



**KMT@GFZ meeting**

**Technical challenges and Material selection:  
Coordination and Communication**

**Potsdam 27-29 April, 2022**

Hjalti Páll Ingólfsson  
General Manager GEORG  
KMT Chief Project Officer

[hpi@georg.cluster.is](mailto:hpi@georg.cluster.is)  
[info@kmt.is](mailto:info@kmt.is)



# The Objectives of Phase Zero WP3

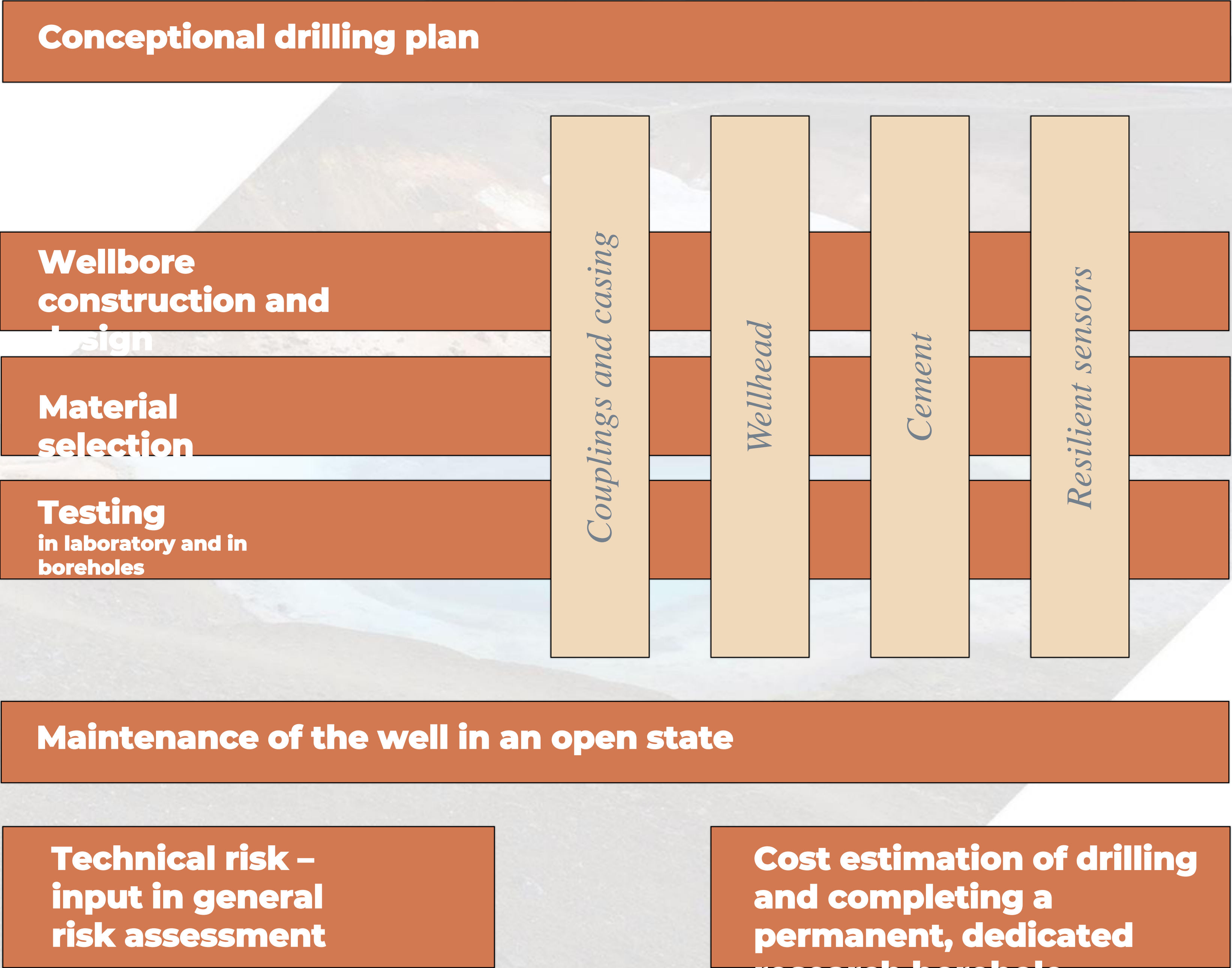
To oversee and manage the preparation engineering and design of the first dedicated research borehole to magma, KMT-1.

To recommend material selection, and material testing needed in the preparation phase for drilling KMT-1.





# Tasks



# Deliverables

**Conceptual Drilling Program, including different scenarios**

**Report on material selection for casing, wellhead, cement, sensor and electronic box, and on cementing methods**

**Report on the result of laboratory tests and deployment in existing boreholes**

**Evaluation of methods for sustainable maintenance of the well in an open state.**

**Technical risk assessment with identification of potential show-stoppers.**

**Cost estimation for drilling and completing KMT-1**



# WP3 – The Team

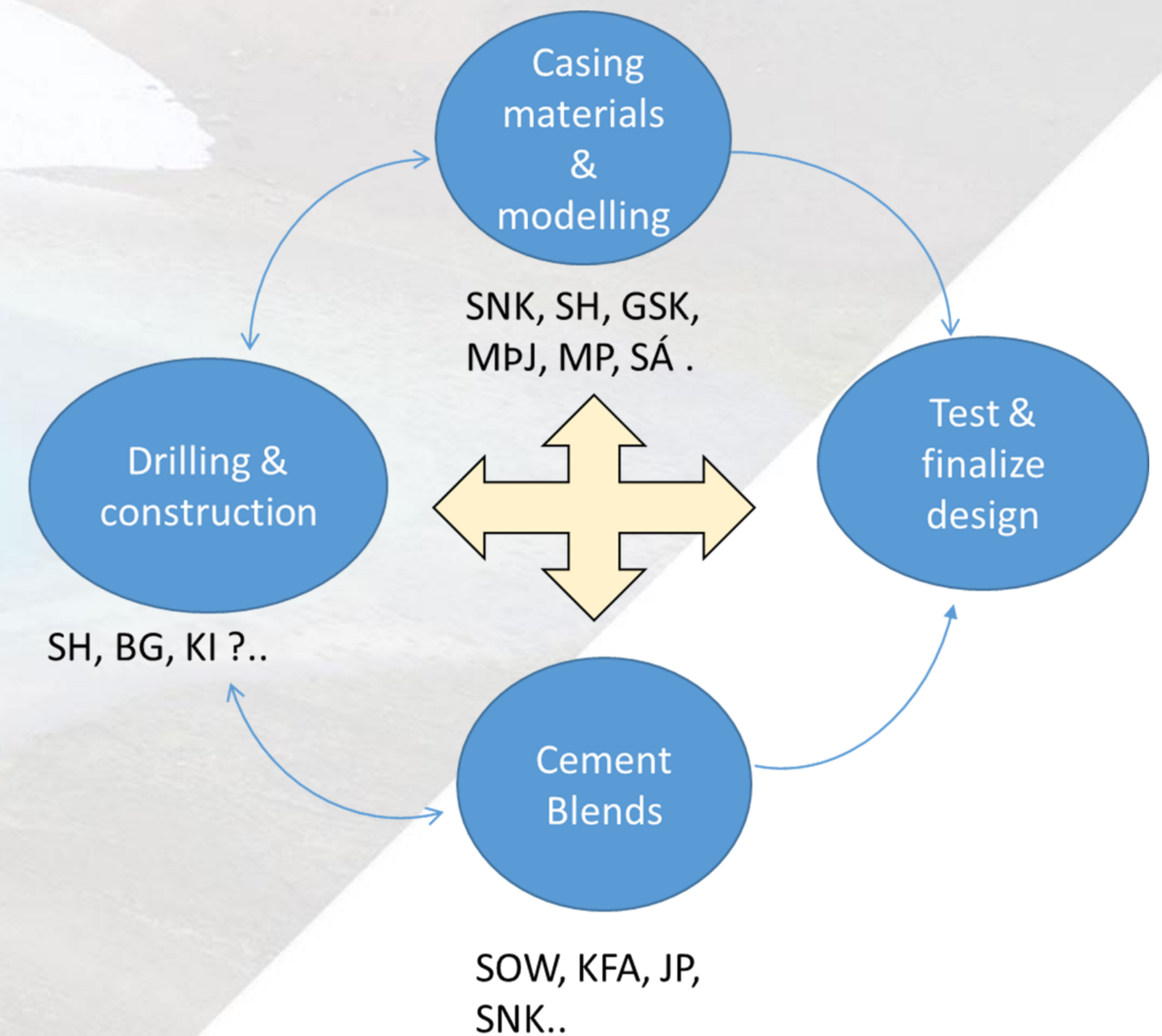
**Sveinbjörn  
Hólmgeirsson**  
**Lead**



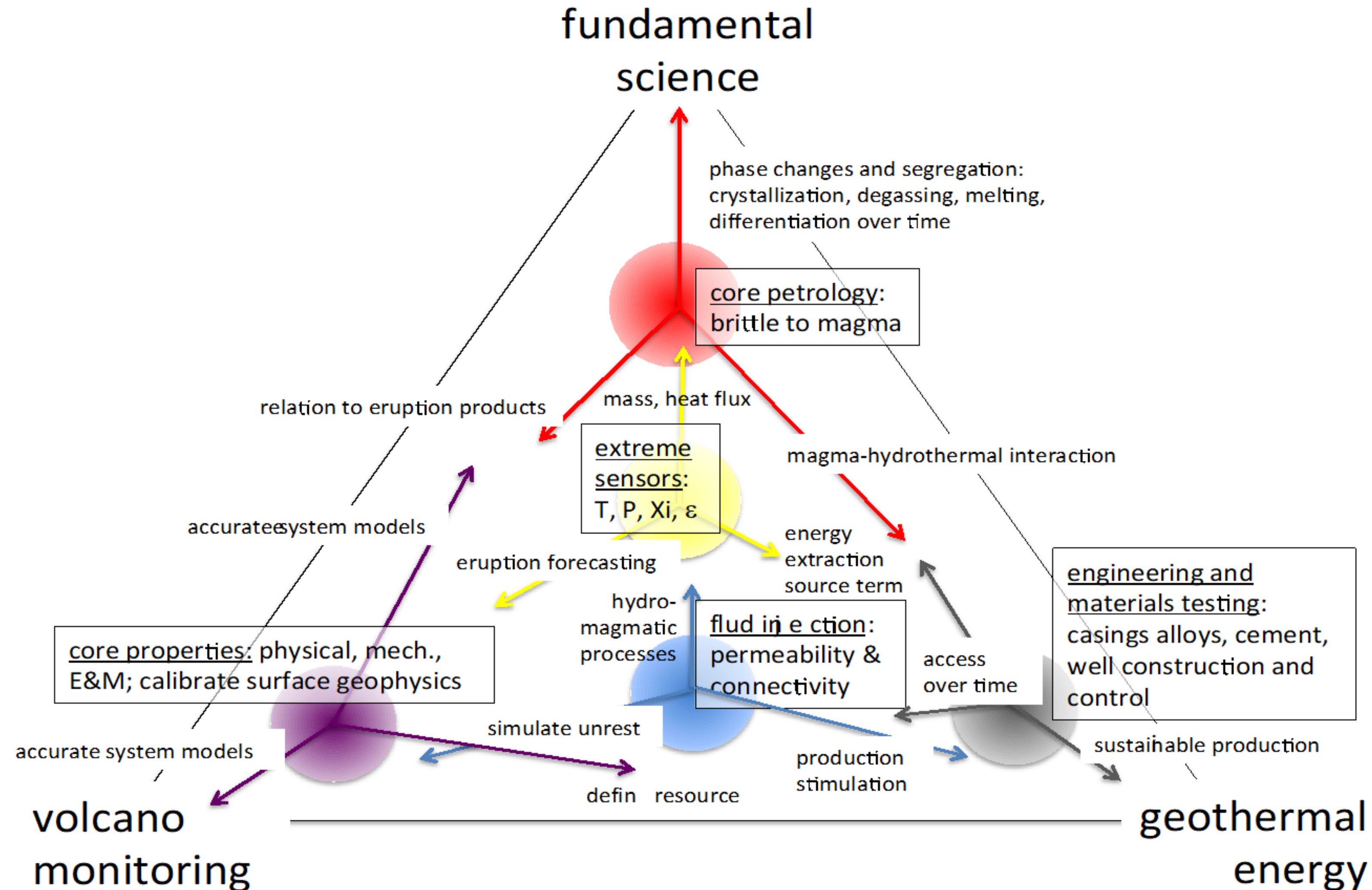
**Sigrún Nanna  
Karlsdóttir**  
**Co-Lead**



WP4 Leaders



# Three challenges, numerous interdisciplinary opportunities





# Coordination Challenge: Synergy between Earth Science (WP4) and Engineering (WP3)

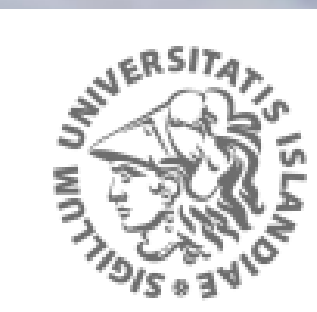


Earth Science.



Engineering.





UNIVERSITY OF ICELAND  
FACULTY OF INDUSTRIAL ENGINEERING,  
MECHANICAL ENGINEERING AND COMPUTER SCIENCE



Tæknipróunarsjóður

# MATERIALS RESEARCH AND MODELING OF GEOTHERMAL WELL MATERIALS FOR HIGH TEMPERATURE AND SUPERHOT GEOTHERMAL ENVIRONMENT

Prof. Sigrún N. Karlsdóttir  
University of Iceland

KMT @ GFZ April 2022



## Motivation

- Need for improvement in design and material selection for near magma & superhot deep drilled geothermal wells



## Main Material Challenges

- **Several challenges are encountered in the design, construction, and production of deep superhot geothermal wells. These include stresses and strain exceeding the yield strength and plastic strain limits of materials used for well casings due to thermal cycling.**
- **Due to high temperatures ( $>300^{\circ}\text{C}$ ) and corrosiveness of the geothermal fluid increased corrosion and erosion-corrosion can be expected.**
- **Carbon steel casing materials start losing their strength at elevated temperatures thus less stress due to thermal cycling is needed for failure.**
- **Carbon steel casings commonly used in these projects are not corrosion resistant and susceptible to various corrosion form such as hydrogen embrittlement, sulfide stress corrosion cracking and micro-cracking due high temperature hydrogen attack.**
- **Materials that have higher corrosion resistance and better resistance against thermal cycling effects are needed to achieve structural integrity of superhot wells.**
- **Potential candidates could include the newly developed titanium alloy Ti-745 (Ti-0.4Ni-3.6Mo-0.75Zr), the nickel alloys SM2245 and SM2550 and self-healing and heat- and acid resistant cement casing blends.**



# Connection to KMT

- Detailed materials testing and analysis will be done that will aid in the next step in the design planning of the KMT well
- Give information for the design strategy of the KMT well
- Collaboration with KMT partners for design criteria of KMT well
- Compliment the work done within KMT for the design preparation and planning





[https://youtu.be/Bf-yA\\_L8mZA](https://youtu.be/Bf-yA_L8mZA)



[www.kmt.is](http://www.kmt.is)