слабой обеспеченности кормовой базой; недостаточность посевных площадей под кормовыми и фуражными культурами; нерациональное использование пастбищных угодий [2].

В странах с менее благоприятным климатом и почвенным составом для сельского хозяйства в прогнозировании урожая и планировании использования земель применяется технологически и научно обоснованный подход во избежание потерь сельскохозяйственного производства. Опыт Иордании и Марокко подтверждает эффективность использования ГИС-технологий для определения пригодности земли для ведения сельского хозяйства. Первым этапом оценки пригодности земель для сельского хозяйства является комплексная оценка пригодности с учетом количества осадков, температуры, процента уклона, типов почвы и пространственного распределения колодцев с подземными водами.

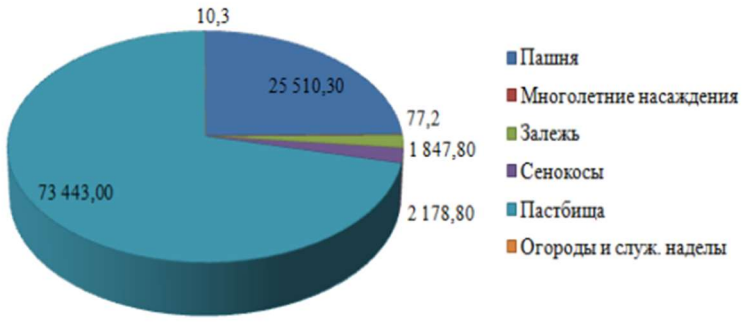
Эти параметры используются в пространственном анализе, который может моделировать пригодность земли. Планирование, связанное с каждым типом землепользования, основано на ArcGIS, и оно включается в информацию об анализе пригодности земли. На его основе сельскохозяйственные угодья подразделяются на четыре класса: высокая пригодность, умеренная пригодность, минимальная пригодность и непригодность (таблица 1). Что касается богарного земледелия, то площадь пригодных земель определяется физическими факторами, в основном климатическими условиями, количеством осадков, температурой, уклоном и типом почв, в то время как пригодность для орошаемых культур определяется в зависимости от доступности и группировки ресурсов подземных вод [3, 4].

Таблица 1 – Классы пригодности земель под сельское хозяйство, сформированные на основе ГИС-технологий

Класс пригодности	Описание ограничения в использовании земли
Высокая пригодность	ограничения отсутствуют либо незначительные
Умеренная пригодность	ограничения, которые в совокупности умеренно осложняют длительное пользование землей
Минимальная пригодность	ограничения, которые в совокупности осложняют длительное пользование землей
Непригодность	Земля с ограничениями, которые могут быть со временем устранены, но это не может быть исправлено существующими знаниями и по приемлемой цене
Примечание: источники [см.3, 4]	

ФАО (Продовольственная и Сельскохозяйственная Организация Объединенных Наций) определяет сельскохозяйственную пригодность земель как способность обеспечить потенциально достижимую урожайность для корзины сельскохозяйственных культур. По данным ФАО, потребность в оценках земель, основанных только на их природном потенциале, снизилась, а более важными стали оценки возможностей управления (технологий и подходов) с учетом характера землепользования и социально-экономических факторов (методики, вложения, затраты и результаты), как это делается, например, в «Оценке степени деградации земель в засушливых районах» (LADA) и во «Всемирном обзоре почвосберегающих и водосберегающих подходов и технологий» (WOCAT) [5]. Чтобы вовлечь неиспользуемые земли в сельскохозяйственный оборот, на наш взгляд, в первую очередь, необходимо внести изменения и дополнения в классификацию отнесения сельхозугодий к определенному виду угодья. В Земельном Кодексе РК от 20 июня 2003 года не представлены требования к экономическим показателям сельскохозяйственных угодий, тогда как критерии пригодности земли к той или иной категории должны учитывать урожайность, стандартизацию агропроизводственных и почвенно-мелиоративных характеристик земель, растительность, уровень загрязненности токсичными веществами и т.д. [6].

По состоянию на 1.01.2020г. площадь земель сельскохозяйственного назначения в структуре земельного фонда РК составляет 106,4 млн га или 40,5% используемых земель. Из них наибольший удельный вес занимают пастбища – 73,4 млн га. (рисунок 2). Однако этот показатель вовсе не означает продовольственную безопасность страны и обеспеченность сельского хозяйства земельными ресурсами.



Примечание: Сводный аналитический отчет о состоянии и использовании земель за 2019г.
Рисунок 2 – Структура сельскохозяйственных угодий в составе земель сельскохозяйственного назначения по состоянию на 1 января 2020 года, тыс.га

В категории земель запаса также преобладают пастбища. Как известно, состав угодий определяет специализацию. Наличие огромных площадей кормовых угодий означает то, что необходимо развивать животноводство. Казахстанские аграрии с естественных старовозрастных сенокосов получают в среднем максимум 5-7 ц/га урожая для заготовки грубого корма, однако, при этом должным образом не принимается во внимание качество кормовой массы. При кормлении животных важна сбалансированность рациона, которая зависит от правильного выбора кормовой культуры и сортов многолетних трав, сроков заготовки этих кормов [7].

С целью рационального использования пастбищ разработан и утвержден Закон РК «О пастбищах» от 20 февраля 2017 года, согласно которому кормоемкостью пастбищ является продуктивность пастбищного травостоя на единицу площади, а нормы нагрузки по видам сельскохозяйственных животных на общую площадь пастбищ, дифференцированных по регионам. С учетом выпаса сельскохозяйственных животных без нанесения ущерба ботаническому составу пастбищного травостоя и его продуктивности определяют предельно допустимые нормы нагрузки на общую площадь пастбищ [8]. Истинную картину состояния угодий можно отследить с помощью космического мониторинга земель. Его значимость возрастает с принятием Государственной программы «Цифровой Казахстан», направленной на развитие экономики и улучшение качества жизни населения республики за счет внедрения цифровых технологий [9]. Одной из задач программы является цифровизация сельского хозяйства, другая задача «государство – гражданам» предусматривает мероприятия по созданию и внедрению информационной системы Единого государственного кадастра недвижимости путем консолидации информационных систем (Автоматизированная информационная система государственного земельного кадастра, Государственная база данных «Регистр недвижимости»).

Особая роль цифровизации заключается в том, что на сегодняшний день в сельском хозяйстве Казахстана доля сельхозтоваропроизводителей, применяющих цифровые технологии при производстве сельскохозяйственной продукции, незначительна. Это негативно сказывается на росте урожайности сельскохозяйственных культур и сокращении затрат при ведении сельского хозяйства. Несмотря на постоянную работу МСХ РК сегодня информационные сервисы трудно назвать развитыми из-за отсутствия единой структуры, интеграции и покрытия всего цикла процессов во взаимодействии субъектов рынка и государства [10].

Проведение космического мониторинга земель позволяет создавать ГИС-платформы посевных площадей сельскохозяйственных культур на основе космических снимков, определить засоренность посевов сельскохозяйственных культур, их видовую урожайность на основе наземных наблюдений и др. [11].

Кроме того, можно выявлять неиспользуемые площади сельскохозяйственных угодий, а также определять их качество. Анализ показал, что за годы реформы качество сельскохозяйственных угодий заметно снизилось. При возврате в сельскохозяйственный оборот земель запаса важно определить – в какой вид угодий их отнести.

Для определения пригодности земель сначала необходимо выбрать методику оценки их качеств. Так в методе, предложенным А.А. Варламовым и другими учеными, при оценке качества земель оцениваются отдельные характеристики: такие как пригодность земель под определенные нужды и функции. В процессе такой оценки учитывается качество земель посредством закрепления и ранжирования показателей качества, численные показатели получают смысловую интерпретацию и оцениваются по баллам. В итоге получается 100-балльная шкала, отражающая качество земель (таблица 2). Данный метод оценки позволяет учесть все особенности земли как функциональные, так и физические [12].

Таблица 2 – Балльная оценка качества земель

Земли по их качеству	Балльная оценка, баллы
Особо ценные	81-100
Ценные	61-80
Среднего качества	41-60
Низкого качества	40-21
Неудобья (непригодные)	1-20
Примечание: источники [см.12]	

Но эта методика игнорирует такие факторы, как климат и почвенная зональность регионов (неоднородность состава почв), выраженная в баллах бонитета. Также одним из важных критериев, не учтенных в данной методике, является урожайность – соотношение урожая в центнерах и площади посевов. Лидерами по площади пашни в составе земель сельскохозяйственного назначения числятся Костанайская (6,0 млн га), Акмолинская (5,9 млн га) и Северо-Казахстанская (4,9 млн га) области. Высокая урожайность этих земель обусловлена благоприятным химическим составом почвы и сравнительно высоким содержанием гумуса, достаточным уровнем пахотопригодности земли.

На примере одной только Акмолинской области можно убедиться в неоднородности территории: баллы бонитета пашни значительно варьируются (23- Ерейментауский район, 57-Зерендинский район). Предлагается внести изменения в методику с применением ГИС-технологий, а для уточнения исходных данных также использовать наземные снимки исследуемой территории. С учетом упомянутых корректировок нами поставлена цель провести исследования в 2020-2021гг. и разработать новую методику соотнесения земель к тому или иному виду сельскохозяйственных угодий.

В увеличении сельскохозяйственного товаропроизводства наиболее продуктивным является вовлечение залежных земель из категорий земель запаса и сельскохозяйственного назначения в сельскохозяйственный оборот. Наряду с этим рациональным будет выявление неиспользуемой земли, осуществление юридически корректного прекращения прав на них и обеспечение перехода земель к эффективному собственнику или арендатору.

Впрочем, на практике процесс изъятия земель зачастую затягивается. Чтобы доказать факт нерационального использования сельскохозяйственных земель, необходимо провести ряд проверок, подача иска об изъятии земли возможна только на третий год. «Расставаться» со своей землей никто не желает добровольно, чаще всего землепользователи подают апелляции на иски, оспаривают их. Следовательно, сроки изъятия неиспользуемых земель задерживаются. Ввиду этого бесхозные земельные участки могут годами не использоваться, простаивают, выбывают из сельскохозяйственного оборота, деградируют, зарастают сорной растительностью. Позднее их восстановление для использования под посев сельскохозяйственных культур будет осложненным.

Таким образом, для решения задач цифровизации сельского хозяйства и оптимизации процесса сельскохозяйственного товаропроизводства незаменимы ГИС-технологии. С их применением можно отследить целевое использование сельскохозяйственных угодий, определить реальную структуру посевных площадей, выявить процессы деградации земель, а также обнаружить неучтенные посевные площади. Но самыми главными преимуществами данных технологий являются мониторинг фактического использования, состояния сельскохозяйственных угодий и картографирование неиспользуемых сельскохозяйственных угодий. Космоснимки являются важным, объективным источником информации о деградации почв. Даже в слабо расчлененных равнинных агроландшафтах материалы аэрокосмических съемок дают возможность фиксировать малозаметные проявления смыва, локализовать ареалы активизации

процессов деградации, дефляции и засоления (заболачивания) пашни, что обеспечивает своевременное выявление изменений состояния земель, тем самым предупреждает нерациональное использование и влияние негативных факторов.

В век высоких технологий урожайность земель зависит не только от физических характеристик земли. Положительно влияют на доходность угодий новые методы и технологии, применяемые в производстве. Поэтому увеличение площадей сельскохозяйственных угодий за счет наращивания пахотных площадей, сенокосов, пастбищ, многолетних насаждений привлекает новых сельхозтоваропроизводителей. Это является вполне выполнимой задачей. Более того, намеченные диверсификация сельского хозяйства и развитие животноводства повышают ценность кормовых угодий и призывают отойти от выращивания монокультуры.

Заключение

1. Несмотря на приоритетность сельского хозяйства в нашей стране все еще имеются огромные территории пустующих земель, которые когда-то активно использовались. Для вовлечения таких земель в сельскохозяйственный оборот необходимо пересмотреть земельное законодательство и внедрить классификацию пригодности сельскохозяйственных угодий на основе ГИС-технологий.

2. Зарубежный опыт доказывает эффективность применения ГИС-технологий в управлении земельными ресурсами, а именно ценность космического мониторинга для выявления неиспользуемых земель и оценки их качественного состояния.

3. В условиях ориентированности экономики на рынок, нацеленность сельского хозяйства на животноводство при казахстанских природных условиях наиболее целесообразно. Это, свою очередь, требует улучшения качественного состояния кормовых угодий – пастбищ, сенокосов и наращивания их объемов.

4. Ситуация, сложившаяся в земельном обороте сельского хозяйства и товарообеспеченности населения отечественной продукцией, обуславливает необходимость создания новой методики соотнесения угодий к конкретному виду сельскохозяйственных угодий.

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NUMBER OF LEAVES IN FODDER BEET (BETA VULGARIS VAR. CRASSA MANSF) AFTER THE FIRST SPRAYING OF THE NANO-GRO HIGHT SUBSTANCE

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Abstract. The article talks about the effect of different norms and ratios of Nano-Gro physiologically active growth substance on the number of leaves from the biometric indicators of fodder beet against the background of mineral and organic fertilizers in Absheron region in 2014-2016 after the first spraying. During the research, in the comparison of the highest results of the first spraying of the leaf mass with Nano-Gro, in 2015, the number of leaves was 75.7 in the $N_{160}P_{90}K_{210}$ + 20 tons of manure option + 4 granules, which is an increase of 113.6% compared to the control. , compared to the $N_{160}P_{90}$ K_{210}+20 t manure option, it is written as 19.2%.

Key words: Fodder beet, leaf mass, number of leaves, mineral fertilizer, manure, growth factor, Nano-Gro

Introduction. The beet plant is considered one of the oldest plants in the world. According to known sources, this valuable fodder plant has been studied by many scientists since the middle of the 18th century, and its historical and agrobiological characteristics have been studied. Beet, like grain crops, cabbage, onions, garlic and potatoes, has been part of our agricultural culture since ancient times. Starting from the 1st millennium AD, ancient people in Mesopotamia used this plant as a food. Cultivation of beet root was started at the beginning of the 18th century. Starting from the 13th-14th centuries, the root of the fruit was used as food in the kitchen in Western Europe, Northern Italy, Switzerland, and the Rhineland regions of Germany [5,9,10,11].

Currently, the wild forms of beet grow on the coasts of the Atlantic, Black, Mediterranean and Caspian seas of Africa and Europe, in Central and Eastern Asia, in the South Caucasus, in the Zuvand mountains of the Talish zone of Azerbaijan.

Archaeological excavations show that 1500-2000 years ago, people living in the Tigris and Euphrates river valleys began to cultivate this plant, and during the period when the Islamic religion was widely established, it was carried to Byzantium, the South Caucasus, Iran, Bukhara, Ferghana, Eastern Siberia, India, China and Japan. . According to written sources, after the 16th century, fodder beet was transported from the Mediterranean Sea to Germany, Italy and the United States [4,6,8,13,14].

Fodder beet is the most valuable fodder plant for providing juicy fodder to livestock. Fodder beetroots have different shapes and weight from 1 kg to 10 kg. Fodder beet is cultivated in all regions of Azerbaijan and in different soil and climate conditions. Even pre-winter planting of beetroot in the lowland regions has a special economic importance, as in fodder beetroot grown

in the western regions of the country, more dry matter, raw ash, protein and sugar are collected [15,16,17].

In the flora of Azerbaijan, beetroot grows wild in the Kura-Araz plain, the Zuvand mountains of the Talish zone, and the shores of the Caspian Sea. It can be said that fodder beet has been cultivated in backyards in all regions of Azerbaijan since ancient times, and its leaves are used in the preparation of many dishes in our national cuisine [3,10].

The purpose of the study. In 2014-2016, taking into account that it is an irreplaceable fodder plant for the production of meat and dairy products and for feeding cattle in our republic, the research was conducted by studying the effect of the physiologically active Nano-Gro size substance on the productivity and product quality of fodder beet against the background of mineral and organic fertilizers under the irrigation conditions of Absheron. The main goal of our research was to offer the results of its work to private farms.

Location and soil conditions of the study. The study was carried out in 2014-2016 in Ashagi Guzdek settlement, Absheron region, on gray-brown soils at the Auxiliary Experimental Farm of the Agricultural Research Institute (Forage). The field to be experimented with has been cleared of predecessors, before sowing, from 5 places of the field in the diagonal direction 0-20; Soil samples were taken from the depth of 20-40, 40-60 and 60-80 cm and analyzed in the Laboratory of Soil and Plant Analysis of the Scientific-Research Agricultural Institute. The amount of pH, carbonation, total humus, total nitrogen, available phosphorus and potassium was determined in the collected soil samples.

In the plow layer of the study area, pH 8.3-8.6, total humus content 1.31-0.86%, total nitrogen 0.9-0.6%, active phosphorus 12.7-1.7 mg/kg, variable and potassium is 207-179 mg/kg. Poor supply of the region's soils with basic nutrients makes it necessary to use organic and mineral fertilizers.

The studied area has a subtropical climate with hot and dry summers and mild winters. The number of hours of sunny days here is 2200-2400 hours/year, the number of sunny days is 230 days. The average annual air temperature is 10-14°C. The average annual amount of atmospheric precipitation is 150-220 mm, mainly in the spring and autumn months of the year. The amount of active temperature is 4560°C. As the territory of the zone is mainly located around the Caspian Sea, the average annual relative humidity of the air is 70-80% [17].

The object and material of the study. The object of our research work was fodder beet "Semi-sugar white beet" variety, ammonium salt from mineral fertilizers, simple superphosphate, potassium sulfate, cattle manure as organic fertilizer and physiologically active Nano-Gro size substance.

During the years of research, we used N_{60}, N_{160} from ammonium salt (34%), P45, P90 from simple superphosphate (18%) and K_{90} from potassium sulfate (47%) according to the active substance as a mineral fertilizer that we used as a background in the experimental field every year. , K_{210} and 20 t of decomposed cattle manure containing N-0.5%, P_2O_5-0.25% and K_2O-0.6% were used as organic fertilizers.

The precision and accuracy of field experiments is highly dependent on its repeatability. Taking this into account, in the research experiment of fodder beet, each option was repeated 4 times, with a protection strip of 1 m between repetitions, 30 m2 x 6 options x 4 repetitions were carried out in 2 schemes on 2112 m2 area. In field experiments, the number of plants per hectare was 47.6 thousand in the 70 x 30 cm sowing scheme. In the years of our research, the sowing operation in the Absheron region was carried out by the row tape method according to the different weather conditions and the degree of soil maturity.

World experience shows that nutrients and trace elements are not applied to plants alone, but against the background of fertilizers. The purpose of our research work was not to study the optimal fertilizer rates, but to determine the effect of the physiologically active Nano-Gro height

substance on the height, development, productivity, product quality of fodder beet against the background of mineral and organic fertilizers.

Therefore, in our research work, the effect of physiologically active Nano-Gro height substance was determined against the background of two different $N_{60}P_{45}K_{90}$ + manure 20t (Background-1) and $N_{160}P_{90}K_{210}$ + manure 20t (Background-2) fertilizer norms. Before sowing with Nano-Gro growth material, the seeds were soaked and the green mass was sprayed 3 times during the vegetation period.

Before sowing, 2 and 4 pieces of Nano-Gro granules were dissolved in 1 liter of water in the bags prepared from the required amount of seeds, and the seeds were soaked in a separate plastic container for 30 and 60 seconds and sown.

2 granules (0.001 kg/ha) and 4 granules (0.002 kg/ha) were applied three times during the growing season by leaf spraying in 200 liters of water.

1. Control - the seeds were soaked in ordinary water and sprinkled.

2. The seed is soaked in a solution of Nano-Gro dissolved in water at the rate of 2 grains (0.001kg/ha) for 30 seconds:

3. The seed was soaked in a solution of Nano-Gro dissolved in water at the rate of 4 grains (0.002 kg/ha) for 30 seconds:

4. The seed was soaked in a solution of Nano-Gro dissolved in water at the rate of 2 grains (0.001kg/ha) for 60 seconds:

5. The seed was soaked in a solution of Nano-Gro dissolved in water at the rate of 4 grains (0.002 kg/ha) for 60 seconds and sprinkled.

Table 1

The sowing and spraying scheme of the experiment was as follows

Seed soaking and sowing scheme with Nano-Gro in the experimental field	
I scheme	II scheme
1. Control	1. Control
2. $N_{60}P_{45}K_{90}$ + 20t manure (Background1)	2. $N_{160}P_{90}K_{210}$+20t manure (Background 2)
3. Background 1+2dgranules(30 s)	3. Background 2+2 granules (30 s)
4. Background 1+ 4granules (30 s)	4. Background 2+4 granules (30 s)
5. Background 1+2 granules (60 s)	5. Background 2+2 granules (60 s)
6. Background 1+4 granules(60 s)	6. Background 2+4granules(60 s)

Continuation of Table 1

Leaf spraying scheme with Nano-Gro in the field	
I scheme	II scheme
1. Control	1. Control
2. $N_{60}P_{45}K_{90}$ + 20t manure (Background -1)	2. $N_{160}P_{90}K_{210}$+20t manure (Background 2)
3. Background 1+2dgranules(30 60 second)	3. Background 2+2 granules (30 60 second)
4. Background 1+ 4granules (30 60 second)	4. Background 2+4 granules (30 60 second)
5. Background 1+2 granules (60 60 second)	5. Background 2+2 granules (60 60 second)
6. Background 1+4 granules(60 60 second)	6. Background 2+4granules(60 second)

Analysis and discussion. Soaking the seed for 30 and 60 seconds may raise the question why such a short time? It is clear that the soaking time of the beet pulp formed by the combination of several seeds with Nano-Gro growth material for 30 and 60 seconds is very short. This is a research study and we took a relatively different approach in this study. Research must have its pros and cons. In many studies conducted in the world and in our republic, soaking of seeds for a few hours or days with growth substances, usually composed of one or more elements, is noted by other researchers. According to the manufacturer, the composition of the physiologically active

substance Nano-Gro used by us is an organic compound consisting of Fe, Al, Ni, Mn, Mg, Ag, sulfate and sucrose. So, we thought, how can such a rich substance have an effect in one and a half minutes? After 30 and 60 seconds soaking of seeds with Nano-Gro growing material, there was no significant difference in field germination in each of the 3 years. Outputs from all options were obtained simultaneously.

However, during the growing season, we observed powdery mildew and beet rot in the variant (Control) where Nano-Gro was not used, while no diseases and pests were observed in the variants using Nano-Gro. It can be seen that the causative agents of diseases and pests in fodder beet seed pods were destroyed within one and a half minutes due to the action of (potassium-permanganate) Mn and Ag (silver) elements contained in Nano-Gro.

In addition to carbohydrates, fats and proteins, which make up the main mass of organic substances of plants, there are also substances that are extremely important in the life activity of living organisms. Because even when these substances are not present in the food or not in sufficient quantity, sometimes severe diseases resulting in death occur. These substances have an important physiological-biochemical role in living organisms, and these substances act as catalysts in close contact with enzymes, which are called growth substances.

As we mentioned, these rich substances are not food, but these substances, whose composition consists of microelements, affect the physiologically active points in the meristematic tissues of the plant and activate their life functions.

Vitamin C, which is used throughout our life, plays the role of an appetite suppressant, and when it is taken, the tissues of the body, which are in a sluggish state, become active and look for nutrients. As we know, this is the working mechanism of micronutrients, as well as the working mechanism of Nano-Gro, an organic substance that contains micronutrients.

The composition of Nano-Gro, which is a physiologically active or height-regulating substance, consists of Fe, Al, Ni, Mn, Mg, Ag sulfate compounds and sucrose, and the weight of one granule is 0.05 g. Nano-Gro was produced in the USA in 2000. Many years ago, the goal of FAO - (Food and Agriculture Organization of the United Nations) and IKARDA (International Center for Agricultural Research in Arid Areas) was that every human being should

Was to create a new technology to provide nutrition, the most elegant science-nano, which is the face of the XXI century, to the creation of a highly and efficient new substance with a small application area and great potential, and at the same time answering many questions in the field of applied agriculture brought [12].

During the research years, we observed very large changes in the plant's leaf mass and fruit root growth due to the effect of spraying the Nano-Gro growing substance during the vegetation period, and we give the explanation in the table.

Also, during the research years, in the Control version where Nano-Gro was not applied, "flourish dew" disease and "beet mold" were observed from the pests, "Colloidal Sulfur" was used against powdery mildew disease, and "BI-58" chemical preparations were used to prevent the disease and beet mold. the pest has been prevented.

Table 2

Number of leaves in fodder beet after the first spraying of Nano-Gro growth agent (2014-2016)

Number	Variants	2014/20-25 VI			2015/20-25 VII			2016/20-25 VI			Orta		
		Number of leaves, no	According to the control, %	By background, %	Number of leaves, no	According to the control, %	By background, %	Number of leaves, no	According to the control, %	By background, %	Number of leaves, no	According to the control, %	By background, %
I scheme													
1	Control	31,0			36,2			35,3			34,1		
2	$N_{60}P_{45}K_{90}$ + 20t manure (Back.-1)	45,3	46,1		45,3	25,1		43,0	21,8		44,5	30,4	
3	(Back.1)+2qran.	48,3	55,8	6,7	53,7	48,3	18,5	49,3	39,6	14,6	50,4	47,8	13,2
4	(Back.1)+4gran.	50,4	62,5	11,2	55,1	52,2	21,6	50,3	42,4	16,9	51,9	52,1	16,6
II scheme													
1	Control	30,4			35,4			39,6			35,1		
2	$N_{160}P_{90}K_{210}$+20t manure (Back. 2)	58,6	92,7		63,5	79,3		59,0	48,9		60,3	71,7	
3	(Back.2)+2 granules	63,4	108,5	8,1	72,8	105,6	14,6	70,6	78,2	19,6	68,9	96,2	14,2
4	(Back.2)+4 gran.	65,3	114,8	11,4	75,7	113,6	19,2	71,0	79,2	20,3	70,6	101,1	17,0

In our dissertation work, despite sowing the seeds for 30 and 60 seconds in 6 variants, there was no significant difference in field germination, taking into account that the 30 and 60 seconds sowing schemes were repeated twice, in accordance with the purpose of the study, the explanation of the results was purposefully shortened and only the main ones were presented in all the tables. we explain the most important 4 options.

The results of the increase in the number of leaves after the 1st spraying of Nano-Gro growth substance by years were as follows: on June 20-25 in 2014, on July 20-25 in 2015, and on June 20-25 in 2016.

As can be seen from table 2, the highest results in the I scheme were the average number of leaves per plant from the replicates in the option of spraying $N_{60}P_{45}K_{90}$+20 t manure and Nano-Gro height substance with 4 granules: 50.4 in 2014, 55 in 2015, 1 units, 50.3 units in 2016, 51.9 units on average over three years, which is an increase compared to the control option.
respectively 62.5%, 52.2%, 42.4%, 52.1% on average from the total of 3 years, compared to the N60P45K90+ 20 t manure variant, the increase is 11.2%, 21.6%, 16.9% respectively %, and it was equal to 16.6% on average over the total of 3 years.

In scheme II, the highest results from the repetitions and the average number of leaves per plant were 65.3 in 2014, 75.7 in 2015, 71 in 2016, in the option of spraying Nano-Gro height substance with 4 granules for the 1st time. 0 units, the average over three years was 70.6 units, the increase compared to the control variant was on average 114.8%, 113.6%, 79.2%, and the average over 3 years was 101.1%, $N_{160}P_{90}$ K_{210}+ Compared to the 20 t manure option, the increase was 11.4%, 19.2%, 20.3%, and 17.0% on average over 3 years.

Comparing the 3 years, the highest number of leaves was 75.7 in 2015, the increase was 113.6% compared to the control, and 19.2% compared to the $N_{160}P_{90}$ K_{210}+20 t manure option.

T.M.Vorobyova, Y.N.Kurkina, R.O.Gazmanov and others, who conducted research with Nano-Gro substance, T.K.Safarov, G.Alnaghiyev, B.S.Bayramov, who conducted research with microfertilizers, noted that productivity increased by 20-30% due to the effect of growth substances [19].

Researchers Q.Y. Mammadov, M.M. Ismayilov [5], H.M. Nagiyev, A.A. Allahverdiyev [7] and others write that beet produces 60-90 and more than 100 leaves during the growing season.

Researcher B.S.Bayramov [2] notes that in the application of N_{90},P_{90},K_{90} (background)+3 kg of Cu, the number of leaves in sugar beet was 87.3, the increase was 59.0% compared to the control, and 19.5% compared to the background.

Researcher H.C. Bagirov [1] notes that the number of sugar beet leaves was 50-66 in the application of N_{90}, P_{120}, K_{90} (background) + B_6 kg in the damya soils of Gadabay in the northern part of the Lesser Caucasus. A leaf is the main organ for photosynthesis, respiration and transpiration in plant life. In order for plants to develop normally and produce high yields, it is necessary to provide them with macroelements as well as microelements.

The result

A leaf is the main organ for photosynthesis, respiration and transpiration in plant life. The most important place in the high productivity of fodder beet is its leaf size, the more the number of leaves, the more the development and productivity of the root fruit. In field experiments, after the first spraying of the physiologically active Nano-Gro bulk substance against the background of various mineral and organic fertilizers, the best effect on the leaf spot in the growth and development of the fodder beet plant was the spraying of Nano-Gro bulk substance with 4 grains (0.002 kg/ha) in both schemes. was an option. Thus, in 3 years, the highest number of leaves after the first spraying of Nano-Gro growth substance in 2015 was 75.7, which is an increase of 113.6% compared to the control, and 19.2% compared to the $N_{160}P_{90}$ K_{210}+20 t fertilizer variant.

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Geological and Mineralogical Sciences

APPROBATION OF FREQUENCY-RESONANCE TECHNOLOGY FOR SATELLITE AND PHOTO IMAGES PROCESSING AT SITES OF EXPLORATION WELLS DRILLING IN CABORA BASSA BASIN (ZIMBABWE)

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Annotation. The results of additional experimental studies at the site of the drilled exploratory well in the Cabora Bassa basin (Zimbabwe) in January and July-August 2023 are presented. The results of reconnaissance survey of a fragment of Zimbabwe territory with a license block and a photo of the drilling site carried out in 2022 allow us to state that the probability of fluid inflows (oil, condensate, gas) receiving in industrial volumes in two designed wells within the block is close to zero! At the end of 2022, drilling operations at the Mukuyu-1 well within the block were completed. However, samples of liquid hydrocarbons from the main and parallel boreholes for final confirmation of the oil and gas capacity of the structure were not obtained! And according to the results of the well logging and the fluorescent glow of the core, the drilled structure is considered promising for the oil and gas deposits discovery, and the drilling of the 2nd well was planned. During the additional survey by direct-prospecting methods of prospective depth intervals and the core, signals from the 10th group of sedimentary (siliceous) rocks and neon gas were recorded! Signals at oil, condensate and gas frequencies was not received! The properties of neon gas allow us to state that the fluorescent glow of the core from the well is due to the presence of neon gas in it, not hydrocarbons! The results of additional instrumental measurements confirm the conclusions made earlier about the absence of hydrocarbon accumulations in industrial volumes at the Mukuyu-1 well drilling site. The results of the additional experimental studies in July-August 2023 confirm the previous conclusions: the probability of oil and gas accumulations detecting in commercial volumes within the Company's licensed block is close to zero. In the eastern part of the block, instrumental measurements confirmed the presence of a kimberlite volcano with diamonds. When processing satellite images and photographs of the Company's block in a detailed mode, the position of kimberlite complexes can be localized and a place for drilling a well determined. When performing instrumental measurements using a helium sample, the responses from this gas were recorded with a delay at the Mukuyu-2 well site. Experiments with the use of seismic sections allow us to conclude that they are informative and appropriate for frequency-resonance processing when surveying large blocks and local areas

within which seismic surveys were carried out. In order to identify the most promising areas (blocks) for detailed oil and gas exploration, a reconnaissance survey project of the entire Zimbabwe territory is proposed. For the practical implementation of such a project, a satellite image of Zimbabwe territory can be divided into 150 local blocks for processing. The research materials, as well as the results of previously conducted experimental work on drilling sites, indicate the feasibility of additional use of direct-prospecting methods at the stages of selecting sites for exploratory wells laying. Once again, it can be concluded that the additional use of direct-prospecting methods at the stages of selecting sites for wells laying makes it possible to identify the most optimal zones, as well as to assess the feasibility of planned wells drilling within the prospective structure.

Keywords. Zimbabwe, Cabora Bassa basin, oil, gas, neon, siliceous rocks, gas migration, fluorescence, abiogenic genesis, volcano, direct exploration, deep structure, chemical elements, cross-section sounding, satellites data processing.

Introduction

The announcement of Invictus Energy Ltd [1] (Company) dated January 3, 2023 announced the completion of drilling operations at the Mukuyu-1 well (including a parallel wellbore, Fig. 3). However, unfortunately for the Company and Investors, no samples of liquid hydrocarbons from the main and parallel wellbores were received to finally confirm the oil and gas potential of the structure! The company's specialists believe that this situation is related to the technical conditions at the well, and yet they are confident that the already drilled structure is promising for oil and gas deposits discovering. In 2023, the Company plans to start drilling a second well (Mukuyu-2) within the licensed block.

Unfortunately for the Company and Investors, the results of direct-prospecting methods testing within the search block allow us to conclude that there is a zero probability of industrial (commercial) volumes of oil and gas detecting within it. The results of the work carried out using mobile direct-prospecting technology were published in conference materials [28-30] before the completion of Mukuyu-1 well drilling. The article presents the materials of additional instrumental measurements in the areas of the drilled (Mukuyu-1, Fig. 3) and projected (Mukuyu-2, Fig. 7, 8) wells carried out in January and July-August 2023, and also proposes a project for a reconnaissance survey of the territory of Zimbabwe.

Research methods

Experimental studies of a reconnaissance and detailed nature are purposefully carried out using mobile methods of satellite images and photographs frequency-resonance processing and decoding, vertical scanning (sounding) of cross-section in order to determine (estimate) the depths and thicknesses of various rock complexes and sought minerals, as well as methods an integral assessment of the prospects for oil and gas potential (ore content, water content) of local areas and large blocks [3, 9-33]. Some methods of the technology used are based on the principles of the “substance” paradigm of geophysical research [3], the essence of which is to search for a specific (searchable in each individual case) substance – oil, gas, gas condensate, gold, iron, water, etc. The developed methods are based on the standing electric waves discovered by Nikola Tesla in 1899 in the deep horizons of the Earth [7-8]. Mobile technology as a whole, as well as its individual methods, are actively used in the testing mode to search for hydrocarbon accumulations at the initial stages of the geological exploration process, including for the integral assessment of the oil and gas potential of large and hard-to-reach blocks and areas, as well as local areas of prospecting and exploratory wells drilling.

In modified versions of the methods of satellite images and photographs frequency-resonance processing, as well as vertical sounding (scanning) of cross-section, bases (sets,

collections) of chemical elements, minerals, rocks and minerals (specific samples) are used [9]. Thus, the collection of oil samples used in instrumental measurements includes 117 samples, gas condensate – 15 samples.

The set of photographs of sedimentary rocks consists of 11 groups: 1) psephites, monomineral conglomerates (22 samples, sample numbers in the set are 2-23); 2) psammites (18, 25-42); 3) silts, mudstones, clays (6, 44-49); 4) kaolinite mudstones (6, 51-57); 5) kaolinite clays (10, 59-68); 6) sedimentary-volcaniclastic rocks; tuff breccias (9, 70-78); 7) limestones (24, 80-103); 8) dolomites (11, 105-115); 9) marls (10, 117-126); 10) siliceous rocks (13, 128-140), salt.

The database of photographs of igneous and metamorphic rocks includes 18 groups: 1) granites and rhyolites (29 samples, sample numbers in the database are 1-29); 2) granodiorites and dacites (7, 31-37); 3) syenites and trachytes (18, 39-56); 4) diorites and andesites (14, 58-71); 5) lamprophyres (14, 73-86); 6) gabbro and basalts (32, 88-119); 7) non-feldspar ultramafic rocks (20, 121-140); 8) feldspathoid syenites and phonolites (23, 142-164); 9) feldspathoid gabbroids and basaltoids (6, 166-171); 10) feldspar-free ultramafic and mafic rocks (10, 173-182); 11) kimberlites and lamproites (20, 184-203); 12) non-silicate carbonatites (8, 205-212); 13) metamorphic granulites (10, 214-223); 14) metamorphic gneisses (26, 225-250); 15) metamorphic crystalline schists (44, 252-295); 16) metamorphic microcrystalline schists (phyllites) (11, 297-307); 17) metamorphosed slates, cleaved sandstone (1, 308); 18) metamorphosed slates, cleaved siltstone (1, 309).

Photos of the used sets of samples of sedimentary, metamorphic and igneous rocks are borrowed from the electronic document [2]. Let us add to this that in our publications the rock classification proposed by the authors of the document [2] is also used.

Materials of earlier experimental studies, obtained with the used set of mobile direct-prospecting methods, are presented in publications [9-33]. The same articles describe the methodological features of measurements during the satellite images and photographs processing using the developed technical means.

When conducting numerous studies using the described direct-prospecting methods in 2019-2023, the optimal procedure (processing graph, sequence of actions) was worked out (and constantly improved), which is used when carrying out work within the blocks and areas of survey. The used processing graph for a separate satellite image (or its local fragment) includes the following sequence of actions (steps).

1. Fixation from the surface of the presence (absence) of responses (signals) from the following set of minerals: oil, condensate, gas, amber, oil shale, argillic breccia, gas hydrates, ice, coal, anthracite, hydrogen, living water (deep), dead water, diamonds, brown coal, iron ore, potassium-magnesium salt, sodium chloride salt (hereinafter simply salt).

2. Registration of responses from the groups of sedimentary, metamorphic and igneous rocks that make up the cross-section.

3. Establishing the presence of deep channels (volcanoes) filled with various groups of rocks in the survey area; determination of the depths of the roots of volcanoes location.

5. Determination of groups of rocks (or individual samples of groups), from which signals are recorded at the frequencies of oil, condensate, gas and water (deep).

6. Establishing the presence (absence) of responses from oil, condensate and gas at the surface (depth) of 57 km - the boundary of hydrocarbon synthesis in deep channels (volcanoes), filled with certain groups of rocks.

7. Establishing the presence (absence) of responses from water (deep) on surfaces (depths) 59 km, 68 km, 69 km - the predicted boundaries of water synthesis in volcanoes of a certain type.

8. By scanning a cross-section with different steps from the surface up to 15 km, depth intervals are determined, within which responses are recorded at the resonant frequencies of oil,

condensate, and gas. Refinement of the depths of location of the most promising for hydrocarbons intervals of cross-section during additional scanning with a finer step.

9. In case of detection of responses from the 6th group of igneous rocks (basalts) on the surveyed area, an assessment is made of the depth of the upper boundary (edge) of basalts, as well as the depths of the beginning of recording responses at resonant frequencies of hydrogen and living (healing) water from basalts.

10. When establishing the presence of signals from the 11th group of igneous rocks (kimberlites) in the survey area, the depth of the upper edge of the kimberlites is determined, as well as the depth interval within which responses are recorded at diamond frequencies.

Given the reconnaissance nature of the studies performed, the described set of separate procedures for satellite images processing in full was not implemented in all surveyed areas.

Once again, we focus on the distinctive feature of the direct-prospecting frequency-resonance methods being developed. Unlike classical geophysical methods, the methods used make it possible in each specific case to fill the cross-section under study with the complexes of sedimentary, metamorphic and igneous rocks present in it, as well as to determine in the first approximation (and refine at the stages of detailing) the intervals of cross-section that are promising for the detection of combustible and ore minerals, immediately, in the process of measurements (registration of signals) by the developed instrumentation and measuring devices (i.e. without additional stages of modeling and geological interpretation of the results of instrumental measurements). In this article, as well as in other published materials, the emphasis is mainly on the presentation of measurement results.

We also note that the developed technology uses the frequency-resonance principle of the useful signals' registration [3]. Satellite images or photographs of research objects, as well as photographs of rock samples, minerals and chemical elements, are, in principle, antinodes of standing electric waves, discovered by Nikola Tesla in 1899 in deep horizons of the Earth [7-8].

When carrying out instrumental measurements using the developed computerized complexes, the spectra of satellite or photographic images of objects studied are sequentially compared with the spectra of rock samples, the desired minerals and chemical elements. In the process of comparison, the measuring unit registers resonances (electromagnetic responses), which make it possible to draw a conclusion about the presence (absence) of specific rocks, the desired minerals and chemical elements in the cross-section of the object of study. Such features of the developed methods of satellite images processing and decoding are the basis for the use of the terms "frequency-resonance technology" ("frequency-resonance methods").

The processing of satellite images and photographs is carried out in laboratory conditions, without organizing and conducting field geological and geophysical studies. This provides an opportunity to quickly conduct research in any region of the globe, and, consequently, developing technology is super-mobile.

In addition to what was said in the previous paragraph, it is worth adding the following. As a result of testing and practical application of the developed measuring equipment in various regions of the world, numerous evidences (facts) have been obtained in favor of the "volcanic" model of the formation of many structural elements of the Earth (and other planets and satellites of the solar system), as well as deposits of combustible and ore minerals (hydrogen and water as well). Instrumental measurements established the existence of 10 types of volcanic complexes filled with various types of rocks. And what is characteristic, the roots of all volcanoes are almost always fixed by scanning the cross-section at the same depths, namely: 95-98 km, 214-218 km, 470 km, 723 km, 996 km.

It is quite natural that the depths of the roots of 470 km or 723 km of a salt or dolomite volcano cause rejection and skepticism among many experts. We also note that at the initial stages of the technology testing, such depths of roots were also surprising to the authors of the

experiments. However, the ubiquitous repetition of such depth values during many hundreds of measurement experiments gives grounds for the assumption that such strictly predetermined values of the depths of the roots of various volcanic complexes are due to certain wave processes in the solar system and our galaxy.

In this regard, it is only regrettable that such skepticism in relation to the depths of the roots of volcanoes is automatically (without detailed consideration and analysis of materials) transferred to the results of instrumental measurements in the upper part of cross-section accessible for drilling.

Information about the study area

The understudied large rift basin on the African land - Cabora Bassa - is located in the north of Zimbabwe. Geological and geophysical surveys in the basin to search for hydrocarbon (HC) deposits are being conducted by Invictus Energy Ltd, an independent oil and gas company listed on the Australian Securities Exchange (ASX: IVZ). The company is headquartered in Perth, Australia and has an office in Harare, Zimbabwe.

A satellite image of the Cabora Bassa basin with the Invictus Energy Ltd license block is shown in Fig. 1a, and an image of the entire territory of Zimbabwe is in Fig. 1b. Figure. 2 shows a summary of the prospective resources of the Cabora Bassa basin and a schematic map of the structures mapped by seismic surveys [1].

The results of the conducted geological and geophysical works and drilling are described in the information message dated January 25, 2023 [1]:

“Geological exploration work has confirmed the presence of an active hydrocarbon system.

The Mukuyu-1 ST1 well recorded 13 potential hydrocarbon zones, including zones with hydrocarbons with a total thickness of 225 m in the main target Upper Angwa horizon.

With the owners of the drilling platform Exalo Rig 202 signed a contract for the next 12 months.

Preparations are underway to assess the oil and gas potential of the Mukuyu structure and drilling of the second well.

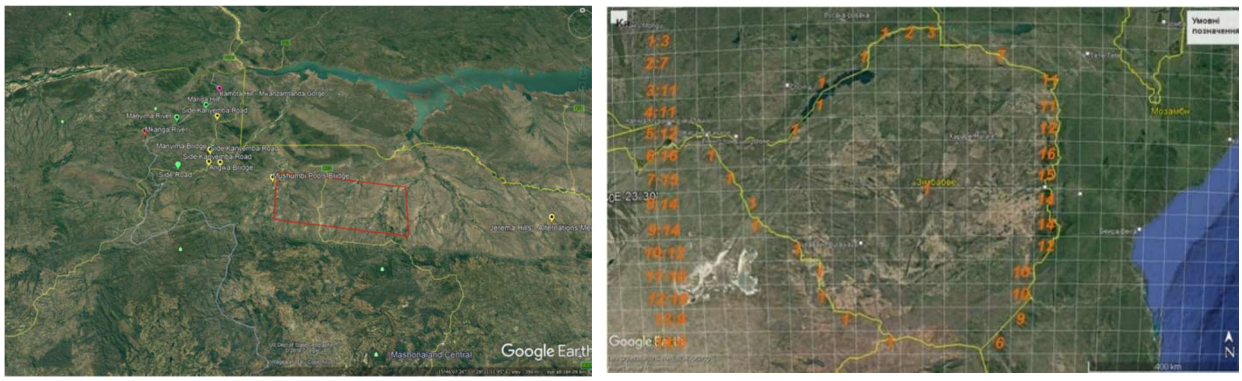
In the marginal zone of the basin, the estimated hydrocarbon resources are estimated at 1.2 billion barrels.

As of December 31, 2022, the Company's financial resources are $12.6 million in cash."

Results of additional studies in January 2023

Additional studies were carried out in early 2023 at the drilling site of the Mukuyu-1 well (Fig. 3). To this information we add the following.

In the process of monitoring the drilling of Calypso exploratory well in the Norwegian Sea, the method of instrumental measurements for the integral assessment of the prospects for detecting oil and gas accumulations within large blocks and local areas (including well drilling sites) has been significantly improved. This improved technique makes it possible to fix the presence (or absence) of hydrocarbons accumulations in the sites and areas of the survey with almost 100% probability.



a) *b)*

Fig. 1. Satellite images of the Cabora Bassa basin [1] *(a)* and the entire Zimbabwe territory *(b)*.

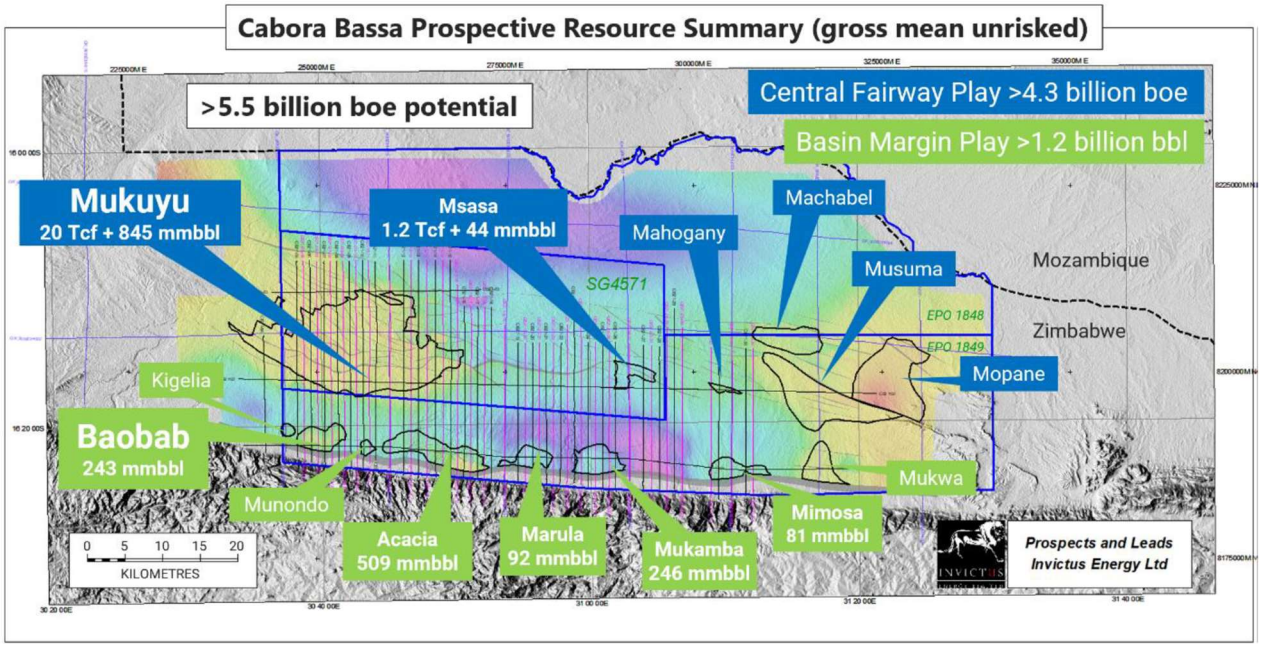


Fig. 2. Summary information on the prospective resources of the Cabora Bassa basin and a schematic map of the mapped structures [1].

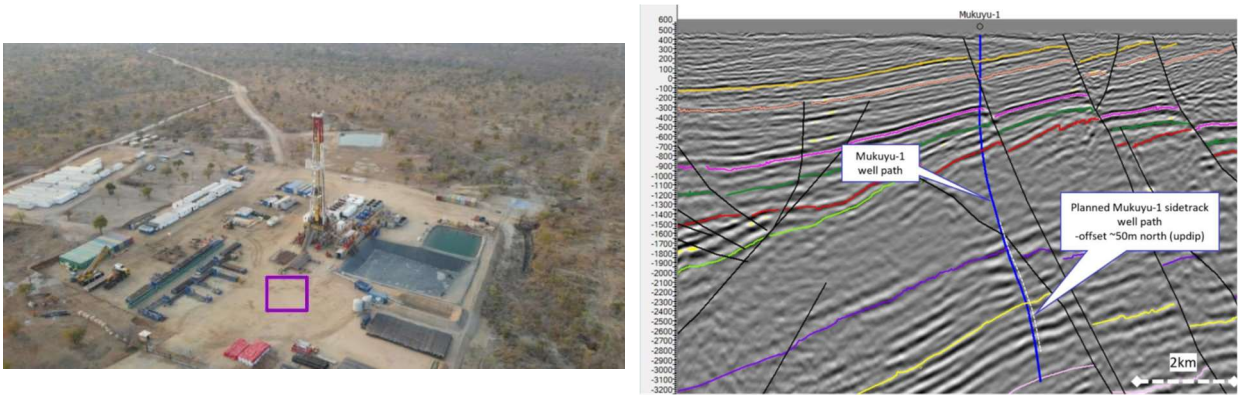
The results of processing a fragment of a photograph from the drilling site of the Mukuyu-1 well (rectangular contour in Fig. 3a) using this improved technique confirmed the previous conclusions: **the probability of detecting oil and gas accumulations in commercial volumes at the drilling site is zero.**

The information message of the company dated November 24, 2022 shows a photograph of the core from a depth of 3168 m, as well as an image of its fluorescent glow (Fig. 4b). Using the core image (Fig. 4b) and a fragment of a photograph from the drilling site (Fig. 3a, rectangular contour), additional instrumental measurements were carried out, the results of which can be summarized as follows.

1. From the interval of 3166-3169 m, responses were recorded at core frequencies in Fig. 4b.

2. Within the interval 3166-3169 m, signals were also recorded at the frequencies of the 10th group of sedimentary (siliceous) rocks (Fig. 4a). From this group of rocks, responses were recorded from only one sample, trepel mudstone (Fig. 4a, sample in a rectangular contour).

3. From the core sample (Fig. 4b), as well as from the interval 3166-3169 m, responses were obtained at **the frequencies of the gas neon! Signals at the frequencies of oil, condensate and gas are not recorded!**



a) *b)*

Fig. 3. Photograph of the Exalo 202 drilling rig at the drilling site of the Mukuyu-1 well *(a)* and the position of the main and parallel wellbores on the seismic section [1] *(b)*.

4. When studying the depth interval 3178.61–4420.36 m, signals of the **10th group of sedimentary (siliceous) rocks (Fig. 4a) and neon gas were recorded! No responses were received at the frequencies of oil, condensate and gas!**

a) *b)*

Fig. 4. Photographs of samples from the 10th group of sedimentary (siliceous) rocks *(a)* and a photograph of a core with fluorescent glow from a depth of 3168 m [1] *(b)*.

The site [4] provides the following characterization of neon gas: "NEON: Widely known as the gas used to fill the tubes of colored advertising signs, neon also has other uses such as optical indicators, voltage regulators, and lasers. Along with other rare gases, it is widely used in specialty fluorescent lamps."

Therefore, the given properties of neon gas allow us to fairly reasonably state that the fluorescent glow of the core from the well **is due to the presence of neon gas in it, and not hydrocarbons!** The results of additional instrumental measurements **confirm the earlier conclusions about the absence of hydrocarbon accumulations in industrial volumes at the drilling site of the Mukuyu-1 well.**

Results of additional studies in July-August 2023

In the second half of 2023, the Company began and completed additional field 2D seismic surveys within the eastern part of the license block, and also prepared the site for second Mukuyu-

2 well drilling. Information about these works is presented in information messages on the Company's website. In this regard, in July-August, additional instrumental measurements were carried out in the reconnaissance (not detailed) mode at these areas. Let us add to the above that at this stage of the experiments, the procedure for recording signals at helium frequencies was also performed.

Figure 5a shows a satellite image of the Cabora Bassa basin in the eastern part of which the area of additional seismic surveys in 2023 is indicated by a rectangle. During processing the image of this area (Fig. 5b), responses from the 10th (siliceous) group of sedimentary rocks, as well as the 11th (kimberlites) group of igneous rocks, were recorded. Signals at the frequencies of diamonds are also fixed! No responses were received at helium frequencies within this area.

The Machabel structural uplift is also located in this area. When carrying out instrumental measurements using a fragment of an image with this structure (Fig. 5c), responses were recorded from the surface only at the frequencies of siliceous rocks; signals of kimberlites, diamonds and helium were not recorded.

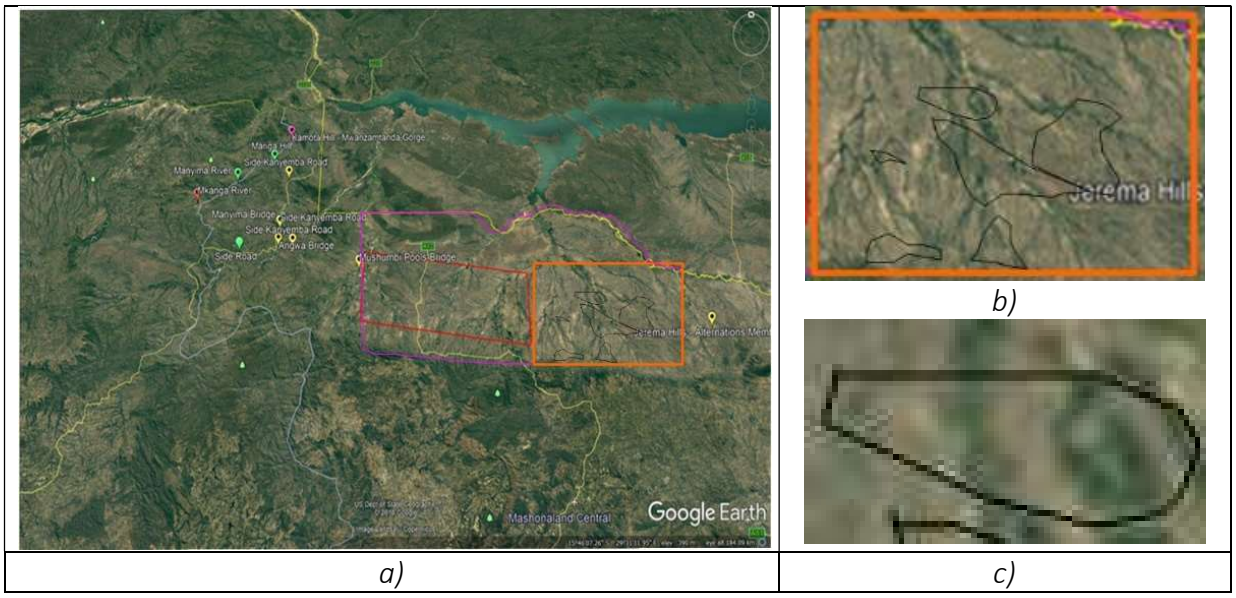


Fig. 5. Satellite image of Cabora Bassa basin *(a)* and areas for additional seismic surveys in 2023 *(b, c)*.

The position of the drilled and planned wells on the Mukuyu structural uplift is shown in Fig. 6, and the seismic section with the trajectory of the projected well Mukuyu-2 is shown in Fig. 7. For the purpose of conducting experiments, frequency-resonance processing of a fragment of the seismic section in a rectangular outline (Fig. 7) was also carried out. In the process of instrumental measurements using this image, responses were recorded at the frequencies of the 9th (marl) group of sedimentary rocks, as well as helium at 15 s of measurements.

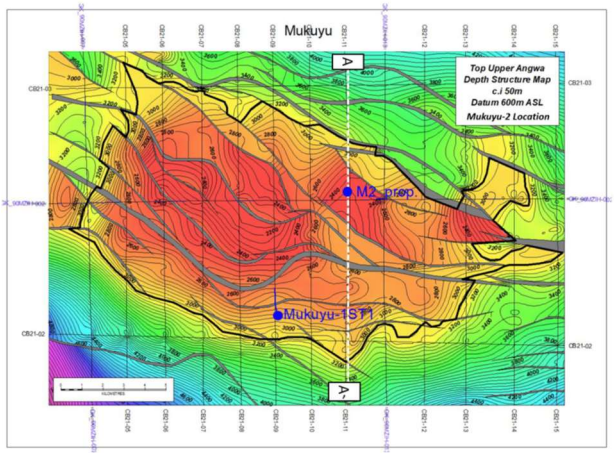


Fig. 6. Position of the drilled and planned wells on the Mukuyu structural uplift [1].

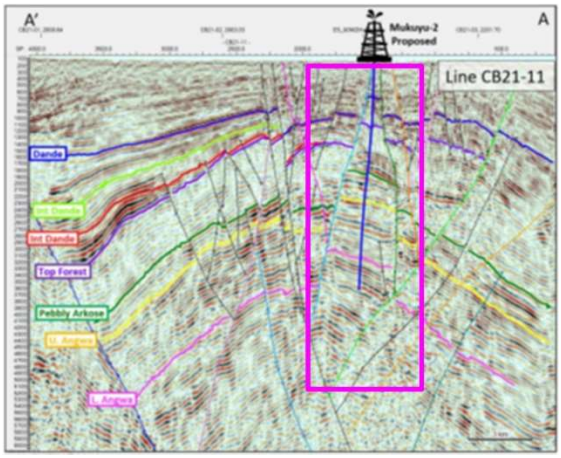


Fig. 7. Design trajectory of Mukuyu-2 well on the seismic cross-section [1].

Fig. 8. Photograph of the Mukuyu-2 well drilling site [1].

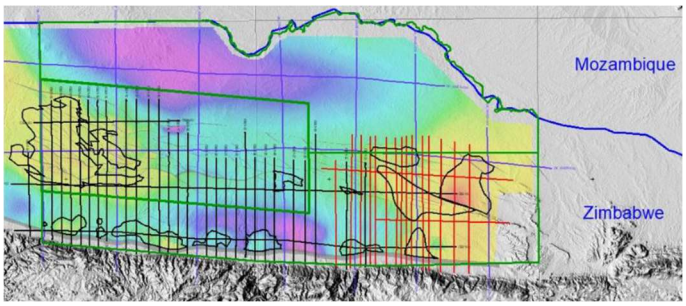


Fig. 9. Position of worked profiles (red lines) in 2023 [1].

A photograph from the Mukuyu-2 well site is shown in Fig. 8. From the surface, when processing this image, signals were also recorded at marl and helium frequencies from 15 s of instrumental measurements. **Responses at HC frequencies (oil, condensate, gas) were not recorded during 120 s of measurements each!**

Field seismic work in the eastern part of the block was completed in August. The position of the worked profiles is shown in Fig. 9 (red lines), and a photographic image from the work site is shown in Fig. 11. The Company information message of the work completion contains a seismic section along one of the worked-out profiles (Fig. 10). During the joint frequency-resonance processing of this section together with the groups of rocks used, common signals were obtained with the 9th (marl) group of sedimentary rocks, the 11th (kimberlites and lamproites) group of igneous rocks, as well as the 12th (carbonatites) and 13th (granulites) groups of metamorphic rocks. Such processing results indicate that some rocks from the listed groups are present in the section along the profile.

Brief conclusions. The results of the additional experimental studies presented above confirm, in general, **the previous conclusions [28-30]: the probability of oil and gas accumulations detecting in commercial volumes within the Company's licensed block is close to zero.**

In the eastern part of the block, instrumental measurements confirmed **the presence of a kimberlite volcano with diamonds [30].** When processing satellite images and photographs of the Company's block in a detailed mode, the position of kimberlite complexes can be localized and a place for drilling a well determined.

When performing instrumental measurements **using a helium sample, the responses from this gas were recorded with a delay at the Mukuyu-2 well site**.

Experiments with the use of seismic sections allow us to conclude that they are informative and appropriate for frequency-resonance processing when surveying large blocks and local areas within which seismic surveys were carried out.

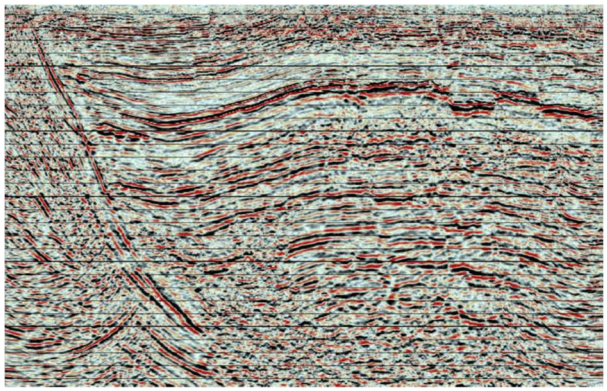


Fig. 10. Seismic section along one of the worked-out profiles [1].

Fig. 11. Photo image from the site of seismic work in 2023 [1].

Projects of Zimbabwe territory reconnaissance survey

In 2023, the Company will drill a second well in Cabora Bassa basin. One of the reasons for such actions can be considered the fact that the Company's specialists understood high risks in hydrocarbon exploration. Thus, in Company presentation, the high risks of oil and gas research are characterized as follows [5]:

"The exploration period is usually 5-8 years from the acquisition of a license area to the start of drilling.

 Oil exploration is characterized by low success rates: 10-20% CoS of commercial discovery.

• Kenya drilled 32 wells from the 1940s until the discovery of the first field in 2012.

• South Africa Republic has drilled about 200 wells and discovered less than 20 fields with industrial (commercial) hydrocarbon volumes.

 Due to the high cost and low success rate of hydrocarbon exploration, companies spread the risk across multiple assets."

All information messages of the Company [1] contain the following reservations: "The expected volumes of oil that can be produced within the framework of the ongoing development project relate to undiscovered accumulations. The above estimates are associated with both the risk of discovery and the risk of development. Further exploration, evaluation and calculations are required to determine the presence of a significant amount of potentially mobile hydrocarbons. The prospective resource estimates in this report have been derived using probabilistic methods in accordance with SPE-PRMS standards."

To speed up the process of identifying accumulations of hydrocarbons in industrial volumes in Zimbabwe, the authors suggest Invictus Energy Ltd to implement a project of reconnaissance survey of the entire country in order to identify promising blocks for prospecting (including a detailed one) for hydrocarbons (oil, condensate, gas) and natural hydrogen.

Oil and gas project. The results of approbation and practical application of the direct-prospecting technology of satellite images and photographs frequency-resonance processing allow us to reasonably conclude that their targeted use in the search and exploration of oil and gas deposits can significantly speed up and optimize the exploration process. Promptly carried out reconnaissance surveys of the territories of large blocks in various regions of the world (in Zimbabwe, including) can be considered as additional confirmation of the potential capabilities of mobile direct-prospecting technology. On the other hand, the results of the survey of large blocks

indicate the potential possibility of a reconnaissance survey of the entire Zimbabwe territory in order to identify the most promising areas (blocks) for oil and gas detailed exploration.

For the practical implementation of this project, the satellite image of Zimbabwe territory may be divided into separate blocks, the frequency-resonance processing of which will be carried out separately. One of the possible options for dividing a satellite image of the Zimbabwe territory into separate fragments is shown in Fig. 1b. This image with rectangular contours shows 150 local fragments (blocks) for processing.

Frequency-resonance processing of all 150 fragments of Zimbabwe satellite image can be performed quite quickly. During image processing, the following set of measurement procedures may be performed: a) fixation from the surface of anomalous responses at frequencies of oil, condensate and gas; b) registration of signals at the frequencies of methane-oxidizing bacteria (bacteria, whose populations are analyzed in method of microbiological exploration for oil and gas by MicroPro GmbH, Germany); c) establishing the presence of a volcanic structure within the survey area, in which there are conditions for the hydrocarbon's synthesis at a depth of 57 km; additional fixation of responses of oil, condensate and gas at this depth; d) fixing signals at frequencies of oil, condensate and gas from lower part of cross-section at depths of 5, 10 and 15 km in order to assess prospects of oil and gas discovering in deep horizons of cross-section.

The listed procedures of instrumental measurements have fully demonstrated their effectiveness and informativeness in the process of direct-prospecting methods approbation in the areas (sites) of drilling exploratory wells on land and shelf in various regions of the globe and basalts volcano's location [12, 14, 16, 21-25], and also in the Cabora Bassa basin [28–30].

Notes. Additional procedures for instrumental measurements and the features of their implementation within the framework of this project can be formulated (clarified), if the expediency of its implementation will be recognized in Zimbabwe.

Within the most promising for oil and gas blocks, found in Zimbabwe, detailed prospecting can also be quickly carried out using methods of satellite images and photographs frequency-resonance processing. The prepared fragments of a satellite image of Zimbabwe territory (Fig. 1b) can be additionally processed in the reconnaissance mode within the framework of separate projects for identifying blocks, that are promising for detailed prospecting for: a) natural hydrogen; b) ore minerals; c) water.

Hydrogen project. During frequency-resonance processing of each fragment of the Zimbabwe territory image in the reconnaissance mode for natural hydrogen searching, a limited set of instrumental measurements of the following nature may be performed separately: a) procedure for recording signals (responses) at frequencies of the 6th group of igneous rocks (basalts); b) the procedure for determining the depth of basalt volcano root (in the case of fixing responses from the surface at basalt frequencies); c) procedures for fixing signals (responses) at the frequencies of hydrogen, phosphorus (red) and hydrogen bacteria; d) instrumental measurements to confirm (or establish absence) of hydrogen migration into atmosphere.

The expediency of implementing the listed set of instrumental measurement procedures during the survey is due to results of direct-prospecting methods testing in various regions of globe. The materials of numerous studies allow us to state following: a) responses at hydrogen frequencies are recorded almost everywhere during instrumental measurements in the contours of basalt volcanic complexes; b) red phosphorus is almost always present in basalt volcanoes; c) hydrogen bacteria create their colonies in the upper part of cross-section in the areas of hydrogen migration into the atmosphere.

To implement the second stage of the work, one of two conditions was met: within one surveyed fragment basalt complexes with hydrogen were found and responses were recorded at the frequencies of red phosphorus and hydrogen bacteria. Further continuation of research within

local block is possible only with the participation of at least one Zimbabwe company in the implementation of the "project".

At the second stage of project implementation within local block, studies of the following nature can be performed: a) the satellite image of the block may be processed in a detailed mode in order to localize areas (zones) of the basalt volcano's location and select the most promising for exploratory wells drilling for hydrogen; b) in the contours of the most promising local zones, a detailed scanning of cross-section will be performed in order to determine the depths and thicknesses of hydrogen reservoirs in the cross-section above the basalts, as well as in the basalts directly; c) within promising local zones, the depths and thicknesses of reservoirs with living (healing) water may be determined by detailed scanning, and healing properties of living water in identified reservoirs of cross-section may be also studied.

Based on the results of detailed processing of satellite image of local block, a decision will be made to drill exploratory wells in the most promising local areas. At the initial stage of drilling, wells can be designed to study reservoirs with hydrogen in the upper horizons of cross-section. During drilling, reservoirs with living water can also be studied. Based on the results of the first wells drilling, a decision can be made on the next stages of research for the further implementation of the "project".

Some comments and conclusion

The results of experimental reconnaissance studies carried out promptly within the Cabora Bassa basin allow us to conclude that the oil and gas exploration wells drilled within the licensed area will be dry.

The research materials also once again confirm the volcanic model of hydrocarbon deposits formation, the features of which can be formulated as follows.

As a result of the experimental studies carried out in different regions of the globe, the presence of 10 types of volcanic complexes were defined on Earth, filled with 1) salt; sedimentary rocks 2) 1-6 groups, 3) 7 (limestones), 4) 8 (dolomites), 5) 9 (marls) and 6) 10 (siliceous) groups, as well as igneous rocks 7) 1st (granites), 8) 6th (gabbros and basalts), 9) 7th (ultramafic) and 10) 11th (kimberlites) groups.

Numerous experiments have shown that the conditions for the synthesis of oil, condensate and gas at the boundary (surface) of 57 km are created only in 5 types of the 10 above volcanic complexes filled with: 1) salt, 2) sedimentary rocks of 1-6 groups, 3) limestone, 4) granites and 5) ultramafic rocks. It should be noted that the conditions for hydrocarbon synthesis do not arise in all volcanoes of each of the 5 listed types.

The results of a reconnaissance survey of the areas where "dry" drilled wells are located [32, 33] (including in the Cabora Bassa basin) showed that almost all of them are located in the contours of volcanic complexes in which there are no conditions for hydrocarbons synthesis! The low efficiency of oil and gas prospecting is quite reasonably explained by the results of instrumental measurements using direct-prospecting methods [9]. Such results should be considered weighty arguments in favor of the expediency of direct-prospecting methods and technologies using for hydrocarbon deposits prospecting and exploration.

During satellite images and photographs processing over the surveyed objects [16-17], additional facts (evidence) were obtained in favor of the deep (abiogenic) genesis of oil, condensate and gas [22] in the process of hydrogen degassing of the Earth [6]. The relevance of the problem of abiogenic synthesis of hydrocarbons and their migration into the upper horizons of cross-section and into the atmosphere is emphasized by many researchers.

The results of earlier conducted experimental works [14, 21-27], also allow us to draw generalizing conclusions of the following nature.

1. In blocks and areas where basaltic volcanoes with roots at different depths are located, signals are almost always recorded from the surface at the frequencies of hydrogen, living water, and phosphorus (red). Quite often, responses from hydrogen bacteria are also recorded, which create their colonies in the near-surface part of cross-section in the areas of hydrogen migration into the atmosphere. Hydrogen bacteria do not produce hydrogen, but use it to maintain the viability of their populations.

2. Responses at hydrogen frequencies are recorded when scanning cross-section with a large step almost from the upper edges of basaltic volcanoes to their roots. This feature allows us to suggest that basalt volcanoes are a kind of channels through which hydrogen is actively migrated to the upper horizons of cross-section and further into the atmosphere.

3. Instrumental measurements indicate that in basaltic volcanoes with roots at depths of 470 km and 723 km on surfaces (boundaries) of 68 km and 69 km, respectively, deep (living) water is synthesized. Hydrogen-enriched water is healing and can be used for health purposes. It is worth noting once again that all the surveyed zones and areas of longevity on Earth [16, part 2] are located within (contours) of basalt volcanoes, in which water synthesized at depths of 68 km or 69 km migrates to the surface and is used for water supply and drinking goals.

4. Hydrogen deposits can be formed by basalt volcanoes in capped reservoirs adjacent to basalts. The local site for hydrogen production in Mali is located outside the contour of a basaltic volcano; responses from hydrogen were recorded at the location of one of the drilled wells from marls. In other areas of the survey, signals from hydrogen were obtained from dolomites (the Carpathians, the island of centenarians Ikaria), as well as marls and limestones.

5. Formed near basalt volcanoes, as well as above basalts, hydrogen deposits in reservoirs of various types can be quickly detected and localized during areal prospecting using direct-prospecting methods (technologies for frequency-resonance processing of satellite images and photographs, including).

6. The problem of studying reservoirs in crystalline rocks (including basalts) deserves attention. Direct-prospecting methods can also be used for these purposes.

7. It should be considered fundamentally important that the experimental studies carried out in numerous areas have shown the possibility (and expediency) of using direct-prospecting frequency-resonance methods of satellite images and photographs processing and interpreting to detect and localize areas of hydrogen accumulation, as well as determine the depths of its predicted deposits. In further studies in this direction, it is advisable to pay attention to the types of reservoirs in which hydrogen can be accumulated, as well as seal rocks that will contribute to the preservation of deposits.

The technology as a whole, as well as its individual methods, can be used in different regions of the globe for a preliminary assessment of the prospects for oil and gas potential of poorly explored and unexplored blocks and local areas. The use of this technology can give a significant effect during the search for industrial accumulations of hydrocarbons in unconventional reservoirs (in particular, in the zones of distribution of shale, coal-bearing seams, crystalline rocks). Timely conduction of additional studies by direct-prospecting methods in local areas of prospecting and exploratory wells will help to increase the success of drilling (increase in the number of wells with commercial hydrocarbon inflows). The drilling of wells in areas where vertical fluid migration channels are located can lead to an increase in hydrocarbon inflows. Mobile technologies can also be successfully used in the exploration of little-studied areas and blocks within known oil and gas fields.

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Geographic Sciences

Landşaftların estetik və psixo-mənəvi xüsusiyyətlərinin insan sağlamlığına təsirinin qiymətləndirilməsi

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Açar sözlər: landşaft estetikası, psixo-mənəvi təsir, estetik resurslar,mənzərə.

Bu gün landşaftların estetik xüsusiyyətlərinin coğrafi öyrənməsinə maraq kəskin artmışdır. Ərazinin estetik potensialı- cəmiyyətin estetik ehtiyaclarının mənəvi cəhətdən təmin olunmasında bu ərazinin mümkün iştirak dərəcəsi kimi müəyyən edilir. Nə vaxt ki, insan ərazinin estetik xüsusiyyətlərindən məqsədyönlü istifadə etməyə başlayır və ya onların istifadəsinin imkanını anlayır, bu zaman onlar resurslara çevrilir. "Təbii estetik resurslar" – müşahidə edəndə estetik təmin olunmaya səbəb olan bizi əhatə edən bütün təbii mühitdir.

Landşaftların estetik xüsusiyyətlərini landşaftşünaslıq elminin xüsusi tətbiqi istiqaməti öyrənir. Landşaftın estetikası – gözəlliyi təbii və təbii-antropogen landşaftlarının şairanəliyi, onların estetik götürməsinin xüsusiyyətlərini öyrənən landşaftşünaslıq elminin xüsusi istiqamətidir.

Landşaftın estetik görünümü mənzərə adlandırılan onun xarici simasıyla təyin edilir. Estetik və mənəvi- psixoloji cəhətdən təsiretmədə mənzərə və onun ayrı- ayri komponentləri başlıca rol oynayır.

Mənzərədə landşaftın çox daxili xüsusiyyətləri açılır, hansılar ki, mənzərəyə məhəl qoymadan dərk etmək mümkün deyil. Mənzərə strukturu kompozisiya elementlərinin uyğunluğuyla təyin edilir, hansılara ki, işıqlanma dərəcəsindən asılı olan günün vaxtı, ilin mövsümü kimi dinamik dəyişmələr daxildir. Mənzərə kompozisiyasını aşağıdakılar təşkil edir:

• mənzərənin elementləri: çay, yol, ağac, məbəd və s.;

• mənzərə süjetləri – mənzərə elementlərinin lokal məcmularıdır, hansılar ki, 1 sujetli, 2 sujetli və daha çox kompozisiya formalaşdıra bilərlər;

• mənzərələrin kompleksləri – icmalın vahid nöqtəsi olduğu halda panorama adlandırılan çoxsujetli mənzərələr.

Mənzərənin çoxsaylı elementləri onun kompozisiya düyünlərini formalaşdırır. Bura birinci dərəcədə müşahidəçinin əsas diqqətini cəlb edənlər və ikinci dərəcəni yaradan mənzərə fonu daxil olur. Kompozisiya hadisələri kimi təbii dominantlar (dağlıq zirvələri, şəlalələr və.s.) və ya antropogen (məbədlər, qalalar, saraylar və.s.) çıxış edir. Kompozisiya düyünləri mənzərə mərkəzində, həm də onun periferiyasında yerləşə bilər. Mürəkkəb mənzərə kompozisiyalarında elementlərin bir neçə fokusuna rast gəlinir.

Məhz mənzərə- coğrafi sahənin hər hansı nöqtəsindən açılan gözəllik və harmoniya nöqteyi-nəzərindən müşahidəçi tərəfindən qiymətləndirilə bilən vizual şəkildir. Bütovlükdə mənzərələr öz ərazi inkişafında fasiləsizdir. Sahənin vizual siması mənzərənin maddi əsası olan coğrafi landşaftdan tamamilə asılıdır.

Ərazinin mənzərə-estetik resurslarının qiymətləndirilməsində aşağıdakı meyarlar əsas götürülür :

*1.Mənzərə müxtəlifliyi.*Ərazinin estetik cazibədarlığının əsas meyarlarından birinə mənzərə müxtəlifliyi aiddir. Parlaq şəkildə vizual bir çox kontrast elementlərlə yaradılan müxtəlif mənzərələr bir qayda olaraq, daha üstün olurlar, nəyin ki, yeknəsəq monoton növlər. Monotonluq insanı yorur.

*2. Mənzərələrin rəng qamması.*Mənzərənin rəng qamması başqa sözlə, mənzərədə üstünlük təşkil edən rəng aspektləri landşaftın bədiiliyinin xüsusi əhəmiyyətli obyektiv parametridir. İnsan yalnız formanı qəbul etmir, həmçinin qəbul edilən rəng qamması zehni obrazın formalaşmasına güclü təsir göstərir. Öz dinamikliyinə məsələn, mövsümi ritmikasına baxmayaraq, bu çox əhəmiyyətli göstəricidir.

Hər rəng insana müxtəlif cür təsir göstərir. Bu təsir obyektivdir. Rənglər insanın orqanizminə biokimyəvi yolla psixofizioloji təsir edir. Sübut edilmişdir ki, rəng nəfəsin tezliyinə, nəbz, arterial təzyiq, bioritmlər, beyin fəaliyyətinin fəallığı və başqalarına birbaşa təsir göstərir. Məsələn, göy və yaşıl rənglər, hipofizə təsir edərək, sakitləşdirici təsirə malik olan serotoninin yaranmasına səbəb olarkən , qırmızı rəng isə, əksinə,hərəkətverici qüvvəyə malik adrenalinin yaranmasına imkan verir.

Hesab edilir ki, mənzərənin ən əlverişli rəng fonunu açıq-yaşıl, firuzəyi, mavi rənglər yaradırlar. Mənzərədə qırmızı, sarı, ağ, narıncı kimi müxtəlif çalarların olması əlverişli təsir edir. Qara və boz rəngin müxtəlif çalarları ən az cazibədarlığa malikdir.

3. Landşaftın meşəliyi- mənzərənin formalaşmasında meşənin iştirakı. Landşaftın meşəlilik dərəcəsi böyük estetik rola malikdir. Meşənin mövcud olduğu landşaft insanların əksəriyyətində sağlam olma şüurunu formalaşdırır.

Yaşıl əkinlər güclü sakitləşdici təsirə malikdir. Bitkilərin yaşıl rəngi insanda xeyirli psixofizioloji effektə səbəb olur. Bitkinin seyr edilməsi gözdaxili təzyiqin azalmasına imkan yaradır, görməni daha az yorur. Əhvalın və əhval-ruhiyyənin yaxşılaşmasına, yorğunluq hissinin çıxarılmasına, yuxusuzluğun, havanın elektrik çirklənməsinin bitkiylə azaldılmasına imkan yaradır.

Beləliklə, bitki zonaları sağlamlığın bərpası, işləmək qabiliyyətinin və insanın uzun ömürünün saxlanması üçün xüsusi şəraitə malik olmaqla, onun istehsal və yaradıcılığının ilham mənbəyi olur. Yaşıl əkmələr əhəmiyyətli səskeçirməyən rolunu oynayır, bundan başqa toz müdafiə rolunu və başqa səhiyyə funksiyalarını yerinə yetirirlər. Meşə mühiti küləklərdən müdafiə edir, rütubəti artırır və hava temperaturunu aşağı salır, zərərli qazlardan və tozdan atmosfer havasını təmizləyir.

4. Landşaftda su obyektlərinin mövcudluğu. Cazibədar mənzərələrdə aparıcı rolu su obyektləri yəni onların mövcudluğu oynayır. Çox müəlliflər hesab edirlər ki, landşafın formalaşması zamanı su obyektləri estetik xüsusiyyətlərə malikdir. Və bu fikir əsassız deyil. Həqiqətən, insanların əksəriyyəti üçün su obyektləri (göl, çay, şəlalə, dəniz və s.) cazibədar landşaftın vacib estetik atributlarıdır. Su obyektləri mənzərənin xüsusi xarakterini müəyyən edir.

Belə ki, sakit meşə gölləri romantik ahəng qurduğu halda, coşqun kandarlı dağ çayları, əksinə, həyəcanlandırır və daxilən aktivləşdirir.

İnsan sağlamlığı çox həssasdır və təəccüblü deyil ki, təbii mühit və landşaft əhvala böyük təsir göstərir. İnsan bütün həyat və təsərrüfat fəaliyyəti boyu təbiətlə təmasda olur, onun təsirini bütün hallarda özündə hiss edir. Bu təsir müxtəlif aspektlərdə qiymətləndirilir. İnsanın təbiətlə yaxın münasibəti onun sağlamlığına təsir edən ən böyük faktorun da mühit faktoru olması ilə səciyələnmişdir.

Sağlamlığa təsir edən mühit xüsusiyyətlərindən ən mühümləri aşağıdakılardır: Rənglər, səslər və formalar. Bunlar bizim mühitimizin ən əhəmiyyətli xarakteristikasıdır. Məhz, onlar hiss orqanlarıyla qəbul edilərək, bizim şüurumuza, ayrı-ayrı orqanların fəaliyyətinə, həm də orqanizmin ümumi vəziyyətinə təsir edirlər. Məsələn, günəş işığı insanın sağlamlığına müsbət təsir edir, süni işıqlandırma isə görmə orqanlarına ziyan vurmaqla bərabər, həm də bu işığı biləvasitə qəbul edən dəri örtüklərinin vəziyyətinə də neqativ təsir göstərir.

Məhz xəstəliklərin meydana çıxması və inkişafına mane olmaq məqsədi ilə öz sağlamlığının qayğısına qalan insanlar "orqanik dizayn" da kök salır. Rəsmdə canlı təbiətin təsviri, arxitektura, şəkillər, ədəbiyyat və hətta musiqi əsərləri insanda şüuraltı qəbul edilir və bu sayədə o mənəvini yaxşılaşdıran daxili harmoniyanı və fiziki vəziyyəti əldə etməyə icazə verir. Hətta canlı təbiətin sadə seyr edilməsi canlandırıcı təsir göstərir: atəş- od tonusu qaldırır, su, əksinə, sakitləşdirir. Təbii səslər – şəlalənin uğultusu, meşənin səs-küyü və.s. analoji effekt yaradırlar. Harmonik təşkil edilmiş mənzərənin seyr edilməsi psixoloji tonusu yüksəldir.

Insanlar təbiətin müxtəlif təsirlərini özündə hiss edirlər. Bəziləri özlərini meşədə daha sakit hiss etdikləri halda, başqalarını, əksinə, çöl yeri çəkir. Bəziləri dənizi görən kimi xoşbəxtlikdən orada dayanır, lakin kimdəsə su narahatlıq yaradır. Alpinistlər dağlara qalxaraq, "şimal" ekstremal turistləri isə tayqanın tufandan yıxılmış ağaclarının arasında girərək xoşbəxtdirlər.

Müxtəlif landşaftların insanlara psixo-mənəvi təsiri müxtəlifdir:

Okean, dəniz mühiti: Belə böyük və açıq su mühitinə malik landşaftlar əbədi hisslərin ani hisslərdən daha əhəmiyyətli olduğu insanlar üçün daha çox celbedicidir. O öz məqsədinin təyini üçün iradə, qaçılmaz qərarların qəbulu üçün güc verir. Təsadüfi deyil ki, məhz dəniz sahilində öz gələcəyimiz haqqında, uzaq səyahətlər haqqında və bu kimi başqa fikirlər haqqında tez-tez düşünürük.

Çaylar: bütün çaylar özündə dəyişikliklərin enerjisini daşıyır. Çay bir suya iki dəfə girmək olmaz fikrini xatırladır. Su axımı əbədidir və heç vaxt tükənmir. Çay landşaftı insana dəyişikliklərin, axıcılığın, comərdliyin enerjisindən əlavə, başqa şəraitə uyğunlaşmaq bacarığını da verir.

Göl: Göl özündə dünyanı əks etdirən güzgünü xatırladır, buna görə o insana daxili ehtiyaclarda və problemlərdə özünə fokuslanmağa kömək edir. Həm də ölçü üzrə göl nə qədər dərin olarsa, insana bir o qədər özünün ruh dərinliyinə enməyə imkan yaradır. Bəzən insan özü güman etmir ki, şəxsi ruhunun dərinliklərində mürgüləyir və bunu görməyə heç də hazır deyil. Amma kimki özünə baş çəkməyə qorxmur, dərin göl landşaftlarına səyahət edərək, bunu hiss edir. Göl nə qədər işıqlı və daha böyük olarsa, bir o qədər yüngülləşdirən, sakitləşdirən və sevinc gətirən təsir yayır. Böyük və işıqlı göllər mənəvi rahatlıq gətirirlər, hansı ki, ailə həyatını qaydaya salmağa həmçinin, əməkdaşlıq münasibətləri qurmağa imkan yaradır.

Meşə- Fotosintez prosesində bir çox ağac, kol və ot bitkiləri böyük aktivliyə malik olan xüsusi kimyəvi birləşmələr ayırır. Alimlər təbii meşələrin havasında 300-dən artıq müxtəlif adlı kimyəvi maddələr, müxtəlif ətirli birləşmələr, efir yağları aşkar etmişlər. Odur ki, meşələr insanların əvəzedilməz sağlamlıq mənbəyidir. Müəyyən edilmişdir ki, şam, ardıc, qovaq, palıd, cökə, tozağac meşələri xəstəlik törədən virusları, mikrobları aloye, sarımsaq, soğan və istiotdan da tez məhv edir. Ona görə də yaşıllıqları havanın «sanitarı», fitonsidləri isə havanın «vitamini» adlandırırlar. Hər bir bitki fitonsidinin özünəməxsus təsiredici xassəsi vardır. Məsələn Böyük Qafqaz meşələrində geniş yayılan palıdın fitonsidləri qanlı ishal çöplərini məhv edir və s. Ardıc, şam, sidr və palıd meşələrində mikrob yox dərəcəsindədir. Palıd və qaraçöhrənin fitonsidləri 5-6 dəqiqə ərzində bakteriyaları məhv etməyə qadirdir.

Həkimlər ürək-damar xəstəliklərinə palıd və digər meşələrin faydalı təsirini çoxdan müşahidə etmişlər. Palıd meşələri təsir göstərdikləri şəraitdə xəstələrin müalicəsində ümumi dərman preparatları daha effektli nəticə vermişdir. Hipertoniya xəstəliyinin bütün mərhələlərində palıd yarpaqlarından istifadə etmək olar.

Estetiklik dərəcəsini yüksəldən aşağıdakı əsas amilləri nəzərə alaraq : bitki örtüyü müxtəlifliyi, geniş rəng diopozonu, relyef müxtəlifliyi, su landşaftlarının mövcudluğu, ahəngdarlıq, zoomüxtəliflik və.s. landşaftları aşağıdakı kimi qruplaşdırmaq olar:

1.Yüksək estetikliyə və psixomənəvi təsirə malik landşaftlar

2.Orta estetikliyə və psixomənəvi təsirə malik landşaftlar

3.Aşağı estetikliyə və psixomənəvi təsirə malik landşaftlar

Azərbaycan landşaftları üzrə bu qruplaşmanı aşağıdakı kimi apara bilerik:

Azərbaycan landşaftlarının estetik və psixomənəvi təsirinin qiymətləndirilməsi

Regionlar	Meşə sahəsi-yaşıl fon	Bio müxtəliflik	Zoo müxtəliflik	Mənzərə müxtəlifliyi	Su obyekt-lərinin möv-cudluğu	buzlaqlar
Böyük Qafqaz	Yüksək	Yüksək	Yüksək	Yüksək	Yüksək	Yüksək
Kiçik Qafqaz	Yüksək	Yüksək	Yüksək	Yüksək	Yüksək	Yüksək
Kür dağara-sı çökəkliyi	Orta	Orta	Orta	Aşağı	Orta	----------
Talış-Lənkə-ran ərazisi	Yüksək	Yüksək	Yüksək	Yüksək	Yüksək	Aşağı
Naxçıvan M.R	Aşağı	Orta	Orta	Yüksək	Yüksək	Orta
Abşeron y.a	Aşağı	Orta	Orta	Aşağı	Aşağı	----------

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Effects of Climate Change on Water Environments

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ABSTRACT

The concept of global climate change, as outlined in the U.S. Global Change Research Act of 1990 (GCRA), refers to alterations in the worldwide environment encompassing shifts in climate, land productivity, water resources, atmospheric chemistry, and ecological systems. These changes have the potential to disrupt Earth's ability to support life. Climatic changes are profound factors that influence all aspects of global development. Interconnected variables such as global warming, the melting of glaciers, rising sea levels leading to increased coastal erosion, accelerated lake evaporation, the greenhouse effect, heightened ocean acidity, greater rates of biological invasions, and declining biodiversity all contribute to this phenomenon. It's crucial to understand that climatic change transcends national borders and is a global issue.

The sudden escalation of severe consequences linked to climatic changes is largely rooted in alterations to the Earth's water systems, particularly the movement of water from oceans to land. This dynamic significantly impacts aquatic species, making them particularly vulnerable. For instance, the coastal regions of the Levantine Mediterranean Sea in countries like Egypt, Israel, and Lebanon are experiencing continuous erosion of their coastlines. This erosion is causing a decline in fisheries due to the critical damage inflicted on the breeding habitats of native fish species in these pristine areas. The historical opening of the Suez Canal in 1869 acted as a catalyst for ecological shifts in the Levantine Mediterranean and the surrounding Egyptian territories by facilitating the movement of various species from the Red Sea basin. This change has enabled invasive species like Rabbit fish and Erythrean mytilid mussels to migrate from the Red Sea to the Mediterranean, negatively impacting the native biodiversity of the southeastern Mediterranean.

Additional detrimental factors that contribute to the decline of aquatic biodiversity include activities like inland aquaculture, eutrophication, destruction, and fragmentation of aquatic habitats. In the absence of innovative international efforts to counteract the destructive impacts of climatic changes on the world's ecosystems, there is a significant risk of endangering all forms of life on Earth.

Keywords: Climate change, global environment, biodiversity, invasive species, Mediterranean Sea

INTRODUCTION

Various groups of distinguished scientists worldwide have extensively engaged in studying the emerging global peril posed by climatic shifts to the survival of all life forms on Earth. The adverse effects of climatic alterations on the biology, reproductive capacity, expansion, and diversity of aquatic, land-based, and airborne organisms have been recognized and studied for a considerable period (1). Over the past twenty years, researchers have dedicated significant effort to formulating standards to precisely define the fundamental concept of "global warming." However, this focus has sometimes led to overlooking the reality that the environment encompasses more than just

temperature changes; it also encompasses a wide array of interconnected elements like gas discharges, chemical waste, and the clearance of forests (2).

The conversion of land, often for agricultural purposes, has had the most significant impact on the terrestrial environment (3). This signifies the most destructive pattern of global climate alteration concerning an integral element of the Earth. Notably, the overexploitation of fishing resources, pollution, and climate change stand out as primary catalysts of change in marine ecosystems (3, 4). Meanwhile, freshwater ecosystems face changes primarily due to alterations in watersheds and their utilization, contamination of water resources by human activity, shifts in hydrological patterns, and the introduction of invasive species (3, 5). Various assessments have acknowledged climate change as a predominant driver of change, a role it will increasingly assume in the forthcoming decades (6). Climate change can take place across evolutionary and ecological timeframes, brought about by both natural and human-induced factors (1).

As a crucial component of the organisms profoundly affected by the rapid global climatic transformations, aquatic creatures have moved to the forefront of the list of the most impacted beings (7). The extent of impact on such aquatic species escalates in tandem with the expansion of industries encroaching upon water bodies within a particular region.

Hence, a pressing requirement to explore underlying triggers significantly contributing to the crisis of global climate change necessitates comprehensive scrutiny across all environmental elements. This review extensively examines the cohesive factors behind global climate shifts and their consequences on both local and worldwide aquatic ecosystems. The ultimate objective is to alert the global community about the dire ramifications of climate change on the well-being, expansion, and advancement of aquatic creatures within their habitats, subsequently impacting global human progress.

DISCUSSION

Rising ocean levels: Due to the expansion of ocean water due to heat and the accelerated melting of glaciers, it is projected that sea levels will increase by approximately 50 centimeters by 2100 (8). Many coastal areas will require enhanced sea defenses, albeit at a significant cost. Nevertheless, for nations with extensive river deltas like Bangladesh, Southern China, Egypt, and numerous islands in the Pacific and Indian Oceans, such adaptive measures may not be feasible (9).

The ongoing rise in sea levels poses a substantial threat to a significant array of aquatic species. In fact, a number of these species might be classified as endangered or extinct by the conclusion of this century due to the continuous sea level increase (10). Among those most susceptible to these profound consequences are migratory fish like mullet and eels, various aquatic creatures such as turtles, red sea corals forming coral reefs, certain aquatic crustaceans, and a significant number of aquatic birds including flamingos, aquatic warblers, pelicans, and swan geese (11). The primary reasons for these threats stem from the destruction of vital spawning and nesting sites for the aforementioned species (10, 11).

Elevated water resource evaporation rate: The gradual increase in the Earth's temperature triggers subsequent instances of water evaporation. This pressing issue results from unchecked human intervention in the natural balance provided by the environment. Currently, human activities account for up to 6% of the evaporation of Earth's river runoff (12). Across expansive

regions worldwide, heavy rainfall patterns could intensify, while semi-arid areas might experience reduced rainfall. More frequent and severe flooding or drought events could become commonplace, particularly in sub-tropical regions susceptible to such phenomena (13). Floods and droughts already result in more fatalities, disasters, and economic downturns than any other form of calamity. Any escalation in their frequency or intensity could constitute the most devastating repercussions of global climate change.

Lake Manzallah and Lake Qarun serve as prominent examples in Egypt, depicting water bodies significantly impacted by gradual evaporation, leading to heightened salinity and reduced surface areas for both lakes (14). Nevertheless, certain enclosed lakes and rivers in Africa are even more susceptible to evaporation and surface area reduction than those that are open or partially open (15). These hydrological shifts in the water cycle prompted numerous aquatic species to relocate to other water bodies in cases of open or semi-open systems, while compelling others to exist in a perilous state of being classified as endangered, threatened, or possibly extinct species.

Impact on marine and estuarine ecosystems: Climate change could lead to elevated sea levels, higher water temperatures, and shifts from current precipitation, wind, and water circulation patterns (16, 17). Estuaries might encounter breeding ground loss, disruption of marine life and organisms, alterations in circulation patterns impacting native species, escalated hypoxia, and more intense storms (17, 18). Coastal and estuarine ecosystems might also witness cold-tolerant species moving toward higher latitudes and warm-tolerant species extending their ranges poleward (16, 19).

Impact on the availability of food resources: Numerous studies on food supply and abundance have revealed an ongoing decline in the global food reserve. The distribution of food production is expected to shift significantly across regions worldwide, primarily due to the escalating scarcity of water resources. Developing nations will be particularly affected by the global water shortage, driven by rapid population growth and insufficient agricultural output.

The greatest uncertainty in predicting the impacts of climate change on ecosystems lies in understanding how it will alter species interactions. Climate change could lead to unforeseen outcomes, as different species exhibit distinct responses to changes in environmental temperatures. Research has shown that the connections between primary producers like phytoplankton and consumers like zooplankton can be disrupted by rising water temperatures. Notably, diatom blooms and other aquatic lifeforms are profoundly influenced by the mismatch in water temperatures induced by global warming (20). Consequently, this disruption is likely to have significant repercussions on the flow of resources to higher trophic levels (21).

There is proof that rising temperatures due to climate change are negatively affecting the productivity of lakes. The warming trends observed regionally since the early 1900s have led to higher surface-water temperatures, disrupting the stability of the water column (22). Additionally, the local reduction in wind speed has contributed to decreased mixing, which in turn lowers the upwelling of nutrients from deep waters and their mixing into surface waters. Some conclusive evidence indicates that the influence of regional climate change effects on aquatic ecosystems' functions and benefits might surpass that of local human activity or excessive fishing (22).
Recent increases in the frequency, intensity, and duration of harmful algal blooms in coastal regions suggest that human activities have impacted both lower and higher organisms within marine food chains (23).

Emission of gases: The Earth captures the heat energy from sunlight primarily at its surface. To maintain a constant temperature, an equivalent amount of energy is emitted upward from the surface at longer, infrared wavelengths (24). Certain naturally occurring atmospheric gases, notably water vapor, carbon dioxide, and methane, absorb a portion of this infrared radiation, effectively acting as insulating "blankets" over the surface (24). Carbon dioxide (CO_2) plays a significant role in influencing the ocean's pH level (25)Since the 1800s, about one-third of human-induced CO_2 emissions have been absorbed by oceans, leading to an average oceanic pH decrease of 0.10 units, representing a 30% reduction. If not addressed, oceanic pH is projected to further decrease by 0.4 units by 2100 (25). The current rate of atmospheric CO_2 increase exceeds any levels observed over the past 650,000 years (26).

A decrease in pH will impact the entire oceanic system, particularly affecting cold-water oceans in high latitudes earlier and more severely compared to warm-water oceans. Concentrations of CO_2 and other radiatively active trace gases in the atmosphere have increased since the start of the Industrial Revolution (7). Such alterations in the atmosphere can disrupt the global climate and hydrological cycle, subsequently influencing water resources (7). The combustion of fossil fuels currently contributes between 5.5 to 20.5 billion metric tons of CO_2 to the atmosphere annually, predominantly in economically developed areas of the temperate zone (27). Given the variable impact of increased CO_2 on different species, substantial shifts in species composition and dynamics across terrestrial and aquatic ecosystems are likely to occur (28).

Agricultural activities, livestock farming, and the burning of fossil fuels result in the emission of excess sulfur dioxide, ammonia, and nitrogen oxides into the environment, where they transform into nitric acid and sulfuric acid. While a considerable amount of these acids is deposited on land, some can remain suspended in the air and travel to coastal regions of oceans and seas. When atmospheric nitrogen and sulfur compounds mix with coastal waters, the resulting alteration in water chemistry accounts for about 10 to 50 percent of the overall changes in acidity attributed to carbon dioxide-driven acidification (13). This modified chemical composition affects the seawater's chemistry, causing increased acidity and a reduction in the upper ocean's capacity to store carbon. Additionally, the growing influx of nitrogen deposition into natural water systems can enhance the prevalence of non-native species (29). Notably, even small additions of nitrogen can benefit invasive species in cases where nitrogen is a limiting nutrient, as shown in studies that examined fertilization effects (13).

CONCLUSION AND CHALLENGES

Climate change is anticipated to profoundly impact aquatic animal populations and their dependents, pushing numerous aquatic species into categories of endangerment, threat, or extinction due to the severe consequences of global climate shifts. A significant factor behind this decline is sea level rise and resulting coastal erosion, devastating breeding habitats for migratory aquatic species like fish, shellfish, and birds. Rising ocean acidity poses a serious threat to shellfish, as heightened carbonic acid levels inhibit calcium deposition essential for shell formation. Additionally, global warming has led to changing sex ratios in marine mammals, fish, amphibians, and aquatic birds, which can jeopardize their survival.

Increased eutrophication in tropical and subtropical areas is a reflection of global warming's impact on regional aquatic environments, potentially harming native species and facilitating the invasion of non-native species. Analyzing how biological invaders respond to global change

underscores the likelihood that critical components of global change will boost the prevalence of these invaders.

The diverse and complex impacts of environmental changes on aquatic food production (wild and captive aquatic animals) highlight the need for precautionary measures in the face of potential threats to global edible aquatic animal production. This calls for proactive approaches to mitigate the course of environmentally damaging global climate shifts.

Coastal regions grappling with climate change also contend with challenges tied to the globalization of aquatic animal production and trade. In less developed countries, inadequate infrastructure, high disease prevalence, and other constraints hinder adaptation efforts. To safeguard fishing sectors and vulnerable coastal communities from the adverse effects of climate change, it's crucial to identify at-risk aquatic species and communities, explore government-supported adaptive strategies, consider limitations on private adaptations, and prioritize long-term vulnerability reduction over short-term solutions. This underscores the urgent need for cohesive policy integration across sectors like coastal planning, river basin management, agriculture, fisheries, and health, which intersect with climate change risks (30).

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Adapting to climate change and implementing Integrated Water Resource Management within the water industry

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Abstract

Integrated Water Resources Management (IWRM) emerged during the 1980s as a method to optimize the allocation of water resources among various sectors. However, the complexity of water systems has increased since its inception due to alterations in the global water cycle brought about by climate change. The recognition of climate change's profound influence on water availability and the risk of floods has prompted both research efforts and policy formulation in the realm of adaptation. This study delves into the key likenesses and disparities between climate change adaptation and IWRM.

The principal contrast between these two concepts lies in their temporal focus. IWRM is primarily concerned with present and historical issues, whereas adaptation centers on the long-term future. The implementation of climate change adaptation encounters a notable challenge in the substantial uncertainties associated with future predictions. To address these uncertainties, two divergent adaptation approaches have emerged. The first, a top-down approach, hinges on comprehensive analyses of large-scale biophysical impacts. This approach aims to quantify and mitigate uncertainty by employing an array of scenarios and various climate and impact models. Nonetheless, a drawback of this method is the propagation of uncertainties throughout the modeling process. In contrast, the bottom-up approach disregards uncertainty and concentrates on enhancing resilience within local-scale water systems. Nevertheless, both these approaches exhibit limitations when it comes to seamless integration into water management practices. The bottom-up approach tends to overly emphasize socio-economic vulnerability while downplaying technical solutions, whereas the top-down approach often results in an overwhelming surge of uncertainty, complicating decision-making.

A more promising avenue for adaptation involves a risk-based approach. This entails formulating adaptation strategies rooted in current and future risks, followed by evaluating these strategies using an array of future scenarios. This iterative process aims to develop robust adaptation measures and strategies that can withstand a range of potential future challenges. Further research should be directed toward refining and testing this approach, which holds the potential to offer a more effective framework for navigating the complexities of climate change adaptation and integrated water resource management.

Introduction

In the 21st century, a pivotal challenge revolves around resource management that meets human needs while safeguarding the environment. Mounting pressures on resources stem from population growth, economic progress, and evolving lifestyles. Particularly in the water sector, competition among users and interest groups intensifies. While agriculture dominates water

consumption in water-scarce regions, demands from other sectors surge (1). Many regions grapple with severe water scarcity due to heightened demands. Furthermore, degraded water quality in developing areas complicates management. To enhance water management, the Integrated Water Resources Management (IWRM) approach emerged in the 1980s, gaining prominence over time. IWRM is often depicted as a process that aims to regulate water use across different sectors, factoring in economic, social, and ecological considerations. Initially assuming stability, IWRM historically presumed that observed natural process variability could extrapolate into the future, enabling predictive modeling and meaningful water use regulation (2). However, this assumption falters in light of changing water availability and flood frequencies due to global warming (3). Uncertainty is high in both physical systems and stakeholder behavior. Recent water management advancements strive to embrace and navigate this uncertainty, ultimately enhancing decision-making (4).

Climate change possesses the potential to significantly alter global precipitation and evaporation patterns, impacting water availability (5). While consensus exists that climate change will affect water availability, uncertainties persist, leaving regions uncertain about whether water availability will rise or decline (6).

Initially, climate change research centered on impacts and emission reduction strategies. It's now evident that some climate shifts are inevitable, necessitating adaptation. Climate change adaptation and Integrated Water Resources Management (IWRM) differ in timescales: adaptation focuses on the future, while IWRM reconciles present needs, typically within 6–10 years. This temporal contrast shapes uncertainty approaches and required strategies. Effective management should consider short and long-term needs, integrating climate adaptation within existing water management systems.

This paper examines the parallels and disparities between climate adaptation and IWRM, emphasizing uncertainty management.

1. Holistic Water Management Approach (IWRM)

The Tennessee Valley Authority (TVA), founded in 1933, stands as a significant IWRM milestone, advocating comprehensive natural resource planning (7). TVA's approach aimed to harmonize hydropower, navigation, flood control, and agriculture through rationalized development, grounded in scientific knowledge. This approach viewed uncertainties as knowledge challenges that scientific expertise could diminish, sidelining political concerns (7).

By the 1990s, IWRM evolved in practice and research, adopting a systems perspective to address interconnections and stakeholder interests (8). The concept gained popularity, though it spawned two perspectives: an expert-dominated approach, aiming to solve water issues with scientific and stakeholder knowledge (8), and an issue-driven approach, acknowledging the political and value-based nature of water concerns (9). These perspectives recognize the complexity of water issues influenced by diverse actors' perspectives, histories, and knowledge (10).

The 'expert dominated' approach in integrated water management focuses on reducing knowledge uncertainties. Uncertainties stem from data quality, simplifications in models, and

limited process understanding. Data and model quality are addressed, but normative values are not considered (11).

The issue-driven approach recognizes inseparable ties between knowledge and politics, emphasizing joint exploration (12). Ambiguous problem definitions, embedded in values, defy straightforward solutions. Scientific input contributes to discussions, requiring scientists to clarify their positions and engage actors.

2. Climate change adaptation

Traditional Integrated Water Resources Management (IWRM) and water system design relied on historical data and stationarity assumptions, now challenged by changing climate (3). Climate change's regional impacts demand new approaches for water resource sustainability and investment preservation. This shift requires abandoning stationarity, though the replacement remains uncertain.

Adapting to a changing climate typically follows three steps: assessing impact/vulnerability, designing/selecting adaptation options, and evaluating these options (13). Water sector impact analyses often employ top-down modeling with emission scenarios and global climate models. Hydrological models assess water availability, flood risks, and drought frequencies (14). Alternatively, the bottom-up approach, focusing on local vulnerabilities exacerbated by climate change, emphasizes socio-economic factors (15).

Research trends split, with biophysical sciences favoring top-down and social sciences favoring bottom-up. Bottom-up adaptation aims at socio-economic vulnerability reduction, while top-down targets physical impacts (16). While bottom-up approaches are effective at small scales and rural areas, their application remains limited in larger scales and urban contexts (17).

3. A theoretical framework

Integrated Water Resource Management primarily revolves around planning and decision-making. The role of knowledge within IWRM spans two extreme stances: an "expert dominated" perspective aims to alleviate uncertainties by integrating scientific and stakeholder knowledge, while the "issue driven" stance accepts ambiguities as part of coping strategies. These positions create an axis depicting different strategies for handling uncertainties, ranging from reduction attempts to acceptance. Climate change adaptation, in contrast, looks ahead to anticipated climate shifts. The contrast between IWRM and adaptation lies in their focus on the present versus the future. The top-down and bottom-up approaches align with the "expert dominated" and "issue driven" axes in IWRM regarding uncertainty management. The top-down approach centers on knowledge and seeks to mitigate or quantify uncertainties, while the bottom-up approach acknowledges an uncertain future and prioritizes adaptive capacities (see Fig 1).

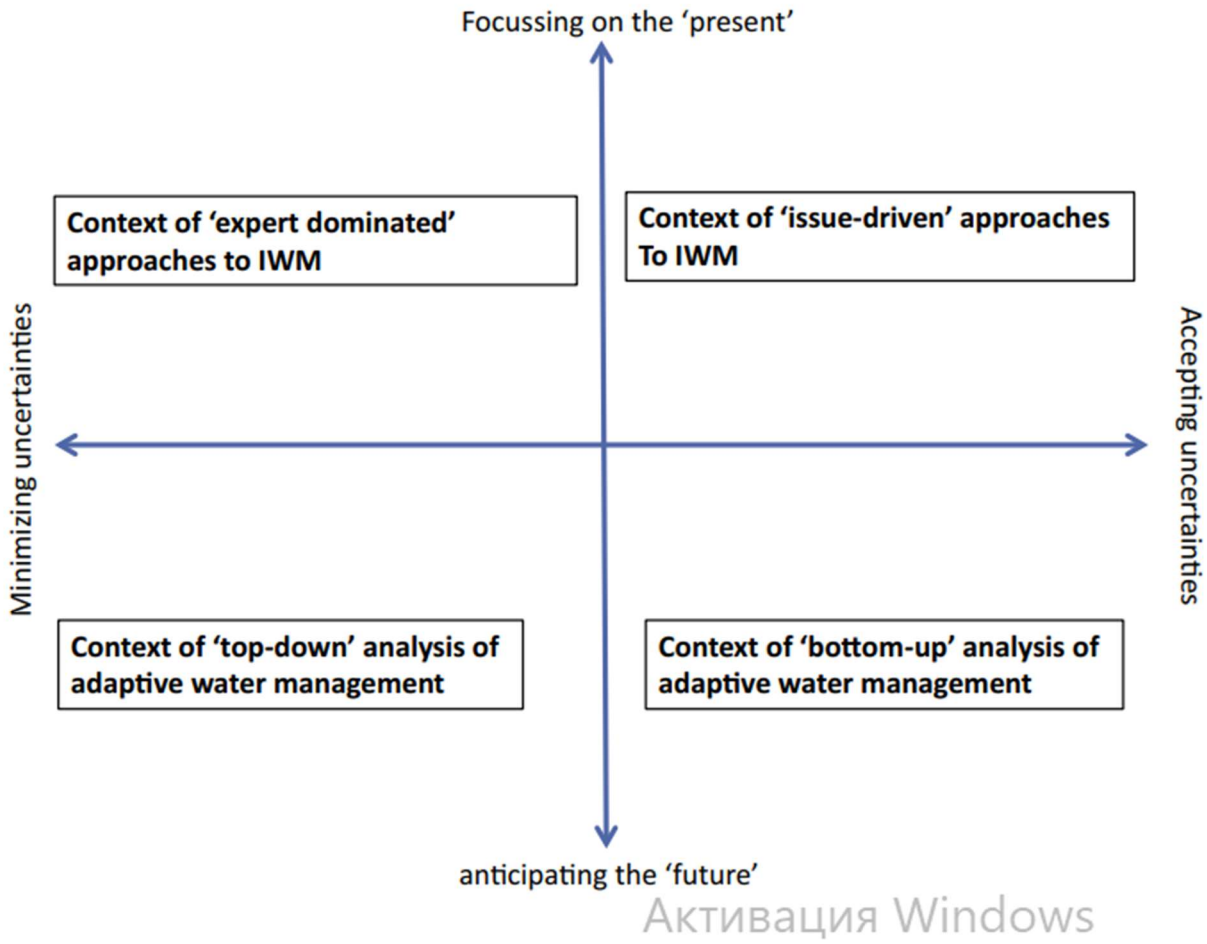

Fig 1

4. Case studies

To exemplify disparities in uncertainty perceptions, two case studies were chosen. The Rhine River basin, well-studied with abundant data, stands in contrast to the Congo River basin with limited management coordination and data scarcity. Both basins' IWRM and adaptation approaches illustrate varied uncertainty strategies and planning implications.

4.1. The Rhine

Although ranking 60th globally in size, the Rhine River holds second place for navigation importance. Flowing through six nations from the Alps to the North Sea, it underwent centuries of transformation for industry and urban growth. Restoration efforts since the 1980s balance human impact, economic interests, and hydrological management. Three international commissions manage the Rhine, employing expert groups and research (18). This case showcases science's role in implementing the EU Water Framework Directive and adapting to climate change (19). The Rhine's Water Framework Directive integration and preparation for increased extreme event probabilities due to climate change are explored (20).

The execution of WFD planning in the Rhine basin necessitates creating programs for ecological and water quality enhancement, encompassing tasks like floodplain restoration, waste stream purification, and nutrient reduction (21). Balancing these actions amidst diverse sectors like

agriculture, industry, and navigation, and integrating them into existing policies proves challenging (22). Amidst such politics, solid scientific input is crucial (23). Yet, data on complex stressors affecting aquatic ecology and water quality harbor significant uncertainties, complicating negotiations and decisions (24).

Local WFD implementation intersects numerous policies, with managers negotiating to realize objectives, illustrated by the "Breakthrough" canal project (25). Stakeholders from flood control to ecological infrastructure collaborated on the canal's design, reflecting competing needs and ecological enhancement concerns. Scientific understanding gaps, like canal design's ecological impact, sparked disputes, with experts unable to resolve them. Switzerland and Germany experienced similar hurdles (26).

To enhance WFD execution, substantial scientific endeavor is now invested in understanding causal relationships within water bodies and basins, aided by data analysis and comprehensive monitoring programs (27).

5. Ambiguities in the Rhine and Congo river basins

Future climate impact assessments using "top-down" approaches are available for both the Rhine and Congo river basins, but they have yet to influence policy due to the considerable uncertainties, complicating interpretation by decision makers. In the Rhine, flood protection strategies still rely on historical event analysis, while in the Congo, climate impact signals remain unclear. Even if models provide clear signals, the absence of basin-wide management hampers effective adaptation planning.

For the Rhine, researchers are proposing alternative methods such as adaptation pathways and multi-layered safety approaches to analyze uncertain futures, acknowledging the need to anticipate the unexpected by embracing uncertainty.

6. Main research and data gaps

Agreement exists in both scientific literature and water management entities regarding the necessity for climate change adaptation and enhanced integrated water management due to heightened competition among various water uses and stakeholders. Nonetheless, substantial gaps persist in the knowledge and tools required for effective integrative and adaptive water management. We pinpoint four crucial areas demanding further advancement.

6.1. Data Quality for Comprehensive Modeling and Scenario Evaluation

The capability to model and predict future developments hinges on comprehending the current baseline situation (28). Absence of robust historical data hampers calibration and validation of climate, hydrological, and water resources models, diminishing their reliability in depicting future scenarios.

Enhancing data availability requires expanded measurements, ensuring data comparability, and fostering accessibility. Numerous regions necessitate systematic monitoring programs, gathering hydrological and meteorological data with adequate spatial and temporal coverage. Essential parameters include rainfall, streamflow, temperature, and water quality indicators for model and scenario formulation. While long-term benefits arise from heightened data collection,

immediate improvements involve enhanced data sharing and accessibility. In various transboundary river basins, data sharing remains constrained, both among riparian countries and within individual nations.

Furthermore, a discrepancy exists between biophysical and socio-economic datasets and models. Socio-economic data often aligns with administrative boundaries, while hydrological modeling centers on natural river basin delineations.

6.2. Dissemination of Uncertainties in Models and Scenarios

The top-down approach to impact and adaptation evaluation initiates with formulating emission scenarios for global climate models (GCMs) (29). GCM outputs necessitate downscaling and bias correction prior to their utilization in impact models, such as hydrological and water resources models (30). Each analysis stage introduces additional uncertainty layers. Future greenhouse gas emissions remain uncertain, though the rise in atmospheric concentrations and resultant temperature increase are evident. However, predicting their impact on rainfall distribution and runoff is highly uncertain, notably in terms of water availability (31). Climate models contribute extensively to this uncertainty, with GCM structural variations identified as a major uncertainty source for temperature and precipitation (32).

To mitigate these uncertainties, employing an ensemble of climate models is recommended. Yet, there's a lack of clear methods for determining the number of climate models suitable for impact assessment (33). Global climate models continue to exhibit significant biases, particularly in precipitation and other variables like radiation (34). Bias correction is often essential for using climate models in impact assessments, though it can be problematic if improperly applied, potentially overlooking critical feedback mechanisms (35). Ideally, the need for bias correction would be obviated, but this requires improvements in the simulation of precipitation, specifically, within climate models.

6.3. Contested Research and Utilization of Research Outcomes in Strategies and Conflicts of Interest

In the Rhine case, policy implementation involves intricate negotiations and strategic maneuvers. Data gleaned from water body monitoring assume strategic importance, forming the foundation for quality assessments and investment decisions for water body enhancement. Consequently, data quality, interpretation, and utilization become integral to water planning negotiations. Advocates tactically leverage scientific knowledge as a persuasive tool, while researchers become integral players in the policy arena (36). Claims of objectivity face skepticism, necessitating researchers to establish credibility and accountability through explicit documentation of assumptions and methodologies, alongside peer assessment in extended scientific communities (37).

6.4. Advancing Ecosystem and Water Management Integration

Experience from implementing the Water Framework Directive (WFD) in the Rhine highlights challenges in comprehending water system behavior amidst various human-induced stressors. Additionally, it underscores the intricate connections between water management, local waterbody enhancements, and broader ecological quality preservation policies such as WFD and Natura 2000. The European Commission's 2009 white paper on adaptation strategies

acknowledges the promising value of ecosystem-based adaptation methods (European Commission, 2009).

7. Future Research Priorities

Future research should ideally address the identified knowledge gaps. However, it's crucial to recognize that varying water management approaches necessitate distinct research agendas. We've outlined four water management methods categorized along two axes (Fig. 1). Enhancing climate models and hydro-meteorological datasets are essential for uncertainty reduction strategies. Traditional Integrated Water Resources Management (IWRM) requires a strong historical understanding, whereas adaptation strategies demand diverse climate scenarios. Improved datasets and tools for climate data manipulation, such as downscaling, upscaling, and bias correction, are necessary. Actor-focused diagnosis and research into conflicting perspectives, issue framing, and social learning are pivotal for bottom-up adaptation and issue-driven IWRM.

Conclusions

This study explores diverse scientific perspectives and policy requirements in the realm of integrated water management and climate change adaptation. Integrated Water Resources Management (IWRM) has aided in more equitable water allocation across sectors, yet climate change, coupled with other pressures, has complicated resource management. Notably, IWRM has not adequately addressed these emerging challenges (38). Although the call for climate adaptation is widely recognized, uncertainties in projections and impacts have hindered effective strategy formulation and implementation. Both top-down and bottom-up adaptation strategies necessitate novel methodologies. The bottom-up approach, primarily rooted in socio-economic sciences, requires greater integration with biophysical sciences like hydrology, alongside socio-economic and technical considerations. Conversely, the top-down approach often introduces heightened uncertainty due to a cascade of models used in impact assessments (39).

Promisingly, a shift towards risk assessments rather than impact assessments can yield more relevant adaptive policies. Research focusing on enhancing and applying risk assessment methods, including hydrological analyses, is imperative. The development of strategies that integrate potential adaptations with assessments of climate change's physical impacts under conditions of deep uncertainty deserves further attention. Generally, there's a demand for appraisal methods that aid policymakers in evaluating adaptation strategies, rather than just diagnosing impacts or defining optimal water use solutions (40).

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Political Studies

ОЦІНКА РИЗИКІВ І ЗАГРОЗ НАЦІОНАЬНІЙ БЕЗПЕЦІ У СФЕРІ ЗАПОБІГАННЯ НАДЗВИЧАЙНИХ СИТУАЦІ ПРИРОДНОГО, ТЕХНОГЕННОГО І ВОЄННОГО ХАРАКТЕРУ В КРАЇНАХ-ЧЛЕНАХ НАТО ТА УКРАЇНІ

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Ризики різного роду катастроф в Україні, що спричиняє російська війна, вкотре актуалізує питання політики попередження і ліквідації надзвичайних ситуацій природного, техногенного і воєнного характеру. Найбільші за масштабами надзвичайні ситуації техногенного характеру трапилися в 1986 році – аварія на Чорнобильській АЕС, у 1998 році в Лос-Фрайласі в Іспанії на гірничорудному підприємстві компанії «Болідеї» стався прорив дамби – хвостосховища, внаслідок чого близько 4 млн. м3 рідких кислотних відходів і мулу вилилося в руку Агрію, що протікає по території Національного парку «Доньяна» – заповідника Європи. В Румунії в 2000 році на золотовидобувному руднику «Ауру» прорвало дамбу ставка – хвостосховища. Більше 100 м3 води зі вмістом висококонцентрованих ціанистих з'єднань потрапило в ріки Тису і Дунай. У результаті транскордонного переносу отрути скоїлоася масова загибель риби, птахів і тварин, більше 2 млн. людей залишилися без питної води тощо. У цьому ж році в Нідерландах у місті Енсхед трапилася серія вибухів на піротехнічній фабриці кампанії "Fiereworks S. E.". Під час аварії на фабричному складі знаходилося понад 100 т піротехнічної продукції. Внаслідок катастрофи 21 особа загинула; понад 1000 одержали тілесні ушкодження. Житлові квартали поблизу фабрики були фактично зруйновані. Катастрофи такого масштабу – непоодинокі випадки у світі. Остання з найбільших трапилася в Україні в 2023 році, коли росіяни у війні з Україною вчинили наймасштабніший за останні роки терористичний акт, зруйнувавши Каховську ГЕС.

Зважаючи на досвід можливих техногенних та інших катастроф, у країнах Європейського Союзу та країнах членах НАТО напрацьована система попередження надзвичайних ситуацій, укладена у відповідні правові і нормативні акти.

В основу політики попередження великої аварії покладено Директиву Севезо (82/50/ЄЕС) про небезпеку великих аварій у деяких галузях промисловості та іншої діяльності, що у 1999 році замінено Директивою Севезо II (96/82/ЄЕС) про запобігання великих аварій за викидом небезпечних речовин. Підходи Директиви Севезо II було визнано і уточнено у низці інших документів, зокрема Конвенції про запобігання великим промисловим аваріям № 3174 від 22 червня 1993 року. Відповідно до принципів Конвенції кожен член МОН повинен формулювати, здійснювати і періодично переглядати національну політику щодо захисту персоналу, населення і навколишнього середовища від ризику великих аварій, спираючись на чинні національні закони і норми, умови, практику, консультації з найбільш представницькими організаціями роботодавців та працівників, і усіма іншими зацікавленими

сторонами. Дія Директиви Севезо II поширюється на всі підприємства, де наявні речовини в кількостях, що дорівнюють чи таких, що перевищують мінімальне граничне значення, вказане в Директиві.

Отже, в Директиві Севезо II чітко прописано визначення великої аварії або надзвичайної ситуації техногенного характеру з відповідними кількісними характеристиками. Отже, до такої аварії відносяться: 1. Аварії з викидом небезпечних речовин – це будь-які, чи вибух, чи випадковий викид небезпечних речовин в кількості, що становить 5 відсотків граничного значення. 2. Аварії із заподіянням шкоди життю і здоров'ю людей, будинкам, спорудам. Йдеться про аварії, пов'язані з викидом небезпечної речовини, і такої, що призвела до однієї з подій, це – один випадок смерті, госпіталізація як мінімум на 24 години шістьох осіб; травмованих на об'єкті, госпіталізація як мінімум до 24 годин однієї людини; травмованої за межами об'єкту, заподіяння збитку будинку за межами об'єкту, що внаслідок аварії втратив товарний попит, евакуація та обмеження пересування людей більш, ніж 2 години (при цьому повинна виконуватися умова – величина показника «кількість людей на час у годинах» дорівнює не менше 500; припинення подачі населенню питної води, електрики, газу, або відключення телефонного зв'язку більш, ніж на 2 години, при цьому має виконуватися умова, що величина показника «кількості людей» на час у годинах дорівнює не менше 1000.

3. Аварія із заподіяння шкоди довкіллю. Сюди відносять аварії наслідком яких є: а) непереборний чи довгостроковий збиток, заподіяний наземному довкіллю (не менше 5 га території, що охороняється законом і має екологічне чи природоохоронне значення; не менше 10 га території, включаючи сільськогосподарські пасовиська); б) істотний чи довгостроковий збиток, заподіяний прісній і морській воді (довжина не менше 10 км ріки чи каналу; площа не менше 1 га озера чи ставка; площа не менше 2 га дельти ріки; площа не менше 2 га берегової лінії чи відкритого морського простору); в) істотна шкода, заподіяна водонасосному шару чи підземним водам на площі не менше 1 га. 4. Аварія з заподіянням збитку майну в таких обсягах: збиток майну , що знаходиться на об'єкті, у розмірі як мінімум 2 млн. євро; збиток майну, що знаходиться за межами об'єкта, у розмірі як мінімум 0,5 млн. євро. 5. Аварія з транскордонними наслідками. Тут йдеться про будь-яку аварію, пов'язану з викидом шкідливої (небезпечної) речовини і такою, що поширюється за кордони національної держави у країни ЄС. При цьому необхідно повідомити відповідну комісію ЄС про інциденти чи аварії, що держави ЄС розглядають як техногенні катастрофи. Вчасна поінформованість може упередити аварію і пом'якшити її наслідки, які можуть не відповідати кількісним щойно описаним критеріям. Запобігання надзвичайним ситуаціям техногенного характеру висувається до організацій, що експлуатують усі об'єкти, на які поширюється чинна Директива.

Уведення управління безпекою пов'язано із формуванням нових управлінських і організаційних методів, а також у вужчому сенсі – із здійсненням змін у виробничій практиці стосовно керування ризиками, що мали місце продовж кінця 1980-х – 1990-х років. Мета політичного регулювання небезпек техногенного характеру полягає в критично необхідному обмеженні числа аварій, які зумовлені управлінським фактором. Як оказують дослідження суб'єктивний (управлінський) фактор ставав причиною 90 відсотків аварій, які трапилися в країнах ЄС із 1982 року.

На адміністрацію підприємства покладається відповідальність підготувати документ, яким регулюється політика запобігання великих аварій і забезпечується її належне виконання.

Наступним кроком цей документ надається компетентним органам, і в ньому зважають на такі основні принципи: 1) політика запобігання великих аварій повинна бути оформлена документально і включати цілі та дії, що стосуються контролю ризику виникнення

аварій і надзвичайних ситуацій; 2) система управління безпекою має бути частиною загальної структури управління підприємством, до якої входять організаційна структура, розподіл обов'язків, методи, процедури, процеси і ресурси для вироблення та реалізації політики попередження аварій; 3) система управління безпекою повинна зачіпати аспекти: а) функції та обов'язки персоналу, пов'язаного із питаннями забезпечення безпеки та виявлення потреб у навчанні персоналу і проведення навчання; б) напрацювання та впровадження процедур для систематичного виявлення ризиків, що виникають при нормальних і позаштатних умовах праці, оцінка їхньої ймовірності та можливих наслідків; в) напрацювання і впровадження процедур та інструкцій з безпечної роботи, включаючи технічне обслуговування елементів устаткування, а також регламенти зупинок і планово-попереджувальних робіт; г) напрацювання та впровадження процедур планування чи модифікації проектування нових технічних пристроїв, технологічних процесів, елементів устаткування; д) напрацювання і впровадження процедур щодо прогнозування надзвичайної ситуації шляхом системного аналізу, а також процедура з підготовки, тестування й аналізу планів ліквідації надзвичайної ситуації; е) напрацювання і впровадження процедур оперативного контролю відповідності цілям, встановленим у рамках політики підприємства з попередження аварій і в рамках системи управління безпекою, а також напрацювання і впровадження механізмів аналізу і застосування корегувальних дій у випадку виникнення відхилень; к) напрацювання і впровадження процедур регулярної періодичної оцінки політики запобігання аварій і ефективності системи управління безпекою.

Організації, які експлуатують підприємства з нижньою граничною кількістю небезпечних речовин, повинні надавати напрацьовану політику запобігання великих аварій компетентному органові на його запит. Організацій, що експлуатують підприємства з верхньою граничною кількістю небезпечних речовин повинні показати у Доповіді з безпеки (це спеціальний документ, який подається на вимогу), що підприємство має напрацьовану політику запобігання великим аваріям.

Саме Директива Севезо II вимагає складання Доповіді про безпеку. Її метою є: показати, що політика запобігання великим аваріям і адміністративна система забезпечення безпеки (інструмент її виконання) створені і втілюються в життя; показати, що небезпеки великих аварій ідентифіковані, що вжито необхідних заходів з метою відвертання таких аварій і обмеження їхніх наслідків для населення і довкілля; довести, що в проєкті, конституції, експлуатації, технічному обслуговуванні та ремонті підприємства, складу, елементів устаткування і будь-якої пов'язаної з їх експлуатацією інфраструктури, щодо яких на їх території є небезпека великої аварії, належним чином враховано розуміння безпеки; довести, що розроблено внутрішній план дій у надзвичайній ситуації і надати інформацію, необхідну для складання зовнішніх планів ліквідації надзвичайної ситуації з метою вживання необхідних заходів у випадку великої аварії; надати компетентним органам достатню інформацію, що дозволяє прийняти відповідні рішення щодо розміщення поблизу підприємства нових підприємств чи споруд.

Значна увага у Доповіді повинна бути присвячена визначенню й аналізу ризику можливих аварій і методам запобігання аварій. Так, у Доповіді має бути подано опис різних сценаріїв аварій та ймовірності їхнього виконання або умов, за яких вони відбуваються, включаючи короткий опис подій, що можуть ініціювати кожен із цих сценаріїв у зв'язку із зовнішнім чи внутрішнім стосовно об'єкта причинам; проведено оцінку масштабу і серйозності наслідків аварій; докладний опис технічних параметрів пристроїв і устаткування, що застосовуються для безпеки об'єкта.

Окремий розділ доповіді присвячується опису заходів попередження аварій і локалізації їхніх наслідків, включаючи опис відповідного устаткування, організації схеми

сповіщення і порядку дій у випадку у випадку аварій, мобілізаційних ресурсів і необхідних елементів для напрацювання плану ліквідації аварії.

«Доповідь з безпеки» періодично розглядається і оновлюється, не раніше, ніж раз на 5 років, а також до закінчення цього терміну (на вимогу компетентного органу, коли це обумовлено або модернізацією небезпечних установок, або необхідністю обліку нових знань з питань безпеки і впливу небезпечних факторів.

Альтернативою в цілому інтуїтивному регулюванню взаємодії людини з навколишнім середовищем є цілеспрямоване керування цим процесом в інтересах досягнення прийнятного рівня безпеки з урахуванням соціальних та економічних факторів і стійкого розвитку.

Наріжним каменем такої політики є переведення управління безпекою на якісно нову основу для того, щоб ризики для людей, майна і навколишнього середовища, що залежить від розташування і діяльності потенційно небезпечних підприємств, міг бути оціненим і належним чином керованим.

Нова стратегія повинна будуватися на засадах, що враховують перехід до аналізу і керуванню ризиком. Центральною ланкою є обґрунтування заходів щодо захисту за критерієм «витрати – вигоди» та їх оптимізація. Таким чином основні зусилля щодо захисту населення або з ліквідації наслідків аварій, які вже відбулися, мають бути спрямовані на їх попередження. Витрати на попередження надзвичайних ситуацій є ефективними вже в середньостроковій перспективі.

Політика запобігання надзвичайних ситуацій в європейському законодавстві тісно пов'язана із плануванням землекористування. Норму про планування землекористування уперше введено в Директиві Севезо II, і в ній законодавчо затверджені висновки, зроблені після аварії в Бхопалі.

Держави – члени ЄС беруть на себе зобов'язання здійснювати контроль за розміщенням нових підприємств, модифікаціями існуючих підприємств, що могли б значно вплинути на небезпеку виникнення надзвичайних ситуацій техногенного характеру, розміщенням нових транспортних комунікацій і будь-яких суспільних споруд існуючих потенційно небезпечних підприємств, якщо від цього можуть збільшитися наслідки можливої великої аварії.

При цьому компетентні органи в кожній державі – члени ЄС і НАТО відповідають за напрацювання процедур, що сприяють впровадження політики землекористування і визнається, що для всіх держав – членів ЄС не може бути напрацьовано єдиної процедури, позаяк між державами існує відмінність у соціально-політичному, економічному, науково-технічному та культурному рівневі розвитку.

Країнами – членами НАТО в рішенні зазначених питань накопичений значний досвід, створено ефективні системи управління, матеріально-технічного, фінансового та іншого видів ресурсного забезпечення дій відповідних сил і засобів в умовах надзвичайних ситуацій мирного і воєнного часу.

Найбільш розвиненої системою є Федеральне агентство по роботі у надзвичайних умовах (ФЕМА) США. Агентство безпосередньо підлегле президентові держави. Агентство було створено на виконання наказів Президента США № 12127 від 31 березня 1979 року і № 12478 від 20 липня 1979 року на базі управління цивільної готовності Міністерства оборони., Федерального управління з надання допомоги населенню у випадку нещасть і Федеральної страхової адміністрації з метою зосередження в одному відомстві повноважень з координації зусиль, спрямованих на управління підготовкою економіки країни до діяльності у надзвичайних умовах, насамперед в умовах глобальної ракетно-ядерної війни. Проте в центрі завдань ФЕМА була стратегія подвійного застосування, тобто, як у мирний, так і воєнний час. Тому головними функціями цього державного органу є: координація діяльності

державних органів США, урядів штатів, і місцевих органів влади з питань мобілізаційного планування і підготовки економіки до війни в масштабі всієї країни, а також забезпечення безпеки життєдіяльності населення при виникненні надзвичайних ситуацій природного і техногенного характеру; планування заходів щодо забезпечення безперервності державного управління у випадку надзвичайних ситуацій, що стосуються національної безпеки; об'єднання і координація роботи всіх складових системи попередження надзвичайних ситуацій і оповіщення у випадку виникнення надзвичайних ситуацій у мирний і воєнний час та організація управління з ліквідації їхніх негативних наслідків; навчання населення і підготовка особливого складу органів управління до виконання покладених на них завдань; організація страхової діяльності в сфері захисту населення і територій від надзвичайних ситуацій різного характеру і відшкодування збитку фізичним і юридичним особам, які постраждали від їх негативних наслідків.

Найхарактернішою особливістю діяльності ФЕМА з виконання покладених на неї функцій є розробка і реалізація, головним чином, великих державних цільових програм (наприклад, мобілізаційної підготовки країни – «готовність уряду», «готовність резервів») та інших програм і проєктів у сфері її відповідальності.

У зв'язку із створенням наприкінці 1981 року Ради мобілізаційної готовності ФЕМА передало їй частину своїх функцій мобілізаційного характеру. Однак, якщо врахувати, що директор ФЕМА є секретарем цієї Ради, то агентство залишається головним координатором матеріальних і людських ресурсів країни та керує ними в надзвичайних ситуаціях.

Організаційно ФЕМА складається з управлінських (Федеральне управління з дій у надзвичайних умовах, Директорат з питань мобілізації, Директорат з цивільної оборони, Директорат із боротьби зі стихійними лихами й аваріями, Навчальний і науково-дослідний директорат, Директорат зі страхування на випадок повеней) і функціональних підрозділів (Федеральне страхове управління, Управління національної готовності, Протипожежна служба США, Управління програм штатів, місцевих програм і надавання допомоги, Управління зовнішніх зносин).

Наступними важливими елементами організаційної структури ФЕМА є її регіональні відділи, що розташовані в кожному із десяти округів військово-економічної мобілізації. Ці відділи підтримують тісні робочі контакти з представниками федеральних міністерств і відомств, які мають свої органи в регіонах, а також з відділами з управління в надзвичайних ситуаціях штатів, що входять до складу кожного округу.

Найважливішою особливістю організації ФЕМА є те, що маючи розгалужену мережі територіальних органів управління, це агентство не має своїх власних формувань для безпосереднього виконання завдань у районах лиха. Тому у разі виникнення надзвичайної ситуацій різного характеру ФЕМА надає право залучити будь-які федеральні сили, засоби і ресурси для порятунку людей і ліквідації негативних наслідків надзвичайних ситуацій, включаючи національну гвардію, корпус інженерів США, пожежні бригади, медичні служби, будівельні організації, поліцію, громадські та інші об'єднання. Якщо всіх цих сил для боротьби з лихом і ліквідації його наслідків недостатньо, ФЕМА залучає сили і засоби збройних сил, для чого підтримує постійний зв'язок з національним центром військового командування і відповідними службами ВПС, ВМС і сухопутних військ (наприклад, для евакуації людей – з оперативним центром ВПС), Північноамериканським командним пунктом ППО та зі штабами різних військових частин на випадок надання допомоги цивільній владі під час лиха, а також з органами управління НАТО й органами надзвичайного управління Канади, Мексики при плануванні спільних дій при можливих національних чи транскордонних надзвичайних ситуаціях. Усі державні і приватні організації зобов'язані всіляко сприяти і допомагати ФЕМА в заходах, що проводяться в районах лиха й оголошених такими.

Крім того ФЕМА здійснює централізоване керівництво аварійно-рятувальними роботами і надає необхідну фінансову й іншу матеріально-технічну допомогу місцевим органам влади і населенню.

Виконання цих функцій ФЕМА здійснює відповідно до концепції об'єднаного управління країною в надзвичайних ситуаціях, суть якої полягає у створенні в США цілком скоординованої структури органів управління. З цією метою в рамках ФЕМА створено Систему управління діями в надзвичайних ситуаціях (NEMS) і Систему оповіщення і попередження (NAWAS).

NEMS – складний механізм, призначений для збору, обробки і розподілу інформації під час організації дій у надзвичайних ситуаціях на федеральному рівні, рівні штатів і місцевому рівні.

NAWAS забезпечує передачу попереджень мережею широкого оповіщення, включаючи радіомовлення і телебачення.

Позаяк безпосереднє керівництво заходами з реагування на надзвичайну ситуацію, що виникла, і роботами з ліквідації її негативних наслідків здійснюють місцеві органи влади, їхній підготовці надається великого значення. Активність у цьому питанні стала особливо помітною після ухвалення рішення про переорієнтацію головної уваги в діяльності ФЕМА з військового аспекту на мирний і затвердження Національної стратегії пом'якшення наслідків стихійних лих, тобто на перший план після закінчення «холодної війни» виходять завдання попередження і ліквідації надзвичайних ситуацій природного і техногенного характеру і використання наявного потенціалу ФЕМА в гуманітарних цілях

Сполучені Штати Америки надають важливого значення захистові населення і територій від надзвичайних ситуацій природного, техногенного і військового характеру, що закріплено у Законі «Про цивільну оборону», ухваленого 1950 року. Прийняті у США закони характеризуються максимальною чіткістю формулювань, ясністю і конкретністю. У федеральному законі Роберта Т. Стаффорда «Про надання допомоги при нещастях і в надзвичайних ситуаціях», ухвалено 1988 року, детально розроблено механізм реалізації спеціальних заходів допомоги і захисту населення і територій від різного роду лих. Закон Стаффорда, щоправда, міг покластися на закони, напрацьовані ще від 1936 року. У чотирьох розділах закону ретельно виписано повноваження Президента США, губернаторів (головних адміністраторів штатів, місцевої адміністрації, федеральних органів виконавчої влади (міністерств, відомств, незалежних установ і державних корпорацій) і приватних «неприбуткових» організацій (комунальних, аварійних, медичних тощо), а також висвітлено відносини між вищезгаданими категоріями посадових осіб і організацій при наданні допомоги в надзвичайних ситуаціях і великих лихах.

Одночасно закон визначає, що під надзвичайною ситуацією розуміється будь-яка подія або випадок, для якого на додаток до зусиль і можливостей місцевої адміністрації необхідна допомога адміністрації штату, що спрямована на порятунок життя, здоров'я і безпеки людей, захисту будь-якого виду майна. Під великим лихом мається на увазі така надзвичайна обставина, яка, на думку, Президента, заподіює збиток таких масштабів, що вимагає залучення сил і засобів, матеріальних та фінансових ресурсів федерального рівня або з інших штатів для надання додаткової допомоги адміністраціям штатів, що постраждали, місцевим органам влади, підприємствам і організаціям. Президентові США надано право також формування надзвичайних груп підтримки, що повинні допомагати федеральному координаторові, у виконанні його обов'язків відповідно до цього закону.

В Україні питання захисту населення і територій від надзвичайних ситуацій техногенного та природного характеру регулюється законом України «Про захист населення і територій від надзвичайних ситуацій техногенного та природного характеру» в редакції від 10 жовтня 2012 року. У законі прописано відповідальність «центрального органу виконавчої

влади, що забезпечує формування державної політики у сфері цивільного захисту населення». Законом визначається поняття «надзвичайна ситуація техногенного і природного характеру», як ті, що порушують нормальні умови життя і діяльності людей на окремій території чи об'єкті на ній або на водному об'єкті, спричинене аварією, катастрофою, стихійним лихом або іншою небезпечною подією, в тому числі епідемією, епізоотією, епіфітотією, пожежею, яке призвело (може призвести) до неможливості проживання населення на території чи об'єкті, ведення там господарської діяльності, загибелі людей та / або значних матеріальних втрат. У законі дано визначення також поняттям «надзвичайної ситуації», «аварія», «катастрофа», «об'єкт підвищеної небезпеки», «потенційно небезпечні заходи», «захист населення і територій від надзвичайних ситуацій техногенного та природного характеру», «запобігання виникнення надзвичайних ситуацій техногенного та природного характеру», «ліквідація надзвичайних ситуацій техногенного та природного характеру», «реагування на надзвичайні ситуації техногенного і природного характеру», «зона можливого ураження», «оповіщення» тощо.

Законодавство України у сфері захисту населення і територій від надзвичайних ситуацій техногенного та природного характеру базується на Конституції України (254к/96-ВР) та складається із щойно названого закону, Закону України «Про правовий режим надзвичайних ситуацій» (1550-14) та інших нормативно-правових актів.

Залежно від обсягів заподіяних надзвичайною ситуацією техногенного та природного характеру наслідків, обсягів технічних та матеріальних ресурсів, необхідних для ліквідації наслідків, визначаються рівні надзвичайних ситуацій: державний, регіональний, місцевий, об'єктовий. Особливості оцінки та реагування на надзвичайні ситуації воєнного характеру визначаються окремим законом. Критерії класифікації надзвичайної ситуації встановлює Кабінет Міністрів України.

Відповідальність центральних та місцевих органів виконавчої влади, виконавчих органів місцевих рад у перший момент скоєння надзвичайної ситуації полягає в оповіщенні населення через засоби масової інформації. Надається достовірна інформація про стан захисту населення і території – зони лиха. Органи виконавчої влади мають забезпечити функціонування захисних споруд (укриттів) для працюючих осіб, чи осіб, що проживають у небезпечних зонах. З цією метою створюється фонд захисних споруд шляхом комплексного освоєння підземного простору міст і населених пунктів для взаємопогодженого розміщення в ньому споруд і приміщень соціально-побутового, виробничого та господарського характеру з урахуванням необхідності пристосування і використання частини приміщень для укриття населення в разі виникнення надзвичайної ситуації. Центральні органи виконавчої влади щорічно визначають перелік сховищ, укриттів та інших захисних споруд, які необхідно збудувати. Наявні захисні споруди при відсутності надзвичайних ситуацій використовуються для господарських, культурних і побутових потреб.

Закон передбачає низку інших заходів: евакуацію населення, інженерний, медичний, біологічний, радіаційний і хімічний захист населення.

Державний нагляд і контроль у сфері захисту населення і територій від надзвичайних ситуацій техногенного і природного характеру організовуються центральними органами виконавчої влади, що реалізують державну політику у сферах цивільного захисту, нагляду і контрою за станом захисту територій від надзвичайних ситуацій природного та техногенного характеру, іншими уповноваженими на це центральними органами влади.

З метою забезпечення реалізації державної політики у сфері захисту населення і територій створюється єдина державна система органів виконавчої влади з питань запобігання і реагування на надзвичайні ситуації, яка складається з територіальних і функціональних підсистем.

До складу сил та засобів захисту населення і територій входять відповідні сили та засоби центральних і місцевих органів виконавчої влади, а саме: професійно-аварійні рятувальні служби і спеціальні (воєнізовані) аварійно-рятувальні служби. У разі виникнення надзвичайної ситуації залучаються частини та підрозділи Збройних Сил України, інші військові формування, утворені відповідно до законів України. Умови залучення частин та підрозділів Збройних Сил України визначаються Президентом України відповідно до Конституції України, законів України «Про правовий режим надзвичайного стану» та «Збройні Сили України».

У ліквідації наслідків надзвичайних ситуацій можуть брати участь об'єднання громадян.

Закон також розподіляє повноваження виконавчих органів влади усіх рівнів з метою ліквідації наслідків надзвичайних ситуацій.

Фінансування заходів щодо попередження, ліквідації надзвичайних ситуацій здійснюються за рахунок коштів державного бюджету, місцевих бюджетів, а також коштів підприємств, установ та організацій незалежно від форми власності і господарювання, а також добровільних пожертвувань фізичних та юридичних осіб, благодійних організацій та об'єднань громадян, інших не заборонених законодавством джерел. Порядок фінансування також встановлює закон Статтею 35.

Матеріальні резерви для ліквідації наслідків надзвичайних ситуацій створюються заздалегідь з метою екстренного використання їх у разі необхідності. Зазначені резерви створюються центральними та місцевими органами влади, а також органами місцевого самоврядування.

Стаття 37 регулює питання міжнародного співробітництва у сфері захисту населення і територій від надзвичайних ситуацій на основі багатосторонніх і двосторонніх угод. Участь України у міжнародному співробітництві у сфері захисту населення і територій від надзвичайних ситуацій здійснюється шляхом проведення спільних наукових досліджень; розроблення та реалізації міжнародних програм, договорів, меморандумів тощо; створення спільних робочих груп управління міжнародними проєктами; здійснення взаємного обміну інформацією та вивчення міжнародного досвіду; участі у міжнародних конгресах, конференціях, симпозіумах тощо; набуття членства в міжнародних організаціях; підтримання міжнародних професійних контактів.

Закон України «Про захист населення та територій від надзвичайних ситуацій техногенного та природного характеру» (2012) регулює питання реагування і ліквідації наслідків надзвичайних ситуацій у більш загальних формах, ніж Директива Європейського Парламенту і Ради 2012/18/ЄС від 4 липня 2012 року про контроль загроз виникнення значних аварій, пов'язаних із використанням небезпечних речовин, та про внесення змін у подальше скасування Директиви Ради 96/82/ЄС.

Література

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2. Актуальні проблеми оцінки ризиків і загроз національній безпеці в контексті євроатлантичної інтеграції України: Науково-інформаційний збірник. Серія: Дослідження і розробки у сфері євроатлантичної інтеграції України. Випуск 9. Київ: Євроатлантикінформ, 2005. 224 с.
3. Директива Європейського Парламенту і Ради 2012/18/ЄС від 4 липня 2012 року про контроль загроз виникнення значних аварій, пов'язаних із використанням небезпечних речовин, та про внесення змін у подальше скасування Директиви Ради 96/82/ЄС. URL: https://zakon.rada.gov.ua/laws/show/984_011-12#Text
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Historical Sciences

Проголошення Угорської Республіки у 1990 р.

Козак Валентин Миколайович
Магістр освітньої програми «Середня освіта. Історія та правознавство»

У березні 1990 р. мали відбутись вибори, що змушували керівництво УСРП почати перебудову в середині партії. На фоні зменшення популярності комуністів і задля збереження влади партійне керівництво вирішило провести зміни ідеологічної основи партії.

Засідання 23 – 24 червня перетворило оперативний керівний орган партії на президентство з трьох осіб у складі: з Ріже Ньєрша, тодішнього генерального секретаря, Каролі Гроша, державного міністра, і Міклоша Немета, який змінив К. Гроша на посаді прем'єр-міністра в листопаді 1988 р. Колишній політичний комітет продовжував функціонувати як Політичний керівний комітет із 21 члена.

На знак поступової зміни балансу сил у партійному керівництві, засідання Центрального комітету УСРП 12 квітня 1989 р. проголосувало за виключення Яноша Береца, який вважався членом жорсткої лінії, зі складу політичного комітету. Це означало перемогу угорських реформаторів над консерваторами та ослаблення владних позицій К. Гроша. На нараді також було прийнято рішення провести XIV з'їзд УСРП у Будапешті на початку жовтня 1989 р.

Також у своїй постанові від 23 – 24 червня 1989 р. партійне керівництво не змогло відкрито висловити важливі змістові аспекти змін. Натомість було сформульовано відданість цінностям марксизму, соціалістичним і гуманістичним ідеям і відкритість до підходів, спрямованих на вирішення глобальних проблем кінця століття. Прагнення оновленої партії полягало в тому, щоб служити інтересам робітничому класові та нації, ставши силою, яка сповідує синтез комунізму з соціал-демократизмом[1].

Комітет партії оприлюднив заяву щодо позиції партії, в якій йшлося про те, що соціалізм в Угорщині може існувати лише в рамках нової економічної та політичної моделі. Нова мета партії, це – демократичний соціалізм, верховенство права, парламентська демократія, заснована на багатопартійній системі, ринкова економіка, заснована на вирішальній ролі власності громади[2].

На другому загальнонаціональному засіданні УСРП 2 – 3 вересня було визначено про необхідність радикального оновлення партії, очищення від консервативних елементів. Водночас голова партії Ріже Ньєрш однозначно заявив, що із УСРП має бути сформована як партія реформ[3].

6 жовтня 1989 р., в Конгрес-центрі Будапешта розпочався останній XIV з'їзд УСРП. Над кафедрою доповідача делегати могли прочитати гасло, відповідне духу нового часу:

[1]Húsz éve szűnt meg az MSZMP / Mult-kor (2009). URL: https://mult-kor.hu/20091007_husz_eve_szunt_meg_az_mszmp (дата звернення: 30.03.2022).

[2] Riba A. Hatalomtechnika a pártállam vegoraibanь (1987–1990) / Doktori értekezés. URL: https://9dok.org/document/z3do3knd-riba-andr%C3%A1s-l%C3%A1szl%C3%B3-doi-ppke-btk.html (дата звернення: 23.03.2022).

[3] Novak Z. Hatodik rész Az MSZMP reformkörök és reformalapszervezetek II. országos budapesti tanácskozása (1989. szeptember 2–3) (2005). URL: https://mek.oszk.hu/01900/01961/html/03.htm (дата звернення: 23.03.2022).

«Демократія, верховенство права, соціалізм!» [4]. Це був гарний приклад того, що майбутні засновники нової партії хотіли показати громадськості.

У своїй політичній вступній промові Р. Ньєрш підрахував ризики заснування партії нового типу, позаяк майбутня партія «демократичного соціалізму» повинна була мати опонентів, які би брали участь у виборах з можливостями та конституційними гарантіями, як і колись керівна партія. Він також пояснив, що нова партія не може бути комуністичною, але й не може бути соціал-демократичною. Він рекомендував підтримувати дружні стосунки з комуністами-реформаторами, соціалістами та соціал-демократами як на Сході, так і на Заході. Його слова на підтримку створення нової партії були особливо сильними, оскільки вони виходили від одного з визначальних членів-засновників УСРП.

К. Грош, у той історичний момент – генеральний секретар УСРП, хоч і наголошував на реформах і «демократичному соціалізмі», явно не в усьому погоджувався з Р. Ньєршом. Справедливо кажучи, він виступав не за нову, а за оновлену партію.

Як і Р. Ньєрш, І. Пожгай проголосував за створення нової партії. Він також висловив думку, що попри всю свою цінність, історія УСРП – це історія партійно-державної інституції.

У полі дискусії Іван Вітаньї від імені «Альянсу реформ», сформованого в рамках УСРП, пояснив, що зі старого має бути створено «радикально нове» і, що нова партія має бути правонаступником УСРП[5]. Його аргументи мали юридичні чинники, адже, окрім іншого, йшлося про успадкування та заволодіння партійними фінансами, майном та інфраструктурою.

Зрештою, 7 жовтня 1989 р. завдяки народно-демократичній платформі УСРП і платформі реформаторської асоціації, з'їзд проголосував за створення нової партії – Угорської соціалістичної партії (УСП). М. Немет згадав, що ані К. Грош, ані Я. Берец не голосували за створення нової партії та не приєдналися до УСП. Президентом нової партії було обрано Р. Нієрса[6].

Таким чином, УСРП було трансформовано, а не ліквідовано, вказуючи на наступність і очікування, що ті, хто проти трансформаційних змін, добровільно вийдуть із організації.

Партійні трансформації та перехід на демократичні принципи державотворення призвели до швидких змін в державному устрої. Почалася підготовка до проголошення республіки та майбутній виборів.

22 жовтня 1989 р. в Сегеді відбувся політичний фестиваль. Ініціаторами його проведення виступила повітова організація УСП у Чонграді, яка мала на меті відкриття загальнонаціональної кампанії на підтримку кандидата від новосформованої партії в президенти республіки. Президент партії Р. Нієрс наголосив на тому, що парламент Угорщини зробив рішучий крок вперед на шляху до конституції та встановленні політичної демократії. Його наступні слова зустріли бурхливими оплесками: «Угорщина – республіка, незалежна демократична правова держава. Наша республіка включила в конституцію перспективний принцип для теперішнього і, без сумніву, наступного століття…. Цінності буржуазної демократії та демократичного соціалізму є дійсними. Ми хочемо поєднати

[4] Bozoki A. The Roundtable Talks of 1989: The Genesis of Hungarian Democracy / CEU Press. 2002. URL: https://books.google.com.ua/books?id=4VQhQqCmSaoC&pg=PA64&lpg=PA64&dq=az+MSZMP+1989&source=bl&ots=tlWP9QPnpD&sig=ACfU3U20fc3sn_WTubJhnxHVTRBLz1fWAg&hl=uk&sa=X&ved=2ahUKEwji5qvHkPn4AhUuiIsKHTveBgUQ6AF6BAgYEAM#v=onepage&q=az%20MSZMP%201989&f=false (дата звернення: 16.08.2022).

[5] Rácz J. Az MSZMP legutolsó kongresszusa. Magyarhirlap (2019). URL: https://www.magyarhirlap.hu/30-eve-szabadon/20191009-az-mszmp-legutolso-kongresszusa (дата звернення: 16.08.2022).

[6] Ibid.

соціалізм, демократію і свободу»[7]. Р. Ньєрс запропонував І. Пожгая на посаду президента республіки.

Проголошення республіки показало рішучість парламенту до нових демократичних змін та остаточного розриву з верховенством СРСР над Угорщиною. Республіка, що мала утворитись, мала взяти курс реформ та змін. Про це наголосив в одному з інтерв'ю газеті «Народне слово» М. Немет: «… кожна нація хоче жити так, як їй найбільше підходить, ми пройшли довгий шлях у цьому напрямку за останні 15 місяців. У найближчі тижні та місяці ми зробимо ще більш рішучі кроки на шляху до парламентської демократії, за якої угорський народ зможе вільно вирішувати свою майбутню долю»[8].

Про те, що Угорщина стала на шлях реформ стверджував прем'єр-міністр М. Немет: «…реформи в Угорщині будуть незворотними, навіть якщо в Москві трапиться небажаний і невдалий поворот подій. Реформи, які вже були здійснені, переступили поріг, після якого перегрупування більше неможливе»[9]. Думка, яка, однак, продовж 2000-х рр. буде підважена усім спектром політичного, економічного та соціального життя Угорщини.

17 жовтня 1989 р. Національні збори, які все ще складалися переважно з представників УСРП, проголосували за мирний політичний перехід до правової держави. «Ми хотіли б повідомити жителям країни, що Угорська республіка буде проголошена в понеділок, 23 жовтня 1989 р., у Кошуттері, Будапешт. Вітаємо всіх громадян Угорщини та іноземних гостей на цій урочистій події»[10], – саме такими словами угорський парламент повідомляв населення, в газеті «Народне слово», про урочистості до дня проголошення республіки.

23 жовтня 1989 р. в Будапешті на площі Кошута, навпроти парламенту, зібралося близько 10 тисяч людей. Проголосив Угорську республіку з балкона парламенту спікер Національної асамблеї Матьяш Сюреш, що став тимчасовим президентом республіки[11].

Після зміни політичного режиму, Угорщина стала парламентською республікою. Вирішальна роль тут належала урядові та прем'єр-міністрові.

Перетворення, які відбулися в Угорщині відбулись завдяки реформ радянського керівника Михайла Горбачова. Перебудова кардинально змінила курс ряду європейський радянських держав та дозволила розвиватись за національними та демократичними принципами.

Реформи трансформації політичної системи в Угорщині стали неминучими та стрімкими. Навіть партійне керівництво розуміло, що для збереження власних позицій у державі та суспільстві, потрібні зміни. Тому Всеугорська конференція УСРП стала поштовхом та причиною наступних радикальних реформаційних дій у партії та суспільстві та проголошення Угорської республіки.

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[7] A szocializmust,a demokráciát, a szabadságot akarjuk ötvözni / Népszava (1989). URL: https://adt.arcanum.com/hu/view/Nepszava_1989_10/?pg=268&layout=s (дата звернення: 17.08.2022).

[8] Ibid.

[9] Nyilatkozata a Der Spiegelnek. A magyar reformok immár visszafordíthatatlanok / Nepszabadsag (1988). URL: https://adt.arcanum.com/hu/view/Nepszava_1989_10/?pg=268&layout=s (дата звернення: 10.09.2021).

[10] A szocializmust,a demokráciát, a szabadságot akarjuk ötvözni. Népszava. 1989. URL: https://adt.arcanum.com/hu/view/Nepszava_1989_10/?pg=268&layout=s (дата звернення: 17.08.2022)

[11] A szocializmust,a demokráciát, a szabadságot akarjuk ötvözni. Népszava. 1989. URL: https://adt.arcanum.com/hu/view/Nepszava_1989_10/?pg=268&layout=s (дата звернення: 17.08.2022)

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