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COMPASS

COMPASS Deliverable D1.1

Data Management Plan

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EXECUTIVE SUMMARY

The COMPASS project aims to develop well technology for near magmatic geothermal systems. The main emphasis of the project is on corrosion mitigation using cladding and flexible cementing solution for releasing stresses in long casings during temperature changes. The COMPASS initiative aims to solve these current challenges in geothermal well design, ensuring sustainable exploitation of geothermal energy and contributing to reducing the levelized cost of electricity and the environmental footprint of geothermal projects. To this end, the project works towards the objectives of:

1. establishing sustainable concepts for geothermal wells,
2. developing flexible foam cement solutions and solutions to mitigate thermal stresses and pressure build-up in casing systems,
3. developing cost-effective cladding solutions to mitigate corrosion of casing and wellhead,
4. developing an integrated well design and decision-support software platform,
5. experimentally verifying and demonstrating the developed technologies, and
6. analyzing the financial and socio-economic impact of increased implementation of geothermal energy.

Key performance indicators (KPIs) have been established for cladding, cementing and APB validation to measure success. The goal is to maximize the implementation and impact of the COMPASS project, which could lead to more sustainable and efficient use of geothermal energy in the future.

The **COMPASS** Data Management Plan (**DMP**) outlines how data will be handled during the project and after its completion. In line with European Commission guidelines, a Data Management Plan describes data management life cycles for data to be collected, processed and/or generated by a Horizon Europe project. The consortium's activity in terms of data collection can therefore be categorized into the following complementary areas:

- Administrative data
- Scientific data (Literature and SOA)
- Key Performance Indicators (KPI)
- Experimental results
- Data developed for the Developed Support System (DSS)
- Data generated as a part of the Life-cycle Cost Analysis (LCA), Levelized Cost of Energy (LCOE), and Life Cycle Inventory (LCI)

The DMP has been developed by ON Power and OR with significant input from other consortium members. The Data Management Plan is considered a living document and will be updated by consortium members when, and if needed during the lifetime of COMPASS.

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1 DATA SUMMARY

1.1 WP1 – Project Management

Administrative data that all consortium partners will use throughout the lifetime of the project. Further description of the data set can be found in table 1.

Table 1: Administrative data (WP1)

Data set reference and name	• D1.1: Data management plan. Describes how data required for the project will be managed and curated along with legal and contractual documents – (ON). • D1.2: Project risk and innovation risk management. Summaries of regular Steering Committee/WPL risk analysis, with mitigation plan, social science, and gender analysis, together with equality targets – (ON). • D1.3: Final project summary report – (ON).
Data set description and purpose	The overall objective of this WP is administrative and is for overseeing the following: • To ensure legal, contractual, ethical, financial, and administrative management of the project, the grant and consortium • To coordinate knowledge management, deliverables, milestone reports and cost statements • To organize consortium meetings and ensure consortium management • To coordinate payments and distribution of funding • To liaise between EC and the consortium
Data type and format and size	Type: Reports and meeting notes. Formats: PDF, Excel tables Size: small
Data origin	Information from partners.
Data set is	Revisable
Data security and storage	Data is stored on the project's SharePoint. However, contact details and financial details are confidential within the consortium. Banking details of partners are stored locally at ON, not on SharePoint.
Data utility and accessibility	D1.1 and D1.3 are public, and D1.2 is sensitive.

1.2 WP2 – Sustainable well concepts, specifications and guidelines

State of the art and internal scientific data on near superhot reservoir conditions and geothermal well technology. The data compiled in WP2.3 (characterization of the intended environment) will be used in WP3 and WP4 for defining the simulated testing conditions. The KPIs will be use throughout the project for validations of the technology developed within the project. Further description on this WP's datasets is shown in table 2.

Table 2: Data sets for the sustainable well concepts, specifications, and guidelines (WP2)

Data set reference and name	• D2.1: Key learnings from intended environment. Report – (OR). • D2.2: Spill-over effect. Report – (OR). • D2.3: Characterizing the intended environment. Report – (OR). • D2.4: Key Performance Indicators (KPI). Report – (OR). • D2.5: Assessment of Circular-by-design concepts. Report – (ISOR).
Data set description and purpose	The data consists of lessons learned from previous wells drilled into superhot formations such as the wells of the IDDP project (IDDP-1 and IDDP-2) and NJ-11 and NJ-32 in Nesjavellir, SW-Iceland. This will be supplemented with measurement data done in the project. Abovementioned data will be used to characterize the environment near heat sources in geothermal systems. That characterization will then be used as an input into other work packages in the project (WP3 and WP4). Moreover, during the project, spill-over effect will be identified and Circular-by design of concepts of the technology will be assessed. Both datasets are part of the results of the project and will be published in reports.
Data type and format and size	Scientific publications, Reports Formats: pdf Size: Variable (Small)
Data origin	Literature review, internal data from OR, ON and ISOR. Measurement data from WP2.3
Data set is	Fixed except the KPI report (D2.4) that will be a living document.
Data security and storage	Data will be stored on the project's SharePoint site hosted by GEORG.
Data utility and accessibility	The results will be made publicly available.

1.3 WP3 – Thermal stress mitigation solutions

Experimental results on foam cements in simulated conditions that are defined in WP2, i.e., at hight temperatures and pressures. Moreover, a prototype of Annular Pressure Build-up (APB) system will be described, and testing data reported. These results will be validated in WP6. Further description on this WP's data sets is shown in table 3.

Table 3: Data sets for thermal stress mitigation solutions (WP3)

Data set reference and name	• D3.1 – A report presenting the cement properties testing solution – (CURISTEC). The report will present the approach and steps for the adaptation of the cell to high temperature as well as the results of the cell validation tests. • D3.2 – A report presenting the optimal foam cements for high temperature wells – (CURISTEC). The data will be the composition of the foam cement as well as the set of validation test results. • D3.3 – A report presenting the optimal retarders for developed foam cement – (SINTEF). Data set will be a report presenting the results of the slurry and validation tests as well as the recommendation for retarder selection. Open access excerpts in the form of report and/or presentations/papers will be prepared and shared. • Excerpt from D3.4 – A report presenting the APB relief prototype and test results – (ISOR). The report will describe results from development and testing of novel solution to release Annular Pressure Build-up (APB) caused by expanding fluids in a cemented annulus under high-temperature loading of geothermal wells. Open access excerpts in the form of report and/or presentations / papers will be prepared and shared.
Data set description and purpose	The overall objective is to develop and evaluate solutions that contribute, together with flexible couplings, to increase flexibility of the systems and reduce thermal stresses of casing systems under HT and super HT loadings. • O3.1: Develop and test innovative flexible foam cement solutions. • O3.2: Develop and test solutions to release Annular Pressure Build-up (APB) in well annuli.

	• O3.3: Provide inputs to numerical models in WP5 and use-case validation in WP6.
Data type and format and size	Reports, scientific publications and presentations Formats: PDF Size: Variable
Data origin	For the deliverables D3.1 and D3.2, the data will be mainly experimental but there will also be information about the design process.
Data set is	The reports D3.1 and D3.2 can be revised (adding additional data for example). The experimental data are fixed.
Data security and storage	The reports D3.1 and D3.2 will be saved on CURISTEC's servers and on our outsourcing provider's server (copy on 2 servers with daily recording). D3.3 will be saved on ISOR's servers and disseminated to the consortium.
Data utility and accessibility	The tests data presented in the deliverables D3.1 and D3.2 will be used to calibrate well cement models developed in WP5, and to select the optimal cement systems for further verification in WP6. The dissemination level is not public but restricted to SEN – Sensitive. 1. Reports will not contain confidential information. 2. For the report on the APB relief prototype and test results, an open excerpt from the deliverable could be provided.

1.4 WP4 – Cost effective cladding for casing and wellhead corrosion mitigation.

Data on chemical composition, process parameters, and performance of laser cladding via EHLA (Extreme High-speed Laser Application) will be developed and tested in simulated environment described in WP2. These results will be validated in WP6. Further description of this dataset is shown in table 4.

Table 4: Data sets for cladding solutions (WP4)

Data set reference and name	There will be four main data sets produced throughout WP4. D4.1 – Effect of key cladding process variables D4.2 – Enhanced laser cladding hardware solution D4.3 – Corrosion performance testing of cladding D4.4 – Cost assessment of the cladding solution

Data set description and purpose	Technical data on the feasibility of laser cladding via EHLA (Extreme High-speed Laser Application) for corrosion resistance of geothermal wells.
Data type and format and size	Type: Reports, presentations, test results, images, hardware cladding samples. Formats: pdf, excel, word, jpg/png. Size: Variable (Small).
Data origin	Experimental data that will originate from TWI laboratories based in Yorkshire and Cambridge England.
Data set is	Fixed and revisable
Data security and storage	Data will be shared throughout the duration of the project by several means such as publications in scientific journals posts through the website and information shred on LinkedIn.
Data utility and accessibility	Data will be shared throughout the duration of the project by several means such as publications in scientific journals posts through the website and information shred on LinkedIn.

1.5 WP5 – Integrated well design and decision support software platform

Reports that will include improved models, simulations, and analyses that can help to optimize the design, operation, and performance of geothermal wells drilled into the intended environment. Additionally, the cost and LCA models developed in WP5.5 can provide valuable information for decision-making and planning purposes supported by the DSS developed in WP5.6. Further description on these data sets is shown in table 5.

Table 5: Data sets for integrated well design and DSS (WP5)

Data set reference and name	Data set will be mainly the deliverables as reports: report D5.1 on hydration models (Task 5.1); report D5.2 on well simulator (Task 5.2); report D5.3 on cost and LCA models (Task 5.5); report D5.4 and a specific database for the webapp (Task 5.6).
Data set description and purpose	The reports will describe the different models and the workflow used by the simulation/prediction which will be performed/presented in the Decision Support System (DSS). A specific database for the webapp (Task 5.6) will be used to store the input and output files of the well integrity simulation, simulate the well integrity, the cost analysis, and the LCA analysis.
Data type and format and size	Type: Report, Presentation, Figure, Material model parameters, Experimental data.

	Formats: PDF, PowerPoint, Excel, CSV, JSON, HDF5. Size: Report size are variables (less than 20 MB), and about 50 MB per simulation for the well integrity simulator.
Data origin	Simulation data.
Data set is	The reports are revisable and the simulation input/output files are fixed (a simulation is unique).
Data security and storage	There will be a specific database to store the input and output files of the DSS. Microsoft Azure (cloud computing services) will be used to set-up the database. The DSS webapp (and therefore the DSS database) is protected by an authentication and authorization procedure. Confidential data and reports will be kept in the project SharePoint site.
Data utility and accessibility	All data and reports will be used to build the DSS. The user of the DSS will use the existing data set produced during the project and the DSS user will generate new simulation data. Excerpts from the data/models used in the simulators can be made available through open access publications and/or presentations.

1.6 WP6 – Technology verification and validation

Well technology components developed in WP3 and WP4 will be manufactures and tested for final validation in small- and large-scale laboratory setups, along with in-situ downhole testing of cladded coupon samples. Further description of the datasets can be found in table 6.

Table 6: Data sets for final validations of the technology developed within the project (WP6)

Data set reference and name	There will be three main data sets produced through WP6: D6.1 – Small-scale well integrity component test results. D6.2 – Large-scale casing system test results. D6.3 – Field exposure tests of claddings and cement.
Data set description and purpose	The data will mainly be experimental on performance and mechanical integrity of: a) small-scale well systems (casing, cement, formation) under relevant temperature and pressure loading, b) large-scale well system at the end of the project testing novel solutions developed in the project

	c) field exposure tests of claddings and cement solutions developed in the project to analyse effect of exposure to field conditions.
Data type and format and size	Type: Excerpts from reports, scientific publications, and presentations Formats: PDF Size: Report PDF (20 MB or less)
Data origin	Experimental results.
Data set is:	Fixed results of experiments.
Data security and storage	Data will be saved on the project's SharePoint site and reports will be disseminated to the consortium.
Data utility and accessibility	The deliverable reports are only published to the consortium. Excerpts from the reports can be made available through open access publications and presentations.

1.7 WP7 – Social, environmental, and economic life-cycle assessment

Data sets generated via financial and environmental performance evaluations, with support from the DSS and LCA model developed in WP5. Within this WP the social aspect of new geothermal technology will be tackled by engaging with local communities to improve their awareness and acceptance towards geothermal energy and attract future students into a career in deep geothermal development and operations. Further description of the data sets can be found in table 7.

Table 7: Data sets for social, environmental, and economic life-cycle assessment (WP7)

Data set reference and name	Data type: • Life Cycle Inventory (LCI) dataset using cradle-to-gate approach for well completion. • Life Cycle Inventory (LCI) dataset using cradle-to-grave approach for surface plant. • Cost performance analysis and environmental performance analysis dataset base on LCI datasets. • Meta-review data set. • Workshops and webinars Registrations. • Webinar recordings. • Workshops visual and audio-visual documentation. • Training presentations. • Events marketing. • ESG Review. • Feedbacks and questionnaires collected from local communities. • Videos and recordings of events and interviews to local communities. • Presentations

	D7.1 – Cost performance of COMPASS geothermal plant D7.2 – LCA of COMPASS enabled geothermal plant D7.3 – Best practices and geothermal NIMBY interventions D7.4 – Communications guide for geothermal projects D7.5 – Report on social engagement D7.6 – Training and educational pilots
Data set description and purpose	Perform cost and environmental evaluation using the data from the two case studies: a. IDDP-3 in Icelandic supercritical/superhot resource scenario b. Tuscany in Italian resource scenario. Perform a meta-review of existing information and research literature. Drawing on EU funded project reports (see non-exhaustive list in 1.2.2) and partner's own internal information sources). The COMPASS consortium includes SSH expertise covering several fields of science required to extract and collate relevant information available from several sources (e.g., economics, acceptance and NIMBY issues, policy and governance linked to licensing etc.). Social and Governance (ESG) risk exposure for geothermal projects will be reviewed as well to establish baseline information for wider take-up of COMPASS results for wider deployment of geothermal energy. Prepare training modules and launch a series of regional workshops supported by WP8 (combined in person & webinars) focusing social research context results in combination with the core technical outcomes. Teach the current best practice workflow for lowering costs and increasing the efficiency of geothermal operations. To codesign the resource usage and COMPASS solutions through feedbacks collected from local communities
Data type and format and size	Delivery reports from WP2-WP4 (format: .pdf, .docx, size: unknown) Well completion and surface plant data provided by the partners (format and size: unknown) Ecoinvent database (format: .spold, .xml, .xlsx, size: around 2GB)

	Open datasets on geothermal well drilling and geothermal surface plants (format and size: unknown) EU-funded project reports (less than 500 Mo) Data gathered from COMPASS partners (unknown) Open datasets on geothermal socio-economics (unknown) Energy policy reports (less than 500 Mo) Search keywords will be provided to optimize possibilities for re-use. Online registration forms created by COMPASS (less than 100 Mo) Webinar recordings (15 Go) Visual and audio-visual documentation (30 Go) Training presentations (10 Go) Events marketing (1 Go) Interviews and recording of events (unknown) Notes from interviews and questionnaires (less than 500 Mb)
Data origin	Experimental, observational, literature.
Data set is	Fixed and revisable
Data security and storage	The data will be stored on the project's SharePoint site along with cloud hosting, Role Based Access Control (RBAC).
Data utility and accessibility	LCI, Cost performance analysis and environmental performance analysis data can be accessed by authorised (consortium partners or registered users) users only through cost and environmental analysis tools. Data will be made publicly if it doesn't conflict with confidentiality within the consortium. In the other case, data will be made available indirectly through scientific publications and dissemination activities. The registrations lists will be kept confidential to respect GDPR. Interviews and questionnaires will be completely anonymous. Results from citizen engagement will be presented aggregated.

1.8 WP8 – Dissemination, exploitation of results and outreach

The project dissemination materials include flyers, brochures, deliverables, posters, YouTube videos and presentations. Electronic versions and links are available via the project website. The deliverables intended for public dissemination have been shared via the project website. All publications (peer reviewed and newsletters) are open access. Further description of the data sets can be found in table 8.

Table 8: Data sets for dissemination, exploitation of results and outreach (WP8)

Data set reference and name	1- Scientific Publications (open access) 2- PR material and Communication kit 3- Virtual events (website-based) 4- IPR Data 5- Replication Assessment D8.1 – Communication plan and outreach visual identity D8.2 – Mid-term communications report D8.3 – Final communications report D8.4 – Exploitation strategy and IPR agreement D8.5 – Replication potential of COMPASS solutions
Data set description and purpose	Communication, Dissemination and Exploitation of COMPASS Project results.
Data type and format and size	Type: scientific publications, photos, videos, flyers, posters, press releases, overview presentation, etc Formats: .jpeg, .docx, .mp4, .png, .pdf, .pptx, .html, .xls, .xlsx Size: 1- Directly from the projects' outcomes (keywords included in the publications) - [~0.5 Go] 2- Created based on the content/scope of the project - [~ 15 Go] 3- Activities within COMPASS - [~5 Go]
Data origin	Experimental and observational.
Data set is:	Fixed and revisable
Data security and storage	Data will be served on COMPASS website and GEORG server.
Data utility and accessability	Data will be made available, except the registration and personal information requested for events organization and data gathering, these are subjected to GDPR and cannot be shared.

1.9 Administrative data

1.9.1 Email list

COMPASS mailing list consists of partners email addresses and is available only to consortium members. Project email info@compass-geothermal.com is available on project website (compass-geothermal.com) for users interested in obtaining project related information.

1.9.2 Online document library, working areas, meetings

The project uses SharePoint hosted by GEORG for storing all project related information. It is accessible only to the consortium partners. The meetings are hosted using TEAMS or other convenient applications.

1.9.3 Dissemination material

The project dissemination materials include flyers, brochures, deliverables, posters, YouTube videos and presentations. Electronic versions and links are available via the project website. The deliverables intended for public dissemination have been shared via the project website. All publications (peer reviewed and newsletters) are open access.

2 ETHICAL ASPECTS

The COMPASS project partners are to comply with article 14 concerning ethics and research integrity principles in the GA.

- Ethical principles (including the highest standards of research integrity).
- Applicable international, EU, and national law

In the COMPASS project, no ethical or legal issues that can have an impact on data sharing have been identified at current stage.

The coordinator will continuously monitor risks concerning ethical aspects with a particular focus on data protection issues in line with the relevant EU legislation. In case changes in legislation or the composition of the data collected and used by COMPASS changes, an updated version of this document will be made.

3 FINDABLE ACCCESSIBLE INTEROPERABLE REPRODUCIBLE (FAIR) PRINCIPLES

All data including metadata generated as a result of the experimental work is available in the form of deliverable reports. Some of these reports are confidential with relevant data only available to the consortium partners (stored using simple file/folder name in GEORG hosted SharePoint system) and the EC. Non-confidential data suitable for release in public domain is ‘accessible’ on project website in form of deliverable reports and/or as open access publications in peer review journals. To enhance

the credibility and acceptability of data the project results have followed the relevant ASTM and ISO standards and are available in formats that ensure interoperability.

4 ALLOCATION OF RESOURCES

All data generated as part of the COMPASS project is managed individually by partners generating the data and are centrally stored in GEORG hosted SharePoint.