CROWDTHERMAL

CROWDTHERMAL DELIVERABLE D4.9

FINAL REPORT ON THE CROWDTHERMAL CORE SERVICES

06.12.2022

Summary:

The present deliverable aims to describe the concept, content and deployment of the CROWDTHERMAL Core Services, which is developed under CROWDTHERMAL Work Package 4: Integrated development schemes, Task 4.4: Core Services development & deployment – led by LPRC - La Palma Research Centre.

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TABLE OF CONTENTS

1 EXECUTIVE SUMMARY 4
2 INTRODUCTION 5
3 OBJECTIVES 6
4 CROWDTHERMAL CORE SERVICES 7
4.1 CORE SERVICES PORTAL 7
4.2 Decision Support Tool 9
4.3 Interactive guide to integrated finance in geothermal energy 11
4.4 Implementation framework for community-based geothermal development 14
4.5 Toolbox for risk-evaluation and mitigation 15
4.6 Meta-database of geothermal projects 17
4.7 Information Catalogue for self-learning 19
4.8 Frequently Asked Questions (FAQ) 22
5 SURVEY AND FEEDBACK 24
5.1 EU Survey 24
5.2 INTERNAL FEEDBACK 25
6 CONCLUSIONS 26
7 REFERENCES 27
ANNEX 1 – THE CORE SERVICES PORTAL 28

LIST OF FIGURES

Figure 1: Process of implementation of the Core Services. 5
Figure 2: Core services menu - introduction. 8
Figure 3: Core Services menu - promotional videos. 8
Figure 4: Core Services menu – Core Services list. 9
Figure 5: Core Services menu – feedback survey. 9
Figure 6: Starting point of the Decision Support Tool. 10
Figure 7: Example of CROWDTHERMAL recommendations at the end of the workflow. 11
Figure 8: Front page of the Interactive Guide, with the list of steps and descriptions. 12
Figure 9: Step 1 of the interactive step plan, with a blank text box to be filled. 13
Figure 10: Illustration of the contents in the interactive guide report. 13
Figure 11: Online report with navigation (left) and visualization (bottom) tools. 15
Figure 12: Cover page of the Toolbox for risk-evaluation and mitigation. 16
Figure 13: Downloadable spreadsheet for practical use of the service. 17
Figure 14: National state of the art of geothermal energy and related regulations. 18
Figure 15: Geothermal projects in Europe. 18
Figure 16: List of wiki articles separated by sections. 21
Figure 17: Example of wiki article and its elements. 22
Figure 18: Menu of the Frequently Asked Questions tool. 23
Figure 19: Example of an FAQ. 23
Figure 20: Logo for the EUSurvey platform. 24
Figure 21: Button to access the Core Services survey. 25

1 EXECUTIVE SUMMARY

The deliverable “D4.9 Final report on the CROWDTHERMAL Core Services” was developed by LPRC – La Palma Research Centre, and it presents the result of the integration and deployment of the CROWDTHERMAL Core Services on the website. The project partners have developed research, case studies and reports addressing the target audiences of the project, concerning social and environmental aspects, risk mitigation, alternative finance, and geothermal energy.

Once the reports were produced, the project partners and the leader of Work Package 4 (Integrated development schemes) have jointly developed methods and formats to convert these results into useful web tools that are available on the project website. This task counted with the help of web developers that were subcontracted to create user-friendly applications and interactive schemes that allow users to easily benefit from CROWDTHERMAL expertise.

These Core Services were launched on the project website, as a portal (https://www.crowdthermalproject.eu/crowdthermal-core-services/). The portal has a simple layout, with the context in which the tools were created, an explanatory video to briefly describe the available tools, as well as three sections with the list of Core Services according to the profile of key stakeholder groups: Community, Project developer, and Local authority. Although each column has a list of suggested Core Services for each group, any visitor can browse and access all of them.

This report introduces the concept and objectives of each Core Service, the target audiences, and how they were integrated on the website. In addition, an online survey is open for users who want to share their feedback and experience in using these services. The purpose of the assessment is to understand the perception and make improvements whenever needed and/or possible.

2 INTRODUCTION

The present deliverable "D4.9 Final report on the CROWDTHERMAL Core Services" is a report related to Task 4.4 Core Services development & deployment, which aims to facilitate the uptake of geothermal projects through CROWDTHERMAL results.

During CROWDTHERMAL lifetime the project partners produced valuable results on social, environmental, and financial aspects in the development of a geothermal project. During 2022, as part of Work Package 4, these outputs were transformed into interactive web tools that are currently available on the project website.

The task leader is the partner La Palma Research Centre – LPRC; which, together with the project experts that produced the CROWDTHERMAL outputs, counted with the professional help of web developers to make these outputs available with a user-friendly interface (Figure 1).

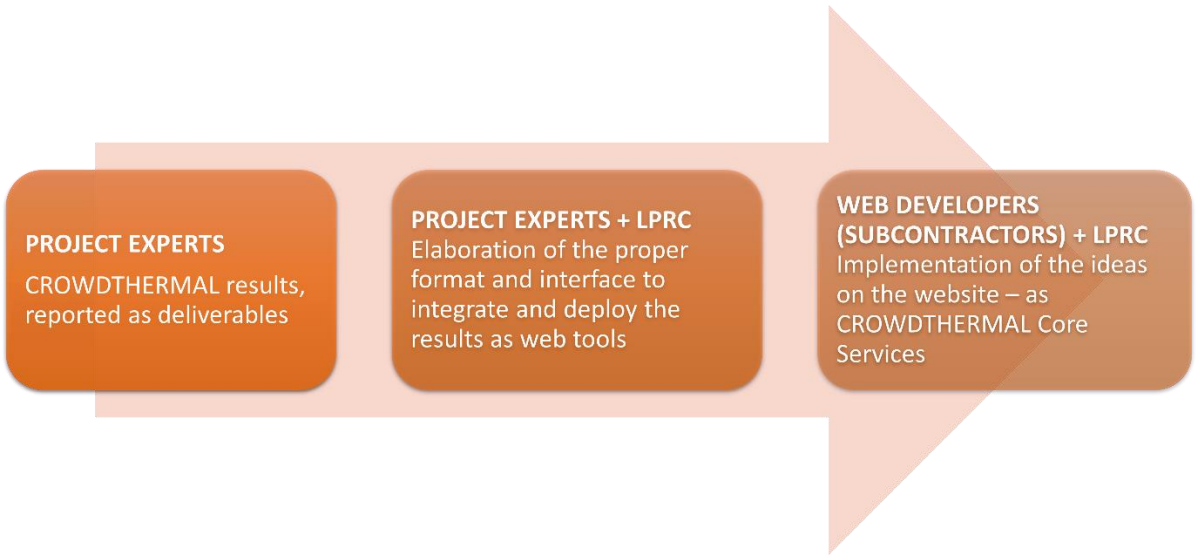


Figure 1: Process of implementation of the Core Services.

3 OBJECTIVES

This document provides an overview of "Task 4.4 Core Services development & deployment", describing all Core Services that were produced by the project partners, and how they were implemented as web tools on CROWDTHERMAL website – through the Core Services Portal.

This report covers the main characteristics of the Core Services, their deployment, and the respective target audiences. In addition, it provides the contact person of the expert(s) that developed these tools – to offer further instructions or to assess the potential opportunity for further consultancy tailored to the users' situation.

4 CROWDTHERMAL CORE SERVICES

The Core Services compiles the knowledge and expertise of the CROWDTHERMAL consortium related to social engagement, alternative finance, risk mitigation and geothermal energy. The related studies and project results were produced and reported as deliverables over the project lifetime, which were deployed as 7 web tools on the Core Services Portal - https://www.crowdthermalproject.eu/crowdthermal-core-services/:

1. Decision Support Tool
2. Interactive guide to integrated finance in geothermal energy
3. Toolbox for risk-evaluation and mitigation
4. Implementation Framework for Community-based Geothermal Development
5. Meta-database of geothermal projects
6. Information Catalogue for Self-learning
7. Frequently Asked Questions

These services are intended to provide added value solutions for communities of citizens, project developers and local authorities in the development of geothermal projects in Europe, contributing to (partially) achieve the ambitious Green Deal goals by 2050.

4.1 CORE SERVICES PORTAL

The Core Services Portal (Annex 1) is the environment in which visitors can access and learn about all available Core Services. There is a suggested division of services for each of the stakeholder categories, which might be repeated in case a service is considered relevant for more than one stakeholder group.

Each service has a specific name, which correspond to the titles of the following sub-items in this report, however, in the Core Services Portal they are presented in the format of questions. Therefore, it is easier for users to consult what is best for them according to their respective needs for the moment. Each question can be clicked, to open the short explanation of the service and their respective link for access.

The Core Services menu is separated by four main sections:

- Core Services presentation: Overview of the available tools, and the added value it can provide to the target audiences (Figure 2).

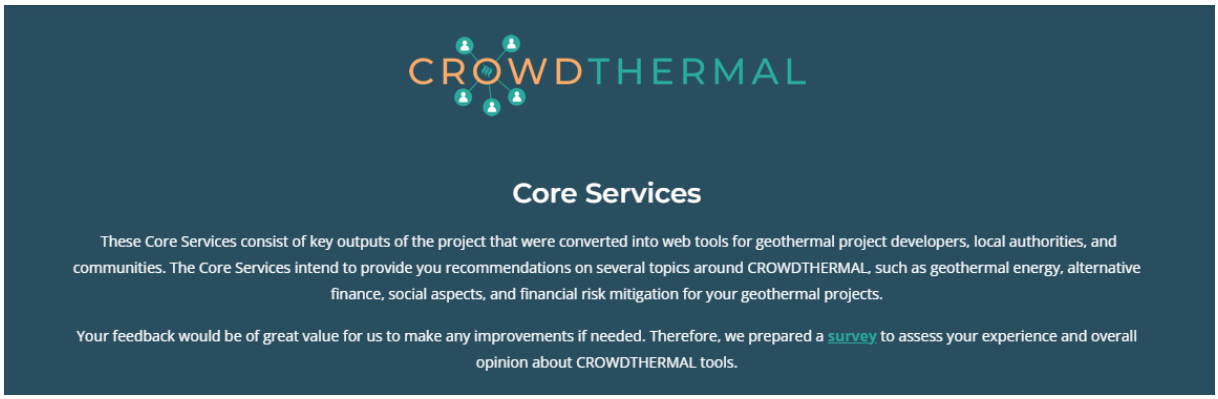


Figure 2: Core services menu - introduction.

- Introduction video: A brief tutorial about the portal and tools (Figure 3).

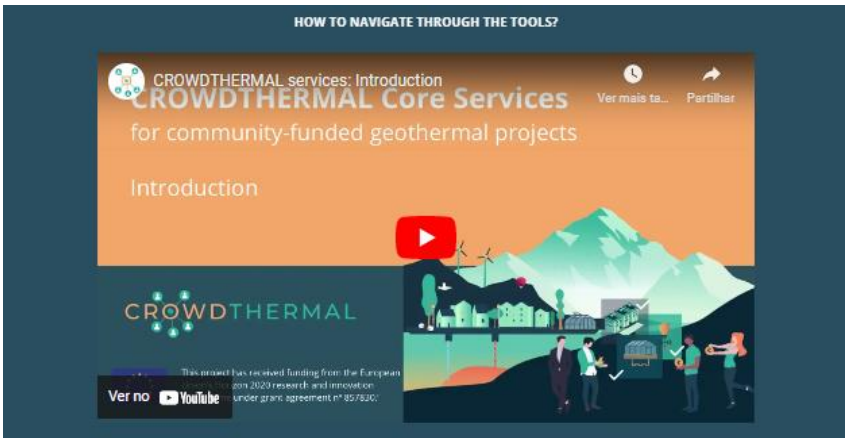


Figure 3: Core Services menu - promotional videos.

- Lists of Core Services for each target audience: This part shows the questions to be answered by the tools, divided by the three target audiences of CROWDTHERMAL. The question format allows visitors to identify which of them to use, based on their own scenario (Figure 4).

Figure 4: Core Services menu – Core Services list.

- Feedback survey: Users are invited to provide their feedback and overview about their experience in using the Core Services (Figure 5), for potential review and adjustments if applicable (or possible).

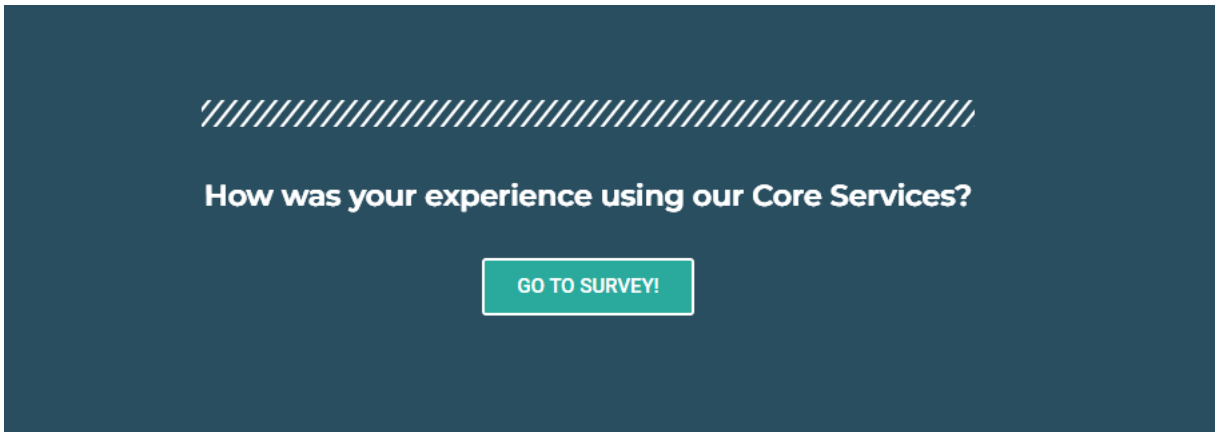


Figure 5: Core Services menu – feedback survey.

4.2 DECISION SUPPORT TOOL

"An algorithm for developers/promoters of geothermal projects to select the most efficient social engagement strategies and financial instruments to be implemented for their respective scenario and context." (Core Services portal, CROWDTHERMAL website)

4.2.1 Concept

The Decision Support Tool *"provides a workflow including a sequence of questions that focus on social, environmental, resource risk and financial factors, following a logical order from start to end with the aim to screen which strategies would be appropriate for a specific setting"* (Ioannou and Falcone, 2021). This tool is designed mainly to geothermal project developers and local authorities who can benefit from recommendations based on their respective situation and objectives in developing a geothermal project.

4.2.2 Integration & deployment

The integration of the decision support tool algorithm into a webtool was efficiently planned and executed using specialized plugins that converted the report (deliverable D4.2. - Guidelines for developers and promoters of geothermal energy) into an online guide (Figure 6). The interactive step-by-step contains a set of questions and options – multiple choices – with related images that will lead the user to a tailored result based on the workflow that had been followed. The final recommendations contain not only text, but also links to further references and related Core Services - if applicable (Figure 7). To benefit from this tool, the user is required to enter her/his email address.

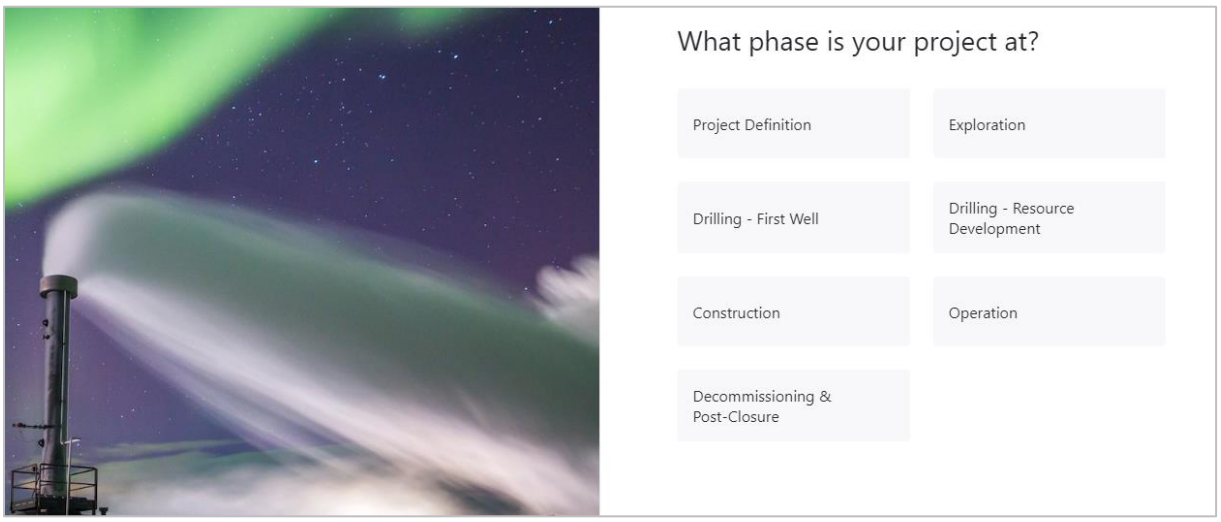


Figure 6: Starting point of the Decision Support Tool.

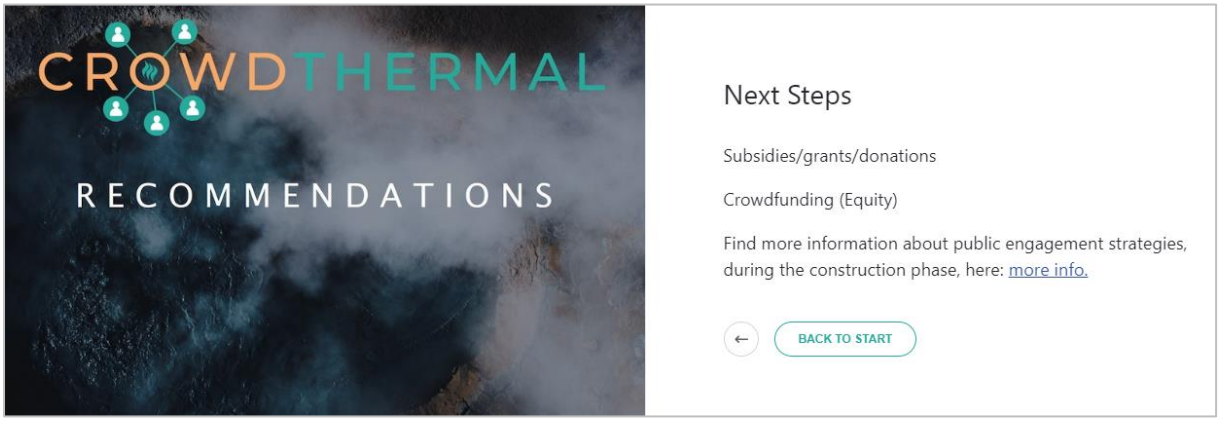


Figure 7: Example of CROWDTHERMAL recommendations at the end of the workflow.

4.3 INTERACTIVE GUIDE TO INTEGRATED FINANCE IN GEOTHERMAL ENERGY

"An interactive step plan with the financial and risk mitigation framework to consider in developing a geothermal project according to the profile of your community." (Core Services portal, CROWDTHERMAL website)

4.3.1 Concept

Interactive Guide to Integrated Finance in Geothermal Energy is a step plan for users to perform a self-assessment on their situation regarding alternative finance and risk mitigation instruments, depending on the community involvement goals (Friederichs, 2021). The target audiences are community of investors interested in geothermal projects, as well as geothermal project developers.

4.3.2 Integration & deployment

This Core Service is available on the project website in two different levels:

1. The cover page contains an introduction and context of it, and it lists 8 steps (questions) that project developers must consider for their geothermal project regarding finance and social engagement. Each of the steps can be clicked to unfold their respective explanation (Figure 8). To fully benefit from this tool, users can proceed to the second level – the interactive step plan, which will require the users' email to be accessed.

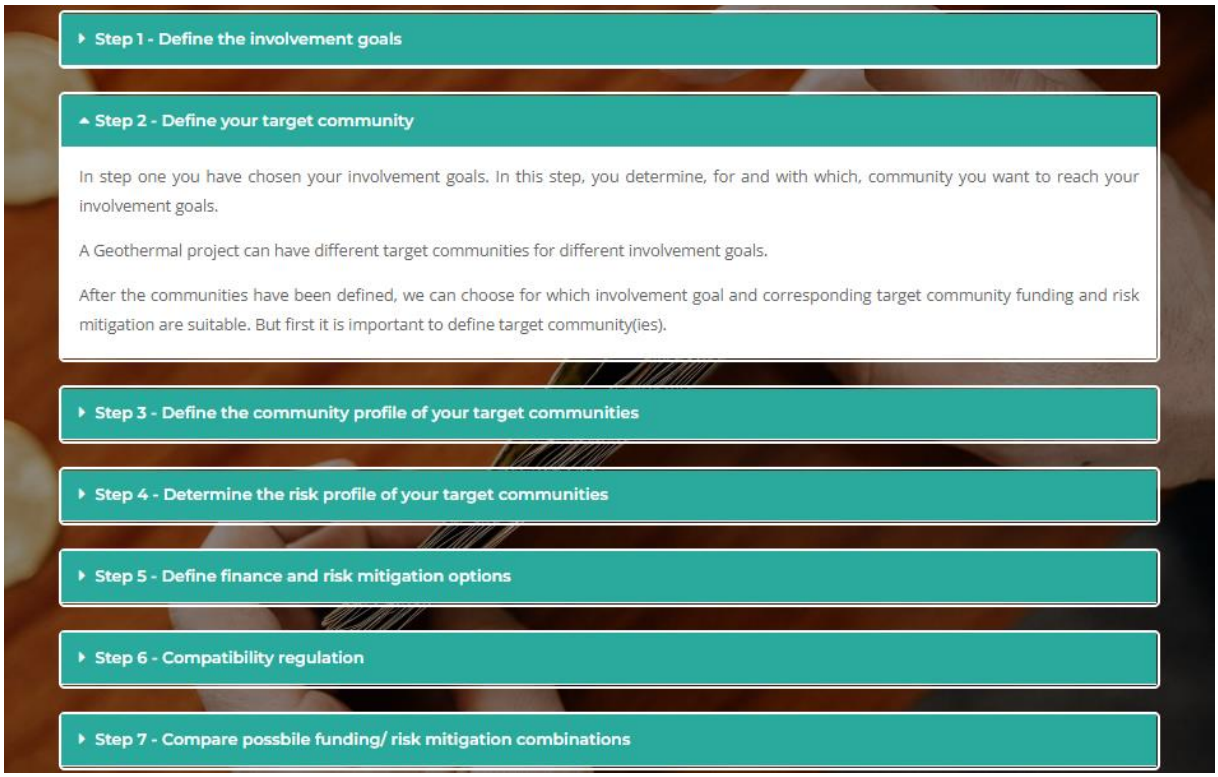


Figure 8: Front page of the Interactive Guide, with the list of steps and descriptions.

2. The second part allow users to go through each of the 8 steps, with the respective questions linked to them. At the bottom there is a text box in which the user shall type their answers for each of the questions (Figure 9). Meanwhile, an automatic report is being generated in the background. Upon completion of the 8 steps, it is possible to download the report that will contain a summary of the whole Core Service, both the introduction of the front page, the questions of the step plan, and the answers entered by the user (Figure 10).

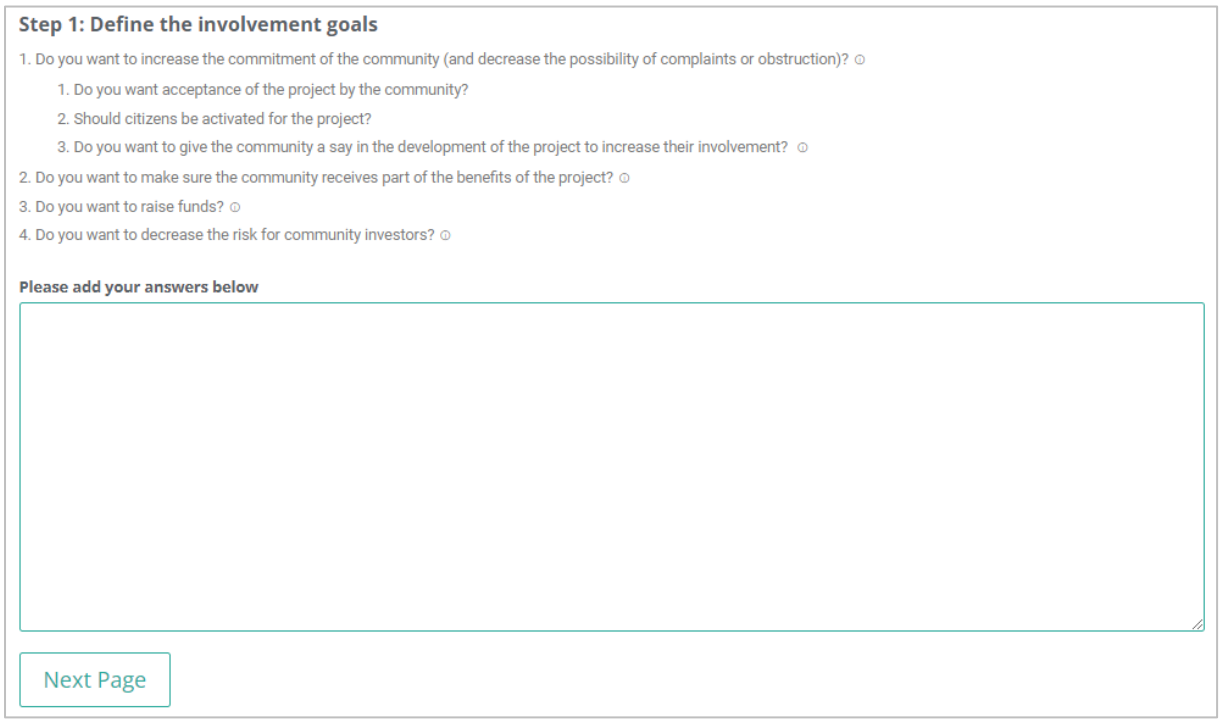


Figure 9: Step 1 of the interactive step plan, with a blank text box to be filled.

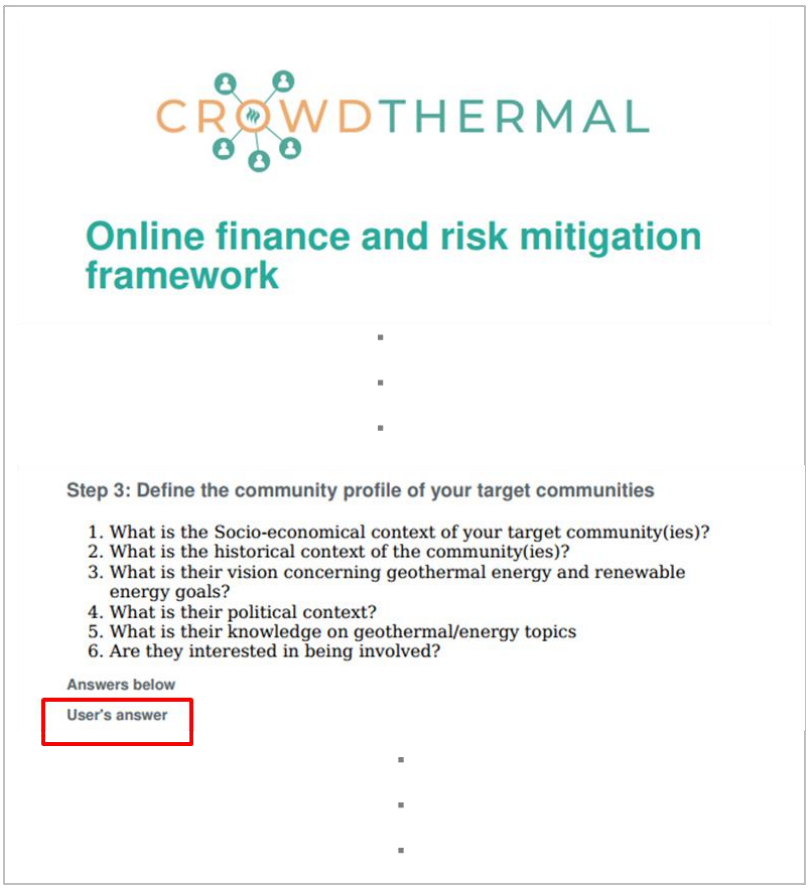


Figure 10: Illustration of the contents in the interactive guide report.

This report is a starting point for users to understand where they stand regarding finance and community involvement in their geothermal project development. This material can be used as input for extra consultancy in case the user needs guidance on how to proceed.

4.4 IMPLEMENTATION FRAMEWORK FOR COMMUNITY-BASED GEOTHERMAL DEVELOPMENT

"Five fundamental aspects to take into account to establish the implementation framework for any geothermal energy project that is developed by a community of citizens." (Core Services portal, CROWDTHERMAL website)

4.4.1 Concept

CROWDTHERMAL performed 3 case studies over its lifetime, applying all areas of expertise involved in the consortium: geothermal energy, alternative finance, risk mitigation and social engagement. Based on this input, the five fundamental aspects for the implementation of a geothermal project were compiled and reported in deliverable D4.1 (de Gregorio and Pérez, 2021):

1. CROWDTHERMAL case studies
2. Social aspects
3. Regulative framework
4. Innovative finance mechanisms
5. Alternative finance risk

4.4.2 Integration & deployment

Due to the nature of this Core Service, project partners and web developers interpreted that it could be displayed as a functional online magazine, with a set of features that allow better visualization and navigation through the document: full screen option, zoom in/out, highlight words, save as PDF, print, and share on social media (Figure 11).

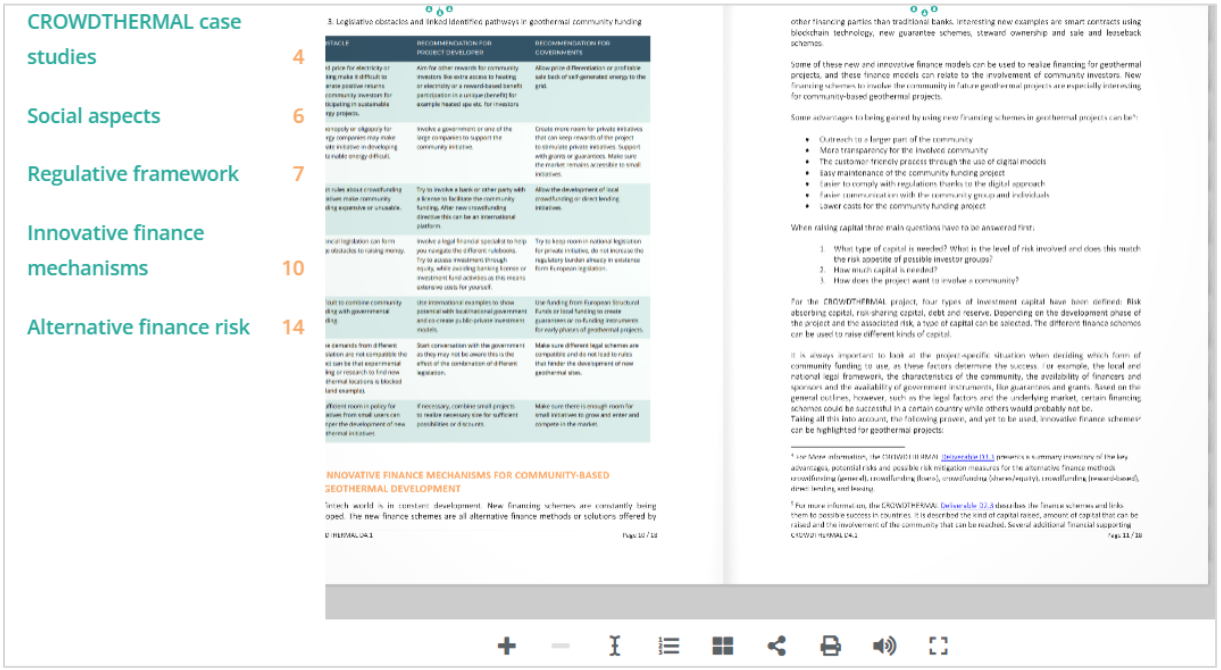


Figure 11: Online report with navigation (left) and visualization (bottom) tools.

4.5 TOOLBOX FOR RISK-EVALUATION AND MITIGATION

"Parameters to perform a complete economic modelling of geothermal projects including key project details, geological parameters, plant specifications, CAPEX, OPEX, and financing plan." (Core Services portal, CROWDTHERMAL website)

4.5.1 Concept

The Toolbox for Risk-Evaluation and Mitigation lists and defines all parameters that need to be considered when computing the costs of a geothermal project. This Core Service is mostly addressed to geothermal project developers who are interested in running a (financial) feasibility study according to their situation.

4.5.2 Integration & deployment

The implementation of the tool is divided into two steps:

1. The cover page is where the Core Service is introduced, with an explanation of its added value and where to go from it. Users can understand about the necessary parameters to perform an economic modelling of a geothermal project, such as: key project details, geological parameters, plant specifications, CAPEX, OPEX, and financing plan (Baisch and Weimann, 2021). All parameters are exemplified in a dropdown list upon left click (Figure 12).

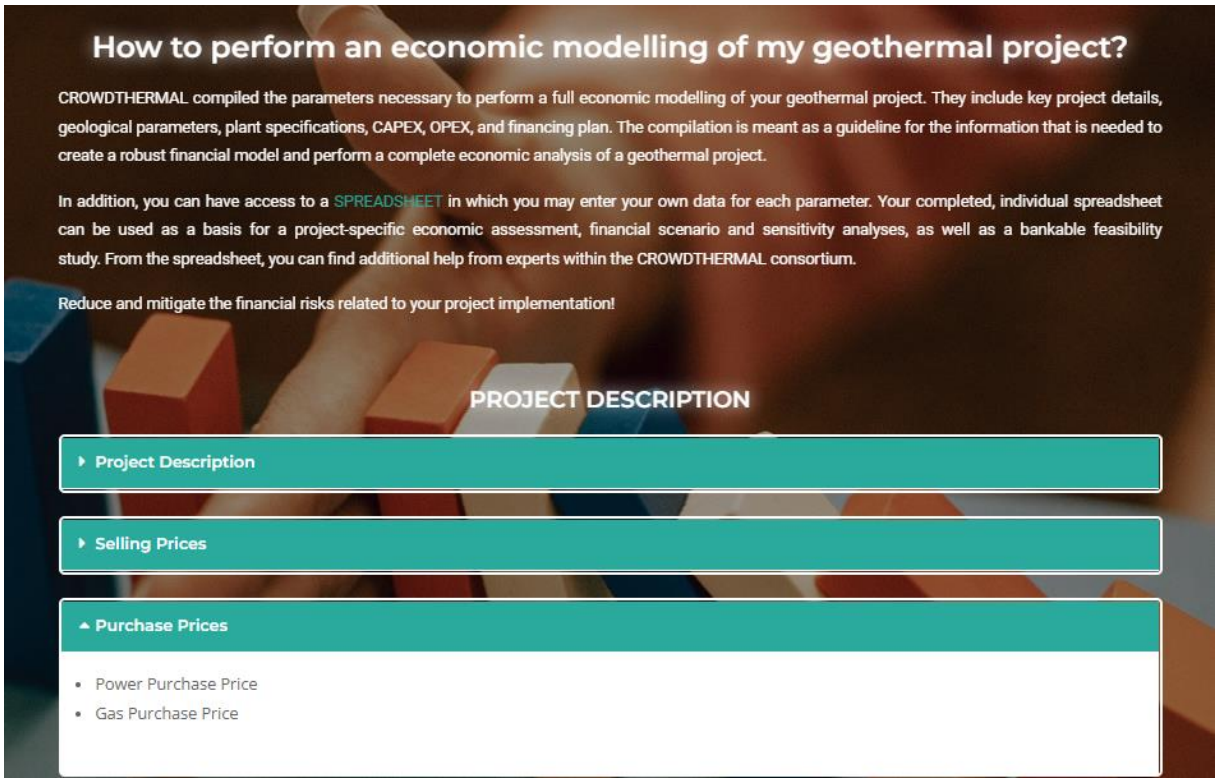
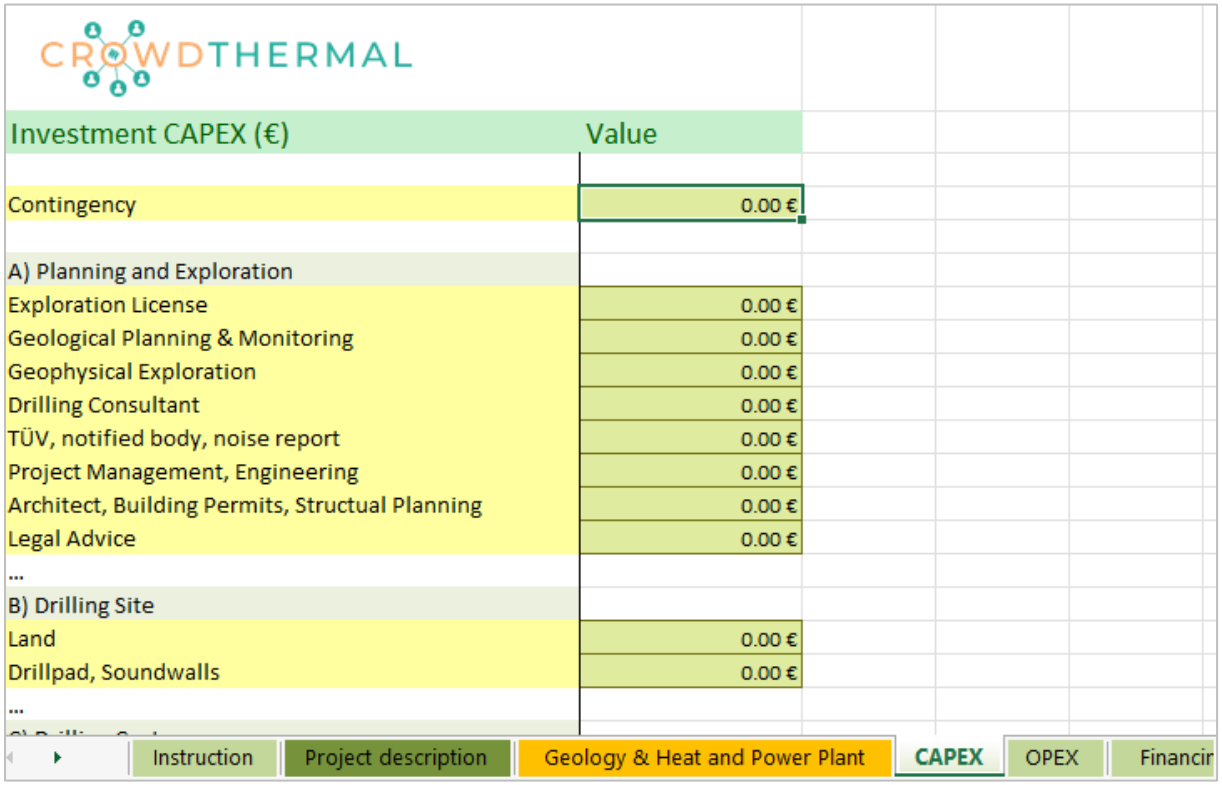


Figure 12: Cover page of the Toolbox for risk-evaluation and mitigation.

2. The second part of the tool consists of a structured Excel file in which all parameters are listed, which is available for download upon registration by entering the email address. The Excel file (Figure 13) allows users to enter their own data from their geothermal project in the allocated cells – while the other ones are password protected to maintain the format and configuration of the tool.



Investment CAPEX (€)	Value
Contingency	0.00 €
A) Planning and Exploration	
Exploration License	0.00 €
Geological Planning & Monitoring	0.00 €
Geophysical Exploration	0.00 €
Drilling Consultant	0.00 €
TÜV, notified body, noise report	0.00 €
Project Management, Engineering	0.00 €
Architect, Building Permits, Structual Planning	0.00 €
Legal Advice	0.00 €
...	
B) Drilling Site	
Land	0.00 €
Drillpad, Soundwalls	0.00 €
...	

Figure 13: Downloadable spreadsheet for practical use of the service.

After the user completes the spreadsheet according to his/her scenario, it can be used as input in case there is interest for specialized consultancy to develop a financial feasibility study of a project.

4.6 META-DATABASE OF GEOTHERMAL PROJECTS

" Updated database of ongoing geothermal projects in Europe, with a user-friendly search engine and thematic maps." (Core Services portal, CROWDTHERMAL website)

4.6.1 Concept

The Meta-database of geothermal projects compiles projects in Europe that can benefit from the CROWDTHERMAL Core Services – to access the possibilities and opportunities related to alternative finance and other available tools. It provides valuable information not only about geothermal projects in Europe, but also about the national framework to support the implementation of such projects. Users can also register their own project to facilitate networking and learn about project developers with common issues, e.g., lack of knowledge and experience with alternative finance and/or public engagement.

4.6.2 Integration & deployment

There are two maps available for consultation, implemented through Geographic Information Systems online. The first one relates to the national framework of most

European countries in terms of permits, regulations, law and resources. Therefore, it provides an overview at country level (Figure 14).

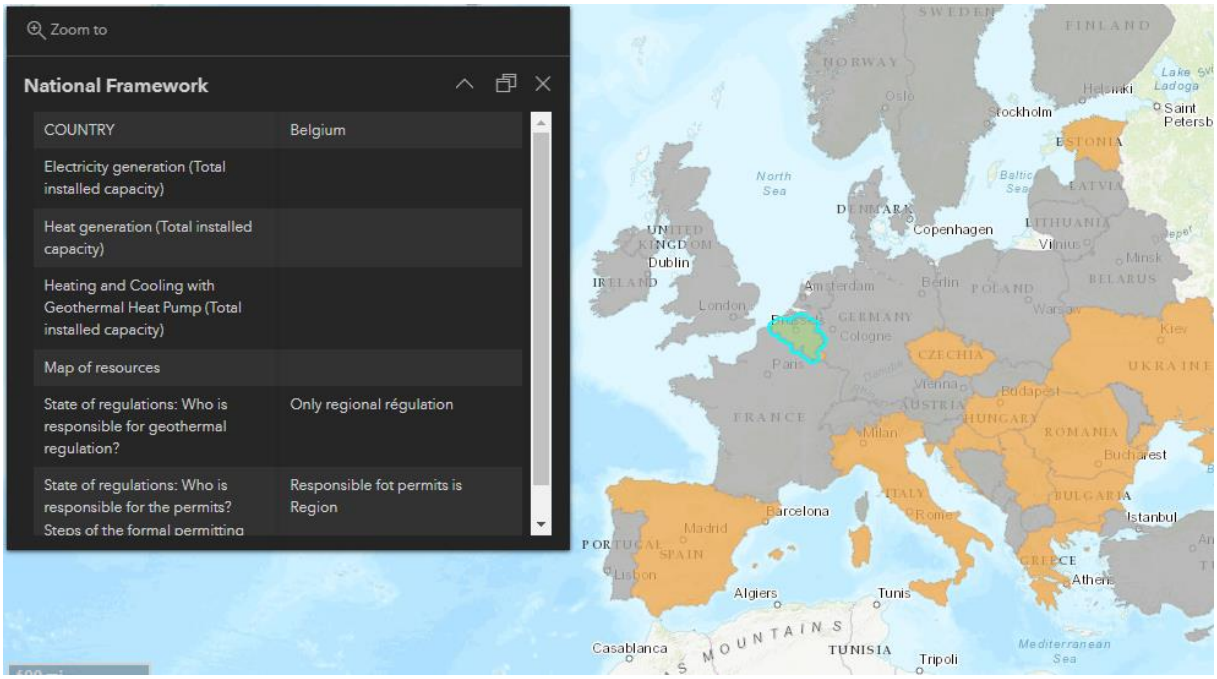


Figure 14: National state of the art of geothermal energy and related regulations.

The second map provides a more in-depth characterisation of the registered geothermal projects with information on contact person(s), geothermal capacity, environmental and technical aspects, demographics, socio-economic risks, and finance (Figure 15).

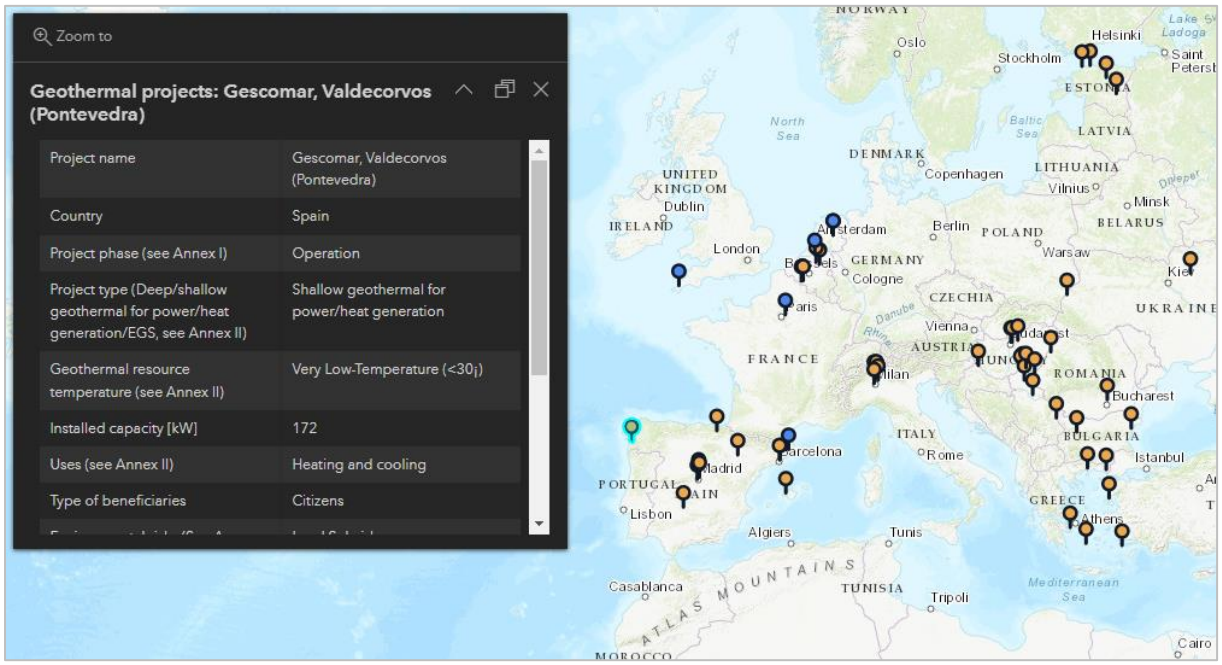


Figure 15: Geothermal projects in Europe.

4.7 INFORMATION CATALOGUE FOR SELF-LEARNING

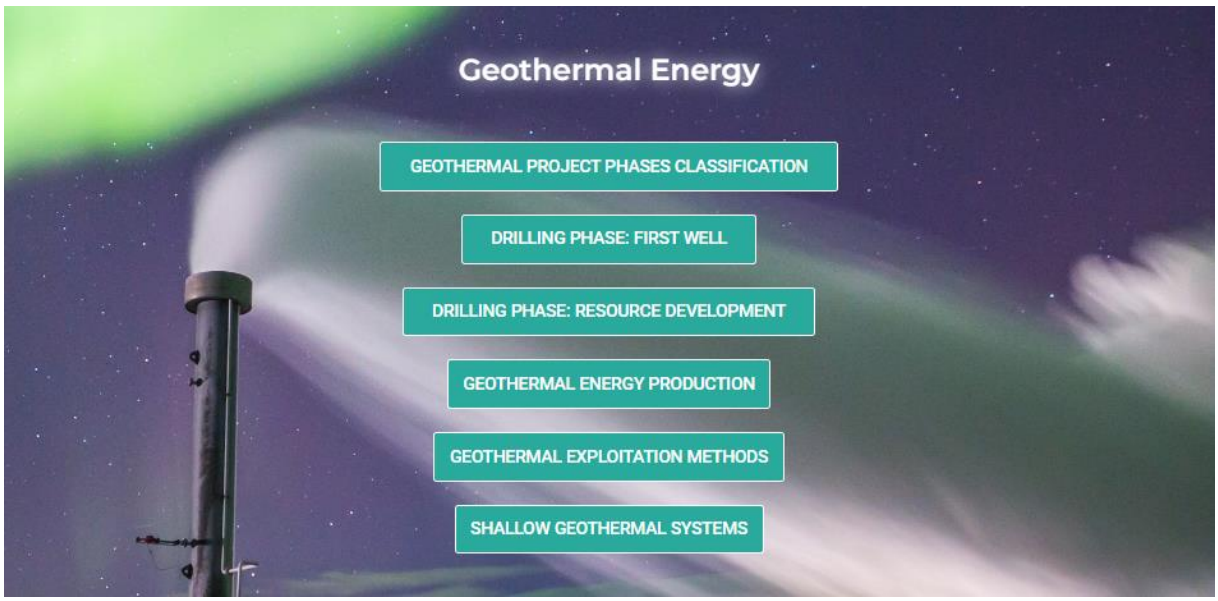
"Self-learning tool for crowdfunding platforms to learn more about geothermal projects, and for traditional geothermal stakeholders to familiarize themselves about alternative finance and social licensing." (Core Services portal, CROWDTHERMAL website)

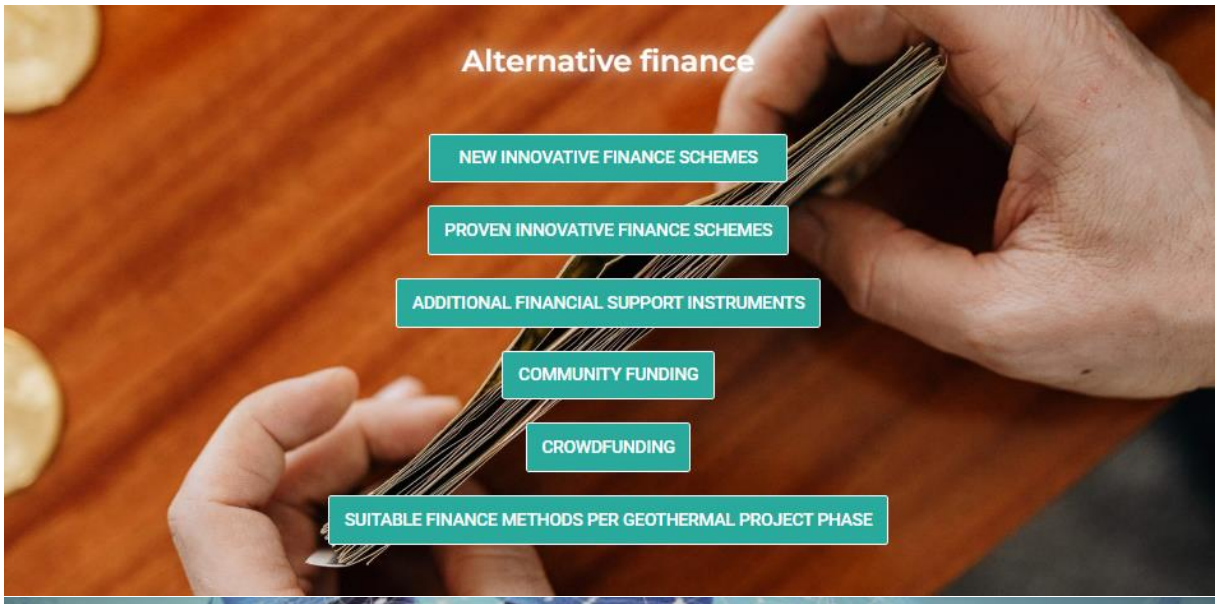
4.7.1 Concept

The Information Catalogue for self-learning consists of short wiki articles that describe key aspects involved in a geothermal project, such as alternative finance, environmental aspects, Social License to Operate, and many others. The purpose of the tool is to simplify these topics and potentially reduce uncertainty and insecurities about them. The expected impact is to lead visitors to the other Core Services and foster the uptake of geothermal projects in Europe (Pinto, 2022).

4.7.2 Integration & deployment

For a better understanding of the information that is being communicated, the Information Catalogue for Self-Learning has a menu in which allow users to browse through the different wiki articles– separated by topics of interest: geothermal energy, alternative finance, social aspects, and risk mitigation (Figure 16).




Alternative finance
NEW INNOVATIVE FINANCE SCHEMES
PROVEN INNOVATIVE FINANCE SCHEMES
ADDITIONAL FINANCIAL SUPPORT INSTRUMENTS
COMMUNITY FUNDING
CROWDFUNDING
SUITABLE FINANCE METHODS PER GEOTHERMAL PROJECT PHASE

Social aspects
WHAT IS PUBLIC ENGAGEMENT?
GUIDELINES FOR PUBLIC ENGAGEMENT: PROJECT DEFINITION PHASE
GUIDELINES FOR PUBLIC ENGAGEMENT: EXPLORATION PHASE
GUIDELINES FOR PUBLIC ENGAGEMENT: DRILLING PHASE
GUIDELINES FOR PUBLIC ENGAGEMENT: CONSTRUCTION PHASE
GUIDELINES FOR PUBLIC ENGAGEMENT: OPERATION PHASE
GUIDELINES FOR PUBLIC ENGAGEMENT: DECOMMISSIONING & POST-CLOSURE
SOCIAL LICENSE TO OPERATE
ENVIRONMENTAL FACTORS

Figure 16: List of wiki articles separated by sections.

Each of the buttons will lead the visitor to a wiki article, which has a standard layout with two major sections (Figure 17):

1. On the left – in white background – there is the definition of the topic of interest, summarized in a few paragraphs.
2. On the right – in green background – there is a section dedicated to providing further sources of information: a) related Core Services, b) related deliverables, c) related factsheets (if applicable), and d) references (in case the wiki article contains scientific references).

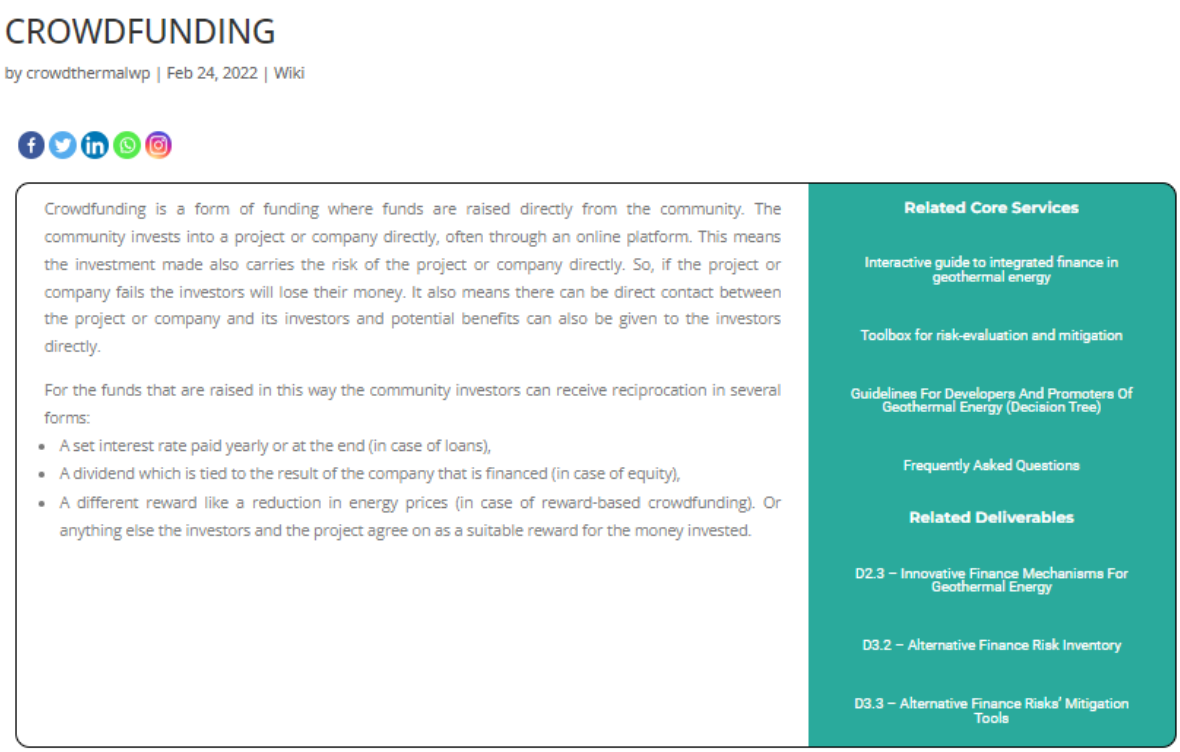


Figure 17: Example of wiki article and its elements.

In addition, users can click on the social media icons on the top left of the article. This feature not only allow visitors to communicate about a chosen topic to their social media network, but also promotes CROWDTHERMAL Core Services to a wider audience interested in geothermal energy, who might not be aware of these tools.

4.8 FREQUENTLY ASKED QUESTIONS (FAQ)

"Self-learning tool for crowdfunding platforms to learn more about geothermal projects, and for traditional geothermal stakeholders to familiarize themselves about alternative finance and social licensing." (Core Services portal, CROWDTHERMAL website)

4.8.1 Concept

Similar to what was developed in the Information Catalogue for Self-Learning, the Frequently Asked Questions also intends to simplify definitions of common subjects related to CROWDTHERMAL expertise, however, in a simple and straight-forward Q&A section.

4.8.2 Integration & deployment

There is a portal with a selection of questions & answers separated by topic, however, with more specific topics and respective explanations. Depending on the topic of interest, users can click on the topic to unfold the dropdown list of questions that can be clicked (Figure 18).

Figure 18: Menu of the Frequently Asked Questions tool.

Once the question of interest is clicked, the visitor is led to a second tab in which the quick explanation is available – together with further references (if applicable). The Frequently Asked Questions also contains social media icons to disseminate the project's output to a wider audience and promote CROWDTHERMAL value (Figure 19).

Figure 19: Example of an FAQ.

5 SURVEY AND FEEDBACK

5.1 EU SURVEY

To effectively assess the users' opinion about the Core Services, LPRC – leader of the Task4.4 – prepared a structured online survey, through the EUSurvey platform (Figure 20). The purpose is to process the feedback provided by different stakeholder groups and implement improvements or adjustments if applicable.

Figure 20: Logo for the EUSurvey platform.

The survey (https://ec.europa.eu/eusurvey/runner/CROWDTHERMALcoreservicessurvey) is available at the bottom of the Core Services Portal (Figure 21), and it includes the following questions:

- Two introductory questions, to analyse the answers based on the target audiences:
    1. *"What is your role? "*. Options:
        a. Geothermal project developer
        b. General public (community)
        c. Public sector
        d. Investor
        e. Other (If Other, please specify)
    2. *"Which Core Service was the most useful to answer your questions?"*. Options:
        a. Online Decision Support Tool
        b. Implementation framework for community-based geothermal development
        c. Interactive guide to integrated finance in geothermal energy
        d. Toolbox for risk-evaluation and mitigation
        e. Information Catalogue for self-learning
        f. Frequently Asked Questions
        g. Meta-database of geothermal projects
- Four questions – for each of the Core Services:
    1. *"How would you rate the usability of the tool?"* Options: 1 (low) to 5 (high)
    2. *"How much added value can it provide to your situation?"* Options 1 (low) to 5 (high)
    3. *"How satisfied are you with this tool, against your expectations?"* Options 1 (low) to 5 (high)

4. *"Please write any open comment/suggestion about this Core Service"*. Open text.

Figure 21: Button to access the Core Services survey.

5.2 INTERNAL FEEDBACK

The format of the Core Services was initially agreed with each task leader who developed the research, prior to their actual implementation as web "apps". Some of the tools could be deployed exactly as planned, while others had to be adapted according to the challenges related to feasibility within the time frame, website plugins, and involved costs.

Upon implementation of the tools, they were subject to internal approval – requested by the project coordinator. The CROWDTHERMAL Management Committee, Project Officer and the Advisory Board agreed with the work done in Work Package 4, which fulfils Milestone 6 of the project: Core Service Package is available online for external users. positive user feedbacks. Approval By the Advisory Board, the Management Committee and the Project Officer.

6 CONCLUSIONS

Deliverable D4.9 (Final Report on the CROWDTHERMAL Core Services) is due December 2022, and it introduces the main outputs of the project and explains how these tools are available as web versions on CROWDTHERMAL website – in the Core Services Portal (https://www.crowdthermalproject.eu/crowdthermal-core-services/).

The CROWDTHERMAL experts in the fields of social engagement, alternative finance, risk mitigation and geothermal energy conducted research and prepared valuable reports that became tools – Core Services – for community of citizens, geothermal project developers and local authorities to foster the uptake of geothermal projects in Europe. Thus, partially contributing to the Green Deal goals by 2050.

There are 7 Core Services that range from self-learning tools, self-assessment guides on finance and social engagement, and tailored recommendations based on project phase, objectives of the project, and current scenario in a geothermal project with regards to community involvement, environmental and risk mitigation concerns.

A survey was prepared to assess the stakeholders' opinion and feedback in using the Core Services. The collected feedback will be used to implement changes and adjust the tools – if applicable – to improve the visitors' experience and satisfaction towards CROWDTHERMAL results.

7 REFERENCES

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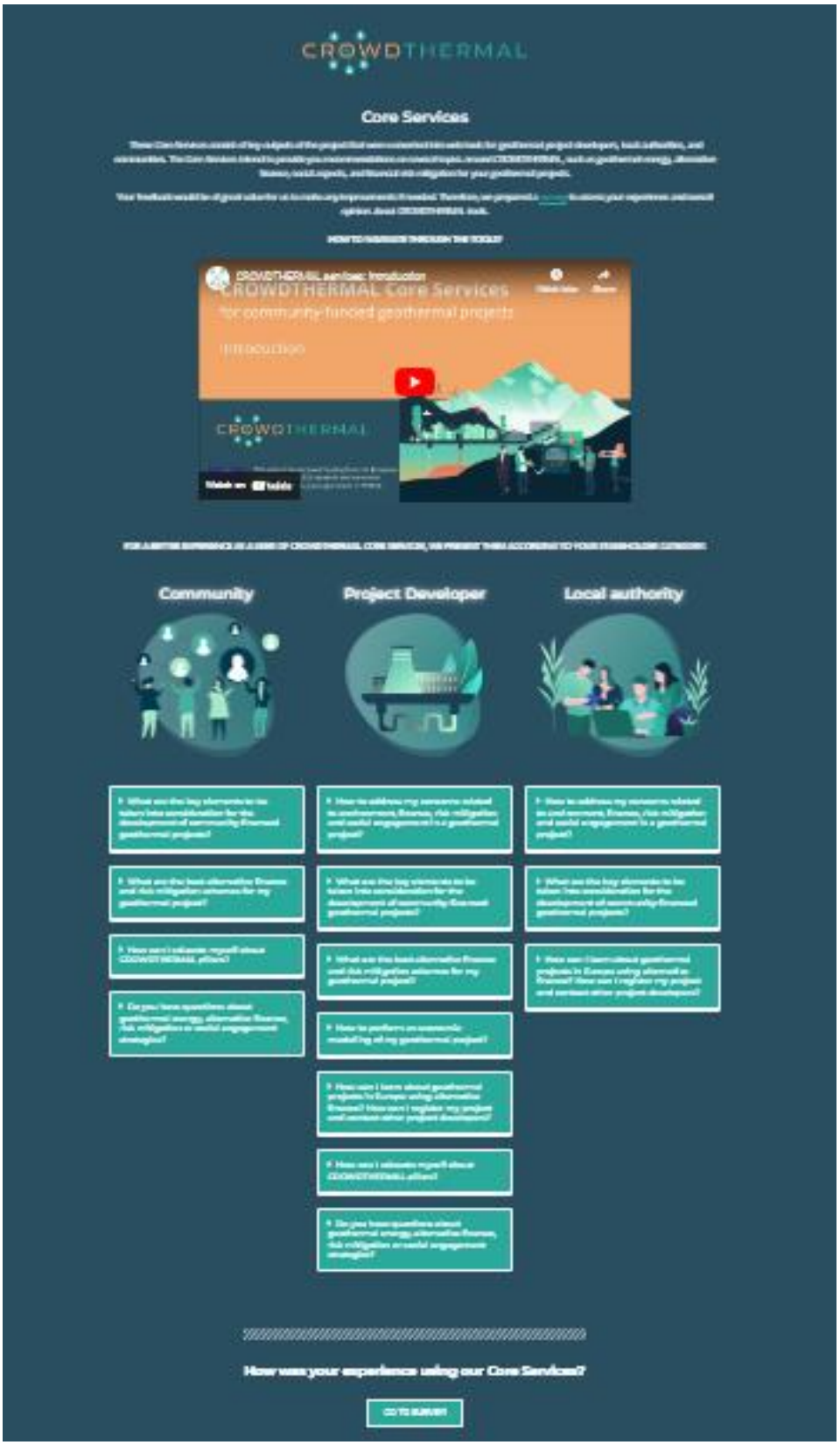
ANNEX 1 – THE CORE SERVICES PORTAL