WATER-ECOSYSTEMS-FOOD NEXUS IN A MEDITERRANEAN BASIN UNDER CLIMATE CHANGE

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SCOPE

Analyzing and simulating the availability of natural resources to meet current and future needs is an emerging and challenging task [1]. The current study proposes a comprehensive methodology for managing Water-Ecosystems-Food (WEF) in the Kokkinorema River Basin, a highly intensive agricultural area in Northern Greece, under the challenging conditions posed by the climate crisis.

METHODOLOGY

The study entails the creation of a comprehensive Geographic Information Systems (GIS) database that allows for the spatial visualization of crucial information, including meteorological, hydrological, geological, agricultural, economic, and social data. The methodology encompasses projecting future climate scenarios, evaluating the quantitative and qualitative status of water bodies, estimating agricultural productivity, and determining ecosystem characteristics. Economic analysis is conducted to assess the benefits and costs associated with both agricultural activities and ecosystem services. The most effective development strategies are finally disseminated to all stakeholders involved.

RESULTS AND DISCUSSION

Implementing the proposed methodology results in a range of environmental, social, and economic benefits. Environmental benefits include the rehabilitation of water systems and the promotion of ecosystem services. Social benefits are realized through the preservation of rural populations. Economic benefits manifest as increased income for farmers and other stakeholders.

CONCLUSIONS

The current study represents a step towards integrated WEF modeling incorporating climate change scenarios to mitigate water scarcity, ecosystems degradation and reduced crops' yield. The developed methodology could be transferred at any other natural resources-stressed water basin with similar characteristics.

ACKNOWLEDGMENTS

This research was carried out as part of the project «Supporting Agricultural Production and Ecosystems Services under the prism of Climate Change» (Project code: KMP6-0219951) under the framework of the Action «Investment Plans of Innovation» of the Operational Program «Central Macedonia 2014-2020», that is co-funded by the European Regional Development Fund and Greece.

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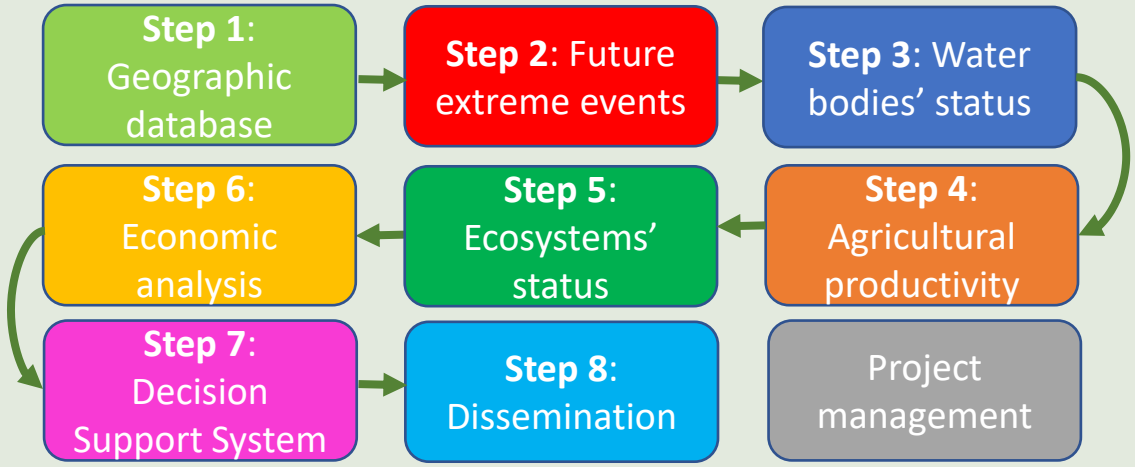
SCOPE



Kokkinorema River Basin

The study proposes a comprehensive methodology for managing Water-Ecosystems-Food Nexus under climate change in the Kokkinorema River Basin; a highly intensive agricultural area in northern Greece.

METHODOLOGY



RESULTS

Following results are expected to be achieved:

- ✓ Agricultural production maintenance
- ✓ Ecosystem services maintenance
- ✓ Local farmers income maintenance
- ✓ Locals job insecurity feeling reduction
- ✓ Developed DSS commercial utilization.

CONCLUSIONS

The developed methodology could be transferred at any other natural resources-stressed catchment with similar characteristics. The results could also contribute to relevant European policies development.

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WATER QUALITY VARIATION IN AN AGRICULTURAL MEDITERRANEAN BASIN UNTIL 2100

D. Malamataris[1,*], A. Tsavdaridou[1], D. Banti[1], A. Malliaras[2], A. Karalis[2], N. Theocharis[3], C. Michos[4], A. Mazaris[1]

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SCOPE

It is widely acknowledged that both human activities and climate change have a significant impact on the safety of water quality. The current study examines the temporal change in the quality of surface water systems in the Kokkinorema basin; a highly productive agricultural water basin in northern Greece.

METHODOLOGY

The study examines the temporal changes in the concentration of total phosphorus and nitrogen in the Kokkinorema River Basin until 2100. Detailed datasets were derived by the Copernicus European Earth Observation and Monitoring Program [1], and in particular, the projections of the bias adjusted HadGEM2-ES+RACMO22E regional climate model of the EURO-CORDEX under the RCP2.6 scenario and the results of the hydrological model E-HYPEcatch provided at catchment scale by the Copernicus Program.

RESULTS AND DISCUSSION

Mean annual precipitation is projected to decrease by 3.99% and mean monthly temperature to increase by +2.27 ^{o}C in 2071-2100 compared to the historical period resulting in an increase of maximum phosphorus and nitrogen concentrations at about 67% of current values by the end of the century.

CONCLUSIONS

Knowledge of future water quality constitutes a crucial part in the process of promoting mid- and long-term climate adaptation techniques. To mitigate the impacts of climate change on water quality, a better control of excessive phosphorus and nitrogen loads have to be ensured.

ACKNOWLEDGMENTS

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SCOPE



Kokkinorema River Basin

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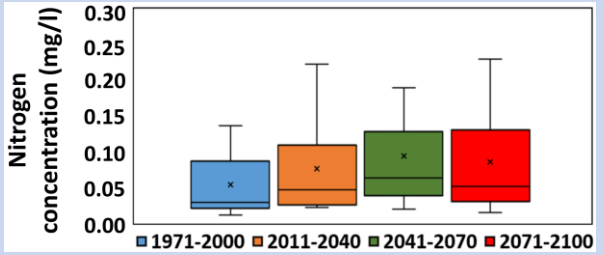
METHODOLOGY

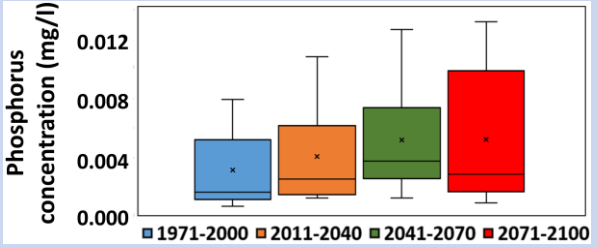
Climate projections until 2100 were derived by the HadGEM2-ES+RACMO22E regional climate model under the RCP2.6 scenario. In addition, projections of phosphorus and nitrogen concentrations produced by the hydrological model E-HYPEcatch were derived by the Copernicus European Earth Observation and Monitoring Program.

RESULTS

Mean annual precipitation is projected to decrease by 3.99% and mean monthly temperature to increase by +2.27 ^{o}C in 2071-2100 compared to the historical period.

These changes in meteorological variables are expected to cause an increase of maximum phosphorus and nitrogen concentration at about 67% of current values by the end of the century.





CONCLUSIONS

To mitigate the impacts of climate change on water quality, a better control of excessive phosphorus and nitrogen loads have to be ensured.

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