GRMF HEAT – TECHNICAL ASPECTS

2ND APPLICATION ROUND

KICK-OFF WORKSHOP

Ms. Kristín Steinunnardóttir

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INDEX

GRMF

A Catalyst for Geothermal Development

African Union

European Union Africa Infrastructure Trust Fund

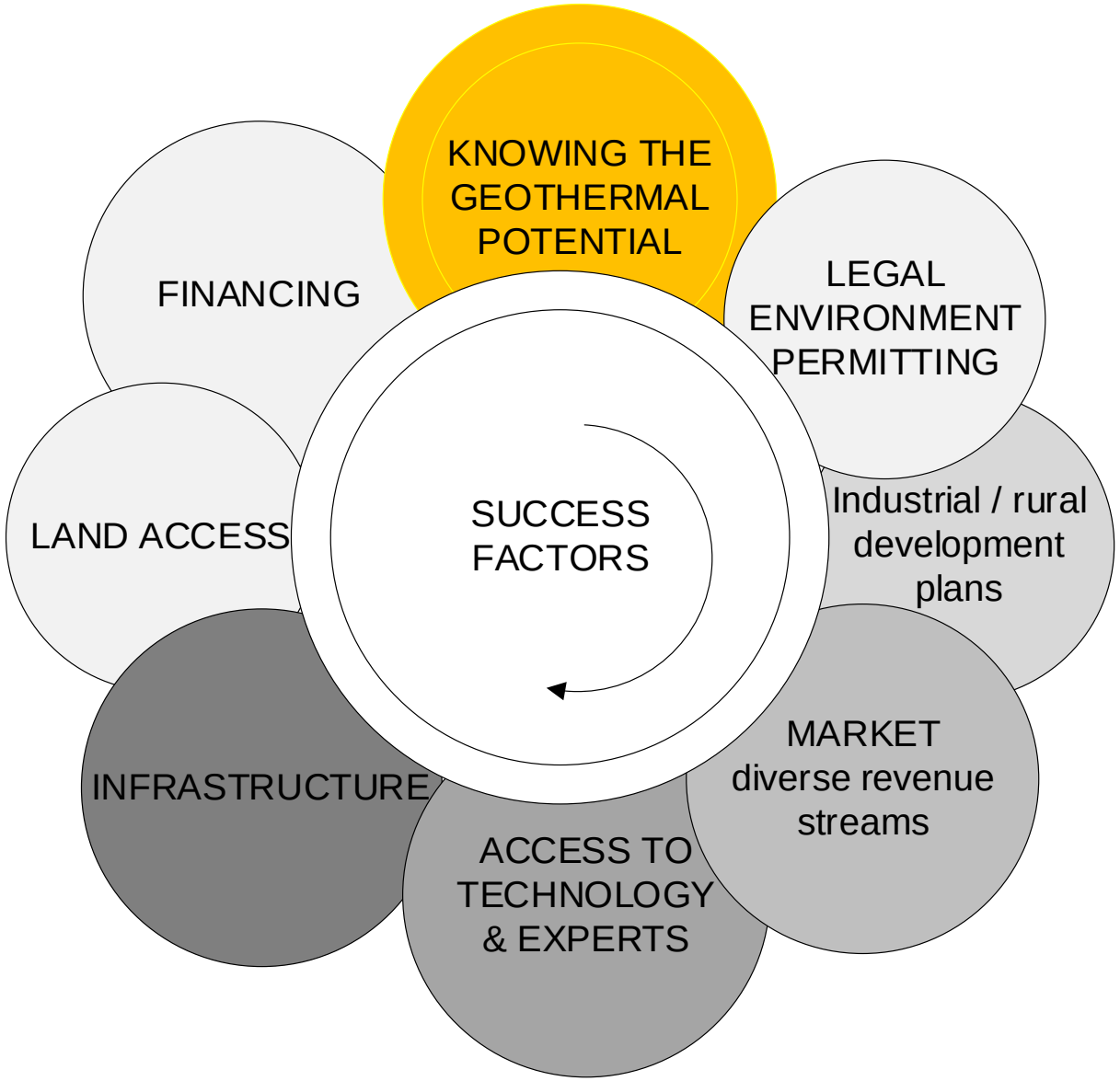
german cooperation
DEUTSCHE ZUSAMMENARBEIT

KFW

1. WHAT TO CONSIDER WHEN PLANNING A GEOTHERMAL DIRECT USE PROJECT?

A certain level of planning should have been reached to be eligible for the GRMF HEAT program.

- <u>The Surface Study (SS) is to refine previous studies in order to site the first well.</u>



1. WHAT TO CONSIDER WHEN PLANNING A GEOTHERMAL DIRECT USE PROJECT?

Each geothermal system is unique.

The production capacity of geothermal systems is highly variable depending on:

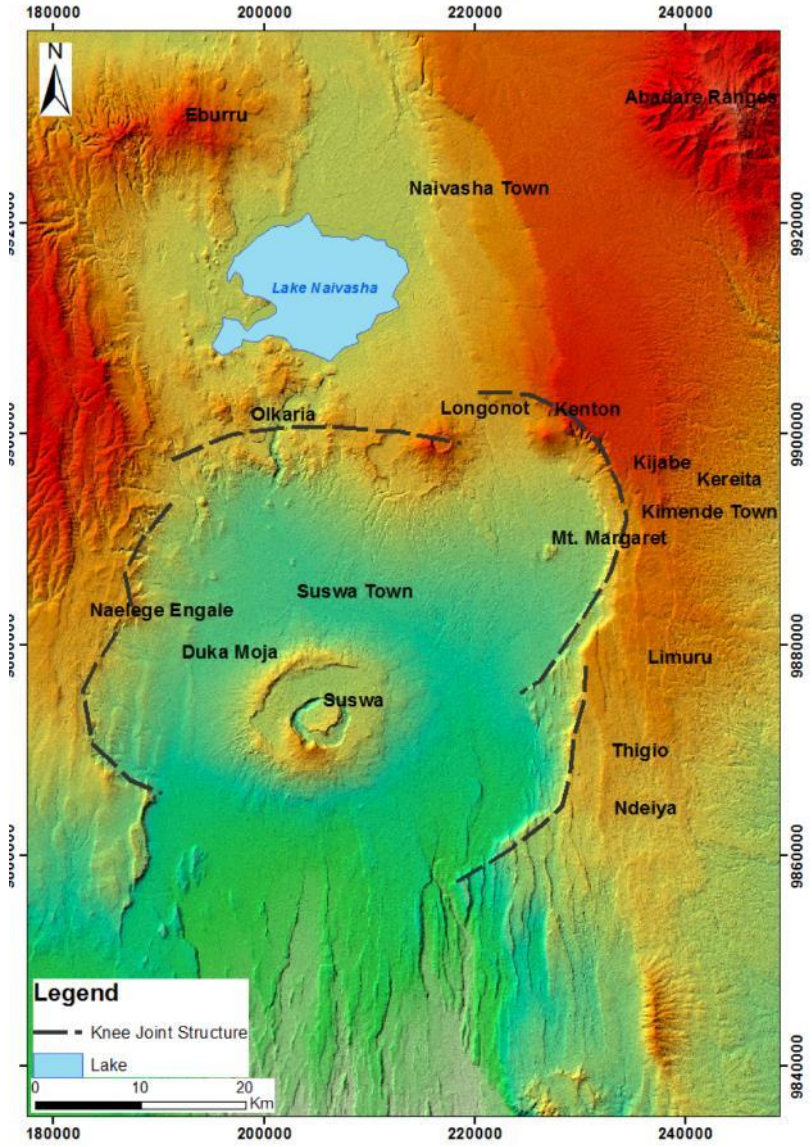
- Temperature
- Reservoir volume
- Geology and tectonics
- Fluid chemistry
- Dynamics and physics

Detailed studies and exploration of the geothermal resource are the foundation of successful geothermal development.

1. WHAT TO CONSIDER WHEN PLANNING A GEOTHERMAL DIRECT USE PROJECT?

- Direct use projects tend to require shallower wells than power projects in high temperature areas.
- Target temperature depends on planned application.
- Appropriate studies for exploring resources for direct use include; structural geological surveys for locating faults and fissures, soil temperature surveys for identifying heat anomalies and drilling of temperature gradient (TG) wells.
- Seismic measurement can be useful to identify the internal structure of the sedimentary layers for locating faults or the depth position of the targeted aquifer – but can be less effective in high temperature areas.
- Use of magneto-telluric method has less

1. WHAT TO CONSIDER WHEN PLANNING A GEOTHERMAL DIRECT USE PROJECT?



Typical surface surveys for locating the site and target for the first wells in low to medium temperature direct use project development are e.g.:

- Data gathering
- Evaluation of existing borehole data
- Interpretation of existing seismic and gravity measurements
- Evaluation of geological maps
- Analysis of tectonics, stress field and fault kinematics
- Geochemical analysis of chemistry data
- Creation of 3D conceptual model of the resource
- Sampling and analysis of wells and thermal springs
- Planning and drilling temperature gradient wells

2. TECHNICAL ASPECTS OF GRMF HEAT EOI APPLICATIONS

For a successful application, please keep in mind to:

- Read the Developer manual.
- Make sure you know what you want to do and that it is eligible.
- Follow the given formats and fill in ALL sections.
- Give all available information.
- Make sure application forms are in coherence with each other.

2. TECHNICAL ASPECTS OF GRMF HEAT EOI APPLICATIONS

Eligible costs

Surface studies (up to 80%) of approved eligible costs:

- **External consulting cost for preparation of EoI and full applications (for public entities)**
- Rental or provision of technical equipment
- Materials and specialist services – such as drilling and logging for shallow TG wells
- Providers of special services
- Personnel, on-site accommodation and transport
- Purchase of aerial photography, remote sensing data or equivalent.
- Consumables
- **Feasibility study**
- Environmental/social studies and assessments
- Environmental/social permits and licenses
- Environmental/social studies/-impact assessments and –management plans
- Well design and drilling program
- Documentation and reports preparation
- Project management
- Mandatory insurances
- Eligible, reasonable and agreed contingencies

Associated infrastructures (up to 20%) of approved eligible costs:

- If applicable: Access roads and/or access road maintenance
- If applicable: Water supply infrastructures to operate a single rig from TG well drilling
- If applicable: Transport and crew accommodation
- Eligible, reasonable and agreed contingencies

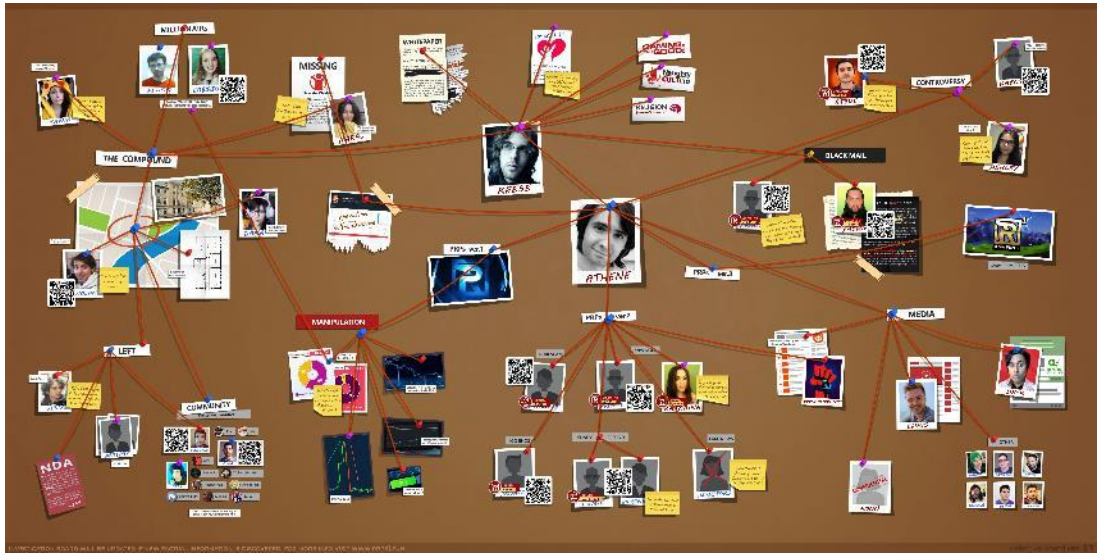
2. TECHNICAL ASPECTS OF GRMF HEAT EOI APPLICATIONS

- A concession wide reconnaissance study is not eligible in GRMF.
- The project area of a Surface Study should be within a previously known geothermal area.
- If the prospect area is near or within the boundaries of another prospect, evidence and justification that the two prospects are not connected is required.

2. TECHNICAL ASPECTS OF GRMF HEAT EOI APPLICATIONS

Justification of actions

- The eligibility of proposed actions can be clarified by connecting the dots on how previous geoscience studies of the area support them.
- The applicant is advised to state clearly what studies have been conducted in the prospect area and how these previous studies are used to define the proposed surface surveys applied for.



2. TECHNICAL ASPECTS OF GRMF HEAT EOI APPLICATIONS

Resource temperature

To avoid uncertainty regarding estimated resource temperature:

- State the range clearly.
- Support your estimate with references to surveys of the area.

2. TECHNICAL ASPECTS OF GRMF HEAT EOI APPLICATIONS

Work plan

- the Applicant is advised to take care to focus the proposed work on a specific area, which has been identified in previous surveys.
- Work plan should be reasonable for the study area, suggested actions should be supported by previous studies and justified for the siting of the first wells.
- Quantification and duration of actions should be clearly presented.

2. TECHNICAL ASPECTS OF GRMF HEAT EOI APPLICATIONS

Experience

Experience of key personnel and experience of the eligible entity are main criteria and need to be met for the project to be eligible for the application phase.

In case of a known experience gap within the Applicant project team please present a strategy for how this will be solved.

In case the Applicant has multiple projects, it is good practice to include also the staffing strategy to meet the expected workload in case all applications are successful.

2. TECHNICAL ASPECTS OF GRMF HEAT EOI APPLICATIONS

Cost estimate

- Breakdown is necessary and should be according to planned activities.

- Budget break down is required to show costs of the individual studies scheduled in order to enable cost comparison.

2. TECHNICAL ASPECTS OF GRMF HEAT EOI APPLICATIONS

Concept strategy and market viability

- Explain the concept of the direct use facility.
- Have some potential customers in mind.

2. TECHNICAL ASPECTS OF GRMF HEAT EOI APPLICATIONS

Feasibility Study

Surface studies shall include a feasibility study regarding the exploitation of the resource and the available market for direct use applications including:

- Market analysis
- Concept strategy
- Design premise
- Engineering works, including surface installations
- Cost/benefit analysis
- Financial analysis
- Risk assessment
- Social & Economic Benefit
- Assessment of regulatory framework regarding implementation of proposed project (e.g. licensing, concessions)
- Project Schedule

3. COMMON PITFALLS

Contradictions in schedules

- In the review the connection between description and justification of the activity and work plan is used to justify the costs applied for.
- All cost should be connected to activities that have a specific duration and execution stated in the work plan and are justified by previous studies of the field.
- When the sections are in contradiction, in terms of e.g. justification of action, method used and size of area to be surveyed, it affects the review accordingly and the cost is questioned.

Description:

Action 1 described and justified

⬇

Work plan:

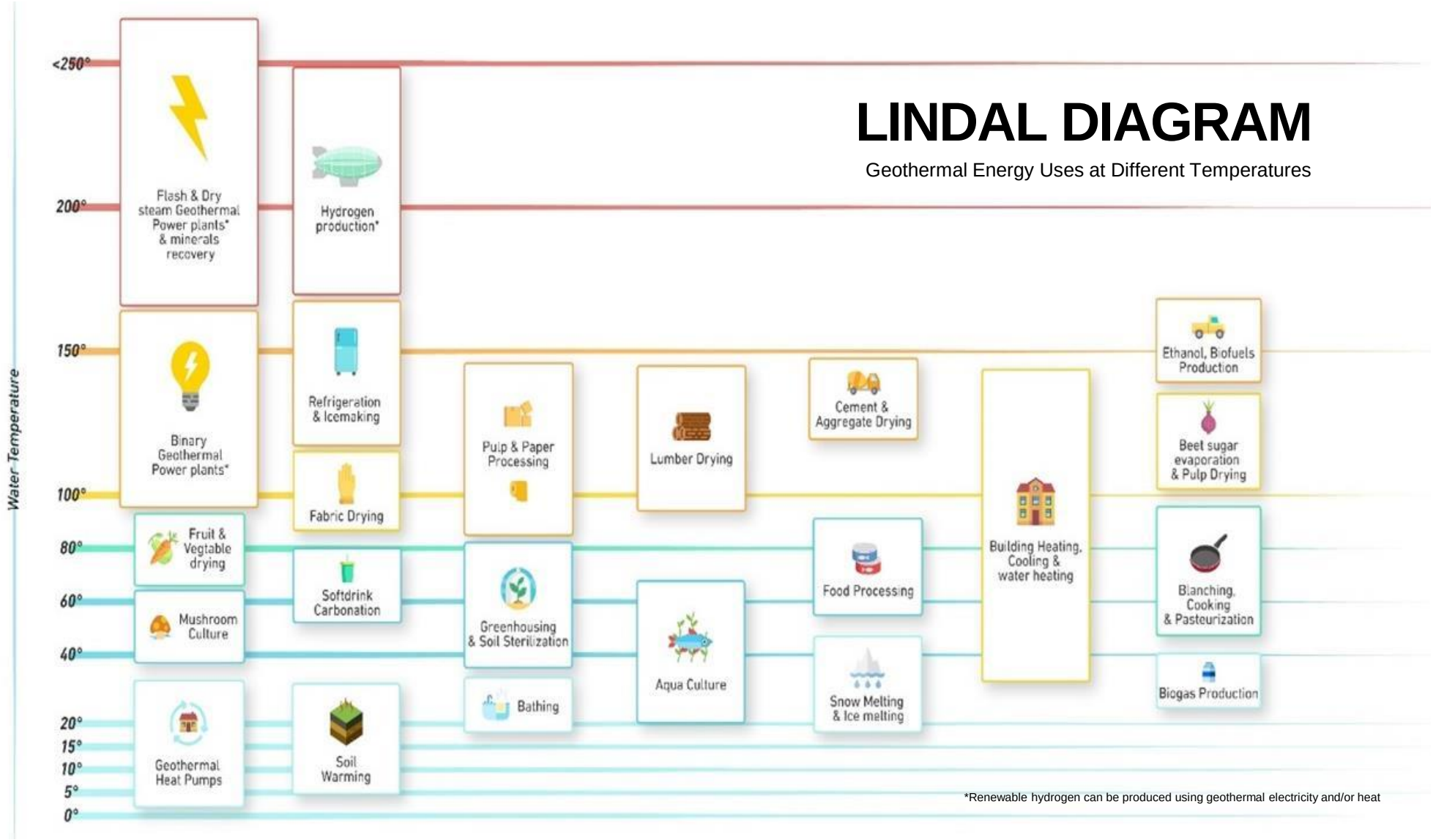
Methodology and duration for Action 1

⬇

Cost estimate:

Cost estimate for Action 1 in coherence with previous sections

4. TYPES OF DIRECT UTILIZATIONS



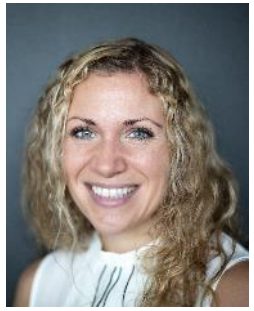
5. QUESTIONS AND ANSWERS

Thank you for your attention!

Kai Imolauer
General Project Manager

Maria Ueltzen
Deputy Project Manager

Johannes Stollenwerk
Local Fund Manager



Kristín Steinunnardóttir
Technical Project Manager

African Union

European Union Africa Infrastructure Trust Fund

german cooperation
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Visit: www.grmf@africa-union.org Contact: grmf@africa-union.org & grmaf@roedl.com