Interreg Danube Region

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Report on outputs SO2 & SO3

Harmonisation of joint monitoring and modelling of groundwater system of Pannonian Plain (PANNONIAN. GW)

Content

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1 Introduction

This report consists of second and the third project output: **Groundwater table in Pannonian Plain-main project (SO2)** and : **Report on funding possibilities and further activities (SO3)**.

This report comprises activities during the second 6 months of the project implementation. All partners and ASPs were included in them. On the basis of results obtained in the first specific objective: **Groundwater (GW) monitoring network (SO1),** further development of the main project has been done.

a) **Groundwater table in Pannonian Plain-main project (SO2)** consists of one activity with three deliverables presented in **Chapter 2.**

Activity A 2.1. Main project work plan
D 2.1.1 Work plan of the main project
D 2.1.2 Project partner composition
D 2.1.3 Indicative budget

b) **Report on funding possibilities and further activities (SO3)** has two activities with two deliverables presented in **Chapter 3.**

Activity A 3.1 Funding sources of the main project
D 3.1.1 List of potential funders

Activity A 3.2 Road map elaboration
D 3.2.1 Road map

Chapter 4 gives conclusion after elaborations of specific objectives SO2 and SO3. This entire report, together with **Report on SO1 -Groundwater (GW) monitoring network (SO1) and 11 maps** has been published on the official project website: **Chapter 5** consists of links to the official project website http://www.gfos.unios.hr/homepage/harmonization-of-joint-monitoring-and-modelling-of-groundwater-system-of-pannonian-plain .

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The wider audience interested in this problem can find results of project activities completed during project implementation. All members of project team were involved in creation of this report.

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2 Groundwater table in Pannonian Plain-main project

2.1 Work plan of the main project

Proposed work plan of the main project has 5 different work packages (Figure 2.1). Each work package is briefly described .

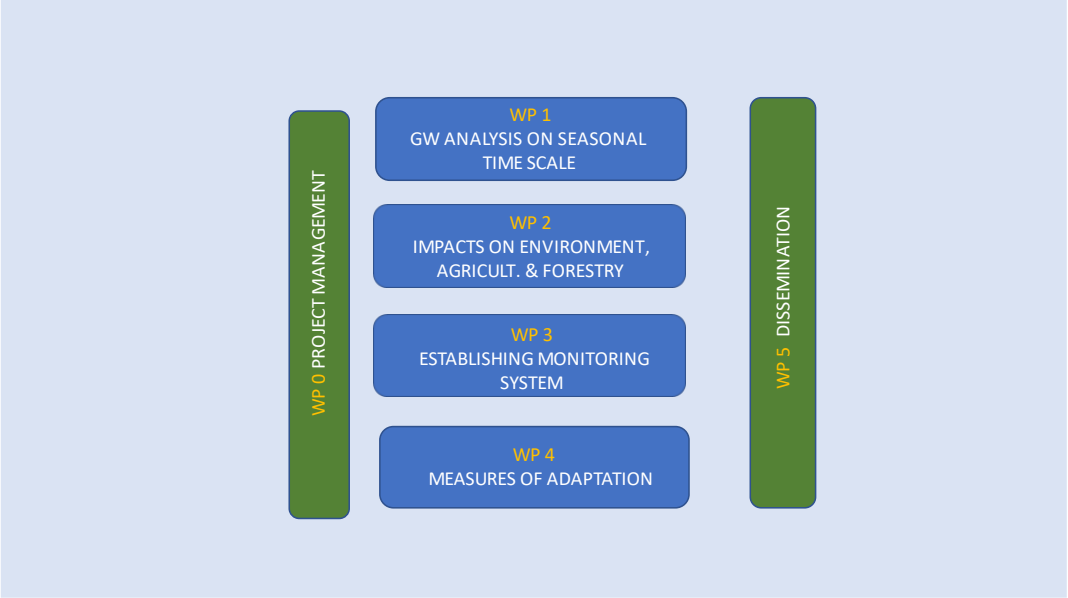

Figure 2.1 Scheme of the main project work plan

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WP0 PROJECT MANAGEMENT

The objective of the WP 0 is to assure the coordination of all work packages and oversee the interface between the different activities. Lead partner will be responsible for WP0 which includes development and management of contractual and legal documents, regular reporting on the project progress and financial management. The activities within this work package are: coordination and project management, controlling and reporting, quality assurance and risk management. The project management coordinates all the activities undertaken in the WPs.

One of the first steps is stakeholder screening and introducing them with project aims and activities

LP will assure the efficient and smooth operation of the work packages and adequate transfer of deliverables between work packages with the close cooperation with work package leaders.

Deliverables:

D 0.1 Financial reports according to call propositions

D 0.2 Plan of regular meetings

D 0.3 Proposed risk-mitigation measures

D 0.4 Planning and organizing of workshops and other meetings

D 0.5 Reports on each activity carried out including reports on regular basis according to call propositions

WP1 GROUNDWATER ANALYSIS ON SEASONAL TIME SCALE

SMF project results are basis for further development of groundwater analysis. Potential problems detected at annual time basis must be further explored on seasonal or even monthly basis. The objective of WP 1 is deeper research of detected GW problem of Pannonian Plain including geological, hydrogeological and pedological analysis. Methods proposed are in the range of comprehensive hydrological modelling of different scenarios related to climate change. The activities within this work package are: extending data series used in SMF model including adding new data series from countries previously not involved in SMF project, hydrological modelling of GW levels in conditions of climate change with its prognosis in the future, help in workshop on applied methodology and results publication. Leader of this WP is responsible for WP 1 and coordinates partners involved .

Deliverables:

D 1.1 Identification of local stakeholders from across the Pannonian Plain

D 1.2 Existing data collection (SMF project) will be updated with GW data of shorter time step. Also, GW data of newly associated countries will be collected

D 1.3 Report on the model results

D.1.4.Scientific research on geological, hydrogeological and pedological properties of the most sensitive areas

WP2 IMPACTS ON ENVIRONMENT, AGRICULTURE & FORESTRY

Earlier detected potential impacts of GW lowering on environment in general, forestry and agriculture in WP 2 will be further developed by experts in this area. One of the first steps is exploration of land cover change during time (CORINE land cover). Besides the quantitative aspect of shallow groundwater levels , GW quality is very important as well. These two aspects are closely related.

Deliverables:

D.2.1; D 2.2; D 2.3 Reports on status of endangered regions from agricultural, environmental and forestrical point of view

WP3 ESTABLISHING MONITORING SYSTEM

Results of WP 1 and WP 2 will lead to establishing monitoring system in the most critical parts of the region. Among other potential locations natural wetlands (nature parks or other protected area) should be particularly emphasized. The activities within this work package are: nomination of monitoring system of 3 to 5 pilot areas depending on previous analysis, design of monitoring network (equipment, parameters) and is implementation, help on workshops organization on obtained data and results publication. Leader of this WP is responsible for WP 3 and coordinates partners involved .

Deliverables:

D 3.1 Result of the WP1 an WP 2. Nomination of the mostly sensitive areas

D 3.2 Establishing additional GW measurement equipment in the pilot areas

D 3.3 Report on data analysis and model verification

WP4 MEASURES OF ADAPTATION

The most difficult part is preparing guidelines for stakeholders directly interested in results, particularly water management bodies.

Measures potentially applied for minimization of GW decreasing can be environmental, socio-economic or in the field of water and soil management.

Deliverables:

D 4.1; D4.2; D 4.3 Groundwater management plan created other basis of outputs of WP1, WP2 and WP3. It would be input to novelation of Danube River Basin Management Plan

WP5 DISSEMINATION

This WP will have input from all partners. The WP leader will be responsible for ensuring that individuals / groups who express interest in the project are kept fully informed. Dissemination is an important component of all work packages. Activities within this WP include: joint events with other networks, promoting public relations and Internal and external communication and dissemination.

A dissemination plan will be developed which will include all necessary features relevant for public relation, for example, folders, posters and presentations.

Deliverables:

D 5.1 Presentations of project results at end of each year

D 5.2 Presentation of results in the media

D 5.3 Publication of research papers in relevant scientific journals, participation in the conferences

Proposed work plan has been developed for the potential duration of the main project of **3 YEARS,** although it is possible to reduce it to **2.5 years or** even extend it to longer period with introducing additional activities (for example related to the water quality). Also, this possible extended duration could be mostly spent on field measurements (monitoring) of GW level in critical regions of Pannonian Plain. The Table 1 presents timetable of proposed activities.

Table 2.1 Timetable

WORK PACKAGES	YEAR 1				YEAR 2				YEAR 3				DELIVERABLES
TIME	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
WP0 PROJECT MANAGEMENT													
0.1 legal and financial management													D 0.1 Financial reports according to call propositions
0.2 WP coordination													D 0.2 Plan of regular meetings
0.3 Risk management													D 0.3 Proposed risk-mitigation measures
0.4 workshop and partner meeting organisation													D 0.4 Planning and organizing of workshops and other meetings
0.5 reporting													D 0.5 Reports on each activity carried out including reports on regular basis according to call propositions
WP1 GW ANALYSIS ON SEASONAL TIME SCALE													
1.1 stakholder mapping													D 1.1 Identification of local stakeholders from across the Pannonian Plain
1.2 GW data acquisitin													D 1.2 Existing data collection (SMF project) will be updated with GW data of shorter time step. Also, GW data of newly associated countries will be collected
1.3 GW modeling in the condition of climate change													D 1.3 Report on the model results
1.4 scientific screening													D.1.4.Scientific research on geological, hydrogeological and pedological properties of the most sensitive areas
WP2 IMPACTS ON ENVIRONMENT, AGRICULT. & FORESTRY													
2.1 potential threats for environment													D.2.1; D 2.2; D 2.3 Reports on status of endangered regions from agricultural, environmental and forestrical point of view
2.2 potential threats for agriculture													
2.3 potential threats for forestry													
WP3 ESTABLISHING MONITORING SYSTEM													
3.1 nomination of pilot areas **(3-5)**													D 3.1 Result of the WP1 an WP 2. Nomination of the mostly sensitive areas
3.2 establishing of monitoring system													D 3.2 Establishing additional GW measurement equipment in the pilot areas
3.3 period of monitoring and data analysis													D 3.3 Report on data analysis and model verification
WP4 MEASURES OF ADAPTATION													
4.1 Link to EU Legislation and strategies													D 4.1; D4.2; D 4.3 Groundwater management plan created othe basis of outputs of WP1, WP2 and WP3. It would be input to novelation of Danube River Basin Management Plan
4.2 Socio-economic measures													
4.3 Environmental measures													
WP5 DISSEMINATION													
5.1 joint events													D 5.1 Presentations of project results at end of each year
5.2 public relations													D 5.2 Presentation of results in the media (TV,
5.3 publicationS													D 5.3 Publication of research papers in relevant scientific journals, participation in the conferences

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2. 2 Project partner composition

Project partners will be from all countries in Pannonian regions. Comparing to the SMF project it is important to include partners from countries that did not participate in this project, PANNONIAN.GW. These countries are: Austria, Czech Republic and Ukraine. It also important to involve partners from different sectors related to water/groundwater management, environmental protection, water utilization, science, climate change adaptation such as:

- Ministries
- Water management authorities
- Climate adaptation and environmental protection agencies
- National NGOs
- Meteorological services
- Academic and research institutions
- International associations
- Agricultural sector
- Private sector

2. 3 Indicative budget

As it was elaborated, proposed work plan has been developed for the potential duration of the main project of **3 YEARS**. Also, potential number of partners is 12. On the basis **of 12 partners** involved in the project activities was created indicative budget.

The Table 2.2 presents indicative budget created on the annual basis (3 years) and Table 2.3 presents budget given per work packages.

In this way we came to the approximate budget of 1.1 million of euros.

Table 2.2 Indicative budget (annual)

	DESCRIPTION	YEAR 1	YEAR 2	YEAR 3	TOTAL
1	DIRECT PERSONAL COSTS	240000	240000	240000	**720000**
2	EXTERNAL EXPERTISE AND SERVICES	11000	22000	25000	**58000**
3	INDIRECT COSTS (administration) 15% of personal costs	36000	36000	36000	**108000**
4	EQUIPMENT	12000	130000	8000	**150000**
5	TRAVEL & ACCOMODATION	22000	25000	26000	**73000**
	TOTAL (euros)	**321000**	**453000**	**335000**	**1109000**

Table 2.3 Indicative budget (per work packages)

	DESCRIPTION	WP 0	WP 1	WP 2	WP3	WP4	WP5	TOTAL
1	DIRECT PERSONAL COSTS	50000	136000	200000	210000	76000	48000	**720000**
2	EXTERNAL EXPERTISE AND SERVICES	5000	2000	18000	22000	5000	6000	**58000**
3	INDIRECT COSTS (administration) - 15% of personal costs	7500	20400	30000	31500	11400	7200	**108000**
4	EQUIPMENT	0	21000	120000	9000	0	0	**150000**
5	TRAVEL & ACCOMODATION	11000	12000	11000	12000	11000	16000	**73000**
	TOTAL (euros)	**73500**	**191400**	**379000**	**284500**	**103400**	**77200**	**1109000**

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3 Report on funding possibilities and further activities

3.1 Funding sources of the main project

Possible funding sources are through EU projects related to water management, environmental protection, transboundary co-operation etc. However, there are also possibilities of funding by international associations, such as ICPDR.

There are several funding mechanisms and programs that could be useful for the proposed project::

- Interreg Danube Region Programme
- HORIZON EUROPE
    - Horizon Europe – Cluster 6: „Food, Bioeconomy, Natural Resources, Agriculture and Environment"
    - **„Water4All"** (Water Security for the Planet)
- ERC Advanced Grant
- LIFE Programme (2021–2027)
- ERA-NET & GeoERA
- COST Actions
- Other national and international funds
- National and international associations International Commission for the Protection of the Danube River (ICPDR), Global Environment Facility (GEF), United Nations Development Programme (UNDP), World Bank, European Investment Bank (EIB), UNESCO – International Hydrological Programme (IHP)

For example, Danube Region Programme is announcing the third targeted call for proposals pre-announcement. The third call will officially open in mid-September, with submissions closing on 15 December 2025. Projects are planned to start on 1 July 2026. The maximum project duration is 30 months, https://interreg-danube.eu/calls-for-proposals/third-call-for-proposals-pre-announcement .

3.2 Road map elaboration

Why this project?

Groundwater is a key resource in the Pannonian Plain, vital for agriculture, forestry, ecosystems and local communities. Recent results from the Pannonian.GW project show both declining and rising groundwater levels across the region, with clear impacts on farming, wetlands, and nature. To address these challenges, partners from multiple countries are preparing a joint project to improve monitoring, modelling and sustainable use of groundwater with a holistic approach.

Our First Goal: Interreg Danube Programme

- Target: Interreg Danube 2021–2027, Third Call (opens mid-September 2025, closes 15 December 2025)
- Focus: transnational cooperation in the Danube Region.
- Themes: groundwater management, agriculture, forestry, and climate resilience.
- Deadline: 15 December, 2025
- Time Available: 4 months (August - December 2025)

Programme Alignment

The Pannonian groundwater project aligns perfectly with Interreg Danube's transnational cooperation objectives:

- **Cross-border collaboration** across multiple Danube Basin countries

- **Environmental protection** and sustainable water management
- **Climate adaptation** and resilience building
- **Knowledge transfer** and capacity building between regions

Alternative Opportunities (if Interreg is not funded)

We are committed to moving forward even if Interreg is unsuccessful. Alternatives include:

- **Horizon Europe:** Cluster 6 **-** water security, sustainable agriculture, climate-smart farming.
- Danube Region Programme
- National and international funds
- National and international associations (ICPDR)

Compressed 4-Month Timeline

- **Month 1 (September 2025): content development and partnership.**
  - **Weeks 1-2:**
    - confirm consortium composition and partner commitment,
    - refine workplan and work packages,
    - define roles and work package leadership,
    - develop preliminary budget framework,
    - initiate contact with key stakeholders and end-users.
  - **Weeks 3-4:**
    - develop detailed work package descriptions,
    - plans for governance and data-sharing mechanisms (i.e., draft data management plan),
    - draft technical methodology,
    - prepare preliminary budget allocations.
- **Month 2 (October 2025): proposal writing.**
  - **Weeks 1-2:**
    - complete first draft of full proposal,
    - conduct internal consortium review,
    - gather letters of support from stakeholders.
  - **Weeks 3-4:**
    - revise proposal based on internal feedback,

        - finalize budget and administrative components,
        - prepare annexes and supporting documentation.
- **Month 3 (November - Early December 2025): finalization.**
    - **Weeks 1-2:**
        - final proposal review and quality assurance,
        - external expert review (if possible),
        - complete administrative forms and compliance checks.
    - **Weeks 3-4:**
        - final revisions and proposal polishing,
        - mock submission test,
        - **submit by 15 December 2025!**
- **Beyond:**
    - adapt proposal for Horizon or other potential calls,
    - monitor 2026 work programme releases.

Key Success Factors for Interreg Application

Consortium Strength:

- maintain current SMF partners as core team,
- ensure geographical balance across Danube Basin,
- include both research institutions and relevant agencies.

Impact Demonstration:

- build on concrete SMF project results,
- show clear benefits for multiple countries,
- include specific measures for agriculture, forestry and environmental protection.

Innovation Elements:

- seasonal groundwater modeling capabilities,
- integrated monitoring systems,
- cross-border data sharing platforms,
- climate adaptation solutions.

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Sustainability:

- long-term institutional commitments,
- policy integration pathways,
- capacity building for ongoing implementation.

Risk Mitigation

If Interreg application is unsuccessful:

- immediately pivot to Horizon Europe,
- leverage consortium relationships for future opportunities,
- continue stakeholder engagement for next application cycle,
- consider national/regional co-funding options as interim support.

Quality Assurance:

- early engagement with Interreg National Contact Points,
- alignment check with programme priorities,
- technical review by experienced Interreg evaluators,
- compliance verification with programme requirements.

Next Steps (Immediate Actions)

1. **Confirm consortium participation** for Interreg application
2. **Assign work package leadership** and writing responsibilities
3. **Schedule kick-off meeting** for proposal development
4. **Identify key stakeholders** for letters of support
5. **Review SMF project outputs** for integration into main proposal
6. **Contact Interreg programme coordinators** for guidance

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This focused approach prioritizes the most realistic and aligned funding opportunity while maintaining flexibility for alternative pathways if needed.

We welcome new partners and stakeholders interested in sustainable groundwater management in the Pannonian Plain.
Together, we can strengthen water security, support farming and forestry, and safeguard ecosystems for future generations.

4 Conclusion

The second and the third project outputs are: **Groundwater table in Pannonian Plain-main project (SO2)** and **Report on funding possibilities and further activities (SO3)** and project team was dealing with it in the second half of project implementation. Results presented in the Report on SO1**, Groundwater monitoring network** were the basis for developing activities in the main project.

Previous analysis proved decreasing of GW levels in many parts of the study area, but in a few parts are designated increasing of GW. However, problems with shallow groundwater table in the Pannonian plain should be explored in a more details through large project.

Results are obtained on the annual time scale what means that we can expect much more variations on the shorter time basis such as season. Further modelling of these changes on shorter time scale, such as season, will be one of the main tasks of the main project.

In SMF project seven countries were included, in the main project it is necessary in have partner from all Pannonian countries. According to draft work plan we stressed importance of involvement new partner and stakeholders from different sectors and countries.

Possible funding sources are through EU projects related to water management, environmental protection, transboundary co-operation etc. In the following period, it will be major interest of all partners and ASPs to do research on calls suitable for developing sustainable groundwater management in the Pannonian Plain.

5 List of websites

Results related to specific objective 2: **Groundwater table in Pannonian Plain-main project (SO2)** and specific objective 3: **Report on funding possibilities and further activities (SO3)** achieved by the project implementation are presented in this Report and published on the official project website http://www.gfos.unios.hr/homepage/harmonization-of-joint-monitoring-and-modelling-of-groundwater-system-of-pannonian-plain as **Report on output (SO1 and SO2),** together with **Report on output (SO1): Groundwater (GW) monitoring network,** and **11 maps** sorted on separate links.

Map 1: Total GW monitoring network of the Pannonian Plain

Map 2: Reduced GW monitoring network of the Pannonian Plain

Map 2a: Map of excluded groundwater observation wells in Pannonian Plain

Map 3: Homogeneity of observed annual GW levels (1990-2022)

Map 4: Average annual GW level in the period 1990-1999

Map 5: Average annual GW level in the period 2000-2009

Map 6: Average annual GW level in the period 2010-2022

Map 7: Differences in average GW levels between the 2nd and the 1st decade

Map 8: Differences in average GW levels between the 3rd and the 2nd decade

Map 9: Differences in average GW levels between the 3rd and the 1st decade

Map 10: Critical spots

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