Establishing the European Geological Surveys Research Area to deliver a Geological Service for Europe

Technical review report for project GeoConnect3D

This report is part of a project that has received funding by the European Union's Horizon 2020 research and innovation programme under grant agreement number 731166.

INTRODUCTION

Technical review report is part of GeoERA's Monitoring and evaluation process for co-funded projects (*hereinafter: project*). The aim of a technical review is to assess the work carried out under the project over a certain period and provide recommendations. Such technical review evaluates the project reports and deliverables, the proper use of resources, the management of the project and the expected impact.

Technical review report consists of four sections, each representing one level of monitoring and/or evaluation of the project:

Level	Monitor / Reviewer	Input	Aim
1 – Monitoring of progress indicators	Monitoring and reporting officer (GeoZS)	MPPR* FPPR**	Monitoring of the effectiveness of implementation of selected projects with respect to finance, time and administration.
2 – Scientific review	Reviewers (GeoZS)	Submitted deliverables MPPR FPPR	Quality review of the deliverables and review of achieving scientific and professional goals.
3 – Review of the theme progress	Theme coordinators	MPPR FPPR	Review of achieving theme objectives.
4 – GeoERA Progress evaluation	Stakeholder Council member(s)	Sections 1 and 2 of this report Review meetings	Overall project progress and general recommendations.

*MPPR = Midterm Project Progress Report (see PI doc no 2)
**FPPR = Final Project Progress Report (see PI doc no 2)

Monitoring and evaluation process:

M0 = End of reporting period
M1 = Submitted (Final) Project progress Report (MPPR / FPPR)
M2 = 1 – Monitoring & 2 – Evaluation
M3 = 3 – Evaluation of the theme progress
M3 = (Final) Review Meeting & 4 – Progress evaluation

Each project will be reviewed twice: for first project period M1-M18 – Technical review report, and second project period M19-M36 – Final review report.
Technical review report is based on Horizon 2020 templates but adopted to GeoERA needs. Technical reviews of projects shall be carried out on a confidential basis.

GENERAL INFORMATION

ERA-NET Cofund Grant Agreement:	731166
ERA-NET Cofund acronym:	GeoERA
Call identifier:	H2020-LCE-2016-2017/H2020-LCE-2016-ERA
Project full title:	Cross-border, cross-thematic multiscale framework for combining geological models and data for resource appraisal and policy support
Project acronym:	GeoConnect3D
Project reference number:	GeoE.171.009
Project topic:	GeoEnergy
Project specific topic:	GE6-Enabling subsurface management and decision support
Lead partner:	RBINS-GSB – Institut Royal des Sciences Natueelles de Belgique (Geological Survey of Belgium – Royal Belgian Institute of Natural Sciences)
Project website:	http://geoera.eu/projects/geoconnect3d/

☒ Technical review report
☐ Final review report

Period covered	01/07/2018 – 31/12/2019
Review meeting date	05.03.2020

Contributor:	Role:	Approved on:
Barbara Simić	Monitoring and reporting officer	05.03.2020
Maja Ilić	Monitoring and reporting officer	09.03.2020
Matevž Novak	Scientific reviewer	06.03.2020
Tina Peternel	Scientific reviewer	09.03.2020
Jasna Šinigoj	Scientific reviewer	11.03.2020
Matija Krivic	Scientific reviewer	10.03.2020
Serge van Gessel	Theme coordinator	17.03.2020
Glen Burrdige	Stakeholder Council member	28.04.2020
Harikrishnan Tulsidas	Stakeholder Council member	21.04.2020

1 LEVEL 1 – MONITORING OF PROGRESS INDICATORS

In this section the project is monitored "remotely" on the basis of the respective reports. This part is filled in by Monitoring and reporting officer with aim to monitor the effectiveness of implementation of the selected projects with respect to finance, time and administration, based on submitted MPPR and FPPR.

	Yes	Partially (comment needed)	No
PROJECT MANAGEMENT			
Has the MPPR / FPPR report been submitted on time?	☒		☐
Have there been any changes in project partnership?	☐		☒
Has the project management been performed as required?	☒		☐
Has the collaboration between partners been effective?	☒		☐
Do you identify evidence of underperforming partners, lack of commitment or change of interest of any partners?	☐ (see comment)		☒
DELIVERABLES and MILESTONES			
Have the planned deliverables for the period been submitted on time according to timeline in Project Agreement?	☒		☐
Have the planned deliverables for the period been completed (from MPPR / FPPR, sheet 4)	☒		☐
Have any changes to deliverables occurred (type/ dissemination level)? (from MPPR / FPPR, sheet 4 and 5)	☐	See comment no.1	☐
Have planned milestones been achieved for the reporting period? (from MPPR / FPPR, sheet 4)	☒		☐
Have the project partnership identify any difficulties achieving any of the deliverables / milestones?	☐		☒
DEVIATIONS (from MPPR / FPPR, sheet 5)			
Has the project partnership identify any deviations that will not affect projects outputs?	☒	See comment no.1	☐
Have any deviations occur on the project, with impact on project outputs?	☐		☒
In case of deviations, have the project adopted corrective measures?	☒		☐
DISSEMINATION, COMMUNICATION			
Has the project adopted its dissemination plan?	☒		☐

Have the planned dissemination activities been completed for the reporting period? (from MPPR / FPPR, sheet 6)	☒		☐
Have the partners' disseminated project results and information adequately?	☒		☐
Is the project following dissemination plan?	☒		☐
Is the project interacting in a satisfactory manner with other GeoERA projects?	☒		☐
Is the project interacting in a satisfactory manner with national/international bodies?	☒		☐

FINANCE			
To the best of your estimate, have the resources used been utilised for achieving the project? (according to MPPR / FPPR, sheet 9)	☒		☐
To the best of your estimate, have the resources used been in a manner consisted with the principle of economy, efficiency and effectiveness?*	☒		☐
Are there any major deviations in the budget consumptions from the financial plan? (zero consumption in M18; deviation from plan exceeding 20% in M36)	☐		☒
Are there any major deviations in the Person - Months consumptions from the plan? (zero consumption in M18; deviation from plan exceeding 20% in M36)	☐		☒
Are any budget modifications for the project needed? (from MPPR / FPPR, sheet 5)	☐		☒

***The principles of economy, efficiency and effectiveness**: refers to the standard of "good housekeeping" in spending public money effectively. Economy can be understood as minimising the costs of resources used for an activity (input), having regard to the appropriate quality and can be linked to efficiency, which is the relationship between the outputs and the resources used to produce them. Effectiveness is concerned with measuring the extent to which the objectives have been achieved and the relationship between the intended impact and the actual impact of an activity. Cost effectiveness means the relationship between project costs and outcomes, expressed as costs per unit of outcome achieved.

Comments (highlighting the project progress) / deviations / recommendations:

Comment no.1: Deliverable D1.4 Midterm Project Progress Report has been postponed for two months (M17 → M19). The modification has no impact on the project implementation.

Project GeoConnect³d aims to develop and test a new methodological approach to prepare and disclose geological information for policy support and subsurface management based on two regional case studies. The project envisages methodology that will bring together different types of geological information in a harmonised and self-explanatory manner, while making full use of modern visualisation technology.
In the first reporting period project achieved all scientific deliverables on time, only one has been postponed for two months, the Midterm Project Progress report.

The project has adopted the dissemination and exploitation plan and has so far reached more than 60.000 people, which is far more than other GeoERA projects, which makes the assessment of the dissemination activities a 5 – Overachiever. The project partners are very active on the online media, the room for improvement is on other activities, where numbers of people reached is deficient.
Overall financial consumption at the end of first reporting period is 44 %, with some partners showing very low consumption at the end the first period. Project lead is aware of this issue and is in constant communication with these partners. Moreover, additional internal financial report will be requested by the Project lead in month 24 for those partners, so the risk of underspending at the end of the project is minimal.
Project management structure is well defined and efficient. No challenges in achieving project outcomes are recognized, the project lead provides good support to partners with implementation of project activities.

Recommendations by the monitoring team:

- keep track of the communication and dissemination activities and try to count or estimate the number of people reached with these activities. The same is applicable for the meetings.

Overall assessment of the project:

☐ 5 - **Overachiever** (the project has achieved all objectives and goals for the period and has even exceeded expectations)

☒ 4 - **Excellent progress** (the project has fully achieved its objectives and goals for the period)

☐ 3 - **Good progress** (the project has achieved most of its objectives and goals for the period with relatively minor deviations)

☐ 2 - **Acceptable progress** (the project has achieved some of its objectives; however corrective action will be required)

☐ 1 - **Unsatisfactory progress** (the project has failed to achieve critical objectives and/or is not at all on schedule)

Summary of dissemination activities (detailed activities are annexed to this report):

Activity	Target audience	Number of people reached
Publications	EU institution	
Publications	Scientific community	
Meetings	EU institution	
Meetings	Scientific community	
Media	General public	60.807

Are the dissemination activities adequate? (link to GeoERA WP5)

☒ 5 - **Overachieved** (the projects dissemination activities have exceeded expectations)

☐ 4 - **Excellent** (the projects dissemination activities have fully achieved its expectations)

☐ 3 - **Good** (the projects dissemination activities are adequate; however, some additional activities are needed)

☐ 2 - **Acceptable** (the projects dissemination activities need corrective actions; additional activities are needed)

☐ 1 - **Unsatisfactory** (the project has failed to disseminate)

Cumulative financial statement:

	Person months	Total eligible costs	Reimbursement rate	GeoERA contribution	In-kind contribution
Plan	334,87	1.857.753	29,7%	551.753	1.306.000
1st period consumption	161,57	823.006	29,7%	240.156	582.850
2nd period consumption					

2 LEVEL 2 – SCIENTIFIC REVIEW

In this section the project is reviewed ”remotely” on the basis of the respective reports. This part is filled in by reviewer with aim to review the quality of the deliverables and review of achieving scientific and professional goals. Scientific review is based on submitted deliverables and reported Impact statement in MPPR/FPPR.

Impact statement (from MPPR / FPPR, sheet 8):

The development of GeoConnect³d was based on the perception that there is room for improvement in the way geological knowledge is communicated, which at present impacts its use for decision making. Our methodology envisages to bring together different types of geological information in a harmonised and self-explanatory manner, while making full use of modern visualisation technology.

The results from the first half of the project include the development of a pan-European structural framework. This material has been introduced to project partners and students at MSc level, from whom positive feedback was received concerning the understanding of complex geological settings (e.g. mountain building events in Europe). This feedback reassures us that our methodology is on the right track to present geological information in an understandable way. It also showed us the potential of the structural framework as teaching material, and we plan to introduce the material to graduate students in Belgium before the end of the project.

The structural framework (pan-European and part of R2R) has also been discussed in detail with experts in geotectonics. We successfully demonstrated the robustness of the method by displaying geological information in a clear way but without losing on scientific accuracy.

As mentioned in item 3. Publishable summary, as a strongly cross-thematic project we have already established collaborations with other GeoERA projects (such as Mintell4EU, FRAME and VoGERA) and intend to provide the space to fully incorporate data generated by these and other projects within the resulting structural framework.

The information produced by the project and released through social media channels, following our communication strategy, seems to raise a significant amount of interest (which can be seen in item 6. Communication, dissemination) and is already changing and complementing the content of geology-related information that can be found on the internet. We see this as a preparatory step for communicating actual outcomes of the project to the different target groups.

Expected impact (from Project Agreement):

The energy transformation that is intimately linked to the growing awareness of the causes and consequences of climate change has diversified the interest in local geo-resources, including conventional and unconventional oil and gas, gas storage, thermal energy storage and geothermal energy. The fact that these resources share the same or adjacent reservoirs has led to the emergence of subsurface spatial planning as a new topic in applied geosciences. Especially where there are overlapping potential and interests in cross-border areas, a better alignment of national science and policy approaches is needed to come to an acceptable and fair use. It is clear that conflicts arising from the use of geological resources, the non-optimal use of geological resources, or overlooked synergies are issues that need to be avoided. This, however, requires a correct understanding of the potential physical effects or interactions associated with exploitation of geoenergy resources, as well as groundwater and raw materials, where these potentially influence each other. This forms the starting point of GeoConnect³d. GeoConnect³d will, through its two case studies and by developing more general evaluation schemes, act as a demonstration case for pan-European efforts in sharing and harmonizing national and regional data and building cross-border, cross-thematic geological models. The workflow for collecting, harmonizing and disclosing geological data for different applications and at different scales that will be developed within the project, can serve as a backbone for future services for applied geo-sciences in Europe, as well as for the definition and harmonization of regional, national and European policy with respect to geo-resources. What is unique about the approach is the combination of data and knowledge from different geological disciplines. This will lead to new insights in complex geological processes. Trends or processes that appear to be erratic from one perspective can, in many cases, be understood when knowledge from other fields is taken into account. The same is true when evaluating the impact of subsurface activities, which can be misjudged when complex interactions between several processes are not considered or understood. In addition, the project will provide two large and two smaller pilots that test and optimize concepts and standards for the harmonization, management, visualization and documentation of geo-information identified at the European level. Thereby, the project contributes to the long-term ambition to integrate Europe's information and knowledge on geo-resources to support sustainable use of the subsurface in addressing Europe's societal challenges. 7 Following from above, GeoConnect³d will make substantial progress in the following pan-European challenges: • Methodologies for harmonising and integrating cross-border, cross-thematic geo-information; • Mapping and modelling strategies for resource assessment that allow cross-border, crossthematic consistency; • Methodologies to analyse the impact of resource exploitation using a cross-thematic approach; • Methodologies to analyse the interaction between subsurface activities; • Improved knowledge about complex geomanifestations; • Tools to disclose geo-information to decision makers and other end-users. As GeoConnect³d will bring together geo-research into a common context, it will improve the valorisation of

ongoing and past projects on which it relies, facilitating the communication of their results. It adds value to ongoing and past national efforts in optimising the use of the underground. This includes preventing and managing potential competitive uses (e.g. interfering injection projects) and removing obstacles for further development of the subsurface. This will be demonstrated in two larger case studies, and two one-country pilots for testing the transferability of the developed methodology. By putting the method into practice in this way, direct results will be generated for 15 of the 16 countries in a challenging cross-border context (Poland is the only participant without a concrete case or pilot study, but is a leading partner for setting up the generic evaluation in WP5). At the same time, this approach will test and demonstrate the exchange of information and knowledge about geo-resources, thoroughly preparing the cross-border, cross-thematic evaluation methodologies to be scaled up to the European level. Apart from the 16 countries that will have been involved in developing and optimizing these methods (fig. 1), additional GeoERA partners will be asked to review the case studies as these are being developed and implemented. These other GSOs will reflect, using their own background and experience, on how this can foster pan-European implementation. The result will be a large group of European geoscientists that will be familiar with the GeoConnect^{3}d workflow that will be proposed as a new template for postGeoERA projects. The data structure will allow and even facilitate future maintenance and updates, encouraging it to be used in post-project initiatives. GeoConnect^{3}d will focus on understanding geological processes using advanced visual representations based on the annotated structural framework that allows explaining them and translating their relevance and relation to exploitation of geological resources to stakeholders from different backgrounds. This again is an aspect that will pave the way for a more consistent and scientifically based national and European planning of the subsurface.

Evaluation of deliverables

Deliverables list status			
No.	Title	Status (Approve/ Reject)	Comments
D1.1	Minutes of virtual (monthly) and physical (annual) meetings of the PMB_ *version 1*	Approved	
D1.2a	First and final version of the project Data Management Plan	Approved with comments	Only the first version submitted. Update, scheduled for M18, is missing. Annex 1 (list of existing data sets used) is incomplete.
D1.3	Dissemination and Exploitation Plan	Approved	
D1.4	Mid-term Project Progress and Monitoring Report		Postponed for two months (M17 → M19)
D1.6 a	Cumulative Expenditure Report 2018,2019,2020	Approved	
D1.6 b	Cumulative Expenditure Report 2018,2019,2020	Approved	
D2.1	Intra- and inter-thematic exchange logbook_ *version 1*	Approved	Mistakes in the head of document
D2.2	Report (in conjunction with IP) on agreed requirements for data I/O and visualization of results	Approved with comments	Different title of the deliverable: GeoConnect3d IP Requirements
D2.3	Report on fault property requirements (in conjunction with GE4-HIKE)	Approved	Different title of the deliverable: GeoConnect3d Fault Database Requirements

Has the quality as a whole been achieved according the objectives? Has the project as a whole been making satisfactory progress?

☐ 5 - **Overachiever** (the project has achieved all objectives and goals for the period and has even exceeded expectations)

☒ 4 - **Excellent progress** (the project has fully achieved its objectives and goals for the period)

☐ 3 - **Good progress** (the project has achieved most of its objectives and goals for the period with relatively minor deviations)

☐ 2 - **Acceptable progress** (the project has achieved some of its objectives; however corrective action will be required)

☐ 1 - **Unsatisfactory progress** (the project has failed to achieve critical objectives and/or is not at all on schedule)

Comments (highlighting the project progress) / deviations / recommendations:

Reviewers found it difficult to evaluate the progress on the project since the most important deliverables are scheduled to be issued within the last quarter of the project implementation. The opposite is the case with the already submitted deliverables, prepared in the initial phases and therefore describing the work plans with no updates (e.g., to the Data management plan and to the Requirements for data I/O and visualization of results) describing the results/progress. Nevertheless, after presentations and discussion at the review meeting, it is obvious that the project team performs good joint work, which stands out in the segment of inter-thematic communication with other GeoERA projects.

Specific comments:

Comment 1: Deliverable D1.2a (First version of the data management plan) was scheduled to be updated in M18 (see Comments on page 2) because it has been unclear what data will be used and what the final results will look like. There are no updates. The list in Annex 1: Existing data sets used is incomplete.

Comment 2: Deliverable D2.1_version 1): It is titled Version 1.0 Deliverable T2.1. In the document history it is written, that this is actually the Version 2.0 and later it is said that this is a ”living report”. But the status is indicated as ”final” after review.

Comment 3: Data harmonization is one of the crucial issues and goals, mentioned several times in the project implementation. In the deliverable Data management plan, however, nothing is said on how it will be performed. From previous experiences, even the graphic harmonization, and even more so the semantic harmonization, can be very difficult especially with the input data you will deal with (different types, scales, …). INSPIRE and even CGI (GeoSciML) standards/codelists are

of limited use for your purposes. We expected to learn about the proposed solutions in the Deliverables D2.1 (Intra- and inter-thematic exchange logbook) and D2.2 (GeoConnect3d IP Requirements). But there, no conclusions or solutions are summarized after the lists of e-mails exchange content and no update of the first (preliminary) list with data type and format description (information, such as ”too early to tell”, should be updated by the midterm of project implementation).

Recommendation:
We suggest that you look into the results of the several projects in which harmonization – not only the graphic, but also the semantic one – was performed as one of the main project tasks. One good example is OneGeology project with its vocabularies.
In WP5 it would be also interesting to identify type of stakeholder (public, private, a person, etc.) and their needs for each country separately. Have you considered that each type of stakeholder has different rules, influence and responsibilities depends on the country and needs? How are you planning to harmonize standards and prepare recommendation considering that?

3 LEVEL 3 – REVIEW OF THE THEME PROGRESS

In this section the project is reviewed ”remotely” on the basis of the respective reports. This part is filled in by Theme coordinator with aim to review the achieved scientific goals in accordance with theme objectives, on the basis of Sheet 3 in MPPR / FPPR – Project contribution to GeoERA project.

Project contribution to GeoERA project (from MPPR / FPPR, sheet 3):

GeoERA objectives:
1) A more integrated and efficient management of the subsurface.
2) More responsible and publicly accepted, exploitation and use of the subsurface.

Geo-energy objectives:
1) Establishing state-of-the-art methodologies for harmonized mapping and assessment of potential resources and capacities.
2) Improving the interoperability of geological datasets that underpin such assessments.
3) Implementing scientific intelligence and information into the policy domain considering relevant cross-thematic links to groundwater and mineral resources.

GeoConnect³d mid-term contributions to these objectives
The central methodology develop in GeoConnect³d is fundamentally different from state-of-the-art approaches in bringing together different types of geological information in a way that is transparent for a general public, policy makers and experts. The methodology entails a redefinition of the structural framework and the introduction of geomanifestations. Developing this methodology is not the final goal of the project. The ambition of GeoConnect³d is to support managing the use of the subsurface for geo-energy and other uses, and to demonstrate how awareness of the opportunities and limits of the subsurface is critically important by developing several use cases.
Generic schemes will be developed in WP5, but current activities are, in line with the project planning, focussed on identifying national and regional stakeholders by mapping out subsurface competences and authorities. This is an early preparation for the regional workshops to be organised in 2020.
The structural framework methodology is one of two highly innovative aspects of GeoConnect³d. It was successfully and on schedule developed. Its implementation is more far reaching than originally anticipated but progressing well and has been embraced by all partners. At the highest zoom levels, the first version of the Europe-wide structural framework is ready and is now gradually being presented to groups outside of the project consortium for discussing its scientific soundness and visualisation, with good hopes to have a browser hosted version ready by the mid-term meeting.
The structural framework is a direct answer to the first geo-energy objective. It is already proving successful to beyond the current state-of-the-art, e.g. by being

applicable to areas that span contrasting geological units (cf. Roer-to-Rhine case study). It does this by taking an alternative approach to harmonisation by identifying shared limits and units and introducing zoom to allow for different levels of detail, rather than attempting to reach one agreed geological model at one specific scale.
The structural framework is also the frame of reference for other geological datasets. GeoConnect³d focusses on data that tests or complements the geological models and geological understanding that they represent and refers to such data as geomanifestations. Which data will be collected in different parts has been outlined in dedicated research plans. These activities are in the projects original planning delayed compared to setting-up the structural framework but have nevertheless progressed significantly, as is evidenced e.g. of the submission of a first paper to an impact factor journal.
GeoConnect³d also ambitions to be a highly cross-thematic project. Contact has been taken with the raw material project Mintell4EU and FRAME in order to assure access to data relevant for the GeoConnect³d case studies. Similar contacts have been established with VoGERA, a groundwater project looking at interactions in a depth range relevant for the exploitation activities that will be considered in GeoConnect³d, and a workshop of VoGERA has been attended. This is part of the third geo-energy objective.
As mentioned, the first part of the project was largely dedicated to establishing the tools to meet the overall GeoERA objectives. In anticipation of this, an active communication strategy was set-up, using several social media channels, at a scale that exceeds the original proposal. The information release by the project seems to raise a significant amount of interest and is already changing and complementing the content of geology-related information that can be found on the internet. We see this as a preparatory step for communicating actual outcomes of the project to the different target groups.

Theme objectives:

Theme objectives: compliant

- Potential subsurface contributions with regards to energy resources and storage capacities;
    - Indirect objective. In itself the project does not determine resources and capacities, but it helps to place such information in a spatial framework for better management. Current results still focus on the framework development. Practical implementation expected in 2nd half of GeoERA
- Potential risks and environmental impacts associated with subsurface use for energy applications;
    - Indirect objective. In itself the project does not determine risks and impacts, but it helps to place and describe such information

(geomanifestations) in a spatial framework for better management. Current results still focus on the framework development. Practical implementation expected in 2nd half of GeoERA

- Risks of competition and interference between different uses of subsurface space, including interactions with surface infrastructures, and rewards of synergies.
    - Main objective: The project in particular provides tools to evaluate the distribution and interactions of subsurface resources, activities, impacts, etc. . A start has been made with the inventory of these aspects (geomanifestations). Practical implementation of these results in the structural framework concept is expected in 2nd half of GeoERA

Theme scope: compliant

The aspects below are generally regarded by GeoConnect3D (scope of subsurface activities and geomanifestations which can be included in the structural framework SF). The project is not focusing on establishing new resource maps and databases but it collects existing information and places this in the novel Structural Framework concept for better subsurface management. Additionally the project interacts (or plans to interact) with other projects to exchange such information (e.g. HotLime, Muse, Vogera). Further practical implementation is expected in 2nd half of GeoERA. The project interacts with other projects to

- Hydrocarbons including conventional/unconventional oil and gas, gas hydrates;
- Energy derived from solid resources such as coal (including coal bed methane (CBM) and underground coal gasification), lignite, peat, uranium;
- Geothermal energy from hydrothermal and petro-thermal resources, both shallow and deep;
- Capacities for temporary storage of energy carriers (natural gas, hydrogen, compressed air and heat);
- Capacities for permanently storage of CO2 and other energy effluents.
- Identification and analyses of overlap and interactions between geo-energy resources and areas prone to seismic activity;
- Determination and analysis of potential connections to groundwater and surface water systems;
    - Particularly regarded aspect in the project
- Identification and analysis of potential interferences as well as synergies/pooling between various geo-energy resources and subsurface uses.
    - Particularly regarded aspect in the project

Theme approach and methods: compliant

- Deliverables proposed by geo-energy theme projects should be compatible with a common spatial geological framework defined by the extent, depth, thickness, as well as essential properties of geological intervals containing relevant geo-energy resources and storage capacities.
    - The project presents a novel framework concept which makes it easier and more effective to communicate and manage subsurface information. Results presented
- Common state-of-the-art methodologies will be developed and applied with the aim to assess and quantify technically recoverable resources.
    - Not in project scope
- Development and demonstration of advanced 3D modelling and assessment activities may be proposed for complex geological configurations typical for specific cross-border regions under the condition that these methodologies have generic value and can be linked to the future objectives of a common spatial-assessment framework.
    - The Structural framework is specifically developed to act as a tool in cross-border regions. It incorporates mostly existing 3D models (also from other projects such as HIKE, 3DGEO-EU)
- The joint call will either ask for final deliverables and methodologies consistent on a transnational to pan European level, or for the demonstration and development in cross-border regions of methodologies that have generic value for future pan-European assessments.
    - The project primarily develops the methodology in two major cross-border regions (Roer-to-Rhine and Pannonian Basin). As a bonus, the project has established an overarching pan-EU structural framework which can be used later as a starting point for other regions.
- Correlation schemes of cross-border geo-energy resources;
    - Core aspect in the project (correlation of structural boundaries)
- Compatible and interoperable model scales/resolutions and geometries;
    - The project strongly focuses on the development and implementation of multiple scale representations (e.g. gradual zooming with increasing levels of detail).
- Commonly agreed modelling and assessment methodologies.
    - The presented Structural Framework is intended to become a common principle for (cross-border) subsurface management

Beyond state of art

- Advanced mapping and 3D modelling strategies that allow for regional to pan-European cross-border consistency and integration;

- This is a core aspect of the project (presented by the structural framework).

- Advanced and harmonized resource estimation workflows addressing uncertainty and sensitivity;
  - Not part of project scope or very limited
- State-of-the-art assessment workflows for analysis of potential geologically related surficial and subsurface effects induced by resource exploitation (e.g. subsidence, tremors, etc.);
  - Not part of project scope or very limited
- Methodologies to objectively weigh interacting or mutually exclusive potential uses of space within the geoenergy theme and across the other themes on groundwater and minerals.
  - This is a core aspect of the project (presented by the structural framework).

Project-2-Project:
GeoConnect3D is already interacting with other projects to establish the Structural Framework concept (e.g. HIKE) and plans further interaction and collaboration to populate/implement the framework (e.g. Vogera, Hotlime, Muse).

Has the project as a whole achieved the objectives and expected impact of the theme?

☒ 5 - **Overachiever** (the project has achieved greater impact on project theme and/or other themes than expected)

☐ 4 - **Excellent progress** (the project has fully achieved its objectives and goals towards the theme as expected)

☐ 3 - **Good progress** (the project has achieved most of its impact towards the theme for the period with relatively minor deviations)

☐ 2 - **Acceptable progress** (the project has minor impact; corrective action will be required)

☐ 1 - **Unsatisfactory progress** (the project has failed to achieve critical objectives and/or is not at all on schedule and/or has no impact on the theme; corrective actions are required)

Comments / deviations / recommendations:

GeoConnect3D progresses in line with the project objectives and thereby follows the theme scope/objectives and GeoERA principles in general as mentioned in the call description.

Additionally the review analyses how the project performs beyond the project scope and raises the overall profile of the Energy Theme and GeoERA as a whole, i.e.:

- Developing and actively implementing standards and methods for panEU harmonization in the GSO community that are of value to the Energy Theme and/or GeoERA in general (i.e. beyond the project scope)
- Successfully introducing and implementing innovative and novel methods and standards in stakeholder/science communities leading to wider recognition of the Energy Theme and/or GeoERA
- Stimulating synergies between projects and themes
- Raising the overall impact and recognition of the Energy theme and/or GeoERA though active engagement of stakeholder and science communities
- Opening opportunities for future research and spin-offs including EP-GSE (i.e. possibilities for sustained development of results after project lifetime)

The GeoConnect3D project is rated as 'overachieving' for the following reasons:

1) Generated a lot of external exposure via online media, not only for the project itself but also for the Energy Theme and GeoERA programme
2) Growing success in promoting new concepts to the science communities (geomanifestations/Structural Framework increasingly recognized via google and other online platforms, parts of the work becoming an element in education programmes)

A broad (transnational, EU) implementation of a complex concept (subsurface management) that is often regarded in local and single-disciplinary context only.

4 LEVEL 4 – GEOERA PROGRESS EVALUATION

In this section the project is reviewed on the Review meetings, where projects present their overall progress and achievements. This section relates to particular project, broader impact of GeoERA as a whole on policies will be covered at the Final Review meeting with questionnaire and interview with Evaluator.

Based on technical review summaries provided by Sections 1 – 3 of this report, and project presentation on the (Final) Review meeting:

Has the project as a whole been making satisfactory progress according to your own understanding and expectations of the GeoERA project?

☒ 5 - **Overachiever** (the project has exceeded expectations)
☐ 4 - **Excellent progress** (as expected)
☐ 3 - **Good progress** (minor recommendations given below)
☐ 2 - **Acceptable progress** (below expectations; minor corrective action will be required)
☐ 1 - **Unsatisfactory progress** (the project has failed; corrective actions are required)

Overall comments for the project (overall recommendations, modifications, corrective actions, or re-tuning the objectives to optimize the impact or keep up with the State of the Art, re-focusing, or a simple praise)

Stakeholder one feedback:
GeoConnect3D is an innovative project that is looking into the sub-surface resource potential of Europe and its optimal use. The project includes essential work on cross-border harmonization of 3D geological models, structural framework models, and geo-manifestations. Optimal use of the subsurface has necessary implications for an environmental and climate-friendly future of the planet. Along with the utilization of conventional resources such as minerals and hydrocarbons, the project looks into unconventional resources such as coal bed methane, capacities of storage of energy carriers such as natural gas, hydrogen, compressed air and heat. The storage of CO2 holds important implications for a low carbon future. Groundwater utilization is an area which links to the nexus of Food-Water-Energy.

The project includes essential work packages on interface and methodology; Roer-to-Rhine cross-border, cross-thematic evaluation of geological resources and applications; Pannonian basin study involving eight counties; and sharing of case studies.

Recommendations:

Interface and methodology: The highlight of this work package is the structural framework model for connecting data that is cross-border, cross-thematic and multiscale. The structural framework is an important aspect that endeavoured to take the full advantages of modern visualization technologies. It is suggested that the structural framework modelling and synthesis aspects may also be captured and published for the benefit of other similar projects.

The structural framework, when linked to geomanifestions such as CO2 rich springs, crude oil and mineral showings, provide a rich context for the benefit of experts, policymakers and the general public. Geomanifestations is an excellent concept, which includes aspects of spatial data, vocabulary, a photo database and links to blog posts. It is suggested that the geomanifestions also include archaeological and geo-parks information wherever possible. The team is congratulated for the excellent work done so far.

Roer-to-Rhine: This work package looks into a cross-border, cross-thematic evaluation of geological resources and applications. This work was particularly challenging due to working across geological borders in multiple countries and regions. The tasks included assimilating regional-scale structural framework, linkage to geomanifestations and geological modelling. The team also attempted an additional task of pan-European structural framework. It is suggested that the work may also consider Sustainable Development Goals and the European Green Deal and see how the grand objectives could be linked to geomanifestations. The work achieved so far is can be considered exceptional, and the project team is encouraged to publish all results in reputed journals.

Pannonian Basin: The tasks include the integration of the structural framework model across eight countries to provide information on sub-surface management and policy support for the exploitation of geo-resources. Harmonised geological-structural framework model and subsurface management of resources are linked to geomanifestations. The team is commented for the traffic-light model indicating suitability for various types of use of the subsurface. It is suggested that it may be linked to the United Nations Framework Classification of Resources (UNFC), which also uses a traffic-light coding.

Sharing the case studies: The tasks include knowledge transfer from WP3-WP4 as a basis for pan-European recommendations; improved methods for decision making for subsurface planning and management; applicability of developed methods on smaller-scale pilot studies; and overall recommendations regarding subsurface planning and management. The methods deployed within the primary case studies will be tested in pilot-scale in Ireland and Germany. The team has done an excellent job in highlighting cases where energy and resource efficiency can be optimised. It is

suggested that the planned pilot studies may give equal emphasis on (a) social; (b) environmental and (c) economic viability when the resource are developed.

In summary, the whole project team is congratulated for the excellent work and achievements. This project is considered as on overachiever for demonstrating the power of geomanifestions as an excellent communications tool. In general, the project has achieved more than what is usually expected on the communications.

Stakeholder two feedback:
The overall impression gained through reviewing GeoConnect3D is that this is a project very much attempting to address the crux of geoscience's most significant issue, namely the communication of the essential messages from its understanding of the Earth.

It is explicitly aiming to provide a bridge between geoscience and policymakers. Outreach is central to its purpose. Not only that, but with a moderate budget, it is unashamedly ambitious in what it seeks to achieve, spanning much of GeoERA's remit.

The power of its easy-to-transmit "Subsurface Challenge for the Future" message is very striking:

- "Ecosystem Earth is under stress"
- "There's a need for alternative uses of the subsurface"
- "Be aware the subsurface will get crowded"

It is evident that three key elements are central to the project's ability to deliver:

1. The GeoConnect3D blog: The success of this seems to have even surprised the co-ordinators and is clearly something they are proud of.
2. The zoom-able Structural Framework concept they have developed
3. The SF's population by what they have coined as "geomanifestations".

Blog:
The coordinators have clearly landed on a simple recipe for uptake by road-testing the content with their own admin support staff and watching which articles get shared and positive responses.

There is a strong lesson in here for not only public bodies like the GSB, but for any organisation trying to enthuse the public about geology: In your midst you have non-geologists who can help you gauge / calibrate public taste and motivations.

Structural Framework
This is clearly a concept that took a certain bravery to adopt, as the term itself has become loaded with software-driven meaning and appropriation. However, the underlying premise of such an entity conceptually remains sound and the project

team have certainly taken the opportunity to re-appropriate it for the purposes of their goals.

The attractiveness of the ability to zoom across a range of scales is evident and very much what is expected in this day and age, but its greatest value probably lies in its potential as a “rallying point” for reconciling diverse research avenues around a given theme or physical location. As was pointed out for its example of the Caledonides, such a framework may end up a reference focal-point of knowledge on a given feature or concept.

Geomanifestations

While the Structural Framework may remain a concept more at home among geologists and forms the broader crucible in which they work, it is the idea of a geomanifestation appears to have caught the imagination of the public, with the term being picked up and used actively for features across Europe.

This is a second lesson we should take away from this project as geologists: Find a positively-inclined term for the features associated with our work which encourages curiosity and on which learning can be hung.

My only critique here is the word itself in English, which appears long and will likely end up truncated by anglophones. Recognising its roots lie elsewhere, consideration should be given to retaining it in those other languages, where it appears appropriate, but swapping it for a shorter and more compact term in English.

Recommendations and suggestions:

- Explore opportunities for using content generated around Geomanifestations as “travel guides” for geotourism purposes. Geoparks are obvious targets.
- Drawing on the effectiveness of the Geomanifestation blogs, can lessons be drawn, on what appeals about certain “geological stories” for different audiences?
- The knowledge-building behind the Geomanifestations concept implies value could be created from mapping the expertise that underlies these features.
- Interviews with geoscientists involved with the project have been well received; confirmation for other projects that the human dimension to any project always provide a mechanism for drawing in attention.
- While Subsurface Management protocols are not specifically in scope, the project’s outputs could be used to help frame these.

Annex 1: Review meeting list of participants

Name	Role	Organisation
Tessa Witteman	GeoERA coordinator	Netherlands Organisation for Applied Scientific Research
Barbara Simić	Monitoring and Reporting Officer	Geological Survey of Slovenia
Jasna Šinigoj	Scientific reviewer	Geological Survey of Slovenia
Matevž Novak	Scientific reviewer	Geological Survey of Slovenia
Tina Peternel	Scientific reviewer	Geological Survey of Slovenia
Serge van Gessel	GeoEnergy Theme coordinator	Netherlands Organisation for Applied Scientific Research
Glen Burrige	Stekaholder council member	European Federation of Geologists
Harikrishnan Tulsidas	Stakeholder council member	UN Economic Commission for Europe
Kris Piessens	Project manager	Geological Survey of Belgium
Renata Barros	Project member	Geological Survey of Belgium
Monika Konieczyńska	Project member	Polish Geological Insitute
Katrijn Dirix	Project member	Vlaams Instituut voor Technologisch Onderzoek
Isaline Gravaud	Project member	The French Geological Survey
Maros Gyula	Project member	Mining and Geological Survey of Hungary

Annex 2: Communication and dissemination activities

Please select activity	Subcategory	Date	Target audience	Number of people reached	Short name of project participant	Author(s)	Link (if applicable)
MEETINGS	Meeting with international body	03.07.2018	EU INSTITUTION		RBINS-GSB	Kris Piessens	
MEETINGS	Internal project meeting	04.07.2018	SCIENTIFIC COMMUNITY				
MEETINGS	Internal project meeting	30.08.2018	SCIENTIFIC COMMUNITY				
MEETINGS	Internal project meeting	18.10.2018	SCIENTIFIC COMMUNITY				
MEETINGS	Internal project meeting	02.04.2019	SCIENTIFIC COMMUNITY				https://geoera.eu/blog/towards-a-project-vocabulary-geological-concepts-for-humans-and-computers/
MEETINGS	Internal project meeting	05.06.2019	SCIENTIFIC COMMUNITY				
MEETINGS	Meeting with other GeoERA projects	04.07.2019	SCIENTIFIC COMMUNITY		TNO, VITO, RBINS-GSB	TNO	https://geoera.eu/blog/how-we-deal-with-our-faults/
MEETINGS	Internal project meeting	15.10.2019	SCIENTIFIC COMMUNITY		RBINS-GSB, SGUDS, BRGM, PIG-PIB, CGS, FZZG, HGI-CGS, LfU, TNO, GeoZS, MBFSZ	RBINS-GSB, SGIDS	
MEETINGS	Other	03.12.2020	SCIENTIFIC COMMUNITY	3	RBINS-GSB	Renata Barros, Kris Piessens	
PUBLICATIONS	PROJECT SPECIFIC PUBLICATION (please specify: leaflet, poster, catalogue, …)	03.07.2018	EU INSTITUTION		VPO, RBINS-GSB, VITO, TNO, SGL, BRGM, LfU, NRW, BGR	Timothy Debacker et al.	https://www.researchgate.net/publication/326991428_GeoConnectd_-_Cross-border_cross-thematic_multiscale_framework_for_combining_geological_models_and_data_for_resource_appraisal_and_policy_support_-_WP3_Roer-to-Rhine

PUBLICATIONS	PROJECT SPECIFIC PUBLICATION (please specify: leaflet, poster, catalogue, …)	03.07.2018	EU INSTITUTION		BRGM, LfU, GSI, PIG-PIB, RBINS-GSB	Isaline Gravaud et al.	https://www.researchgate.net/publication/327185873_GeoConnectd_Cross-border_cross-thematic_multiscale_framework_for_combining_geological_models_and_data_for_resource_appraisal_and_policy_support_WP5-SHARING_THE_CASE_STUDIES_Objectives
PUBLICATIONS	PROJECT SPECIFIC PUBLICATION (please specify: leaflet, poster, catalogue, …)	03.07.2018	EU INSTITUTION		MBFSZ, GeoZS	Gyula Maros et al.	
PUBLICATIONS	PROJECT SPECIFIC PUBLICATION (please specify: leaflet, poster, catalogue, …)	03.07.2018	EU INSTITUTION		RBINS-GSB	Kris Piessens	https://www.researchgate.net/publication/327185132_GeoConnectd_Cross-border_cross-thematic_multiscale_framework_for_combining_geological_models_and_data_for_resource_appraisal_and_policy_support
PUBLICATIONS	ABSTRACTS	12.09.2018	SCIENTIFIC COMMUNITY		RBINS-GSB, VPO, VITO	Kris Piessens et al.	https://www.researchgate.net/publication/327939533_Understanding_the_Earth_for_the_people_that_inhabit_it_Belgian_and_Flemish_institutes_joining_hands_in_the_framework_of_GeoERA
PUBLICATIONS	PAPERS	28.06.2019	SCIENTIFIC COMMUNITY		IGR	Valentina Cetean et al.	https://www.researchgate.net/publication/335099383_A_CHALLENGING_ATTEMPT_-_CROSS-BORDER_HARMONIZATION_OF_GEOLOGICAL_DATA_IN_THE_WESTERN_PART_OF_ROMANIA?channel=doi&linkId=dca4585153e594a800f&showFulltext=true
PUBLICATIONS	ABSTRACTS	09.10.2019	SCIENTIFIC COMMUNITY		HGI-CGS	Marko Špelić et al.	https://www.researchgate.net/publication/336687187_SEDIMENTARY_BASIN_FILL_OF_LAKE_PANNON_IN_THE_EASTERN_PART_OF_DRAVA_BASIN
MEDIA	ONLINE MEDIA	05.07.2019	GENERAL PUBLIC	798	GSB	Renata Barros	https://geoera.eu/blog/meet-the-scientist-1/
MEDIA	ONLINE MEDIA	02.08.2019	GENERAL PUBLIC	663	VPO	Renata Barros	https://geoera.eu/blog/meet-the-scientist-2/
MEDIA	ONLINE MEDIA	13.09.2019	GENERAL PUBLIC	577	GeoZS	Renata Barros	https://geoera.eu/blog/meet-the-scientist-3/
MEDIA	ONLINE MEDIA	27.09.2019	GENERAL PUBLIC	515	GeoZS	Renata Barros	https://geoera.eu/blog/meet-the-scientist-4/
MEDIA	ONLINE MEDIA	11.10.2019	GENERAL PUBLIC	417	BRGM	Renata Barros	https://geoera.eu/blog/meet-the-scientist-5/
MEDIA	ONLINE MEDIA	22.11.2019	GENERAL PUBLIC	263	HGI-CGS	Renata Barros	https://geoera.eu/blog/meet-the-scientist-6/
MEDIA	ONLINE MEDIA	19.12.2019	GENERAL PUBLIC	473	GSS	Renata Barros	https://geoera.eu/blog/meet-the-scientist-7/

MEDIA	ONLINE MEDIA	10.01.2020	GENERAL PUBLIC	226	BRGM	Renata Barros	https://geoera.eu/blog/meet-the-scientist-8/
MEDIA	ONLINE MEDIA	25.07.2018	GENERAL PUBLIC	1059	RBINS-GSB	Kris Piessens	https://geoera.eu/blog/ground-to-cover-for-r2r/
MEDIA	ONLINE MEDIA	01.10.2018	GENERAL PUBLIC	1451	VPO, SGL, RBINS-GSB	Helga Ferket et al.	https://geoera.eu/blog/geomanifestations/
MEDIA	ONLINE MEDIA	11.10.2018	GENERAL PUBLIC	1063	VPO	Timothy Debacker	https://geoera.eu/blog/updated-aoi-for-the-r2r-area/
MEDIA	ONLINE MEDIA	17.10.2018	GENERAL PUBLIC	1420	GeoZS	Nina Rman	https://geoera.eu/blog/geomanifestations-in-north-east-slovenia/
MEDIA	ONLINE MEDIA	06.11.2018	GENERAL PUBLIC	1620	BRGM, RBINS-GSB	Isaline Gravaud, Kris Piessens	https://geoera.eu/blog/subsurface-management/
MEDIA	ONLINE MEDIA	12.11.2018	GENERAL PUBLIC	1072	RBINS-GSB	Kris Piessens	https://geoera.eu/blog/coming-soon-what-kind-of-meetin
MEDIA	ONLINE MEDIA	14.11.2018	GENERAL PUBLIC	1356	HGI-CGS	Marko Špelić et al.	https://geoera.eu/blog/the-story-of-medical-oil-naphtalan
MEDIA	ONLINE MEDIA	30.11.2018	GENERAL PUBLIC	1502	GSS	Tanja Petrović Pantić	https://geoera.eu/blog/geomanifestations-in-north-serbia-vojvodina/
MEDIA	ONLINE MEDIA	07.12.2018	GENERAL PUBLIC	1737	FZZG	Natalija Samardžić et al.	https://geoera.eu/blog/significant-geomanifestations-in-b and-herzegovina/
MEDIA	ONLINE MEDIA	12.12.2018	GENERAL PUBLIC	1985	RBINS-GSB	Kris Piessens	https://geoera.eu/blog/would -you-fund-geoconnect%c2%b3d/
MEDIA	ONLINE MEDIA	21.12.2018	GENERAL PUBLIC	1735	TNO	Johan ten Veen	https://geoera.eu/blog/geoman ifestations-acoustic-bright-spots -and-shallow-gas-in-the-netherlands/
MEDIA	ONLINE MEDIA	28.12.2018	GENERAL PUBLIC	1029	RBINS-GSB	Kris Piessens	https://geoera.eu/blog/season-greetings-with-a-geologists perspective/
MEDIA	ONLINE MEDIA	04.01.2019	GENERAL PUBLIC	3851	GEOINFORM	Boris Malyuk	https://geoera.eu/blog/far-ne-pannonian-basin-trans-carpathian-trough-of-ukraine/
MEDIA	ONLINE MEDIA	11.01.2019	GENERAL PUBLIC	3439	RBINS-GSB	Kris Welkenhuysen	https://geoera.eu/blog/a-story-of-water-and-bubbles/
MEDIA	ONLINE MEDIA	17.01.2019	GENERAL PUBLIC	1130	SGUDS	Balazs Kronome	https://geoera.eu/blog/history-and-structure-of-the-danub and-transcarpathian-basins-in-slovakia/
MEDIA	ONLINE MEDIA	24.01.2019	GENERAL PUBLIC	1078	RBINS-GSB	Renata Barros	https://geoera.eu/blog/geomanif estations-how-uncommon-mineral-occurrences-can-help-t reveal-geological-evolution-processes/
MEDIA	ONLINE MEDIA	01.02.2019	GENERAL PUBLIC	2144	MBFSZ	Gyula Maros, Eva Kun	https://geoera.eu/blog/geomanifestation-or-spa-city-both
MEDIA	ONLINE MEDIA	08.02.2019	GENERAL PUBLIC	1105	GSI	Brian McConnell	https://geoera.eu/blog/the-irish-border-problem/
MEDIA	ONLINE MEDIA	15.02.2019	GENERAL PUBLIC	1095	LfU	Gerold Diepolder	https://geoera.eu/blog/geot

							hermics-and-geomanifestations-1-a-geothermal-bonanza-b of-geomanifestations/
MEDIA	ONLINE MEDIA	22.02.2019	GENERAL PUBLIC	1271	LfU	Gerold Diepolder	https://geoera.eu/blog/geothermics-and-geomanifestation a-geothermal-terrain-of-outstanding-geomanifestations/
MEDIA	ONLINE MEDIA	28.02.2019	GENERAL PUBLIC	942	PIG-PIB	Piotr Lenik et al.	https://geoera.eu/blog/tracking-the-history-for-a-new-prospection-of-subsurface-assets/
MEDIA	ONLINE MEDIA	08.03.2019	GENERAL PUBLIC	3722	VITO	Bernd Rombaut, Jef Deckers	https://geoera.eu/blog/can-seismic-amplitude-anomalies-i the-campine-basin-be-related-to-geomanifestations/
MEDIA	ONLINE MEDIA	15.03.2019	GENERAL PUBLIC	1253	CGS	Vit Hladik	https://geoera.eu/blog/greenhouse-gas-neutral-europe-ar the-role-of-geology/
MEDIA	ONLINE MEDIA	22.03.2019	GENERAL PUBLIC	1011	IGR	Valentina Cetean, Radu Farnoaga	https://geoera.eu/blog/the-slow-cooking-of-the-earth-in-b pots/
MEDIA	ONLINE MEDIA	05.04.2019	GENERAL PUBLIC	912	RBINS-GSB	Renata Barros, Kris Piessens	https://geoera.eu/blog/towards-a-project-vocabulary-geological-concepts-for-humans-and-computers/
MEDIA	ONLINE MEDIA	19.04.2019	GENERAL PUBLIC	3682	VPO	Timothy Debacker	https://geoera.eu/blog/gravity-doesnt-lie-does-it/
MEDIA	ONLINE MEDIA	03.05.2019	GENERAL PUBLIC	2107	RBINS-GSB	Kris Piessens	https://geoera.eu/blog/sf-part-i-disagreeing-on-a-structura framework/
MEDIA	ONLINE MEDIA	10.05.2019	GENERAL PUBLIC	758	RBINS-GSB	Kris Piessens, Renata Barros	https://geoera.eu/blog/sf-part-ii-revolution-in-the-air/
MEDIA	ONLINE MEDIA	17.05.2019	GENERAL PUBLIC	864	RBINS-GSB	Kris Piessens, Renata Barros	https://geoera.eu/blog/sf-part-iii/
MEDIA	ONLINE MEDIA	24.05.2019	GENERAL PUBLIC	796	RBINS-GSB	Kris Piessens, Renata Barros	https://geoera.eu/blog/sf-part-iv/
MEDIA	ONLINE MEDIA	31.05.2019	GENERAL PUBLIC	645	HGI-CGS	Marko Špelić et al.	https://geoera.eu/blog/the-blood-from-depths/
MEDIA	ONLINE MEDIA	13.06.2019	GENERAL PUBLIC	554	GeoZS	Miloš Markič	https://geoera.eu/blog/a-survey-of-presumably-hydrocarb containing-water-ponds-in-the-kog-hills-pannonian-basin-r slovenia/
MEDIA	ONLINE MEDIA	28.06.2019	GENERAL PUBLIC	795	GSS	Petar Stejić et al.	https://geoera.eu/blog/fruska-gora/
MEDIA	ONLINE MEDIA	12.07.2019	GENERAL PUBLIC	644	TNO	Johan ten Veen, Harry Middelburg	https://geoera.eu/blog/how-we-deal-with-our-faults/
MEDIA	ONLINE MEDIA	26.07.2019	GENERAL PUBLIC	566	RBINS-GSB	Kris Piessens	https://geoera.eu/blog/turning-the-hottest-day-on-record an-experiment/
MEDIA	ONLINE MEDIA	09.08.2019	GENERAL PUBLIC	871	MBFSZ	Gyula Maros	https://geoera.eu/blog/heat-pannonian-basin/

MEDIA	ONLINE MEDIA	23.08.2019	GENERAL PUBLIC	686	GSI	Brian McConnell	https://geoera.eu/blog/the-quaternary-connect3d/
MEDIA	ONLINE MEDIA	06.09.2019	GENERAL PUBLIC	596	SGUDS	Balazs Kronome	https://geoera.eu/blog/podhajske-baths-in-slovakia/
MEDIA	ONLINE MEDIA	19.09.2019	GENERAL PUBLIC	425	PIG-PIB	Olga Lipińska	https://geoera.eu/blog/how-sport-and-geology-go-togethe
MEDIA	ONLINE MEDIA	07.10.2019	GENERAL PUBLIC	466	VITO	Katrijn Dirix, Jef Deckers	https://geoera.eu/blog/timing-is-everything/
MEDIA	ONLINE MEDIA	21.10.2019	GENERAL PUBLIC	350	CGS	Aleš Havlin	https://geoera.eu/blog/thermal-water-czech-republic/
MEDIA	ONLINE MEDIA	31.10.2019	GENERAL PUBLIC	863	IGR	Valentina Cetean	https://geoera.eu/blog/movile-cave-romania/
MEDIA	ONLINE MEDIA	15.11.2019	GENERAL PUBLIC	340	LfU, GeoZS	Gerold Diepolder, Nina Rman	https://geoera.eu/blog/sands-have-a-story-to-tell/
MEDIA	ONLINE MEDIA	02.12.2019	GENERAL PUBLIC	325	GeoZS	Nina Rman	https://geoera.eu/blog/mofettes-in-slovenia/
MEDIA	ONLINE MEDIA	12.12.2019	GENERAL PUBLIC	190	GEOINFORM	Igor Melnyk	https://geoera.eu/blog/thermal-waters-trans-carpathian-trough/
MEDIA	ONLINE MEDIA	26.12.2019	GENERAL PUBLIC	234	RBINS-GSB	Kris Piessens	https://geoera.eu/blog/seasons-greetings/
MEDIA	ONLINE MEDIA	24.01.2020	GENERAL PUBLIC	133	RBINS-GSB	Renata Barros, Kris Welkenhuysen	https://geoera.eu/blog/counting-bubbles/