CRISIS MANAGEMENT AND TECHNOLOGIES. 2025. No 1 (26)

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THE ENVIRONMENTAL CONSEQUENCES OF WIND REDUCTION

The intricate dynamics of Earth's climate system are governed by a multitude of factors, including solar radiation, atmospheric pressure, and oceanic currents. Among these, wind plays a pivotal role in shaping weather patterns, dispersing seeds and pollen, and facilitating the global exchange of heat and moisture. Technological advances, climate change, the current conditions and extent of urban development and the growing concern about their consequences have led to increased interest in wind mitigation measures. While wind reduction may lead to some localized benefits, its impact on the environment needs to be studied separately.

Key words: *reduction of winds, crisis ecological consequences, reduction of energy costs, thermal equilibrium, greenhouse gases, change of living conditions.*

Wind is not merely an atmospheric phenomenon; it is an essential component of the Earth's energy balance and climatic regulation. Winds contribute to the process of oceanic upwelling, which bring nutrient-rich water to the surface, supporting the marine food chain. By facilitating the mixing of air and ocean waters, winds also help in regulating temperatures and maintaining the Earth's thermal equilibrium. Additionally, wind patterns are crucial for the dispersal of pollutants and greenhouse gases, dictating how these substances propagate through the atmosphere and impact ecosystems and human health.In nature, there are such natural resources which are called renewable, and they allow to optain a sufficient amount of energy resources. Wind is considered one such wealthlectrical, thermal, mechanical. The advantages of wind energy are as follows [7].

- wind energy helps save the environment;
- the use of traditional energy resources is reduced;
- the number of emissions harmful to the biosphere is reduced;
- when the power generating units operate, smog does not occur;
- the use of wind energy excludes the possibility of acid rain.

This energy can be used in everyday life for various needs. Wind generators, sails, and windmills are commonly used to convert win.

Efforts to reduce wind-wheather through urban design that aims to create sheltered environments or through the proliferation of wind turbines that harness energy-can inadvertently disrupt the delicate balance of local ecosystems and broader climatic patterns. As a result of the analysis of the data collected by us, we have come to such a conclusion that the decreasing trend of winds in the Republic of Armenia in recent years is inevitable. During the period 2016-2022, the lowest level of wind speed reduction was recorded in 2021, 2022 recorded a slight increase, but taking into account a number of circumstances, we can state that this process can continue for a long time, as long as the state does not intervene to prevent it [6].

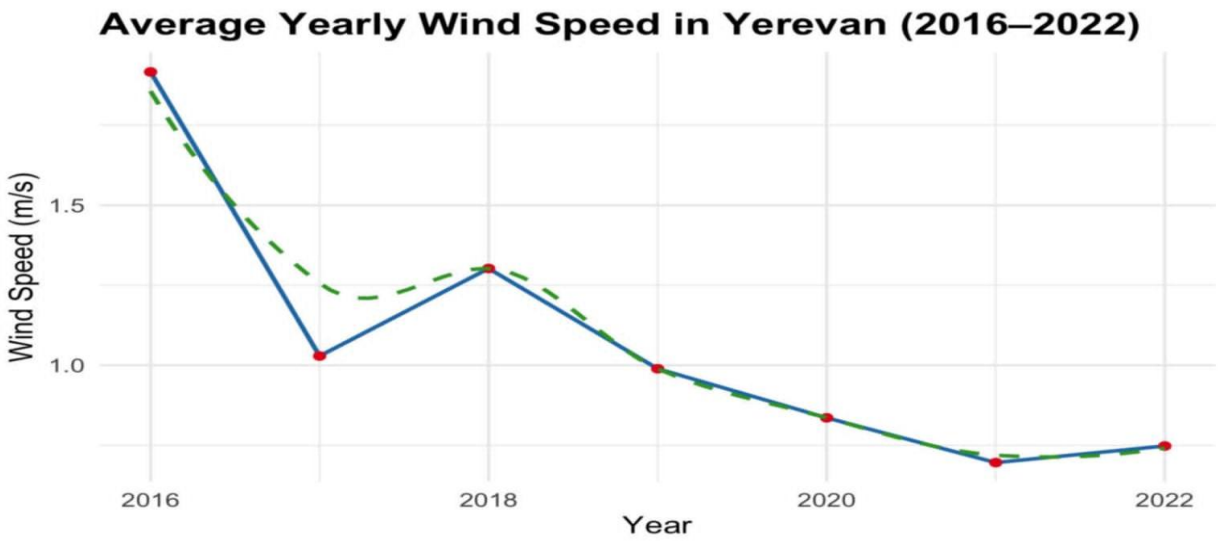

Diagrama 1. Average Yearly Wind Speed in Yerevan 2016-2022 [6]

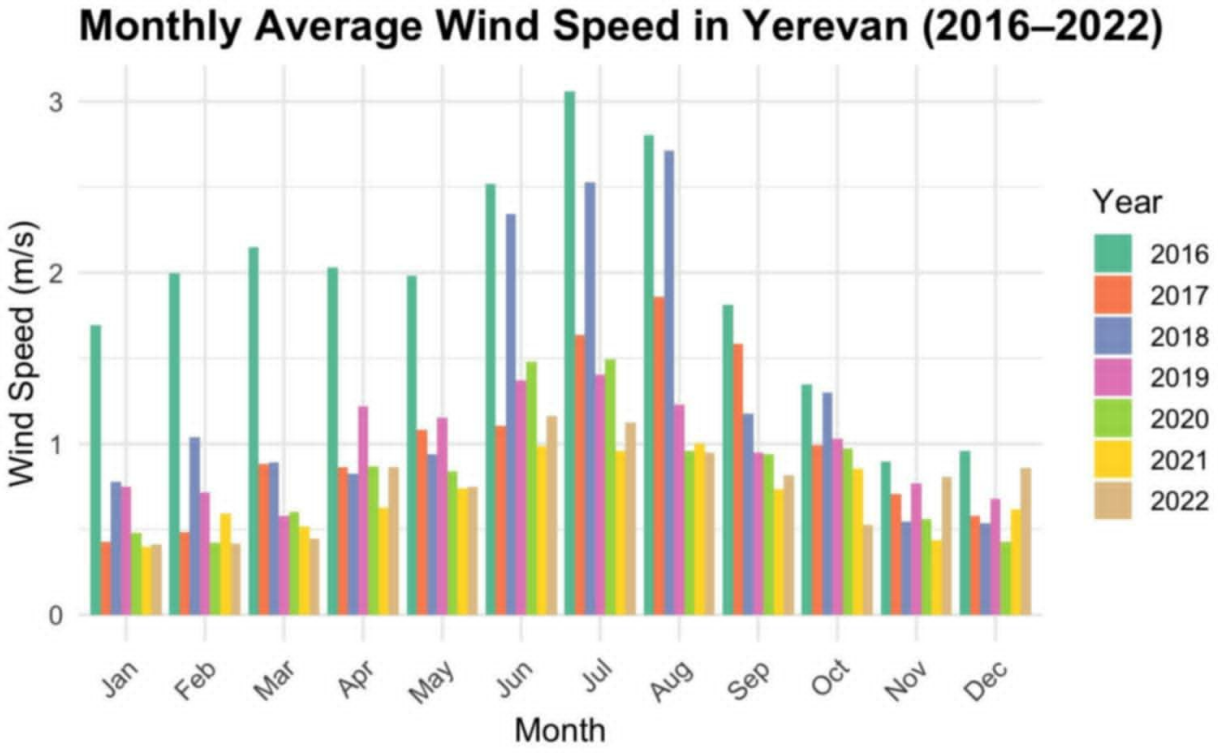

Diagrama 2. Monthly Average Wind Speed in Yerevan 2016-2022 *[6]*

According to the studies, the increase in wind speed was observed only in the summer months during 2016-2022.It can also be noticed that only those months of 2016 and 2018 recorded the highest indicators [6].

Here, we explore several of the significant environmental consequences associated with reducing winds.

The reduction of winds can lead to changes in temperature and precipitation patterns. In urban environments, the construction of high-rise buildings can create wind tunnels or obstruct natural airflow, resulting in localized areas of stagnant air. As a result, these areas may experience

higher temperatures—often termed "urban heat islands"—due to the accumulation of heat and pollutants. This phenomenon not only raises energy consumption for cooling but also exacerbates air quality issues, ultimately impacting publichealth.Our previous studies document exactly this [1].

Many ecosystems depend on the dispersal mechanisms facilitated by wind. Plants, for instance, rely on wind for seed dispersal, while numerous insect species depend on wind for navigation and feeding. The reduction of wind can disrupt these natural processes, potentially leading to declines in plant populations and disruption of pollinator activities [3]. Such changes can have cascading effects throughout the food web, ultimately jeopardizing biodiversity. Moreover, the local fauna that depends on particular flora for sustenance may also be adversely affected, leading to possible local extinctions and decreased genetic diversity [8].

The complex interactions between weather systems and ecosystems can give rise to unintended climate feedback loops when winds are reduced. For example, stagnant air can lead to higher concentrations of greenhouse gases in the lower atmosphere, amplifying the greenhouse effect and accelerating climate change. With increased temperatures and changing weather conditions, ecosystems may shift, leading to habitat loss and further imbalance within various naturalsystems [2].

According to forecasts, the yield of agricultural crops will decrease by 8-14% by 2030 [5].

The negative impact of climate change on this indicator is mainly due to the direct impact of changes in temperature and precipitation, increasing demand for irrigation water and decreasing irrigation water reserves in the conditions of reduced precipitation and high evaporation, as well as increasing the frequency, intensity and duration of climatic risks and expanding their spatial distribution.According to forecasts, by 2030, as a result of climate change, the total area of pastures in Armenia will decrease (areas of pastures in the sub-alpine and alpine zone by 19-22%), and the volume of crops obtained from them will decrease by 4-10%.Due to the negative impact of climate change, the issue of food security is also becoming more vulnerable in the republic [5].

The deployment of wind turbines is a significant step toward renewable energy generation, yet this practice, while aimed at reducing reliance on fossil fuels, can lead to undesired outcomes if not carefully managed. Large-scale wind farms can influence local wind patterns, potentially leading to a localized reduction in wind speeds. This may create a feedback loop that diminishes the efficiency of wind energy generation as nearby turbine installations affect the airflow required for optimal energy production [9].

Wind not only influences atmospheric conditions but also plays a crucial role in oceanic currents. The reduction of winds can alter these vital currents, impacting marine ecosystems and global climate systems. Ocean currents contribute to the distribution of heat across the planet, and any alteration in these currents can result in unpredictable weather patterns, shifts in marine biodiversity, and changes in fish migration routes. Such disruptions can lead to economic consequences for communities reliant on fisheries and tourism [4].

While reducing winds can yield immediate benefits, particularly in urban contexts, the broader environmental consequences warrant careful consideration. A holistic approach is necessary, one that weighs the short-term advantages against potential long-term repercussions. Sustainable urban

planning, effective pollution control measures, and conservation strategies must be implemented to mitigate the negative environmental impacts of wind reduction. As we confront the dual challenges of climate change and biodiversity loss, a nuanced understanding of the role of wind within our ecosystems is more critical than ever. Our commitment to sustainable practices not only preserves the intricate balance of our planet's climate but also safeguards the rich tapestry of life it supports. In forging ahead with advancements in technology and urban development, we must prioritize strategies that harmonize with natural processes to ensure a sustainable and resilient future for generations to come.

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ՔԱՄՈՒ ՆՎԱԶՄԱՆ ԲՆԱՊԱՀՊԱՆԱԿԱՆ ՀԵՏԵՎԱՆՔՆԵՐԸ

Երկրի կլիմայական համակարգի բարդ դինամիկան կարգավորվում է բազմաթիվ գործոններով, ներառյալ արեգակնային ճառագայթումը, մթնոլորտային ճնշումը և օվկիանոսային հոսանքները: Քամին առանցքային դեր է խաղում եղանակային օրինաչափությունների ձևավորման, սերմերի և ծաղկափոշու ցրման, ջերմության և խոնավության գլոբալ փոխանակման հեշտացման գործում: Տեխնոլոգիական առաջընթացը, կլիմայական փոփոխությունները, քաղաքաշինության ներկա պայմաններն ու ծավալները և դրանց հետևանքների վերաբերյալ աճող մտահոգությունը, հանգեցրել են քամու նվազեցման միջոցառումների նկատմամբ հետաքրքրության բարձրացման: Թեև քամիների կրճատումը կարող է հանգեցնել որոշ տեղայնացված օգուտների, սակայն շրջակա միջավայրի վրա դրա ազդեցությունն առանձին ուսումնասիրության կարիք ունի:

Առանցքային բառեր. *քամիների կրճատում, ճգնաժամային էկոլոգիական հետևանքներ, էներգիայի ծախսերի կրճատում, ջերմային հավասարակշռություն, ջերմոցային գազեր, կենսապայմանների փոփոխություն:*

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ЭКОЛОГИЧЕСКИЕ ПОСЛЕДСТВИЯ СОКРАЩЕНИЯ ВЕТРА

Сложная динамика климатической системы Земли определяется многими факторами, включая солнечную радиацию, атмосферное давление и океанские течения. Среди них ветер играет ключевую роль в формировании погодных условий, распространении семян и пыльцы, а также облегчении глобального обмена тепла и влаги. Технологический прогресс, изменение климата, текущие условия и масштабы городского развития, а также растущая обеспокоенность по поводу их последствий привели к повышению интереса к мерам по смягчению последствий ветра. Хотя сокращение ветров может привести к некоторым локальным выгодам, воздействие на окружающую среду требует отдельного изучения.

Ключевые слова: *уменьшение ветров, критические экологические последствия, сокращение затрат на электроэнергию, тепловой баланс, парниковые газы, изменение условий проживания.*

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Presentation date: 04.04.2025
Review date: 08.04.2025