



PRACTICAL OUTLOOK ON GENDER ISSUES **IN THE WATER RESOURCES SECTOR**

**PRACTICAL OUTLOOK
ON GENDER ISSUES
IN THE WATER
RESOURCES SECTOR**

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The goal of the proceedings is to attend a broad audience to the improvement of regional communities through extension of women's role in water sector management.

The articles in the proceedings are grouped into three main blocks: "Women and water education", "Women and access to water" and "Women in water resource management". The articles describe examples from Central Asia and some other countries.

The proceedings is intended for regional activists, researchers and politicians involved in solving practical issues related to the role of women in the water sector. The proceedings will be useful to all readers interested in the status of women in relation to the practical issue of water resources management.

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The Team:

Marina Kovaleva: Project coordinator

Andrey Vladimirovich Mitusov: editor of the articles

Ekaterina Aleksandrovskaia: technical assistance and communication

Barbara Janusz – Pawletta: co-coordinator of the Project

Siarhei Miadzvecki: English proofreading and translation

Irina Sapronova: Russian proofreading

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<http://cakn.online/en/proceedings/2.pdf>

FOREWORD

Promoting Women’s Role in Water Resources Management in Central Asia

Julia Komagaeva

Coordinator, Central Asia Knowledge Network (CAKN) of the Central Asia Water and Energy Program (CAWEP)

To develop and manage water, land and related resources in a way generating the highest positive impact on communities, it is necessary to promote local ownership and ensure regulation and law-making begin at the lowest governance level. It can be achieved by involving female users and stakeholders in decision-making, and will be effective from all perspectives: governance, social, economic, etc.

It has been nearly three decades since the world has recognized the women’s crucial role in the water realm – the 1992 UN Conference on Environment and Development stated that “women play a central part in the provision, management and safeguarding of water” (Dublin Statement on Water and Sustainable Development, URL).

In Central Asia (CA), women are most often the collectors, users and managers of water in households. An increasing number of Central Asian women have been managing irrigated and rain-fed farms due to the lack of male support (FAO, 2016). Through these roles, women are accumulating considerable knowledge on water resources, including quality and reliability, restrictions and acceptable storage methods. By now, the advantages of engaging women in water management should have become more than evident.

All-male extended family meetings – like the traditional “makhalla(s)”– draw important decisions on land use and irrigation, water supply scheduling, quantity, sources, costs, and payments (GWANET, URL). Thus, a great source of knowledge and expertise of the female part of local communities is left untapped, undermining water management’s overall efficiency and curbing economic growth.

Unfortunately, women in CA end to be less aware and engaged in water user associations, public water management agencies and water committees, all these imposing significant disadvantages on the administrative processes within water management systems (ADB, 2006).

The absence of women at the decision-making table has other negative implications, including on health and sanitation. Women are faced with the lack of or inadequate public conveniences. Traditionally, it is women who ensure acceptable sanitary environment for housecleaning and bathing children. Poor sanitary and hygienic conditions intensify pressure on women and exacerbate the spread of water-related diseases: diarrhoea, cholera, typhoid, to name just a few (SA Tajikistan..., 2018).

Several gaps exist in women’s access to information, education and capacity-building, including the limited number of designated programs to support young female researchers (PhD, graduate) from universities and research institutes in Central Asia and Afghanistan (Rasulova et al., 2020). It is vital to ensure the water sector becomes gender aware and sensitive. This process should commence with knowledge and capacity-building interventions targeting water professionals and community or grassroots mobilizers (GWP, URL).

The World Bank Group’s Central Asia Knowledge Network (WBG CAKN) (CAKN, URL) under the Central Asia Water and Energy Program (CAWEP) (CAWEP, URL) aims to promote gender in water resources management in CA and Afghanistan by raising awareness and forging opportunities for gender knowledge exchange among academic and expert communities in Central

Asia. The CAKN has partnered with the Kazakh-German University to implement the project on the gender aspects of water resources management in Central Asia and Afghanistan. The initiative has supported young researchers from universities and research institutes in CA and Afghanistan investigating water, energy and/or climate change and related issues with a strong gendered focus on water management in Central Asia. The proceedings comprise contributions by invited speakers and participants at the series of online conferences convened by the project team. The conferences have explored different gender facets of WRM, namely “women and access to water”, “women and water education”, “women, water and health”, “women, water and climate change”, “women and disaster risk reduction”, etc. The English and Russian audio recordings of the events are available on the WBG CAKN website (<http://cakn.online/en/gender-water/>).

The conferences have also rendered young scientists, researchers, international and regional experts, as well as student sample opportunities to discuss key gender challenges in the water sector and to promote the advancement of local community capacities.

Women can provide valuable advice on effective water management and are key to the success of water resources development and irrigation policies and programs. Appreciating and realizing the importance of supporting women of Central Asia in water management, the CAKN team will pursue mainstreaming actions geared toward raising awareness, training and sharing cross-boundary knowledge among women in 2020-2021 under the CAWEP Work Program via the Central Asia Knowledge Network (WBG CAKN) Platform.

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INTRODUCTION

Proceedings “Practical Outlook on Gender Issues in the Water Resources Sector”: short review

Andrey Vladimirovich Mitusov

Candidate of Agricultural Sciences, Doctor rerum naturalium, editor of the articles of the proceedings “Practical Outlook on Gender Issues in the Water Resources Sector”, Head of Land and Water CA YouTube Channel; e-mail: a_mitusov@mail.ru

Abstract

How, in the face of gender inequality, economic and environmental challenge, do Central Asian women live, work and succeed? The proceedings “Practical Outlook on Gender Issues in the Water Resources Sector” explores this broad question in terms of water resources. This article reviews the practical proposals by the articles’ authors of how to improve women’s life and status in the modern societies in Central Asia. The articles identify several areas for applied actions:

- Ensuring equal access to education in all forms, from master classes to full university courses, keeping in mind that online technologies significantly expand the audience of face-to-face educational programs;
- Forging an enabling information environment to transform archaic and neo-archaic social norms, since public mentality is as important a factor in gender imbalance as economy;
- Fostering civic engagement of women and raising their self-awareness through peer support groups and women’s participation in applied decision-making, considering that senior women represent a group with a strong potential to influence local communities;
- Supporting female entrepreneurs through targeted small grants, as well as rendering social support to single women entrepreneurs. Infrastructure improvements and attracting agricultural investment impact female farmers most positively.

The authors noted a number of challenges associated with proper collection of scientific evidence pertaining to women, as well as low efficiency of information dissemination about community projects in Central Asia.

Summarizing the conclusions by the proceedings authors, it is possible to argue that the propagation of female self-identity and the struggle for equal rights shall be most effective based on a harmonious combination of various approaches under joint efforts on resolving specific tasks crucial for men and women alike.

Keywords: Central Asia, climate change, water resources, IWRM, woman, women’s role, women’s education, agricultural development.

1. Introduction

The modern Central Asian Region is of great interest for gender researchers. The memory of social equality inherited from the Soviet Union, modern Western cultural trends, religious perceptions of female role in society, archaic and neo-archaic behavioural norms – it is all there. This variety of norms coexists and evolves amidst the realities of a peripheral economic model featuring severe financial discrimination.

Gender research per se is not new for the region. Yet, the attention to issues revealing women's interaction with the natural environment against the backdrop of social relations is clearly insufficient. How, in the face of gender inequality, economic and environmental challenges, do Central Asian women actually live, work and achieve success? The proceedings "Practical Outlook on Gender Issues in the Water Resources Sector" limits the investigation of this rather broad question to water.

The purpose of this article is to review the practical proposals for enhancing women's life and status in modern Central Asia (CA) societies with the focus on the water dimension by the authors of the proceedings "Practical Outlook on Gender Issues in the Water Resources Sector".

2. Education

J. Komagayeva (Komagayeva, 2020) of the World Bank notes the small number of educational programs for women in Central Asia. Education represents the most important social resource critical for person's self-sufficiency and his/her ability to communicate within modern society. Investing in women's intellectual development has yet another very important aspect to it. H. Barseghyan (Barseghyan, 2020a) rightly holds that women play a key role in nurturing the domestic behaviour of their children. Thus, by teaching a woman how to deal with nature, we simultaneously teach her children. In other words, there are obvious and self-organizing chains of knowledge transfer directly from her to her environment, which is the overarching objective of any educational initiative, be it a short-term training or a university course.

Many authors of the proceedings emphasizes the need to design a comprehensive vocational education program for different categories of women in rural areas (Bozorova, 2020; Rasulova and Makhmudov, 2020; Begishbek, 2020; Otunchiyeva, 2020). As, for example, Kh. Rasulova and S. Makhmudov (Rasulova and Makhmudov, 2020) point out, parallel to teaching applied disciplines in the field of engineering, hydrology, management, etc., the re-thinking of gender stereotypes by women themselves – i.e. internal barriers limiting free will – will occur. It is during this period of change that it is vital to support the female audience with trainings to unlock their internal potential and bring out their leadership qualities. M. Laiño (Laiño, 2020) voices similar ideas based on the Argentina's experiences.

A wide educational network could include both full-fledged programs and courses at educational institutions, as well as master-classes and workshops facilitated by individual specialists targeting local issues. The UNESCO-UNEVOC TVET technical development model utilized by Canada and Germany manifests an interesting approach. The group of A. Sultanbekova (Sultanbekova et al., 2020) describe the concept of adapting this model to the CA context. One of their principal findings is that investing in education and practical skills dramatically increases public resilience to emergencies. Since women are much more vulnerable to extreme situations [than men], education becomes a lifesaving factor for them.

To implement viable educational initiatives, Kh. Rasulova and S. Makhmudov (Rasulova and Makhmudov, 2020) recommend organizing field schools for rural women and establishing continuous online educational courses and trainings. M. Begishbek (Begishbek, 2020) makes similar recommendations and supplements the toolset with the need to focus on experience-sharing programs and simple guidelines understandable to rural women.

The value of women's access to higher education in general and specifically related to the water sector merits special attention. Based on the case of two research and development teams in Kyrgyzstan, O. Kalashnikova and E. Omorova (Kalashnikova and Omorova, 2020) illustrate that

higher education for both sexes is an important driver of breaking gender stereotypes in Central Asia.

3. Information environment as the basis for gender equality

On the example of Tajikistan, Kh. Rasulova and S. Makhmudov (Rasulova and Makhmudov, 2020) examine in detail the composition of students pursuing different majors and reveal a clear gender imbalance, with the underlying causes for the phenomenon including economic factors and public perceptions. Their findings once again prove that it is impossible to address the matter simply by financial instruments or severe gender restrictions.

In her turn, H. Barseghyan (Barseghyan, 2020b) clearly indicates that archaic social norms negatively impact education's efficiency. It is the transformation of the cultural foundation, as M. Laiño (Laiño, 2020) stipulates, which underpins the struggle against gender stereotypes. In this regard, considerable efforts should be made to create a media environment instilling the ideas of female and male equality in people.

4. Distribution of and access to information

Collection of gender-sensitive statistics, search for factors and monitoring behavioural changes in local communities with respect to practical issues still remain the paramount tasks for researchers (Barseghyan, 2020b; Laiño, 2020). In this context, real help on behalf of international donors could manifest itself in creating a large information portal presenting social science data. Mere integration of CA publications and videos into such a single platform would give a powerful impetus to regional researchers, especially if materials were accompanied by translations into Central Asian languages. The Central Asia Knowledge Network (CAKN, 2020a) stands a good candidate for the role. In fact, this knowledge-sharing network has already rendered information support to online conferences under the Project “Gender aspects of water resource management in Central Asia and Afghanistan: Supporting young researchers through publication of articles in the CAJWR” (CAKN, 2020b).

Effective information dissemination is likewise extremely important for various community useful projects (Rasulova and Makhmudov, 2020). It is not enough to design a good project – it is essential to communicate information about it to every potential participant. Yet, to date this part of the job has been often neglected.

5. Women’s civic engagement and self-identification

On the one hand, involvement of women in water decision-making is integral for building local communities (Komagayeva, 2020). On the other hand, according to A. Otunchiyeva (Otunchiyeva, 2020) women themselves should strive to assume the corresponding responsibilities deemed absolutely natural for all spheres of modern society. In Central Asia, women can become leaders of local peer support groups possessing different legal status, from formal to informal. In fact, they already exist in rural areas today. In her paper, O. Korenkova (Korenkova, 2020) describes one of such female entrepreneur mutual assistance groups.

An ordinary social network uniting women residing in the same location, a network within which one or more female activists set its positive agenda can become the prime engine of responding to multiple local challenges. Participation in such mutual assistance groups also significantly boosts the self-esteem of less active (due to personal character or upbringing) women (Rasulova and Makhmudov, 2020).

While hoping for local activists, it is also necessary to strongly foster women's engagement in decision-making (Barseghyan, 2020a), which can be facilitated by promoting joint events with wide participation of the general public, as well as representatives of government and non-government organizations (Laiño, 2020). The "Adventure of Science: Women and Glaciers in Central Asia" Program is a great example of such involvement (Imanaliyeva et al., 2020). Under this project, young women from CA participated in a mountain expedition learning the basics of field landscape research. The initiative's organizers note that as a result the program's participants became more self-confident stimulating their intention to embark on the currently male-dominated career paths. Intended as an annual program, this year it was prevented by the COVID-19 situation.

The legal framework in Central Asian countries (Sakhvayeva, 2020), as well as the observance of gender balance in all programmes and projects (Laiño, 2020) manifest equally important mechanisms for including women in public life. According to Z. Khaibullina and co-authors (Khaibullina et al., 2020), women's engagement in policymaking and management in various fields leads to an automatic increase of women in leadership positions, in particular in the water sector, although the authors assert that it happens based on solicitation by international organizations. Therefore, caution is required to avert overreaching while extending such "artificial" support, which may yield a sense of gender discrimination among men, thus, only aggravating the existing problems.

A. Otunchiyeva (Otunchieva, 2020) holds that it is necessary to educate and involve in public life not only young but also women of mature age. When the younger generation take on family and household care duties, senior women – possessing a wealth of experience – receive the opportunity to partake in various social events. In addition, unlike the younger people, such women enjoy prestige inside their communities.

6. Support to women entrepreneurs

Maintenance of properly operating infrastructure significantly improves the living conditions of rural women (Korenkova, 2020). The corresponding local tasks require the intervention on behalf of the state and major international donors. The author also highlights the need to attract investors in profitable agricultural businesses.

Single women with children engaged in entrepreneurial activity in the agricultural sector represent a peculiar phenomenon in Central Asia. Quite often, the children are assisting their mothers. This is due to early male mortality (Krylova et al., 2020) and labour migration to Russia (Begishbek, 2020). According to A. Korenkova (Korenkova, 2020), targeted state support for such women could become an important factor of social stability.

Small grants from CA and international non-governmental organizations could serve a core element of supporting female activists. Such grants should target introducing advanced agricultural technologies on the level of small farms (Rasulova and Makhmudov, 2020). In this case, best practices will get best localized via strong social links among women.

M. Begishbek (Begishbek, 2020) also flags the importance of small grants as a means of encouraging women to actively participate in water user associations. According to this author, women's engagement in WUAs will render water use an added value benefitting entire communities.

7. Conclusion

Soft-power efforts should be coupled with enhanced economic frameworks – gender discrimination is the strongest in the poorest communities. For instance, the lack of water supply creates a number of problems specifically for women. Environmental dimension – both anthropogenic and natural – represents yet another important aspect (Tillyakhodzhayeva and Tillahuzhayev, 2020). In this sense, nature can be an additional driver of violence against women. It is essential to regularly explain that gender-mainstreaming efforts by international organizations do not aim to discriminate men but to attain gender equality in all spheres of life.

The articles included in the proceedings “Practical Outlook on Gender Issues in the Water Resources Sector” clearly demonstrate that fostering women's self-awareness and struggling for gender equality will yield the best outcomes if based on the harmonious combination of different approaches through joint solution of specific tasks vital for both men and women. Whereas in one case, it might be rural water issues, in the other, it might have to do with health, safety, business, or something else. O. Kalashnikova and E. Omorova (Kalashnikova and Omorova, 2020) make a very good point that joining efforts on the way towards a shared goal constitute the basis for surmounting gender stereotypes still alive not only in Central Asia but across the world.

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Chapter I.

Women and water education

Challenges of mainstreaming women's participation in integrated water resources management: education and employment aspects

Khairiniso Abduraufovna Rasulova

Senior Faculty, Accounting and Audit Department, Academician B. Gafurov Khudzhand State University, Khudzhand, Sughd Region, Republic of Tajikistan; e-mail: nisso_r@list.ru;

Saidlukmon Saidmansurovich Makhmudov

Bachelor student (Management Major), Russian-Tajik Slavic University, Dushanbe, Republic of Tajikistan; e-mail: lukmon_13@mail.ru

Zhanara Myrzabekova

Leading Water Resource Management Specialist, State Agency on Water Resources under the Government of the Kyrgyz Republic; e-mail: myrzabekovazhan@gmail.com;

Abstract

This study aims to provide a gender-based overview of Tajikistan's education system to identify prospects for increasing women's participation in integrated water resources management (IWRM). Along with a significant untapped labour potential, the example of the administration system in the Tajik part of the Syrdarya River Basin likewise demonstrates the low level of women engagement and activeness in IWRM. One of the key factors of weak women's participation in IWRM is their low level of education in hydrology and hydraulic engineering. The sector of water resources management exhibits gender stereotypes which prevent girls and women from actively realizing their potential and filling the cadre gap in the industry.

Keywords: gender, IWRM, women empowerment, student dynamics, education system, Tajikistan.

1. Introduction

The relevance and importance of proper water management in the context of population growth, rapid urbanization and industrialization, development of agriculture and tourism, as well as climate change worldwide, including in Tajikistan, are undeniable. According to the Four Dublin Principles of 1992 (Rysbekov, 2012), IWRM should be based on the participatory approach (2nd Principle) and the importance/need to involve women in water management (3rd Principle). Thus, strengthening women's role in IWRM is an important and key factor of achieving gender equality in line with Sustainable Development Goal 5 and adhering to IWRM principles.

Meanwhile, the active position and role of women in water management requires an adequate level of technical and managerial knowledge and skills which are not present today.

Due to objective reasons related to the transformational processes in the early 1990's, Tajikistan's system of university education has undergone changes that had led to the decreased enrolment of both men and women. Yet, the disproportion of female students has been most noticeable and significant.

Due to the low level of education in the sphere of IWRM and hydraulic engineering, as well as existing stereotypes, women's corresponding potential is not utilized to the full extent. In turn, this prevents them from filling the shortage of WRM personnel.

Up until today, the causal relationship underlying the declining trend of women's and girls'

participation in both education and water management has not been sufficiently investigated. This precludes the identification of ways to boost the participation of Tajik women in IWRM.

The aim of this study is to provide a gender review of the education system in Tajikistan for the purpose of determining the prospects for increasing women's participation in IWRM.

2. Drivers of gender misbalance in university education in the Republic of Tajikistan (RT)

The relevance of young people's education is justified by the analysis of statistical data showing that overall Tajikistan's population is young. The high rate of population growth is projected to foster the expansion of the young labour market in the coming decades. Women's share in the population amounts to 49.5%, and their potential is underutilized in the economy of Tajikistan (Population of the RT, 2019). This is especially obvious in technical areas, including hydrology, geology, processing and manufacturing (Labor Market in the RT, 2018). This factor substantiates Tajikistan's course to accelerate gender equality mainstreaming via education.

Tajikistan has adopted the National Human Rights Education Program and continues to provide quotas for girls from rural communities to enter higher education. Professional training and education of female residents is one of the priorities of the national government. As of October 1, 2018, 21197 students were studying in primary vocational education institutions administered by the Ministry of Labor, Migration and Population Employment (MLMPE) of the Republic of Tajikistan, including 4875 (23%) young women (Education in the RT, 2019).

Under the State Employment Promotion Programme, 16097 people were enrolled in short-term courses, of whom 13253 (82%) were girls and housewives. These short-term courses were self-funded by 20497 persons, of whom 9984 (49%) were women (National Survey of the RT on the Implementation of the Beijing Declaration and Platform for Action (1995), 2020).

Despite the state's desire to increase the proportion of women actively participating in the country's economic life, the following are observed:

- gender imbalances in university education point to unequal access to education for men and women;
- social and economic challenges and issues associated with education's commercialization cause girls not receiving proper education.

Another obstacle to enhancing the level of education among girls and women are the following existing stereotypes:

- reduced prestige of education in general ("success in life doesn't depend on education");
- "predestination of an Asian woman is to be a mother" and, thus, the main thing for her is "to get married and not get an education";
- "male" and "female" occupations – low percentage of girls studying technical sciences;
- high preoccupation of girls and women with domestic labour (especially in rural areas);
- early marriage and childcare are the main women's tasks.

2.1. Specialization in university education: challenges

Given the limited financial capacity of households to provide quality education for their children, parents, of course, prefer their sons over daughters. As per the official statistics, whereas girls account for about half of students in public general educational institutions, in non-state establishments (the education where is believed to be better) the number of girls and boys is 33%

and 67%, respectively (Education in the RT, 2016).

Against the background of positive trends in secondary and higher vocational education, the gender imbalance in terms of specialization in these establishment is rather substantial. For instance, the number of girls at the Tajik Agrarian University is declining every year (Education in the RT, 2017):

- in 2002-2003, it was 10%;
- in 2016-2017, it amounted to 7.3%.

3. Discussion

3.1. Gender assessment of water resources management training

The situational analysis and gender assessment of the national education system show that while in 2018 75% of the water resources in the country (as per the data of the Ministry of Water Resources and Energy of the RT) were used in agriculture, forestry, hunting and fish farming, the number of 2018-2019 graduates with corresponding majors amounted to only 0.35% of their total quantity (Education in the RT, 2019). Simultaneously, the gender ratio (girls-to-boys) was 1 to 25.

In its own turn, the share of water resources consumed by mining and manufacturing industries, as well as by power, gas, water and heat generation and distribution amounted to 16% of the total amount used in the country; the comparative analysis revealed 4% of the total number of 2018-2019 graduates with corresponding majors. The gender ratio among these graduates was 1 to 8 (Education in the RT, 2019).

The disproportion between the water resources used and the availability of young professionals in the main water-consuming sectors (agriculture, forestry, hunting and fish farming), as well as the gender imbalances, are more than obvious.

3.2. Priority avenues for mainstreaming rural women participation in water resource management and IWRM

Women need to improve their knowledge in technical areas of water use, especially in irrigation, water distribution, and water consumption calculation. To foster women's engagement in the work of water user associations (WUAs), it would be expedient to organize special thematic schools (courses), including on accounting, for women 40-45 years of age and older. Such trainings' format could be full-time, by correspondence, or evening classes. Online education tools also render most broad opportunities. To accomplish this, it is necessary to attract specialists and – upon training completion – issue official state diplomas and advanced training certificates (for short-term programs) recognized by employers.

Education will strengthen women's self-esteem and make them active WUA members. To this end, based on the experience of non-governmental organizations it would be effective to set up women's mutual assistance groups within WUAs. Active women within such groups' top management are always great role models, and the groups themselves quickly become centres for knowledge dissemination and public opinion moderators.

A full transition to lifelong education is necessary – from early childhood to higher and adult education. In order to do so, equal conditions must be created for both formal and informal education. It is important to create not only a lifelong education system, but also an education system for all without exception with parity training of boys and girls, young men and women,

people from rural and urban communities, including training opportunities for people with disabilities, those living in remote communities, those wealthy and poor.

While designing new curricula and educational literature for all levels of education, it is vital to emphasize the role of the educational system in overcoming gender stereotypes against girls and women as full-fledged and active members of society.

4. Conclusion

Education is a key social resource for overcoming gender inequalities, both social and financial. Women's education will make them confident in themselves, competitive in the labour market, economically independent, as well as will stimulate their engagement in societal transformational processes, raising healthy children and contributing to the overall family and society development by improving household material, technical and housing conditions, rationally and efficiently allocating family budget, actively expressing their ideas on rural development and playing a role in addressing socially significant tasks associated with drinking water supply, opening kindergartens, schools, medical centres, and training courses for girls.

The gender assessment and situational analysis conducted suggest that hydrology and hydraulic engineering are currently in dire need of skilled personnel which can potentially be rural women – members and leaders of dekhan (farm) enterprises – who are actually engaged in water and land management during vegetation season already today. This will require enhancing their skills and capacities via specialized short- and long-term training and counselling programs.

5. Recommendations

Based on the mentality and traditions in rural communities of Tajikistan, in order to foster women's participation in WRM the study suggests the following:

- conduct an information campaign among rural women to raise their awareness about the prospects of hydraulic engineering training/education;
- boost women's self-esteem and confidence in their potential, as well as nurture leadership qualities by uniting them within mutual assistance groups;
- promote the attraction and allocation of small grants (3-10,000 USD) to active rural women to facilitate the deployment of water-efficient technologies based on mutual assistance groups, which will serve as demo-sites for other women;
- set up field schools for women to improve their agricultural and hydraulic knowledge, as well as organize regular online educational courses and trainings.

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UNESCO-UNEVOC TVET – technical and vocational education and training for women in emergencies

A. Sultanbekova

LAMEC, Nazarbayev University (NU)

N. Tuzelov

LAMEC, Nazarbayev University (NU)

Zh. Sagintayev

Environment and Energy-Efficient Technology Cluster, Nazarbayev University; e-mail: zhanay.sagintayev@nu.edu.kz

A. Batalova

LAMEC, Nazarbayev University (NU)

A. Tabelinova

Qazaq Geography

Abstract

This article aims to assess the potential for adapting and expanding the UNESCO-UNEVOC TVET Model in Kazakhstan, Central Asia, as an already operating and successful social support system for the population, including women, in emergency situations. Women and children are more vulnerable to disasters. Based on the analyses by the UN Office for Disaster Risk Reduction, floods represent the most common type of emergencies and account for 43% of all natural disasters. In this regard, balanced integrated water resources management, vocational training, and basic knowledge on effective emergency management constitute important measures to reduce the corresponding risks. The UN recommends strengthening the preparedness among the population via various target vocational education programs and measures. The issues of poor training system and the importance of upgrading vocational education have been raised more than once. The authors compared the status with women's preparation for emergencies in Kazakhstan, Germany and Canada. In Kazakhstan, women's vulnerability as a percentage of labour force is 3 times higher than among women in Canada. In the latter, women enjoy a more stable employment system and are less vulnerable to risks than women in Kazakhstan. A comprehensive approach is necessary to reduce the difference in the level of women's vulnerability -- in general due to the attitudes within society, population, and state agencies. The experience of Germany and Canada shows that these countries are intensively promoting the system of continuous professional development and vocational education, including based on the international UNESCO-UNEVOC TVET system. It manifests a highly effective social support model for the population, allows scaling-up courses based on the already operational methodology for teaching new skills in a short time, as well as training the population, including women, on emergencies.

Keywords: emergencies, natural disasters in the Republic of Kazakhstan, advanced training courses, rural development.

1. Introduction

Emergencies/disasters occur across the world. Forecasting and preparedness actions, and training are important on all levels, be it government, specialized services or local population. Disasters, including floods, landslides, fires and other natural and man-made emergencies take place in

Kazakhstan regularly. According to the UN, floods represent the most common type of disasters and account for 43% of all natural emergencies over the past 20 years (UNDRR, 2016). In 1996, Kazakhstan adopted the Law on Natural and Technogenic Emergencies. It is the basic legal instrument governing relations in the field of disaster prevention and management. Protection of the population, environment and facilities from disasters and their consequences is one of the state policy priorities. The law regulates public relations on the territory of the Republic of Kazakhstan aimed at preventing and responding to natural and man-made emergencies. Unfortunately, the lion's share of support is rendered to the population after an emergency event has already occurred and has caused significant economic and human losses. International organizations recommend focusing more on preliminary preparation for various disaster events. The United Nations (UN) and the US Federal Emergency Management Agency (FEMA) suggest using a simple formula – each dollar invested before an emergency event saves 5-10 dollars spent on responding to an emergency aftermath (Porter et al., 2017). Training, education, and involvement of local communities are recommended by the UN Department for Disaster Risk Reduction. Health and Safety Basics (HSB) (Gafner, 2016) were among the most important training courses, but recently – as a result of experiments imposed on the domestic education system – multiple subjects related to safety culture, use of basic devices, and first aid were removed from technical and vocational training and education schemes (Kusainov, 2013).

The purpose of this article is to assess the situation in the Republic of Kazakhstan (RK) and review the unified international UNESCO-UNEVOC TVET system (UUT, 2020) of vocational training in terms of opportunities for its applied adaptation and use for emergency preparedness efforts in the Central Asian regional conditions, especially for women's preparedness.

2. Relevancy: why women and emergencies?

In 2019, the Ministry of Emergency Situations (MES) of the RK registered 15821 emergency events in the country that affected 2759 and killed 573 people. Financial and physical damage from those events amounted to about 3.5 bln tenge. The values for 2018 were approximately the same (MIA RK, 2020).

The most wide-spread causes of natural and man-made disasters include the following:

- professional negligence;
- dilapidation of installations, facilities and systems built in the Soviet time;
- environment pollution;
- poor forecasting of natural phenomena due to weak scientific and technical capacities.

As opposed to the recommendations of international and US organizations – like the UN and FEMA – the efforts of Kazakhstan's MES are mostly directed towards responding to the already happened emergency events in absence of a comprehensive program to preliminary prepare for them.

The southern and south-eastern regions of the RK are affected by natural disasters the most. The highest hazards are posed by foothill areas (where earthquakes occur on a regular basis), river valleys (which are mostly affected by floods), dry and hot climate (often leading to droughts and precipitation deficit, as well as strong snow storms and mudflows (MIA RK, 2017).

Women in Kazakhstan are more vulnerable to emergencies/disasters than men, and are often unable to protect themselves and their children. Due to various circumstances, many women are forced to

take care of their children themselves, are often left without jobs and livelihoods (KTK, 2018). Every year, the number of divorces in Kazakhstan is increasing. Whereas in 2007, 36 000 couples divorced, in 2017 it was already 54 000 (CM, 2020). The majority of women lose their earlier acquired professional skills due to lengthy housekeeping and parenting. However, women are flexible in crisis situations and can learn additional and advanced skills quickly. On the one hand, by nature women are more responsible for their own safety and safety of their children, as well as are less exposed to risks. On the other hand, they have limited opportunities for advanced and vocational education and training.

3. Education system: levels and certification

In Germany and Canada, the support system via vocational trainings on various skills and specialties is continual starting in high school, smoothly transitioning into college, and reaching university. At each stage, there are opportunities for taking credit courses which add up, thus, allowing moving on to the next training level. At each level, there is an opportunity for obtaining special certification under the condition of successfully passing independent professional exams. In Kazakhstan, such a *school-college-university* chain has not been worked through to a sufficient extent. Usually, after graduating from school parents try to send their children to universities, bypassing colleges. Universities ignore course credits obtained on the college-level due to low quality of college education. A support system to assist professional training on various skills is underdeveloped. There are no possibilities of accruing the credits obtained on the lower levels to get to the following levels. The system of independent assessment of professional knowledge is also poorly developed.

4. Comparing Kazakhstan's and Canada's sustainability

As of 2019, the population of Kazakhstan was nearly 2 times smaller than this of Canada – 18.8 and 37.6 mln people, respectively (WB, 2018). Of these, 6 mln Kazakhstani and 12.3 mln Canadians are able-bodied (WB, 2020a). In Kazakhstan, 42.5% of the total population lives in rural communities, and in Canada – 18.6% (WB, 2019). Matching these values with the total populations in both countries demonstrates that in the RK more able-bodied people live in rural areas than in Canada. The unemployment rates among women of working age are similar in Kazakhstan and Canada (WB, 2020b). In the course of the past 8 years, in Kazakhstan women's participation in agriculture has been declining every year (data until 2018), as manual labour in this sector has been increasingly replaced by automated systems. In Canada, though, no major changes have been observed (WB, 2020b). In the RK, many employed women are vulnerable to job instability – they get dismissed first, and it is more difficult for them to have a permanent professional job. Women's vulnerability has changed from 32.9% to 22.6% of these employed in Kazakhstan, and from 8.8% to 9.4% of these employed in Canada over the same 8-year period (WB, 2020c). Yet, the situation in Canada is more assuring, women are less at risk of unemployment, women employment structure is more stable, and they are less vulnerable while employed. Women's vulnerability in Kazakhstan is 3 times higher than in Canada (Fig. 1).

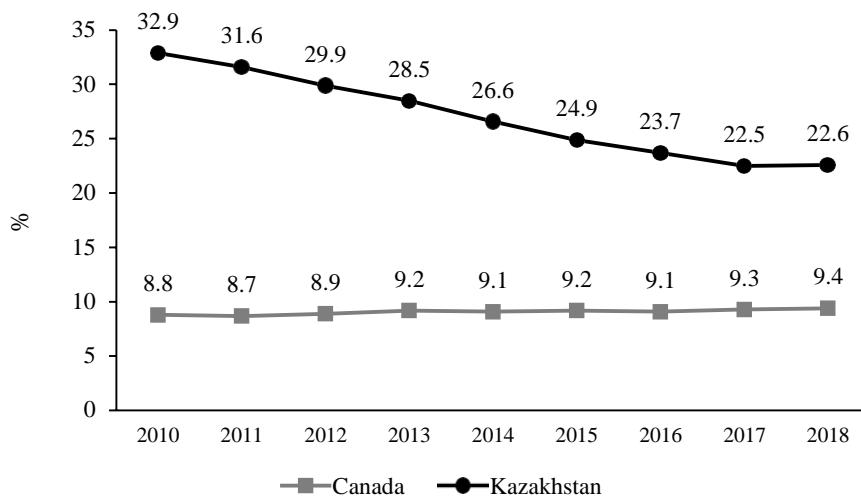


Figure 1. «Women's vulnerability», % of female labour force (WB, 2020c).

5. Adaptation of the UNESCO-UNEVOC TVET model

Society's resilience to natural and man-made crises is based on the following main factors:

- overall preparedness of the population for various critical situations;
- ability to withstand complex and/or extreme events;
- presence of a vocational training system similar to the international UNESCO-UNEVOC TVET model (UUT, 2020);
- opportunities to constantly improve qualifications for the population;
- people's readiness for various changes and events.

Such programs operate in Germany and Canada. For instance, the Niagara College (Canada) is a partner of UNESCO-UNEVOC TVET teacher education on digital technologies (NC, 2019). There fresher (advanced) training programs help Native Americans of Canada to master various technologies associated with emergencies and eco-tourism in combination with local traditions. For example, women of Indian Reserves in Canada use trainings on computer-based technologies for eco-tourism purposes (Carriere, 2020; Serikov, 2019).

6. Basic knowledge on organizing technical and vocational education and training for the population's emergency adaptation

6.1. Geodesy and mapping

Geodesy and mapping (cartography) are interconnected. Whereas the former is aimed at land surface field research and data collection, the latter helps turning the obtained information into graphic and sign models. Naturally, other disciplines -- often deriving from geodesy and cartography – are involved in this process too. For instance, today in many cases geodesy is inseparable from topography – the science devoted to surveying the surface of planet Earth and presenting the obtained data on plans. Yet, this relationship should be considered against the background of the modern meaning of sciences. The basic elements of such thematic courses could include land navigation, identification of cardinal directions, geography of location, assessment of potentially hazardous zones in case of emergencies.

6.2. Meteorology

The science of the atmosphere, including its structure, properties and internal physical processes, is one of the geophysical sciences. Nowadays, meteorology comprises several separate disciplines

each focusing on different categories of atmospheric processes or studying them based on differing research methods. There are also a number of applied meteorological disciplines like, for instance, agricultural meteorology. Introductory and basic knowledge of climatic conditions and properties could become the basic components of this thematic course to be able to anticipate prerequisites for natural emergencies caused by weather conditions, such as severe storms, floods, earthquakes, and lightnings.

6.3. Geology

Geology is a set of sciences about the structure of planet Earth as well as its origin and development, and is based on the study of geological processes, material composition, structure of the Earth's crust and lithosphere by all available methods using the data coming from other sciences and disciplines. Geology can be defined as the science about the surface, composition, structure and laws governing the Earth's development. Knowing geology basics allows understanding the reasons for natural disasters as well as the lines along which they evolve. Likewise, basic knowledge of chemical and physical properties of earth materials makes it possible, for example, to identify combustible and/or building materials in ordinary life and in extreme situations.

6.4. Hydrology and hydrogeology

These are the sciences investigating natural water resources, their interaction with the atmosphere and lithosphere, as well as various phenomena and processes taking place in water (evaporation, freezing, etc.). Such thematic courses could focus on the basic concepts of water chemical and physical properties, determining the location of drinking water sources (ex.: the principle of location of springs and abandoned wells, and – in case of rescue not coming in or residents being cut off of their settlements for a long time – the knowledge and skills of locating groundwater). A school-based training program in the state of Nebraska, US, is a good example of such a course (Snow, 2020).

6.5. First aid courses

The skills which such courses provide are necessary not only during natural disasters or emergencies, but also in everyday life. Rendering first aid before rescuers and/or medical professionals arrive can save lives.

6.6. Pharmaceutics and botany

In addition to first aid, the basic knowledge of pharmaceutics and botany allows understanding how to use legal drugs and medicinal plants. For example, in emergencies taking place in foothill or remote villages, external assistance may simply be not physically possible, especially during the actual duration of disasters. The training program for the residents of Indian Reserves and Settlements in Canada could become a good model to build on in Central Asia (Carriere, 2020; Serikov, 2019).

6.7. Psychology

Psychological stability, ability to rationally analyse and make informed decisions in crisis situations are among the main survival factors during disasters. To a large extent, survival of an individual or an entire group in extreme situations depends on these.

7. Conclusion

The discussion within the framework of the online scientific conference “Women and Disaster Risk Reduction” (May 16, 2020) – held by the Kazakh-German University in Almaty and CAJWR with

the financial support of the World Bank and CAWEP – highlighted the importance of vocational training on disaster risk reduction. Training the population on emergencies and upgrading corresponding technical skills based on the UNESCO-UNEVOC TVET system (supported by the governments of Germany and Canada) is extremely effective. Promoting such programs with developed methodologies allows quickly addressing the following tasks:

- reduce unemployment;
- develop eco-, ethno- and agro-tourism in a given region;
- master new technologies;
- raise the overall level of social education;
- address gender imbalances;
- ensure operational support by local communities in case of emergencies;
- reduce risks of women's vulnerability to disasters.

Mainstreaming of distance learning/education allows reaching out to and covering a much larger target audience, as well as using class recordings repeatedly to ensure better skills and knowledge retention among target audience. Combining distance learning with hands-on field training based on the UNESCO-UNEVOC TVET methodology/programs is recommended for further assessment as to their potential application and replication in all regions of Central Asia.

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A new scientific communications program “Adventure of Science: Women and Glaciers in Central Asia”

Perizat Imanalieva

Central Asian Institute of Applied Geosciences (CAIAG), Kyrgyzstan

Dilorom Jalolova

Glaciology Centre, Academy of Sciences, Tajikistan

Zamira Serzhan kyzzy

State Enterprise KazSeleZashchita (Kazakhstan Mudflow Protection), Kazakhstan

Marlene Kronenberg

Department of Geosciences, University of Fribourg, Switzerland

Tamara Mathys

Department of Geosciences, University of Fribourg, Switzerland

Helga Weber

Oeschger Centre for Climate Change Research and Institute of Geography, University of Bern, Switzerland

Kristine Tovmasyan

UNESCO Almaty Office, Kazakhstan

Martina Barandun

Department of Geosciences, University of Fribourg, Switzerland, and Laboratory of Environmental Chemistry, Paul Scherrer Institute, Switzerland

Abstract

The Adventure of Science: Women and Glaciers in Central Asia Program empowers young women to lead and succeed through science, arts, and wilderness exploration. All young women deserve an opportunity to explore the world around them. The research shows that many girls are interested in science and outdoors at an early age, but drift away as they grow older. By encouraging girls' natural curiosity, inspiring them to connect their interests in science and arts, and cultivating trust in their own physical capabilities, the Program aims to engage more women in pursuing their passions in science and outdoor activities.

Keywords: Central Asia, women, glaciers, inquiry-based teaching.

1. Introduction

Adventure of Science: Women and Glaciers in Central Asia is a program which takes young Central Asian women from diverse backgrounds on an expedition in an alpine environment. The instructor team consists of local and international female scientists and a female mountain guide. During the expedition, the participants:

- (i) get an introduction into cryospheric sciences and environmental change;
- (ii) acquire mountaineering and wilderness camping skills;
- (iii) acquire observation and critical thinking competences;

(iv) participate in tailored activities introducing them to scientific methods.

The expedition is surrounded by pre- and post-course events, where the participants discuss the upcoming and gained experiences with a wider public. A further project's aim is to build a regional network of female scientists and professionals representing various domains affected by climate change.

2. Program format

Participants from different countries in a conflict-prone region (Tashtemkhanova, 2015) grow together as an expedition team. The project consists of events fostering the formation of a multi-country exchange platform. Thematically, the program focuses on mountain environments, and the hands-on research events allow raising the participants' awareness of the relevancy of in-situ data. The project also aims to expand the institutional capacities by highlighting the ongoing environmental changes. Furthermore, local institutions are encouraged to include young female scientists and students in their academic and research efforts.

3. The worldwide “Inspiring Girls Expeditions” Program

The program's idea is based on the “Girls on Ice” (i.e. “Girls on Ice Switzerland”) programs coordinated by “Inspiring Girls Expeditions” (IGE, 2019). The basic teaching concepts like inquiry-based teaching and experimental learning were adopted therefrom. The programs combine science, art and mountaineering dimensions. Scientific projects – planned and executed by a team of participants and supervised by thematic instructors – manifest a core course element. Whereas “Girls on Ice” participants are teenage girls, the new program focuses on young adults. Therefore, “Adventure of Science: Women and Glaciers in Central Asia” includes capacity-building components. While the “Girls on Ice” Program mainly focuses on the participants' personal development, the “Adventure of Science: Women and Glaciers in Central Asia” Program aims not only to make young women more self-confident to proceed with careers in male-dominated spheres, but also envisages to grow a network of young women across national borders.

4. First experiences: Adventure of Science, 2019

The first target program took place in the summer of 2019 and was extremely successful.

Altogether, the participants worked on the five following topics:

- Vegetation around glaciers;
- Pro-glacial rivers;
- Glacier mapping;
- Point mass balance;
- Elevation model and area change.

During the 7-days long expedition to the Golubin Glacier in Ala Archa, Kyrgyzstan, and its surrounding, eight Central Asian female participants collected data for their research projects. After the field expedition, they processed and analysed the collected data against the initial research hypotheses, as well as presented the outcomes at a public event.

The research presentations complied with the corresponding scientific standards, and comprised research questions, data, methodology, results illustrated by statistics, graphics and/or maps, as well as conclusions. Importantly, the participants demonstrated great interest in completing the tasks as well as creativity while working on presentations. The public event was well received by the audience that included the representatives of media, scientific and state institutions, non-governmental organizations, as well as local female activists. Several participants got involved in the scientific efforts by local research institutions and post-mentoring through the instructor team.

4. Conclusion

As an international female-only team, the “Adventure of Science: Women and Glaciers in Central Asia” Program has proved successful in fostering young women’s self-confidence in their physical, intellectual, and leadership abilities. The program helps forging lifelong advocates of the Earth science and wilderness stewardship, as well as promotes the establishment of a network for early-career scientists, artists, and guides through continuously developing opportunities and collaborations on the transboundary level. The project also has an institutional impact by encouraging local institutions to involve young female scientists and students in academic and research initiatives. Boosting the participation and diversity of women in field sciences, arts, and outdoor recreation stimulates local communities and fosters regional development.

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Women and water education in Armenia

Hasmik Barseghyan

President of the European Youth Parliament for Water (EYPW), Future Energy Leader at the World Energy Council, Member of Women in Climate and Energy (WICE) Armenia; e-mail: hasmik.official@gmail.com

Abstract

This paper reviews the main international projects on water and women executed in Armenia in 2019, as well as aims to assist project managers, donors and other stakeholders in planning their water-related educational efforts more effectively. Awareness-raising is crucial in changing behaviour. This article suggests that although benefits of education in changing practices may appear positive, monitoring of post-project behavioural changes among trainees is still lacking and, likewise, is highly recommended for inclusion as a project component.

Keywords: Armenia, quality education, water, behaviour change, women empowerment.

1. Introduction

While Armenia's Constitution and the overall domestic legal framework guarantee and promote sex equality and non-discrimination, Armenian women cannot fully benefit from legit equal opportunities and enjoy gender equality. The progress in terms of implementing, enforcing and monitoring gender equality is mixed (UN, 2018).

As the Gender Gap Index rating indicates, educational access and attainment in Armenia demonstrate a relatively high level of equality. Yet, statistics analysis allows revealing certain existing gender differences.

The 2013-2014 enrolment data showed a smaller proportion of girls, with the trend reversing for middle school and higher education. This shift may be related to the significant differential in preliminary vocational institutions – with only 24% of enrolled girls – reflecting both traditional gender gaps in the skilled trade and technical employment sectors, and the number of boys opting for them rather than pursuing university degrees (FAO, 2017). Although females tend to enter postgraduate and higher professional education, they are less likely to actually obtain an academic degree (ARMSTAT, 2015) – young women account for only 28% of PhD graduates (WEF, 2015). Males outnumber females in state and non-state higher educational institutions in the agro-food sector by 70% and 30%, respectively. Likewise, only 38% of STEM (science, technology, engineering and mathematics) graduates are females (WEF, 2015).

This paper aims to review the main international projects in the field of water and women.

2. Enabling women to participate in sustainable water management in Armenia, 2019-2021

The *Enabling Women to Participate in Sustainable Water Management in Armenia* Project (AWHHE, 2020) launched in 2019 (finishing in 2021) and funded by the United Nations Democracy Fund (UNDEF) intends to aid women in designing sustainable water management strategies in the Ararat Valley region. It is implemented by the Armenian Women for Health and Healthy Environment (AWHHE) and comprises multiple actions from discussions on tariff compensation to trainings on project design for community representatives.

The project aims to enhance water management knowledge and skills among women's groups as well as build their capacities to ensure effective and equitable water distribution inside their communities.

The *Knowledge, Attitudes, and Practices Baseline Study* (April 2019) covered 10 most vulnerable communities in Armenia and revealed the urgent need of raising public awareness on issues related to water scarcity and hygiene, including the necessity to bring down water consumption.

Two of the key activities of the project are the launch of a regional awareness campaign on sanitation and the promotion of the slogan "Water Is Life". During the campaign, the representatives of the organization visited schools in remote areas of the country.

Last May, a *WASH Training* took place in the villages of Taperakan and Burastan. A simple presentation of sanitation standards to children became a real catalyst as it allowed reaching out to parents and school staff, as well as raised their awareness on adequate day-to-day water management (UNDEF, 2019).

The organization's efforts also include actions to enhance cooperation between communities and local authorities. Thanks to it, a large network of various stakeholders, officials, community groups, etc. was established. Engaging water providers in improving the existing infrastructure in the region remains a challenge.

3. EUWI + EU water initiative for Eastern partnership, 2016-2020

The new agreement between European Union and Armenia signed in November 2017 aims to substantially deepen bilateral relations. Under the Comprehensive and Enhanced Partnership Agreement (CEPA), Armenia *inter alia* assumed obligations to approximate its legislation to the EU acts and international instruments (Delegation of the EU to Armenia, 2016). In terms of water quality and water management, these are 5 EU Directives: Water Framework Directive, Floods Directive, Urban Wastewater Directive, Drinking Water Directive, and Nitrates Directive.

The aim of the EU-funded *EU Water Initiative Plus for the Eastern Partnership (EUWI+)* Transboundary Project is to enhance sustainable management of water resources in 6 countries included in the European Eastern Neighbourhood Policy (EUWI+EU, 2018).

In order to meet the standards of the EU Water Framework Directive, monitoring capacities and management plans for river basins and transboundary rivers in Armenia, Azerbaijan, Georgia, Moldova, Belarus and Ukraine were elaborated and await implementation. Jointly with their partners, experts from EU member-state institutions are setting up water monitoring systems to be deployed in model regions (Environment Agency Austria, 2019).

The institutions in charge are undergoing training, and appropriate administrative management will be developed in 6 target countries (EUWI+, 2019 b, c, d). Within the framework of the EUWI+ Project consortium, assigned French and Austrian experts (mainly from Environment Agency Austria, Federal Ministry of Sustainability and Tourism, and International Office for Water in France) collaborate with stakeholder countries. As EUWI+ project partners, UNECE and OECD are supporting national policy reforms and institutional building.

Expected project outcomes include an education and awareness-raising component actualized via joint trainings with Armenian local civil society organizations (CSOs).

In 2019, EUWI+ and Country Water Partnership Armenia jointly held a series of *Water Quality Monitoring Trainings* for school faculty in Sevan Lake (CWP, 2019a) and Hrazdan River Basins (CWP, 2019b), awareness raising campaigns devoted to the World Environment Day 2019 (CWP, 2019c), World Water Monitoring Day (CWP, 2019d), as well as other training sessions and actions (CWP, 2019e).

In June 2019, Water Quality Monitoring Training sessions in the basins of Lake Sevan and the Hrazdan River engaged about 350 students and 30 teachers of secondary schools (EUWI+, 2019a). Hands-on summer workshops on water quality sampling and monitoring allowed their participants to test water samples using water quality tool kits provided by EUWI+. The participating pupils presented their results at the official event at Sevan dedicated to the World Water Monitoring Day. The corresponding findings were published on the EUWI+ and World Water Monitoring Day websites.

4. PURE Water: Participatory Utilization and Resource Efficiency of Water, 2017-2020

The *PURE Water* Project is jointly funded by USAID and local partners (Country Water Partnership” (CWP) NGO, Environmental Law and Research Center (YSU), and Urban Foundation for Sustainable Development.

The project’s goals are to reduce groundwater intake in the Ararat Valley and to increase water productivity, quality and efficiency of water use through public awareness campaigns and increased citizen participation. The project aims to enhance the pertaining policy and legal framework, foster responsible water use, “encourage individuals and civil society to participate in and oversee water resource management, and help design small-scale infrastructure projects” (USAID, 2017). The project consists of four components:

- Component 1: Policy and regulatory improvements to foster citizen participation;
- Component 2: Participation in and oversight of water resources management;
- Component 3: Public awareness education and behavioural change;
- Component 4: Small-scale water infrastructure pilots projects.

Target communities are villages in Ararat and Armavir Regions with the total population of up to 40,000. So far, 1,450 persons (or 3.6% of the total target audience, including 47% women and 54% young people) underwent trainings on citizen participation, monitoring and advocacy, phone surveys, journalism, and integrated water management practices. 1,700 residents (or 4.2% of the total target audience) participated in community meetings, including 55% women and 20% young people (URBAN, 2019a). 2,200 individuals (or 5.5% of the total target audience) were reached out by awareness campaigns in target communities via events and festivals, educational workshops, peer-to-peer exchanges among communities, educational tours to fisheries and artesian wells, and direct mail on special days. Around 25 CSOs are engaged in these initiatives.

In 2018, a private company, Coca-Cola HBC Armenia, joined the *PURE Water* Project with financial support. The new joint collaboration – *Drop by Drop towards Efficient and Participatory Water Management and Use in Ararat Valley* – mainly aims to raise public awareness on the importance of water conservation, effective water use, and sustainable water management in the Ararat Valley (USAID, 2018). The initiative is youth-oriented and includes public awareness events and campaigns to educate young Armenians and residents of the Ararat Valley on local water

challenges, publication and dissemination of public information materials, field trips to fish farms and wetlands, as well as open lessons for schoolchildren (URBAN, 2019b). Thanks to this collaboration the Citizen Scientists youth network was established to engage young people from community action groups and CSOs in elaborating innovative solutions and executing projects with the application of modern IT and communication technologies. In 2019, Citizen Scientists implemented 2 very interesting projects: installing waste collection nets on irrigation canals (CWP, 2019f) (Yerkir Media, 2019) and launching the Byoor Akn mobile application to locate free drinking water fountains in the city of Yerevan (Pure Water, 2019).

Also in 2019, PURE Water core educational events included the following: *ECO Camp for Schoolchildren* (URBAN, 2019c), *Towards Vardavar Holiday, Citizen Journalism Training, Skills for Obtaining Water Use Permits through Online System Training and Improvement of the Irrigation System in PoqrVedi Community Trainings.*

5. Partnership between the Ministry of Environment of the Republic of Armenia and USAID ASPIRED

Sponsored and implemented by USAID ASPIRED, the Project is a collaboration between USAID and Water Resources Management Agency (WRMA) of the Armenian Ministry of Environment. The project aims to build capacities of WRMA water sector specialists. The following two large trainings were held under the initiative in 2019:

I. *Ecological flow training course, January 2019 (2 weeks)*. The ASPIRED Project conducted the training course on the new calculation method of the ecological flow (sanitary/regulation release) in Armenian rivers, as part of water use permitting and compliance assurance. The new method was designed by the USAID Clean Energy and Water Program in 2015 and adopted by the Government of Armenia in January 2018 (USAID ASPIRED, 2019a).

The course participants included specialists of various divisions of the Armenian Ministry of Environment, Ministry of Agriculture, and Inspectorate for Nature Protection and Mineral Resources under the Government of Armenia. The course combined both theory and practice, including the general overview of data management, GIS systems, general hydrology, methods of determining monthly and yearly ecological flow values of both studied and unstudied rivers of Armenia based on the Arpa River model. The participants received the user manual, template file in MS Excel, and a geo-database (GIS files) necessary for calculating ecological flows.

II. *GIS Training, April, 2019 (1 week)*. A full-week training course on GIS-mapping improved the participants' skills of using GIS, specifically working with different types of data, designing thematic maps, generating statistical data, exporting data, etc. (USAID ASPIRED, 2019b).

6. Conclusion

For education to raise awareness, it should provide an individual with a better understanding of his/her personal connection to the situation (Arlinghaus et al., 2018) (i.e. case of training sessions in the basins of Lake Sevan and the Hrazdan River). Altering students' knowledge on water issues affects their willingness to act only when they are prepared to take action and have the tools (i.e. case of Citizen Scientists). Trainings may be ineffective in terms of changing practices because other factors – like social norms and situational influences – dominate. For such actions other

strategies may be required, and further research to pinpoint the factors influencing behaviour change in water use is needed.

Therefore, it is recommended to monitor the behavioural changes in trainees after project completion. This dimension is highly important to evaluate the impact of positive and/or negative behaviour change on water quantity and quality, as well as to evaluate the need to replicate. Considering the overwhelming involvement of women in the education of children, disaggregated data on the basis of sex and social status (decision making and influencing capacities) is required.

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Chapter II.

Women and access to water

Women, Health and Water Governance

Alice M. Bouman-Dentener

Director Water Equality, Cansu International; Vice-President, Water Research and Training Centre International Foundation; Director, DiploriA – sustainable development solutions; e-mail: alice.bouman@gmail.com

Abstract

Providing universal access to safe and sufficient water and adequate sanitation is a global challenge and a collective responsibility for all humanity. The way in which people are affected by and/or impact on water availability and water quality is quite heterogeneous; and it has a distinct gender dimension. In traditional societies, women are often the water seekers and carriers, while their involvement in decision-making on how water is managed and treated is limited. This work addresses the interface between the Gender Equality Goal (SDG5), Water Goal (SDG6), and Health Goal (SDG3) of Agenda 2030 for Sustainable Development, as well as interlinks Rio/Dublin Principle 3 for Integrated Water Resources Management (IWRM), Beijing Platform for Action, and UNECE Protocol on Water and Health.

Keywords: Protocol on Water and Health, Beijing Platform for Action, Rio/Dublin Principle 3, water governance.

1. Introduction

In the 21st century, inadequate water supply continues to be the most harmful water risk for people, and globally accounts for the largest economic losses (UNICEF, 2004; Sadoff et al., 2015). While clean water and adequate sanitation services are taken for granted by many people living in Europe, the stark reality is that at present in the pan-European region an estimated 19 mln people do not have access to improved water sources and about 67 mln people lack access to improved sanitation facilities (UNECE, 2020). Not having access to sufficient and safe water for basic needs is a feature of extreme poverty. The consequences of the lack of access to safe drinking water and sanitation are stupendous. The global cost of poor sanitation was estimated at US\$ 222.9 bln in 2015, and on average amounts to 0.9 per cent of Gross Domestic Product (GDP) of the countries most impacted by poor sanitation (LIXIL et al., 2016). The link between health and access to water and sanitation is well documented. Insufficient water supply affects health by causing acute infectious diseases such as diarrhoea, and likewise limits productivity (Hunter et al., 2010). Globally, water and sanitation-related diseases caused an estimated 1.9 mln casualties in 2016 (WHO, 2020). WASH (water, sanitation, hygiene) -attributable diarrhoea kills a child under 5 every 2 minutes (Prüss-Ustün et al., 2019). Poor WASH services also weaken health systems, threaten health security and place a heavy strain on economies (WHO, 2019a). Mortality costs families more than US\$ 122.8 bln in lost earnings and loss of productivity equals US\$ 16.5 bln (LIXIL et al., 2016). Furthermore, lack of safe water, sanitation, and hygiene negatively impacts quality of life and undermines fundamental human rights (WHO, 2019b).

While gender statistics on water is scarce and scattered (Fletcher and Schonewille, 2015), it is safe to say that the larger burden still falls on women and girls, who are the traditional water seekers and carriers in secluded communities and least developed countries, but generally do not have a voice in decision-making on water supply and management. The water-gender-development nexus is arguably a promising and largely untapped connection to reach those furthest behind, in particular through the meaningful involvement of women at all levels and stages of water management

processes as called for in Dublin Principle 3 for IWRM of 1992 (Dublin Statement on Water and Sustainable Development, 1992).

This work zooms in on the interface between the Gender Equality Goal (SDG5), Water Goal (SDG6) – notably Targets 6.1 and 6.2 on WASH and Target 6.3 on improving water quality and reducing pollution – and Health Goal (SDG3), in particular Target 3.9 to substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination, of Agenda 2030 (UN, 2020). It links SDG Target 6.5 and Target 5.5 to the Beijing Platform for Action of the 4th World Conference on Women in Beijing held 25 years ago; and to the Human Right to Water and Sanitation celebrating its 10th anniversary this year. It looks at the gender discourse through a water lens explaining what gender-sensitivity in water policymaking and governance entails. In the same manner, it looks at water governance in the context of women's inclusion in decision-making. Integrated Water Resources Management – the UN-agreed water governance concept – emphasises inclusive water governance (Rio/Dublin Principle 2), and in particular calls for institutional mechanisms to include women in decision-making at all levels (Rio/Dublin Principle 3).

2. Beijing Platform for Action

This year, 2020, we celebrate the 25th anniversary of the Beijing Platform for Action, the revolutionary action agenda adopted at the 4th World Conference on Women in Beijing, China, by the 189 participating UN Member States in 1995, and a landmark in the continuous efforts to achieve equitable and sustainable development by addressing gender and women-inclusiveness across the board. At that time, water was not included among the twelve Critical Areas of Concern of the Beijing Action agenda; water is also rather marginally included in area C - Women and Health, articulating the health impacts of unsafe water and inadequate sanitation and urging governments, NGOs and international actors to work for universal access soonest (UN, 1995).

3. The Protocol on Water and Health

Ten years ago, on July 28, 2010, the United Nations General Assembly recognized water and sanitation as a human right (UN, 2010), obliging governments to ensure that people can enjoy clean, available, acceptable, accessible, and affordable water and sanitation. In 1999, 56 UNECE Member States, including the countries of Central Asia – Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan – adopted the Protocol on Water and Health (UNECE and WHO/Europe, 1999) to ensure universal access to safe drinking water and adequate sanitation for all citizens of the pan-European region. The Protocol entered into force in 2005 and is the first international agreement of its kind, designed specifically to attain an adequate supply of safe drinking water and adequate sanitation for everyone, and to effectively protect drinking water sources (WHO/Europe, 2018). Occurring even before the proclamation of the human right to water and sanitation (UN Resolution A/RES/64/292), it provides an excellent framework for translating the human right to water and sanitation into practice. The Protocol specifically commits its Parties to promoting equitable access to water and sanitation, and to setting specific targets and target dates (Bouman-Dentener, 2015). The Protocol's main aim is to protect human health and wellbeing through good water management, including the protection of water ecosystems, and by preventing, controlling and reducing water-related diseases (Bouman-Dentener, 2015). The Protocol on Water and Health works within the IWRM framework, in that it takes an integrated approach to water management, propagates

decentralization to the lowest appropriate level, practices a rights-based approach, and promotes public participation.

Since the adoption of the Protocol, between 2000 and 2017 in the pan-European region over 63 mln people gained access to drinking water services and 84 mln people to sanitation services. The majority of these lacking access to basic sanitation services live in rural areas (Enkhtsetseg Shinee, 2018). There is a clear implementation challenge: in most countries procedures are in place, but the level of participation is low. This is not a new phenomenon, and the way to overcome such challenges is known – a 2000 World Bank evaluation of its rural water supply projects deemed social capital a precondition for making decentralized services sustainable and reaching the intended beneficiaries. Greater social capital in a community leads to more participation in service design, more effective rules for governing implementation and better monitoring of construction, use and maintenance (Ronald and Tauno, 2000). Women's civil society represents high social capital and can therefore be a powerful ally in closing the remaining gap in access to water and sanitation services (Bouman-Dentener, 2017a, b).

4. Rio/Dublin Principle 3

The IWRM framework prominently includes the role of women in the provision, management and safeguarding of water. It is in fact one of the four guiding principles (Rio/Dublin Principle 3). Women's inclusion in water-related development efforts was also a specific objective of the UN Water for Life Decade 2005-2015. While the water-gender interface is increasingly acknowledged as an important but still underused pathway to further sustainable and equitable development, the baseline survey for IWRM implementation (SDG6, Indicator 6.5.1) shows that while 80% of the surveyed countries are well underway towards implementing IWRM, the gender targets are lagging behind (UN Water, 2018). The transformation to gender-sensitive and women-inclusive water governance still has a long way to go, as it is a complex process in a sector that is highly fragmented and traditionally in the technical domain of public administration.

Women's contributions to water governance are manifold. In their individual capacity, women can be decision-makers, scientists, water professionals or water users. Research remains strongly biased towards women as water users. Women's role in water management has received limited scholarly attention despite the agreement by UN Member States since 1992 that it is a cornerstone for Integrated Water Resources Management. Data on the proportion of women scientists and researchers exist for STEM (Science, technology, engineering, and mathematics). A similar assessment for the water realm is yet to come. A review of water and gender publications after 2000 leads to concluding that looking into the gender dimension of water is a primarily women's business (Bouman-Dentener, 2020).

Since the World Water Vision for the 21st Century presented at the 2nd World Water Forum (Cosgrove and Rijsberman, 2000) in The Hague, women's civil society has been increasingly coming to the fore as an important actor to create bespoke solutions for water challenges taking local gender realities into account. The social capital of women's organizations and the diversity of their networks cutting across sectors and societal layers make them a useful partner for realizing the integrated approaches at the core of Agenda 2030.

5. Conclusion

By 2025, half of the world's population will be living in water-stressed areas. In least developed countries, 22% of health care facilities have no water service, 21% no sanitation service, and 22% no waste management service (WHO, 2019). Providing safe and sufficient water and adequate sanitation for all is a global challenge and a collective responsibility for the entire humanity. The way in which people are affected by and/or impact on water availability and water quality is quite heterogeneous, with a distinct gender dimension.

Social relations between women and men result in gendered roles that vary between social strata, cultures, ethnicities and generations. In traditional societies women are often the water seekers and carriers, while their involvement in decision-making on how water is managed and treated is limited (Bouman-Dentener, 2015). It is high time to implement Rio/Dublin Principle 3 endorsed by UN Member States already in 1992. The way forward is enshrined in the text of the Principle:

"This pivotal role of women as providers and users of water and guardians of the living environment has seldom been reflected in institutional arrangements for the development and management of water resources. Acceptance and implementation of this principle requires positive policies to address women's specific needs and to equip and empower women to participate at all levels in water resources programmes, including decision-making and implementation, in ways defined by them."

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Gender in water resource management in Armenia

Hasmik Barseghyan

President of the European Youth Parliament for Water (EYPW), Future Energy Leader at the World Energy Council, Member of Women in Climate and Energy (WICE) Armenia; e-mail: hasmik.official@gmail.com

Abstract

Water in Armenia is considered one of the most delicious and purest in the world. Indeed, it comes from clean natural sources and can be consumed raw straight from the tap without boiling. Despite the country's abundant water resources and a series of legislative and institutional reforms launched over the past decade, Armenia's water sector still faces major challenges as to its management and protection – a significant share of the population enjoy drinking water supply only a few hours a day. Moreover, only 5% of rural communities are connected to a central sewage system. This paper treats water supply and sanitation in Armenia from the gender perspective. The study suggests that women are more vulnerable to poor sanitation due to their gender role within society and at home. Likewise, women's priorities are not accounted for on the local level – due to vast underrepresentation among local-level authorities, they have limited opportunities for engaging in formal decision- and policy-making.

Keywords: gender, women, Armenia, equality, sanitation, water.

1. Introduction

1.1. Water resources in Armenia

Armenia has a wealth of water sufficient for drinking, irrigation, and industrial use. The rivers flowing through the country's territory are tributaries to the main rivers of the southern Caucasus, namely the Araks and Kura. The Kura River also drains into the Caspian Sea. About 76% of the total domestic area belongs to the Araks and 24% to the Kura Basins (FAO, 2008). The 14 sub-basins within the two main river watersheds are grouped into 6 basin management areas (Fig. 1.).



Figure 1. Armenia's basin management areas (WRMA, 2019).

About 9,500 small and large rivers with the total length of 23,000 km flow across the country. Armenia's water bodies are typical mountainous with sharp seasonal variations, spring freshets and low water in summer (FAO, 2008). Sevan and Arpi Lakes are the most important in terms of size and economic significance. Sevan is the largest domestic lake. Located 1,900 m ASL (FAO, 2008), it is a strategic source of hydropower and irrigation water, as well as plays an important hydrological role. The lake is also a landmark recreational site, natural habitat and cultural resource of Armenia.

2. Gender equality

Armenia is a country of ancient traditions, and women's rights were respected there since antiquity. The Soviet-time gender equality policy had considerably influenced the nation and had led to major improvements as to women's legal and social status, including their active participation in the labour market (ADB, 2015). Since gaining independence in 1991, more patriarchal views and customs have spread. During the recent decades, many different women's civil society organizations have emerged aiming to advance women's rights and gender equality, and the country has embarked on establishing a solid legal and policy framework ensuring gender equality.

International assessments of the extent to which Armenian males and females are en par indicate a

limited progress in the last 10 years, although overall the situation is close to the global average. On the one hand, the country has systematically scored high in the ratings of equal access to education and positive health outcomes for women. On the other hand, it is counterbalanced by poor progress as to women's political empowerment, lower than the average (WEF, 2020) and women's insufficient access to economic opportunities. Women in Armenia have very little involvement in formal decision-making both locally and nationally, and their priorities receive meagre reflection in policies. However, it was considered that women have distinct views on the development of their communities and that male leaders may not adequately convey them (ADB, 2015).

3. Water supply and municipal services

Almost all urban and rural communities have access to non-contaminated drinking water mainly originating from ground sources and/or springs and requiring only chlorination/disinfection. Based on the report of the World Health Organization and UN Children's Fund (2013), virtually 100% of urban and 98% of rural residents enjoy access to drinking water sources in Armenia. Despite the abundance of water, not all needs are met, and a substantial share of the population is supplied potable water only a few hours a day (Gharabegian, 2013). In some remote settlements, water is supplied without disinfection once every 3-4 days (ADB, 2011). When water is not piped into households, it is collected from public pumps. Household surveys conducted in Yerevan and all 10 constituencies in 2009 showed that 94% of families had centralized water supply. However, only 46% of families had hot water inside their premises (MLSI, 2009).

Armenia faces several challenges associated with water supply, including dilapidated networks and systems. Built during the Soviet period, many of them require upgrading. Old and leaking piping, the human factors (water-meter tampering by magnets, leaving open taps, using second and third unmetered inlet pipes at residential units), as well as the lack of a water-saving culture lead to extremely high water losses. In Armenia, water has never been scarce and is viewed as a "free gift" (USAID, 2012). Key national water-related priorities include increasing the share of the population with access to potable water at least 12 hours a day, full deployment of a water-metering system, and engaging with communities on efficient water use and management.

4. Sanitation and women's vulnerability

By estimates, in Armenia 96% of urban and around 80% of rural population use improved sanitation facilities, including flush toilets (e.g., piped sewage systems or septic tanks), pit latrines or composting toilets. Only 5% of rural communities are connected to a central sewer system. The rest "make their own provision for sanitation such as latrines and septic tanks" (ADB, 2011). A survey on housing and dwelling conditions of households (MLSI, 2009) revealed that 25% of families in Armenia do not have flush toilets in their homes, 15% do not have bathrooms, and 23% (mainly in rural areas) are not connected to centralized sewerage. Outside the capital, public buildings (e.g., kindergartens, schools and clinics, including maternity hospitals) lack centralized sewage connection (ADB, 2015).

According to the UN Children's Fund survey (WASH in Schools, 2011), 60% of female and 70% of male students "never or rarely use toilets in their schools". Many of them did not use school toilets because of concerns about their cleanliness (41%), and the majority of schoolchildren were "concerned about the social implications of using toilet, and reported feeling ashamed to do so at

school”. Poor sanitation facilities combined with the lack of running water and soap “means that students can’t effectively wash their hands with soap in critical moments, such as after using toilet and before handling food” (World Vision Armenia, 2010). Many students and teachers also avoid drinking during school time in order not to have to use latrines. While both students and faculty are all susceptible to health hazards due to poor sanitation and hygiene, women (making up the majority of school staff) and girls are even more vulnerable, because they have special needs related to menstrual hygiene. Thus, inadequate water supply and sanitation stimulate girls’ absenteeism from schools.

4.1. Women’s workload

As in many countries around the world, fulfilling various household tasks – including cooking, cleaning, laundry, bathing children, cultivating kitchen gardens and caring for livestock, etc. – makes women the main water users in Armenia. Likewise, women also have to collect and/or purchase water for domestic use, store and manage it and, thus, they are highly affected by water limitations. In areas where water is scarce, only available a few hours a day or on certain weekdays, families collect it in containers to last them until supply is resumed. In case of non-centralized water supply, “it is mainly women, usually girls and children who collect water with rather big containers outside the immediate vicinity of their homes” (Manvelyan et al., 2006). A significant proportion of women’s time is spent on obtaining and managing water at home. In case the quality of piped water is poor, families often purchase potable water. Female-headed households are particularly vulnerable, as they are already at risk of impoverishment. Collecting baseline data to assess changes in women’s workload is key for investigating how water supply and sanitation projects benefit them.

4.2. Decision making

Women in Armenia are concerned about water supply and sanitation problems but have limited opportunities for engaging in formal decision-making. During ADB (Asian Development Bank) studies, women expressed frustration about several critical water and sanitation issues that they felt had not received proper attention on behalf of male-dominated local authorities. ADB case studies revealed some interesting behavioural patterns. In the town of Berd, Tavush Region, 2 serious outbreaks of waterborne diseases took place in a local kindergarten. The incidents affected so many children that local hospitals could not accommodate all patients. The local women stated that they could merely bring publicity to the issue since “women will not be allowed to take control” when important resources (e.g., water) are at stake.

In the city of Gyumri, Shirak Region, the local maternity hospital had one toilet in extremely poor condition. The women commented that “because men do not use the facility, its repair was not a priority”.

In another instance, several women requested a village head to install a toilet near a local landmark that they considered to potentially become a tourist attraction. Based on the women’s account, the male leader responded that having a paid toilet would be a “shameful” way of earning money, and building a public toilet was not a priority for the village.

“The level of maintenance of water systems and the quality of water-supply services often depends on personal qualities of village head: his/her background, experience, leadership qualities and management skills” (USAID, 2012). Women are vastly underrepresented in local governance bodies (only 2% of mayors are female, all of them in rural areas), so women’s priorities may not be

represented in local decision-making.

4.3. Employment opportunities for women

According to the National Statistics Service of the Republic of Armenia (2005), 25% of all employees in the water sector are women, mostly dealing with administrative work. Very few women work in construction industry, as it is considered a “men’s work”. In the State Water Management Committee, no women occupy chair or advisory posts but head financial and economic, procurement and external relations departments. Women are well represented in civil society organizations focusing on ecology and environment.

5. Conclusion

Collection of gender-disaggregated data and in-depth study of impacts on women associated with water and sanitation challenges is extremely important to ensure the implementation of targeted and effective projects and solutions. Women involvement in decision-making and empowerment may enhance the overall understanding of the scope of corresponding issues. Women are more concerned about clean water, health of their children, and mitigating climate change than men. Men are perceived as primarily “motivated by money” and less interested in the long-term consequences of natural resource use. Women are an entry point for behavioural change towards waste disposal as well. Finally, it is women who play an important role in educating children about environmental protection, be it at home or inside communities.

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Access to potable water in rural isolated communities of Argentina: gender mainstreaming challenges

Mora Laiño

Researcher, Buenos Aires University/Engineering Without Borders Argentina; e-mail: moralaino@gmail.com

Abstract

In Argentina's isolated rural communities, women's lack of access to potable water, and the role they play in water supply reveal the degree of gender inequality and greater vulnerability to climate crisis. The inclusion of a gender perspective in water access projects, plans and programs is essential to reduce these inequalities. In the same way, having gender-sensitive data on women's access to water resources is essential to address social and environmental problems, as well as to influence the adoption of gender-transformative climate action policies.

Keywords: gender mainstreaming, climate action policies, water supply, rural isolated communities, non-governmental organizations.

1. Introduction

Empirical evidence shows that the impacts of climate crisis mainly affect populations with fewer economic resources, especially women, among whom poverty reaches higher levels than among men (IPCC, 2014). Therefore, the public policies related to the phenomenon of climate change are not gender-neutral. Blind to inequalities or promoting greater equity by problematizing them from a gender perspective, action plans against climate change effects can deepen structural gender gaps.

When considering the differentiated impacts, some key aspects associated with the role women play at the global level should be taken into account.

- Women are primarily responsible for water management, food supply, networking and care tasks.
- Women's role in household economy and persistence of gender stereotypes in many cases expose them to greater vulnerability to climate change effects in the context of "feminization of poverty"— 70% of people in situations of vulnerability in the world are women (UN, 2015).
- Women play an active role in the conservation of nature's goods, especially in rural contexts. Indigenous women play a central role in the sustainable management of natural assets due to the traditional knowledge which they preserve and transfer.

This article aims to consider the implications of incorporating the gender approach in projects and initiatives related to water and sanitation in isolated rural areas, such as the study case presented. This approach means a significant contribution -especially in the absence of gender-sensitive data on access to water- to analyse the impact of community initiatives and the benefits of a possible articulation with those public policies aimed at guaranteeing basic human

2. Water and sanitation conditions in Argentina

Argentina faces inequity in access to drinking water. The availability of water is not even between rural and urban areas. To mention some general indicators, 22% of the population don't have access to public water mains; and 41% -- don't have access to sanitation. There are 4,400 poor neighbourhoods – i.e. 5 million people in crowded and/or isolated rural areas – without access to

water and sanitation; and 2.8% of Argentina's residents need to travel daily to obtain water (Juarez, 2015). This data shows us that the lack of access to clean water interfaces with poverty and habitat issues. Thus, poor households also have to cope with additional hazards like higher exposure to pollutants and open-air garbage dumps.

The global phenomenon of climate change impacts the interface between water supply and gender dimension. As we know, climate change negatively affects water sources which, in turn, exert pressure on water supply for basic vital, household and productive use. Furthermore, it has a significant impact on women, since they are traditionally responsible for domestic water supply and sanitation in most of the countries, including in rural communities of Argentina (Camilioni, 2016). Thus, we observe a significant increase of household chores which women have to bear, and as a result more gender inequalities by culturally assigned roles, less access to safe water, and worse health and sanitary condition.

In rural isolated communities of Argentina, it is very common to see women, youth and children carrying water on foot from a community well or tap to their homes. Usually, women are in charge of supplying water from tank trucks, dams or wells, including this not suitable for human consumption due to arsenic contamination. They spend up to 6 hours a day fetching water (Juarez, 2015).

The United Nations Organization has committed to provide relevant scientific information to understand the impacts of climate change, and has already mentioned that climate change and gender are strongly linked. The Intergovernmental Panel on Climate Change reports (IPCC, 2014) likewise refer to how inequalities, poverty, gender discrimination and lack of institutions increase vulnerability to climate hazards. They affect poor and vulnerable groups disproportionately by increasing negative exposure and susceptibility to damage, as well as decreasing such groups' ability to cope with and recover from such damage. Thus, the empirical evidence demonstrates that climate change impacts mainly affect communities with fewer economic resources, especially women, among whom poverty is higher than among men (IPCC, 2014).

While assessing the differentiated impacts of climate change, some key aspects associated with the role women play on the household level should be taken into account (United Nations, 2015). Various studies from the field of ecofeminism and feminist political ecology have already been proposed in relation to these axes of inequality addressing the relationship between gender, environment and development, and its public policy implications.

- Women are usually responsible for water management, food supply, networking and household tasks.
- Women's role in household economy and persistence of gender stereotypes expose them to a major vulnerability.
- Land ownership rights as well as access to and control of natural resources like water, and participation in decision-making are also predetermined by gender inequalities.
- Women play an active role in the conservation of nature's goods, especially in rural contexts, but have very limited access to them.
- Women also face financial access barriers as well as discriminatory rules and social norms preventing their access to control and use of land and other productive resources.

3. Study case: access to potable water in rural isolated communities of Argentina

Engineering without Borders Argentina is an interdisciplinary non-profit organization aiming to

assist the development of socially-deprived local communities via engineering projects in urban and rural constituencies. It has a diverse action track portfolio, including Water and Sanitation. One of the main organization's projects focuses on isolated rural communities and engages target community members in joint designing and building of harvest and rainwater storage systems. The project was already implemented in 3 communities of Santiago del Estero Province benefitting 150 families which now have access to safe water.

Under the project, Engineering without Borders Argentina has been pursuing the inclusion of a *gender equality approach* into the survey and diagnostic process. The organization has designed an instrument allowing (1) to survey gender-sensitive data about women's and men's situation with the purpose of identifying gender roles in household economy, health and care tasks; (2) to analyse the division of productive and reproductive work, i.e. to collect information related to the implications of labour division associated with access to and management of water; (3) to assess who is in charge of water supply in a community, and how much time it takes. The instrument also helps to survey the differentiated expectations and needs among women and men regarding the project.

At the same time, it aims to favour instances of equitable participation and to identify differentially constructive skills in domestic water supply systems. It also assists in collecting information on water management and access and analysing that makes and benefits from resources-related decisions. The decision-making dimension pinpoints the actual number of women and men engaged in various areas of interaction.

Regarding the identification of challenges, as next steps Engineering without Borders Argentina aims to integrate the gender mainstreaming approach not only in the project design but also in execution and implementation. Also, since it was discovered that there is no gender-sensitive indicator related to access to potable water in Argentina, the organization would like to pursue this task in the rural communities where Engineering without Borders Argentina is already involved.

4. Conclusion

It's essential to consider the importance of including a gender analysis as a strategy for making gender stereotypes and inequalities visible, evidencing the interface between gender inequality and other multiple inequalities (class, age, ethnicity, sexual orientation, etc.), revealing the situation of women, their realities, their contributions and their rights; considering the need for affirmative and anti-discrimination actions to transform the cultural bases of gender stereotypes.

Among others, the challenges related to women, water and climate change projects include the following:

- Promoting coordination actions between local governments and actors, and civil society organizations;
- Encouraging the development of gender-sensitive statistics;
- Promoting integrated water resource management through participatory processes;
- Facilitating training on gender and human rights approaches for the key actors involved;
- Improving intervention models by encouraging gender and social equity approaches in the analysis and evaluation programs and projects at different stages;
- Identifying relevant information and generating guidelines to facilitate gender mainstreaming in water and sanitation projects;
- Influencing the adoption of gender-transformative projects fostering the discussion of gender inequalities.

More information about water initiatives in Argentina can be found online:

- Engineering without Borders Argentina (Engineering..., 2020);
- Plataforma del Agua (Plataforma..., 2020);
- SEDCERO Programme. Agua para el Desarrollo (SEDCERO, 2020).

The report of the World Health Organization (2014) provides a global thematic overview. Summarizing, gender-sensitive data on women's access to and control over water resources is crucial to address social and environmental challenges, as well as to ensure success of any mitigation or adaptation plan.

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Gender balance and access to water in the Kazakhstan section of Tashkent Transboundary Aquifer Basin

V.S. Krylova

Candidate of Geographical Sciences, Executive Secretary of Issues of Geography and Geo-Ecology Journal, Senior Research Associate at Landscape Science and Environmental Management Laboratory, Institute of Geography; e-mail: v_krylova@inbox.ru

O. Podolny

Dr. of Geological and Mineral Sciences, Institute of Geography

I. Skorintseva

Dr. of Geographical Sciences, Institute of Geography

Abstract

The study aimed to detect gender imbalances at different levels – starting with the highest interstate basin management body down to local farming communities – based on the example of the Kazakhstan section of Tashkent Transboundary Aquifer Basin. The data on demographic indicators, population growth, life expectancy at birth, level of economic activity, unemployment rate by gender used within the research were collected in Turkestan Oblast (Region) during the period of 1995 to 2019. Target surveys were conducted in 110 families residing in the region.

Turkestan Region is characterized by population growth and represents a source of the largest migration flows within Kazakhstan. The female population slightly exceeds the male population due to the high mortality among men aged 40-45 years. In turn, this leads to deteriorating economic wellbeing of widows and orphans.

In 2019, the salary correlation between women and men amounted to 79.0% in favour of the latter (Committee on Statistics (CS) of the Ministry of National Economy (MNE) of the Republic of Kazakhstan (RK)). The indicator is still progressing, reflecting the fact that women are paid the lowest across the country. Furthermore, the level of economic activity among females is lower than among males, correlating with wage imbalances and traditionally higher unemployment rates among the former.

The number of women working in district-level government agencies across the oblast is minimal due to the fullest preservation of traditional family and household values rejecting a woman an opportunity to have a dominating position. Yet, women already in high decision-making positions and professionally employed do not experience any discrimination.

Population growth leads to increased drinking water intake. The Ak-Bulak Program (Enactment of November 9, 2010) designed to provide the population with clean water has not been progressing well. Not all residents of not all districts in the country enjoy access to drinking water. In addition, the existing irrigation system in the agricultural sector is obsolete – 46% of the surveyed farmers of both genders expressed dissatisfaction with water distribution.

The main research observation is that within families, men make all decisions associated with water security and supply. However, responsible for household management, it is women who monitor water quality. This dichotomy generates a significant share of water management issues.

Keywords: women, equal rights, gender indicators, water consumption, Tashkent Aquifer Basin, Central Asia.

1. Introduction

Globally, gender equality is recognized as a major factor of sustainable human development. Kazakhstan has been rendering great attention to gender issues, as well as has forged the necessary legal framework to observe gender balance. Kazakhstan has acceded to and ratified almost all United Nations gender-related conventions, e.g. the UN Conventions on the Elimination of All Forms of Discrimination against Women; on the Nationality of Married Women; and on the Political Rights of Women; as well as the International Covenants on Civil and Political Rights; and on Economic, Social and Cultural Rights (UN: Conventions and Agreements). Kazakhstan's Constitution and domestic law stipulate for equal men's and women's rights in all spheres of life and activity. However, progressive law does not mean real equality in everyday life, especially in local rural communities.

The study aimed to identify gender imbalances in water use at different levels of social and public life based on the case of the target transboundary basin.

2. Research area

The study covered 3 constituencies (administrative districts) in Southern Kazakhstan Region, namely *Saryagash*, *Kazygurt* and a small part of *Shardara* Districts. The study area included 41 rural districts with 234 communities. In the summer of 2018, Southern Kazakhstan Region was renamed Turkestan, and that translated into certain changes in the region's territorial-administrative structure. Geographically, one more administrative unit -- *Keless* District – was included in Turkestan Region.

The target constituencies are located within the limits of Tashkent Transboundary Aquifer Basin (TAB). The basin is a unique source of deep-seated fresh groundwater in Central Asia. Based on the studies by U.M. Akhmedsaf in and V.V. Veselov, the aquifer is shared by Kazakhstan and Uzbekistan (Akhmedsafin, 1964; Groundwater Deposits of Kazakhstan, 1999; Veselov, 2002).

3. Research methodology

Key socio-economic and demographic issues underwent investigation in terms of population growth, life expectancy at birth, level of economic activity, and unemployment by gender. The indicators' dynamics were traced from 1995 to 2019 with a 5-year interval.

The current state of the environment was assessed by such parameters as climate change, pollution and depletion of underground and surface water resources.

To examine the issue of access to water both male and female respondents from 110 families residing in the settlements of Tashkent TAB underwent direct interviewing. In addition to target surveys, the study analysed the data from region- and district-level *akimats* (administrations) (Akimat of Saryagash District; Akimat of Kazygurt District), as well as official statistics of the region-level Department of Statistics (CS of the MNE of the RK).

4. Results and discussion

4.1. Total population

The population analysis (Table 1.) suggests that the target area will continue experiencing annual population growth in the future. The relatively low figures for 2019 were due to the resettlement

program. The area is the source of the largest migration flows to other regions – Almaty, Astana, Karaganda, and Eastern Kazakhstan – thus making it one of the main domestic migration donors.

Table1. Key gender-disaggregated statistics for Tashkent TAB.

Indicator	1995	2000	2005	2010	2014	2019
Total population, persons	307,600	325,406	368,075	424,626	463,434	320,777
including: females	154,107	163,028	184,405	212,737	232,180	156,646
Males	153,492	162,377	183,669	211,888	231,253	164,131
Life expectancy at birth, years	68.70	67.32	67.39	67.07	71.60	72.30
Including: females	72.70	71.61	71.75	71.63	71.99	76.61
Males	64.30	63.20	63.12	62.69	62.92	68.13
Female and male wages correlation, %	58.7	60.8	61.9	62.4	63.8	79.0
Level of economic activity, %	69.9	69.4	69.7	70.4	71.1	82.5
including: females	43.6	43.2	43.4	43.5	43.8	-
Males	56.4	56.8	56.6	56.5	56.2	-
Unemployment, %	10.4	8.1	7.8	7.3	6.6	5.5
including: females	12.0	9.6	9.2	8.7	7.9	-
Males	8.9	6.7	6.4	5.9	5.3	-

Source: CS of the MNE of the RK.

4.2. Gender balance in population

For many years, the female population has prevailed over the male one in the region (see Table 1), the reason being the high mortality in men of the most able-bodied age, i.e. from 40 to 45 years. The high mortality rate leads to the fact that out of ten 30-year-old men four (or 38.7%) do not reach the age of 60. Yet, there is a controversy. Whereas women predominate (52.1%) among urban population, with a slight difference of 0.2% men predominate in rural areas (CS of the MNE of the RK).

Although the analysis of fertility trends by gender has pointed to the higher number of boys than girls born in the region, the analysis of the population's gender and age composition for different years has shown that starting from the age of 20 the male share of the population declines at a much higher rate than the female one.

Due to the early death in men, the number of widows and children without fathers is increasing. In turn, this leads to lower household incomes and poorer educational opportunities, thus boosting the risk of such children not being able to find employment in the future. Ultimately, it has a negative impact on the sustainability of widows and children in other areas (health, housing, etc.). To date, the gender difference in life expectancy amounts to 8.48 years in favour of women.

4.3. Gender balance in incomes and unemployment

In 2019, the gender wage correlation was 79.0% in favour of men (see Table 1). The dynamic analysis of this indicator in the target region has demonstrated the 20% decrease compared to 1995. In the former Southern Kazakhstan (now, Turkestan) Region, women had the lowest salaries across the country. Throughout Kazakhstan, the gender wage gap has not changed for eight years. In 2010, males earned an average of 33.9% more than females. Based on the data of the CS of the MNE of the RK, in 2018 the wage difference between men and women was 33.3% in favour of men.

The wage level manifests one of the most important indicators of the region's social development, as well as exposes the overall performance of human capital. Gender equality in wages likewise constitutes the basis for equalizing the intra-family positions of males and females, e.g. more equal access to family spending and higher financial independence of women. Women receive salaries almost equal to men only in three sectors of Kazakhstan's economy: health care, education and hotel services. All other industries demonstrate a gender gap in wages.

According to Table 1, the level of economic activity among women is showing a slight upward trend, but it is still lower than that of men, which correlates with the wage imbalance. An important factor here is earlier retirement and, thus, earlier departure from the labour market.

The analysis of the unemployment rate in the region has shown a downward trend (see Table 1). In 2000, it was 8.1%, and in 2019 – 5.5%. The unemployment rate for women had also decreased between 1995 and 2014, although for men it was *significantly* lower.

4.4. Involvement of women in decision-making

The record shows that the majority of senior officials in Kazakhstan are male. In certain constituencies there are no women at all at the political administration level. Compared to other constituencies, the target region shows the lowest number of women in political, administrative and/or public decision-making positions (CS of the MNE of the RK).

In the region, female representation in decision making is as follows: 8 women are deputies of city and district *maslikhats* (local elected representative body), 2 women are rural district *akims* (head of local administration), 9 women are heads of departments (education, finance, language development, culture, and protection of children's rights) in district and rural *akimats*. 9 media outlets are registered in the region with 2 of them headed by females.

This female vs. male distribution in civil service is due to the fact that in the south of Kazakhstan the traditional family and household values have been preserved to the fullest extent and, thus, women have no chances of taking dominating positions. Even if employers appoint a woman as manager, she is paid less than a man. This is partly a consequence of gender stereotypes diminishing women's management capabilities. However, it is noteworthy that very often family represents a higher value for women than for men, which automatically makes females less attractive candidates for top management positions compared to men in the eyes of potential employers.

4.5. Water resources management at the international level

Based on the data about the Joint Interstate Commissions for the Protection and Use of Transboundary Rivers, they also include women. Table 2 below illustrates the distribution of the Commissions' members by gender, position and type of activity, and confirms the gender imbalance. However, during the negotiations of riparian Joint Commissions and at the decision-making stage, the views of the Commission's female members – as per their official posts – are considered on an equal basis with these of male ones. Thus, the contribution of females and males to decision-making can be considered equal.

Table 2. Disaggregation by gender, position and type of activity among members of the Joint Commissions for Protection and Use of Transboundary Rivers.

Job category	Highest tier		Middle tier		Lowest tier	
	Quantity					
	Male	Female	Male	Female	Male	Female
Executive Staff	5	2	7	3	-	-
Consultant	1	-	1	-	4	2
Technical Staff	-	-	5	2	-	-
Administrative Staff	-	-	1	-	-	-

1.2. Quality and availability of drinking water

In general, human health depends on our attitude towards it, including the observance of basic hygiene standards and timely application to medical institutions, as well as the overall quality of medical care. Yet, it is the quality of drinking water which can be deemed the most important factor impacting the satisfactory reproductive health among the residents of the target region.

The increase in population leads to increased water intake from both surface and underground sources. Over the past 10 years, the number of water sources within the limits of the Tashkent TAB has decreased. The study allowed detecting 18 dry wells and 10 requiring cleaning and repair.

In fact, during the implementation of the Ak-Bulak Program (Enactment of November 9, 2010), the clean water access project for the residents of Kazygurt District was accompanied by scandals. The installed water pipeline to supply water from nearby springs operated intermittently and the supplied water was of poor quality; and the expensive hypochlorite treatment unit got broken. According to the initial project worth 425 mln tenge, it was planned to take water from two springs and build a 400 m³ reservoir close to the intake point. The local residents were assured that everyone would get enough water, but in the end the project was changed. As the result, water does not reach two communities at all, and where it does it does not meet sanitary requirements, and its supply is unstable.

In Saryagash District, only 65 communities out of 154 total have centralized water supply insufficient for providing their population with potable water. 19 settlements have scheduled water supply; the residents of the remaining ones have to get water from boreholes, wells, open sources, or buy it in shops. The district has built a water intake tower with a 6,000 m³ reservoir, which should allow residents of the town of Saryagash and 10 more villages to have the 24/7 water supply. This gives hope that at some point the local situation with water supply will normalize.

Gender differences became obvious while assessing drinking water safety, sanitation and hygiene. Whereas adult (20-50 years old) male respondents expressed satisfaction with water amount and quality (7 points on the 10-point scale), adult female respondents showed lower values (5-6 points on the 10-point scale). This deviation confirms that it is women who deal with water issues directly and, thus, are better informed about the corresponding challenges.

That said, officially the quality of drinking water complies with sanitary standards (Order of the MNE of the RK of March 16, 2015). In large communities, tap water undergoes chemical decontamination; in small settlements, water from decentralized sources undergoes purification via

settling and purification filters. Certain well-off families can afford buying bottled water, but their number is very small.

4.6. Local-level water distribution in agriculture

In the Tashkent TAB, the irrigated land is used for cultivating cereals and legumes, technical and fodder crops, potatoes, vegetables and cucurbits. Fruit, berry and grape plantations are also present (Archive of Statistics Compilations). Water is supplied to irrigated fields around the clock. However, the irrigation system is obsolete – water supply disruptions are frequent, and irrigation schedule issues get addressed only sporadically. Hence, to facilitate better water supply scheduling there are plans of transferring the networks under single ownership.

Irrigation systems are mainly managed by male specialists with women practically not involved. At the same time, 46% of the farmers (both men and women) surveyed in the Tashkent TAB stated dissatisfaction with water distribution. The reasons for it are multiple, including the basin's transboundary nature – all rivers within the system originate in Uzbekistan responsible for their management.

5. Conclusion

Based on the survey, on the one hand, within households 100% of water security and supply issues are resolved by men. However, on the other hand in 90% of cases water quality monitoring is women's task since they are mainly engaged in day-to-day household management. This dichotomy is the driver behind a significant share of water management problems. Summing up, it is possible to draw the following conclusions:

- the surveyed area does face challenges associated with women's access to quality potable water;
- the aforementioned challenges are most obvious in rural communities;
- women are more likely to enter into water disputes, as they are responsible for domestic household issues;
- demographic studies show the annual population growth in the Tashkent TAB;
- population growth will lead to increase water intake;
- females prevail over males in the region, and live longer. Women are responsible for family health and are interested in improving the water situation in the region. This points to the need to train qualified female water specialists;
- labour market demand for males is higher than for females;
- wage correlation between women and men remains low. Females are generally paid less than males for the work of equal value. Moreover, women are forced to agree to any type of work, including with hazardous and hard working conditions;
- development of women's entrepreneurship is also causing concern;
- women in the Tashkent TAB have been traditionally focusing on the housekeeping role, are neither seeking to continue their education nor actively participate in any decision-making, including in water management;
- women who succeeded in taking high-level positions competently perform their functions and do not experience any discrimination.

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Water burden of rural women in the climate change context: case study of Shybran Village, Kyrgyzstan

Aiperi Otunchieva

PhD student, University of Kassel, Witzenhausen, Germany; e-mail: aiperi.otunchieva@gmail.com

Abstract

Currently, rural women in Kyrgyzstan face hardships due to social-economic and climatic factors. The aim of this article is to explore challenges women encounter while ensuring proper home nutrition in the context of water insecurity. The study site – Shybran Village – is located in Kadamjai District, Batken Province, Kyrgyzstan. 20 low-income households and 4 experts were interviewed within the research in 2014. Water shortage and quality are the major issues which local women face. The lack of infrastructure forces them to spend at least 30 min a day fetching water. On one occasion, 60% of children had diarrhea within a 30-days period most likely because of poor water quality and sanitation. The study also revealed that water was present near toilet only in 9 households, and only 4 of them had soap. Prolonged droughts negatively affect poor households, especially women. Concerns about water quality in the village impose additional psychological pressure on them. Females are eager to change the situation but remain inactive in discussing water issues and reluctant to take steps and participate in decision-making related to water. Women should raise their voice and take lead in water management decision-making.

Keywords: women, nutrition, sanitation, water shortage, water quality, climate vulnerability.

1. Introduction

Population growth, on-going climate change, poor water infrastructure and water scarcity constitute the main challenges in achieving food and water security (Hanjra and Qureshi, 2010; Fahim, 2011; Gohar et al., 2013). Shortage of water is a threat generated by climate change, as it decreases the annual mean precipitation and river runoff (Xu et al., 2013).

Water availability is a crucial element of agricultural production. Climate change inevitably impacts rain fed and irrigation agriculture, since the demand for water increases, especially in low-humidity areas (Turrall et al., 2011; IFAD, 2015). In Central Asia, land degradation and poverty often correlate (IFAD, 2015). Thus, the poorest part of rural population suffer drought and land degradation impacts the hardest within their communities (Christmann et al., 2009).

In the majority of cases, females play the role of primary caregivers ensuring proper nutritional status of families, especially this of children (Gomes, 2013). Likewise, it is women who bear the burden of safe water supply to their family members, foremost to their children. Moreover, women are also responsible for domestic hygiene and sanitation – an especially difficult task in poor and arid areas. Long-term droughts and land degradation aggravate women's lives even more.

This paper aims to investigate the challenges women face while ensuring proper home nutrition in the context of water insecurity.

2. Location

Central Asia is characterized by arid and semi-arid land and low-humidity ecosystems (Mannig et al., 2013). There is also the intricacy of varying precipitation in rangelands, deserts, woodlands and

grasslands. In the long-run, shrinking glaciers will diminish the water flow of the Amudarya and some Syrdarya tributaries by about 25-30% (IFAD, 2015).

The study site – village of Shybran – is part of Alga Village located in Kadamjai District, one of the three districts of Batken Province in Kyrgyzstan. The geographic coordinates of Kadamjai District are 40°07'N and 71°44'E. As of 2014, Shybran Village officially had 507 inhabitants, including 249 females and 258 males; they comprised 127 100% ethnically Kyrgyz families. Shybran Village is located 12 km away from Alga Village. The main local water source is insecure, unprotected and is used both by humans and animals.

3. Methods

This research manifested a community-based cross-sectional study. The data was collected in 2014 by interviewing 20 low-income village households with at least one child under 5. Mothers and/or grandmothers then participated in informal conversations with subsequent written surveys in the Kyrgyz language. Focus group discussions were conducted with villagers. In addition, semi-structured interviews focusing on irrigation and agriculture were held with a set of respondents. The initial respondents recommended the following ones. This method – called snowball sampling – was applied while choosing respondents and interviewees. Later on, several experts underwent additional semi-structured interviews (see Table 1). Interpretation and narrative analysis constituted the main strategy for analysing interview outcomes.

Table 1. List of experts of semi-structured interviews.

Respondent number (interview date)	Occupation, affiliation
Respondent 1 (Sept 27, 2014)	Representative of Alga Rural Administration
Respondent 2 (Oct 2, 2014)	Representative of Shybran Village Administration
Respondent 3 (Oct 3, 2014)	Village resident, local leader, farmer
Respondent 4 (Oct 15, 2014)	FAO expert on agriculture and water resources management

4. Results

Diarrhoea, acute respiratory infections (ARI) and anaemia are common among local children under the age of 5. The study revealed that one month prior to the survey 30% of kids suffered from ARI and 60% had diarrhoea. 35% of child population experienced anaemia within the last year. The survey discovered that some children had recently fell victims of both diarrhoea and ARI.

The survey participants were inquired of their major daily challenges. The survey results suggest that water-related issues represent the highest concern which Shybran village women face every day. Both water shortage and low quality impede normal household life. Other most common problems stated were the lack of financial resources and frequent illnesses. Responding to the question about water, the local female residents said that it took them at least 30 minutes a day and a lot of effort to get water from the well located in the upper part of the village. Fetching water for household use left them less time for childcare.

While analysing low-income household behaviour, it was important to learn what actions they undertook in case their families grew larger due to the birth of a child or multiple children. 8 out of

20 respondents stated that at least one member of their family had migrated to another country searching for a well-paid job. 11 respondents said that they produced their food by either farming or breeding cattle. The remaining interviewees did not refer to any particular additional actions to sustain their families. Although 16 households stated having a land plot, only 10 of them used it for growing foods like wheat, potatoes, tomatoes, etc. According to Respondent 3, due to the extremely dry weather in the course of the last 2 years, the locals failed to produce any food at all. Lack of irrigation water makes Shybran residents vulnerable.

An observational analysis was conducted to assess hygiene. A respondent was asked to show the toilet facilities to detect the availability of soap and water in the vicinity of local sanitation sites. As the result, water was found in/near toilets (either in a jar, a bucket or ditch) only in 9 households. Strikingly, only 4 households had soap in their toilets. 7 households had no water available near toilet installations.

Traditionally, females are the main child caregivers as well as carry the responsibility of ensuring household food and nutrition. Thus, getting water for drinking and domestic purposes rests with them also. On average, they spend 30-60 minutes on fetching water to their homes.

5. Discussion

Water plays a crucial role in nutrition and food security. Water affects women's lives in Shybran Village in two ways. Firstly, they are responsible for safe water supply for their households. Secondly, they have to grow foods amidst water scarcity. The following subchapters will detail these two arguments.

5.1. Background

Geographically, Kyrgyzstan is in a favourable condition due to the abundance of water. In the Soviet time, water supply systems were built in approximately 1,200 villages around the country. The entire centralized water supply system was constructed by the Soviet government in the 1960's. Their service time was estimated at 30-40 years. According to Respondent 4, by the 1990's – when the Kyrgyz Republic became independent – the water system had dilapidated due to the insufficient funding allocated for reconstruction and renovation of the existing Soviet-time infrastructure. Since 2000's, the European Bank of Reconstruction and Development, Asian Development Bank and World Bank have been rehabilitating the drinking water supply system in the country.

5.2. Climate change

Since the time of construction of the domestic water supply system in the 1960's, the groundwater table had dropped from 10 to 15 meters. The well was designed to produce water with the groundwater level of 35 meters. The lowering water table prevents the previously built water supply system to obtain water. The failure of the local population to understand this issue and community resistance to collect money to contribute to building a new water supply system are the main impediments to restoring potable water supply. It is important to raise awareness on the importance of self-financing for the common good among local residents.

Kyrgyzstan's water resources are distributed unevenly in space and time. May, June, and July are usually dry with low precipitation and, thus, agriculture gets less water. Glaciers start melting in August. Respondent 2 stated that the last 3 years were extremely dry with very little rain. Due to this, farmers failed to do their work as trees and vegetables dried up. Since families cannot bring anything to their table, they tend to migrate to Russia searching for a better share.

Confirming Respondent 2, Respondent 3 said that frequent drought events made life in Shybran hard, and all their labour went in vain due to prolonged rainless periods. The same respondent also said, – “A human lives where there is water. Even animals do not live where there is no water. Where there is water, there is life, there are trees, there is agriculture, and a person can live a sustainable life”. He complained that 2014 was quite difficult for the population of Shybran Village. Only once in a 90-days period they had water to irrigate their land plots. “Please, tell me what plant, what farmer or what agricultural crop can survive without water for 90 days!?” - he said.

The main source of water in the village is the well. The quality of well water consumed by the locals is inadequate for drinking, as it contains too much salts and uranium compounds. Local men claimed that it was very hard to leave someone's birthplace, and that was why people continued to live in Shybran and drink the water available. According to Respondent 2, previously Shybran had around 400 families, but because of droughts they moved to Alga Village, and there were only 115 families left in the village. The closest bazaar (marketplace) where people bought food was in Khalmiyon. People have to survive under such harsh conditions.

This situation inevitably puts extra burden on women both physically and psychologically. Lack of medical care and shortage of safe water make their life in Shybran hardscrabble.

5.3. Water insecurity and women's burden in Shybran

According to Respondent 1, Shybran Village was the poorest village in Alga Administrative Unit mainly due to water deficit. The water supply system built during the time of the Soviet Union had degraded and required major renovation.

According to Respondent 4, poor-quality water caused a number of infectious diseases. The survey results led to the alarming assumption that Shybran children might be infested with an array of parasites. According to Respondent 4, there were 1,830 villages in Kyrgyzstan. After the collapse of the Soviet Union, water-related funding drastically reduced, and the cost of building an irrigation or drinking water system became very high. For a long time, Kyrgyzstan's potable water supply system was administered by the Ministry of Agriculture and, thus, all pertaining issues were considered together with irrigation matters.

According to village residents, they collected water in containers and had to wait for a long time before drinking it, as they had no other choice. Their children became sick and suffered from stomach pain. In addition to uranium contained in the local water, it became additionally contaminated because it had to stay in open containers for a long time. In other words, it means that they have no safe water, and this is the reality of Shybran residents. It was great news for them when the water level in the well grew. According to Respondent 3, although young people were offered a land plot in Shybran village, they were reluctant to take it, because it was impossible to make use of it without water. Every village family had members – both female and male – who had left for Russia with the lack of water as the only reason for that. If there was water, the young people would stay in the village, build houses, create families, engage in farming and develop. As the youth migrated, small children stayed with their grandparents, lacked proper care, drank polluted water and fell sick. The villagers got ill frequently with the potential reason for it being the water, although they were not sure. A small *fельдшер* (rural primary medical care) station was the only place in the village to get first aid like checking blood pressure and getting anti-fever medicine.

Since household chores are predominantly done by women, they are more willing to relocate than men. When questioned, the men explained their lack of desire to move to another village, because it was the land of their ancestors.

6. Conclusion

The purpose of this study was to investigate how women ensure nutrition and food security in low-income families against the backdrop of safe water shortage in Shybran Village in the southern part of Kyrgyzstan. They study revealed that it was females who primarily faced challenges associated with collecting water for household use and irrigating family kitchen gardens and land plots. Women were eager to change the situation but remained inactive in discussing water issues and reluctant to take part in decision-making related to water. In turn, this hindered their getting better education and jobs. Further research should include testing water quality to understand how it impacts the health of local residents including small children. Moreover, experimental research should be conducted to assess whether rainwater harvesting could enhance food and water security of the village.

7. Recommendations

Women should self-organize through traditional local gatherings, and use this platform to discuss the issues they face and become vocal during water management decision-making.

The non-commercial organizations focusing on gender should include senior women in their efforts as well, as they may suggest alternative water solutions.

Awareness-raising sessions on safe water and smart water use are recommended for conducting either in person or via sending digital educational materials to the areas with limited mobile and/or internet connection.

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Rural female health and water quality in Uzbekistan

Z. Tillyakhodzhayeva

Senior Research Associate, PhD Candidate, Hydrometeorological Research Institute of Uzhydromet, Tashkent, Uzbekistan; e-mail: tilla.79@mail.ru

T. Tillahuzhayev

Student, Medical School of AKFA University, Tashkent, Uzbekistan; e-mail: t.tillukhudjaev@akfauniversity.org

Abstract

The study aimed to detect the nosogeographic aspects of the influence of hydro chemical qualities of surface water on female health in Uzbekistan's rural communities. In the course of the research, the data on water resources and public health were converged into a single database and underwent GIS-visualization. The target data were obtained from the State Committee on Statistics, Center of Hydrometeorological Services and Ministry of Health of the Republic of Uzbekistan (RU). The investigation allowed establishing an increase in the number of reported cases in the lower streams of the main domestic rivers and canals, especially in Tashkent Region, and below the town of Chirchiq (Chirchik), as well as an elevated exposure risk in areas used for recreation by the public. Another important research observation is that the higher chemicals content, including the overall water mineralization of the Chirchik and Akhangaran Rivers, is caused by a high anthropogenic impact.

Keywords: climate change, Syrdarya River, water resources, mineralization, groundwater pollution, gender issues, public health, nosogeography.

1. Introduction

The global climate change has been orchestrating the alteration of the water regime in the whole Central Asian (CA) region. The challenges associated with watercourses' hydrological regimes and, thus, access to water have a strong impact on public welfare, as well as social and economic progress. In this context, the assessment of water resources and changes to hydrological cycle characteristics due to climatic and man-made factors is gaining utmost significance (Surface Water Resources of the USSR, 1969). Proper catering to subsistence needs, rational use of natural resources, environmental security and public health – especially of rural communities – are becoming priority tasks for Uzbekistan.

Despite the copious nosogeographic research, an evidence-based method of evaluating the impact of environmental factors against the background of deteriorating environmental situation – especially in terms of surface water chemical composition – is still lacking (Myagkov et al., 2010). Under such conditions, addressing female health issues is of foremost importance.

The research aimed to identify the nosogeographic aspects of the influence of hydro chemical characteristics of surface water on women's health in rural areas of Uzbekistan, with a special focus on Tashkent Region.

2. Research methodology

The study covered all 12 Uzbekistan's constituencies, Tashkent City and Autonomous Republic of Karakalpakstan. The 14 districts inside Tashkent Region were subject to a particularly detailed investigation.

The research utilized the data provided by the national State Committee on Statistics (Urban to Rural Population Ratio, 2020), Center of Hydrometeorological Services (*Uzhydromet*) under the Cabinet of Ministers, and Ministry of Health.

The data (collected via the hydro chemical post network) covered the period from 2004 to 2015. The cations (Ca^{++} , Mg^{++} , Na^+ , K^+) and anions (SO_4^{--} , Cl^- , HCO_3^- , NO_2^- , NO_3^-) were selected as priority indicators due to their relative stability and, thus, the possibility of both forward and reverse extrapolation. Soil salinity and water mineralization data were considered as well.

Disease prevalence in rural females was averaged over the period of 1996-2006. The following diseases in women of reproductive age were studied: infertility in females of childbearing age, diseases during pregnancy, labour and postpartum period, anomalies arising during perinatal period.

The relationship strength was determined based on the linear correlation coefficient (e.g., with the correlation module of ≥ 0.37 , the significance value equalled 0.05). Subsequently, digital nosogeographic maps indicating the distribution of water quality and disease prevalence were compiled based on the initial analysis outputs.

3. Statistical analysis of gendered prevalence in rural women across Uzbekistan

Based on the analysis, the correlation coefficient between the average number of anomalies arising during perinatal period vs. mean water mineralization equalled -0.54 ($r=-0.54$); and -0.29 ($r = -0.29$) –vs. the presence of contaminants in water. Thus, water mineralization could be one of the possible causes of conditions during perinatal period in rural women.

The correlation coefficient between the average number of infertility cases in women of reproductive age and mineralization of and contaminant content in surface water amounted to -0.47 ($r=-0.47$ and to -0.50 ($r=-0.50$), respectively. Thus, the analysis has pointed to the possibility of mineralization and presence of contaminants in surface water negatively impacting reproduction functions. Hence, it is possible to conclude that infertility in reproductive age females is linked with environmental factors.

The correlation between the mean soil disturbance and salinity values, on the one hand, and the mean number of recorded cases of high-risk pregnancy, childbirth and complications during postpartum period was likewise established ($r=-0.47$ for soil disturbance, and $r=-0.56$ for soil salinity, accordingly). These results also demonstrate that soil disturbance and salinity significantly influence the prevalence of the above-mentioned conditions.

Considering the above, infertility in females of reproductive age, as well as anomalies arising during perinatal period to a certain extent depend on soil and water quality.

4. Analysis of watercourse hydro chemical regimes and certain diseases in Tashkent Region

The detailed analysis of the data for Tashkent Region has allowed detecting a multivariate regression dependence of increased prevalence risk on the surface water mineral concentration.

The regression formula applied is as follows:

$$Y=7657-4.7*X_1+13*X_2+107*X_3+13.7*X_4+177*X_5+480*X_6-2.67*X_7-92.2*X_8,$$

where Y is the number of diseases registered in a district, X_1 is the total mineralization; and X_2 is calcium, X_3 is chlorine, X_4 is hydro carbonates, X_5 is potassium, X_6 is magnesium, X_7 is sodium, and X_8 is sulphates content.

The following principle was employed to select the most significant X_i factors: the relationship between effective and factorial features should be higher than inter-factorial relationship.

The resulting standardized regression equation applied is as follows:

$$YC = -0.21*X_1 + 0.11*X_2 + 0.33*X_3 + 0.11*X_4 + 0.24*X_5 + 1.36*X_6 - 0.011*X_7 - 2.19*X_8,$$

where Y is the number of diseases registered in a district, X_1 is the total mineralization; and X_2 is calcium, X_3 is chlorine, X_4 is hydro carbonates, X_5 is potassium, X_6 is magnesium, X_7 is sodium, and X_8 is sulphates content.

The determination coefficient was calculated at $R^2 = 0.38$ with moderate relationship. The analyses results can be utilized to forecast exposure to diseases due to the concentration of elements in the water courses in Tashkent Region with the wait condition of 0.67% (Myagkova, 2019).

The aforementioned methodology was used to calculate multivariate linear regressions for all districts in Tashkent Region. The corresponding factor values calculated based on standardized regression equations and determination coefficients are presented in Table 1 below.

Table 1. Factor values based on standardized regression equations and determination coefficients for districts of Tashkent Region (Tillyakhodzhayeva et al., 2019).

District	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	R ²
Akkurgan	-0.13	0.22	0.23	0.11	0.25	1.15	-0.01	-2.03	0.31
Akhangar	-0.18	0.14	0.34	0.15	0.22	1.18	-0.09	-2.01	0.29
Bekabad	-0.33	0.15	0.37	0.10	0.23	1.22	-0.02	-1.33	0.25
Bostanlyq	-0.22	0.38	0.29	0.21	0.27	1.44	-0.12	-3.21	0.38
Buka	-0.44	0.15	0.37	0.09	0.19	2.01	-0.09	-0.21	0.34
Zangiata	-0.22	0.23	0.27	0.12	0.14	1.27	-0.12	-1.18	0.38
Qibray	-0.38	0.34	0.33	0.14	0.28	0.97	-0.02	-2.11	0.37
Parkent	-0.27	0.21	0.32	0.11	0.22	1.24	-0.01	-1.78	0.34
Pskent	-0.33	0.21	0.42	0.12	0.21	1.56	-0.14	-2.91	0.37
Tashkent	-0.22	0.22	0.37	0.17	0.19	1.37	-0.01	-3.01	0.28
Orta Chirchiq	-0.32	0.12	0.36	0.12	0.22	1.33	-0.06	-1.81	0.34
Chinaz	-0.43	0.25	0.28	0.11	0.27	1.21	-0.24	-0.11	0.39
Yukori Chirchiq	-0.21	0.19	0.34	0.12	0.25	1.11	-0.12	-3.73	0.37
Yangiyol	-0.31	0.27	0.35	0.10	0.23	1.26	-0.08	-2.88	0.29
Tashkent Region	-0.21	0.11	0.33	0.11	0.24	1.36	-0.01	-2.19	0.38

The table demonstrates that the hydro chemical regimes of water courses impact the overall disease prevalence to a significant degree. Moreover, the districts with highly-developed industry are more prone to the impacts of other factors not included in the equations (Tillyakhodzhayeva et al., 2019).

5. Discussion

The nosogeographic mapping has shown that even within zones used for recreational purposes by urban residents (Bostanlyq and Parkent Districts) local communities face the risk of higher incidence stemming from the fact that the latter – living in mountainous and foothill areas – use spring water lacking chemical elements essential for human health for drinking.

The analysis of nosogeographic maps has also demonstrated a substantial growth in the number of registered cases in the lower streams of the main domestic rivers and canals, especially in Tashkent Region and further below the town of Chirchiq.

The analysis of the hydro chemical regime of surface water bodies within the Chirchiq and Akhangaran River Basins has exposed an ascending concentration of chemical elements along the river course, including the overall water mineralization due to strong anthropogenic influence on river basin water resources.

The statistical analysis has pointed to a definite correlation between possible causes of infertility in females of reproductive age, complications during pregnancy, labour and postpartum period, as well as developmental abnormalities during perinatal period, on the one hand, and the levels of water mineralization, soil salinity and contaminant content in surface water, on the other hand.

6. Conclusion

The risk of growing disease incidence is contingent on the spacial variability of natural and socio-economic impact factors. The research results allowed establishing that while river water mineralization was minimal in their upper sections, it massively scaled up in downstream sections. Thus, the lack or excess of essential elements in water leads to higher prevalence of certain diseases. Simultaneously with natural factors, human-induced water pollution and land degradation also significantly deteriorate female health.

7. Recommendations

It is necessary to conduct regular nosogeographic surveillance using modern GIS technologies and applications to observe the dynamics of emerging incidence trends in rural communities, as well as to take timely prevention measures to mitigate the corresponding risks.

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Chapter III.

Women in water resource management

Women in Water User Associations of Central Asia

Minura Begishbek kyzzy

Master Student of IWRM, German-Kazakh University, Almaty, Kazakhstan; e-mail: begishbekovam@gmail.com

Abstract

The article overviews women's role in Water User Associations (WUAs) of Central Asia compared to other countries. The comparative analysis targeted Central Asian countries and Nepal, India, South Africa and Azerbaijan. The literature review in the article identifies the main features of the methods used in these countries to expand the role of women in WUAs. For instance, to empower women Kyrgyzstan has adopted the Decree "On Measures to Improve Gender Policy", which has led to significant changes, i.e. the share of women working in the water sector has increased up to 25% (Sakhvayeva, 2007). Similar changes are observed in Kazakhstan, where women are becoming WUA leaders. In Tajikistan and Uzbekistan, whose citizens often go to work abroad, women become leaders of WUAs thanks to state and non-governmental organizations. The most important point is that women in WUAs face water resources management challenges always and everywhere. Research shows that gender mainstreaming within the framework of WUAs aims to reduce the existing and future gaps between male and female water users, as well as their responsibilities and needs in water management.

Keywords: water user association, gender role, Central Asia, women, water management.

1. Introduction

Governments and international organizations around the world are exploring various options to increase women's participation in irrigation, strengthen their right to use, and transfer responsibility to them (Vermillion, Sagardoy, 1999; Shah et al., 2000). The United Nations Water Conference in Mar del Plata in 1977 (UN Water Conference Report, 1977) and the International Conference on Water and the Environment in Dublin (Dublin Conference, 1992) clearly stated the central role of women in the provision, protection and management of water resources. The international water decade has highlighted the importance of boosting women's participation in all water-related development events and actions, as well has acknowledged women's knowledge and capacities as water decision-makers and managers.

The widespread trend of transferring water management responsibilities from the state to local user groups and/or communities tends to ignore the impact of authority differences within communities on water management efficiency and equity. Gender manifests a constant source of such differences (Zwarteeven, 2001; Prachandra, 2016), despite the fact that it is females who represent the key water users in water user associations. The reason for this is that women are not sufficiently aware of WUA structure and tasks, and therefore do not actively engage in management and decision-making inside WUAs.

In addition, the balance between costs and benefits of participation is often negative for women, since compliance with institutional rules and practices assumes significant time input and social risks. Women's more formal participation in WUA efforts can strengthen their negotiating positions as resource users in households and communities (Merkleit et al., 2012). Greater involvement of women can also improve the effectiveness of the organization by improving women's compliance with institutional rules. A further detailed research is necessary to identify the root causes affecting women's participation and strengthening their role within WUAs.

The article explores women's role in WUAs of Central Asia and compares it with the situation in other countries.

2. Water user association and women membership issues

A WUA is a group of water users – irrigators – pooling together their financial, technical, material, and human resources to operate and maintain a water system (Sakhvayeva, 2012). WUA usually selects managers, resolves internal disputes, collects fees, and ensures maintenance. In most cases, WUA membership depends on a person's physical residence and/or location of his/her land plot near a water source such as a water well, canal or natural river.

The relationships among WUA members are often non-formal and depend of the status in the local community oftentimes strongly affected by gender stereotypes. This is the first and utmost prerequisite of women's engagement in WUAs. With respect to irrigation, women tend to view themselves as supporting their husbands and believe that men are capable of satisfying water-related household needs better at the level of a local community (Zwarteeven, 2001; Prachandra, 2016). This situation can be observed across the board and clearly illustrates the well-known "classical" gender roles in socio-economic spheres: women – internal and men – external activity (Blackstone, 2003).

3. Experiences of enhancing women's role in water user associations

The 20th century was the era of changing women's roles in politics, economy, law, culture, and science. They became increasingly involved in making important management decisions, and their social status grew more and more stable. Moreover, these changes did not fully penetrate the water sector. The overview of the enhancing and changing women's role in WUAs based on several country-specific cases is presented below.

3.1. Kyrgyzstan

The social norms within the Kyrgyz society – still dictating male dominance in public spheres – limit women's ability to lead, attend and/or vocally contribute to community meetings (Van Koppen, 2001). However, water access does not dependent solely on participation. Zwarteeven and Neupane (1996) demonstrate that women can effectively use informal means to access water and resolve conflicts.

March 20, 2006, Kyrgyzstan adopted the Decree "*On Measures to Improve Gender Policy*" that aimed to cover at least 30% (Sakhvayeva, 2007) of women working in state and local government agencies, including in management positions. As the result, the number of female deputies in the national parliament has increased from 0 to 25% (Sakhvayeva, 2012). Significant changes have likewise taken place in the National Committee on Water Resources and Land Reclamation and its subsidiaries, where previously women made up only 19% of the total number of water specialists and managers in the country. The same ratio was typical for other basin-level water management organizations.

Overall, the international donor community has been promoting the creation of WUAs with the membership of female farmers as the ultimate path towards successful and sustainable irrigation management (Sehring, 2009).

3.2. Tajikistan

Due to the high outflow of male population from rural areas in Tajikistan, the number of women managers in farms and WUAs has been increasing (Balasubramanya et al., 2016) in the country. Over the past five years, the number of female-headed farms has grown from 4,237 in 2009 to 14,014 in 2014, i.e. 13% of the total number of farms in the republic (Khasanzoda, 2015). Many studies show that the majority of women become heads of households and WUAs thanks to international organizations. WUAs created by non-governmental organizations have a higher percentage of female-headed households as their members compared to other WUAs, although the difference is statistically insignificant (FFP Tajikistan, 2013). Often, this difference results in women not being aware of WUA existence, yet another time indicating that women are excluded from the information-sharing networks operating on the community level and notifying stakeholders about WUA events. Active engagement of all farm managers, including women, as WUAs members is seen as an important step towards the overall success and longevity of water management.

3.3. Uzbekistan

After the collapse of the Soviet Union, male labour outward migration became an important source of income in Uzbekistan. As of June 1, 2019, 2,234,737 Uzbek migrant workers were registered in Russia, and in 2014 there number was 2,551,309 (Burdiak et al., 2019). That has led to new responsibilities for women in the agricultural sector, as they had to learn to organize their time to attend to additional and hard farming tasks.

The expansion of WUAs has become a promising social innovation expected to lead to improvements for all (Manschadiet et al., 2010). However, it has not yet affected women in WUAs. They continue to lack irrigation water risking their own and their families' livelihoods. Women have special needs and interest in having a reliable and sufficient access to water to continue growing crops. Water is vital for their existence, livelihood, health and life.

The recent cases show that the increasing women's role in Uzbekistan's agricultural sector is achieved at the expense of time, health and, ultimately, lives of women. A typical day of a farmer wife in a WUA starts at dawn and can last until midnight with a short break due to extreme mid-day heat (Kim, 2018). Such women also contribute to community-level water management by managing water distribution and controlling the shared resources.

3.4. Kazakhstan

Agriculture is the most important economic sector in Kazakhstan. Starting 2010, the domestic industry as well as farming have undergone radical changes (Herve-Bazin, 2008). In Kazakhstan, WUA establishment rendered a unique opportunity to strengthen the still intact social cohesion left by the former Soviet water system (Van Koppen, 2001).

The studies by international and non-governmental organizations have shown that WUA membership requirements – favouring men “in positions” within a community, such as land owners or household heads – systematically exclude women from participating in these organizations (CAP-NET/GWA, 2014), even though they are the key water management stakeholders. However, the country's striving towards gender balance is proved by the fact that women do work in positions allowing them to make decisions and/or become leaders. For example, in 2008 the Committee on Water Resources under the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan had 34 staff, including 16 women (Omarbekova, 2008). Similar positive indications are

present in WUAs in Kazakhstan. The main reason for this is women's desire to make decisions and their ability to combine non-household and household tasks.

4. Discussion

4.1. Central Asia

The relevancy of this study is proved by the fact that the Central Asian agricultural policy continues to be dominated by the idea that “farmers are men” and women’s role is to be home keepers and helpers (Shiva, 1991). This is explained by ethnic peculiarities and the overall high attention to family and children among Central Asian women. Women are more engaged in household work, which is quite hard physically but very difficult to evaluate in material terms. Even if men’s and women's water needs are the same, their opinions and preferences in decision-making, for instance, on irrigation scheduling may differ (Meinzen-Dick and Zwarteween, 1998).

WUAs in Kyrgyzstan and Kazakhstan have traditional male-dominated norms restricting women from assuming official roles, making decisions, attending meetings, and expressing their views within communities. Females’ low involvement in water management is often explained by their poor public speaking skills, low level of education, lack of recognized authority, sparse participation and disregard for their opinions (Agarwal, 1997). Nevertheless, women’s desire to better understand and know their rights leads to positive changes. This is evidenced by the fact that in recent years an increasing number of females have become water sector leaders in both of the aforementioned countries.

In Uzbekistan and Tajikistan, the importance of women in agriculture became apparent after the collapse of the Soviet Union because of the mass migration of men to work abroad (mainly to Russia) and women being forced to run households on their own. They became actively involved in and made decisions on farming. As the result, they received recognition as key WUA members. Special national-level programs are undergoing development to strengthen and expand the role and education of women in WUAs.

4.2. Comparison of Central Asian and other countries

Zwarteveld and Neupane (1996) make it clear that the gender situations in Nepal and Central Asia are similar. In the beginning of WUA creation, politicians and/or husbands had often played a stronger role that ultimately undermined women’s credibility as competent water user representatives. However, the Nepali women from remote villages were able to transform the entire rural economy by joining line water and commercial agencies/departments, and that, in turn, allowed them improving their status.

In Azerbaijan, with the help of non-governmental international organizations the role of women in WUA is expanding thanks to training efforts. Various seminars, workshops and courses have helped to increase women's knowledge on WUA management and decision-making. In general, there is no yawning gap between Central Asia and Azerbaijan as to female participation in water resources management via WUAs. The education level among women farmers is 30% higher than in Central Asia (Merkleit et al., 2012). The high educational potential of rural women helped to improve their ability to share knowledge and skills, as well as conduct professional trainings focusing on agriculture and water management.

In South Africa, women produce 70% of food (Aureli and Brelet, 2004) making them the main water users and managers in the agricultural sector (Singh, 2006). Compared to Central Asia, South African WUAs have indeed become a mechanism for enabling local populations to manage water

resources effectively and fairly. There, WUAs facilitate provision of water to local women (Taylor, 1996).

As in Central Asian countries, in India irrigation is perceived as the male's domain and men are considered the main participants/beneficiaries of thematic programs and policies by the government and development agencies (Von Benda-Beckmann, 1998). Even if women play an important role on a farm, they do not participate in development interventions. Men and women often make decisions on land use and crops together, but men are the ones mostly deciding on irrigation issues. At the community level, irrigation-related decisions are usually made in forums with often poor female representation.

The comparison of Central Asia with other countries like Nepal, Azerbaijan, South Africa, and India shows that the challenges and needs of women in WUAs are the same. However, the approach to addressing them varies depending on a country, knowledge and cultural values. This requires the exchange of methods and experiences among countries.

5. Conclusion

The review of the women's role in WUAs has shown that gender issues are still relevant in water management. Until now, irrigation and water management were considered a "men's job". However, the best practices in Nepal, Azerbaijan, South African Republic and India demonstrate that the role of women in this sphere is extremely important, and their active engagement in management increases water use efficiency and expands economic opportunities. In addition, it allows women in WUAs to benefit from information-exchange systems, as well as enhances availability of new agricultural technologies and innovations to ensure adequate, reliable and equitable water distribution.

This study demonstrates the importance of considering the increasing women's role within WUAs based on real-world examples. Although specific and unique in their own way, they are present in each case of WUA with female membership. The economic stability of women in WUAs is a necessary prerequisite for maintaining the structural environment for initiating and resolving water issues.

6. Recommendations

The review has led to the development of the following recommendations, which can help enhancing women's role in WUAs:

- hold courses, trainings, and seminars for women to improve their skills and knowledge on WUAs;
- exchange experiences and knowledge among women in WUAs between Central Asian and other countries by conducting short study-trips and/or online events;
- create cost-effective incentives to support rural women's participation in WUAs, for example, based on small grants;
- develop guidelines and/or recommendations for women in WUA.

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Climate change and access to water resources: challenges and solutions for women entrepreneurs in agriculture

Anastasiya Korenkova

private entrepreneur, Almaty, Kazakhstan; e-mail: arbatalm@gmail.com

Abstract

This article reviews the efforts by an informal network of rural women entrepreneurs in Kazakhstan. The network operates based on mutual assistance among members. Its main action areas inter alia include: rendering administrative support to rural women; designing solutions to ease women's physical labour burden; developing eco-technologies in agriculture; introducing sales practices from developed countries; informing higher authorities on rural challenges. Lack of drinking and irrigation water, power and POL supply disruptions constitute the main challenges for female farmers. Addressing them often places additional physical burden on them. However, examples of alternative eco-solutions do exist. The overall conclusion is that infrastructure rehabilitation and maintenance, construction of new facilities, as well as targeted financial assistance to single rural women entrepreneurs shall contribute to Kazakhstan's future development.

Keywords: women in agriculture, farm products, handicraft production, small-scale production, water resources, heat impacts, rural challenges.

1. Introduction

Whatever difficulties can be surmounted if not being afraid of them, approaching them in a systematic way, always searching for solutions and believing in oneself and in one's strength, as well as doing one's favourite occupation with love (in a feminine way), and thereby inspiring others for accomplishments.

Our women unite with the aim of assisting each other. Each of them is engaged in her own sphere, but there are shared aspirations as well like ensuring employment stability and facilitation, labour transparency and substantial social guarantees. Some of them are more active in monitoring legal changes, and assist others in resolving legal and paperwork issues. Others are vigorously supporting their colleagues in setting up product sale and delivery models, as well as product design and service frameworks. Our principles are mutual help in finding new solutions, environmental friendliness, honesty and conscientious work. We jointly set our goals, prioritize tasks and respond to challenges emerging on the way. Our informal association consists of women entrepreneurs operating in Almaty City and Almaty Region.

2. The network's scope of action

Our network focuses on rendering mutual assistance among rural women entrepreneurs.

2.1. Support to rural women

Farming is physically hard. For many, survival in modern market conditions is extremely difficult and uncertain. Extending support to female farmers willing to work and even expand their livestock or crop production businesses rather than shifting to other "physically easier" sectors is vital. It's worth noting that without the use of sophisticated equipment, chemicals, and commercial leavens, etc. rural small-scale production mostly survives thanks to women. It is also important to keep in mind that this business model is at the heart of eco-friendly food production in Central Asia.

Women members of our association need help with organizing sales, legal assistance, as well as support in executing and submitting paperwork to relevant authorities, etc.

2.2. Promoting eco-practices

Searching for and deploying alternative eco-solutions to minimize costs and ease the physical labour burden on women manifest the most important aspects of our efforts. For example, fermentative beddings for pig and goat breeding significantly reduce the amount of physical work, as using them eliminates the need to clean barns daily, kills the unpleasant smell, and upon completion of estimated service life they can serve an excellent fertilizer.

Eco-friendly agriculture excluding the use of antibiotics and other chemical additives is quite relevant today. However, breeding cattle capable of surviving without special feeds and antibiotics poses certain risks. For instance, while raising pigs or goats capable of yielding progeny – which, in its own turn, will be able to survive without antibiotics – one should be ready for a significant share of animals dying. On the one hand, it's worth it because this way we get genuinely “clean” meat and milk. On the other hand, such production model is not sustainable without additional support.

2.3. Introduction of sales practices from developed countries

It is impossible to build trust between producer (seller) and customer (buyer) without a sense of stability and confidence in the future among farmers. Favourable legal and infrastructure conditions will foster direct product delivery to urban communities. Elimination of resellers will allow urban residents interacting with real farmers as well as establishing trust between them.

2.4. Promoting favourable working conditions

Neither extreme heat waves nor water shortages or power outages should bother producers. Local authorities, investors, and state programs can assist in addressing these tasks. It is the mutual solidarity among women entrepreneurs which makes it easier for them to communicate their needs to policy- and decision-makers with respect to [local- and regional-level] development.

3. Major rural challenges

3.1. Lack of potable water

During extreme heat waves, drinking water deficit due to improper distribution and/or inadequate maintenance of wells is becoming increasingly acute against the background of climate change. As the result, farms are forced to stock up on water in advance, buy additional water and/or install additional equipment for collecting drinking water.

3.2. Lack of irrigation water

It is extremely important to provide plants with enough moisture during vegetation season. Amidst the lack of irrigation water, female farmers are forced to collect it in advance and carry it to the field manually to irrigate seedlings. This leads to the increased physical labour burden, decreased production, and higher self-costs.

Alternative solutions are not accessible for self-employed women farmers due to their high price. Under the condition of a reservoir or river present nearby, the most convenient approach is installing pumping stations, water collection systems, wells, and drip irrigation systems.

3.3. Power supply disruptions

Operation of air conditioners (in hot season), pumps, and additional lighting increases electricity consumption. As the result, power supply networks cannot cope with overload, and chain blackouts

occur. It's obvious that generating capacity and power grid put through capacity do not meet the current requirements of rural energy consumption.

3.4. Growing fuel consumption

Most often, our women use generators to deal with electricity supply shortages. The constantly growing fuel prices, as well as fuel shortages in the high sowing and harvesting seasons lead to increased production costs and a more complicated production process.

Biogas installations represent a very good “green” solution. This power generation technology allows utilizing waste products as fuel and does not significantly impact the environment. Considering the fact that 1 m³ of biogas provides the same amount of thermal energy as firewood (3.5 kg), coal (1-2 kg), and electricity (9-10 kWh) (Teplo Proyekt, 2020), it is a fairly cost-effective solution, although not suitable for all types of production, as it requires uninterrupted access to raw waste materials.

4. Conclusion

A significant share of rural challenges has to do with the overall deterioration of infrastructure, including the dilapidation of power grids and water canals, irrigation reservoir leakages, as well as with the lack of qualified personnel. Practically all infrastructure available today is the legacy of the Soviet era. After Kazakhstan gained independence, the lack of funds allocated for support, maintenance, replacement, and development of technical facilities, as well as poor compliance control and outflow of qualified personnel have created an avalanche of corresponding issues. As of today, the government has developed a water resource development program (Official information resource of the Prime-Minister of the RK, 2020), aimed at improving the situation. Some of the pertaining issues can be addressed by attracting investors.

Construction development of pasture zones significantly complicates cattle breeding. In addition to losing pastures, agricultural reservoirs get drained or become inaccessible.

During severe heat, plants and animals need additional moisture. Lack of water results in decreased milk yields, poultry stops laying eggs, vegetable and fruit-berry crop yields drop also. Moreover, water deficit leads to the increased pest pressure affecting product quality, competitiveness and price. Thus, it is vital to address rural water issues as quickly and efficiently as possible.

Very often, it is women who keep rural households alive. They collect water, do household chores, as well as take care of cattle, plants, grow foods and sell them. Physically, women are weaker than men and, thus, face additional difficulties.

The life of a rural single woman is the most difficult. Alone or with older children, she has to provide for herself and her dependants, as well as do business. Under such conditions, child labour becomes inevitable leading to decreased education among the younger generation and, as a result, to rural degradation in general. Infrastructure rehabilitation and maintenance, construction of new facilities, targeted financial assistance to single women farmers manifest an investment into our country's future. In addition, the corresponding measures shall decrease internal rural-to-urban migration, strengthen our economy, as well as will render opportunities for all these willing to do their own business without extra burdens.

In the recent years, the on-going issues described above have led to decreased volume of eco-products from small-scale producers sold at markets in Almaty City and Almaty Region, increased imports and lower quality of consumption goods. According to experts monitoring Kazakhstan's

economy, as of the end of the 2nd quarter of 2019 the cow population in Kazakhstan amounted to 3.8 mln heads (Sputnik, 2019) or 1/5 of a cow per each resident of the country.

Based on statements by rural residents of Almaty Region, over the past decades the number of cows in farmsteads has substantially fallen due to the growing number of unresolved issues. For instance, in the village of Kyzyltu-2 close to Almaty City only two households are currently keeping cows.

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Spain's experience of women representation in governance as an example for Central Asia water management

Zhaniya Khaibullina

PhD candidate, al-Farabi KazNU, Almaty, Kazakhstan; e-mail: khaibullina.zhaniya@gmail.com

Minura Begishbek kyzzy

Master student of IWRM, Kazakh-German University (KGU), Almaty, Kazakhstan; e-mail: begishbekovam@gmail.com

Diana Aripkhanova

Master of IWRM, Kazakh-German University (KGU), Almaty, Kazakhstan; e-mail: diana.aripkhanova@mail.ru

Abstract

This article aims to review women's representation in governance in Spain as an example for Central Asian (CA) water management institutions. The comparative analysis focused on Spain and CA countries, namely Kazakhstan and Kyrgyzstan. The review allowed identifying the main features of methods used in these countries to increase women's role in water institutions. To mainstream gender, Spain has adopted an ambitious national policy aimed at pushing up the number of women engaged in the sector, overall women's participation and changing water management practices. The most important point is that women in Spanish water institutions enjoy support under gender equality legislation. Female representation in water management in the country targets reducing the existing and future gaps between male and female water users, their responsibilities and water management needs.

Keywords: gender, Spain, equality, water governance, women, representation, Central Asia.

1. Introduction

Water management has always been an important matter in Spain. Many countries have national policies stipulating for equal men's and women's representation in water management, and gender equality in access to and control of water resources. However, their [policies'] effectiveness largely depends on the extent to which governments actually integrate these strategies in the "physical" government framework, finance them and measure their impacts on women, families and communities. Spain has adopted an ambitious national policy to increase the number of women working in the water sector, expand women's participation and change water management practices (Organic Act 3/2007, 2007). More importantly, Kazakhstan and Kyrgyzstan have adopted formal mechanisms to ensure that gender policies do not just sit on the shelf – designated gender focal points were introduced to human resources departments without any budget or support.

This paper aims to review female representation in the Spain's governance sector as an example for Central Asian water management institutions.

2. Research area

The total area of Spain is around 509,000 km², and the average annual precipitation is 649 mm (EEA, 2019). Spain is divided into 9 Hydro graphic Confederations, one per each big river in the country (taking into account that 4 rivers are shared with Portugal: Miño, Duero, Tajo and Guadiana). According to Aqueduct (<https://aqueduct.io>) – the data platform run by the World

Resources Institute – Spain suffers a high level of water stress (3.74), very similar to Uzbekistan (3.82), Greece (3.80), Afghanistan (3.80), Algeria (3.69), Tunisia (3.67), Syria (3.64) and Turkey (3.56). The main reason of being listed among desert and/or semi desert countries is that Spanish population is very high, and every year Spain receives millions of tourists who need affordable water. Moreover, according to the European Environment Agency, (Ministry of Agriculture, Food and Environment, 2014) “... between 1990 and 2017, annual renewable freshwater resources per inhabitant decreased in southern Europe from 2,800 to 2,400 m³ per person in general, and in particular for Spain the reduction was -65%”. In addition, we should take into account that 14% (Price Waterhouse Coopers, 2018) of the total water consumption falls on urban communities. Another 67% of water consumption falls on the agriculture – the most relevant segment in terms of economic value and number of consumers.

3. Water governance in Spain

Spain’s water governance system combines measures to manage demand and supply. Emphasizing the efficient use of the resource as a guarantee for the implementation of a sustainable model is efficient in ensuring supply for all uses in all parts of the country and environmentally friendly as per the most stringent requirements of European legal water- and environment-related regulations.

Spain’s water governance is based on the application of two main tools: integrated water resources management via *Hydro graphic Confederations* and *Hydrological Plans* (European Rivers Network, 2020). A hydrological plan comprises infrastructure (dams, reservoirs, desalination plants, water transfers, etc.) and non-infrastructure (management, information and communication systems, etc.) measures and represents a joint integrated action framework. Each river basin district has a Hydrological Plan as part of the joint National Hydrological Plan. Moreover, there are special plans regulating the coordinated use of surface, desalinated and re-utilized water.

As per the Spanish law, water is deemed a public resource and falls within what we call the public domain water resources, i.e. public (government) administration always exercises its ownership over it. Consequently, access to water is regulated by law determining which uses are freely accessible. It is possible to distinguish two main types of use:

- common uses: general uses (directly from natural waterways for drinking, bathing, watering livestock, etc.) governed by the principles of freedom, gratuity, and equality requiring administrative authorization; and special uses (navigation, etc.) involving special circumstances/regimes based on hazardousness and/or use intensity which may curb proper conservation of the public water domain; for this reason, the aforementioned principles do not apply, and such uses are subject to administrative authorization;
- private uses: types of use which can potentially limit and/or exclude usage of the public water domain (water supply to towns, irrigation, hydropower plants, etc.) by others, whether involving consumption or not.

4. Female representation in governance

4.1. Spain

In Spain, the legal change on equality has already confirmed one tendency: it is normal to see women empowered, leading companies and ministerial departments. This mentality has been consolidated for two decades at least and – although there has not been a female prime minister – women occupy the posts of presidents in some regions. This has become a tangible effect of the

Law on equality: more women have received an opportunity to demonstrate their value, capacities and skills to the wide public, which it appreciated.

The Spanish Constitution ensures the equality of men and women – both genders have access to high-level positions in public and private institutions. The European institutions set a milestone to enhance female presence in executive bodies, as they lobbied to introduce some legal amendments to the Spanish legislation, such as the concept of “Party democracy” (Party Democracy, 2020), i.e. “equivalent participation rates for women and men, within the 40 to 60% range of representation, in the full democratic process is a principle of democracy”.

In 2007, Spain’s government suggested a new legislation, and the parliament passed the *Act for the effective equality of women and men* (Organic Act 3/2007, 2007). In the very beginning – before the actual articles – it acknowledges “...the Law provides, in order to achieve this real and effective equality between women and men, a general framework for the adoption of the so-called positive actions”. One of these measures is equal access or parity for both men and women (50%, or the more flexible version of around 40-60%) in drawing the lists of candidates for deputies, senators, local counsellors, etc. and any public bodies and/or institutions in general.

Besides that, every year the National Institute of Statistics studies the percentage of women at every level of administration and on executive boards of the main companies. This year (2020), 58.8% of ministers are women (Biswasand Tortajada, 2003). In the context of this article, it is noteworthy that as of January 13, 2020 Ms. Teresa Ribera Rodriguez has taken the post of the Minister for Ecological Transition and Demographic Challenge, supervising *inter alia* the Office of water resources headed by Mr. Teodoro Estrela Monreal (Royal Decree 7/2020, 2020). Although the publication of the data on members of every single public body and/or institution is compulsory, gender-based disaggregation (male/female) of this information is still not easily affordable.

4.2. Central Asia

Providing women with 30% of leadership positions constitutes an essential goal, which Kazakhstan has identified on its development path. Based on the 2015 data, 20% of seats in the upper chamber of the national Parliament (Senate) were occupied by females, yet for the lower chamber (Majilis) this indicator was only 6.4%. In local provincial representative bodies, women made up 12.6% of the total number of members. In January 2016, 55% (or 50,219) of all civil servants were women, with 9.7% (or 40) of them designated for political positions. Women constituted 36.6% of the diplomatic service with 6% occupying senior positions (UN Human Rights Committee, 2016).

Empowerment of women in Central Asia is lower than in Spain. Social norms dictating male dominance in public spheres limit women’s ability to lead, attend, or vocally contribute to community meetings (Van Koppen, 2001). However, international organizations have been mainstreaming the process, and the number of women in governance has increased – for instance, in the Parliament of Kyrgyzstan it is 25% (Sakhvayeva, 2012). The trend has led to the larger number of women in the National Committee on Water Resources and Land Reclamation – highest-tier water management agency. As in Spain, this effect can be extrapolated to the whole region of Central Asia – general increase of female members in the government leads to the growing women representation in water management.

5. Discussion

In water resources management, achieving gender equality and creating conditions for women’s development manifest important factors for the overall sector’s progress. Inefficient use of the

capacities offered by the female half of the population – deprived of equal opportunities to implement their life plans and tasks – results in continuing tensions at the level of interpersonal communications, institutional relations and, in general, between citizens and authorities.

The establishment of women's water groups within national and sub-national legislatures can serve as a focal point for advocacy, legislation, and policy funding promoting inclusive water policies with respect to all the aspects of water resource planning, development, and management. In countries where the legislature approves the appointment of regulators, the water faction in the legislature may also have an impact on increasing the number of female water regulators.

Lawmakers and ministers can push for reforming recruitment, promotion and performance management practices in water-related ministries and agencies to enable more women to enter and advance in the roles of increasing responsibility and influence. Simultaneously, ensuring that well-funded programs are available to develop women practitioners through mentoring, peer networks, technical training fellowships, knowledge management, and leadership training can help both men and women overcome traditional barriers and start creating new norms for women's roles in the water sector.

6. Conclusion

As effective as water assemblies are, creating a more egalitarian representation in the legislature takes time and effort. Barriers include social stereotypes about women's leadership and partisan political groups that do not want to include women in their ranks. Breaking down these attitudes will require time, yet targeted steps can speed up the process of change: encouraging women to exercise their right to vote, introducing minimum quotas for women's participation in elected bodies and political appointments, urging political parties to actively recruit women leaders, and promoting stricter gender-disaggregated data to better understand factors that hinder official female participation.

In economic areas such as urban planning women can influence water management by providing policy makers with valuable services to identify both occupational and environmental hazards in order to minimize water scarcity risks.

7. Recommendations

According to the abovementioned conclusions, the authors recommend the following:

1. Use the concept of parity democracy allowing equal or equivalent female/male participation in water management ranging from 40 to 60 %, as in Spain;
2. Apply the Spain's experience of implementing legislation on women rights and their representation in the governments of Central Asia;
3. Foster experience- and knowledge-exchange among women experts in Spain and CA.

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Gender Distribution of Labour in the Water Sector of Uzbekistan

Makhzuna Alizhonkizi Bozorova

National University of Uzbekistan named after Mirzo Ulugbek, PhD student, Tashkent, Uzbekistan,
email: mahzuna.bozorova@gmail.com

Abstract

This research aimed to investigate men's and women's representation among management personnel and in household routine. According to the research outcomes, water sector leadership positions in Uzbekistan are occupied mainly by men, while women are generally responsible for household water-related duties.

Keywords: Uzbekistan, gender, water sector, Mass Media, press.

1. Background

Water is a strategic natural resource for any state. Provision of water, sanitation and hygiene services to population contributes to the overall economic development of a country. However, the emerging issues with free public access to water directly impact intra-family relations, attitudes and values. The gap between men and women as to possibilities for self-fulfilment and personal development is rapidly widening as a result of expanding household management duties of the latter propelled by the growing water deficit and worsening sanitary conditions. Thus, the relevancy of this research is determined by the need of scientifically studying gender-based distribution of labour in several domains of Uzbekistan's water sector with the aim of eliminating the existing gender asymmetry and stereotypes about women in the industry.

The aim of this research was to analyse men's and women's engagement in management and at home.

2. Research region and methods

The Republic of Uzbekistan (RUz) is located in Central Asia and borders on Kazakhstan in the north and northeast, Kyrgyzstan and Tajikistan in the east and southeast, Turkmenistan in the west, and Afghanistan in the south. As of December 14, 2019, the population of the RUz amounted to 33 mln 902 thou. 435 people (Official website of the State Committee on Statistics of the RUz, 2019). The number of women and men in Uzbekistan is almost equal: the former make up 49.75% and the latter 50.25% of the total population. Almost equal shares of women – 50.75% and 49.25%, and men – 50.3% and 49.7%, respectively, live in urban and rural communities (Statistics on women and men balance..., 2017).

The works by Uzbek researchers – *Peculiarities of Gender Aspects in Uzbekistan* by I. Akhmedkhodzhayeva (2007), *Gender and Water in Central Asia* by G. Stulina (2008), and *Gender, Agriculture and Rural Development in Uzbekistan* (2019) – laid the theoretical foundation for this paper. In addition, the author used the data of the national State Statistics Committee, Ministry of Water Management, and Ministry of Agriculture, as well as these of the Asian Development Bank, etc.

In the course of the study, the author applied theoretical methods (action methods: problem setting, hypothesis building, proving; operation methods: analysis, synthesis, comparison, instantiation, generalization, induction, deduction); and empirical methods (operation methods: review of literature, documents and activity outputs).

3. Household water and sewage supply

According to Uzbekistan's SCS, in 2008 potable water supply covered 75.3% of households (Statistics on drinking water supply of apartments (houses)..., 2018). The highest values (above 90%) were registered in Andizhan and Tashkent Regions, as well as Tashkent City; the lowest (an average of 40%) – in Bukhara and Khorezm Regions. Meanwhile, “only 17% of water users in urban and rural communities have continuous access to water, and over 65% of users receive water for less than 6 hours a day” (Sustainable Development Goals, 2018). It's worth emphasizing that unlike urban residents; villagers with centralized water connection can also utilize additional water sources. In particular, “97% of such rural households use external taps, 27% use water pumps located in their yards, and 26% collect water from rivers, lakes and ponds”(Gender, agriculture and rural..., 2019, pp. 46-48).

Sewage supply of houses and apartments is low with the mean 2018 value for Uzbekistan amounting to 35.7% (Statistics on sewage supply of apartments (houses), 2018). Except for Tashkent City – where this indicator was the highest – the value for other national constituencies was below 43%, with the lowest values in the Republic of Karakalpakstan and Kashkadarya Region (10.7% and 17.9%, respectively).

4. Gender-based distribution of labour in the state water management sector of Uzbekistan

The 2018 national report on the economically active population issued by the national SCS (Economically Active Population Indicators, 2018) showed that 43% of women and 57% of men offer their labour for the production of goods and services in the Uzbekistan employment market. In particular, women and men are concentrated in agricultural, forestry and fishery sectors. In addition, while the “tender gender” representatives are active in manufacturing, education, trade, health and social services, men work in construction, manufacturing, transportation and storage sectors.

The analysis of women-to-men ratio in the water sector of Uzbekistan based on the data of the Ministry of Water Management (Official website of the Ministry of Water Management of the RUz, 2019) showed that leadership positions in the agency – specifically, the positions of minister, three deputy ministers, heads of basin irrigation system departments, reclamation expeditions, pumping stations and energy departments, subsidiary agencies, etc. – are occupied exclusively by men. The same situation is observed in the Ministry of Agriculture (Official website of the Ministry of Agriculture RUz, 2019). Out of 85 positions, only 1 woman holds the post of the head of Food Processing Development Department, and 76 posts are taken by men (the remaining posts were either vacant, or the names of persons holding them were not indicated). As per the data of the *Tadbirkor Ayol* Association of Business Women of Uzbekistan, “prior to land optimization in Uzbekistan in 2018, 160,371 farms were registered, and only in 10% of cases they were headed by women” (Gorner, 2019).

The article *Participation of women in water management* (2019) indicated that the “number of women employed by water management organizations is minimal, i.e. an average of 6.3% across the regions of the Republic of Uzbekistan. The majority of female staff in basin irrigation departments works in financial and economic, engineering and technical departments, where their share is relatively high and amounts to 19-23%”. Based on this, it can be concluded that women do not take part in public water management, which leads to overall gender asymmetry within the society.

5. Gender-based distribution of labour at home

In remote areas of the country, in addition to their traditional duties – cooking, washing dishes and clothes, cleaning, childcare – women perform other tasks like livestock rearing and care, cultivating kitchen gardens, collecting water for drinking and other domestic purposes. At least “in 61% of households, women are responsible for securing water for their families; in 33% of cases it is men’s duty when water sources are located far from households” (Multi-indicator cluster study..., 2007). “Fulfilling this task, women spend an average of 2-3 hours a day, and in some areas this time is 3.6-5.3 person-days a month” (History in stories... 2013, p. 6), which is due to the fact that “over 65% of users receive water for less than 6 hours a day” (Gender, agriculture and rural..., 2019, pp. 46-48). Thus, rural households are forced to use alternative water sources, including external taps, water pumps and/or rivers, lakes and ponds. This points to gender asymmetry likewise in water collection, storage and decontamination – women are fully responsible for dealing with water-related domestic matters because of traditional societal perceptions. Since men are family breadwinners, they are more often engaged in public affairs and, thus, occupy practically all leadership positions in the water sector.

6. Discussion

Women and men are equally represented in agriculture, forestry and fishery. This is due to the fact that Uzbekistan has a well-developed agro sector attracting the majority of the able-bodied citizenry. On the contrary, the managerial staff of the Ministry of Water Management and Ministry of Agriculture of the RUz is represented by the male part of the population. 90% of farms in Uzbekistan are managed by men, that is explained by the traditional gender image of women stemming from historical societal stereotypes about their role of “hearth guardians”. The social mind still maintains the prejudice that a woman cannot move up career ladder because of alternating maternity and sick leaves and the duty of raising children imposed on women (by men). This paves the way for another stereotype: engaging in household affairs and caring for family members undermines men’s reputation.

7. Conclusion

It was established that most of the able-bodied citizens (men and women) work in industries consuming a significant amount of Uzbekistan’s water resources, i.e. agriculture, forestry and fishery.

Based on the data presented on the official website of the national Ministry of Water Management, men hold all 62 management positions within the agency. The Ministry of Agriculture of the RUz shows a similar dynamics – out of 85 positions, 76 are taken by the “sterner gender” representatives, and only 1 by a woman. Women manage only 10% of the total number (160,371) of farms operating in Uzbekistan. At home, 61% of women bear the burden of providing water to family members; 33% of men collect water when water sources are located far from households. Women devote to this task an average of 2-3 hours daily. In some regions, this figure goes up to 3.6-5.3 person-days per month.

Summarizing, we can state that although women are underrepresented in the public water management sector and – performing predominantly household duties – remain stereotype victims, they are more aware of the water sector challenges and methods for optimizing industry-specific efforts by local authorities. Consequently, professional training of women (technical and management skills) may allow narrowing the gender gap among water managers.

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Gender Mainstreaming in the Water Resource Sector of the Kyrgyz Republic

E.P. Sakhvayeva

Kyrgyz Research and Development Institute of Irrigation, CAR@WAN and CAWWA Regional Networks, Bishkek, Kyrgyzstan; e-mail: tadar51@mail.ru

Abstract

The study suggests the insufficient integration of women's rights in the water legislation of the Kyrgyz Republic, low female participation in decision-making inside water user associations as well as in field-level water use. The case of villages located in the Kurkureu River Basin points to the scarce drinking water supply of households with females mainly responsible for this task. This situation is typical for many settlements across the country.

Keywords: gender assessment, legislation, water user associations, drinking water supply, drinking water quality.

1. Background

It is hard to imagine a sustainably developing modern society without gender equality. In Central Asia, the Scientific and Information Centre of the Interstate Water Coordination Commission (SIC ICWC) was the first to turn its eye to this issue and gender mainstreaming in the water sector in 2004, and later implemented the Gender and Water Project (ADB).

The GWP CACENA sociological studies in the countries of Central Asia and the Caucasus supported by the Canadian International Development Agency (CIDA), as well as the EU-sponsored gender assessment of the water sector of the Kyrgyz Republic (KR) in 2018 are also worth mentioning in this context.

This study aimed to investigate the following:

- observance of women's rights in the water law of the KR;
- female participation in decision-making based on the case of water user associations;
- local issues associated with drinking water supply and quality based on a specific case.

2. Kyrgyzstan and international legislation on gender equality

To date, the Kyrgyz Republic has ratified over 40 international instruments sharing the common aim of protecting the rights of and eliminating all forms of discrimination against women. In 1996, by acceding to the Convention on the Elimination of All Forms of Discrimination against Women Kyrgyzstan committed to implementing the Sustainable Development Goals, including the following:

- ensure healthy lives and promote well-being for all at all ages;
- achieve gender equality and empower all women and girls;
- ensure availability and sustainable management of water and sanitation for all.

3. Kyrgyzstan domestic legislation on gender equality

The Kyrgyz Government has adopted laws On State Guarantees of Equal Rights and Equal Opportunities for Men and Women, On Social and Legal Protection Against Domestic Violence, On the National Strategy and National Action Plan for Achieving Gender Equality in the Kyrgyz Republic until 2020 that became the first long-term documents in this field.

The country collects gender statistics and issues regular statistical reports Women and Men of the Kyrgyz Republic, various demographics accounts, as well as has published a special report describing the outcomes of the national Public Perception of Gender Survey.

Out of the total Kyrgyzstan's population of 6 mln 390 thou. people, 3 mln 220 thou. are females and 3 mln 170 thou. are males. While 52.4% of urban residents are women, men dominate (50.7%) in rural communities. By the 40's of the 21st century, women's share of the rural population is expected to exceed this of men. Moreover, the increase will be more than two-fold for the 80+ age group. This study showed that the national 2018-2020 Gender Equality Action Plan does not stipulate for women's access to water as a criterion/indicator of women's economic empowerment.

The current Water Code lacks non-discrimination and equality clauses as well as doesn't provide for a mechanism ensuring female's participation in decision-making and assessment of water needs of the most vulnerable population groups.

The Unified Information System on Water (UIS Water) does not establish requirements for the data accumulated in the system, i.e. disaggregation by sex, age and other discrimination basis.

4. Irrigation water supply on the level of agricultural fields

In Kyrgyzstan, field-level irrigation water supply is mainly carried out by water user associations (WUAs), public non-commercial associations established based on the hydro graphic principle within the service zone of a certain irrigation system. WUAs are headed by chairpersons elected by WUA members. In their turn, WUAs are members of the WUA Federation and the WUA Republican Union. WUA members independently establish water tariffs which include the state tariff paid by district water management department. Currently, 488 WUAs operate in Kyrgyzstan, including 9 headed by females. WUA membership and staff are male-dominated.

5. Drinking water supply to rural communities

To ensure stable supply of safe drinking water to rural population, Rural Drinking Water User Public Associations (RDWUPAs) were established under the Rural Water Supply and Sanitation Project (2002). Out of the 633 established RDWUPAs only 390 actually operate today. Due to low capacity and institutional deficiencies, a share of water supply pipelines had degraded. To address the matter, the Government of the KR issued the Enactment *On Transfer of Rural Water Supply Systems from Rural Drinking Water User Public Associations to the Balance of Local Governance Bodies*, i.e. transferred them to the state balance sheet.

6. Drinking water supply challenges based on the case of villages in the Kurkureu River Basin

The issues with on-the-ground drinking water supply became obvious after the survey conducted under the USAID+CAREC SMART Waters Project (2017) that aims to introduce a long-term planning system to ensure sustainable development of the Aspara, Kurkureu (Kyrgyzstan/Kazakhstan), Padshaata (Kyrgyzstan/Uzbekistan), Isfara, Aksu+Isfana (Kyrgyzstan/Tajikistan) small transboundary river basins.

The main tasks while drafting the Kurkureu River Basin Plan were to identify challenges affecting water resources and issues associated with irrigation and drinking water supply, as well as to develop the corresponding Problem Matrix and Work Plan. To this end, local residents, representatives of district administrations and rural districts were interviewed. As a result, the issues

of access to and quality of potable water were found to cause the highest concern in almost all villages of the Kurkureu River Basin (Kyrgyzstan side). 85% of respondents noted the insufficient drinking water supply, since the street water pillar fountains installed during the Soviet time had not operated since the late 90's. Water supply stand-pipes (55%), wells (15.5%), and open sources (4.8%) were described as the main sources of potable water.

This study likewise revealed that the major burden of delivering drinking water for household use falls on women and children; often, they have to deliver water from a long distance (over 100 meters). The respondents also highlighted such problems as low water quality (56.1%), poor infrastructure (15.5%); location of water sources in contaminated areas (4.8%); location of drinking water sources far from households (7.1%); electricity and water supply disruptions; and negative impacts of low-quality water on health.

To an extent, these issues are expected to be addressed in the near future under the Basin Plan. For instance, at the time of drafting this article, the construction of a reservoir to enhance potable water supply in one of the target villages was undergoing planning.

7. Water resource quality

The drafting of work plans for the Talas, Chu, Issyk Kul-Tarim, Naryn-Syrdarya and Karadarya-Syrdarya River Basins (NWRMP, SDC+WB, 2019) allowed identifying economic activities adversely affecting water resources: housing and communal services, agriculture (animal husbandry, crop production, fish farming), industry, and tourism.

The reasons for degrading water quality include the following: lack and violation of water-protection regimes (zones and strips) around/along water bodies, non-compliance with sanitary zone regimes; lack of sewage systems and treatment facilities in towns and cities; deteriorating urban wastewater treatment facilities; seepage of domestic wastewater into upper aquifers and watercourses; improper storage of solid household waste, etc.

8. Discussion

Kyrgyzstan has ratified over 40 different international documents aiming to protect the rights and eliminate all forms of discrimination against women, as well as has undertaken to implement all Sustainable Development Goals, one of which is to empower all women and girls. The country has also adopted several special fundamental laws, a target long-term strategy and Gender Equality Action Plan. Yet, neither the strategy nor current water legislation stipulate for female's access to water as their economic empowerment criterion. Legal provisions on non-discrimination and equality, mechanisms to ensure women's participation in decision-making and assessment of water needs of the most vulnerable groups are also absent.

The 2018-2040 National Development Strategy currently under implementation inter alia aims to improve irrigation and potable water supply, and rational water resource management. This fact speaks of the awareness of challenges which the Kyrgyz Republic is facing on the highest political level. The implementation of this strategy is thought to significantly facilitate the life of women, especially in rural areas.

9. Conclusion

At present, irrigation water supply on the field level is characterized by poor women's representation in both use and decision-making. Likewise, access to quality drinking water remains

a challenge for rural households. Meanwhile, the burden of providing families with water, as a rule, falls on females. For this reason, it is women who are most interested in enhancing potable water supply.

The efforts on drafting basin plans across the country allowed pinpointing economic activities negatively impacting the overall state of water resources, as well as the main reasons for degrading water quality.

10. Recommendations

To successfully address the challenges which the water sector of the Kyrgyz Republic is currently facing, it is clearly necessary to do the following:

- eliminate legal gaps associated with gender mainstreaming;
- expand opportunities for women participation in decision-making on water management and distribution;
- respond to on-going issues associated with drinking and irrigation water supply.

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Women in the prevention of hazardous hydrological phenomena on Kyrgyzstan's rivers

Olga Kalashnikova

Central-Asian Institute for Applied Geosciences (CAIAG), Research Associate, 2nd Department (Climate, Water and Natural Resources), Bishkek, Kyrgyzstan; e-mail: o.kalashnikova@caiag.kg

Elvira Omorova

Head of Hydrological Forecasting Department, Agency for Hydrometeorology under Ministry of Emergency Situations, Bishkek, Kyrgyzstan; e-mail: omorova.elvira@mail.ru

Abstract

Kyrgyzstan's women engaged in the public sector and working in research institutions have been joining efforts to prevent hazardous hydrological events on domestic rivers. The Central Asian Institute for Applied Geosciences (CAIAG) has elaborated a series of satellite data-driven river flow forecasting methods. These methods have been integrated into the Kyrgyzhydromet system and facilitate the prediction of hazardous river-related events in Kyrgyzstan against the background of information scarcity obtained within the framework of budget-constrained hydro meteorological surveys. The article demonstrates a case of effective cooperation among organizations with female and male predominance.

Keywords: hydrological phenomena, hydro meteorological service, hydrological forecasting, women in science, Kyrgyzstan, CAIAG, Kyrgyzhydromet.

1. Introduction

The forecasting of hazardous hydrological processes associated with spring and summer high (floods) and low (hydrological droughts) water periods on Kyrgyzstan's rivers is vital in preventing their potential adverse aftermath.

Comprised mainly of women, the team of the *Kyrgyzhydromet* (Kyrgyzstan Hydrometeorological Service) Hydrological Forecasting Department (HFD) has been striving to generate high-quality hydrological forecasts, as well as to timely inform decision makers in public and emergency response agencies, water and power supply sectors of expected high-risk events. *Kyrgyzhydromet* has been enjoying substantial support on behalf of the colleagues at the Central-Asian Institute for Applied Geosciences (CAIAG) engaged in designing sophisticated prediction models based on satellites now cover data. One third of CAIAG staff is women.

The positive experience of applying CAIAG's models by *Kyrgyzhydromet* allows addressing the challenge of scarce information required for hydrological forecasting and enhancing the quality of hydrological services provided to the water and hydropower sectors, public authorities and emergency agencies (Kalashnikova, 2015).

2. Scope of action

Currently, 50 hydrological posts generate daily reports on the current hydrological regime of Kyrgyzstan's rivers for *Kyrgyzhydromet*. Subsequently, its Hydrological Forecasting Department uses this information to produce daily river water content bulletins and forecasts of varying lead time (5-and 10-days, monthly, vegetation period, etc.) distributed among relevant local agencies and organizations, as well as hydro meteorological agencies in the neighbouring countries.

The information on snow accumulation in the mountains serves basis for hydrological forecasting. In 2013-2015, CAIAG researchers developed a set of river water content forecasting methods based on the MODIS satellite snow cover imagery processed with the MODSNOW-Tool (Kalashnikova et al., 2017).

The MODSNOW-Tool software automatically downloads open-access MODIS images from the Internet and removes the cloud cover, allowing the further assessment of the snow cover dynamics and snow accumulation conditions for hydrological forecasting purposes (Gafurov et al., 2016). The forecasting covers 14 catchments across Kyrgyzstan and renders it possible to timely notify of hazardous processes potentially occurring on its watercourses.

3. Team gender composition

Whereas the *Kyrgyzhydromet*'s staff is mainly female, the CAIAG's team is predominantly male because of the often heavy physical burden associated with glacier surveying, installing measuring devices and investigating landslide, seismic and mudflow activity in hard-to-reach mountainous areas (Table 1).

Table 1. Women and men engaged in various efforts and leadership at CAIAG and *Kyrgyzhydromet*.

Type of activity	Kyrgyzhydromet		CAIAG	
	men	women	men	women
Administration and international unit	2	20	17	10
Expert/research staff	38	93	25	11
Leadership	5	20	4	1
Total	40	113	42	21

The HFD's female staff at *Kyrgyzhydromet* work seamlessly as a single unit taking every effort possible to produce high-quality hydrological products. Experts with over 25 years of hydro meteorological surveying and forecasting experience make up the team's core. Coupled with the desire of staying abreast with innovations, their expertise and continuous advanced professional training foster constant exploration of innovative forecasting methods. In addition, the young specialists on the team – quickly digesting the knowledge of their senior colleagues and mastering novel ways of data collection and processing – are making their fair contribution to tackling the ongoing *Kyrgyzhydromet*'s tasks.

Compared to other seasons, the spring-summer period annually features a several-fold increase in the workload among all Central Asian (CA) hydrological forecasting agencies compiling and distributing reports of changing water levels and/or potential mudflows to relevant agencies. Inter alia, this means weekend shifts for female staff who have to simultaneously deal with household issues, take care of their families and require time to recuperate. Clearly, all of these depend on the amount of time and effort invested into performing their jobs.

Thus, the assistance which female specialists get from research institutions (like CAIAG) renders them opportunities for professional fulfilment, sparing unnecessary effort and, likewise freeing up some time to rest – all integral elements of addressing gender issues.

4. Knowledge and technology transfer

In March 2015, the first workshops on applying CAIAG methods of using MODIS imagery were held for *Kyrgyzhydromet* specialists. At present, they are employing the new techniques in their routine practices. The aforementioned methods allow closing the snow cover data gap, are easy and convenient to use and, thus, cut time necessary for making forecasting calculations. They also enhance the overall promptness, quality and accuracy of hydrological products.

The successful experience of *Kyrgyzhydromet*'s HFD has served a model for hydro meteorological agencies in other CA countries as to designing their own techniques. The working meetings carried out under the CAWa Project (Image 1) – with hydrological forecasting and modelling among their themes –enabled conveying the advantages of the proposed methodology and sparking the interest towards this innovative approach among the hydrometeorology experts in the region. As the result, in the course of 2016-2019 *Kazhydromet*, *Uzhydromet*, *Turkmenhydromet* and *Tajhydromet* had also installed the MODSNOW-Tool on their production servers.



Image 1. Expert Working Meeting of national hydro meteorological agencies within the framework of the CAWa Project, Tashkent, 2016 (author's copyright).

5. Conclusion

In the 1990s, the *Kyrgyzhydromet*'s hydro meteorological observation network (stations and posts) had shrunk almost twofold due to insufficient funding. Shutting down observation sites in remote mountainous areas across the country had resulted in the lack of snow cover data key for assessing the expected water levels in Kyrgyzstan's rivers. That, in turn, had translated into the national hydro meteorological agencies of Central Asia suffering an information deficit bringing down the quality of their products.

The female-only hydrological teams operating within the national hydro meteorological agencies were exactly the ones who took on the burden of supplying the much-needed information to water users/consumers and decision makers, as well as assumed the responsibility for data quality.

The joined efforts of research institutes and public agencies engaged in preventing hazardous hydrological events, collaborative exploration and deployment of innovative instruments, support on behalf of international projects in the form of working meetings, workshops and conferences to

facilitate knowledge- and experience-sharing have fostered fulfilling multiple practical tasks related to quality hydrological services.

Thus, in this article the authors have presented an example of common challenges deepening cohesion and cooperation between female- and male-dominated expert organizations. Equal access to higher education for both genders, engagement of the international community and pulling efforts together for a common cause forge a solid foundation for overcoming gender stereotypes still alive not only in Central Asia but also throughout the world.

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