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# Flood Risk Management and Nature-Based Solutions in the Banat Hydrographic Area, Romania

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**Abstract** This study examines flood risk management and nature-based approaches in the Banat Hydrographic Area of south-western Romania using a structured documentary analysis of supplied planning material. The study area covers approximately 18,312.20 km$^2$ and includes a registered river network exceeding 6,700 km. The analysis distinguishes conventional structural defenses, non-structural preparedness and ecological measures such as wetland restoration, floodplain reconnection, remeandering and riparian management

## • Introduction

Flood risk management increasingly requires the simultaneous protection of people, infrastructure and riverine ecosystems. Directive 2007/60/EC establishes a European framework for assessing and managing flood risks, while Directive 2000/60/EC requires water-body protection and improvement [1,2]. Their joint application encourages management measures that provide both risk reduction and ecological benefits.

## Material and method

The study applied qualitative thematic coding to the supplied material and its discussion of the Floods Directive, Water Framework Directive, river basin management and flood-risk management plans [1–4].

Measures were grouped as structural, non-structural and nature-based, then assessed conceptually for potential risk-reduction and ecological co-benefits.

## • Results and discussions

The hydrological role of forest cover is particularly relevant in the mountainous and hilly sectors of the Banat Hydrographic Area, where slope gradients and concentrated rainfall may contribute to rapid runoff generation. Forest vegetation can improve soil structure through root development, litter accumulation and biological activity, thereby supporting infiltration under suitable soil and moisture conditions.

## Conclusions

The geographical diversity of Banat creates distinct flood-management challenges, ranging from rapid runoff generation in mountainous catchments to extensive inundation potential in lowland floodplains.

Structural flood-defense systems remain necessary in locations where settlements and critical infrastructure require direct protection. Nevertheless, reliance exclusively on structural measures may restrict natural river processes and generate substantial long-term maintenance requirements.