



ASSESSING THE IMPACT OF EXTREME WEATHER EVENTS ON WATER QUALITY: THE CASE OF PINIOS RIVER BASIN (GREECE) AFTER THE DANIEL STORM - PRELIMINARY FINDINGS

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Scope

The impact of flood events on the aquatic environment is of major concern worldwide, due to the increasing frequency and intensity of extreme weather events, mostly driven by climate change. This study's aims is to present the preliminary assessment of the impact of the Daniel Storm event, which occurred on 3 September 2023 and caused extended floods in the Pinios River Basin (PRB)^[1] (Fig. 1) on the quality of the basin's surface waters.

Methodology

For the purposes of the study, results of analyses from samples collected prior to the flood for the period 2014 – 2023 were compared with those collected afterwards for the period of 3-10/10/2023. The long-term samplings were conducted as part of the monitoring program for the ecological quality of rivers, coastal, and transitional waters of Greece, in accordance with Directive 2000/60/EC (WFD), funded by the Ministry of Environment and Energy (<https://www.ymeperaa.gr/>). For the present preliminary findings only 7 of the 15 available sampling stations were chosen. Specifically, conductivity, pH, dissolved oxygen (DO), BOD, turbidity and nutrient data were examined before and after the floods in Pinios tributaries in areas of Karditsa and some stations in the main flow of Pinios after the city of Larisa. Conductivity, pH, DO and turbidity were measured in situ and the remaining parameters (nutrients, BOD) in the laboratory with standard techniques. Descriptive and statistical analysis of the available data was performed with SPSS.

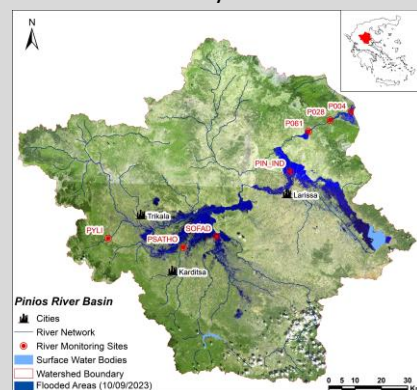


Fig. 1. Map of the study area (basemap: Sentinel-2 False Color Urban imagery)

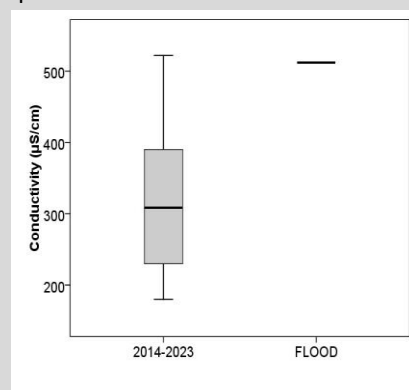


Fig. 2. Conductivity in station PSATHO

Results and Discussion

After the flood event, the conductivity at the upstream stations of the PRB (area of Karditsa) increased significantly compared to previous values (i.e. Fig. 2), while pH and dissolved oxygen (DO) were lower. The nutrient levels (nitrites, nitrates, total nitrogen and total phosphorus) increased 2 to 10-fold after the flood event, indicating increased organic load due to the flood (Fig. 3 and 4). On the contrary, the conductivity, pH and DO values at the stations of the main Pinios flow, downstream of Larisa, were similar prior and after the flood event. In one station the BOD after the flood event increased. The nutrient levels also increased after the flood event in the downstream stations.

For the purposes of the WFD monitoring program, a water quality classification (HIGH, GOOD, MODERATE, POOR, BAD) based on a set of parameters and their possible impact on the ecosystem is used to characterize the water quality status in the monitoring stations. At some of the examined stations after the flood event, the status remained GOOD despite the increase in nutrient values, but in others the status changed from HIGH and GOOD (60-82% of the time) to MODERATE.

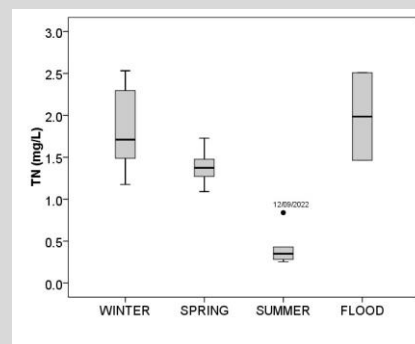


Fig. 3. Station SOFAD N-NO₃ (mg/L)

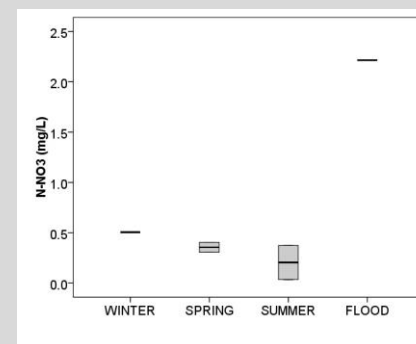


Fig. 4. Station P004 TN (mg/L)

Conclusions

In summary, the Daniel Storm event resulted in the degradation of the water quality in the main flow of the Pinios River and its tributaries. Further evaluation of the water quality in more stations in the PRB through statistical analysis of long-term seasonal data, in combination with the current data, is necessary to improve the assessment of the impact of the flood event on the overall quality of the PRB.