


# Chapter 12


## Increasing the Economic Efficiency of Irrigation Restoration Investment Projects in the Face of Climate Change

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### ABSTRACT

*The chapter presents a scientific and methodological approach to justify investment projects for restoring irrigation systems in southern Ukraine that were not damaged*

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*by hostilities. It focuses on irrigation systems in the Odessa region covering up to 10000 hectares with water supply from local sources. The economic efficiency of investment projects for system restoration is analyzed under different agricultural scenarios. Proposals for modernizing a small irrigation system in Odessa are developed, considering legislative reforms for water user organizations. The chapter evaluates the technical condition of infrastructure, land use, legislative reforms, climate change, and water resources availability. Legal aspects of irrigation restoration are examined, and modernization plans are proposed with results mapping. Profitability indicators are calculated for various investment return scenarios, comparing them with the basic business scenario. Sensitivity analysis is conducted to assess project resilience to changes in key parameters.*

## **BACKGROUND**

Russia's war with Ukraine has caused instability in global food markets, for example, limited availability of food due to disruption of logistics routes and reduced production in Ukraine due to the ongoing war and the destruction of the Kakhovska Dam. This affected the export volumes of cultivated grains and led to an increase in prices on agricultural markets. Future challenges are expected to worsen due to the destruction and impairment of crucial hydrotechnical infrastructure that facilitates irrigation in water-demanding regions of Ukraine. This impending exacerbation is compounded by the ongoing impact of progressive climate change, particularly in Ukraine, where the average annual temperature is rising faster than the global average.

For example, data from the Institute of Water Problems and Reclamation of the National Academy of Sciences (IWPLR) and the Ukrainian Hydrometeorological Center shows a significant 1.2°C increase in the country's average annual air temperature over the past thirty years. This divergence in the rate of temperature rise in Ukraine compared to the broader European context during the period of 1975-2019 is noteworthy. Meanwhile, changes in the average annual amount of precipitation do not show a clear regularity over time, but there is a trend of increasing intensity of rainfall.

This climate analysis utilized data from the Ukrainian Meteorological Center's network of meteorological stations, along with information from IWPLR, the regional forecast projecting the average monthly air temperature and monthly precipitation amounts until 2050 and 2100. The forecast is based on the A1B scenario, anticipating a global warming of +2.8 °C by 2100.

Ukraine has six main moisture zones, with areas experiencing a significant deficit of natural moisture supply increasing by 7% from 1991 to 2015. These zones now cover over 29.5% of Ukraine's total land area, totaling 11.6 million hectares, which

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