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Biological sciences

COMPARATIVE GROWTH ANALYSIS OF SACCHAROMYCES CEREVISIAE S288C ON CONVENTIONAL AND PLANT-DERIVED MEDIA

F.S. Nabiyeva

Independent researcher
Samarkand State Medical University,
Samarkand, Uzbekistan

Abstract

The yeast *S. cerevisiae* is a microorganism that has been reintroduced into biotechnological applications. This is primarily due to its inherent safety, well-studied genetic background, simplicity and ease of genetic manipulation, and high resistance to extreme conditions of growth.

Nutrient media play an important role in research based on biotechnological and microbiological processes. The correct selection of nutrient media is one of the important factors that ensure effective results of research.

Currently, research into various other inexpensive and effective feed sources for the cultivation of *Saccharomyces cerevisiae* yeast strains is a pressing issue in many countries. From this point of view, it is advisable to cultivate *S. cerevisiae* S288C in nutrient media prepared based on the chemical composition of various root and tuber crops and their combinations, rich in proteins, carbohydrates, and mineral elements.

The aim of the study is to investigate the optimal conditions for the cultivation and proliferation of the yeast strain *Saccharomyces cerevisiae* S288C.

Materials and methods. The object of this study was the yeast strain *Saccharomyces cerevisiae* S288C. The S288C strain of yeast was grown on Saburo and nutrient media prepared from potatoes, beets, and various food wastes, and their growth dynamics were determined using spectrophotometric and microscopic methods.

Standard Saburo nutrient medium containing peptone - 10 g/l, glucose - 40 g/l, agar - 15 g/l, distilled water - 1 l was used for cultivation. The pH of the medium was 5.6 or 0.2. Sterilization was carried out in an autoclave at 121°C for 15 minutes. Cultivation was carried out at 30° C for 96 hours. Due to the use of a liquid medium, it was ensured by continuous aeration in a shaker at 150 rpm. The volume of yeast cultivation was 1% of the average volume.

The morphology of S288C yeasts was observed on stained slides using an MBS-10 microscope. Also, the dynamics of cell growth was measured in an optical density spectrophotometer at a wavelength of 600 nm (OD600) at 12-hour intervals, and a yeast growth curve was constructed based on the OD600 values.

Research results. At the initial stage of the study, S288C yeast cells were cultured in Saburo medium. The growth dynamics of the yeast were measured at 12-hour intervals by determining the optical density at a wavelength of 600 nm using a spectrophotometer. Based on the obtained OD600 values, a yeast growth curve was constructed. Cell morphology was observed using light microscopy.

Based on the obtained results, a growth curve for S288C strain was constructed. The active phase of logarithmic growth was observed within the time interval from 12 to 60 hours. After 72 hours, the culture entered the stationary phase, followed by a decline in optical density, indicating the onset of the degradation phase (Figure 1).

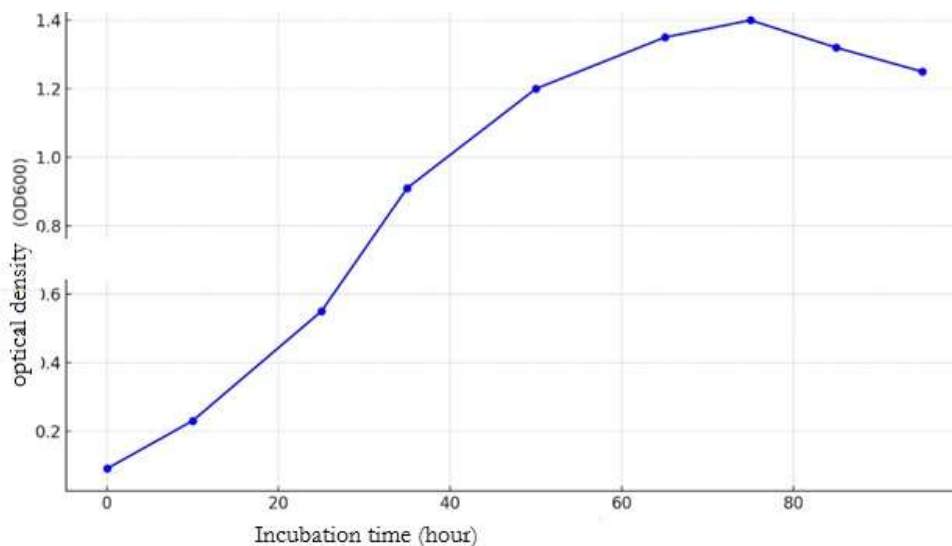


Figure 1. Growth curve of yeast strain S288C in Saburo medium

The morphology of yeast cells was analyzed in stained preparations. Within the first 12 hours, a small number of round cells were observed. During the period from 24 to 48 hours, active budding of the yeasts was observed, and the cells formed aggregates. At 72 hours and later time points, an increased number of vacuolated and disintegrating cells was recorded.

After activation of the S288C strain of yeasts in Saburo medium, it was re-inoculated into nutrient media prepared from potatoes, beets, and food waste, and a comparative analysis of cell growth in different nutrient media was conducted. Optical density (OD600) was measured every 12 hours at a wavelength of 600 nm (Figure 2).

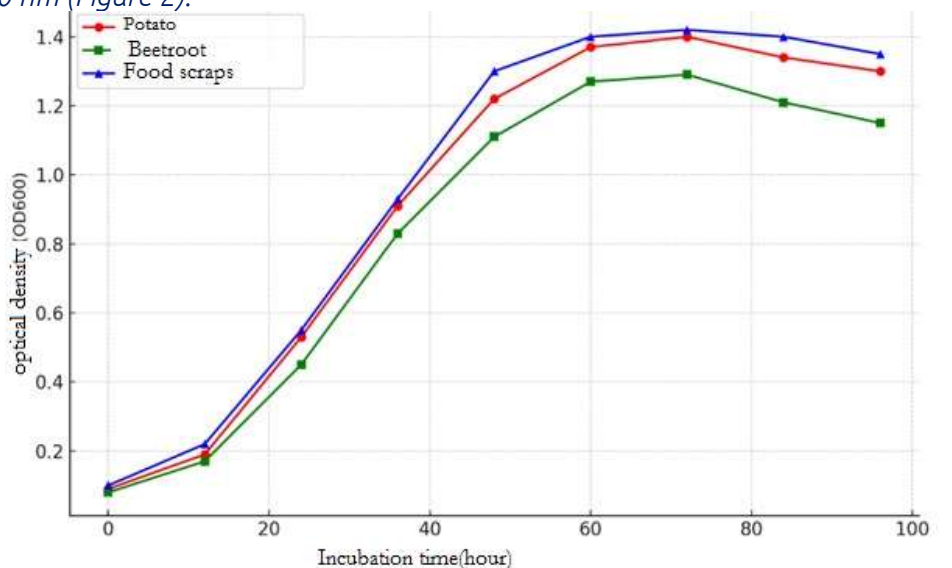


Figure 2. Growth curve of yeast strain S288C on various nutrient media

When stained preparations made from yeast cells were observed under a microscope, active growth and multiplication of cells in all types of nutrient media was found. In the medium prepared from food waste, the cells maintained morphological integrity until the end of the experiment, whereas in the media prepared from beets and potato tubers, signs of cell wall destruction were observed after 72 hours.

Conclusion. The results indicate that nutrient media prepared from all studied types of plant products can be used for the cultivation of the S288C yeast. The highest growth indicator, with a maximum OD600 of 1.43 was achieved in the medium prepared from food waste. This is associated with the rich chemical composition of the waste mixture, which contains various micro- and macroelements.

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CAPPARIS SPINOSA L. THE EFFECT OF CARBOHYDRATES AND GROWTH REGULATORS IN THE MULTIPLICATIVE PHASE IN MICROCLONAL MULTIPLICATION IN IN VITRO

Sevara Khalilova

Institute of Biochemistry, Samarkand State University
named after Sharof Rashidov, Samarkand, Uzbekistan

Gavkhar Dushanova

Institute of Biochemistry, Samarkand State University
named after Sharof Rashidov, Samarkand, Uzbekistan

Capparis spinosa L. in Uzbekistan is an oligotrophic plant that thrives in nutrient-poor soils. This plant is known to form symbiotic relationships with nitrogen-fixing bacteria in saline and low-fertility soils, thereby enhancing its adaptability to harsh environmental conditions. Cultivation of caper in the Central Asian region holds not only economic significance but also strategic importance in increasing the region's resilience to climate change. For this reason, large-scale cultivation of this species has become a pressing issue [1,4].

Despite the rising demand for planting material for commercial purposes, propagation challenges remain. Although seed propagation is the most common and straightforward method, it is associated with high variability among progeny. This leads to considerable differences in plant growth habits, yield, and quality. Vegetative propagation has been proposed as a reliable alternative to overcome these limitations; however, conventional clonal methods often face difficulties related to root development. To address this issue, micropropagation techniques have been successfully applied and are recognized as a viable and flexible solution for propagating various genotypes of *Capparis spinosa* L. [2,3].

In this study, healthy young shoots of *Capparis spinosa* L. were collected in July 2024 from Urgut district, Samarkand region, Uzbekistan. The shoots were segmented into approximately 5 cm-long sections and prepared for sterilization. Initially, the plant materials were rinsed under running tap water for 5 minutes. The sterilization procedure was carried out as follows: the shoots were immersed in 70% ethanol for 2 minutes, followed by 30 minutes in a 5% sodium hypochlorite (NaOCl) solution, with the addition of 0.1% Tween-20 as a surfactant. After surface sterilization, the explants were rinsed four times in sterile distilled water, each rinse lasting 5 minutes. Subsequently, under aseptic conditions and with the aid of a stereomicroscope, shoot tips approximately 1 mm in length were excised from terminal and lateral buds.

The excised shoot tips were transferred into 12 cm test tubes containing 10 mL of Murashige and Skoog MS nutrient medium. The composition of the medium included standard MS salts and vitamins, supplemented with 3% sucrose, 100 mg/L myo-inositol, 0.8% agar (Difco Bacto), 1.5 mg/L 6-benzylaminopurine BAP, 0.2 mg/L indole-3-butyric acid IBA, and 0.1 mg/L gibberellic acid GA3. The pH of the medium was adjusted to 5.8 before autoclaving.

To obtain a sufficient quantity of explants, the initial subculture cycle lasted 35 days. During the following three subculture cycles, only 0.5 mg/L BAP was used in the culture medium. In the first subculture phase, to prevent bacterial contamination and to ensure successful rooting and optimal proliferation of the explants under sterile conditions, cefuroxime was added to the medium at a concentration of 500 mg/L.

Based on the results of the experiment, the isolated buds exhibited successful initial growth, with a regeneration rate exceeding 83%. However, bacterial contamination was observed during the early stages. In the subsequent 35-day subculture period, explants were transferred to a nutrient medium supplemented with 500 mg/L of the antibiotic cefuroxime. As a result, cultures were brought to aseptic conditions, and after additional subculturing, a sufficient quantity of plant material was obtained for further experimentation.

The multiplication phase in vitro involves the increase in the number of plant explants and is primarily influenced by the addition of growth regulators (mainly cytokinins) to the culture medium. Other factors such as the type of explant, its physiological condition, the cultivation technique, and incubation conditions also play a crucial role in this process. During this stage, optimal proliferation outcomes can be achieved by effectively managing the morphogenetic activity of the plant.

In our study, the effects of Murashige and Skoog (MS)-based culture media, various cytokinins, and carbohydrate sources on the in vitro propagation efficiency of *Capparis spinosa* L. buds were investigated.

Initially, the buds were incubated on MS medium supplemented with 0.5 mg/L 6-benzylaminopurine (BAP) to induce primary proliferation. The developed buds were then segmented into two-node stem sections approximately 5 mm in length and placed horizontally on fresh culture media.

At this stage, MS media were enriched with two types of carbohydrate sources-3% sucrose or 3% glucose. As cytokinins, BAP, zeatin (ZEA), 2-isopentenyladenine (2iP), and meta-topolin (mT) were each tested at three different concentrations: 0.1, 0.3, and 0.5 mg/L. A hormone-free MS medium served as the control group. For each medium combination, a total of 72 explants were cultured, distributed across nine Magenta GA-7 vessels, with eight explants per vessel. The duration of the experiment was 45 days, and the primary evaluation criteria were the number of shoots (shoots per explant) and shoot length (≥ 5 mm).

In the initial phase, shoot elongation of approximately 0.5–1 cm was achieved in the medium supplemented with 0.5 mg/L BAP, and these shoots were subsequently selected for rooting. In the second phase, data were collected from explants cultured with 0.5 mg/L meta-topolin (mT). The shoot formation dynamics in response to low, medium, and high concentrations of mT and BAP were thoroughly analyzed.

Table 1

Effect of cytokinin type and concentration on the in vitro shoot multiplication of *Capparis spinosa* L.

Cytokinin type	Concentration of Cytokinins	No. of Shoots/Explant $\pm$ SE	Average Length of the Shoots $\pm$ SE (mm)
mT	0,5	17,3 $\pm$ 2,4	7,2 $\pm$ 0,4
	0,3	13,5 $\pm$ 1,5	7,1 $\pm$ 0,2
	0,1	11,2 $\pm$ 1,3	5,3 $\pm$ 0,3
BAP	0,5	12,5 $\pm$ 1,8	7,2 $\pm$ 0,3
	0,3	9,9 $\pm$ 1,3	5,4 $\pm$ 0,2
	0,1	8,7 $\pm$ 1,0	5,4 $\pm$ 0,3
ZEA	0,5	4,8 $\pm$ 1,0	8,1 $\pm$ 0,3
	0,3	7,3 $\pm$ 0,7	7,9 $\pm$ 0,4
	0,1	6,2 $\pm$ 0,6	8,5 $\pm$ 0,3
2iP	0,5	3,1 $\pm$ 0,2	8,9 $\pm$ 0,5
	0,3	2,8 $\pm$ 0,3	8,1 $\pm$ 0,6
	0,1	2,1 $\pm$ 0,3	8,0 $\pm$ 0,7
HF	0	2,0 $\pm$ 0,3	8,9 $\pm$ 1,1

Intensive shoot proliferation on medium supplemented with 0.5 mg/L mT cytokinin (a), and root formation on MS-IAA1 medium (b); scale bar: 1 cm

The effectiveness of cytokinins was evaluated through ANOVA analysis. The results indicated that both the type and concentration of cytokinins had a statistically significant effect on shoot induction ($p < 0.05$). Meta-topolin (mT) emerged as the most effective cytokinin. Specifically, 0.5 mg/L mT induced an average of 17.3 ± 2.4 shoots per explant. BAP followed as the second most effective treatment, yielding 12.5 ± 1.8 shoots per explant. The lowest responses were observed in hormone-free (GM) and 2iP-supplemented media.

The interaction between carbohydrate source (sucrose or glucose) and cytokinin type was evaluated separately. While sucrose-containing media generally resulted in a higher number of shoots, glucose was more effective in promoting shoot elongation. Additionally, sucrose was noted to reduce the incidence of hyperhydricity in explants.

According to the data presented in Table 3.1, sucrose at 3% concentration produced an average of 6.5 ± 0.7 shoots per explant with an average shoot length of 8.5 ± 0.3 mm, whereas 3% glucose led to 4.9 ± 0.5 shoots per explant and a shoot length of 9.5 ± 0.8 mm.

Table 2.

Micropropagation efficiency, as affected by the sugar type.

	No. of Shoots/Explant $\pm$ SE	Average Length of the Shoots $\pm$ SE (mm)
Sucrose 3%	6,5 $\pm$ 0,7	8,5 $\pm$ 0,3
Glucose 3%	4,9 $\pm$ 0,5	9,5 $\pm$ 0,8

According to the experimental results, the application of BAP and mT cytokinins at lower concentrations 0.1 and 0.3 mg/L led to a moderate level of new shoot formation. Moreover, increasing the cytokinin concentration resulted in a significant rise in shoot number. Specifically, in the medium supplemented with 0.5 mg/L mT, two-node explants produced an average of 17 shoots. In contrast, the control group HM, which lacked growth regulators, exhibited the lowest shoot induction rate. Although the shoot induction rate in the medium supplemented with 2iP was slightly higher than that of the control, its overall effectiveness was lower compared to other cytokinins.

The longest shoots were observed in the GM medium, as well as in media containing 2iP and 0.1 mg/L ZEA. In contrast, the shortest shoots were produced in media supplemented with BAP and mT. (Table 1.2, Figure 1a)

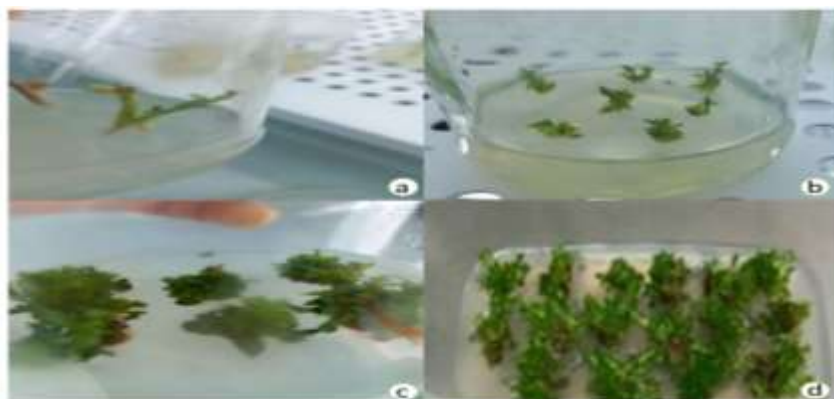


Figure 1. Number and length of explants on nutrient medium supplemented with 0.5 mg/L mT.

Conclusions

According to the results of the study, *Capparis spinosa* L. sucrose carbohydrate and mT cytokine were chosen as the optimal combination for effective micro competition of in vitro conditions. It is in these conditions that the number of shoots and their morphological development showed high results. This situation serves as an important basis for scientific researchers working with this type of plant in the creation of future microclonal propagation protocols.

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Cultural sciences

ORIENTATIONS AND SOLUTIONS TO ENHANCE THE ROLE OF WOMEN FISHERFOLK IN DA NANG CITY, CENTRAL VIETNAM

Nguyễn Thị Hạnh

Institute of Social Sciences of Central Region and Central Highlands, Vietnam.

Abstract

Based on research into the current role of women fisherfolk from the household to the community, this study proposes solutions to empower them amidst climate change and dwindling marine resources. The core issue is that the State and local authorities need to optimize and implement fisheries policies aimed at creating employment, increasing income, and thereby improving the material and spiritual well-being of women fisherfolk. Accordingly, we propose initial fundamental orientations and solutions to enhance the role of women fisherfolk in Da Nang City, Central Vietnam.

Keywords: women, fisherfolk, role, solutions, orientations, Central Vietnam.

1. Introduction

Fieldwork in three coastal wards of Da Nang City revealed several significant challenges. These areas are predominantly inhabited by fishing communities, and many women have limited educational backgrounds, with some being illiterate. This significantly hinders efforts to disseminate information and conduct training programs on legal awareness, gender issues, and gender equality. Leaders must constantly adapt their program content and training methods to suit diverse audiences. Furthermore, these women primarily engage in small-scale, seasonal trading, leading to unstable employment and low incomes. This results in considerable difficulties in their family lives. Campaigns promoting legal awareness on gender equality and domestic violence also face social stigmas, leading to low male participation in training sessions. A current challenge is that many women aged 15-55 cannot use transportation or social media. This limits their mobility, making it hard to receive information from local Women's Union leaders. The "Project 939: Supporting Women's Startups" has also highlighted the struggles faced by women fisherfolk groups in promoting and marketing their products. Their offerings often lack competitiveness, and they struggle to gain broad exposure or attract customers through social media. These issues underscore the urgent need for appropriate and timely orientations and solutions.

2. Research Approach and Methodology

This article adopts gender theory and gender role approaches to examine the involvement of both sexes (men and women) in family and social life activities. However, the extent of participation by men and women in various types of work differs, shaped by social perceptions and norms. Accordingly, this approach highlights the socially constructed differences between men and women in terms of roles, behaviors, and the values each gender creates.

The study employed a secondary literature review method, utilizing local economic reports from three coastal wards: Tho Quang, Man Thai, and Nai Hien Dong. These areas were chosen due to their high concentration of fisherfolk engaged in fishing and exploitation activities. The purpose was to understand the actual living conditions of the residents. Additionally, qualitative research was conducted through in-depth interviews to gather information and analyze the research problem. We interviewed 14 women and 6 husbands from households involved in near-shore and off-shore fishing and trading. The narrative method was combined, analyzing real-life stories from fisherfolk to gain deeper insights into their lives. Diverse age groups were selected for interviews to collect stories about family life, community life, and their adaptation to the ecological environment. This revealed that despite their significant contributions to families and communities, women fisherfolk face considerable difficulties and challenges.

3. Research Findings

3.1. Orientations

Based on the 2023 summary report from the Man Thai Ward Women's Union Executive Committee and the mid-term review of the resolutions from various levels of the Women's Union Congress, including the 15th Man Thai Ward Women's Union Congress Resolution for 2024, a key orientation is to "enhance

the application of information technology in Union activities, with 100% of branches responding and piloting the 'Vietnamese Women' application/app." This involves resolutely applying IT in operations and utilizing electronic documents in a networked environment. The strategy emphasizes maximizing social media for communication, training, knowledge dissemination, and organizing competitions. It aims to effectively promote activities on the Union's website and fan pages. Members will receive guidance and support for digital transformation, and Union officials will be trained and upskilled to competently use application software and digital platforms. The goal is to build a team of branch leaders and heads of groups/teams capable of using smart devices and participating in social media platforms. All branches will establish and deploy Facebook pages and Zalo groups in line with local government directives. This is crucial because, during training programs and product promotions, some middle-aged and older women fisherfolk are unfamiliar with or unable to use smartphones for access. Therefore, it's essential to ensure that 100% of women, including women fisherfolk, know how to use apps and social media communication groups.

Secondly, the goal of building prosperous, happy, progressive, and civilized Vietnamese families first requires fostering the image of women who meet the demands of sustainable development and international integration. To achieve this, the Women's Unions at various levels in Son Tra District have been promoting the development of positive family values. This is through the effective implementation of the Directive on Strengthening the Party's Leadership in Family Building in the New Situation¹. Key efforts include intensifying the dissemination of information about the beautiful values of Vietnamese families, and providing knowledge and skills for family building to all women members. They organize effective communication and education activities on parenting skills, pre-marital education, reproductive healthcare, and domestic violence prevention. They continue to implement the "Building a Family of 5 No's, 3 Clean's" campaign, contributing to nurturing positive Vietnamese family values in several district wards. Additionally, they emphasize moral and lifestyle education within families, linked with the campaign "All People Unite to Build a Cultural Life in Residential Areas." To enhance the education of traditional cultural values, women are encouraged to actively participate in events like "Ao Dai Week" and the "Graceful Ao Dai: Past and Present" competitions, honoring the cultural beauty and identity of traditional Vietnamese women. These competitions are widely promoted in residential groups and communities, with Women's Union branches annually encouraging women fisherfolk to actively participate. This is combined with promoting widespread cultural, artistic, physical exercise, and sports dance movements across the district. Through these activities, the Standing Committee of the Son Tra District Women's Union has advised on implementing the project "Enhancing the Quality of Traditional Education, Cultural and Artistic Activities, Physical Exercise, Sports, and Supporting Women's Development, Meeting the Requirements of the New Era" for the 2024-2028 period.

Beyond building a safe environment for women and children, various activities are implemented from the district to grassroots levels to support happy family building. These include oral communication, training, and organizing contests. Notably, they spread positive family values by commending and rewarding exemplary happy families that have made significant contributions to the local area². These activities foster positive family values in the new context by effectively maintaining models and clubs such as: "Women and the Law," "Preventing Domestic Violence," and "Building Happy Families"³. They also sustain the operations of trusted addresses and "Safe for Women and Children" models in the community, providing timely support to women and children who are victims of violence, abuse, or trafficking. Through the plan "Building Son Tra District: Safe - No Violence Against Women and Children"⁴, Union branches at all levels have collaborated to organize training on preventing violence against women and children, and skills for preventing child abuse. Many awareness points have been established to prevent online child abuse and school violence, especially in the three coastal wards of Son Tra District, Da Nang City, which are the focus of this study.

In parallel with sustainable development and international integration in the new context, the Da Nang City Women's Union and its branches in coastal wards are focused on supporting the economic empowerment of women fisherfolk. Through poverty reduction efforts, various levels of the Union have initiated activities such as providing capital, livelihood resources, and guiding them in developing family

¹ Directive 06-CT/TW dated June 24, 2021, of the Secretariat of the Central Committee, on strengthening the Party's leadership in family work.

² Women's Union branches at various levels organized 15 training classes for 2,270 officials on skills for building happy families and basic mediation; 25 contests, exchanges, festivals, and specialized sessions on "Building Happy Families." The Son Tra District Women's Union and 7 wards recognized 217 exemplary happy families.

³ As of now, the entire district maintains 8 "Women and the Law" clubs (119 members), 8 "Happy Family" clubs (314 members), 4 "Preventing Domestic Violence" clubs (106 members), and 4 "No Third Child" clubs (120 members).

⁴ Plan 08-KH/QU, dated October 30, 2020, of the Son Tra District Party Committee.

economies. This has been effective in helping women escape poverty, with a strong focus on mobilizing resources to support sustainable poverty eradication. They also prioritize the effective implementation of social welfare policies, paying due attention to vulnerable women, including those in poor or difficult circumstances. The "Supporting Women's Startups" Project 939 (2017-2025) continues to be implemented, promoting the role of female entrepreneurs, small traders, and women members in startup activities. It encourages women to actively apply digital technology platforms for product promotion and sales connections, and supports women in producing goods along the value chain to enhance product competitiveness.

Third, beyond their family roles, women fisherfolk are encouraged to engage in social activities and gradually participate in Party and local government building and gender equality initiatives. Guiding women fisherfolk to align with the Party's directives and the State's laws and policies is currently a crucial endeavor. The Da Nang City Women's Union has closely followed the Son Tra District Party Committee's communication guidelines to intensify the dissemination of information regarding the Party's guidelines and the State's policies and laws⁵. Specifically, they consistently direct local Women's Union branches to solicit feedback and recommendations from members and women. Additionally, Union branches at various levels have organized 28 sessions on traffic law knowledge, 21 sessions on marine and island issues, and 25 sessions on preventing drug abuse and social vices for members and women, attracting over 9,000 participants.

To "implement the National Strategy on Gender Equality for the 2021-2025 period"⁶, organizations actively support women and protect their legal rights and interests in accordance with the law. This involves coordinating and leveraging the role of Committees for the Advancement of Women at all levels and in various sectors to achieve gender equality and sustainable development goals. Proactive efforts are being made to develop collaborative programs and mobilize resources to address women's issues. There's also a focus on enhancing the knowledge and skills of Women's Union officials, collaborators, and grassroots gender equality communicators in gender mainstreaming. Promoting communication and education to raise awareness, along with supporting the material and spiritual well-being, protection, and care of women and children, are key to achieving gender equality. To implement policies related to women, children, and gender equality, the Women's Unions in coastal wards have proactively collaborated with relevant authorities to establish specialized monitoring teams. These teams focus on preventing and combating gender-based violence in four schools across the district. They also work on preventing and responding to violence and child abuse in childcare groups within Man Thai, Nai Hien Dong, and Phuoc My wards.

3.2. Solutions

First, Enhance Leadership and Operational Oversight. It's vital to strengthen leadership and operational oversight. This involves increasing the accountability of Executive Committee and Standing Committee members in implementing resolutions and proposing solutions related to women's legitimate rights and interests within the community. We must empower leaders, progressively elevating the role of advisory boards and leaders at all levels of the Women's Union from city, district, and ward levels to branch offices, residential groups, and communities.

Beyond executing directives, resolutions, and action programs, the Union must consistently engage closely with the daily lives of women fisherfolk members and their families. This allows for timely understanding of their aspirations and resolution of their difficulties and concerns. The aim is to progressively build on their strengths and address their limitations. We must help them recognize their uniquely important role in both family and broader community life.

Alongside this, we must accelerate the application of information technology in the Union's work. This includes effectively using member management software and tools to monitor Union activities. We'll provide guidelines for appropriate communication within social media groups, supporting the Union's management and operations. Simultaneously, we'll establish training classes and groups to instruct women fisherfolk who have limited access to devices like smartphones and computers on how to use IT and social media. This will enable them to use software and online platforms to sell and promote products on social media, gradually shifting from traditional sales methods. Furthermore, to facilitate meetings, information exchange, and training programs, we'll encourage active participation from women fisherfolk, providing them with opportunities to access new technology applications in their daily lives.

⁵ The Son Tra District Women's Union's 2023 report indicates that all 7 wards integrated and organized 165 outreach points to disseminate the Resolutions of Party Congresses at all levels, including the 6th Son Tra District Party Congress Resolution for the 2020-2025 term, reaching 20,850 officials, members, and women within the Women's Union branches.

⁶ Da Nang City People's Committee Plan No. 139/KH-UBND dated July 22, 2021, on Gender Equality.

Second, Innovate Communication and Awareness Campaigns

We need to constantly innovate communication and advocacy efforts to raise awareness among women fisherfolk members. Many women fisherfolk have limited schooling, dropped out early, and married young, often resulting in slower assimilation of the Union's program concepts and operational models. Therefore, to boost education and enhance their understanding of women's position and role in families and society, we will leverage personal social media pages of officials and members to amplify Union activities, turning each member into an advocate for the organization.

This will be combined with innovating communication methods, focusing on diversifying content and approaches based on target groups (considering age, occupation, and education level). Communication will be delivered in various formats, adapting to the needs and capabilities of each group to maximize effectiveness. Additionally, we will broaden the application of information technology in communication, supporting women fisherfolk members in accessing public services on digital platforms and using smart technology to gain useful information and knowledge tailored to their needs. Concurrently, we should increase articles about women and the Union's work, highlighting and commending good examples on ward and Women's Union social media pages at all levels. Monthly, regular knowledge and skill training will be provided for the Union's communicators.

Third, Enhance Collaboration and Resource Mobilization

It's crucial to improve the effectiveness of coordination with various departments and organizations and to strengthen linkages, collaboration, and resource mobilization. Maintaining the Union's activities requires substantial funding, but the financial resources of the Women's Union at all levels are currently limited, making it challenging to sustain operations. Therefore, mobilizing and connecting with individuals and charitable organizations for programs supporting vulnerable women and assisting those in difficulty through activities like "zero-dong markets" and "mutual support groups" is essential. This aims to appeal to organizations, departments, mass organizations, and individuals for financial and resource assistance.

We also encourage exemplary women fisherfolk who regularly participate in Women's Union activities at branches, residential groups, and communities to undergo Party-sympathizer training and join the Party, thereby creating favorable conditions for their involvement at various levels of the Women's Union. Furthermore, coordinating with the Fatherland Front and other mass organizations is key to supporting the Union's activities.

Finally, Sustain and Enhance Program Implementation

Lastly, it's crucial to sustain and enhance the coordinated implementation of National Target Programs and local socio-economic development programs. This involves diversifying resources for women's initiatives, particularly focusing on vocational training and job creation for women fisherfolk. Simultaneously, we must refine policy mechanisms and continue to advance gender equality to fully leverage the active role of women fisherfolk in the new context. National development programs and projects are comprehensive, aiming to improve all aspects of people's lives, especially fishing households. To ensure these programs are effective, policymakers need to deeply engage with and understand the daily lives of fishing households, particularly women fisherfolk. This close interaction will enable the formulation of more complete solutions and policies, gradually raising awareness and creating employment opportunities for women in these communities.

Conclusion

This article outlines initial orientations and solutions aimed at enhancing the role of women fisherfolk in Da Nang City, Vietnam. While these directions and solutions are broad, they underscore the critical need for timely guidance from all levels of the Women's Union and leaders of relevant departments and mass organizations, all of whom should be working from the reality on the ground. It's essential for leaders to develop and implement resolutions, directives, and action plans that address the immediate and underlying challenges faced by women fisherfolk. Within the scope of this article, we've presented some fundamental solutions based on the identified issues. While this initial exploration may not cover every dimension of the research problem, the goal is to significantly elevate the role of women fisherfolk in the current context, ensuring their contributions are recognized and their challenges are met with effective and timely support.

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Geographical sciences

CHANGES IN TEMPERATURE AND PRECIPITATION REGIMES FOR THE PERIOD 1961-2024 TO DATA METEOROLOGICAL STATION KRASNODAR

Kesheva Lara Asirovna,

Candidate of Physical and Mathematical Sciences
FSBI "High Mountain Geophysical Institute", Nalchik, Russian Federation

Teunova Nataliya Vyacheslavovna,

Candidate of Physical and Mathematical Sciences
FSBI "High Mountain Geophysical Institute", Nalchik, Russian Federation

Abstract

Modern climate change is one of the most pressing issues facing the global community. According to the World Meteorological Organization, since the 1980s, each subsequent decade has been warmer than the previous one, and the trend towards global warming is becoming increasingly evident. Global warming manifests itself both in an increase in average temperatures and in an increase in the frequency of extreme hydrometeorological events.

The source material for analyzing climate data and identifying the features of current changes is data on temperature and precipitation regimes obtained at Roshydromet weather stations. In the 20th-21st centuries, global warming processes have various regional manifestations: the processes are ambiguous and sometimes multidirectional. In this article, based on the data of the Krasnodar meteorological station located in the Prikubanskaya Lowland at an altitude of 26 m above sea level, the dynamics of time series of average annual and seasonal values of air temperature and precipitation regime are studied, graphs of the annual distribution of climatic indicators for the period 1961-2024 and during the onset of global warming 1976-2024 are constructed.

An increase in the value of the angular coefficient of the linear trend for the period from 1976 to 2024 indicates ongoing warming, where the highest average monthly air temperatures occur in the period after 2000, which confirms the fact of warming.

In contrast to the change in temperature, Krasnodar is characterized by an uneven distribution of seasonal precipitation amounts.

Keywords: weather station, temperature, precipitation regime, linear trend, climate norm.

The World Meteorological Organization has confirmed that, based on six international data sets, 2024 was the warmest year on record and, given the uncertainties, is likely to be the first year in which the global average temperature has been more than 1.5°C above the pre-industrial average (1850-1900), the threshold set by the Paris Agreement [1]. The most consistent increase in global air temperature has been observed since the mid-1970s.

Observations of climate and weather are not only and not so much a scientific task, they also have a purely practical interest. Analysis of climate processes will allow us to assess the changes taking place.

Data on temperature and precipitation are fundamental climate indicators in describing the regional climate. Using information on the temperature and precipitation regime allows us to solve a wide range of scientific and practical issues.

Particularly relevant is the study of general trends, analysis of regional manifestations in various regions of Russia and the world, modern models and forecast scenarios, issues of improving regional systems of environmental monitoring and air pollution in urbanized areas [2]. The studies in the article were conducted for series of average monthly, seasonal and annual temperatures and precipitation amounts, as in the works [3, 4].

In recent years, the Krasnodar Territory has increasingly faced the challenges of climate change, which can dramatically affect its ecosystems, economy and lifestyle of the population. Situated in the south of the country, the region combines the subtropical climate of the Black Sea coast with a moderate continental climate in the plains and foothills, which makes it especially vulnerable to global warming.

According to Roshydromet, the climate in Russia is warming up 2.5 times faster than the global average, and the Krasnodar Region is no exception. Over the past 50 years, the average annual

temperature in the region has increased by approximately 0.4-0.5°C per decade, which is higher than the global average (about 0.18°C per decade) [5].

To conduct this study, we used instrumental measurement data at a representative weather station in Krasnodar, provided by the North Caucasus Hydrometeorological Service and data from an electronic resource [6].

To analyze the dynamics of average annual and seasonal air temperature and precipitation, the recommendations of the World Meteorological Organization (WMO) for compiling series and calculating average indicators were used. According to the WMO recommendation, the value of the norm of the studied value was determined as the average value for the period 1991-2020 [7].

Table 1 presents the average values of average temperatures with a standard deviation for the period 1961-2024. The average annual air temperature for the 63-year period is 0.5°C below the climatic norm. All values of average seasonal temperatures are positive, including the winter season, when the average temperature was +1.2°C, with interannual variability of 0.1°C and a standard deviation of 2.0°C, which is the largest of all seasons. The coldest winter was 1972, when the average winter temperature was -3.5°C. From Table 1 it can be seen that all maximums of average zonal temperatures (except for winter) were observed already at the beginning of the 21st century. The warmest summer was 2010, when the maximum average summer temperature was +26.4°C [7].

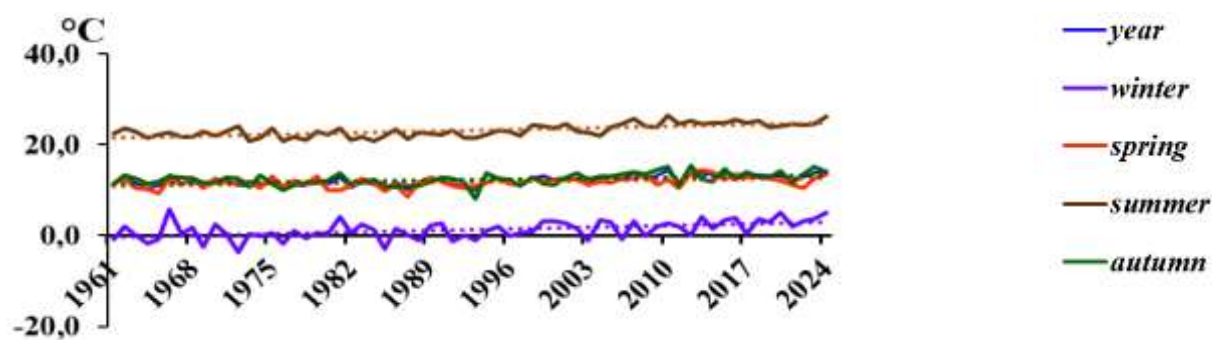
Table 1

Statistical characteristics of temperature for 1961-2024

p/p	Statistics	year	winter	spring	summer	autumn
1	Mean (standard error), $\bar{x}$	12.2 (0.1)°C	1.2 (0.2)°C	11.8 (0.1)°C	23.2 (0.2)°C	12.4 (0.2)°C
2	Standard deviation, σ	1.2°C	2.0°C	1.2°C	1.4°C	1.7°C
3	Minimum, min (season, years)	10.1°C (1976)	-3.5°C (1972)	8.7°C (1987)	20.9°C (1973)	8.0°C (1993)
4	Maximum, max (season, years)	15.3°C (2024)	5.7°C (1966)	14.4°C (2013)	26.4°C (2010)	20.4°C (2024)
5	Range, R	5.2°C	9.2°C	5.7°C	5.5°C	12.4°C
6	Asymmetry, As	0.232	-0.05	-0.199	0.193	1.519
7	Excess, E	-0.358	-0.368	-0.250	-0.809	7.279
8	Normal distribution, $P>0.05$	0.078>0.05 normal.	0.067>0.05 normal.	0.084>0.05 normal.	0.082>0.05 normal.	0.098>0.05 normal.
9	Climate norm (1991-2020), N	12.7	1.7	12.2	23.9	12.8
10	Extremes	-	-	-	-	1 extremes ≤ 8
11	Trend slope, a1/10 years 1961-2024	0.41°C/ 10 years	0.53°C/ 10 years	0.21°C/ 10 years	0.48°C/ 10 years	0.40°C/ 10 years
12	Trend slope, a2/10 years 1976-2024	0.68°C/ 10 years	0.62°C/ 10 years	0.39°C/ 10 years	0.82°C/ 10 years	0.58°C/ 10 years

The coefficients of asymmetry and excess of average temperatures are small ($As<3$, $E<3$), therefore the temperature series obey the Gaussian distribution, there is a small right-sided asymmetry ($As>0$) in the summer, autumn seasons and the year as a whole. In the winter and spring seasons, there is a left-sided asymmetry ($As<0$). In all seasons (except autumn), there is a negative excess ($E<0$), that is extreme values are less common.

In the series of average temperatures, there are no extremes, with the exception of the autumn season, where there is 1 extremum below the threshold value. In all seasons and in the year, a significant increase in the angular coefficient of the linear trend was observed for the period from 1976 to 2024 than for the period from 1961 to 2024, especially the summer season stands out, where, starting from 1976, the angular coefficient increased to 0.82°C per 10 years, while since 1961 it was equal to 0.48°C per 10 years. Figure 1 shows graphs of average seasonal and annual temperatures with trends for the period 1961-2024.



rend equations:	winter	$y=0.053x-0.5$	$R^2=0.24$
	spring	$y=0.021x+11.1$	$R^2=0.11$
	summer	$y=0.048x+21.6$	$R^2=0.42$
	autumn	$y=0.04x+11.2$	$R^2=0.20$
	year	$y=0.041x+10.8$	$R^2=0.44$

Figure 1. Graphs of average seasonal and annual temperatures with trends

All trends are statistically significant, with the determination coefficient (R^2) from 11% in the spring season to 42% in the summer season.

Figure 2 shows the annual anomalies (deviation from the average for 1991-2020) of the average temperature. The number of negative anomalies is greater than positive (39:23). Before 2000, Krasnodar mainly observed negative anomalies with a record negative anomaly (-2.6°C) in 1976 and 1993, and since 2000 there have been only 5 negative anomalies, all other anomalies are positive with a record high anomaly of $+1.7^\circ\text{C}$ in 2010.

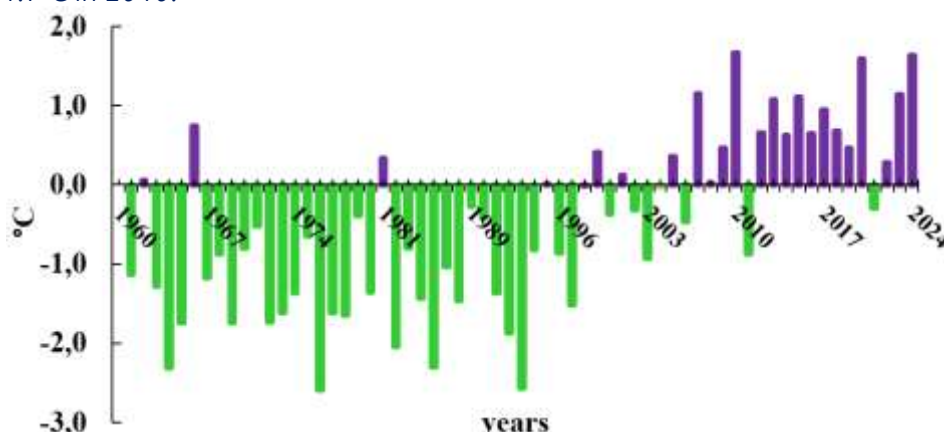


Figure 2. Annual mean temperature anomalies, 1961-2024.

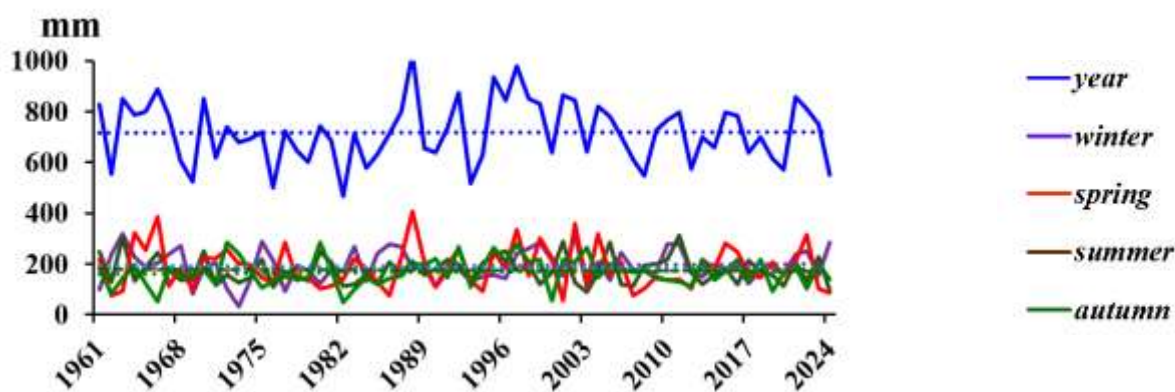
To analyze the precipitation regime, the average values of seasonal and annual precipitation amounts, asymmetry and excess coefficients were calculated, extreme values in the precipitation series were identified, and linear trends were constructed for the period 1961-2024. The characteristics of the change in the precipitation regime are given in Table 2.

Table 2

Statistical characteristics of precipitation amounts for 1961-2024

p/p	Statistics	year	winter	spring	summer	autumn
1	Mean (standard error), $\bar{x}$	718.0 (15.2) mm	190.4 (7.69) mm	174.4 (6.65) mm	185.7 (10.3) mm	166.7 (6.9) mm
2	Standard deviation, σ	121.7	61.5	53.2	82.3	55.3
3	Minimum, min (season, years)	465 mm (1982)	32 mm (1973)	90 mm (2003)	53 mm (2001)	47 mm (1982)
4	Maximum, max (season, years)	1027 mm (1988)	316 mm (1963)	311 mm (2011)	407 mm (1988)	284 mm (1980)
5	Range, R	562 mm	284 mm	221 mm	354 mm	237 mm
6	Asymmetry, As	0.138	0.125	0.623	0.700	0.143
7	Excess, E	-0.405	-0.359	-0.215	-0.032	-0.106
8	Normal distribution, $P>0.05$	0.078>0.05 normal	0.067>0.05 normal	0.084>0.05 normal	0.082>0.05 normal	0.098>0.05 normal
9	Climate norm (1991-2020), N	732.1	189.0 mm	179.2 mm	186.9	178.1
10	Extremes	-	-	-	2 extremes ≥384 mm	-
11	Trend slope, a1/10 years 1961-2024	0.09 mm/ 10 лет	2.52 mm/ 10 лет	-1.47 mm/ 10 лет	-2.32 mm/ 10 лет	2.7 mm/ 10 лет
12	Trend slope, a2/10 years 1976-2024	6.81 mm/ 10 years	4.98 mm/ 10 years	4.25 mm/ 10 years	0.82 mm/ 10 years	0.11 mm/ 10 years

Figure 3 shows graphs of average seasonal and annual precipitation amounts with trends.



trend equations:

winter	$y=0.252x+182,2$	$R^2=0.005$
spring	$y=-0,147x+179,1;$	$R^2=0.002$
summer	$y=-0,232x+193,2;$	$R^2=0.002$
autumn	$y=0,27x+157,9;$	$R^2=0.008$
year	$y=0,009x+717,6;$	$R^2=0.000$

Figure 3. Graphs of average seasonal and annual precipitation amounts with trends

Krasnodar is characterized by an approximately uniform distribution of seasonal precipitation amounts, as can be seen from Figure 3, with a slight predominance in winter of 190 mm and then decreasing in summer 185.7 mm, in spring 174.4 mm and in autumn 166.7 mm. The annual precipitation amount is large and amounts to 718.0 mm. As can be seen from Table 2 and Figure 3, the precipitation regime in Krasnodar is even and stable in all seasons, statistical equality of average and climatic norms is maintained (average precipitation amounts are below the norm in the range from 1.2 mm (summer) to 14.1 mm (year). And only in the winter season was there a slight excess of the average precipitation amount from the climatic norm (1.4 mm).

The range between the minimum and maximum precipitation amounts is: summer - 354 mm, winter - 284 mm, autumn - 237 mm and only spring - 21 mm. Two extreme values were identified in the summer season, exceeding the threshold of 384 mm (1988 - 407 mm, 1966 - 384 mm).

In the period from 1961 to 2024, both an increase (winter, autumn) and a decrease (spring, summer) in precipitation amounts were observed, while in the period 1976-2024 years, the trend is positive in all seasons and in the year as a whole, but all these trends are statistically insignificant.

The conducted analysis of anomalies of annual precipitation amounts for the period from 1961 to 2024 showed that the number of positive and negative anomalies for the entire study period were distributed approximately equally (31:32). The record high positive anomaly was observed in 1989 (309 mm), and the negative one in 1982 with a value of -253 mm (Fig. 4).

Unlike temperature, in the series of precipitation amounts, the number of positive and negative anomalies were distributed almost equally (31:32).

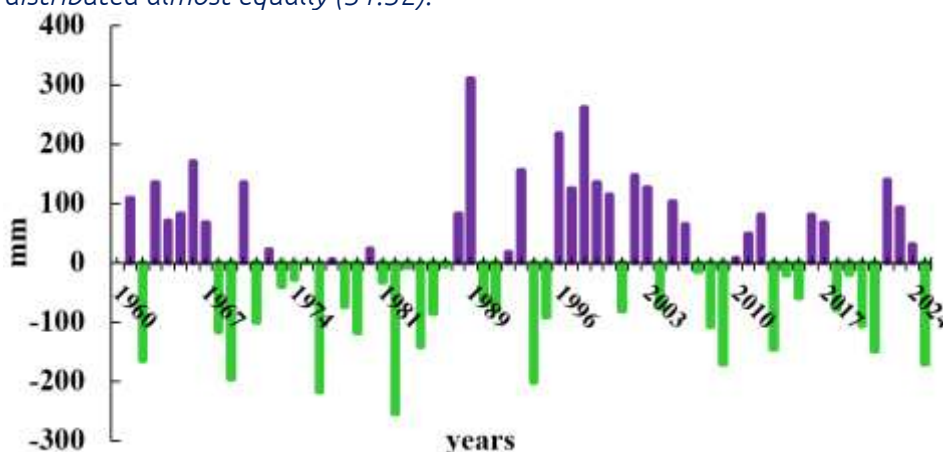


Figure 4. Annual anomalies of precipitation totals, 1961-2024

Since 2024 was the warmest year in the history of observations in Russia [1], it is of interest to study the seasonal and annual temperature anomalies for this year at a single m/station. An analysis of seasonal and annual anomalies for 2024 was conducted. In all seasons and in the year, positive anomalies of average temperatures were observed at the Krasnodar m/station, with the winter anomaly leading, followed by the summer one (Fig. 5).

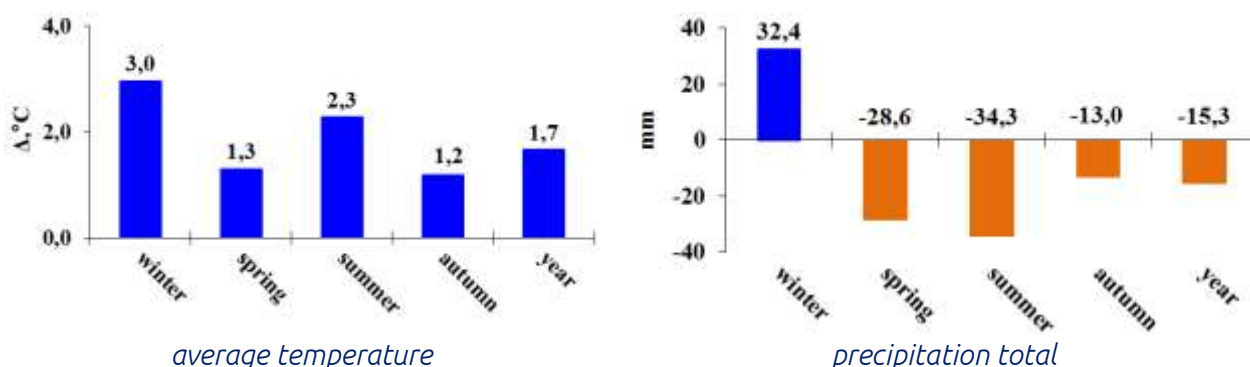


Figure 5. Seasonal and annual anomalies of average temperature and precipitation total for 2024

An analysis of anomalies in seasonal and annual precipitation amounts for 2024 showed that there was a deficit in precipitation amounts in the year and in all seasons except winter.

Conclusion: As a result of the statistical analysis of average temperatures and precipitation amounts, it was revealed that at the Krasnodar station in the period from 1961 to 2024, the average annual temperature was below the climatic norm (average for 1991-2020) by 0.5°C. All values of average seasonal temperatures are positive, including the winter season. In all seasons and in the year, an increase in the angular coefficient of the linear trend was observed, both for the entire observation period (1961-2024) and in the modern period (1976-2024), especially the summer season stands out, where, starting from 1976, the angular coefficient increased to 0.82°C over 10 years, while since 1961 it was equal to 0.48°C over 10 years. All trends are statistically significant. The analysis of anomalies showed that for the entire studied period, the number of negative anomalies is greater than positive (39:23) and since 2000, only 5 negative anomalies of the average annual temperature were observed.

The analysis of the precipitation regime showed that Krasnodar is characterized by an approximately uniform distribution of seasonal precipitation amounts. In the period from 1961 to 2024 both an increase and a decrease in precipitation amounts were observed, while in the period 1976-2024 the trend was positive in all seasons and in the year as a whole, but all these trends were statistically insignificant. Analysis of anomalies of annual precipitation amounts for the period from 1961 to 2024 showed that the number of positive and negative anomalies for the entire study period was distributed approximately equally (31:32). Analysis of anomalies of seasonal and annual temperatures and precipitation amounts for 2024 showed that in Krasnodar, only positive anomalies of average temperatures were observed, while precipitation anomalies were negative in all seasons except winter.

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Geological and mineralogical sciences

THERMAL PROPERTIES OF PLIOCENE SEDIMENTS IN THE ABSHERON OGBR

Parviz Yunus Mammadov

Ministry of Science and Education Republic of Azerbaijan
Institute of Geology and Geophysics

Abstract

This study evaluates the geothermal potential of the Absheron Oil - and Gas -Bearing Region (OGBR) by analyzing the thermal and petrophysical properties of Pliocene-aged sediments. The variation of thermal conductivity, specific heat capacity, and temperature with depth is investigated using high-precision instruments such as the ISOMET 2114. Results demonstrate that lithological composition and depth significantly influence geothermal heat accumulation, and the southern coastal areas exhibit higher values of heat storage. Findings lay the foundation for geothermal resource modeling and sustainable energy planning.

1. Introduction

The global energy transition has intensified the exploration of renewable energy sources, especially geothermal energy, due to the depletion of fossil fuel reserves [3]. While technologies like solar and wind are widespread, geothermal energy remains underutilized despite being weather-independent and continuous. It is especially promising in tectonically active regions such as the Ring of Fire [7], where mantle heat rises due to convection processes [8].

Geothermal resources are particularly valuable when geological conditions support efficient heat transfer. The accurate assessment of geothermal potential thus requires detailed understanding of subsurface thermal characteristics. This study focuses on the Absheron OGBR, analyzing depth-dependent thermal conductivity, specific heat capacity, and related parameters.

2. Geological Background

The Absheron OGBR lies within the South-East Caucasus oil and gas province. The tectonic setting features periclinal depressions and step-like structures that significantly affect subsurface heat flow. Fields such as Lokbatan, Puta, Gushkhana, Binagady, and Garadagh are situated within this geologically complex region [2].

Sediments from Miocene to Quaternary age are present, with Productive Horizons (PH) playing a key role in reservoir capacity. The lithological variety includes sandstones, sandy clays, limestones, and aleurolites, all of which influence thermal behavior [2].

3. Materials and Methods

Thermal measurements were carried out using the ISOMET 2114 device, which applies dynamic probing to determine thermal conductivity, volumetric heat capacity, and thermal diffusivity [1]. The core surfaces were prepared to ensure full contact with measurement probes. Data were collected from multiple wells, including Garadagh (Well No. 479), Puta (Well No. 220), Lokbatan (Well No. 1660), and Binagady (Well No. 1515).

Instruments provided precise data within depth intervals up to 3200 m, enabling the modeling of temperature distribution and heat flux density in geological cross-sections.

4. Results and Discussion

4.1 Petrophysical Variations with Depth

As depth increases, rock density and thermal conductivity rise due to compaction, while porosity declines. Crystalline rocks like granite and basalt exhibit higher conductivity. Specific heat capacity varies based on mineral composition and porosity, especially in water-saturated layers.

For example, thermal conductivity values in Well No. 479 ranged from 1.21 to 1.40 W/(m·K) within 3198–3204 m, and volumetric heat capacity reached over 2.7 million J/(m³·K). The calculated geothermal energy density was 0.104 GJ/m², enough to power household appliances for several days.

4.2 Regional Models and Distributions

The study shows that geothermal characteristics increase from north to south in the Absheron region. In fields like Zira and Hovsan, specific heat capacity reaches 1227 and 1050 J/(kg·K), respectively.

Similarly, thermal conductivity at the base of Pliocene layers reaches up to 3.5 W/(m·K) in coastal zones [2].

Figures from wells in Puta, Lokbatan, and Binagady fields show that deeper zones have higher temperature gradients and greater heat flux densities. In Well No. 1660 (Lokbatan), heat flux peaked at 75.4 mW/m², while Binagady reached thermal conductivity of 2.7 W/(m·K) at only 680 m depth.

5. Practical and Social Relevance

Beyond technical evaluation, societal engagement plays a key role in geothermal project success. Studies highlight that public perception, education, and communication shape acceptance [6]. A higher level of knowledge reduces resistance to development, while mistrust and insufficient information may lead to project failure [5], [4].

Thus, government institutions and geothermal companies must invest in awareness campaigns and public training to meet renewable energy goals. Transparent communication strategies will reduce risks and foster collaboration.

6. Conclusion

This research confirms that geothermal energy potential in the Absheron OGBR is closely tied to variations in thermal properties with depth. Pliocene-aged sediments show significant heterogeneity in heat accumulation and conduction. Regions near the Caspian coast offer the greatest geothermal prospects due to favorable lithology and high thermal capacity. These findings support the development of heat transfer models and energy reserve estimates for sustainable geothermal utilization.

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Historical sciences

THE IMPORTANCE OF THE SECOND CONGRESS OF BITOLA FOR THE PROTECTION OF ALBANIAN SCHOOLS AND THE ALBANIAN ALPHABET

Nevila Mehmeti

*Lifelong Learning Centre, Faculty of Education, University "Aleksandër Moisiu", Durrës, Albania,
ORCID: 0009-0002-0633-1217*

Abstract

The aim of this paper is to highlight the continuous efforts of Albanian patriots for the issue of schools in the native language and the alphabet with which the Albanian language would be written. When Albanian-Turkish relations had reached the peak of tension, Albanian patriots gathered another national congress in the city of Bitola. The objective of the study is to argue, through facts and testimonies from archival sources, monographs, and periodical press sources, that despite the difficulties and obstacles, Albanians did not stop their efforts for Albanian schools and the Albanian alphabet.

For this paper, a preliminary research method was used to collect facts and testimonies regarding the Second Congress of Bitola. Then, an analysis of archival sources, publications by Albanian and foreign authors, and periodical press from the time was conducted, focusing specifically on the issues of schools in the Albanian language and the alphabet that would be used for writing the Albanian language. The analysis aimed to reach accurate conclusions.

The Second Congress of Bitola addressed the challenges that the Albanian language and school continued to face. The Congress was organized by the "Bashkimi" Society, Bitola branch, and was attended by 20 delegates representing 34 clubs and societies. The purpose of this gathering was to discuss issues related to the protection of the Albanian school, the writing system, and national culture against the reactionary policies of the Turks and the assimilatory policies they pursued to the detriment of the Albanians.

The Second Congress of Bitola served as a key political and national event for the Albanian people. Both the speeches of the delegates and the decisions made at the congress expressed strong opposition to the harmful actions taken against the Albanian language and alphabet by the Turkish government. The resolutions of the congress underscored the determination of the Albanian patriots to safeguard the Albanian script, education, and national culture.

Keywords: *The Congress of Bitola, Albanian schools, Latin alphabet, Turkish government, Albanian patriots, national culture.*

INTRODUCTION

The Elbasan Congress laid the foundations for the creation of the national Albanian school system. With students from all regions and the dedication of the teachers, it sparked enthusiasm among Albanian patriots. However, in addition to the enthusiasm surrounding the successful start of the school, there were unresolved issues in the field of education. The most important of these was the alphabet that would be used for writing the Albanian language. Since the Congress of Dibra and afterward, the issue of the alphabet had been left unresolved, even though it was at the core of the development of the Albanian school system. For almost a year and a few months, the Latin or Arabic alphabet had become not just an educational issue but a political one. Albanian patriots had declared more than once that it was impossible to achieve a national education based on the Arabic script. The decisions of the Congress of Dibra did not provide a final solution to this problem. The parties reached a compromise, agreeing that in each school, whether already opened or to be opened, the community would decide which alphabet to use. However, this raised a significant question: Could the use of the alphabet be left to the will and desires of each community? Certainly not. A unified decision was needed, one that would be applicable to everyone. The Congress of Monastir, held from November 14-22, 1908, left an open window for discussions on this issue. One of its important decisions was to call for another congress two years later, to discuss the progress of education in Albania.

During the two years following the First Congress of Monastir, the Young Turks abandoned their liberal promises regarding the national rights of the Albanian population. They launched a wave of violence and pressure, including punitive military expeditions. In a short period, the mistrust between Albanians and the Young Turks turned into animosity, which was on the verge of exploding. The Young Turks, with their organized efforts against the establishment of a national Albanian school system, crossed all limits of tolerance among Albanians. By the beginning of 1910, there was still a faint hope for the restoration of dialogue, but the following months dashed all such hopes. To give more ground to their supporters, the government made an effort to distance itself from the alphabet conflict, adopting a neutral stance, which was both incomprehensible and entirely unreasonable. "In February 1910, the government made it known that it would not take sides on the issue of the "Albanian Alphabet." A telegram was sent to the provinces of Rumelia, stating that after the constitutional reforms, the teaching of the Albanian language was left free. In some schools, instruction began in the Albanian language using the Latin alphabet, while in others, the Arabic alphabet was used. It was emphasized that since the government had allowed this earlier, it was impossible for it to intervene." (Çelik, 2004).

This government announcement reveals how out of touch it was with reality. On one hand, it treated the alphabet issue as an "Albanian problem," while on the other hand, it accepted that the Albanian language in official schools could be written with either the Latin or the Arabic alphabet. But the Young Turks stirred the waters and brought the issue of the alphabet into discussion at a congress like the one in Dibra, when they themselves had treated it as an Albanian issue. It was clear that the government sought to impose its will by leaving space for its supporters to actively promote the Arabic alphabet. Not stopping at this point, the Young Turk government, through its prime minister Ibrahim Haki Pasha, would declare to the deputy Hasan Prishtina that "The government considers the desire of Albanians to adopt the Latin script as the first step toward breaking away from Turkey. The government must do everything in its power to prevent the introduction of the Latin alphabet." (Skëndi, 2000).

From Istanbul to every corner of the four Albanian vilayets, the Young Turks and their supporters insisted on forcing the use of the Arabic script for writing the Albanian language. Meanwhile, the Albanians responded in kind, with thousands of people taking to the streets in support of the Latin alphabet and Albanian schools.

The spring of 1910 would organically blend the military and educational actions of the Albanians. While preparations for an uprising in the north of the country were underway, preparations for the Second Congress, which would be held in Monastir, were nearly complete.

METHODOLOGY

This paper employs the method of gathering archival documents, facts, and testimonies from participants in the Second Congress of Monastir, as well as articles from the contemporary press regarding the developments of this significant event for the Albanians. Special attention is also given to a series of publications by both Albanian and foreign authors, which provide a clear overview of the educational situation in Albanian territories.

The collected data were organized chronologically, providing a clear picture of the efforts made by Albanian patriots to write the Albanian language using the Latin alphabet. The use of a qualitative descriptive and analytical approach was deemed appropriate, relying on existing literature (Lichtman, 2006). Qualitative descriptive research aims to offer a general view of events or experiences as they were lived by groups or individuals (Lambert & Lambert, 2012). It is worth noting that the facts and testimonies collected have been analyzed both qualitatively and quantitatively

RESULTS

The study revealed that the convening of the Congress was preceded by a series of demonstrations, meetings, and petitions, most of which centered around the issue of teaching the Albanian language with the Latin alphabet rather than the Arabic one. However, a decisive stance on this issue was expected to be taken by the next congress. To ensure the best organization of this congress, the Monastir club sent out a notification calling for wide participation from representatives across the country. The announcement emphasized the need for inclusive participation with the goal of countering growing tendencies to control the Albanian movement. The organizers of the congress sought to openly demonstrate to the authorities that Albanians wanted to build a national identity, education, and culture rooted in their own traditions, rather than borrowing from the Ottoman Empire.

As evidenced by the call issued by the "Bashkimi" (Unity) club in Monastir, the purpose of this Congress was to discuss matters related to defending Albanian schools, writing, and national culture against the Young Turk reaction and their assimilative policies. The Congress was also expected to take further steps to expand the network of Albanian schools.

After a preparatory phase, the Congress was called for early April, or more specifically, on April 2-3, as described in *The History of Albanians in the 20th Century*. This version is also supported by Nathalie Clayer in her book *On the Beginnings of Albanian Nationalism*, where she highlights that the Congress took place in early April 1910. However, other authors' data raise questions about the start and end dates of the Congress. They provide different dates for the convening of the Second Congress of Monastir, in accordance with reports from foreign diplomats they used. For instance, in the newspapers *Bashkimi i Kombit* and *Korça*, on March 25, 1910, the chronicles of the event's development were published, giving all of its decisions. In an article in *Bashkimi i Kombit*, published in Monastir, titled "The Meeting of Albanians in Monastir," the organization of the congress and its content are described in great detail, suggesting that the congress was initially scheduled for March 15, 1910. The article states, "The general meeting of Albanians here in this city could not be held on the scheduled date, i.e. March 15, as the distinguished representatives from Kosovo arrived on March 19. Therefore, on March 20, at 3 AM, the meeting opened in our club, Dituria." Additionally, the call from the Central Club of Monastir, addressed to other clubs, set March 15 as the date for the Second Congress in Monastir. "Dear Brothers, you know the struggle we have had with the enemies of our language. The Central Club has stood and will stand until death for these rights that the government does not give you. Therefore, today it has been decided to invite all clubs in Albania to a general meeting on March 15, 1910, to discuss our demands. We ask that each club send a delegate, choosing the most capable and knowledgeable among them." (AQSH, 1910). This suggests that the Congress may have been held around March 20-24, 1910.

This version is supported by Skëndi and Jacques, who both state that the Congress took place in the last week of March 1910. "Between March 21 and 23, 1910, a second congress organized by the supporters of the 'national alphabet', as the Latin alphabet was called, was held in Monastir with the aim of discussing all related issues." (Skëndi, 2000). Referring to the data from the Austro-Hungarian consul in Monastir, Kondis writes that during the ongoing uprising in Kosovo, the Second Congress in Monastir took place on March 20, 1910. It seems that the Austro-Hungarian reports give one date, while the Italian and French reports provide another. Meanwhile, the newspapers of the time mentioned earlier give the impression that by March 25, the Congress had concluded its work and issued two documents: a 10-point resolution and another 4-point resolution directed directly to the Sultan.

Despite these contradictory data, it is interesting to delve into the proceedings, goals, participants, and decisions of this Congress. Turkish scholar Çelik somewhat limits the goals and obligations of the Second Congress of Monastir, noting that in 1910, Albanians organized their second congress in Monastir. They decided to open a high school in Skopje, and began collecting donations from the public for the expenses needed for the school. This initiative was also supported by Albanian representatives in the parliament.

The data show that, upon analyzing the work and decisions of this Congress, there was a firm determination among Albanians to resolve once and for all the issue of the alphabet and the writing of the Albanian language. To ensure broad inclusion, delegates represented more than one region and came from all parts of the country and beyond. "Faced with popular agitation in support of the Arabic alphabet, the network of Albanian patriots tried above all to consolidate itself, and with this goal, in early April 1910, a Congress was held in Monastir. This meeting conveyed the will of both 'Gegs' and 'Tosks' to mobilize together against their 'enemies.'" (Clayer, 2009).

The participants of the Congress were 24 individuals, who, according to reports from the press of the time and telegrams from foreign consuls in the city, represented all Albanian regions. For example, the Catholics of Shkodra "regretted that they received the invitation late but appointed the delegate of Elbasan, Gani Beu, to represent them." (AIH. HHSt.A.PA.A. Vj 20-10-1065). Initially, it was planned for the congress to take place away from the public eye and the authorities, but this plan was abandoned. In fact, even government officials were invited to attend the congress. "The proceedings of the congress were not held behind closed doors as initially planned, but were public. Apart from the delegates of the clubs, only one government representative participated." (AIH. HHSt.A.PA.A. Vj 20-10-1065).

The fundamental issue addressed by the Congress was widely known. "In the spring of 1910, the Second Congress on Language focused on the central theme of resolving the alphabet issue. The majority of Albanians supported the idea that the Albanian language should be written using the Latin alphabet. However, there were also some conservative Albanians who, although few in number, continued to insist on the use of the Arabic script, securing support from the Young Turks. Of course, the conservative Albanians supported the teaching of the Albanian language. The question was, with which alphabet would the Albanian language be taught?" (Çelik, 2004). Çelik's observation, supported by Ottoman documentation of the time, was accurate. The press shows that this choice of the Albanians was imposed

by the situation. "This time, the issue of the writing system again forced the Albanians to gather at their center in Monastir." (Korça, 1910).

A further analysis shows that many authors emphasize the dynamics of events, particularly the speech of Dervish Hima before the delegates of the Congress. His speech is described through a deep political, social, and cultural analysis of the Albanian regions. It highlights the significant obstacles created by the Young Turk government to the national movement for education. The Albanian deputy in the Ottoman parliament reminded the Young Turk government of the promises made to the Albanians. "When the Albanians arrived in Monastir, the Young Turks gave us their word that we would be free to teach our language, they said they would help us in every way with our progress. Where are the aids for schools and the protection of the Albanian language and nation?" (Bashkimi i Kombit, 1910).

In the second volume of *The History of the Albanian People*, it is emphasized that both Hima and other delegates spoke about the needs for the development of education, the spread of knowledge, and the progress of the Albanian nation. They criticized the "Central Committee for Union and Progress," which, contrary to its promises to the Albanians, was denying their right to national education and to freely use the Albanian language, intervening aggressively in the issue of the Albanian alphabet, which was the natural right of any nation.

A further analysis reveals that the core of the Congress's work would be expressed in two main documents: the 10-point Resolution, which contained the decisions made at the meeting, and the Memorandum sent to the Sublime Porte on behalf of the entire Albanian people. These documents outlined significant measures for the development of national education, for the protection of the Albanian alphabet, and for the publication of books and textbooks in Albanian. A significant portion of the decisions made at the conclusion of the Congress was proposed during Dervish Hima's speech. "I have several points here that you will hear, and we will discuss every viewpoint you have on them." (Bashkimi i Kombit, 1910).

At the end of the proceedings (according to the chronicle, the last meeting started at 3:30 AM on March 21 and concluded around the afternoon), the decisions were approved, and they were referred to as the "Ten Points decided by the General Meeting in this city." (Bashkimi i Kombit, 1910). The Korça newspaper, as well as *Kalendari* and *Leka*, emphasized that the Second Congress of Monastir concluded its proceedings on March 21. "The delegates of all Albanian clubs and societies arrived in Monastir, and on March 20, 1910, the Congress opened, which in three sessions concluded all discussions and ended by deciding to approve a regulation and a memorandum." (Korça, 1910). In the *Bashkimi i Kombit* newspaper, it was stated that the decisions of the general meeting would be published in their pages in both languages, referring to Albanian and Ottoman Turkish.

The analysis of the data suggests that, in general, the decisions adhered to the proposals of Dervish Hima, but there were also decisions made from the proposals of other delegates. Equally important was the memorandum sent to the governor of Monastir to forward to the Sultan. Both of the documents approved by the Congress contained significant measures for the development of national education, for the protection of the Albanian alphabet, and for the publication of Albanian books and school textbooks. Also of importance was the decision to establish a secondary school in the city of Skopje. This school, which would operate like the Elbasan Normal School, would attract students from all Albanian regions.

Another noteworthy detail from the meeting was the speech of Rexhep Beu, the delegate from Mitrovica, who, in a lengthy address, expressed his support for "the opening of an Albanian secondary school and the founding of a newspaper in Skopje. According to him, many young people were falling victim to Serbian, Italian, and Austro-Hungarian propaganda, as they were forced to attend foreign schools due to their desire for education." (AIH. HHSt.A.PA.A. Vj 20-10-1065).

Now that schools had been opened, their expansion could not be sustained without ensuring textbooks. This shows that the educational movement had moved beyond its initial phases of organization and was aiming to establish a school with a national curriculum and textbooks produced and printed by Albanians themselves. Referring to the work of the Congress, the Korça newspaper, among other things, writes: "An academic commission should be established, composed of distinguished gentlemen, to create and print the necessary books and a dictionary from Albanian to Turkish and vice versa." (Korça, 1910).

The new dictionary would pave the way for the translation of works by Albanian authors who had written in Turkish into Albanian, and vice versa. For this purpose, Konica drew attention to the need for "two types of books, originals and translations. The Albanian language, which is as old as Greek and Latin, has lagged behind these languages and must be developed rapidly to make up for the lost time." (Konica, 2010).

A sensitive issue that the Congress decided to address through a delegation it formed was the discussion with Muslim religious leaders regarding the Albanian alphabet. The matter had long been entangled in a whirlwind of accusations and counter-accusations, writings in newspapers, the establishment of various forums, and even demands to the Young Turk government. Until 1910, the government had remained neutral in this process, despite its visible and hidden support for the clerics who promoted the Arabic script. However, since it was considered a problem specific to Albanians, the government preferred to leave the debate open among the Albanians themselves.

To preempt any government decision under pressure from the Muslim clergy, the Albanian patriots declared in the decisions of the Congress that they were ready to engage in discussions with the religious leaders in Albania in order to address the issue in a way that would be in the interest of both sides. In March 1910, the head of the Muslim faith in Istanbul had issued an ultimatum forbidding the use of the Latin alphabet and ordered the exclusive use of the Arabic script. This decree was sent to the highest religious authorities in Istanbul, with the aim of having it circulated throughout all religious institutions in Albania. "At the instigation of the Turkish government, Sheh-ul-Islam sent a circular letter to all the muftis of Albania on April 5, 1910, in which it was stated: 'We hasten to inform you that on March 22, 1326 (1910), through an official letter from the Ministry of Education, we drew the attention of that Ministry to reject the Latin alphabet for the Albanian language and insisted that its use in schools be strictly prohibited.'" (Skëndi, 2000).

Despite this declaration from the government and the highest religious authority in Istanbul, the French consul in Monastir reported to his government: "Almost all Albanians unanimously declared against the decision of the Young Turk government in the Congress of Monastir regarding the use of the Arabic alphabet. Among the many signatures published in the press, the consul was able to identify those of many members of the Muslim clergy, who, without a doubt, believed that adopting the Latin alphabet would not pose any threat," (BOA PR. SYS, dosya No. 145/61).

The conclusions drawn from the above reports confirm that foreign diplomats' reports like this one validate how both the Ottoman state authorities and religious leaders, in an absurd manner, sought to impose an educational policy in Albania that was not approved by the majority of the population on the ground. It is indeed astonishing that the Young Turks repeatedly attempted to enforce their ideas of Ottomanizing education in Albania, even though they failed each time. Yet, the Young Turks continued to insist on this point.

The Congress showed both caution and determination in signaling to the government not to interfere in the issue of the alphabet. In the memorandum sent to the Sublime Porte, the Albanians reminded the government of the decisions made at the Congress of Dibra and urged it to stop any pressure, demonstrations, and threats against the Albanians who were advocating for the use of the Latin alphabet for the Albanian language.

For this reason, it can be concluded that the delegates of the Congress made it clear that "they wanted the issue of the alphabet to be resolved, not based on the judgment of the Minister of Education, but according to the will expressed by the majority of Albanians." (Korça, 1910). The Albanian patriots warned the government to support their decisions, which represented the majority's desire, and not to back the minority.

Supporting this minority would cost the government itself, as well as its supporters. As the final point in the memorandum, but with significant importance, the Congress called on the government to protect the national and linguistic interests of their Orthodox brothers, who were under pressure from Greek ecclesiastical circles. It was strongly requested that the Young Turk government allocate a part of the Ministry of Education's budget specifically for Albanian schools in areas where Albanian Christians lived. This request was also inspired by the patriot Petro Nini Luarasi, who sought to break the influence of Greek authorities over Albanian schools. Therefore, the Congress also called on the government to assert its own authority and prevent that authority from being replaced by Greek or other ecclesiastical authorities.

The conclusions further indicated that a larger congress would be convened in July 1910 in Janina, which would resolve the issue of the alphabet once and for all, by selecting one of the two Latin alphabets that had been approved by the First Congress of Monastir. In summary, the Congress of Monastir took a firm stand in defending the right of the Albanian people to choose the Latin alphabet for their language, despite pressures from both the Ottoman government and religious authorities. The decisions made at the Congress highlighted the importance of national sovereignty in matters of language and education and set the stage for future educational reforms in Albania.

CONCLUSIONS

The Second Congress of Monastir (1910) marked an important step in the struggle for the development of education and the preservation of the Albanian national identity. By addressing the issue of the alphabet and supporting the use of the Latin script, the Congress created a platform for the defense of Albanian national interests and the efforts to free Albanian education from foreign influences. In this way, the Congress of Monastir made a significant contribution to shaping national education and Albanian culture. From the analysis of the developments and decisions made during the Second Congress of Monastir, several key conclusions can be drawn.

➤ *Opposition to Ottoman Assimilationist Educational Policies.* One of the most important outcomes of the Congress was the clear stance taken by the Albanians present against the Ottoman government's and religious authorities' policy of imposing the Arabic script. Although the government in Istanbul had tried several times to enforce this script, these attempts failed, and the resolute stance of the Albanian delegates demonstrated that the majority of the population would not accept it. This reflected a consistent effort by Albanians to protect their national and linguistic identity.

➤ *Support for the Latin Alphabet and the Freedom of Education in the Albanian Language.* The Congress decided that the issue of the alphabet would be determined according to the will of the majority of Albanians. By adopting the Latin alphabet, the Second Congress of Monastir rejected the Ottoman and religious authorities' insistence on the Arabic script. This was not just a technical matter of writing, but a significant national issue, linked to the cultural and educational identity of the Albanian people. The majority of the delegates saw this as an important step toward cultural autonomy and the promotion of education in the Albanian language.

➤ *Efforts to Negotiate with Muslim Religious Leaders.* Another key moment in the decision-making process was the Congress's attempt to engage Muslim religious leaders in a dialogue about the issue of the alphabet. Despite the Ottoman government supporting clerics who advocated for the Arabic script, the Congress considered this as an opportunity to reach a consensus with religious authorities and resolve the issue without causing an open confrontation. This reflected a diplomatic and prudent approach by the Albanians, who sought a solution that would serve national interests without creating further tensions with religious authorities.

➤ *Final Resolution at the Congress of Ioannina (1910).* Another important conclusion was that the Second Congress of Monastir paved the way for a final resolution of the alphabet issue. By calling for a larger congress in Ioannina in July 1910, which would definitively solve the problem by selecting one of the two Latin alphabets approved by the First Congress of Monastir, the Albanians sought to ensure a decision backed by the majority and one that would provide a sustainable and acceptable solution for everyone. This congress aimed to adopt a single Latin alphabet that would enable the development of Albanian education and literature in a centralized manner.

➤ *Support for National Education Funding.* Another significant request emerging from the Congress was the call for financial support from the state for the establishment of Albanian-language schools. This request aimed to ensure sustainable support for Albanian schools, particularly in areas where Albanian Orthodox communities lived, who were exposed to Greek influence. This reflected the need to detach Albanian education from foreign influences and to foster its development in an independent, national framework.

➤ *Support for the Protection of National and Linguistic Identity.* The Second Congress of Monastir, through its decisions, supported the preservation of the Albanian national and linguistic identity. The uncertainty of the Ottoman government's decisions regarding education and the use of the Albanian language showed that Albanians had to make continuous efforts to protect their cultural and national rights. The Congress considered the protection of the Albanian language as a top priority and its use as a key element of national identity.

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Pedagogical sciences

THE PECULIARITIES OF SOCIAL-PEDAGOGICAL WORK WITH TEENAGERS OF DEVIANT BEHAVIOR

Samedov Kamran Enver oglu

Doctor of Philosophy in Pedagogy, Associate Professor
Baku Slavic University

УДК 37.013.42

ОСОБЕННОСТИ СОЦИАЛЬНО-ПЕДАГОГИЧЕСКОЙ РАБОТЫ С ПОДРОСТКАМИ ДЕВИАНТНОГО ПОВЕДЕНИЯ

Самедов Кямран Энвер оглы

доктор философии по педагогике, доцент
Бакинский славянский университет (Баку, Азербайджан)

Abstract

The given article is dedicated to one of the actual problems of pedagogues – to social-pedagogical work with teenagers of deviant behavior. An article analyzes reasons of appearance such a social phenomenon as teenagers of deviant behavior. In the article are shown difficulties and complications in the activity of social institutions of society in the work with teenagers of deviant behavior. In the article is noted a high level of individual form work of social teacher in social-pedagogical activity with teenagers of deviant behavior. An article offers necessary recommendations to improvement of social-pedagogical work with teenagers of deviant behavior.

Аннотация

В статье рассматриваются вопросы организации социально-педагогической работы с подростками, проявляющими девиантное поведение. Анализируются причины возникновения данного социального феномена — подростков девиантного поведения. Особое внимание уделяется трудностям и проблемам, с которыми сталкиваются социальные институты общества в работе с данной категорией подростков. Отмечается высокая эффективность индивидуальной формы работы социального педагога в социально-педагогическом сопровождении подростков с девиантным поведением. В статье также предлагаются действенные и эффективные формы социально-педагогической работы, направленные на коррекцию и поддержку таких подростков.

Keywords: teenagers, deviant behavior, social teacher, social-pedagogical activity, secondary school, social institutions of society

Ключевые слова: подростки, девиантное поведение, социальный педагог, социально-педагогическая деятельность, социальные институты общества

Проблема работы социальных институтов общества с подростками девиантной моделью поведения является одной из важных и актуальных в современном обществе. На формирование, развитие, социализацию подростков направлены большие усилия социальных институтов общества, прослеживается определенный видимый эффект этой работы. Однако говорить о полном позитивном разрешении этих вопросов пока что преждевременно. Причины этого кроются во многих аспектах современной жизни – изменяются характер и направленность социальных связей личности с обществом, постоянное изменение каких-либо параметров самого общества, непостоянный уровень духовно-интеллектуального и личностно-социального развития молодых людей и т.д. Конечно, практически все социальные институты общества систематически повышают уровень эффективности своей социально-педагогической работы с девиантными подростками, делая основной упор на работу двух самых главных базовых социальных институтов общества, однако, как мы видим, проблема настолько глубока и многоаспектна, что до сих пор имеются различного характера трудности в полном ее разрешении. Мы считаем, что, если основываться на процессах философии о развитии общества, проблема девиантного

поведения подростков полностью не может быть нивелирована, она может быть существенно ослаблена и не выступать деструктивным фактором, серьезно воздействующим на планомерное демократическое развитие общества. «Практика показывает, что даже положительный потенциал воспитательно-формирующей работы таких социальных институтов общества, как семья и образовательные учреждения, не всегда могут положительно разрешить некоторые вопросы позитивной социализации подростков девиантного поведения» (1, 18). Многие практические работники, имеющие большой профессиональный потенциал своего развития и обладающие большим социально-педагогическим опытом деятельности, считают, что большую помощь всем социальным институтам общества может оказать именно индивидуальная работа социальных педагогов с подростками девиантного поведения.

Ученые-исследователи (С.А. Беличева, А.И. Захаров, В.Л. Леви, Б.Н. Алмазов, В. Г. Баженов, А.И. Кочетов, Д.И. Водзинский, Н.Н. Верцинская, А.Г. Громцева, Л.А. Грищенко и др.) неоднократно в своих исследованиях подчеркивают, что для повышения уровня эффективности социально-педагогической работы с девиантными подростками, надо в обязательном порядке считать эту работу коммуникативной, вбирающей в себе очень много направлений. Даже глубокий анализ и последующая эффективная работа с одним из направлений социально-педагогической деятельности с подростками девиантного поведения, не может дать позитивный результат, который может очень существенно повлиять на образ мыслей и поведения молодых людей. Слов нет, конечно же, определенные разрешения вопросов одного из направления социально-педагогической работы с подростками девиантного поведения, необходимо воспринимать как большой позитивный успех в разрешении всей проблемы. Однако, как подчеркивают ученые-исследователи и практические работники, определенное практическое позитивное разрешение проблемы требует именно коммуникативный характер деятельности.

В самом деле, допустим, получены очень обнадеживающие результаты в области работы с девиантными подростками путем очень эффективного изменения характера межличностных отношений, где этот подросток растет и развивается, однако, даже этот успех еще не гарантирует, что он очень эффективно подействует на другие факторы, способствующие появлению феномена подростков с девиантной моделью поведения и практической деятельности. К примеру, как разрешить другие, также очень важные факторы, так серьезно воздействующие на личность подростков – влияние СМИ, круг друзей в классе, школе, соседей по месту жительства, влияние членов неформальных подростково-молодёжных объединений, встреча с личностями, с криминальным прошлым, асоциальный образ жизни родителей, дворовая негативная обстановка по месту жительства и т.д. По этой причине поставленная цель по повышению эффективности социально-педагогической работы с девиантными подростками, ориентированное на существенное нивелирование этого феномена, должна быть запланирована и претвориться в жизнь с учётом работы специалистов именно по многим направлениям этой проблемы. «В научной психолого-педагогической и социологической литературе подчёркивается мысль, что индивидуальная работа социального педагога с девиантно настроенными подростками, является столь эффективной по своей сущности и ориентировки на долгосрочный эффект» (2, 28).

Индивидуальная работа социального педагога с подростками девиантного поведения, на первый взгляд не представляется такой уж сложной. В самом деле часто встречается с молодым человеком девиантного поведения и по мере своих индивидуальных личностных и профессиональных возможностей, разрешает его проблемы. К большому сожалению, если модель индивидуальной работы социального педагога воспринималась бы так элементарно, то скажем прямо, феномен девиантного поведения подростков не представлял бы для общества особой проблемы. Индивидуальная работа социального педагога с подростками девиантного поведения очень сложна, многофакторна и требует к себе самого пристального и серьезного внимания. Социальный педагог должен, если он хочет получить от своей работы с подростками девиантного поведения обнадеживающие позитивные результаты, наладить контакты со многими людьми так или иначе являющийся вторыми фигурантами его профессиональной деятельности. Вроде бы всё ясно в теории, а на практике очень часто встречается с незапланированными трудностями. К примеру, не всякий родитель столь доброжелательно относится к тому, что посторонний человек, даже если он по статусу социальной педагог вмешивается в личную жизнь его детей. Его модель и модель семейного воспитания, как он думает, будет идти в разрез с профессиональными требованиями социального педагога, что существенно подорвёт его уважение, авторитет как главы семьи, в глазах его детей и супруги.

Бывают, и довольно-таки часто, когда родители осознанно позволяют своим детям подросткам встречаться с социальным педагогом.

В силу своей профессиональной педагогической деятельности мы часто встречались с социальными педагогами, имели с ними долгие беседы об их профессиональной деятельности и довольно живо интересовались нюансами их работы, которые не всегда заметны с расстояния. В процессе бесед выяснилось, что имеются трудности в работе как с семьями, так и, что очень удивительно, со стороны педагогического коллектива образовательного учреждения. Справедливости ради, мы должны особо заметить, что определенные трудности для социальных педагогов доставляли исключительно молодые педагоги с небольшим опытом профессиональной деятельности. Трудности эти выражались в том, что не всегда молодые учителя охотно помогали социальным педагогам в их социально-педагогической работе с конкретными подростками девиантного поведения.

Часто на предложение социального педагога молодым учителям оказать ему профессиональную помощь (допустим, совместно посещать семьи девиантных подростков) молодые учителя воспринимали эту просьбу очень неохотно и замечали, что работа с подростками девиантного поведения не их работа, а конкретно социального педагога, потому что она оплачивается со стороны государства. «Очень часто нежелание со стороны молодых учителей оказать помощь социально-педагогической работе социального педагога мотивируется тем, что, якобы, они и так профессионально перегружены и у них нет свободного времени на дополнительную воспитательную деятельность» (5, 37). Таким молодым учителям, как видно и невдомёк, что их профессиональная деятельность как раз-таки и состоит в организации любых видов воспитательной работы с таким контингентом, как девиантно настроенные подростки.

Мы считаем, что такая личностно-профессиональная позиция молодых учителей в корне своём неверна и требует самого серьёзного вмешательства в их работу со стороны руководства образовательного учреждения. Социальные педагоги нам говорили, что можно также встретиться с такими фактами, когда руководство образовательного учреждения (допустим, средняя школа) чтобы не «осложнять» себе жизнь дополнительной многоаспектной социально-педагогической деятельностью, выбирают, на их взгляд, самые верные решения этой проблемы. Это заключается в том, что они всем коллективом убеждают таких подростков в том, что у них не хватит ни сил, ни возможностей закончить среднюю школу и получить аттестат зрелости и лучшим выходом для них в создавшейся ситуации будет сменить среднюю школу на профтехучилища.

Проводя такую в корне непрофессиональную деятельность педагогический коллектив думает, что он принял единственно верное решение – освободил среднюю школу и Педагогический коллектив от множества проблем облегчил жизнь самому социальному педагогу и определил удобную модель личностно-социального развития подросткам девиантного поведения. Конечно, могут возникнуть ситуации, когда подросток с девиантной моделью поведения сам, исключительно сам выбирает профтехучилище для продолжения своей учёбы и получение интересующей его профессии. Однако, очень часто можно быть свидетелями, когда принципы добровольности выбора дальнейшей модели обучения грубо нарушается и подростки девиантного поведения вопреки его личным желаниям, перенаправляют в профтехучилища. Считаем, со своей стороны, заметить, что такая некорректная работа средней школы, её руководства, должна быть в корне пересмотрена, так как является видимым маркером серьёзного непрофессионализма работы всего образовательного учреждения.

Как мы уже отмечали выше, «социально-педагогическая работа социального педагога с подростками девиантного поведения включает в себе много самых неожиданных направлений деятельности» (6, 43). Специалисты считают что, в принципе, все эти направления работы, конечно же, очень условно, можно подразделить на несколько направлений, имеющих по своей сущности, базовой характер:

- а) диагностическая;
- б) аналитическая;
- в) коррекционно-вспомогательная;
- г) профилактическая;

д) работа по созданию условий и предпосылок как для более эффективной личностно-социальной самореализации девиантных подростков;

е) духовно-образовательная работа с родителями подростков девиантного поведения. Каждый из этих направлений имеет самое серьёзное значение для повышения уровня эффективности социально-педагогической деятельности социального педагога. К примеру, диагностическая деятельность социального педагога, на первый взгляд, кажущаяся очень элементарной и лёгкой, на самом деле представляется очень важной и имеющей самые серьёзные негативные последствия, если она организована на низком профессиональном уровне. Здесь возникает масса вопросов, решить которые очень даже непросто - в самом деле, когда можно считать подростком девиантного поведения – подростка, который нечаянно уронил сумку с парты своей одноклассницы или же молодого человека, который после учебных занятий не идёт домой, а проводит время с другими одноклассниками рядом со школой. Кажущаяся, на первый взгляд, проблема столь сложна, несколько раз уронил сумку с парты своей одноклассницы – можно сказать, что он очень неуклюжий человек, но записывать его, только лишь по жалобе его одноклассницы, в список трудновоспитуемых подростков девиантного поведения, будет очень неправильно.

Другой пример, который мы отметили выше – подросток сразу же после учебных занятий в школе, не идёт домой, а довольно долгое время общается со своими одноклассниками рядом со школой. Как поступить в таком случае, утверждать, что он не идёт домой, как все остальные, и общается со своими друзьями возле школы – это является фактором того, что он молодой человек девиантного поведения – весьма неверно. В доме, допустим нежелательная социально-психологическая атмосфера и подросток не хочет сразу же после занятий идти домой, а выбирает общение со своими друзьями. Разве можно утверждать, что подросток не идёт домой, значит это подросток девиантного поведения. По этой причине, диагностическая работа в деятельности социального педагога является очень важной и должна проводиться на самом высоком профессиональном уровне. Иногда в ответ на самые серьёзные усилия социального педагога организовать контакт с предполагаемым подростком девиантного поведения, обречена на провал. Здесь очень много факторов, очень неоднородных, которые требуют самого серьёзного профессионального подхода. не идут на первичный контакт с социальным педагогом по многим причинам: личностная неприязнь к этому человеку – он ведёт себя развязно, говорит на сленге, часто очень возбужденно жестикулирует, смеётся по поводу и без.

Восприятие такого социального педагога со стороны подростков, конечно же, будет самым неоднозначным, а проще говоря негативным. «Первый контакт с подростками девиантного поведения должно быть организовано только лишь после самых серьёзных бесед с их классными руководителями, учителями-предметниками, воспитателями школ, после бесед с его одноклассниками и, что очень важно, после длительных наблюдений за этими подростками в процессе их жизнедеятельности» (4, 56). Иногда организация первичного контакта с подростком девиантного поведения существенно осложняется ввиду того, что социальный педагог организует этот контакт непрофессионально. К примеру, в школе сложилась определенная группа подростков, которых учителя считают девиантными молодыми людьми. Зная об этом, эти же подростки весьма искусственно демонстрируют окружающим своё особое положение в школе и хвастаются этим. Если социальный педагог будет стараться организовать контакт с одним из таких подростков, тем более на виду его товарищей, то это будет признано его явной неподготовленности к социально-педагогической деятельности с подростками девиантного поведения.

В таком случае контакт этот может обернуться для конкретного подростка осуждением со стороны его товарищей, смехом, обвинением его в слабости и т.п. Социальному педагогу, как мы считаем, необходимо знать несколько очень важных положений, чтобы его социально-педагогическая деятельность с подростками девиантного поведения имела позитивный характер:

а) необходимо принять во внимание психологию подростков с девиантным поведением – они настроены так, что во всех своих бедах и трудностях считают виновниками взрослых людей, которые вовремя не протянули им руку помощи;

б) подростки считают, что некоторые социальные работники просто чисто формально отработывают своё рабочее время и по большому счёту, нет никакого дела до судеб таких молодых людей;

в) если социальный педагог пытается организовать первичный контакт с подростком девиантного поведения, обвиняет и осуждает его родителей, подчёркивая их непрофессионализм в работе со своими детьми, то контакт, однозначно не состоится.

Дальнейшая попытка возобновить контакт с такими подростками будут обречены на провал. Социальному педагогу необходимо очень чётко разобраться – девиантное поведение подростков является его внутренней потребностью или же он поступает таким образом под влиянием других молодых людей, чтобы они его не осуждали и не обвиняли в малодушии и трусости. Бывают ситуации, когда в основе того, что первичный контакт с подростком девиантного поведения никак не удастся по причине определенных гендерных фактов. К примеру, подросток ведет себя вызывающим образом, потому что считает, что он таким образом вызывает восхищение у любимого им человека. По этой причине, социальному педагогу надо очень профессионально разбираться не только в вопросах педагогики, психологии, социологии, но также на достаточном уровне разбираться в вопросах гендерного характера.

Следует особо заметить, что в работе с подростком девиантного поведения социальный педагог не должен всё время критиковать и осуждать своего подопечного в том, что он всегда поступал неправильно и поэтому окружающие его не уважают. Этот метод работы однозначно не профессионален и обречён на неудачу. Подросток девиантного поведения должен видеть и чувствовать, что работа социального педагога с ним основано не на постоянной критике его поведения, а носит позитивный конструктивно-созидающий характер, способствующий высокому уровню его личностно-социальные самореализации в жизни.

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Philological sciences

THE IMPORTANCE OF LEARNING ENGLISH IN THE MODERN WORLD

Gunel Aliyeva Ilham
Doctor of Philosophy, ASPU,
Republic of Azerbaijan

Introduction

In our increasingly interconnected and globalized world, the ability to communicate in English has become a powerful tool for both personal and professional development. English is more than just another language; it serves as a gateway to knowledge, innovation, cultural understanding, and international collaboration. Whether in education, business, travel, or digital communication, proficiency in English provides individuals with significant advantages. This paper explores the significance of learning English in the modern world, highlighting its role as a global lingua franca, its benefits in education and career development, and its broader cultural and personal impacts.

1. English as a Global Language

One of the primary reasons English holds such global importance is its status as the most widely used second language across the world. Although Mandarin Chinese and Spanish have more native speakers, English is unique in its role as a "lingua franca"—a bridge language used for communication between people who do not share a native language.

English is the official or dominant language in over 70 countries and is extensively used in many international organizations, including the United Nations, NATO, and the European Union. It is the standard language in aviation, maritime communication, and global diplomacy. This widespread use makes English a critical tool for participating in global dialogue, negotiations, and international collaboration.

2. Educational Opportunities and Access to Knowledge

Education is another field where the importance of English cannot be overstated. A vast majority of academic journals, research papers, and scientific publications are written in English. Prestigious universities around the world—such as Harvard, Oxford, MIT, and Cambridge—offer programs primarily or exclusively in English, attracting international students from all corners of the globe.

Furthermore, many developing countries use English as the medium of instruction in higher education to enhance the global competitiveness of their graduates. Students who are proficient in English can access a broader range of academic resources, participate in international exchange programs, and stay up-to-date with the latest research findings and technological advancements.

In many non-English-speaking countries, English is also taught as a compulsory subject in schools, further highlighting its perceived value in academic settings.

3. Career Advancement and Economic Benefits

From an economic standpoint, English has become the language of global business and trade. Multinational companies require employees who can communicate with clients, partners, and colleagues across borders. The ability to speak and write in English is often a prerequisite for employment in international firms, especially in industries such as finance, information technology, aviation, and hospitality.

A report by the Economist Intelligence Unit revealed that companies with a strong English-speaking workforce tend to perform better in global markets. Professionals who speak English fluently are often preferred for promotions and international assignments. In fact, in many countries, English language proficiency is directly correlated with higher income levels and better employment prospects.

For entrepreneurs and small business owners, English also provides access to international markets, global suppliers, and online platforms such as Amazon, eBay, and Alibaba, where English is the dominant language of communication.

4. Digital Communication and Technological Literacy

The internet has revolutionized communication, and English plays a central role in this digital transformation. According to research, more than half of all web content is written in English. Social media platforms, online courses (MOOCs), forums like Reddit and Quora, as well as video platforms like YouTube, are predominantly English-based.

Tech giants such as Google, Microsoft, and Apple develop their products with English as the default language, making English proficiency essential for navigating digital tools and software. In the field of

computer science, most programming languages and documentation are written in English, making it almost indispensable for tech professionals.

Moreover, with the rise of remote work and online freelancing, English has become the standard language for global collaboration. Platforms like Upwork, Fiverr, and LinkedIn favor users who can interact fluently in English, opening up countless work-from-home opportunities worldwide.

5. Cultural Understanding and Travel

Language is a window into culture. By learning English, individuals can access a wide array of cultural content, from classic English literature to Hollywood movies, global news outlets, TED Talks, and popular podcasts. This exposure not only enhances language skills but also fosters a deeper understanding of different cultures and viewpoints.

Additionally, for travelers, English serves as a practical tool. Whether navigating airports, booking hotels, or ordering food abroad, a basic knowledge of English can make international travel smoother and more enjoyable. Tourists and backpackers often rely on English to connect with people from different countries and backgrounds.

6. Cognitive and Personal Development

Learning English, or any second language, is also beneficial for the brain. Studies show that bilingual individuals often have better memory, problem-solving abilities, and multitasking skills. Learning a language improves concentration and can delay the onset of age-related cognitive decline.

Moreover, acquiring a new language builds self-confidence. Language learners often feel a sense of achievement as they master new vocabulary and grammar structures. It encourages resilience, patience, and perseverance—qualities that are valuable in all aspects of life.

Conclusion

In conclusion, the importance of learning English in the modern world extends far beyond the classroom. As a global language, English opens doors to education, employment, technology, and culture. In an age where international cooperation and digital connectivity are more important than ever, English remains a vital skill for personal empowerment and global participation. Therefore, investing time and effort into learning English is not only wise but essential for anyone wishing to thrive in today's world.

Keywords: Global Language, Education, Career Development, Digital Communication, Cultural Awareness

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TEACHING ENGLISH IN A MULTILINGUAL WORLD

Mammadova Sevinj Gulmammad*Azerbaijan State Pedagogical University, English teacher
Republic of Azerbaijan***Abstract**

In the 21st century, English has become the lingua franca of international communication, academia, and commerce. However, this global expansion of English has also brought with it new educational responsibilities. Traditionally developed methods of teaching English for monolingual students are no longer sufficient in multilingual, multicultural classrooms. Due to migration, digitalization, and international education opportunities, teachers are increasingly faced with linguistically diverse classrooms. This article examines the challenges, opportunities, and effective pedagogical approaches to teaching English in multilingual environments.

Keywords: *Knowledge, Multilingual, Advantages, Interact*

Multilingualism: The Reality of Modern Classrooms

In today's classrooms, not only students' English levels but also their native languages, cultural values and educational backgrounds vary greatly. For example, students who speak Arabic, Kurdish, Russian, Persian, French, Turkish or Chinese may coexist in a classroom. This requires a multi-layered approach for teachers, both pedagogically and culturally.

Multilingual classrooms are not unique to Western countries. Multilingualism is also common in countries such as Turkey, which are both immigrants and have regional language diversity. In this context, it is important for teachers to see linguistic diversity not as a problem but as a learning resource. Students' native languages can be integrated into the English learning process without being suppressed.

Challenges: Obstacles in Multilingual Classrooms

Teaching English in multilingual classrooms presents a variety of challenges. These challenges are both linguistic and cultural:

1.1. Linguistic Inequality

Exposure to English can vary greatly among students. Some students have a background in English through television programs, games, or courses, while others encounter it for the first time at school. This makes it difficult for teachers to maintain balance in the classroom.

1.2. Cultural Differences and Prejudices

There may be situations of misunderstanding or exclusion between students from different cultural backgrounds. In addition, some teachers or students may have prejudices against certain accents or native languages. This negatively affects students' self-confidence and participation.

1.3. Lack of Materials

Many English language teaching materials are still based on the assumption of a "single type" of student. The scarcity of original materials for multilingual classes forces teachers to produce their own resources.

2. Opportunities: Educational Advantages of Multilingualism

Although there are challenges, multilingualism also offers significant educational opportunities. Research suggests that multilingual students may have advantages over their monolingual peers in areas such as cognitive flexibility, problem-solving skills, and metacognitive awareness.

2.1. Switching Between Languages (Translanguaging)

The "Translanguaging" method allows students to actively use their native language while learning English. For example, practices such as explaining the meaning of a word in their native language or comparing an English concept with their native language support the student's process of making sense.

2.2. Cultural Sharing

Multilingual classrooms are micro-societies where different cultures live together. In this environment, cultural stories, proverbs and traditions are shared, which supports not only linguistic but also social learning.

2.3. Empathy and global awareness

As students interact with peers from different languages and cultures, they develop empathy, tolerance, and global awareness skills that are as valuable as communication in the modern world.

3. Effective Approaches and Strategies

3.1. Differentiated Instruction

Since each student's language level, learning style, and needs are different, one-size-fits-all methods may be ineffective, so teachers should prepare lesson plans that are flexible and adaptable.

3.2. Cooperative Learning

Knowledge sharing can be encouraged among students through group work and project-based activities, so that more experienced students can support others.

3.3. Digital Tools

Digital education platforms can enable multilingual students to learn at their own pace. Visual, audio and interactive content reduces language barriers and increases interest.

4. The Role and Education of the teacher

4.1 To be successful in multilingual classrooms, teachers must possess not only language knowledge but also cultural awareness, flexible pedagogical skills, and communication competence

4.2 Professional Development: Teachers should receive in-service training on multilingualism, inclusive education and intercultural communication.

Awareness of Bias: Teachers must be aware of their own biases and observe linguistic justice..

4.3 Supportive Attitude: A classroom environment that encourages and supports all students, regardless of their language level, should be created.

CONCLUSION

Teaching English in a multilingual world requires more inclusive, flexible and culturally sensitive approaches beyond traditional methods. Integrating students' linguistic diversity into the learning process, rather than suppressing it, increases both academic achievement and interpersonal understanding. In this context, teaching English plurilingually is not only a pedagogical imperative, but also a social responsibility. Teachers, students and education systems can realize this potential by working together.

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THE USE OF KHATIB TABRIZI'S COMMENTARY IN THE STUDY OF ABU-L-ALA AL-MAARRI'S DIVAN**Naila Taghiyeva***PhD in Philology, Azerbaijan National Academy of Science (Azerbaijan, Baku)***ИСПОЛЬЗОВАНИЕ КОММЕНТАРИЯ ХАТИБА ТАБРИЗИ ПРИ ИЗУЧЕНИИ ДИВАНА АБУ-Л-АЛА АЛ-МААРРИ****Наиля Тагиева***Доктор философских наук по филологии, Национальная академия наук
Азербайджана (Азербайджан, Баку)***Abstract**

The works of the great Arab poet and philosopher Abu l-Ala al-Maarri are characterized by their complexity, depth of meanings and richness of philosophical ideas. In his divan "Sakt al-zand" ("Sparks from the Fire Stick") the poems contain hidden meanings that require explanation. The author himself wrote a commentary on the poem. However, there remained a need for a more detailed presentation of the content of the diwan, which was originally done by his student, the Azerbaijani scholar Khatib Tabrizi. Since the completion of the commentary, philologists, poetry lovers have turned to Khatib Tabrizi to study the poem.

The article, based on the publication by S.M. Stern, who studied the manuscripts of Baghdad philologists of the 12th century, originating from the school of Khatib Tabrizi and his direct students, considers the issue of using the manuscript of Khatib Tabrizi's work "Sharh Sakt az-zand" ("Commentary of the Sparks from the Fire Stick") in the study of al-Maarri's divan. Records of students who took courses based on Khatib Tabrizi's commentary are preserved on ancient manuscripts. In the process of training, the students transcribed the teacher's work by making copies. These handwritten commentaries contain the teacher's notes attesting to the completion of the course by the student. The notes are valuable evidence that the training was supervised by Khatib Tabrizi himself. The article emphasizes the great popularity of Khatib Tabrizi's commentary and its influence on subsequent studies of the poem "Saqt al-Zand" by Arabic authors.

Аннотация

Произведения великого арабского поэта и философа Абу-л-Ала ал-Маарри отличаются своей сложностью, глубиной смыслов, насыщенностью философских идей. В его диване «Сакт ал-занд» («Искры из огнива») стихи содержат скрытые смыслы, которые требуют объяснения. Сам автор написал комментарий к поэме. Однако оставалась потребность в более подробном изложении содержания дивана, что первоначально было сделано его учеником, азербайджанским ученым Хатибом Табризи. С момента завершения работы над комментарием филологи, любители поэзии обращались к Хатибу Табризи с целью изучения поэмы.

В статье на основании публикации С.М.Стерна, исследовавшего рукописи Багдадских филологов XII века, происходящих из школы Хатиба Табризи, и его непосредственных учеников, рассматривается вопрос использования рукописи труда Хатиба Табризи «Шарх Сакт аз-занд» («Комментарий Искр из огнива») при изучении дивана ал-Маарри. Записи об учениках, прошедших курсы на основании комментария Хатиба Табризи, сохранились на древних рукописях. В процессе подготовки ученики переписывали труд учителя, создавая копии. Эти рукописные комментарии содержат записи учителя, свидетельствующие об окончании курса учеником. Заметки являются ценным подтверждением того, что обучение проходило под руководством самого Хатиба Табризи. В статье подчеркивается большая популярность комментария Хатиба Табризи и его влияние на последующие исследования поэмы «Сакт ал-занд» арабских авторов.

Keywords: Khatib Tabrizi, Abu-l-Ala al-Maarri, "Sharh Sakt al-zand", manuscript, training**Ключевые слова:** Хатиб Табризи, Абу-л-Ала ал-Маарри, «Шарх Сакт ал-занд», рукопись, обучение

Введение: В статье востоковеда С.М.Стерна [1], посвященной рукописям поэмы «Сакт ал-занд» («Искры из огнива») Абу-л-Ала ал-Маарри [2], рассматриваются древние манускрипты, хранящиеся в различных библиотеках мира. Параллельно с их описанием освещаются заметки на титульных листах, на полях этих рукописей, рассмотрение которых представляет научный интерес. Многочисленные записи подтверждают, что азербайджанский ученый Хатиб Табризи пользовался большой популярностью среди любителей и ценителей поэзии ал-Маарри, а его комментарий к этой поэме с момента написания был незаменим при изучении поэмы великого поэта.

Основная часть: Особенностью филологического учения Хатиба Табризи (421/1030 – 502/1109 гг.) является то, что он уделял много внимания поэтическим произведениям своего учителя Абу-л-Ала ал-Маарри. Это было присуще и его последователям. «Это пристрастие к работам Абу-л-Ала стало традиционным в багдадской школе филологов VI/XII веков, которые, в основном, были учениками ал-Табризи или учениками учеников ал-Табризи. Поэтому не случайно, что наиболее важные рукописи стихотворений ал-Маарри принадлежат представителям этой школы», – отмечает С.М.Стерн. Сохранившиеся документы свидетельствуют о прохождении учебы Хатибом Табризи у Абу-л-Ала ал-Маарри, а также о передаче им знаний многочисленным ученикам: «У нас имеется несколько рукописей основных поэтических сочинений Абу-л-Ала «Сикт аз-занд» и «Лузум ма ла йалзам», которые являются материальными свидетельствами курсов, прочитанных ал-Табризи по творчеству Абу-л-Ала, а одно из них свидетельствует об учебе ал-Табризи у Абу-л-Ала» [1, 322].

Работа над комментарием была завершена Хатибом Табризи в 475/1982/83 г. По этой рукописи автор вел преподавание своим ученикам, изучающим поэму «Сакт аз-занд». Один из его учеников Абу-л-Касим ал-Кунбаи приступил к изучению поэмы в том же 475 году. С этой целью им был скопирован комментарий из оригинального текста учителя, о чем гласит запись: «(скопировано) с оригинала (asl) ал-Табризи, его комментатора». И после завершения курса Хатиб Табризи подписал копию рукописи, отметив, что ал-Кунбаи посещал его курс [1, 325]. Позже рукопись ал-Кунбаи (хранится в Кембриджской библиотеке под № Qq 115) была многократно использована исследователями поэмы «Сакт ал-занд» для обучения, а также при исправлении ошибок для сравнения со своими рукописями. Ал-Кунбаи во время работы над своей рукописью читал ее вместе с Са'д ал-Хайром, который тоже изучал поэму у Хатиба Табризи, имея свой переписанный с оригинала комментарий. Как отмечает С.М.Стерн: «По любопытной случайности до нас дошел также экземпляр «Сакт ал-занд» Са'д ал-Хайра, который он читал вместе ал-Табризи» [1, 327].

Ученика Хатиба Табризи Ибн ал-Джавалиги и Са'д ал-Хайра был ученик Али б. Абд ал-Рахим б. ал-Хасан ал-Сулами, известный как Ибн ал-Ассар. Во время изучения поэмы «Сакт аз-занд» с целью исправления ошибок в своей рукописи (Стерн предполагает, что он заимствовал рукопись Са'д ал-Хайра у аристократа-любителя из Багдада эмира Абу ал-Мурхафа Насра б. ал-Мансур ан-Нумайри, к которому к середине века перешла рукопись), и он так же сравнивал ее с рукописью ал-Кунбаи [1, 327].

Как следует из записей, оставленных на этой самой рукописной копии Са'д ал-Хайра, Абу ал-Мурхаф Наср б. ал-Мансур ан-Нумайри изучал поэму вместе с другим учеником Хатиба Табризи шарифом Абу ал-Муаммаром ал-Мубараком б. Ахмадом ал-Ансари. Необходимо отметить, что на этом лекционном курсе присутствовало несколько выдающихся ученых: Абу Галиб Мухаммад б. ал-Мубарак б. Мухаммад б. Мухаммад б. Маймун (автор объемистой антологии арабской поэзии), Ибн ал-Хашшаб (известный филолог, выступавший в роли «пре лектора», зачитывал произведение для объяснения лектором в то время, как остальные присутствующие слушали. Свидетельство о слушании было написано неким Али б. Юсуфом б. ал-Мухаввали и подписано лектором [1, 328].

Любопытным фактом является то, что в начале XII века эта копия перешла во владение Баха ад-Дина Абу Исхака Ибрахима (ум. 630/1232 г.), сына Абу ал-Юсра Шакира, внучатого племянника Абу-л-Ала ал-Маарри в пятом поколении [1, 329]. Баха ад-Дин был учеником знаменитого грамматиста Абу-л-Юмна ал-Кинди и наставником самого Ибн ал-Адима. Как было установлено С.М.Стерном, племянник ал-Маарри – Абу Мухаммад Абд Аллах (сын его брата Абу-л-Маджда Мухаммада I) был его верным другом и подготовил множество экземпляров его стихов. Сын же Абу Мухаммад Абд Аллага – Абу-л-Маджд Мухаммад II, с детства прекрасно понимавший поэзию, получил «Сакт ал-занд» как от своего отца, так и от самого Абу-л-Ала. Далее, Абу-л-Маджд передал его своему внуку Абу-л-Юсру аш-Шакиру, отцу Баха ад-Дина. И Баха ад-Дин изучал

«Сакт ал-занд» вместе со своим отцом. Кембриджская рукопись была его собственностью, и приведенные данные проливают свет на примечания, содержащиеся в рукописи [1, 331]. Все вышесказанное подтверждает тот факт, что наследники Абу-л-Ала изучали и преподавали произведение «Сакт ал-занд», которое было прокомментировано Хатибом Табризи.

Баха ад-Дин неоднократно читал лекции по «Сакт ал-занд». В Кембриджской рукописи сохранились записи о трех его курсах: 617/1220, 622/1225, 625/1228 годов. Запись о курсе, который был завершен в 617 г., т.е. о первом слушании /«сама»/ была оставлена переписчиком ал-Багдади, которого звали Ибн ал-Карим. Он сопоставил свою собственную копию с настоящей, сделав соответствующую запись. Здесь С.М.Стерн отмечает, что та самая копия (собственная рукопись Ибн ал-Карима) хранится в настоящее время в библиотеке мечети Лалели в Стамбуле (№ 1765) [1, 334]. Он переписал «Сакт ал-занд» еще Багдаде до 600/1203 года, где он изучал книгу со своим учителем филологом Абу Галибом. После переезда в Дамаск он изучал произведение с Баха ад-Дином в 617/1220 г. и был знаком с копией Баха ад-Дина. Он обнаружил в ней запись о том, что Абу Галиб читал эти стихи с Абу ал-Муаммаром ал-Ансари. Заинтересовавшись этой «сама» Ибн-ал-Карим «не упустил случая скопировать его в свою рукопись», сообщает С.М.Стерн [1, 335]. Затем Ибн ал-Карим вернулся в родной город Багдад.

Что касается второго курса, то он проходил в доме Баха ад-Дина в Дамаске и был закончен в 622/1225 г. На курсе присутствовали Абу-л-Фадл абд ал-Мухсин ал-Танухи (секретарь Аййубидского принца Изз ад-Дина Сархада), который выполнял функцию «чтеца»; Фасих ад-Дин Абу Бакр Мухаммад ал-Иджли ал-Маусыли; Наджиб ад-Дин Абу-л-Фатх Наср Аллах ал-Саффар; Шараф ад-Дин Абу Мухаммад Абд ал-Муним ал-Танухи и двое его сыновей, Наср Аллах и Мухаммад; сын лектора Исхак; Джамал ад-Дин Абу Абд Аллах Мухаммад ал-Мугани ал-Макдиси. Это свидетельство было написано Ахмадом б. Абу ал-Фадаилом [1, 332].

Третий курс, также, как и второй, проходил в доме Баха ад-Дина в Дамаске и был закончен в 626/1228 г. На нем присутствовали: Ваджих ал-Дин абу Закарийа Йахья б. Вассаб ал-Кинани ал-Мысри, исполняющий обязанности «чтеца»; Изз ал-Дин Абу-л-Аббас Ахмад б. Али б. Макиль ал-Мухаллаби (происходил из Химса); кади ал-Дин Абу-л-Мансур Зафир; сын эмира Саад ад-Даулы Юсуф; сын Муизз ал-Даулы Асад; сын Рукн ал-Даулы Исмаил б. Амид; Наджиб ал-Дин Абу-л-Фатх Наср Аллах ал-Саффар; сын лектора Исхак (оба сына: ал-Саффар и Исхак присутствовали также на курсе 622/1225 г.; племянник лектора Шихаб ад-Дин Абу-л-Фадл ал-Аббас б. Мухаммад б. ал-Шакир; Ибрахим б. Умар б. Абд ал-Азизал-Кураши, записавший данный «сама». Частично лекцию прослушали Шараф ад-Дин Абу Мухаммад Исхак б. Исмаил б. Абд ал-Самад ал-Ансари ал-Ирбили, а также Шараф ад-Дин Абу-л-Гасым Абд ал-Карим б. ал-Мухсин б. Аби-л-Гасым ал-Сури [1, 333].

14 лет спустя другой ученик Хатиба Табризи Абу-л-Хасан Саад ал-Хайр б. Мухаммад ал-Ансари, переписал его рукопись. Она уникальна тем, что на ней содержится автограф Хатиба Табризи [1, 336]. Эта рукопись комментария «Сакт ал-занд» хранится библиотеке Фейзуллы в Стамбуле, она аналогична Кембриджской рукописи ал-Кунбаи. Переписчик был уроженцем Валенсии. В биографической заметке говорится, что он был учеником Хатиба Табризи по адабу (это полностью подтверждается свидетельствами в рукописях). Учениками ал-Ансари являлись Ибн Асакир, Абу Юмн ал-Кинди, Ибн ал-Джаузи. Стерн пишет, что имя ал-Ансари часто упоминается в багдадских рукописях. Согласно стамбульской рукописи, он изучал «Сакт ал-занд» с Хатибом Табризи в 489/1096 г., а из другой его рукописной копии, подписанной Хатибом Табризи (Лейден, 446) следует, что семь лет спустя (496/1103 г.) он учил у Хатиба Табризи произведение «Ислах ал-Мантык» Ибн ас-Сиккита. Кроме того, в 489 г. ал-Ансари с настоящей рукописью на руках проходил курс у Хатиба Табризи. Частично он выступал в роли читателя, частично в роли слушателя, в то время как другой человек читал. Стерн предполагает и другой вариант, когда, возможно, было два курса: один ал-Ансари прочитал частично, а другой прослушал от начала до конца [1, 337].

С.М.Стерн также сообщает о рукописной копии ученика медресе ан-Низамийа, которая хранится в библиотеке Кеprüлю. Имя ученика – Абу Исхак Ибрахим б. Абдаллах ал-Вафраванди. Он пишет: «Этот том был скопирован в месяце шаабан 501/1108 г. в медресе ан-Низамийа с автографа Хатиба Табризи неким Абу Исхак Ибрахим б. Абдаллах ал-Вафраванди». Стерн предполагает, что она была скопирована для частного пользования, так как в ней нет никаких записей. Он сообщает еще об одной копии, написанной в 566/1170 г. неким Мухаммадом б. Мухаммадом б. Ибрахимом б. ал-Ала [1, 338].

И это только небольшой список людей, изучавших поэму, рукописи которых были описаны, несомненно, их количество намного больше. К примеру, азербайджанский комментатор Абу

Йакуб Юсуф бн Тахир ал-Хуваййи (ум. примерно в 549/1154 г.) при составлении собственного комментария «Шарх ал-танвыр» на поэму «Сакт ал-занд» полностью опирался на комментарий Хатиба Табризи [3, 542].

Ранее нами было описано египетское издание Комитета возрождения наследия Абу-л-Аля ал-Маарри под названием «Шурух Сакт ал-занд» («Комментарии Сакт ал-занд») [4]. Первоначально учредители комитета во главе с Таха Хусейном планировали издать комментарий Абу-л-Аля ал-Маарри «Ду'у Сакт ал-занд», однако, в итоге они посчитали правильным выбрать комментарий Хатиба Табризи, объединив его в издании с двумя другими известными комментариями: ал-Батальясви и ал-Хаваризми. После исследования и сопоставления различных рукописей этих трех комментаторов, за основу был принят комментарий Хатиба Табризи, как наиболее совершенный и достоверный [5, 7].

Важно отметить труд ученого из Сирии Фахраддина Габавы «Идах фи Шарх Сакт ал-занд ва ду'у» («Разъяснение Комментария Сакт ал-занд и его света»), посвященный комментарию Хатиба Табризи, изданный им в 2020 году [6]. Как скрупулезный ученый, он также отдал предпочтение комментарию Хатиба Табризи. На основании этого и вышеупомянутого египетского изданий проводится изучение поэмы «Сакт ал-занд» в настоящее время.

Conclusion

When studying Abu-l-Ala al-Ma'arri's "Sakt al-zand", interested persons preferred to attend courses where the training was based on Khatib Tabrizi's commentary. The high authority of Khatib Tabrizi as a teacher and commentator attracted a lot of students, among whom were famous scholars. The presence of Khatib Tabrizi's autographic notes on the copies of commentaries compiled by his students, the use of these copies by subsequent generations of researchers, as well as the further copying of these manuscripts for the study of the poem shows that it was the commentary of the Azerbaijani scholar who was on special account among scholars-philologists, poetry lovers.

Заклучение

При изучении дивана «Сакт ал-занд» Абу-л-Аля ал-Маарри заинтересованные лица предпочитали посещать курсы, где обучение проводилось на основании комментария Хатиба Табризи. Высокий авторитет Хатиба Табризи как учителя и комментатора привлекал множество учеников, в числе которых были и именитые ученые. Наличие автографических записей Хатиба Табризи на копиях комментариев, составленных его учениками, использование этих копий последующими поколениями исследователей, а также дальнейшее копирование этих рукописей для изучения поэмы показывает, что именно комментарий азербайджанского ученого находился на особом счету у ученых-филологов, любителей поэзии.

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Technical sciences

DESALINATION METHODS FOR WATER WITH HIGH SALINITY

O.O. Aliyeva

Phd, Head of the Laboratory «Alternative energy»

Azerbaijan State University of Oil and Industry

Research Institute "Geotechnological problems of oil, gas and chemistry" Dilarya Aliyeva

227, Baku, Azerbaijan

X.M.Mirzayeva

Azerbaijan State University of Oil and Industry

Research Institute "Geotechnological problems of oil, gas and chemistry" Dilarya Aliyeva

227, Baku, Azerbaijan

Abstract

Highly mineralized waters, including seawater and brines, are a significant resource for providing fresh water in conditions of its deficit. However, their desalination is associated with high-energy costs and technological difficulties.

This article discusses the main methods of desalination, their advantages and disadvantages, as well as promising areas of technology development, such as membrane processes, thermal desalination and hybrid systems.

Keywords: desalination, highly mineralized water, distillation, energy efficiency.

It is known that there is a deficit of fresh water on the territory of more than 40 countries of the world, accounting for about 60% of the entire surface of the Earth's land. Fresh water has become one of the commercial products such as oil, gas, the degree of availability of which determines the social and economic condition of the population of individual countries and regions. Therefore, desalination of highly mineralised water is one of the priority problem areas facing mankind. Analysis of desalination methods shows that the main methods that have found industrial application are thermal distillation, reverse osmosis and electrodialysis.

According to literature data one of the main obstacles on the way of desalination cost reduction by thermal and reverse osmosis methods is the problem of scale formation on heating surfaces of thermal plants (TP) and fouling of membranes of reverse osmosis plants (RO) with organic, biological and mineral precipitates [1,2]. Moreover, in thermal plants these scales are mainly CaCO_3 , $\text{Mg}(\text{OH})_2$ and CaSO_4 , and in RO units - CaCO_3 and CaSO_4 . In addition, RO membranes are very sensitive to fouling by these and therefore more thorough treatment of the source water before RO is required. Thus, both in thermal and reverse osmosis desalination, mineral deposits are the most dangerous. Of these, CaCO_3 and $\text{Mg}(\text{OH})_2$ are easily eliminated by the widely used acidification method. The most problematic and not found until recently its effective solution is to prevent the deposition of CaSO_4 . It is known that to eliminate the formation of CaSO_3 and to a certain extent CaSO_4 often resort to acidification of the initial highly mineralised water (sea, ocean, etc.) in combination with the introduction of special additives (antiscaling). In this connection it should be noted that, firstly, some of these antiscaling additives are toxic and rather expensive. Besides, this method of raw water treatment cannot reliably exclude calcium sulphate formation on the membranes of desalination plants and heating surfaces of thermal units. Therefore, desalination plants, especially thermal desalination plants, along with the use of acid and antiscaling agents, are forced to resort to operational methods to prevent the formation of CaSO_4 . In particular, limit the degree of concentration of source water and carry out the process of thermal distillation in the region of low temperatures. These forced measures lead to high costs for desalination, and also make unprofitable industrial processing of residual concentrates on chemical products of marketable quality. That is why in the last century in a number of countries, including Azerbaijan, researches on softening of sea water for elimination of so-called sulphate barrier, i.e. for prevention of CaSO_4 in desalination plants were started. As a result of many years of research in Azerbaijan, a thermochemical method of seawater softening was proposed, which has found long-term industrial application at two Caspian littoral thermal power plants: in Baku and Krasnovodsk.

For that period, thermochemical softening was one of the efficient methods. This method allows deep softening of sea water, but the use of steam at the stage of thermal softening and complex processing technology lead to high softening costs, which are about 0,5 \$/m³. However, the results of research on this method and the experience of operation of thermochemical plants, as well as the results of other studies in this area allowed the scientist from Azerbaijan G.K.Feyziev to recommend an original method of deep softening of sea water directly by Na-cationic on ordinary standard filters, without resorting to the use of steam. The depth of softening by this method (residual hardness on the example of Caspian Sea water is 20-30 µg-eq/l i.e. reduction of hardness of initial water is ~ 99,97%) completely excludes formation of all forms of scale practically at any temperatures of evaporation and evaporation rates. Practical implementation showed that the cost price of softened water is 0.07- 0.08\$ /m³.

The possibility of such deep softening of sea water gave rise to a new scientific trend. Thus, for the first time in the world desalination practice, the idea of large-scale production of desalinated water at thermal power plants with implementation of an open cycle of the plant was put forward and subsequently scientifically substantiated.

Advances in the development of efficient technologies for ion exchange softening of seawater have led to the expansion of research in two other areas [4]:

- highly mineralised waters of a wide class with salt content from 3 to 35 g/l and hardness from 10 to 130 mg-eq/l were covered as the object of research;
- taking into account the diversity of source waters, the main quantitative regularities of desulfatation and decarbonisation processes by Cl-anionisation and decalcification and desulfatation by Na-Cl-ionisation were studied along with Na- and Mg-Na-cationisation.

The studies have substantiated the possibility of deep softening and desulphatisation of the considered water classes, proposed a methodology for selecting a rational ionisation technology depending on the composition of the initial water, and solved optimisation problems of various levels. Cheap and effective methods of solving the sulphate problem (elimination of CaSO₄ deposits formation) and organisation of thermal distillation process even in the temperature range of 180-100°C instead of 105-40°C, evaporation ratios of 10-12 instead of 2-3, which are forced to be practiced nowadays at thermal desalination, have been developed. This allows to reduce desalination costs by 60-80% [3]. At high-temperature thermal desalination there is a possibility of essential increase of efficiency of dual-purpose systems on generation of electric power and fresh water.

In this connection it was established on the example of power unit K-200-130 that by optimising the scheme of inclusion of distillation unit into the cycle of TPP it is possible to obtain more than 100 thousand m³/day of fresh water with heat costs of about 30 MJ/m³, which is less than the energy costs of modern PPAs.

The idea of direct feeding of medium and high pressure drum boilers with softened sea water was also proposed. The results of a set of studies of intra-boiler processes under these conditions proved and substantiated their proper course. This makes it possible to turn the seaside thermal power plants into a multi-purpose plant, where, along with the traditional generation of heat and electric power, desalinated sea water and chemical products will be produced. This significantly increases the industrial and environmental potential of the TPPs and allows for the production of desalinated water and chemical products in the most environmentally friendly way. Operation of TPP with direct feeding of drum boilers with softened seawater and implementation of an open cycle allows to reduce heat costs for desalination to less than 30 MJ/m³, which makes it possible to carry out large-scale production of cheap desalinated water (even without taking into account the profit from the sale of extracted by-product chemical products).

In view of the above, two methods of complex processing of mineralised waters of sulphate-chloride class have been developed. The first method is based on a new sequence of physical and chemical process of water treatment including:

- deep desulphatisation of the desalination stage concentrate by the introduction of CaCl₂ to produce gypsum;
- precipitation of magnesium from desulfatised concentrate by liming to give Mg(OH)₂;
- thermal separation of the remaining NaCl-CaCl₂-H₂O system into its constituent components;
- using a part of the obtained CaCl₂ for desulphatisation of the initial concentrate.

The target products of this technology are desalinated water as well as gypsum, Mg(OH)₂, CaCl₂ and NaCl of commercial quality.

According to the second method, transformation of the system Na₂SO₄- NaCl – H₂O into the easier to separate system NaCl – CaCl₂- H₂O is carried out by preliminary ion-exchange separation of chloride

and sulphate ions followed by precipitation of $Mg(OH)_2$ from concentrates of the Na-cationisation stage and gypsum from concentrates of the Cl-anionisation stage. In addition to desalinated water, the target products are NaCl, $Mg(OH)_2$ and gypsum. Approximate material balance of this process:

1) Seawater flow rate 88.7 m³/h, lime flow rate 149 kg/h.

2) Production - desalinated water 85.1 m³/h, NaCl - 710 kg/h, $Mg(OH)_2$ - 154 kg/h, gypsum - 500 kg/h.

The developed new methods of complex processing of mineralised water are based on a new sequence of traditional processes (ion exchange, evaporation, precipitation, etc.), for each of which rich material for calculation and design of industrial plants has been accumulated.

Conclusions

1. Despite a variety of methods of desalination of mineralised water, the most widely used methods are thermal and reverse osmosis desalination. One of the main reasons slowing down the development of desalination plants is low efficiency of applied measures for prevention of scale formation and deposits on evaporating surfaces and membranes. At that the most problematic is prevention of calcium sulphate deposits. The method of preliminary acidification in combination with the introduction of antiscaling agents, widely used for this purpose in the world practice, does not provide an effective solution of the sulphate problem, and in ecological terms is imperfect.

2. For reliable prevention of scale formation (primarily sulphate), taking into account the peculiarities of the Caspian Sea water composition, Azerbaijani scientists have developed economical and environmentally friendly methods of ion-exchange softening and desulphatisation of mineralised water before desalination. They are equally acceptable for thermal and reverse osmosis systems, but are most effective for thermal desalination. The use of these methods allows more than halving the cost of thermal desalination.

3. A reliable solution to the sulphate problem opens up broad prospects for large-scale desalination at a thermal power plant, turning it into a multi-purpose energy and water chemistry plant to produce electricity and heat, as well as desalinated water and commercial chemical products

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SOFTWARE ENGINEERING IN HISTORICAL RETROSPECT: STANDARDS, MISTAKES, AND NEW HORIZONS

Erzhan Zheenbekov

Bachelor in Computer Science
at National Louis University
(Chicago, Illinois)

<https://orcid.org/0009-0000-9344-9584>

Abstract

The article examines the historical evolution of software engineering — from the rigid and linear development models of the 1960s–1980s to modern flexible, adaptive, and human-centric approaches. By analyzing such milestones as Waterfall, CMM, ISO 9126/25010 standards, and the introduction of DevOps, Agile, and CI/CD, the author reveals the patterns of development of the discipline and points out typical mistakes of the past that became the foundation for new quality standards and architectural solutions. Particular attention is paid to the influence of artificial intelligence and machine learning on the design, testing, and implementation stages, as well as the growth of microservice structures, systems-of-systems, and digital twins as a reflection of the transition to a modular, scalable architecture of the future. The author emphasizes that despite technological progress, a person remains at the center of software engineering — as a creator, integrator, and keeper of system meanings.

Keywords: DevOps, digital twins, software engineering, microservices, ISO standards.

Introduction: In this introduction, we define software engineering, its role as a discipline based on a systems approach, and justify the conclusion about the need for historical analysis. Software engineering is an interdisciplinary field that synthesizes the principles of programming, systems engineering, and project management. Its goal is to ensure the reliability, scalability, and quality of software systems, which is critical in the era of digital transformation {2}. Analyzing the historical path of software engineering evolution — from the modest beginnings of the discipline in the 1960s and 1970s to modern complex ecosystems using AI/ML, DevOps, and microservice architecture — allows us to identify patterns, lessons, and promising areas for the development of the industry {1; p. 2}, {10; p. 5}, {14}.

Initially, the discipline focused on formal methodologies and standards, reflecting the desire for predictable development results and reduced risk of design failures {7}. However, over time, practice has revealed the limitations of the “rigid” approach: numerous standardization initiatives (e.g., the Waterfall model {13}, CMM {11}, ISO 9126 and later ISO 25010 {8}) were only partially successful in fulfilling their mission. Today, we are witnessing a process in which strict regulation is complemented by flexibility, automation and an emphasis on user quality {3}.

The article then goes into detail on key stages and turning points, starting with the first standards, through the crises of large projects, then the transformation of quality standards, and finally an analysis of the turn to Agile and DevOps {5}, {6}, as well as the introduction of AI and microservices as elements of a new engineering paradigm {10}.

In the second part of the article, devoted to the early stages of software engineering, we will consider the key historical period of the 1960s and 1970s and the birth of the first standardized method — the Waterfall model {13}.

In the 1960s, in parallel with the growing complexity of software systems, a “software crisis” emerged {4; p. 14}. Systems were becoming larger, more complex, and their development was increasingly over budget and over schedule. In response to this challenge, the so-called NATO Software Engineering Conferences were held in 1968–1969. At these, the demand for a discipline based on engineering design principles and rigorous process management methods was first formally formulated {13}.

In 1970, Winston Royce published *Managing the Development of Large Software Systems*, which for the first time demonstrated a model of a linear phase approach: requirements → analysis → design → coding → testing → operation {13}. Although Royce himself did not call it a “waterfall” and emphasized the risks of such an approach, it was this scheme that formed the basis of the Waterfall model,

which received its name in the mid-1970s. The appeal of the model was its simplicity and clear structure, which resembled a sequential flow: each phase strictly follows the previous one {13; p. 2}.

Managers and developers welcomed Waterfall as a tool for managing large projects—it promised predictability, control, and extensive documentation. However, Royce had already warned of the dangers: delayed testing and errors in early phases could lead to a complete redesign of the system and serious budget disruptions {13; p. 3}.

Thus, the early days of software engineering are characterized by duality: rigid structures and standards are contradictory and rich in both management opportunities and serious risks {3}. It is these contradictions that became the foundation for subsequent transformations of the discipline, and below we will consider what lessons the industry learned and how they influenced the evolution of standards {6}.

The second part of the article, devoted to the 1980s and 1990s, reveals the emergence of the Capability Maturity Model (CMM) as a continuation of the idea of standardizing software engineering processes {11}.

In the mid-1980s, during a period of rapid growth and increasing complexity in software projects, dozens of large US Department of Defense contracts were experiencing systematic delays and budget overruns. In response, the Software Engineering Institute (SEI) at Carnegie Mellon University, funded by the US Air Force, began developing a means of assessing the maturity of contractor processes. Watts Humphrey led the initiative, adapting the idea of Deming's famous Plan–Do–Check–Act cycle to the software context as early as the early 1980s {11; p. 3}, {7; p. 9}.

In 1987, the SEI released its first report describing five levels of process maturity, from “basic” to “optimized,” and an assessment scale used as a diagnostic and improvement planning tool {11}. The SW-CMM version 1.0 was formally released in 1991, and then version 1.1 was released in 1993, containing revised key process areas and self-assessment questions {11}.

The CMM model provided five stages of maturity: from chaotic, unregulated practices to systemic management and continuous improvement of processes. Each stage was accompanied by specific requirements for the formalization of procedures, metrics, management mechanisms and improvement culture. This allowed organizations to objectively assess the level of maturity and gradually build internal improvements {11}.

By the late 1990s, thanks to the efforts of Bill Curtis and colleagues, the model had gained widespread acceptance outside the defense sector and became the basis for extended versions (People CMM, CMMI) and industry adaptations. However, frequent critics pointed to excessive bureaucratization and the risk of losing flexibility, which subsequently stimulated the transition to the integration of processes with adaptive approaches - for example, Agile and DevOps {5}, {6}.

Thus, the 1980s and 1990s saw the emergence of the CMM as the first large-scale, structured system for assessing engineering maturity in software, which became a milestone on the path from unbridled improvisation to controlled and measurable processes {11; p. 7}, {3}.

In the second part of the topic “Past Mistakes and Crises,” we should pay attention to the key factors of failure in software engineering. The most obvious and common problem was requirements instability. As Jeff Atwood notes in the well-known blog Coding Horror, “one of the two most common causes of project failure is unstable requirements” and “requirements errors are the most costly in the late stages” {3; p. 11}.

This statement illustrates how changing the direction of specifications through shifting emphasis, introducing new features, or changing priorities contributed to increased costs and delays, especially when the project was already in its final phase.

Early methodologies, based on a strict waterfall approach, encouraged the rejection of flexibility and iteration. In practice, this meant that any deviation in requirements could lead to the need for a global redesign of the system, which often resulted in additional weeks or months of work {13; p. 4}.

This tendency towards linear development without regularly returning and re-evaluating intermediate decisions creates a well-known vulnerability where “the system only developed flaws” during the integration testing phase {13}.

Finally, costly bugs discovered late in the development process are the result of all the previous mistakes: inconsistent requirements, lack of iteration, and insufficient testing. When bugs are discovered in production or during deployment, fixing them requires significant investment not only in fixing the code, but also in updating documentation, retesting, retraining staff, and redesigning processes {3; p. 15}, {4; p. 142}.

This creates a snowball effect, where each new inaccuracy multiplies the consequences of previous ones, resulting in both financial and reputational losses.

Thus, these typical mistakes formed a vicious circle: unstable requirements led to a refusal to be flexible, which led to delays and costly corrections. The next step in the discussion will be to analyze the organizational, architectural, and human factors that aggravate these crisis scenarios {2; p. 89}.

Human factors play an important role in software crisis analysis. A systematic review by Mohanani and colleagues found that 37 different cognitive biases have been documented in software development practice that manifest themselves during project work, ranging from anchoring to overconfidence in one's own decisions {3; p. 16}. These biases often lead to unfounded assumptions, underestimation of risks, and deviations from optimal decisions.

A special place is occupied by the phenomenon of automation: relying on tools and automatic support systems, developers can miss important signals and ignore counterarguments, which is called "automation bias" (see commission/omission phenomena) {3; p. 17}. Such excessive trust can have catastrophic consequences when results are misinterpreted or errors are ignored.

Organizational failures also play a key role. According to Conway's Law, the communication structure of an organization is reflected in the architecture of the systems it creates, leading to "architectural seams" and duplication of effort if the boundaries of inter-team interactions are opaque {2; p. 164}. A lack of effective knowledge sharing makes matters worse: research shows that experienced architects often fail to communicate their findings beyond their team; this hinders learning and repetition of cycles on other projects {14}.

Finally, architectural anti-patterns such as the "Swiss Army Knife" (overly generic, overloaded modules) and "reinvent the wheel" (reimplementation of previously existing solutions) arise from a lack of abstraction, poor communication, and a lack of standardization of approaches {3; p. 18}. Without timely identification and correction of such architectural errors, difficulties with scaling arise, agility decreases, and technical debt grows.

Thus, cognitive and organizational biases not only create errors at the micro level, but also form macro problems in architecture and collective practice.

ISO 9126, developed and published in 1991, laid the foundation for a systematic approach to software quality assessment. It identified six key characteristics—functionality, reliability, usability, efficiency, maintainability, and portability—that were accompanied by detailed metrics at both the code and user perception levels {8}.

In 2011, ISO 25010 replaced the previous version, expanding it to eight characteristics: suitability, performance, compatibility, usability, reliability, security, maintainability, and portability. The new model includes additional quality aspects, such as security and compatibility, reflecting modern software requirements. ISO 25010 offers two interrelated models: product and quality-in-use, which allows for more flexible and context-sensitive assessment {8}.

In parallel with the development of ISO 9126 and ISO 25010, ISO 29119 was developed between 2007 and 2013 to cover testing processes, documentation, and techniques {9}. However, the standard has attracted strong criticism from experts. Among the complaints is an excessive focus on bureaucracy and processes that crowd out the practical value of testing. Leading representatives of the context-oriented testing school, such as James Bach and Jeff Christie, have noted that ISO 29119 does not reflect the diversity of practices and stifles innovation. Petitions against the standard, including the Stop 29119 petition, have been characterized as reflecting a dramatic split in the community between standardization and agile practices {9}.

Thus, the software quality paradigm has evolved from the ISO 9126 model with its six characteristics to the expanded and context-oriented structure of ISO 25010. At the same time, the introduction of ISO 29119 has revealed a serious problem: standardization of testing risks becoming a formal procedure, far removed from real quality assurance processes. This tension between standardization and practical flexibility continues to shape the modern software engineering landscape.

In recent years, the adoption of AI/ML has become a key driver of transformation in software development. Tools like GitHub Copilot, Amazon CodeWhisperer, and Meta CodeLlama automatically generate and complement code, eliminating routine work and speeding up the process of creating applications. Analyst forecasts indicate that by 2028, about 75% of developers in large companies will use such assistants to write and review code {18}.

At the same time, a paradigm shift is observed: developers are no longer just programmers and are transforming into "builders" creating systems with the help of AI assistants - the new concept is called vibe coding {18}.

From a practical point of view, AI/ML has already become firmly established in every stage of the life cycle:

1. **Code generation and refactoring** — Automated template generation, automatic code completion, and style checking allow developers to focus on architecture and logic {18}.
2. **Dynamic testing and defect analysis** — AI models analyze past bugs and test coverage, predict risk areas, and independently generate tests, focusing on vulnerabilities {18}.
3. **Implementation and Operations (DevOps + SRE + AIOps)** — MLOps and AIOps combine development flows and ML models into a single CI/CD process, providing automated deployment, monitoring, and incident management {2; pp. 102–113}.

At the production level, AI has become not just an auxiliary tool, but also a catalyst for innovative approaches:

- **Autonomous Agents (Agentic AI)** perform testing and tuning of applications without constant human intervention {18}.
- **Self-correcting tests** respond to changes in the interface, maintaining automation stability {18}.
- **LLM-aided design** uses large language models to generate design documentation, API codes, architectural scripts and templates, becoming a full-fledged participant in the design process {18}.

In addition, AI/ML has significantly increased the focus on ethical, safe, and quality development. AI Governance platforms monitor the compliance of models and prevent bias and vulnerabilities. Safety tests for AI are becoming a tool similar to SLO and SLI, recording the quality of the model {3; p. 18}, {18}.

Despite the significant benefits, the implementation of AI is associated with challenges:

- **Reliability and consistency of code:** AI can radically speed up the process, but it produces code that is “untethered” and potentially full of vulnerabilities {18}.
- **Reducing the role of traditional skills:** average engineers are replaceable by AI, but experts are needed who can evaluate architecture, hypotheses, and system reliability {3; p. 19}.
- **The Gap Between DevOps and ML:** 85% of ML models never make it to production due to isolated processes. The need for integrated pipelines is key to scalability {18}.

Thus, modern software engineering is on the threshold of a new era, where AI/ML are not only tools, but also partners and sources of innovation. The industry faces the challenge of balancing automation and control, investing in training “AI builders” rather than just writing code, and adapting the life cycle to hybrid DevOps+MLOps practices. This will allow combining speed, quality, and sustainability in a new technological context.

Below is a comprehensive and detailed overview of the topic “The Rise of Microservices, SoS Architectures, and Digital Twins”.

The emergence of microservice architecture reflects a profound transformation in the approach to application development. Modern systems consist of multiple autonomous services, each of which solves a limited set of problems: this allows scaling individual components, accelerating changes, and reducing dependence on a single monolith. According to estimates, the global microservices economy reached \$6.27 billion in 2024 and may reach \$7.45 billion in 2025 with a CAGR of almost 19%, expecting further growth to \$15.97 billion by 2029 {10; p. 4}.

A major growth catalyst is the rise of cloud, IoT, serverless and DevOps culture {5}.

Systems-of-Systems (SoS) evolved from SOA and microservices as a scalable way to combine independent subsystems into a flexible whole. Each subsystem—or service—has its own API, interacts with a clear contract, and is managed independently, allowing heterogeneous components to be integrated and the entire system to evolve without stopping other parts {14}.

The rise of microservices requires effective orchestration and management. The orchestration tools market was already valued at \$4.7 billion in 2024 and is projected to reach \$5.8 billion in 2025, with a CAGR of over 23%, driven by widespread adoption of Kubernetes, service meshes, and cloud-native solutions. Gartner also predicts that by 2025, over 85% of companies will focus on cloud infrastructure, driving adoption of service meshes, monitoring, and security {10; p. 6}, {2; p. 87}.

Digital Twin(digital twin) — a dynamic virtual model of a physical object. Previously, digital twins were created monolithically, but modern developments are moving towards a microservice approach. Research shows that the architecture of a digital twin is built on the basis of distributed, exchanging API services, which increases scalability, flexibility and integration with third-party components {14}, {19}.

Examples also apply to industrial equipment: digital copies of cranes and robots consist of services that support modeling, data collection and analysis, cache, synchronization with edge devices and the cloud {14}.

The DTaaS (Digital Twin as a Service) platform is based on containerized microservices and Kubernetes: services are responsible for model generation, scenario analysis, authentication, and data storage. This architecture makes the digital twin "composable": each service can be replaced, expanded, and scaled independently, while ensuring compatibility between ecosystem participants {14}, {19}.

Key Benefits and Challenges:

- **Modularity and scalability:** services can be scaled independently, adapting resources to the load {14}.
- **Integration with IT infrastructure:** Individual teams own their services, accelerating deployments and releases {14}.
- **Flexibility and evolution:** Digital twins can adapt on the fly, increasing computing power and introducing new components {19}.

However, the complexity of communication, orchestration, and fault tolerance remains a key problem in SoS zones of architectures. These challenges are addressed through a microservice stack: Kubernetes, service mesh, distributed tracing, and monitoring {10; p. 6}, {14}.

Conclusion

In conclusion, we find ourselves in front of a generalizing metaphor: software engineering is not just a technological discipline, but a living organism that has gone through a difficult path of maturation. From the mechanical straightforwardness of Waterfall to the flexible and self-adapting flexibility of Agile and DevOps, from the rigid bureaucracy of specifications to digital twins, AI assistants and scalable microservices - each generation of approaches was born from the pain of the previous one, from mistakes understood and rethought.

The past here is not baggage, but a navigator. Requirements crises, disasters due to architectural vulnerabilities, deferred bugs and silent teams have taught the industry to talk, test and adapt - continuously, quickly, consciously. Today, this is embodied in the practices of CI/CD, DevSecOps and human-centric automation. Tomorrow, it may be a symbiotic model in which artificial intelligence does not displace the developer, but enhances his intuition, critical thinking and strategic vision.

New horizons are opening up before us, but the leading role belongs not to the machine, not to the code, not to the system, but to the person. The new generation engineer is an architect of flexibility, a translator between the logic of the algorithm and the values of society. His mission is not just to build reliable systems, but to design trust, security and meaning.

The future of software engineering will not be impersonal and fully automated. It will be hybrid, scalable, and deep — and at the center of this future will remain the human being with the ability to see beyond the line of code.

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OCNA DEJ SALT MINING: A DIALOGUE THROUGH TIME CONNECTING PAST TRADITIONS, PRESENT PRACTICES, AND FUTURE PROSPECTS

Octavian Markos

PhD Student, University of Petroșani

Simona Cucăilă

Lecturer PhD. Eng.,

Mining Engineering, Surveying and Construction Department,

Mining Faculty, University of Petroșani

Abstract

The Ocna Dej salt mine in northern Romania serves as a living chronicle of technological progress, cultural continuity, and economic adaptation spanning nearly two millennia. From the hand-dug shafts of Roman and medieval miners to the precision tools and sustainability protocols of the 21st century, Ocna Dej illustrates the evolving relationship between human societies and one of Earth's most vital resources: salt. This study traces the development of extraction methods, labor systems, and infrastructural innovations at Ocna Dej, examining how salt mining practices reflected and shaped broader socio-political, economic, and technological trends. It highlights the mine's enduring role in regional development, from a Roman strategic asset and medieval trade hub to an industrial powerhouse under the Austro-Hungarian Empire and Romanian state.

Today, the site integrates automated mining technologies with environmental safeguards and heritage preservation, while serving as a center for speleotherapy and cultural tourism. Through historical analysis and technological contextualization, the paper underscores how Ocna Dej exemplifies a dynamic model of resilience—preserving its legacy while adapting to future challenges.

Keywords: Salt mine, mining tools, monitoring, mining practices, deformations, GPS, topography, subsidence, surveying.

Introduction

The Ocna Dej salt mine in northern Romania offers a unique case study in the evolution of mining techniques over centuries, reflecting broader shifts in technology, labor practices, and socio-political control. From its early exploitation by the Romans through medieval expansion and into the modern industrial era, the methods used to extract salt have continuously adapted to meet the demands of each historical period. This enduring importance of salt—for food preservation, military logistics, trade, and industrial applications—has ensured the mine's central role in regional development. As such, understanding the materials and methods used throughout its operational history is key to appreciating both the technical ingenuity and the cultural legacy of this site.

Materials and Methods

During the Roman period, salt was an extremely valuable resource, essential for food preservation, seasoning, and various industrial and military uses. The Romans recognized the rich salt deposits in the region of Dacia (modern-day Romania), including the area around Dej, where the Ocna Dej salt mines are located.

Early Roman salt extraction often involved surface and shallow mining. Miners accessed salt through natural outcrops or shallow underground deposits by following salt veins exposed at the surface or digging shallow pits to collect salt crystals. In some locations, the Romans also used brine evaporation methods, creating shallow ponds filled with salty water. The sun would evaporate the water, leaving behind salt crystals. This technique was simpler and widely used in areas where underground mining was difficult.

For deeper salt deposits such as those found at Ocna Dej, Roman miners relied on manual mining using hand tools like iron or bronze picks and hammers. They dug tunnels and chambers underground, carefully following the salt layers to extract the valuable mineral.

Salt mining during Roman times was often organized and controlled by the state or imperial authorities, due to salt's strategic importance. The workforce typically included local Dacians skilled in salt

extraction, as well as Roman slaves or soldiers who were assigned to mining tasks. To support mining operations, the Romans built infrastructure around these sites, including roads, storage facilities, and fortifications. This ensured protection of the salt supplies and efficient transport to other parts of the empire.

Salt from Ocna Dej and other Dacian mines was vital to both the Roman army and civilian populations. It played a crucial role in preserving food for soldiers on campaigns and was also used in various industries such as tanning, dyeing, and religious rituals.

Control of the salt mines contributed significantly to the wealth and stability of Roman Dacia, and the salt trade helped connect Dacia to wider networks within the Roman Empire.

Salt mining at Ocna Dej continued to be a crucial economic and strategic activity throughout the medieval period. Building on centuries of knowledge passed down from Roman times, medieval miners refined and expanded their extraction techniques to meet growing demand. Salt was indispensable for preserving food, especially meat and fish, and was a key ingredient in everyday life, making it one of the most valuable commodities in medieval Europe.

The mining operations at Ocna Dej were primarily focused on accessing underground salt deposits. Miners dug deep vertical shafts to reach the salt layers, then extended horizontal tunnels—called adits—following the veins of salt embedded within the rock. These tunnels often extended for hundreds of meters and required careful engineering to prevent collapses. Timber supports were used to shore up unstable sections, and ventilation shafts were dug to allow fresh air to circulate, protecting miners from toxic gases.

Tools used in mining were predominantly hand-operated. Iron picks, hammers, chisels, and wedges were the primary instruments for breaking the salt rock. The labor-intensive nature of the work demanded a skilled and experienced workforce, often composed of local miners who had inherited techniques passed down through generations. Mining was dangerous, with risks of tunnel collapses, flooding, and health problems related to prolonged exposure to salt dust.

The ownership and control of the salt mines at Ocna Dej typically fell under the jurisdiction of local feudal lords or monarchs. These rulers understood the economic importance of salt and established systems of regulation and taxation to profit from its extraction. Miners often paid fees or shared a portion of their salt production with their lords, who in turn protected the mines with fortifications and guards to prevent theft or illegal mining.

Salt from Ocna Dej was not only consumed locally but also became a significant trade good. It was transported along medieval trade routes throughout Transylvania and neighboring regions, reaching markets in towns and cities far from the mine itself. This trade contributed to the economic development of Dej and the wider region, encouraging the growth of infrastructure such as roads, inns, and marketplaces.

In addition to solid rock mining, medieval salt extraction sometimes involved processing brine from salt springs or wells in the vicinity of the mine. This method involved pumping salty water to the surface and evaporating it in large pans, a technique especially useful when solid deposits were harder to access. However, underground mining remained the dominant practice, due to the deposits available.

Communities around the mines grew to support the workforce. Settlements housed miners and their families, with facilities like blacksmith workshops, storage warehouses, and religious establishments. The salt trade and mining industry fostered a distinct social and economic structure in the region, where mining families often held specialized knowledge and privileges. Overall, the medieval period saw Ocna Dej salt mines thrive as an important center of salt production in Transylvania. The combination of skilled labor, technological improvements, and organized management ensured the mines' continued significance well into later centuries.

The 18th century was a time when salt was not only a valuable commodity but also a strategic resource, used for food preservation, trade, and even taxation. At that time, mining techniques were rudimentary and deeply reliant on manual labor. The process began by carving out bell-shaped vertical shafts, known locally as "clopot" due to their resemblance to church bells. These shafts were dug directly into the salt deposit by skilled miners using basic tools—pickaxes, chisels, wooden mallets, and wedges—all operated by hand.

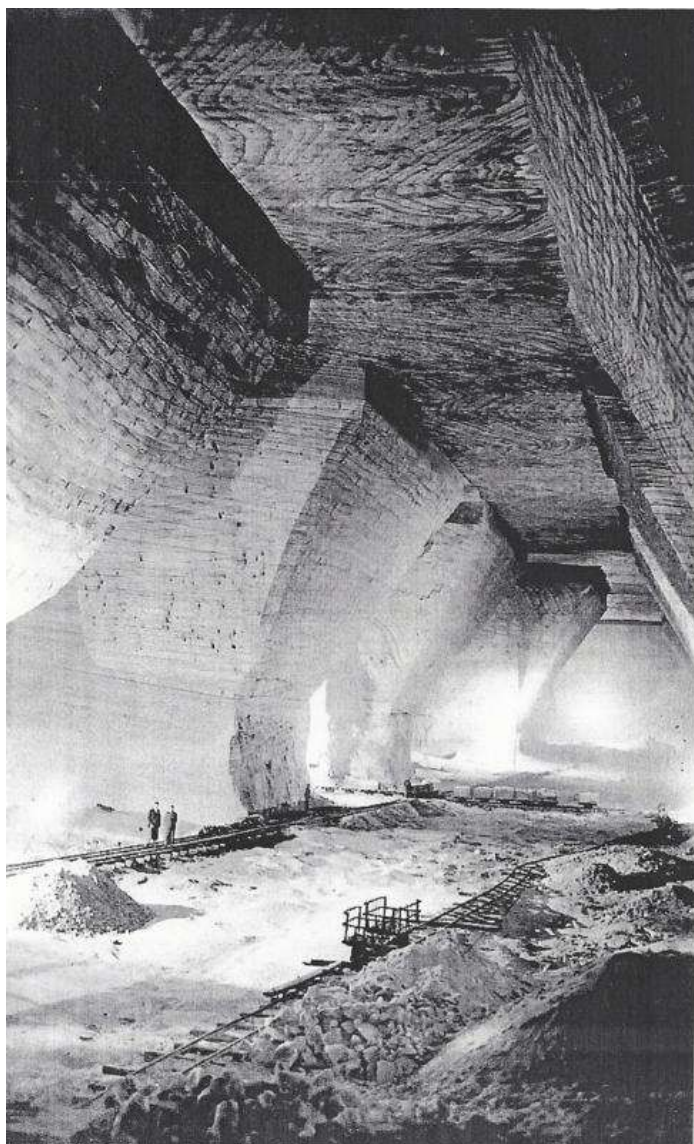


Figure 1 – The old Ferdiand Mine at Dej

https://www.salinaocnadej.ro/wp-content/gallery/istoric/istorie0010_490x800.jpg

Salt blocks were extracted in an irregular, unshaped form and transported to the surface in wooden baskets or carts. The lifting mechanism involved ropes and pulley systems, often operated by teams of men or with the assistance of draught animals, reflecting the physically demanding and hazardous nature of the work. In addition to solid salt mining, miners developed brine extraction techniques, where underground chambers were intentionally flooded with fresh water to dissolve the salt and create concentrated brine pools. This salty solution was then hauled to the surface and evaporated in large cauldrons or open pans heated by fire, leaving crystalline salt behind. Though this process was time-consuming and labor-intensive, it provided a steady supply of salt to local communities and supported a modest trade network in the surrounding regions.

The 19th century marked a period of transformation for Salina Ocna Dej, mirroring the impact of the Industrial Revolution across Europe. As new technologies became available, the mine began adopting steam-powered hoisting equipment, significantly improving the efficiency of lifting salt from deep underground. The introduction of timber reinforcement systems allowed miners to excavate larger and deeper chambers safely, expanding the mine's capacity. Within the galleries, horse-drawn rail carts were introduced to streamline transportation, reducing the physical burden on workers and improving productivity.



Figure 2 – Carbide lamp made of steel

<https://biblioteca-digitala.ro/reviste/carte/satu-mare/Catalogul-expozitiei-Drumul-Sarii-Drumul-Tarii.pdf>

Simultaneously, brine extraction techniques became more sophisticated with the introduction of mechanical pumps, which could regulate water flow and dissolve salt more effectively. The salt output was now shaped into uniform blocks, making it easier to handle, store, and ship. These innovations corresponded with a broader expansion of salt markets, as improved transportation infrastructure—including railroads—linked Dej more directly with national and even international trade routes. The mine, once a local operation, began to emerge as a strategic industrial site within the Austro-Hungarian Empire and later the Romanian Kingdom.

In the 20th century, especially following World War II and under the centralized control of the communist regime, Salina Ocna Dej underwent a sweeping program of modernization and expansion. The use of mechanized drills, electric cutters, and controlled explosives replaced older manual techniques, allowing for more precise and efficient salt extraction. Comprehensive ventilation systems were introduced to maintain air quality and reduce the risk of gas accumulation, while motorized carts and conveyor belts replaced horse-drawn systems, accelerating the movement of materials through the mine.

One of the most notable advancements was the adoption of hydraulic mining methods, where fresh water is injected under pressure to dissolve salt layers, creating a saturated brine that is then pumped to the surface. This method allowed for salt to be extracted without needing to physically remove large quantities of rock, thereby increasing efficiency and reducing the strain on mine infrastructure. During this period, parts of the mine were also adapted for therapeutic use. Researchers and doctors began to recognize the health benefits of the underground environment, particularly for individuals with respiratory illnesses. Speleotherapy chambers were developed, offering a unique fusion of industrial space and medical treatment, and foreshadowing the mine's eventual dual purpose as a production and wellness site.

Today, in the 21st century, Salina Ocna Dej continues to be an important center for salt production, but it operates under principles of technological precision, sustainability, and heritage preservation. Modern automated drilling systems and digital monitoring tools ensure not only the efficiency of operations but also the safety of workers and the long-term integrity of the mine's structure. Engineers and geologists utilize 3D mapping and modeling software to plan new extraction areas while minimizing ecological disruption and preserving the stability of existing galleries.

Environmental regulations and modern mining practices are now integral to the operation, aiming to reduce the carbon footprint and protect the surrounding landscape and water sources. At the same time, Salina Ocna Dej has embraced its role as a cultural and therapeutic destination, attracting tourists, school groups, and patients alike. The salt mine features underground chambers open to visitors, complete with saline air therapy zones, artistic installations, and educational exhibits on the history of salt mining in the region. These developments showcase how the mine has transformed from a site of hard manual labor into a multifaceted facility that blends industry, healthcare, education, and tourism.

The continued operation of Salina Ocna Dej is a testament to the adaptability and resilience of both the site and the communities that have depended on it for centuries. From the humble shafts dug

by hand to the modern facilities of today, the mine stands as a living record of Romania's industrial heritage and its enduring relationship with one of Earth's most essential minerals—salt.

Results and Discussion

The historical and technological evolution of salt mining at Salina Ocna Dej reflects a continuous trajectory of innovation and adaptation spanning nearly two millennia. The mine's long-standing operation—beginning with rudimentary Roman extraction methods and progressing to modern high-tech systems—offers valuable insights into the shifting priorities of society, from sustenance and strategic control to sustainability and heritage preservation.

During the Roman period, salt extraction was vital for both economic and military functions. The Romans employed surface mining and shallow excavation using hand tools like picks and hammers, alongside brine evaporation techniques in shallow basins. These early systems were simple yet effective, driven by salt's high strategic value. The creation of infrastructure, including roads and fortifications around salt sites like Ocna Dej, demonstrated the mineral's centrality to the Roman imperial economy and its importance in preserving food, especially for military campaigns.

In the medieval period, mining techniques became more sophisticated. Miners dug deep vertical shafts and horizontal adits to follow salt veins, relying on timber supports to stabilize galleries and hand tools to extract rock salt. Mining remained dangerous, but it became a cornerstone of regional economic life. Feudal lords or monarchs often controlled mining rights and instituted taxation systems, recognizing the immense value of salt as a trade commodity. Salt from Ocna Dej circulated far beyond the region through extensive medieval trade routes, making it a key driver of local development. Mining communities formed around the site, cultivating intergenerational knowledge and specialized labor practices.

The 18th century saw the introduction of the distinctive bell-shaped shafts, enhancing underground chamber efficiency. Manual labor continued to dominate, with salt lifted via rope-and-pulley systems powered by humans or animals. Brine extraction was also developed, involving the deliberate flooding of chambers to create salt-saturated water, which was then evaporated to recover salt. These labor-intensive processes were critical in sustaining both local consumption and modest trade.

The 19th century ushered in a transformative phase influenced by the Industrial Revolution. Salina Ocna Dej incorporated steam-powered hoisting equipment, standardized block production, and horse-drawn rail carts for improved underground transport. Timber reinforcements enabled the excavation of wider and deeper galleries, while mechanical pumps enhanced the brine extraction process. This industrial scaling aligned with new trade networks fueled by rail transport, connecting Dej more directly to national and even international markets.

In the 20th century, the mine underwent a comprehensive modernization under centralized state control. Mechanized drilling, electric cutting tools, controlled explosives, and comprehensive ventilation systems improved productivity and worker safety. The transition to hydraulic mining further revolutionized salt extraction by injecting water under pressure to dissolve salt layers, allowing for brine recovery without extensive rock removal. This technique proved more efficient and less structurally disruptive. Simultaneously, Salina Ocna Dej began to diversify its use by incorporating speleotherapy chambers to harness the mine's microclimate for respiratory health treatments, representing a unique synthesis of industrial and therapeutic space.

Today, the mine operates at the intersection of technological precision, sustainability, and heritage preservation. Advanced digital systems, including automated drills and real-time monitoring, enhance safety and efficiency. This high-tech framework represents a paradigm shift from reactive to proactive mine management. Modern tools not only secure the longevity of salt production but also preserve the structural integrity of the mine for cultural and therapeutic purposes. The adaptive reuse of mine spaces for tourism, education, and healthcare demonstrates how legacy industries can transform in response to changing social and environmental expectations. Salina Ocna Dej now stands not only as a production site but also as a cultural institution and wellness destination, showcasing how technological and historical depth can coexist to ensure both economic resilience and cultural continuity.

Conclusions

The history of salt mining at Ocna Dej presents a remarkable continuum of human ingenuity, adaptation, and resilience. From the earliest Roman endeavors—when salt was a strategic and economic asset tightly woven into imperial infrastructure—to the labor-intensive techniques of the medieval and early modern periods, and finally to today's highly mechanized and environmentally conscious operations, the mine has evolved in step with broader societal and technological transformations. Each era introduced not only new methods and tools but also new meanings and uses for salt, from food preservation and industrial utility to health therapy and cultural heritage.

This long-standing tradition of salt extraction has shaped not just the economic fabric of the Dej region but also its social and cultural identity. Generations of miners, engineers, scientists, and local communities have contributed to a living legacy that continues to evolve. Today, Salina Ocna Dej is more than an industrial site—it is a space where history, innovation, and wellness intersect. It stands as a model for how heritage industries can respond to modern challenges while preserving their roots.

Looking ahead, the mine's future lies in maintaining this delicate balance: advancing sustainable practices and integrating cutting-edge technologies to ensure operational safety and environmental protection. Modern tools such as high-resolution laser scanning, GPS-based monitoring systems, and 3D geological modeling play a crucial role in assessing structural integrity and managing extraction zones. Additionally, the use of predictive models for land deformation helps prevent subsidence and ensures long-term stability, protecting both the mine and the surrounding community. These technologies not only support safe and efficient mining but also contribute to documentation and conservation efforts, bridging the gap between industrial use and heritage preservation.

Yet, even as we look forward, we must acknowledge that none of this progress would be possible without the foundations laid by the past. The knowledge, craftsmanship, and perseverance of those who came before continue to inform and inspire today's practices. The present owes everything to the past: every tunnel carved, every innovation made in response to challenge, every lesson learned through hardship has contributed to the advanced systems and values that guide the mine today.

Ocna Dej exemplifies how a site rooted in ancient tradition can embrace innovation to remain relevant in a rapidly changing world. It continues to connect communities and generations, telling a story that spans millennia—linking past, present, and future through the enduring value of salt.

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