# GENDER VULNERABILITY INDEX AND CLIMATE LINKAGES IN MOLDOVA

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## SUMMARY

Gender equality is a pressing issue on the agenda of many countries. Climate change is a global problem that cannot be solved without joint efforts. In Moldova, the problem of climate change is particularly acute, as the country is agrarian. Over the past six years, every second year, due to climate cataclysms, the volume of agricultural production has fallen. First of all, crop production volumes declined by an average of 30% in 2020, 2022, and 2024. On the other hand, Moldova strives to mitigate gender inequality, which manifests itself in various spheres of life (economy, health care, participation in decision-making bodies). This study tests the hypothesis about the impact of climate change on gender vulnerability. The authors suggest that in Moldova, climate change is exacerbating existing gender vulnerability, widening gender gaps in income, employment, poverty, and political participation. The research methodology is based on correlation analysis of publicly available data from the National Bureau of Statistics. The novelty of this study lies in the development of the Gender Vulnerability Index (GVI), consisting of six sub-indices that reflect the gender gap in income, employment, absolute poverty level, life expectancy at birth, representation in Parliament, and ministerial positions. The results of the study showed that there is a statistically significant relationship between climate change and the level of gender vulnerability. Gender gaps in employment and income exert the most significant impact on the GVI. These two indicators reflect women's limited opportunities in the labor market and wages compared to men, and their value has been higher in the last five years than in the previous period. The developed equations of multiple linear regression not only confirmed the proposed hypothesis but also proved that to mitigate gender vulnerability, it is necessary to promote strategies and programs aimed at reducing female unemployment and increasing the level of women's education.

***Keywords:*** *climate change, gender vulnerability, gender inequality, gender gap, vulnerability assessment scale*

## INTRODUCTION

In recent years, Moldova has increasingly faced climate cataclysms and is one of the most vulnerable countries in Europe to climate change. Temperatures in Moldova have registered long-term warming trends (Taranu et al., 2024). Moldova's vulnerability is inherent, as agriculture remains one of the main sectors of the economy. The contribution of agriculture, forestry and fishing to GDP is 7.1% in 2023 and 2024, and the share of the population employed in this sector is 20.9% in 2023 and 18.1% in 2024. Thus, for every fifth citizen, the agricultural sector is the primary source of income, which makes their well-being directly dependent on climatic conditions.

The increase in the frequency and intensity of extreme weather events leads to a rise in the country's climate vulnerability (Gutium & Taranu, 2021). Droughts in 2012, 2015, 2020, 2022, 2024, and frosts during the growing season caused significant damage. Since 2020, climate cataclysms have become more frequent. Gross agricultural production fell by 27.2% in 2020, 29.2% in 2022, and 14.6% in 2024, including crop production by 35.7% in 2020, 35.9% in 2022, and 22.9% in 2024 (NBS, 2025).

Gender inequality remains a significant challenge for countries worldwide. Moldova is no exception; in 2023, the Gender Income Gap stood at 15.57%. Climate change is not gender neutral, so one of the aims of this study is to examine the hypothesis regarding the impact of climate change on gender vulnerability. Since the National Bureau of Statistics does not calculate the Gender Vulnerability Index, the second aim is to develop this index for Moldova, taking into account the country's specific characteristics.

*The novelty of this study lies in the development of an Index that reflects the degree of aggregate gender vulnerability in Moldova, as well as a vulnerability assessment scale.*

## LITERATURE REVIEW

Most studies examining the link between climate change and gender vulnerability focus on the agricultural sector (Walker et al., 2022a). Researchers have identified a cause-and-effect relationship: natural disasters lead to higher costs and unemployment, as well as reduced food security. Due to inequality, men and women experience different levels of vulnerability to climate change (Adeola et al., 2024; Walker et al., 2022b), and women are more prone to food insecurity (Moon, 2024).

There are significantly fewer studies focusing on climate change adaptation policies that consider gender vulnerability (Lawson et al., 2020). Empirical research on male- and female-headed households indicates a gender gap in climate change adaptation (Aryal et al., 2022). Madhuri argues that gender mainstreaming in climate policy can address women's vulnerability (Madhuri, 2025). X. Li demonstrated that social investment in climate change adaptation is necessary to reduce gender inequality (Li et al., 2025).

Most of the works on the topic of gender-climate vulnerability are narrative (Dasgupta, 2024). There are very few scientific articles that develop regression models with fixed effects (Kumar & Maiti, 2025). Such studies require large open-access databases across multiple countries. The model developed by Sanchez-Olmedo et al. proves that improvements in the Global Gender Gap Index (GGGI) reduce $CO_2$ emissions per capita (Sanchez-Olmedo et al., 2025). Valls Martínez et al., using a regression model with panel data, demonstrated that the ratio of women to men on boards of directors is inversely proportional to the $CO_2$ emissions of these companies (Valls Martínez et al., 2022). A similar study was conducted by Allison Wu, who used the least squares method to test the hypothesis that "female governors have a negative impact on state-level $CO_2$ emissions per capita" (Wu, 2025).

One of the gaps in the scientific literature is that the Gender Vulnerability Index has not been developed. This index would include, alongside the indicators in the Gender Inequality Index (health, education, and employment) (UNDP, n.d.), additional indicators such as those reflecting poverty and income levels. Another gap is the absence of a developed scale for assessing gender vulnerability. Therefore, as mentioned above, one of the two aims of the study is to develop the Gender Vulnerability Index for Moldova.

## METHODOLOGY: HYPOTHESIS AND GENDER VULNERABILITY INDEX CONSTRUCTION

To prove the hypothesis that there is a statistically significant relationship between climate change and the level of gender vulnerability of the population of the Republic of Moldova, the following multiple regression models were developed (Models 1 and 2):

$$GVI_t = \beta_0 + \beta_1 \times AAT_t + \beta_2 \times AQP_t + \beta_3 \times FUR_t + \beta_4 \times WE_t + s_t \quad (1)$$

Where:

$GVI$ – Gender Vulnerability Index, %;
$AAT$ – Annual average air temperature, Celsius degrees;
$AQP$ – Annual quantity of precipitation, m;
$FUR$ – Female unemployment rate, %;
$WE$ – Proportion of women with tertiary education, % (or $SF$ – Average years of schooling for females, years);
$\beta_i$ – Parameters;
$s$ – Stochastic term;
$t$ – Year.

To verify the model's accuracy tests for autocorrelation and heteroscedasticity were performed using EViews 9.5 software. Suppose the coefficients for the climate variables ($\beta 1$ and $\beta 2$) are statistically significant and positive in the case of annual average air temperature. In that case, this will confirm the hypothesis that climate change affects gender vulnerability. The value of the parameter $\beta 2$ can be positive or negative. If the annual quantity of precipitation is very low, this indicates a drought and leads to increased vulnerability. Conversely, if this indicator is very high, it demonstrates that heavy rains and floods are likely to occur, which also increases vulnerability. Therefore, this regression equation will indicate the statistical significance of the impact of annual precipitation on gender vulnerability.

To determine the sign of the effect of precipitation on gender vulnerability (positive or negative), we will develop another regression model (Model 3) in which the climate change indicators will be replaced by the indicator "growing season precipitation anomalies (% of the norm 1991-2020)." Since this indicator exhibits both negative and positive values (non-linear effect), a U-shaped relationship is observed between precipitation anomalies and gender vulnerability. Therefore, we introduced the square of the precipitation anomalies into the regression equation.

$$GVI_t = \beta_0 + \beta_1 \times AP_t^2 + \beta_2 \times FUR_t + \beta_3 \times WE_t + s_t \quad (2)$$

Where:

$AP$ – Growing season precipitation anomalies (% of the norm 1991-2020), %;

The National Bureau of Statistics (NBS, n.d.) doesn't estimate the Gender Vulnerability Index. Therefore, this study proposes an algorithm for calculating this index, taking into account the specific characteristics of Moldova and the availability of relevant indicators in open-access gender statistics. The Gender Vulnerability Index (GVI) is a composite indicator that measures the vulnerability of women relative to men, comprising six sub-indices. This index considers the gender income, employment, and poverty gaps, the gender life expectancy gap at birth, and the gender gap in representation in government and parliament. The closer the value of this index is to 100%, the higher the gender vulnerability. Data from 2014 to 2023 were used to calculate the GVI. Gender statistics were explicitly revised for this period, as the NBS switched from estimating the stable population to assessing the usually resident population.

$$GVI_t = \frac{1}{6}\left(GIG_t + GEG_t + GPG_t + GLEG_t + GGM_t + GGP_t\right) \quad (3)$$

Where:

*GIG* – Gender Income Gap, %;
*GEG* – Gender Employment Gap, %;
*GPG* – Gender Poverty Gap, %;
*GLEG* – Gender Life Expectancy Gap at Birth, %;
*GGM* – Gender Gap in Ministerial Positions, %;
*GGP* – Gender Gap in Parliamentary Representation, %;

The formulas for calculating gender gaps are not identical for all six sub-indices, as they differ in their impact on gender vulnerability (positive or negative). Equations 4–9 present their calculation formulas.

$$GIG_t = \left(\frac{ASM_t - ASW_t}{ASM_t}\right) \times 100 \quad (4)$$

Where:

*ASW* – Average monthly gross (or net) salary of women, lei;
*ASM* – Average monthly gross (or net) wage of men, lei.

The GIG reflects gender disparities in earnings. When calculating this sub-index, the net value of wages can be used in place of the gross value, as the tax rates are identical for both women and men.

$$GEG_t = \left(\frac{MER_t - FER_t}{MER_t}\right) \times 100 \quad (5)$$

Where:

*FER* – Female employment rate, %;
*MER* – Male employment rate, %.

A higher value of *GEG* indicates greater vulnerability to female employment.

$$GPG_t = \left(\frac{PRW_t - PRM_t}{PRM_t}\right) \times 100 \quad (6)$$

Where:

*PRW* – Absolute poverty rate of women, %;
*PRM* – Absolute poverty rate of men, %.
If the GPG is positive, then the vulnerability of women is higher. Thus, the higher the GPG, the greater the gender inequality in poverty affecting women.

$$GLEG_t = \left(\frac{LEBW_t - LEBM_t}{LEBM_t}\right) \times 100 \quad (7)$$

Where:

*LEBW* – Life expectancy at birth for women, years;
*LEBM* – Life expectancy at birth for men, years.

In Moldova, as in most countries worldwide, women live longer than men. Therefore, to avoid negative values in case of the GLEG, female life expectancy at birth is subtracted from male life expectancy in the numerator. This sub-index reflects the vulnerability of men in the health sector.

$$GGM_t = \left( \frac{SMM_t - SWM_t}{SMM_t} \right) \times 100 \quad (8)$$

Where:

*SWM* – Share of women ministers, %;
*SMM* – Share of men ministers, %.

The GGM signals the extent of underrepresentation of women in executive political roles.

$$GGP_t = \left( \frac{SMD_t - SWD_t}{SMD_t} \right) \times 100 \quad (9)$$

Where:

*SWD* – Share of women deputies in parliament, %;

*SMD* – Share of men deputies in parliament, %.

A higher value of GGP indicates greater gender inequality in legislative power. Two sub-indices were included in the gender vulnerability calculation algorithm because, if women are underrepresented in decision-making bodies, their specific needs are not taken into account when developing adaptation policies.

The focus was placed on these indicators because women are more vulnerable to the impacts of climate change due to lower income, underrepresentation in decision-making processes, less formal employment, and higher participation in the informal sector. The index includes not only indicators where the gap favours men but also those where it favours women, such as life expectancy at birth. It does not include indicators reflecting the education gap, as the 'Share of women with tertiary education" is used as a control indicator (exogenous variable) in Model 1, and "Average years of schooling for females" in Model 2.

A comparative analysis of the Gender Vulnerability Index created by the authors and the Gender Inequality Index (GII) (United Nations Development Programme, n.d.) showed both similarities and differences. Both indices include indicators related to employment in the labour market, health status, and representation in parliament. However, the GVI covers more areas, including gender income and the poverty gap, which the GII does not address. When developing this index, the authors focused particularly on economic vulnerability. This broader coverage enables the GVI to more accurately reflect the socio-economic aspects of gender inequality in Moldova. Global indices do not always capture the specific realities of individual countries, so the authors designed a GVI tailored to Moldova's particular context. The created index complements existing global indices and provides a more detailed perspective on gender vulnerability.

## ASSESSMENT AND EVOLUTION OF THE GENDER VULNERABILITY INDEX

The gender indicators needed to calculate the GVI and its six sub-indices were sourced from the official website of the NBS (National Bureau of Statistics of the Republic of Moldova, n.d.). The results of the evaluation are shown in Table 1. The trend of the GVI fluctuates; the highest level of gender vulnerability was recorded in 2019, while the lowest, within the analysed period, was in the following year. The 6.43 percentage point rise in the GVI in 2019 is attributed to the largest gender gap in the poverty rate between women and men during 2014-2024, as well as gender disparities in government leadership roles. A notable decline in gender vulnerability in 2021 was caused by a low level of the gender income gap, the gender life expectancy gap at birth, and the gender gap in parliamentary representation.

## *Table 1*

*Evolution of the Gender Vulnerability Index and Climatic Indicators in Moldova, 2014-2023*

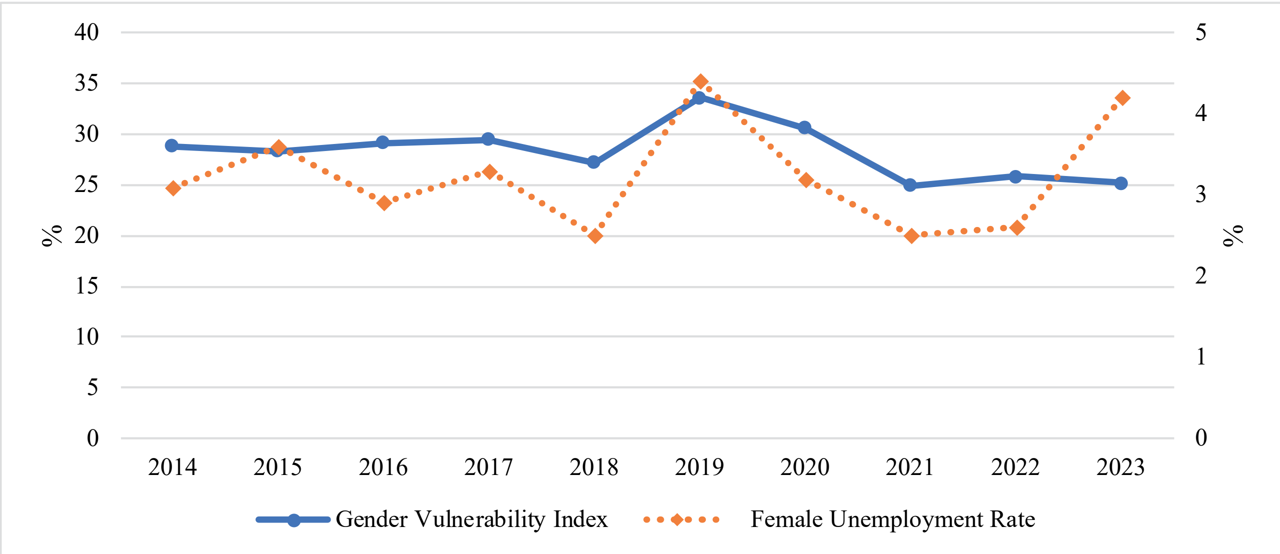
| Year | Gender Vulnerability Index, % | Annual average air temperature, Celsius degrees | Annual quantity of precipitation, mm |
|---|---|---|---|
| 2014 | 28.82 | 10.5 | 635 |
| 2015 | 28.34 | 11.5 | 426 |
| 2016 | 29.11 | 11.0 | 626 |
| 2017 | 29.45 | 10.8 | 596 |
| 2018 | 27.19 | 10.9 | 531 |
| 2019 | 33.62 | 11.8 | 482 |
| 2020 | 30.61 | 12.2 | 545 |
| 2021 | 24.94 | 10.3 | 587 |
| 2022 | 25.83 | 11.4 | 399 |
| 2023 | 25.19 | 12.3 | 426 |

*Source: The GVI calculation by the authors and the BNS data*

To ensure that the developed Gender Vulnerability Index accurately reflects differences in the socio-economic positions of women and men, we will first perform a comparative analysis of the trends in the GVI and the female unemployment rate. As shown in Figure 1, from 2016 to 2022, the trends of these two indicators align, with their periods of increase and decrease matching. The highest level of gender vulnerability (33.62%) and the highest female unemployment rate (4.4%) were both recorded in the same year (2019), while the lowest levels occurred in 2021.

## *Figure 1.*

*Evolution of the Gender Vulnerability Index and Female Unemployment Rate in Moldova, 2014-2023*



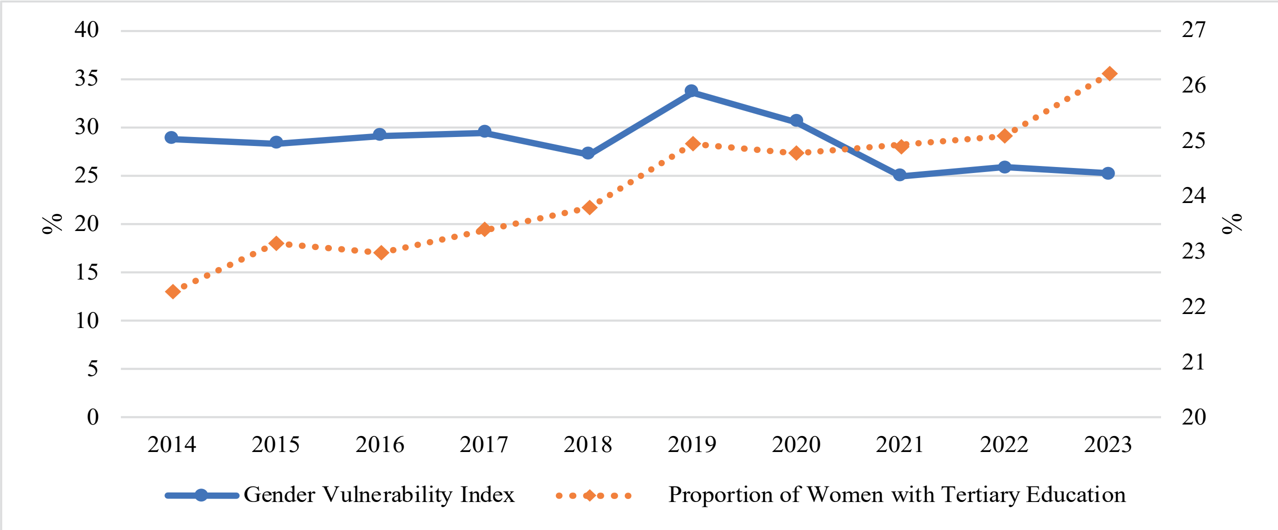

*Source: The GVI calculation by the authors and the BNS data*

Although 2019 marks the fourth consecutive year of real Gross Domestic Product (GDP) growth, the position of women in the labour market has worsened this year, indicating non-inclusive GDP growth concerning women and an increase in the gender employment gap. Therefore, it can be concluded that economic development without gender equality can increase women's vulnerability even during periods of macroeconomic stability.

A comparative analysis of the dynamics of the Gender Vulnerability Index and the proportion of women with tertiary education showed an inverse relationship between these indicators (Figure 2). The exception is 2019. Education fosters social mobility. Following the COVID-19 pandemic, an increasing number of women have chosen to pursue higher education to enhance their social mobility. It is clear that a rise in the proportion of women with higher education correlates with a decrease in gender vulnerability. In conclusion, we observe that after 2020, there has been a trend towards reduced gender vulnerability, due to a narrowing of the gender gap in parliamentary representation (GGP).

## *Figure 2.*

*Evolution of the Gender Vulnerability Index and Proportion of Women with Tertiary Education in Moldova, 2014-2023*




*Source: The GVI calculation by the authors and the BNS data*

For the developed and calculated Gender Vulnerability Index, considering that the range of values varies between 24 and 34, we propose the following interpretation scale (Table 2). The scale is based on the principle of grading risk levels, also recognizing that a higher index indicates greater inequality and vulnerability. Typically, scientific literature uses logical intervals of 5, 10, or 20. Since our GVI values fall within the range of 20-35, we chose an interval of 5 percentage points ((35-20)÷3=5).

## *Table 2.*

*Gender Vulnerability Index interpretation scales*

| GVI Value Range (%) | Level of gender vulnerability | Interpretation |
|---|---|---|
| GVI < 20 | Very low degree of gender vulnerability | There is almost no gender gap. Gender equality in key areas of life (economic, social, political). |
| 20 ≤ GVI < 25 | Low degree of gender vulnerability | Minor gender vulnerability. |
| 25 ≤ GVI < 30 | Medium degree of gender vulnerability | There are noticeable but not critical differences that need to be corrected. |
| 30 ≤ GVI < 35 | High degree of gender vulnerability | Gender vulnerability is expressed in several areas. |
| GVI ≥ 35 | Very high degree of gender vulnerability | Systemic gender vulnerability that requires government intervention. |

*Source: Elaborated by authors*

The scale developed in this way uses a five-percentage-point interval, starting from the GVI level of 20%, below which the vulnerability level is considered very low. This scale helps us identify years with low, moderate, or high levels of gender vulnerability. The lowest vulnerability level was recorded in 2021, when Moldova began to recover from the COVID-19 lockdown, while the highest levels occurred in 2019 and 2020.

At the start of 2019 (on 24 February), parliamentary elections took place in Moldova. Since no party won a majority of seats, the process of forming a coalition was very prolonged. As a result, 2019 became a year of political upheaval in Moldova, with two parallel centers of power emerging within the year. The following year, 2020, was marked by an economic recession caused by the COVID-19 lockdown and climate catastrophes, which led to a 27.2% decline in the agricultural sector compared to the previous year, including a 35.7% reduction in crop production. Women working in agriculture are comparatively more vulnerable than women in the service and industrial sectors.

The indices assessing gender vulnerability used in Eastern Europe and the Commonwealth of Independent States (CIS), as well as the index developed in this article, differ in their methodologies. Nevertheless, it is possible to perform a comparative analysis and identify common patterns of gender inequality. In Bulgaria, similar to Moldova, the pay gap between women and men increased from 2021 to 2023. The Gender Income Gap in Moldova rose from 13.64% in 2021 to 15.57% in 2023, while in Bulgaria, the Gender Pay Gap (GPG) increased from 11.9% in 2021 to 13.5% in 2023 (Eurostat, 2025, March). Although Romania's GPG in 2023 is slightly lower than in 2022, it remains relatively high at 21.6% (PwC Romania, 2024, March). The wage gap between women and men in Georgia was 18% in 2022 and decreased to 11.5% in 2023 (U.S. Bureau of Labour Statistics, 2023). According to the World Bank report, in recent years, women's gross wages in Armenia have been 25-30% lower than men's (World Bank, 2023). The data analyzed from 2021 to 2023 indicate that women in Moldova and in Eastern Europe and the CIS countries occupy lower-paid jobs than men. A comparative analysis of other indicators revealed a similar pattern. The study's findings demonstrate that, in Eastern European and CIS countries, the patterns of gender inequality are consistent with those observed in Moldova.

## TESTING THE CLIMATE-GENDER HYPOTHESIS: THE CASE OF THE REPUBLIC OF MOLDOVA

Moldova is an agricultural country, so its economy is susceptible to climate change. Climate disasters impact not only the economy but also the standard of living of the population and increase gender vulnerability by placing a heavy burden on women, especially in rural areas. To test the hypothesis about the influence of climate on gender vulnerability, the following two multiple linear regression models were developed.

Model 1:

$$GVI_t = 1.6677 \times AAT_t + 11.4974 \times AQP_t + 3.0696 \times FUR_t - 0.2382 \times WE_t - 6.9194 \times D23 \quad (10)$$

Model 2:

$$GVI_t = 2.0563 \times AAT_t + 14.9512 \times AQP_t + 3.0449 \times FUR_t - 0.9779 \times SF_t - 7.4611 \times D23 \quad (11)$$

Where:

*D23* – Dummy variable that takes the value 1 in 2023 and 0 in 2014-2022.

Using the least squares method, the coefficients of the regression equations were calculated, and Table 3 presents the results of testing the null hypothesis (H0) that these coefficients are equal to zero.

*Table 3.*

*Testing the null hypothesis that the regression coefficients are equal to zero (Models 1 and 2)*

| Variables | Model 1 | | | |
|---|---|---|---|---|
| | Coefficient ($\beta_i$) | Standard error | t-value | p-value |
| AAT | 1.667715 | 0.673745 | 2.475292 | 0.0562 |
| AQP | 11.49736 | 3.195948 | 3.597479 | 0.0156 |
| FUR | 3.069621 | 0.638881 | 4.804681 | 0.0049 |
| WE | -0.238183 | 0.098221 | -2.424965 | 0.0598 |
| D23 | -6.919409 | 1.170570 | -5.911147 | 0.0020 |
| | Model 2 | | | |
| AAT | 2.056252 | 0.683549 | 3.008198 | 0.0298 |
| AQP | 14.95119 | 4.121880 | 3.627274 | 0.0151 |
| FUR | 3.044922 | 0.555855 | 5.477910 | 0.0028 |
| SF | -0.977937 | 0.372048 | -2.628524 | 0.0466 |
| D23 | -7.461087 | 1.036684 | -7.197068 | 0.0008 |

*Source: Authors' computations*

If we set the significance level at 5%, the null hypothesis is rejected for Model 2 and accepted for Model 1. However, if we set the significance level at 10% when testing the developed regression equations 10 and 11, the hypothesis H0 is rejected for both models. To make a final decision regarding the choice of model, the quality of the models was assessed, and the results are shown in Table 4.

## Table 4.

*Quality test results of Model 1 and Model 2*

| Indicators | Model 1 | Model 2 |
|---|---|---|
| *R-squared* | 0.938671 | 0.949961 |
| *Adjusted R-squared* | 0.889608 | 0.909930 |
| *Standard Error of the Regression* | 0.887313 | 0.801489 |
| *Sum of Squared Residuals* | 3.936621 | 3.211923 |
| *Log likelihood* | -9.528073 | -8.510810 |
| *Durbin-Watson statistic* | 1.661879 | 1.769226 |
| *Akaike info criterion (AIC)* | 2.905615 | 2.702162 |
| *Schwarz criterion* | 3.056907 | 2.853454 |
| *Hannan-Quinn criterion* | 2.739647 | 2.536194 |

*Source:* Authors' computations

Comparing the obtained results, we conclude that Model 2 demonstrates a better fit to the empirical data. R-squared and Adjusted R-squared are higher, and the values of the Akaike criterion, Schwarz criterion, and Hannan-Quinn criterion are lower in Model 2 than in Model 1. Since the Durbin–Watson statistic for Model 2 falls in the uncertain zone (0.88<1.769226<1.86), an additional test is required. The results of the Breusch-Godfrey LM Test (lag 2) are presented in Table 5, which indicate the absence of autocorrelation of the first- and second-order residuals. The results of the Breusch–Pagan–Godfrey test (Table 5) prove that the residuals of the model are homoscedastic. Thus, Model 2 successfully passed all tests.

## Table 5.

*Results of testing for autocorrelation and heteroscedasticity of residuals of Model 2*

| Breusch-Godfrey Serial Correlation LM Test | | | |
|---|---|---|---|
| *F-statistic* | 0.583225 | ***Prob. F (2,3)*** | 0.6110 |
| *Obs×R-squared* | 2.799625 | ***Prob. Chi-Square (2)*** | 0.2466 |
| **Heteroskedasticity Test: Breusch-Pagan-Godfrey** | | | |
| *F-statistic* | 0.572848 | ***Prob. F (5,4)*** | 0.7237 |
| *Obs×R-squared* | 4.172698 | ***Prob. Chi-Square (5)*** | 0.5248 |
| *Scaled explained SS* | 0.713640 | ***Prob. Chi-Square (5)*** | 0.9822 |

*Source:* Authors' computations

Model 2 of multiple linear regression confirmed our hypothesis that there is a relationship between climate change and the level of gender vulnerability of the population of Moldova. The value of the regression coefficients shows that this relationship is statistically significant, since $\beta_1$ = 2.0563 and $\beta_2$ = 14.9512. An increase in the female unemployment rate by one percentage point leads to a rise in gender vulnerability by three percentage points. An increase in average years of schooling for females by one year will lead to a decrease in gender vulnerability by one percentage point.

Below is a multiple linear regression model that should confirm or refute the hypothesis that growing season precipitation anomalies influence gender vulnerability.

Model 3:

$$GVI_t = 55.6728 + 0.0014 \times AP_t^2 + 1.0592 \times FUR_t - 1.3355 \times WE_t + 6.037 \times D19 \quad (12)$$

Testing the null hypothesis (Table 6) showed that the coefficients of the regression equations are nonzero.

## Table 6.

*Testing the null hypothesis that the regression coefficients are equal to zero (Model 3)*

| Variables | Coefficient ($\beta_i$) | Standard error | t-value | p-value |
|---|---|---|---|---|
| $\beta_0$ | 55.67280 | 8.510190 | 6.541898 | 0.0012 |
| $AP^2$ | 0.001390 | 0.000517 | 2.690822 | 0.0433 |
| *FUR* | 1.059217 | 0,316777 | 3.343729 | 0.0205 |
| *WE* | -1.335450 | 0.366276 | -3.646017 | 0.0148 |
| *D19* | 6.036993 | 1.646006 | 3.667662 | 0.0145 |

Source: *Authors' computations*

The coefficient of determination is 0.8824 (Table 7), indicating that 88.24% of the variation in gender vulnerability is explained by the variables included in Model 3. Probability (F-statistic) is 0.015203, and this value is less than 0.05. This proves that the regression model as a whole is statistically significant at the 5% level.

## Table 7.

*Quality test results of Model 3*

| Indicators | Value |
|---|---|
| *R-squared* | 0.882407 |
| *Adjusted R-squared* | 0.788333 |
| *Standard Error of the Regression* | 1.228669 |
| *Sum of Squared Residuals* | 7.548142 |
| *Log likelihood* | -12.78297 |
| *F-statistic* | 9.379883 |
| *Probability (F-statistic)* | 0.015203 |
| *Akaike info criterion (AIC)* | 28.31084 |
| *Schwarz criterion* | 2.670595 |
| *Hannan-Quinn criterion* | 3.556593 |

Source: *Authors' computations*

According to the results of the Breusch-Godfrey test, no 1st or 2nd order autocorrelation was detected in the residuals (Table 8). Heteroscedasticity of the residuals was also not detected.

## Table 8.

*Results of testing for autocorrelation and heteroscedasticity of residuals of Model 3*

| Breusch-Godfrey Serial Correlation LM Test | | | |
|---|---|---|---|
| *F-statistic* | 1.550990 | ***Prob. F (2,3)*** | 0.2638 |
| *Obs×R-squared* | 3.844800 | ***Prob. Chi-Square (2)*** | 0.1463 |
| **Heteroskedasticity Test: Breusch-Pagan-Godfrey** | | | |
| *F-statistic* | 1.590687 | ***Prob. F (4,5)*** | 0.3083 |
| *Obs×R-squared* | 5.599656 | ***Prob. Chi-Square (4)*** | 0.2311 |
| *Scaled explained SS* | 0.807537 | ***Prob. Chi-Square (4)*** | 0.9374 |

Source: *Authors' computations*

Multiple linear regression (equation 12) confirms the hypothesis of a direct impact of precipitation anomalies on gender vulnerability. It proves that to reduce gender vulnerability, it is necessary to reduce female unemployment and increase the level of women's education.

## LIMITATIONS

The number of observations is limited—only 10 for the period 2014-2023—because the methodology for calculating most socio-economic and demographic indicators has changed. Since 2014, the NBS has been calculating the usually resident population, whereas previously it provided information about the stable population. In this regard, testing Model 2 for robustness is necessary. The results of the test are presented in Table 9. After excluding 2019 (the peak of the Gender Vulnerability Index evolution), the results confirm the robustness of all model variables.

*Table 9.*
*Results of robustness tests for Model 2*

| Variables | Coefficient ($\beta_i$) | Standard error | t-value | p-value |
|---|---|---|---|---|
| *AAT* | 2.226533 | 0.627195 | 3.549983 | 0.0238 |
| *AQP* | 16.13885 | 3.803901 | 4.242711 | 0.0132 |
| *FUR* | 2.204309 | 0.763117 | 2.888561 | 0.0342 |
| *SF* | -0.987701 | 0.341220 | -2.894613 | 0.0444 |
| *D23* | -6.417732 | 1.174807 | -5.462799 | 0.0055 |

*Source: Authors' computations*

A comparative analysis of research results presented in Tables 3 and 9 showed that after excluding 2019, "Annual average air temperature," "Annual quantity of precipitation," and "Average years of schooling for females" remain significant and stable at the same level. In parallel, the significance of the variable "Female unemployment rate" decreased, but remained within the acceptable values (p-value < 0,05). Thus, Model 2 is stable.

# CONCLUSIONS

The novelty of this study is in developing the Gender Vulnerability Index for Moldova, which considers vulnerability across economic, social, and political sectors. The GVI is a composite indicator composed of six sub-indices (GIG, GEG, GPG, GLEG, GGM, GGP). To interpret the Index values, a gender vulnerability assessment scale was introduced. This scale functions both as an analytical tool and as a means to set priorities in gender policy and to monitor the implementation of strategies and programmes aimed at promoting gender equality.

Gender vulnerability in the Republic of Moldova generally remains at a moderate level, averaging 28.31% from 2014 to 2023. This indicates noticeable but not critical disparities in women's and men's access to economic, political, and social resources that require attention. A high level of gender vulnerability was only observed in 2019 and 2020 due to political and economic instability in the country. A comparative analysis between the Gender Vulnerability Index and the female unemployment rate, as well as between the GVI and the proportion of women with tertiary education, revealed that the GVI calculation method is highly sensitive to economic and social changes, confirming its usefulness for tracking progress towards gender equality goals.

The study's results confirmed the hypothesis that climate change increases gender vulnerability. A one-degree Celsius rise in average air temperature results in a two-percentage point increase in the gender vulnerability index. The developed models of multiple linear regression demonstrate that women's education serves as a resource for adapting to climate change, and higher education levels are associated with decreased gender vulnerability. Another factor that may help reduce gender vulnerability is a decline in female unemployment.

To support women engaged in agriculture, it is important to develop and implement financial and technical support programmes that include specific measures. First, establish grant schemes, enhance access to soft loans for women investing in drip irrigation, and buy drought-resistant seed varieties. Second, organize training sessions for women through the National Rural Development Agency (ACSA) on topics such as crop diversification and conservation agriculture. Another promising area for reducing gender vulnerability is decreasing the energy poverty faced by rural women. Therefore, it is essential to execute a national programme to subsidize the installation of solar panels, solar water heaters, and energy-efficient stoves (biomass stoves) in households headed by low-income women.

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