

NATURAL ENVIRONMENTAL

**ANALYSIS OF EFFECTS OF THE CLIMATE CHANGE IN THE
CONTEXT OF CLIMATE JUSTICE IN DEBED RIVER BASIN OF THE
REPUBLIC OF ARMENIA AND PUBLIC AWARENESS ABOUT IT**

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Climate change has become a contemporary issue globally, regionally and locally. The aim of the paper is to discuss the effects of "climate in/justice" related to extreme weather impacts and local inhabitants' poverty in Debed river basin in the Republic of Armenia (RA). Based on analysis of available scientific literature, we notice that climate change already affected the air temperature (+1,3°C), precipitation (about - 10%), average annual water volume of river (decreased by 16 million m³), and extreme weather conditions in the basin during last decade.

We considered climate inequality issues according to four principles of Mary Robinson Foundation of the research area, which is the novelty of our paper. Debed river basin is affected by climate change negatively. The natural environment and the local population have climate justice issues in this area. Future research should stress adaptation and mitigation strategies to find solutions in local, regional and global levels.

Keywords: Debed River; Climate Change; Climate Justice; Mary Robinson Foundation Principles

Introduction

Climate Change is a contemporary issue, which has a significant influence on the Earth and its ecosystems by causing changes in weather patterns, sea levels, and water flows of rivers, biodiversity, and deforestation. It also busts social and political issues. Thus, the awareness of this topic is vital to avoid future dramatic and costly effects at the global, regional, and local levels. The aim of this paper is to discuss the issues of climate inequality bringing out issues of "climate in/justice" related by extreme weather impacts and local inhabitants' poverty in Debed river basin in the Republic of Armenia (RA), which is a unique area with one of the largest forest cover in RA. In this paper, we intended to answer the following research questions:

- To what extent does climate change affect the water flow of the Debed river? To clarify this question, we imply that the answer to this question will help us to determine if climate change has a specific influence on our research area.
- How do we address issues of climate inequality and "climate in/justice" in the area of the Debed river basin? By answering this question, we will discuss real-world situation of the case study and analyze the relationships of Mary Robinson Foundation criteria of Climate Justice.
- What strategies do we suggest for solutions of climate justice issues in the Debed river basin? This question will guide us to think about adaptation and mitigation strategies to face Climate Change and Climate Justice issues in the basin of the Debed river.
- How to inform the public about it through the Geological Museum after H.T. Karapetyan.

The state of the issue

Climate Change is the defining problem of the current times. From shifting weather patterns that threaten food production, to rising sea levels that increase the risk of catastrophic flooding, the impacts of climate change are global in scope and unprecedented in scale. Without drastic action today, adapting to these impacts in the future will be more difficult and costly. Because of climate change, there are many different problems in the world (7). Due to the problem of water use, there are problems in using water resources, and especially for agriculture. In some places there are even wars for water, the Sahara and other deserts increase their territories in exchange of savannah and forests.

Global climate change is a truly important issue for the humanity, so the solution to this problem has been included in the UN Sustainable Development Goals (13th goal). A number of conferences have been organized to address this issue; several agreements have been adopted by UN member states, in particular, the Kyoto Protocol, Paris.

The main policy is to reduce industrial waste from major industrial countries to mitigate climate change and the reasonable utilization of all natural resources.

Climate change is a global challenge that has no borders and combating it requires coordinated work by all countries. Unfortunately, many countries do not have any effect on climate changes, but will suffer the consequences.

One of these countries is Armenia. Armenia does not have a large industry, and itself has very little influence on climate change throughout the world, but the global climate change affects Armenia too. The fact that Armenia is located in the subtropical zone of the ridges of the central part of the Lesser Caucasus significantly affects the climate of the country, in latitudes characterized by a manifestly arid and continental climate. The climatic features of the country are determined by its mountainous terrain. The assessed changes show that during the past 80 years the increase in annual temperature by 1.3⁰C and reduction in precipitation by 10% were observed (5).

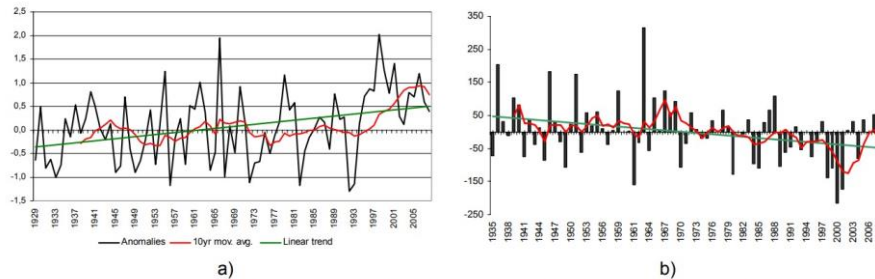


Figure 1: Observed annual air temperature (a) and precipitation (b) anomalies compared to 1961-1990 baseline mean (black line), their decadal moving averages (red line) and linear trends (green line)

(Source: 4 p. 5)

Case study of Debed river basin in the Republic of Armenia (RA).

Armenia's rivers are the streams of the South Caucasian major rivers Araks and Kura, the total length of the latter being around 25,000 km. Debed river (178 km) is one of the tributaries of Kura River, which flows through the area of the Republic of Armenia (RA) and the Republic of Georgia. In addition, Debed is one of the major rivers of RA (average annual water volume is 1070 mil m³). This unique area was chosen as a case study of our research, as the basin of the river is covered by forests, which are about 30% of RA total forest area, and deforestation is a vital problem in RA. The catchment of the river has been populated since the ancient times and now it has a population of about 230 000, most of them (above 60%) are involved in agriculture and already face negative effects of extreme weather conditions. Climate change has become an issue in Debed river basin, as high temperature and low snow cover, hails and flooding took place during the recent decade many times. Because of high temperature in winter, snow cover does not formulate sufficiently, which causes decreasing water flow in Debed and its tributaries (5).

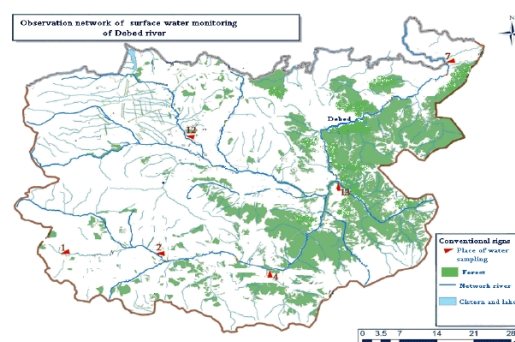


Fig.3 Debed River Basin in the Republic of Armenia (Source: (2))

This report focuses on two Sustainable Development Goals – Climate action and no poverty. The Global Climate Change impacts the Debed river water regime, generally reducing the number of precipitation in the study area,

resulting in problems with irrigation (7). As a consequence of this, the population is unable to carry out normal agricultural work because of the lack of water. Climate change increases the average ambient air temperature in the Debed basin (1961-1990) ranging from 0.2 to 0.6°C. The amount of precipitation has dropped by about 10%. From 2009 to 2020, the average annual flow of Debed river decreased by 4m³/sec., and the average annual water volume decreased by 16 million m³ (5). Since agriculture is the main occupation of the majority of the population in the study area, the issue of irrigation also poses a problem of poverty growth (6).

Table 1

Meteorological stations of Debed River basin and their features (Source 7)

METEOROLOGICAL STATIONS				
N	name	Elevation, m	Annual mean precipitation, mm	SNOW COVER, SM
1	Debedashen	453	444	
2	Mecavan	1573	663	-
3	Shnogh	656	505	7
4	Alaverdi	721	516	5
5	Tashir	1507	713	17
6	Stepanavan	1397	683	19
7	Odzun	1127	554	-
8	Urasar	1547	785	-
9	Tumanyan	1200	597	10
10	Pushkino	1522	702	21
11	Spitak	1552	439	12
12	Vanadzor	1350	589	17
13	Lermontovo	1798	708	30

Local people, especially farmers who use water resources of Debed for irrigation, are involved to solve this problem. Local businesses, municipalities, and other governmental organizations are also involved whose concern should be the reduction of the impact of global climate change on this area and the prevention of its poverty growth. This issue should also be the focus of attention of relevant scientists and specialists.

The main focus of our research is based on adaptation strategies, although mitigation also is one of significant aspects of our thoughts.

Applying the principles of Climate Justice according to the Mary Robinson Foundation in Debed river basin of the Republic of Armenia (RA)

Guided by the core principles the Mary Robinson Foundation, Climate Justice dedicates itself to action in order to realize its vision of a world engaged in the advancement of climate justice. Below, the principles considered for the application in the Debed river basin, are discussed as these might have significant changes in the reality of our research area and are urgent. Climate variability is predicted to bring about significant changes especially in agricultural production and production systems (3).

Respect and Protect Human Rights. “The huge injustice of climate change is that it is those who have done the least to cause the problem – the most vulnerable, from the world's poorest communities – who are hardest hit” (Alex Salmond MSP, Scotland’s First Minister). This statement is true about our case study too, as it does not have a major role in the global share of pollution, but it faces the reality of changed climate. The Global North pollutes the environment by using natural resources and emissions directly or indirectly affecting the whole world. The Republic of Armenia protects human rights, provides equal opportunities for social, economic well-being for its citizens based on the Constitution and the international agreements related to human right protections. In fact, there are all legal backgrounds to have a dignified and worthy life in RA. But the reality of Debed river basin is that climate change causes local inhabitants’ poverty (both absolute and relative), which contravenes people’s well-being by causing health problems, social and psychological issues of the society. Moreover, as the basin is mainly agricultural and semiarid area, expenses for irrigation rose last decade. Drinking water and food prices are higher with nearly the same income conditions. Forests produce less fruits and wood, which used to bring some money. All these additional costs push local inhabitants to have low quality of life, sometimes even migrate to other regions or countries to have more water and food access. We would suggest developing water management system in the region and decrease taxes to encourage people to stay in the Debed river basin, which traditionally used to be one of the most profitable agricultural areas.

Highlight Gender Equality and Equity. Gender Equality and Equity is widely appreciated in RA, which is recorded in the Constitution and social norms of RA. We have a law of “Protection against violence in family, protection of victims in family and restoration of family in family” to address gender issues.

Climate change affects the productivity of crop, livestock and fishery systems disrupting food distribution, markets, and access to food. Debed river area is cultivated by growing various subtropical plants. It is the second largest area by grape and peach production in RA. Due to the lack of water access in the highly populated areas and irrigation, profitability for agricultural products has decreased. Therefore, some farmers (men) prefer either to switch to other jobs, such as car service and construction, or migrate to other regions or

countries to earn some money. As a result, the main burden of household, agriculture work remains on women, who are also responsible for bringing up their children. Therefore, it is vital to make adaptation policies for the whole society to avoid women's overload and protect their constitutional rights based on SDG strategies. This statement especially refers to low-income families which cannot afford to have workers in farms. These issues are also discussed at the level of laws in Armenia (1).

Support the right to development. There are poor farmers who suffer a lot because of anomalous climatic phenomena in this area: droughts, hail, etc. Due to these disasters, the expenses of the poor increase and the quality of life falls. As a matter of fact, they are more vulnerable to global climate change. Wealthy farmers suffer less from natural disasters, as they have an income compared to the poor, whose land and animals are few.

Share Benefits and Burdens Equitably. The Alaverdi Copper-Molybdenum Combine operates in a research area that pollutes the environment, including the Debed River, through which irrigation is done. The company invests some money for social and environmental protection projects to decrease the damage to the local population and the environment. The investment implements several social programs aimed at improving the welfare of the local population. Governmental investments were also made, anti-hail stations were created, which partially alleviates the situation.

Discussion

As a result of our study, we have arrived to the conclusion that global climate change has affected the Debed River and surrounding areas, since the average temperature in this region has increased by about 1,3 degrees over the past 80 years, and the annual rainfall has decreased the water level in the river by 10 percent. In addition, droughts and hail here have become more frequent (5).

In this area of climate justice, there are certain issues that we have seen in need of certain solutions in line with Mary Robinson's Foundation.

It also became clear that climate change has a negative effect on women, as they perform heavy agricultural work instead of men. And men, in order to provide for their family, go abroad to work.

In Debed river basin, we addressed several issues of climate change and climate inequity, and for some we could offer certain solutions.

This area generally does not have major impact to climate change, but suffers from its negative effects, so adaptation strategies should be used in this area (equipment to reduce environmental pollution, cash compensation for farmers, etc.). This issue should always be the focus of attention of the governing bodies, and appropriate protective work should be carried out.

In particular, some investments in this region or financial compensation are needed to protect against the adverse effects of climate change (frequent

droughts, anomalous hail, water scarcity of Debed river, poor rainfall, forest degradation).

Investments can be made for a number of operations, such as building a reservoir that will properly use water from the Debed river, partly to prevent drought, build hail stations, and so on.

In addition, it is possible to organize several workshops among the local population, which will help to adapt to the effects of climate change and to farm correctly.

Thus, we have seen that the questions raised have certain ways to solve them.

It is very important to inform the public about this topic, because it is the availability of knowledge and information that leads to protection. To this end, we propose to hold special seminars-discussions with the local population at the Geological Museum of IGS NAS RA, to organize an educational program on global climate change for schoolchildren, in order to raise awareness among them.

Conclusion

Climate Change already has an impact on the Debed river basin by causing extreme weather conditions and decreasing productivity of agriculture and life quality. It also stimulates human migration which, in its turn, affects women's daily overloaded life especially in low income communities. Therefore, we suggest SDG-based adaptation projects be fulfilled in this area. It is vital to have efficient collaboration of the government, businesses, and local people to improve adaptation programs for the most vulnerable communities and people. The issue of Climate Justice and Equality is a new research area for Debed river basin, as there is a lack of specific information and research on this topic, which could provoke the attention of the environmental protection organizations, the government, and local citizens.

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**ՀՀ ԴԵՔԵԴ ԳԵՏԻ ԱՎԱԶԱՆՈՒՄ ԿԼԻՄԱՅԻ ՓՈՓՈԽՈՒԹՅԱՆ
ՀԵՏԵՎԱՆՔՆԵՐԻ ՎԵՐԼՈՒԾՈՒԹՅՈՒՆ՝ ԿԼԻՄԱՅԱԿԱՆ
ԱՐԴԱՐԱԴԱՏՈՒԹՅԱՆ ՀԱՄԱՏԵՔՍՏՈՒՄ ԵՎ ԴՐԱ ՎԵՐԱԲԵՐՅԱԼ
ՀԱՆՐԱՅԻՆ ԻՐԱԶԵԿՈՒՄ**

Սահակյան Ն.Ա., Մկրտումյան Ա.Ս., Գրիգորյան Գ.Ռ.

Ամփոփում

Կլիմայի փոփոխությունը դառնում է ժամանակակից խնդիր գլոբալ, տարածաշրջանային և տեղական մակարդակներում: Հոդվածի նպատակն է քննարկել ՀՀ Դեքեդ գետի ավազանում «կլիմայական ան/արդարադատության» հետևանքները՝ կապված ծայրահեղ եղանակային փոփոխությունների ազդեցության և աղքատության հետ: Հիմք ընդունելով առկա գիտական գրականության վերլուծությունը, մենք նկատում ենք, որ կլիմայի փոփոխությունը արդեն ազդել է օդի ջերմաստիճանի (+ 1,3°C), տեղումների (մոտ -10%), գետի ջրի միջին տարեկան ծավալի (նվազել է 16 մլն մ³-ով) և վերջին տասնամյակում ավազանի եղանակային պայմանների վրա:

Մենք ուսումնասիրեցինք հետազոտվող տարածքում կլիմայի անհավասարության խնդիրները՝ համաձայն Մերի Ռոբինսոնի հիմնադրամի չորս սկզբունքների, ինչը սույն հոդվածի նորությունն է: Կլիմայի փոփոխությունը բացասաբար է ազդում Դեքեդ գետի ավազանի վրա: Բնական միջավայրը և տեղական բնակչությունն այս ոլորտում ունեն կլիմայի արդարադատության խնդիրներ: Ապագա հետազոտությունները պետք է ուշադրություն դարձնեն հարմարվողականությանը և խոցելիության մեղմացմանը՝ տեղական, տարածաշրջանային և գլոբալ մակարդակներում լուծումներ գտնելու համար:

**АНАЛИЗ ПОСЛЕДСТВИЙ ИЗМЕНЕНИЯ КЛИМАТА В
КОНТЕКСТЕ КЛИМАТИЧЕСКОЙ СПРАВЕДЛИВОСТИ В
БАССЕЙНЕ РЕКИ ДЕБЕД РЕСПУБЛИКИ АРМЕНИЯ И
ОБЩЕСТВЕННАЯ ОСВЕДОМЛЕННОСТЬ ОБ ЭТОМ**

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Резюме

Изменение климата становится актуальной проблемой на глобальном, региональном и местном уровнях. Целью данной статьи является обсуждение последствий «климатической не/справедливости» в бассейне реки Дебед Республики Армения в связи с воздействием экстремального изменения погоды и бедности. На основе анализа существующей научной литературы отметим, что изменение климата уже повлияло на температуру воздуха (+ 1,3°C), количество осадков (около -10%), среднегодовой

объем воды реки (уменьшен на 16 млн ^{м3}) и погодные условия в бассейне за последнее десятилетие.

Мы исследовали климатическое неравенство в исследуемой области в соответствии с четырьмя принципами Фонда Мэри Робинсон, что является новинкой данной статьи. Изменение климата отрицательно сказывается на бассейне реки Дебед. Природная среда и местное население сталкиваются с проблемами климатической справедливости в этой области. Дальнейшие исследования должны быть сосредоточены на адаптации и уменьшении уязвимости для поиска решений на местном, региональном и глобальном уровнях.