Interreg Programme VI-A – Estonia-Latvia
Toiv.Joul@estlat.eu
Sõbra 56
50106 Tartu

27.08.2025 no 10-3/25-1384

Response to Interreg Programme VI-A – Estonia-Latvia Monitoring Committee decision about project application HydroScope

Dear Managing Authority,

On behalf of the Lead Partner (Geological Survey of Estonia), we hereby submit our formal response to the specific conditions set by the Monitoring Committee for the project HydroScope (EE-LV00250), as outlined in Annex 1 of the selection decision.

Below, we list each condition along with our detailed reply.

1. Please explain whether and how the planned activities described under Activity 2.5 are linked to the defined output indicators. If those activities do not contribute to and support directly the planned jointly developed solutions, they must be removed from the application form and the budget reduced accordingly. In the latter case, please also review the related aspects of Activity 2.4 and either provide justification for keeping them or remove them from the application.

The activities under A.T2.5 are essential components of the jointly developed pilot solutions, supporting both Outcome 1.1 (Real-time decision-making groundwater platform) and Outcome 2.1 (Pilot actions for groundwater monitoring and pollution mitigation). The two pilot innovations – (1) real-time telemetry systems and (2) digital spring monitoring combined with pollution mitigation measures – are directly supported by the practical implementation steps outlined in Activity 2.5.

The purpose of these activities is to ensure that the monitoring data feeding into the early warning system is reliable, representative of actual groundwater conditions, and gathered from well-maintained, natural spring environments. Without these actions, there is a high risk that the monitoring data (especially from digital springs) would be compromised by external contamination or site degradation, lowering the accuracy and usefulness of the platform.

Each of the four tasks in A.T2.5 contributes directly to these goals:

1. Spring site cleanup (provide access, remove litter, sediment, and pollutants from spring sites), supports both O 1.1 and O 2.1.

   Cleaning activities at digital spring monitoring sites are a critical preparatory step for enabling reliable groundwater data collection. Sediment buildup, litter, and pollution residues can artificially distort flow conditions and water quality readings, leading to inaccurate interpretations of groundwater status. Removing these disturbances helps restore the spring's natural flow regime and ensures that any pollution alerts reflect actual changes in groundwater quality, not surface

Fr. R. Kreutzwaldi 5 / 44314 Rakvere, Estonia / info@egt.ee / www.egt.ee/en

contamination. This action directly supports the quality assurance of the monitoring data, which is a foundational element of the early warning platform.

2. Visitor management infrastructure installation (install small-scale infrastructure such as signs, bins, and water collection systems to guide visitor behavior, reduce contamination risks, and educate people on the project), supports both O 1.1 and O 2.1.

   Signage and infrastructure play an important role in preventing human-caused disturbances that could compromise monitoring quality. Installing informational signs, bins, and designated access points or water collection systems helps to minimize direct human interference with the spring outlet, prevent littering and contamination from recreational use, educate visitors and local communities about the function and sensitivity of the site, thereby increasing local support and awareness of the early warning platform. These infrastructure elements therefore support both data protection and stakeholder engagement for a functional and sustainable decision-making system.

3. Site maintenance (municipalities will perform regular maintenance of spring sites to ensure infrastructure functionality and address ongoing site needs, such as debris removal and monitoring physical changes), supports both O 1.1 and O 2.1.

   Even with initial cleaning and infrastructure, spring sites remain dynamic natural environments subject to seasonal changes, vegetation growth, or debris accumulation. Ongoing maintenance by municipalities is necessary to maintain the functionality and accessibility of the monitoring equipment, ensure consistent flow conditions, and address minor but frequent changes that would otherwise affect data quality. Without this task, the operability of the digital springs as monitoring points would be at risk, and high-quality real-time data collection could not be guaranteed.

4. Small scale pilot activities (municipalities will implement small scale pilot activities, outlined by UT in Activity 2.4, meant for mitigating spring groundwater quality and protecting as well as improving the health of groundwater-dependent ecosystems at and near spring sites), support both O 1.1 and O 2.1.

   Small-scale pilot measures are a critical and planned component of HydroScope's implementation strategy, and they are scheduled to be carried out during the project timeframe. These actions are directly tied to the jointly developed solution described under Outcome 2.1, which combines digital spring monitoring with pollution mitigation. Their purpose is to test in practice how municipalities can respond to real-time alerts and whether such responses lead to measurable improvements in groundwater quality or ecosystem health.

The measures will be implemented in both Saaremaa and Dienvidkurzeme based on early monitoring results from the digital spring systems installed under Activity 2.2 and the guidance documents developed under Activity 2.4. These measures include replanting native vegetation around springs to reduce runoff, stabilizing eroded areas to reduce sediment load, and installing buffer zones to prevent surface contamination.

These actions are an essential test of whether the platform can support operational decision-making. In practical terms:

1) municipalities will receive an alert from the system (e.g. elevated nitrate concentration),
2) based on guidelines from Activity 2.4, they will implement a mitigation action (e.g. install a vegetative buffer),
3) continued monitoring will show whether the mitigation has been effective.

This feedback, from alert to action to outcome, is a defining feature of the HydroScope solution and cannot be tested without actual mitigation activities in the field. Without these pilot measures, the project would lack a full demonstration of how the early warning platform supports local decision-making.

In summary, all four sub-activities in A.T2.5 are directly linked to the defined outputs of the project. They are necessary for ensuring the accuracy, functionality, and relevance of the digital spring monitoring system and for demonstrating how municipalities can act on the information provided by the early warning platform. Rather than standalone actions, these measures are embedded within the jointly developed solution and are crucial for its successful piloting and future replication. Removing them would significantly reduce the reliability and impact of the early warning system, particularly in relation to real-world pollution mitigation and local-level decision-making.

2. Please address the inconsistency between Output 1.1 and Activity 1.4 by clarifying whether a single unified early warning platform will be developed for both countries or if a separate platform is planned for Estonia and Latvia. Please ensure a consistent description throughout the application form.

A single, jointly developed early warning system will be created for both countries. This system will be deployed through two separate web platforms, one for Estonia and one for Latvia, to ensure that municipalities and stakeholders in each country have access to locally relevant data through familiar national portals.

This approach is technically and practically justified. Hosting the platforms within existing national environmental GIS portals guarantees that groundwater data is easily accessible to the municipalities and other stakeholders who will use these platforms more regularly. It also ensures that the system remains functional and visible beyond the project lifetime without requiring the creation of an entirely new cross-border IT infrastructure, which would be significantly more costly and less sustainable.

It is important to emphasize that while there are two separate web platforms for practical deployment, they both visualize and operate on data generated from the same jointly developed early warning system. The cross-border collaborative process focuses on creating a shared solution for data collection, real-time monitoring and predictive modeling, while the user interfaces will be tailored to the needs, languages, and technical environments of each country. **In summary, the HydroScope project will develop one unified early warning system, delivered through two separate early warning platforms.**

Necessary corrections will also be made in JEMS to ensure consistency. The sections needing revision are presented below, with the underlined parts highlighting the changes:

Changes to overall objective:

HydroScope will enhance groundwater protection and management in Saaremaa and Dienvidkurzeme municipalities by providing local governments with a real-time early warning system for decision-making, available as two national platforms. It includes predictive tools to mitigate pollution and safeguard ecosystems. By project's end, the early warning platforms will be fully functional and integrated into municipal workflows, supporting biodiversity and faster responses to pollution events.

Changes to activities:

Activity 1.4 Creation of the early warning platforms, integrating real-time data with predictive insights and visualizations

This activity focuses on developing two tailored early warning platforms – one for Estonia and one for Latvia. These platforms will function as user interfaces for the shared early warning system developed during the project. The platforms will allow municipalities to protect groundwater-dependent ecosystems, preserve biodiversity, and mitigate pollution risks by providing real-time data, predictive insights, and accessible visual tools. By ensuring usability and integration with existing systems in both countries, the platforms will support effective and sustainable groundwater management.

…

4) Predictive insights module. Machine learning algorithms developed in Activity 1.3 will be integrated into the core early warning system, which then feeds both national platforms. In this way, municipalities in Estonia and Latvia benefit from the same predictive engine, while accessing results through their own tailored interfaces. This functionality will provide reliable forecasts of drought and pollution risks, enabling proactive measures to safeguard ecosystems and reduce environmental impacts.

…

6) Cross-border collaboration and knowledge sharing. Although the platforms will be developed separately, knowledge sharing between Estonia and Latvia will ensure that the early warning system and its two platforms benefit from shared expertise and best practices. The platforms will be designed to address regional challenges while maintaining flexibility for local adaptations.

Activity 1.5 Collection and integration of feedback from municipalities for system development and improvement

…

1) User testing and feedback collection from pilot municipalities. Municipalities participating in the telemetry and digital springs pilots will test their respective platforms in multiple stages and provide detailed feedback on their experiences with the platforms. This will include usability assessments of the platforms, effectiveness of the real-time alerts, and the relevance of the provided data for local decision-making.

2) Meeting on early warning system development and Estonian site visit. A key event will be organized in Saaremaa, combining discussions on system development with a site visit to a spring and monitoring wells. This meeting will bring together project partners and municipalities to explore the system's functionality and gather actionable feedback for development. Approximate number of participants from Estonia is 15, from Latvia is 6.

Activity 2.1 Piloting telemetry systems for groundwater monitoring wells and integration of telemetry data into early warning system

This activity focuses on the procurement, installation, and operational setup of real-time telemetry systems to monitor groundwater levels and quality, as well as the integration of collected data into the early warning system, which then feeds into the two national platforms. The activity ensures seamless data transfer and processing, enabling municipalities to utilize real-time insights to safeguard groundwater-dependent ecosystems, mitigate pollution risks, and enhance biodiversity conservation.

…

4) Data pipeline development: Build automated pipelines to transfer real-time data from telemetry and digital spring systems into the early warning system, ensuring consistent analysis capabilities.

…

By combining the technical implementation of real-time monitoring systems with the integration of telemetry data into early warning system, this activity bridges planning and practical execution. Municipalities will gain actionable insights for proactive groundwater management, pollution mitigation, and ecosystem protection.

Activity 2.2 Piloting digital spring systems and integration of digital spring data into early warning system

…

1) Procurement of digital monitoring equipment based on the technical specifications and site selection developed in WP1 Activity 1. The equipment will include multiparameter units with sensors to measure

discharge rates, selected water quality parameters, and telemetry modules for near real-time data transmission to the early warning system.

…

4) Real-time data pipelines will be created to ensure seamless monitoring data transfer to the early warning system. These pipelines will allow daily or more frequent updates to the national early warning platforms, enabling continuous predictions based on fresh data inputs.

5) The machine learning models developed in WP1 will be embedded into the early warning system and connected to the data streams from digital springs and wells. Their forecasts on discharge, water quality, and pollution risks will then be published through the national platforms for municipal use, with interface improvements guided by user feedback from A.T1.5.

Activity 3.1 Publication and dissemination of the early warning system

…

4) Dissemination of the solution. Visually appealing materials summarizing the early warning system's key features, benefits, and results will be developed. Project results and functionalities of the early warning platforms will be shared through partner websites, GIS portals, social media platforms and newsletters, ensuring accessibility and relevance. The decision-making platforms will also be introduced and promoted by partners during topical government level meetings and/or other relevant events.

…

Activity 3.2 Compilation of final report and recommendations

…

4) Ensuring open access and knowledge sharing. Spatial datasets created during the project will be made publicly available. The code behind the system's machine learning models and data pipelines will be shared as open source to the extent that it does not compromise UL's intellectual expertise.

Activity 3.4 External capacity building and stakeholder engagement

…

1) Capacity building webinars in Estonian and Latvian. Two external capacity-building webinars, one in Latvian and one in Estonian, will be held to promote the early warning platforms and build stakeholder capacity, approx 30 participants per country. The webinars will introduce the early warning platforms, their functionalities and potential applications – how the underlying system addresses groundwater challenges and how municipalities (or other stakeholders) can adopt and benefit from it in the future.

…

3) Stakeholder engagement and feedback. Actively involve stakeholders online, during webinars and throughout the project implementation period to gather their insights on the usability of the platforms, address potential questions and map their needs. Feedback will be used to fine-tune the platforms, but also develop recommendations and strategies for broader adoption.

…

Changes to output indicators:

Output 1.1 Real-time decision-making platforms for municipalities (Dienvidkurzeme and Saaremaa) to safeguard our drinking water and groundwater-dependent ecosystems from extreme climate events and pollution

A jointly developed early warning system for groundwater monitoring and forecasting, delivered through two national platforms integrates real-time telemetry, machine learning, and ecological considerations. The platforms will predict droughts and assess pollution risks in near real-time. Tailored for municipalities in Estonia and Latvia (Dienvidkurzeme and Saaremaa), they will empower decision-making to safeguard drinking water and groundwater-dependent ecosystems against climate extremes and contamination.

Output 2.1 Pilot actions for groundwater monitoring and pollution mitigation

Pilot actions in Saaremaa and Dienvidkurzeme will jointly develop and implement 1) real-time telemetry systems in groundwater monitoring wells and 2) digital spring monitoring with pollution mitigation. Estonia's first telemetry systems will be installed through cross-border collaboration, with both countries developing shared methods for data integration and response. These systems will provide continuous groundwater data to the early warning system and through it, two national platforms. Guidelines will support future upscaling.

Changes to result indicators:

Result 2.

The solution developed and taken up by the project is a jointly developed early warning system for groundwater, including real-time monitoring, predictive modeling, and pollution response components. This system will be deployed through two national web platforms, integrated in the existing GIS environments of EEA (Estonia) and LEGMC (Latvia).

These platforms will enable municipalities, environmental agencies, and other stakeholders to monitor groundwater quality, predict risks (droughts or pollution), and implement timely mitigation actions.

During the project, the system will be adopted by the partner municipalities for daily decision-making and integrated into their workflows. National institutions will align the solution with existing monitoring strategies. The uptake and scalability of the solution will be documented in national monitoring frameworks, municipal action plans, and practical guidelines, ensuring long-term impact and wider applicability in groundwater management.

Changes to project management:

C.7.2 Which measures will you take to ensure quality in your project?

…

5) External evaluation: An independent external evaluator will be engaged at key milestones to assess the project's progress, adherence to objectives, and overall impact. This evaluation will include reviewing the early warning platforms' functionalities, monitoring system effectiveness, and stakeholder satisfaction.

…

C.7.5 Cooperation criteria

Joint implementation. The project is structured to ensure active collaboration among partners throughout its implementation period. Each partner is assigned specific tasks and responsibilities. Regular communication and information exchange will be facilitated through quarterly meetings, progress updates, and shared online platforms. Cross-border activities, such as the harmonization of monitoring systems and the development of the early warning system, involve all partners, fostering mutual learning and ensuring that project outputs are jointly developed and owned.

Changes to long-term plans:

C.8.1 Ownership

University of Latvia; UL will be credited as the main developer of the machine learning algorithms and data pipelines integral to the early warning system.

…

- Institutional integration: UL will ensure that data pipelines are configured for automated data transmission to early warning system post-project, minimizing disruptions in data flow. Occasional troubleshooting support might need to be provided in cases of data flow disruptions.
- Usage: UL's machine learning models will enable accurate predictions for groundwater risks, and their expertise will remain credited as the foundation for further enhancements or adaptations of the early warning system.

C.8.2 Durability

Partner municipalities – Saaremaa and Dienvidkurzeme

Saaremaa and Dienvidkurzeme municipalities will directly integrate the early warning and groundwater management platforms into their workflows, ensuring that they become an essential tool for decision-making across multiple departments. In practice, this means municipalities will use their respective platforms to track real-time pollution events, enabling rapid responses to mitigate risks to drinking water and sensitive ecosystems. For example, detecting spikes in bacterial contamination or nitrates will allow them to trace pollution sources and implement immediate containment or cleanup measures. Drought predictions from the early warning system will guide water usage restrictions, ensuring sustainable resource management during dry periods.

…

Local organizations and stakeholders in partner municipalities

…

Local residents will also rely on the platforms to identify pollution hotspots, empowering them to make decisions about their water consumption or advocate for environmental protections.

National agencies (EEA and LEGMC)

The Estonian Environmental Agency (EEA) and Latvia's LEGMC will use the early warning system as a tool for modernizing their groundwater management frameworks. EEA, which has agreed to promote the concept of telemetry systems in national discussions, will position the early warning system as a pivotal step forward in Estonia's groundwater management. LEGMC, with its established telemetry network, will focus on leveraging the system's advanced data processing and automation capabilities to improve decision-making efficiency and reduce manual workloads. Both agencies will use the project's findings to inform future national strategies, ensuring the durability and scalability of the solution.

National policy makers

…

These outputs, such as the early warning platforms and ecosystem health insights, align with broader policy goals of addressing groundwater pollution and drought risks.

…

C.8.3 Transferability

Priority 1. Open access to project outputs

The project outputs will be made publicly accessible to ensure widespread usability and transparency. The two national versions of the early warning and groundwater management platform will be published in Estonian and Latvian on the GIS portals managed by EEA and LEGMC – key national platforms for environmental data access. This ensures local-language accessibility and relevance to both nations. Additionally, the platforms will include user manuals in Estonian, Latvian, and English, tailored to diverse audiences like municipalities, national agencies, and researchers.

…

To promote transparency and foster scientific collaboration, the code behind the early warning system's machine learning models and data pipelines will be shared as open source to the extent that it does not compromise UL's intellectual expertise.

…

Priority 3. Ensuring scalability

The early warning system is built with adaptability in mind, offering a customizable framework that can accommodate the specific needs of various regions. Municipalities or agencies can integrate site-specific data into their platforms, adjust thresholds for alerts, and expand monitoring networks seamlessly.

…

3. Please explain how the two planned pilot actions are jointly developed between Estonian and Latvian partners.

The two pilot actions, (1) the deployment of real-time groundwater telemetry systems, and (2) the implementation of digital spring monitoring with pollution mitigation measures, are the result of a joint development process involving both Estonian and Latvian partners at every step. These actions are not separate initiatives carried out in parallel, but rather integrated, cross-border efforts designed collaboratively to address shared groundwater challenges and build a harmonized early warning system.

In the case of telemetry systems (developed under Activity 1.1 and implemented under Activity 2.1), LEGMC, with its existing telemetry experience, provides practical guidance to Estonian partners on procurement, technical options, installation, and maintenance. Input from Saaremaa and Dienvidkurzeme municipalities is used to define specific groundwater problems (e.g. drought sensitivity, contamination risks) and data needs. These local insights guide decisions about where and how telemetry systems should be installed.

While Latvia contributes prior experience in telemetry system deployment, the development of the pilot solution is a mutually beneficial, co-creative process. Estonian partners contribute several important elements to the joint development of the telemetry solution:

- Estonia introduces new groundwater contexts, which require adapting telemetry design and data interpretation to different geological conditions. This challenges and expands the technical model developed from Latvian experience, helping validate the flexibility and applicability of the solution in varied settings.
- GSE and UT contribute hydrogeological and pollution expertise, informing sensor selection and well placement in ways that increase the system's ability to detect pollutant transport and groundwater dynamics. These insights are integrated into joint planning discussions (Activity 1.1) and improve the scientific robustness of the overall system.
- The Estonian context also helps broaden the machine learning component. For instance, differences in monitoring history and data gaps are addressed together with UL, allowing the algorithm development to account for real-world diversity, which will benefit both countries and future scaling.

- Finally, Estonia's contribution to joint design decisions, testing, and platform integration ensures that the telemetry solution is technically functional and practically applicable across both national systems. The Estonian side benefits from Latvian experience, but also expands, adapts, and strengthens the shared solution, helping ensure that it serves both countries effectively and sets the stage for broader regional use.

The scientific partners also collaborate closely. UL evaluates what types of monitoring data are needed for machine learning models and defines data formats and resolution requirements (Activity 1.1). UT contributes to the design and site selection process in Estonia, ensuring sensors are placed where they can provide the most meaningful insights for tracking pollutant transport and aquifer conditions. GSE, as lead partner, facilitates and coordinates these technical discussions, making sure that all partners' perspectives are reflected in the decisions and that the outcome supports the development of a truly cross-border early warning system. National monitoring authorities (EEA in Estonia and LEGMC in Latvia) make sure that the pilot monitoring sites align with and add value to national monitoring networks.

The digital spring monitoring systems and pollution mitigation measures are also jointly developed under Activity 2.2, Activity 2.4, and Activity 2.5. First, the two municipalities identify a list of potential spring sites. These are jointly assessed by GSE, UT, LEGMC, EEA, and UL, who contribute expertise on hydrogeology, monitoring infrastructure, national monitoring system compatibility, and data modelling needs. The final selection of digital spring systems takes into account ecological relevance, data requirements, and logistical feasibility, and is agreed upon collaboratively by all involved partners.

The design of mitigation measures (such as buffer zones, erosion control features, or protective installations) is based on jointly developed guidelines and thresholds produced by UT under Activity 2.4, with scientific coordination from GSE and input from EEA and LEGMC to ensure national relevance. These guidelines are rooted in the ecological and hydrogeological analysis carried out jointly earlier in the project (Activity 1.2). The final mitigation solutions are implemented in both countries under Activity 2.5 (supported by UT with close cooperation with the municipalities), following a shared logic to ensure comparability, replicability, and common learning outcomes. Throughout the pilot, the municipalities receive continuous technical guidance and field-level support from all partners involved.

Cooperation takes place through joint planning sessions, site visits, and cross-border meetings, many of which are scheduled alongside other project events to ensure broad participation. For example, Estonian partners will visit LEGMC's existing telemetry sites in Latvia to learn from their setup (Activity 1.1), and Latvian partners will visit Saaremaa's spring site and monitoring wells (Activity 1.5). These sessions result in shared technical plans, implementation schedules, and data integration strategies that support the early warning system.

In summary, both pilot actions (telemetry systems and digital spring monitoring with mitigation) are co-developed by all partners. Technical, scientific, and municipal partners from both countries contribute to every relevant activity. Rather than pursuing country-specific solutions, HydroScope takes a collaborative, cross-border approach to building an early warning system that is rooted in shared learning, joint technical development, and aligned goals. This ensures that the outcomes are innovative, scalable and sustainable across both national contexts.

Updates in Jems:

Activity 1.1 Design and planning of real-time monitoring systems for telemetry and digital springs

"….

1) Selecting sites for monitoring systems. Collaboration between GSE and LEGMC to identify optimal locations for installing telemetry wells and digital springs. The selection process will prioritize sites where groundwater challenges are putting ecosystems or biodiversity at risk. The goal is to place systems where they can deliver the most valuable insights for protecting vulnerable environments. <u>First, the two</u>

municipalities identify a list of potential spring sites. These are jointly assessed by GSE, UT, LEGMC, EEA, and UL, who contribute expertise on hydrogeology, monitoring infrastructure, national monitoring system compatibility, and data modelling needs. The final selection of digital spring systems takes into account ecological relevance, data requirements, and logistical feasibility, and is agreed upon collaboratively by all involved partners.

….

3) Sharing knowledge across borders. LEGMC's experience with telemetry installations in Latvia will inform Estonia's design process. This will include practical advice on configuring the equipment, choosing monitoring intervals, and ensuring data flows smoothly and in real time. Estonian partners contribute to the co-development of the pilot solution. Specifically, Estonia's varied geological conditions introduce new challenges that require adjustments to system design and parameter selection. This enhances the robustness of the shared telemetry model and ensures its adaptability across diverse contexts in both countries. The learnings from Estonia's field testing will be shared with LEGMC and other partners to potentially inform upgrades or refinements in Latvian monitoring strategies.

…."

4. Please explain and, if necessary, include corresponding information on planned system setup activities in Latvia under Activity 1.2, to complement the Estonian example in Saaremaa.

We assume that the question refers to Activity 2.1 – the piloting of telemetry systems – rather than Activity 1.2, which focuses on the preparatory analysis and definition of groundwater droughts and does not involve municipality-specific technical setups.

The planned system setup in Dienvidkurzeme follows the same general logic as in Saaremaa. GSE will procure and install approximately 7 to 10 telemetry systems in Saaremaa, with the exact number and type determined in collaboration with the municipality and other project partners based on which parameters are most relevant and where monitoring coverage is the most essential. Similarly, LEGMC is expected to procure approximately 5 to 7 telemetry systems.

The difference in budget and number of systems is due to the different starting points in each country. While Saaremaa requires the establishment of an entirely new telemetry network, in Dienvidkurzeme the focus is on strengthening and optimizing the existing network to support the early warning system. Depending on the results of the coverage analysis, the setup in Dienvidkurzeme may also prioritize fewer but more advanced systems that capture key site-specific parameters relevant to local groundwater management. This would also support the broader development of more advanced telemetry practices in Latvia. The final setup will be determined collaboratively, based on an assessment of existing infrastructure, results from the coverage analysis, and discussions with Dienvidkurzeme municipality and project partners.

In conclusion, the telemetry setup approach is consistent for both countries. The final selection of monitoring wells, parameters and sensor types will be based on technical assessments and close collaboration between project partners, ensuring that the monitoring networks are fit for purpose and fully integrated into the early warning system.

Updates in Jems:

Activity 2.1 Piloting telemetry systems for groundwater monitoring wells and integration of telemetry data into early warning platforms

"….

The main tasks for this activity include:

1) Procurement of telemetry equipment: Necessary telemetry systems will be procured based on specifications developed in WP1 Activity 1. The planned system setup in Dienvidkurzeme and Saaremaa follows the same joint logic, with national implementation adapted to local needs and technical starting points. In Saaremaa, where no telemetry system currently exists, GSE will procure and install approximately 7–10 new telemetry systems, based on a coverage gap analysis, site assessments, and consultations with the municipality and project partners. In Dienvidkurzeme, LEGMC is expected to procure and install approximately 5–7 telemetry systems, with a focus on enhancing and optimizing the existing network to support the needs of the early warning system. Depending on site-specific requirements, Latvian partners may choose fewer but more advanced systems to capture key groundwater parameters. Final system setup decisions in both countries will be made collaboratively, based on technical feasibility, monitoring priorities, and input from municipalities and scientific partners.

…"

5. Please indicate the number of digital spring sites planned in Estonia and Latvia under Activity 2.2.

Under Activity 2.2, one digital spring site is planned in Estonia and one in Latvia, resulting in a total of two. Digital spring monitoring systems are more technically complex and resource-intensive compared to well telemetry, as they require equipment for continuous automated measurements of flow, water quality, and sometimes additional ecological parameters. This also makes them more costly. As this is the first time spring data will be used in an early warning system in either country, it is both practical and methodologically sound to focus on one site per country. This approach allows the project to properly test how the system functions, evaluate its usefulness for real-time monitoring and decision-making and understand its role in protecting groundwater-dependent ecosystems. Limiting the pilot actions to one spring site per country also ensures that sufficient attention can be given to understanding the specific environmental conditions around each spring.

Updates in Jems:

Activity 2.2 Piloting digital spring systems and integration of digital spring data into early warning platforms

"….

1) Procurement of digital monitoring equipment based on the technical specifications and site selection developed in WP1 Activity 1. The equipment will include multiparameter units with sensors to measure discharge rates, selected water quality parameters, and telemetry modules for near real-time data transmission to a centralized server. One digital spring site is planned in Estonia and one in Latvia. Digital spring monitoring systems are more technically complex and resource-intensive compared to well telemetry, as they require equipment for continuous automated measurements of flow, water quality, and sometimes additional ecological parameters. Limiting the pilot actions to one spring site per country will allow the project to properly test how the system functions, evaluate its usefulness for real-time monitoring and decision-making and understand its role in protecting groundwater-dependent ecosystems.

…"

6. Please explain how the guidelines developed under Activity 2.4 will be practically integrated into the platform's operation and use.

The guidelines developed under Activity 2.4 are directly integrated into the platforms' operation and use in two key ways.

Firstly, the thresholds and indicators developed under Tasks 1 and 2, such as baseline conditions, pollution limits, and ecological thresholds, form the basis for how the early warning system functions. These thresholds are essential for the system to provide meaningful alerts. Without them, the early warning platforms could only show raw data, leaving municipalities to interpret on their own what constitutes a risk or an unacceptable condition. Instead, the guidelines define when groundwater quality or quantity becomes critical for either human use or ecosystem health, and they are embedded into the system logic to automatically trigger warnings or advisories when these conditions are met or approached.

Secondly, the mitigation and resilience measures developed under Task 3 are connected to the platforms in a practical way. When municipalities receive an alert (for example, that nitrate levels are nearing a critical threshold or that drought conditions are emerging), the platforms are complemented by the guidelines, which help municipalities understand what the risk means and what response actions are available. This means the platforms inform about problems and direct users toward appropriate solutions, tailored to groundwater quality management and the protection of groundwater-dependent ecosystems.

During the project, selected measures from the guidelines will be piloted together with municipalities based on preliminary monitoring data, as described in Activity 2.5, and further under Question 1. This ensures that municipalities gain hands-on experience with the full decision-making process and are able to go from interpreting platform alerts to implementing actual mitigation and prevention actions. The developed guidelines that will be used for small-scale pilot actions during the project are thus crucial for building the capacity of municipalities to use the early warning platforms effectively after the project ends.

Guidelines developed under Activity 2.4 also align with Activity 3.1, specifically the preparation of user guides, which will further ensure that the guidelines are presented in an accessible, user-friendly format that complements the platforms' day-to-day use.

Updates in Jems:

Activity 2.4 Pollution assessment and development of mitigation and prevention strategies for ecosystem protection

"This activity focuses on detection, reduction and prevention of groundwater contamination, as well as on protecting groundwater-dependent ecosystems through targeted research and practical pilot actions. UT's expertise will be instrumental in identifying contamination sources, assessing impacts, and implementing measures to protect ecosystem health. The activity equips municipalities with actionable tools and guidelines for safeguarding groundwater quality and biodiversity. These guidelines will be directly integrated into the functioning and use of the early warning platforms and form a critical link between real-time data, risk detection, and municipal decision-making.

The main tasks for this activity include:

....

3) Developing resilience and mitigation strategies. UT will develop guidelines for pollution prevention, damage control, and ecosystem restoration. These guidelines will be directly tied to contamination and ecological thresholds: when groundwater quality or quantity approaches or exceeds defined limits critical for human use or ecosystem health, the system will automatically trigger warnings or advisories. The alerts received by municipalities (for example, rising nitrate levels or emerging drought conditions) will be accompanied by clear guidance explaining what the risk means and outlining possible response actions. The guidelines will also include practical, small-scale measures to be piloted by partner municipalities during the project, such as installing buffers, removing invasive plants, preventing erosion, or adding biodiversity-supporting elements around spring sites. These actions will help mitigate groundwater quality risks and protect the health of groundwater-dependent ecosystems near spring sites. UT will also collaborate with UL to integrate ecological thresholds into the early warning system,

ensuring actionable insights for proactive management. This means the platform informs about problems and directs users toward appropriate solutions, tailored to groundwater quality management and the protection of groundwater-dependent ecosystems.

…"

7. For Activity 3.1, please define what types of technical documentation and user guidelines will be made public and which will be tailored specifically for participating municipalities. Also, please specify the content and materials planned to be developed for capacity-building seminars.

In Activity 3.1, the HydroScope project focuses on the publication and dissemination of the jointly developed early warning system to ensure its visibility, usability, and long-term impact. As part of this process, several types of technical documentation and user guidelines will be created, each tailored to different audiences and use cases.

Publicly available materials will include a general user guide to help both professionals and non-experts understand how to interpret and use the web-based early warning platforms published on the national GIS portals (Keskkonnaportaal in Estonia and LEGMC's portal in Latvia). This guide will explain the visual logic of the platform, such as the meaning of colour-coded alerts, how to toggle data layers, navigate the timeline, and access specific spring or well data. In addition, metadata will be published alongside the datasets, detailing when the data was last updated, which institution collected it, and under what methodology. A simplified technical overview of the machine learning algorithms used in the system will also be made available, focusing on transparency: it will describe what data types feed the model and what kinds of predictive alerts (e.g. drought or pollution risk) the system is capable of producing. These materials will be accessible directly from the platform interface and are modelled after similar guides used in existing national mapping portals.

Municipality-specific documentation will include a more detailed set of scenario-based user guidelines to the needs of Saaremaa and Dienvidkurzeme municipalities, but is designed to be adaptable by other regions in the future. These materials will include instructions on what steps to take when the platform signals a rising pollution risk or groundwater level decline. For example, if the concentration of a chemical compound increases in a digital spring, the guide will explain how to check for possible non-groundwater-related causes (e.g. surface contamination) and assess whether further sampling or field inspections are required. If a drought warning is triggered, the materials will identify which areas in the municipality are most vulnerable and recommend step-by-step response measures, such as water-saving protocols or communication with local water users. These guidelines will cover multiple categories of risk (e.g. groundwater quality, quantity, ecosystem thresholds) and outline actions that can be taken both immediately and preventively. While these materials will be provided directly to municipalities, a broader overview of this content (summarizing key findings, recommendations, and pilot outcomes) will be included in the project's final public report to support transparency and replication.

For capacity-building seminars, the project will produce a complete set of instructional materials to be used during and after the events. These include slides and scenario-based exercises. The content will explain the core functionalities of the early warning platform and provide a simplified explanation of how the machine learning models operate. It will also guide participants through practical examples of how to interpret system alerts and visualizations, and what actions could be taken in various real-world situations. These seminars will help a wider group of stakeholders (beyond the two pilot municipalities) understand how the platform can be used for operational decision-making. Case-based discussions will show how different user groups (e.g. municipal planners, environmental inspectors, emergency responders) can engage with the platform and how its outputs can support evidence-based responses.

Updates in Jems:

Activity 3.1 Publication and dissemination of the early warning system

"….

Main tasks in this activity include:

1) Publication of early warning platforms. The early warning platforms for Estonia and Latvia will be made publicly available through the web portals of EEA and LEGMC, ensuring open access for everyone, including municipalities and decision-makers. These platforms will visualize real-time telemetry and digital spring data, early warning indicators, and predictive results generated by the machine learning models.

2) Preparation of user guides and documentation. Multiple types of guidance materials will be developed to support users:

- A general user guide will help both professionals and non-experts navigate the platforms. It will explain key features such as how to interpret colour-coded alerts, use the timeline, toggle map layers, and access site-specific metadata.
- A simplified technical overview of the machine learning component will describe which data types feed the models and what kinds of predictions (e.g. drought, pollution) the system can generate.
- Municipality-specific scenario-based guides will be developed specifically for the two pilot municipalities (Saaremaa and Dienvidkurzeme) and are provided in Estonian and Latvian. They are practical, scenario-based guides explaining what steps local authorities should take when the early warning system issues alerts (e.g., rising pollution levels or declining groundwater levels). These guides will help municipalities interpret alerts, assess risks, and take appropriate mitigation measures. While they are based on content from the final report, they are presented in a highly practical and accessible form tailored to municipal workflows.

3) Organization of events. A 2-day internal event in Riga, organized by LU, will be held to develop materials for capacity-building seminars (A.T3.4); approx 6 participants from Estonia, 14 from Latvia.

4) Dissemination of the solution. Visually appealing materials summarizing the early warning system's key features, benefits, and results will be developed. Project results and functionalities of the early warning platforms will be shared through partner websites, GIS portals, social media platforms and newsletters, ensuring accessibility and relevance. The decision-making platform will also be introduced and promoted by partners during topical government level meetings and/or other relevant events.

5) Production of capacity-building materials. These include slides used during stakeholder training events. They explain the functioning of the early warning platform, interpretation of alerts and visualizations, and possible actions that different stakeholders can take. The materials are prepared in Estonian and Latvian and will be made available to participants after the seminars. While thematically similar to the municipality-specific guides, these materials are more general and outreach-oriented, aiming to introduce the system to a broader stakeholder group, including sectoral agencies, NGOs, and potential future users.

…"

8. For Activities 3.1 and 3.2, please provide a clearer structure distinguishing the various planned materials (e.g., stakeholder-friendly guides, reports, roadmaps) and explain how they complement one another.

Under Activity 3.1, the focus is on user guidance, awareness-raising, and capacity-building. The following key materials will be produced:

1) Municipality-specific user guidelines (targeted for Saaremaa and Dienvidkurzeme):
   These materials are developed specifically for the two pilot municipalities (Saaremaa and Dienvidkurzeme) and are provided in Estonian and Latvian. They are practical, scenario-based

guides explaining what steps local authorities should take when the early warning system issues alerts (e.g., rising pollution levels or declining groundwater levels). These guides will help municipalities interpret alerts, assess risks, and take appropriate mitigation measures. While they are based on content from the final report, they are presented in a highly practical and accessible form tailored to municipal workflows.

2) Capacity-building seminar materials:
These include slides used during stakeholder training events. They explain the functioning of the early warning platform, interpretation of alerts and visualizations, and possible actions that different stakeholders can take. The materials are prepared in Estonian and Latvian and will be made available to participants after the seminars. While thematically similar to the municipality-specific guides, these materials are more general and outreach-oriented, aiming to introduce the system to a broader stakeholder group, including sectoral agencies, NGOs, and potential future users.

Under Activity 3.2, the emphasis is on synthesising and documenting the full project process and outcomes to support knowledge transfer and replication. This includes:

1) Final report (in English):
A comprehensive report co-authored by all partners, documenting the methodology for real-time monitoring and predictive modeling, including lessons learned, system architecture, integration processes, and key findings. It will cover technical, ecological, and operational aspects, with dedicated sections explaining what worked well and what challenges were encountered. The report is intended for research and policy communities and future cross-border groundwater projects.

2) Replication roadmap:
This short, practice-oriented document will accompany the final report and be produced in English, Estonian, and Latvian. It is designed for municipalities, government agencies, and water authorities who may wish to implement similar systems. The roadmap will summarize key steps, suggest appropriate sensor types and coverage strategies, and provide guidance on scaling, from small pilots to national-level platforms. It will clarify which elements are context-specific and which are broadly transferable, and may include estimated cost ranges and planning considerations. It will be visually structured and user-friendly to support practical planning.

3) Stakeholder-friendly outreach materials, including a one-sheet summary:
This concise, accessible document will summarize the core achievements of the project, including the location and purpose of the telemetry systems, the functioning and benefits of the early warning platform, and next steps. It is designed for decision-makers and will be produced in Estonian and Latvian. The Estonian version will focus more on the potential for future uptake of real-time monitoring solutions, while the Latvian version will highlight how existing telemetry data was used effectively for the first time in a real-time context. These materials are suitable for distribution at events, government-level meetings, or follow-up communication with relevant institutions.

Updates in Jems:

Activity 3.1 updates are already shown under question number 7.

Activity 3.2 Compilation of final report and recommendations

This activity focuses on summarizing the project's results, lessons learned, and actionable insights into a comprehensive final report to ensure the long-term impact and scalability of the early warning system.

Main tasks in this activity include:

1) Compilation of the final report. A comprehensive final report will be compiled in English, with input from all project partners. The report is intended for research and policy communities and future cross-border groundwater projects. The report will provide a detailed overview of the methodology used to transform real-time groundwater data into actionable insights. Documenting this process is essential, as the methodology is complex, with many interdependent components, making replication challenging. By clearly outlining what worked and what didn't, the report will enable knowledge-sharing with relevant stakeholders. In addition to methodology, the final report will present key findings from the project, as real-time groundwater telemetry has not been applied in this way before in either Latvia or Estonia. The report will include insights on groundwater droughts, pollution patterns, and the relationship between groundwater and health of dependent ecosystems in the pilot areas. Having all findings in one document will allow for easy reference after the project's completion, ensuring that results can be quickly accessed and shared. Since real-time groundwater monitoring is crucial for protecting groundwater resources and groundwater-dependent ecosystems, the project aims to support its wider adoption in both countries, following the example of several EU nations. To facilitate this, it is essential that this first-of-its-kind project is properly documented in a way that is both accessible and easy to share.

2) Producing stakeholder-friendly materials. Concise documents and briefs, such as a one-sheet summarizing key findings and the benefits of groundwater telemetry systems, will be developed in Estonian and Latvian. These materials will be designed for decision-makers in government, sectoral agencies, and municipalities, presenting the practical advantages of real-time groundwater monitoring in a clear and easy-to-understand format. The one-sheet will include information on the location and purpose of the telemetry systems, the functioning and benefits of the early warning system, and planned next steps. It will be suitable for distribution at events, government-level meetings, and in follow-up communication with relevant institutions. The Estonian version will focus more on the potential for future uptake of real-time monitoring solutions, while the Latvian version will highlight how groundwater telemetry data was used in real-time for the first time.

3) Developing a replication roadmap. A general roadmap document will be compiled to support the replication or scaling up of the methodologies used in this project. It will provide guidance for implementing real-time groundwater telemetry systems and early warning platforms in other regions. The roadmap will clarify which aspects of the methodology are universal and which need to be adapted to local conditions.
It will be produced in English, Estonian, and Latvian, and structured in a visually accessible, user-friendly format aimed at municipalities, government agencies, and water authorities. The roadmap will summarize key implementation steps, suggest appropriate sensor types and coverage strategies, and provide guidance on scaling, from small pilots to national-level platforms. It will also include estimated cost ranges and practical planning considerations, helping users understand which components are context-specific and which are broadly transferable. Where necessary, it will reference relevant sections of the final report for additional detail.

4) Ensuring open access and knowledge sharing. Spatial datasets created during the project will be made publicly available. The code behind the platform's machine learning models and data pipelines will be shared as open source to the extent that it does not compromise UL's intellectual expertise.

9. For Activity 3.3, please indicate the number, format, and expected audience of knowledge-sharing sessions. Please also justify participation in the EGU General Assembly, including the need for two representatives per country and its relevance for reaching the project objectives.

After feedback from the Committee, section 1 of Activity 2.3 (*Online knowledge-sharing sessions; „Internal capacity building through knowledge exchange“*) has been removed, as project meetings in most formats are not regarded, or at least not described as knowledge-sharing sessions. The corresponding adjustments will also be made in JEMS.

The HydroScope project aims to establish real-time groundwater monitoring for the first time in Estonia and significantly advance it in Latvia. The goal is also to translate this data into practical tools that help municipalities protect and manage their water resources. While Latvia has installed some of the first telemetry systems, the real-time data has not yet been actively used or integrated into decision-making processes. For both countries, the development of a functioning early warning platform represents a series of firsts. Attempting to design and implement all of this in isolation would not only be inefficient but also increase the risk of mistakes and unnecessary costs.

Across Europe and beyond, there are countries, regions, and research teams that have already tackled parts of these challenges. Some have applied machine learning to drought prediction, others have developed early warning systems and learned first-hand about the pitfalls, and in some regions, the relationship between groundwater-dependent ecosystems and spring water quality has already been studied. While scientific articles and reports document parts of this work, they highlight only successes and leave out mistakes and lessons learned, especially the kinds of practical details that are most valuable when developing applied solutions, like we will do in the HydroScope project.

To ensure that the HydroScope early warning system (1) works, (2) works for municipalities, and (3) works over the long term, we need input from those who have direct experience with similar systems. This is not something that can always be achieved through email exchanges. Conferences provide the right environment for sharing knowledge and fostering collaboration, as participants are already committed to taking the time to engage and share their experiences.

The EGU General Assembly is the largest geoscience conference in Europe, and it brings together leading experts in all areas directly relevant to HydroScope. It offers the most effective way to meet those with practical experience, exchange ideas, and learn what should be done differently in our own project. Conferences like EGU are also where "insider" information is exchanged: for example, which companies' equipment or which types of sensors proved unsuitable to certain environments, which systems require unexpected amounts of maintenance, or how a clever way of measuring some parameters indirectly can save costs while still producing reliable results. In addition, EGU showcases the newest research before it appears in journals, ensuring the HydroScope team can access the most up-to-date approaches available.

Another important aspect of EGU is the opportunity to engage directly with equipment providers, including suppliers of groundwater telemetry systems. Meeting these companies face-to-face allows us to compare technologies, ask detailed questions and sometimes negotiate better terms. It also exposes the team to new types of sensors and approaches, helping us design monitoring systems that respond directly to the needs of Saaremaa and Dienvidkurzeme municipalities in the most effective and cost-efficient way possible.

Participation in EGU is therefore directly linked to the HydroScope project's objective: to deliver an early warning system that is smart, cost-effective, long-lasting, and easy to maintain, while also reflecting real-world conditions and serving municipal needs. It ensures the team can avoid avoidable pitfalls, maximise environmental benefits, and make the system as strong and reliable as possible.

Two participants from each country will attend the EGU General Assembly. Because the Estonian and Latvian partners contribute quite different skillsets, each attendee will focus on a specific aspect of the early warning system, ranging from telemetry and monitoring to machine learning, groundwater-dependent ecosystems, contamination pathways, simple communication of complex data, or municipal implementation. This ensures that all critical topics are covered and that participants can connect with experts in their own field. The conference also provides a valuable opportunity for project partners to meet in person, exchange ideas in light of new information, and engage with other teams that have developed similar solutions. These exchanges directly support the collaborative development of the pilots and overall system.

In addition to attending, presenting our work at the EGU offers even more possibilities. Submitting abstracts comes at a minimal additional cost but significantly increases the visibility of HydroScope and of the EstLat programme. Presenting initial concepts and approaches in 2026 would also allow the project to attract the interest of others working on related problems, opening opportunities for exchange of ideas.

All in all, the EGU General Assembly is the best opportunity to gather insights that will make HydroScope stronger, smarter and more sustainable. The conference helps us learn from others' experiences, avoid unnecessary costs, maximise environmental impact, and work collaboratively with other experts who face similar challenges. This allows us to focus our efforts on building the best early warning system possible, rather than reinventing the wheel.

10. Please explain why only five organisations are expected to continue cross-border cooperation post-project, despite seven being represented in the project partnership.

Our aim is to maintain cross-border cooperation among all seven project partners after the project ends, and we will be actively working toward that goal. The reason five organizations (GSE, LEGMC, EEA, UL, UT) are listed with a higher degree of certainty is simply because these are scientific and governmental institutions that already have a long-standing history of collaboration through previous projects and other initiatives, like cross-border river basin management plan meetings. Among these five organizations, the intent to continue collaboration beyond the current project has already been discussed during previous projects, and there is a very strong foundation for continued joint activities.

With partner municipalities, the situation is somewhat different because their participation in future cross-border collaboration typically depends on the thematic focus of upcoming projects, their local priorities, and the resources they have available at the time. After the project ends and the digital springs and telemetry systems have been installed, there is a clear need for continued cooperation and communication between Saaremaa and the Estonian project partners, as well as between Dienvidkurzeme and the Latvian project partners. The procured telemetry systems will require joint maintenance over their lifespan, and the early warning system will also need ongoing feedback and periodic updates. Hopefully, there will also be chances for future collaboration between the two municipalities themselves. However, as said, cross-border cooperation involving all seven partners will depend on how well future project topics align with municipal interests and how much time and capacity they have to participate.

Even so, we are committed to strengthening collaboration with both Saaremaa and Dienvidkurzeme municipalities during the HydroScope project. Discussions about potential follow-up initiatives will include all partners, as our goal is to ensure that collaboration continues not only between the core scientific partners but also with the municipal partners whenever the scope and needs align.

Conclusively, the five scientific and governmental institutions are likely to continue working together across borders, as they have done successfully in the past, but our long-term goal is to extend this cooperation to include all project partners whenever the opportunity arises. Even if not all seven partners are involved in every upcoming project, the trust and familiarity developed during the project will make future cooperation, whether large-scale or within smaller groups, far more likely.

Regarding necessary updates in JEMS, we feel that the content in section C.8 (Long-term plans) is already appropriately focused on ownership and transferability, as intended. The answers provided there respond directly to the guiding questions outlined in the descriptions of each sub-section. Since these sub-sections do not address cross-border collaboration, we haven't added additional information about cooperation there.

Updates in Jems:

Result indicator. Organisations cooperating across borders after project completion (5)

The HydroScope project will ensure that GSE, LEGMC, EEA, UL, and UT continue working together through a formal agreement established during the project. This will include sharing data, maintaining the monitoring systems, and improving tools like the early warning platform. The partners will also collaborate on research, organize joint workshops, and support municipalities in using the project's results.

Although not counted under the formal indicator, cooperation with Saaremaa and Dienvidkurzeme municipalities is also expected to continue through follow-up activities, maintenance needs, and shared experience with the digital springs and telemetry systems. By continuing their cooperation, the organizations will strengthen cross-border groundwater management and build on the achievements of HydroScope.

11. The budget related conditions:

In the budget of LP1, please justify the number of working hours planned for the financial manager. If justification is insufficient, the costs must be reduced.

As the lead partner of the HydroScope project, the Geological Survey of Estonia (GSE) is assuming financial coordination responsibilities for an international partnership involving seven institutions. While we acknowledge that the preparation and submission of individual partner reports is the responsibility of each partner, GSE remains fully accountable for the overall financial integrity of the project, including audit preparedness, managing internal budget changes, ensuring coherence across all entries, and verifying compliance with eligibility criteria and programme requirements.

However, considering the Programme's feedback, we have revised the planned working hours as follows:

- The financial manager's allocation has been adjusted to 0.2 FTE, reflecting a more focused role in overseeing compliance, internal control, documentation, coordination of budget changes and audit preparedness. We consider this the lowest feasible allocation to fulfil the responsibilities of accounts, financial reporting, and handling of ERDF funds and national co-financing in coordination with the project manager and partners.
- Meanwhile, the project manager's FTE has been increased to 0.4, to account for the higher coordination load, including managing cross-border communication, partner alignment, progress reporting and strategic adjustments during the project's lifespan.

As a first-time lead partner in an Est-Lat project, to ensure all Programme requirements were met, a more generous share of time was previously allocated to the financial management role. However, based on the Programme's feedback and after reviewing how similar projects typically distribute responsibilities, we recognise that the financial workload is likely to be more targeted and periodic in nature, while the project manager's role requires more continuous coordination, communication and oversight across partners and activities. The updated FTE distribution reflects this improved understanding and ensures that both roles are aligned with the demands of a lead partner position in an international context.

The revised FTE allocations will also be updated in JEMS.

In the budget of LP1, please provide a cost breakdown and justify the costs allocated for communication and awareness materials. If justification is insufficient, the costs must be reduced.

The budget allocated to 'Project communication and awareness materials' was reduced following a reassessment of needs. External design services originally planned for the capacity-building seminar materials and the one-sheet will instead be handled in-house by the project's communication manager. As a result, the costs were reduced from 2700 € to 1100 €. The revised amount covers only the essential communication and awareness materials required for events and stakeholder engagement activities led by the Lead Partner (GSE), primarily under WP3 (Dissemination, capacity building, and outreach). While modest, this budget ensures high-quality and professional communication that meets programme visibility requirements and effectively supports stakeholder engagement.

The majority of project communication is digital to minimize environmental impact and cost. However, some printed and well-designed visual materials are essential to ensure the effective uptake of the project's outputs, especially when communicating complex technical topics like telemetry, predictive modeling, and groundwater protection to local decision-makers and non-technical municipal staff.

The materials include:

- Printed agendas/programmes for all in-person meetings, seminars and workshops;
- Name badges/lanyards for participants at seminars/workshops;
- Directional and other event signage (temporary prints for seminars/workshops, like arrows, room signs, schedules);
- Printed forms to gather feedback on early warning platforms;
- Event photography for final 2-day event in Tartu (*Activity 3.4, "External capacity building and stakeholder engagement", point 2*). For most activities, visual coverage will be provided by the communication manager. However, the final 2-day event in Tartu, which gathers both Estonian and Latvian partners and stakeholders, will be supported by a professional photographer to capture group photos and high-quality documentation. The images will support the final newsletter, reporting and dissemination of results to stakeholders.
- Two-sided roll-up banner, displaying the project logo, programme visibility elements, and key project objectives in both Estonian and Latvian. The banner will act as an introductory tool during seminars and workshops, while also raising awareness among staff and stakeholders in the buildings where events take place, ensuring the project's goals and relevance are clearly communicated. The banner will also be used during topical government level as a visual aid for introducing the project.

In total, 400 € is allocated for event photography and 200 € for the two-sided roll-up banner. The remaining 500 € covers the smaller scale printed materials required for agendas, name badges, event signage and feedback forms. Altogether, this represents a modest and cost-efficient communication budget that ensures compliance with programme visibility requirements and provides the minimum necessary materials to effectively support stakeholder engagement.

The revised budget will also be updated in JEMS, alongside the cost description for the category "Project communication and awareness materials".

Please justify the need for participation in the EGU 2026 conference. Clarify what is included under the membership fee and abstract submission, and how these expenses directly contribute to the project's objectives. If justification is insufficient, the costs must be reduced.

Further justification for participation in the EGU General Assembly is provided under Point 9 in the "Activities" section. Below, the two additional mandatory costs associated with conference participation are clarified:

1. An EGU membership fee. The EGU membership fee (10 € for students, 20 € for regular applicants) is a mandatory step in the conference registration process. While formally structured as an annual membership, in practice it is simply a small one-time fee linked to that year's conference participation. The fee enables the European Geosciences Union to manage participant accounts and provide access to registration and conference services. No additional benefits or services are obtained through this membership beyond the ability to register for the conference.
2. An abstract submission fee. The abstract submission fee (approximately 50 € per abstract) is required for the contribution to be handled and published in the official EGU conference system and programme. This ensures the abstract is uploaded, assigned to the correct session, indexed with keywords, and accessible to all other participants. Without this fee, the project cannot be introduced at the conference. Presenting HydroScope at EGU is essential for effective knowledge exchange. While HydroScope representatives will actively seek out relevant contacts themselves, having an official presentation makes it easier for other interested researchers, institutions, and technology providers to find them. This significantly increases the opportunities for dialogue, feedback and collaboration, which are crucial for gathering insights and ideas relevant to the successful implementation and future scaling of the project. In addition, accepted abstracts are published in the open-access EGU conference proceedings, ensuring long-term international visibility of HydroScope's objectives and supporting the project's goal to develop transferable, cross-border solutions for actionable groundwater monitoring.

In the budgets of LP1 and PP2, please justify the quantity and cost of the digital spring monitoring equipment, ensuring it is necessary and proportionate to the pilot activities.

Both partners (GSE in Estonia and LEGMC in Latvia) plan to procure and install one digital spring monitoring system, with a budget allocation of 21 500 € per unit. This amount is based on existing experience in Latvia, which indicates that the typical cost of a complete digital spring system falls within the 20 000–21 000 € range. These systems are technically complex, as they continuously measure both discharge (flow) and physico-chemical parameters. Unlike groundwater wells, springs offer a unique opportunity to assess groundwater discharge under natural, undisturbed conditions, making them ideal for evaluating ecosystem health, baseflow dynamics, and climate-related impacts.

These systems are essential for piloting real-time monitoring at spring sites, and this activity cannot be meaningfully conducted without such equipment. The budgeted cost is appropriate and proportionate considering the technical requirements and the market price of these systems. The total cost also includes a small buffer of 500–1 000 € per country to cover installation materials, such as protective mounting frames or small adaptations that may be needed at the selected spring sites. Final equipment specifications and exact costs will be confirmed during procurement, but both countries will jointly ensure that the selected systems remain within the allocated budget.

Provide justification for the number of hours allocated to web-based application development and clarify whether this refers to the same platform described in other sections of the application form. If justification is insufficient, the costs must be reduced.

The budgeted cost of 25 000 € per partner (EEA and LEGMC) is intended for the development and integration of two separate web-based platforms, each developed for one country. These platforms are not separate systems but two interfaces connected to a single, jointly developed early warning system that includes real-time telemetry, machine learning–based predictions and ecological insights. The reason two platforms are needed is practical and strategic: the HydroScope system will be embedded into existing national GIS portals (Estonian Keskkonnaportaal and the LEGMC GIS portal), which are already known and trusted by municipalities and environmental agencies. This ensures long-term accessibility, usability, and sustainability of the platform after the project ends, without requiring a new standalone web solution, which would be significantly more expensive to develop and maintain.

The budget of 25 000 € (each) is based on an approximate workload estimate of 400 to 500 hours. The tasks covered under this workload include:

1. The integration of real-time data pipelines from telemetry and digital spring systems (approximately 120 – 150 hrs). This means connecting new telemetry stations and digital spring monitoring into national systems that already exist. The challenge is that each country's databases are built differently and haven't handled real-time groundwater data before. This means data pipelines must be tailored, tested and secured to make sure the data flows reliably at all times.
2. Automation of map updates and visualization of predictive results (approximately 100 – 120 hrs). Here, the machine learning results must be turned into clear maps that update automatically. This is not a simple process: the raw model outputs must be reformatted, linked to mapping tools and displayed in a way that decision-makers without technical training can still understand.
3. User interface adaptation (approximately 100 – 120 hrs). Because the platforms will be part of existing national GIS portals, the new features must be built to fit smoothly into different layouts, languages and user habits. This requires redesigning the interface so that municipalities and agencies can use the tools easily, without training or confusion.
4. Iterative testing and refinement based on project partner feedback (approximately 80 – 100 hours). After development, the system must go through several testing rounds with project partners and stakeholders. This is time-consuming because each round usually identifies new issues or improvements, and the system must be adjusted accordingly to make sure it works as intended in real-world conditions.

While it is not possible to specify the exact number of working hours in advance since hourly costs may vary and development may be contracted either at a fixed price or hourly service depending on the provider, the budget reflects our partners' expert estimates of the minimum feasible cost to deliver these platforms.

The exact distribution of hours will also depend on the technical starting points in each country. For example, Latvia already has some preliminary telemetry data pipelines in place, which may reduce effort in that area, while integration with Estonia's Keskkonnaportaal is expected to be comparatively smoother. These differences may shift how time is spent between tasks, but the total workload is still expected to fall within the 400 – 500 hour range. The aim is to deliver a robust, user-friendly solution that meets project objectives without unnecessary complexity or features beyond what stakeholders actually need.

Cutting these costs would directly compromise the functionality, usability, and long-term value of the early warning system. Therefore, the allocated sum is entirely necessary to meet the technical and strategic goals of the project.

Please justify the planned catering costs for LP1, PP3, PP4, and PP7, ensuring they are appropriate and clearly linked to project events or activities. If justification is insufficient, the costs must be reduced.

Following the Committee's feedback, we have reviewed and adjusted the catering costs for each project partner responsible for hosting an event. A cost level of 45 € per person per day has been applied instead of the previous, higher estimate. This covers two coffee breaks (coffee, tea, fruit, snacks) and a warm lunch, including full service at the seminar location and accommodation of dietary requirements. For the event happening in Riga, organized by the University of Latvia (PP3), however, a rate of 55 € per person per day has been applied, as catering services in the capital city are consistently more expensive than in Tartu or more regional locations. This is based on recent price offers received by project partners for comparable events in Riga. The new estimates better reflect current market offers for catering services. The revised catering costs for each partner are outlined below in the order they appear in JEMS:

1. LP1 (4500 €, reduced from 7000 €): Covers two separate 2-day events in Tartu. The first event (*Activity 1.2, "Preparatory analysis and definition of groundwater droughts", point 4*) will host approx. 15 participants (budget 1350 €), and the second event (*Activity 3.4, "External capacity building and stakeholder engagement", point 2*) will serve 30 – 35 participants (budget 3150 €).
2. PP3 (1925 €, reduced from 3500 €): Covers a 2-day event in Riga (*Activity 3.1, "Publication and dissemination of the early warning system", point 3*). Day 1 will be a stakeholder seminar for ~25 participants, and Day 2 is an internal workshop for ~10 participants.
3. PP4 (2250 €, reduced from 3500 €): Covers a 2-day event in Saaremaa (*Activity 1.5, "Collection and integration of feedback from municipalities for system development and improvement", point 2*), including a workshop day (~25 – 30 participants) and a field trip to pilot sites (telemetry wells and digital springs). The budget is calculated on the basis of 25 participants per day.
4. PP7 (2250 €, reduced from 3500 €): Covers a similar 2-day format in Dienvidkurzeme: approx. 1,5 days of discussions and half-day field visits to potential pilot sites, with ~25 participants (*Activity 1.1, "Design and planning of real-time monitoring systems for telemetry and digital springs", point 5*).

Taking into account the increased catering prices in recent years, the number of participants, the full-day nature of these events, and the partners' recent experience in organizing similar gatherings, we consider the now-reduced catering budget to be appropriate and balanced.

The revised catering costs will also be updated in JEMS.

Please justify the costs for the high-performance computer for PP3 by specifying its use in relation to "the study areas" and its necessity for project implementation. If justification is insufficient, the costs must be reduced.

A high-performance computer is essential for UL's role in developing advanced machine learning models, which require significantly more computational power than standard office computers. These models, developed under task WP1 Activity 1.3, will integrate diverse datasets, including real-time drought and pollution prediction based on data from both Estonian and Latvian study areas, to predict groundwater levels and assess drought and pollution risks in both countries.

While the high-performance computer itself will be physically located at the University of Latvia in Riga, it will process data from both pilot areas: Saaremaa (Estonia) and Dienvidkurzeme (Latvia). The location of the hardware does not affect the relevance of the data, as its function is to deliver cross-border predictive tools that support municipalities in both countries. UL is the only partner in the project with the necessary expertise in machine learning, which is why this work must be carried out at their facilities in Riga.

The current computing resources available to the UL team are inadequate for such advanced modeling due to limitations in processing power and RAM capacity. A new high-performance computer is therefore necessary to ensure the successful execution of these tasks.

While the primary use of this computer will be for WP1 Activity 1.3, it will also support WP1 Activity 1.2 for historical data analysis and other UL activities within the project.

Equipment and related staff costs listed by PP4 and PP7 need to be justified, ensuring they are directly linked to pilot activities and necessary for achieving the intended outcomes. If justification is insufficient, the costs must be reduced.

The equipment and related staff costs under PP4 and PP7 are directly linked to Activity 2.5 and are essential for the successful implementation of the jointly developed early warning system. These costs support the maintenance, cleaning, and small-scale mitigation measures at digital spring pilot sites, ensuring that monitoring data remains reliable and actionable.

Spring monitoring is only effective when the spring site reflects true natural groundwater conditions. However, many springs are impacted by surface-level disturbances such as litter, erosion, unmanaged access, or runoff from surrounding land. Without proper site maintenance and protection, telemetry data from digital springs can show pollution from surface inputs instead of groundwater sources. This would undermine the reliability of the early warning platform, leading to incorrect risk assessments.

To prevent this, equipment is needed to clean and protect the digital spring site, install visitor management infrastructure, and prevent surface contamination. The exact equipment depends on the final site conditions, which will be determined collaboratively during the project. The amounts budgeted per category are modest and proportionate to the scope of the pilots. They are designed to cover only the minimum necessary tools and materials necessary for the monitoring sites to remain viable in the timeframe of the project. Partners will choose the most cost-effective solutions available, ensuring that the chosen solutions deliver maximum benefit. These are not large infrastructure investments, but rather essential field tools and materials needed to ensure the usability of the digital monitoring system.

Detailed description of the equipment costs and related staff needs:

1. Tools for maintenance and cleanup of digital spring sites.

Includes: trash bags, gloves, rakes, hand tools, shovels, equipment for debris removal and invasive species management

Purpose and justification: This equipment is required to carry out initial and ongoing cleanup at digital spring sites. Removal of litter, sediment buildup, and invasive vegetation is critical to restore natural flow conditions and ensure that the monitoring data reflects groundwater conditions, not surface contamination. This directly supports the reliability of the telemetry system and the spring site cleanup sub-activity under A.T2.5. Without these tools, the site cannot be adequately prepared or maintained for high-quality data collection.

2. Equipment for litter prevention and contamination control

Includes: waste bins, protective covers, and site-specific contamination prevention materials

Purpose and justification: To protect the site between maintenance visits, infrastructure such as bins or protective covers will be installed to reduce ongoing contamination risks (e.g., from recreational use or windblown debris). These measures support the visitor management and site protection sub-activity in A.T2.5 and ensure that spring monitoring remains functional without requiring constant manual cleanup. This contributes to data continuity and long-term usability of the monitoring infrastructure.

3. Equipment for guiding visitor behavior and protecting natural conditions

Includes: rope fencing, water collection systems, directional signage, and educational boards

Purpose and justification: Monitoring sites are often located in accessible natural areas. These tools are essential for preventing direct disturbance, protecting the installed sensors, and educating visitors about the ecological importance of the site and the function of the early warning system. These actions support the engagement aspect of the project (as part of stakeholder awareness in Outcome 1.1) and help safeguard both the ecosystem and the equipment. This also reduces the risk of false alerts caused by human interference.

4. Supplies for natural area remediation and ecosystem protection

Includes: erosion control materials, native plants, biodiversity-supporting structures

Purpose and justification: These items will be used to implement small-scale pilot measures developed under A.T2.4 and carried out under A.T2.5, such as stabilizing eroded banks or planting native vegetation. These measures are not decorative or optional, they are integral to testing the system's ability to detect and respond to pollution risks. Municipalities will use early monitoring data to identify risks, act using the supplied materials, and evaluate the results through continued data collection. This cycle (alert, action, and feedback) is central to demonstrating the real-time functionality of the HydroScope system.

5. Digital spring site maintenance technician (staff cost)

Role and justification: The digital spring site maintenance technician positions in both municipalities are necessary to support these efforts. These roles are temporary, project-funded staff who will:

1) perform site cleanup and maintenance, install and monitor small-scale mitigation measures,
2) ensure the monitoring equipment remains protected and functional,
3) respond to any platform alerts (e.g., pollution spikes or abnormal discharge) by checking conditions on site,
4) collaborate with UT and UL to implement ecological or technical recommendations from Activity 2.4.

These tasks require regular attention throughout the project to ensure pilot sites remain viable for continuous, high-quality data collection. Moreover, the hands-on experience gained by municipal staff in maintaining spring sites and implementing real-time mitigation actions is a critical part of building long-term capacity. The HydroScope platform is designed to support informed and timely municipal action. For that to be effective, the municipalities must also be equipped to act, and this includes the necessary personnel and basic tools.

Please clarify whether bus rental costs are intended for project staff or external participants, and how they support specific project activities. Please note that travel and accommodation costs for project staff fall under the cost category "Travel and accommodation".

Based on the Committee's feedback, we understand that bus rental for field trips, even when it is part of on-site project activities rather than transport to and from the meeting venue, cannot be covered under "External services". In line with this guidance, we will remove the bus rental costs from the budgets of PP4 and PP7 and make the corresponding changes in JEMS.

We trust that the explanations provided here adequately address all the stipulated conditions. We are prepared to update the project application in the Jems system as soon as this content has been agreed upon with the Joint Secretariat.

Please do not hesitate to contact us should you require any additional clarification or documentation.

Sincerely

(signed digitally)
Magdaleena Männik
Hydrogeologist
Geological Survey of Estonia

(signed digitally)
Jaak Jürgenson
Deputy Director
Geological Survey of Estonia