

GLOBAL  
GEOTHERMAL  
ALLIANCE



Food and Agriculture  
Organization of the  
United Nations



# POWERING AGRI-FOOD VALUE CHAINS WITH GEOTHERMAL HEAT

## ENABLING FRAMEWORK CONDITIONS TO FOSTER INVESTMENT

CAPACITY BUILDING EVENT – GLOBAL WEBINAR

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- ✓ The integration of geothermal energy within the agri-food sector requires supportive government **policies** and **regulations** to support a nascent industry
- ✓ Critical to attract developers and **encourage private sector participation**

## Policy

- ✓ Ministry of Agriculture
- ✓ Ministry of Industry/Trade
- ✓ Ministry of Rural Development
- ✓ Prioritize agri-food sector of the economy
- ✓ Remove market barriers through supportive fiscal/tax policies, subsidies and risk mitigation support

### *Examples:*

- ✓ France
- ✓ Indonesia
- ✓ Netherlands

## Regulation

- ✓ Concessions for exploration and development
- ✓ Simplified procedures to obtain licenses and permits
- ✓ Regulations governing surface rights
- ✓ Framework for socio-economic considerations

### *Examples:*

- ✓ Ethiopia
- ✓ France
- ✓ Hungary
- ✓ Chile

# Cross-Sectoral Coordination: Country-Level Roadmap

Conduct studies to collect and analyse relevant information (resource parameters) to identify and prioritise project development and inform decision-making  
Set objectives/targets for the direct use geothermal heating sector

Propose relevant technology solutions to achieve targets  
Align policies and regulations across different sectors of the economy (energy, agriculture, industry etc.)

Identify all stakeholders, secure their participation and build their capacity

Provide incentives to foster industry/private sector participation

Establish budgets, timelines and milestones to achieve sector targets  
Allocate appropriate human and financial resources to achieve targets (i.e., through fundraising, providing technical assistance etc.)

# Financing Options

Financing mechanism	Description
<b>Pure grants</b>	<ul style="list-style-type: none"> <li>✓ Funding for risky activities such as initial exploration and initial drilling</li> <li>✓ Grantors are typically governments or international development organisations</li> <li>✓ No strings attached if the work is performed as contemplated</li> </ul>
<b>Contingent grants</b>	<ul style="list-style-type: none"> <li>✓ Typically provided during the exploration and initial drilling stage                             <ul style="list-style-type: none"> <li>• If drilling is unsuccessful, the grantee has no monetary obligations</li> <li>• If the operation is successful, the grant converts into a loan that the grantee will repay over time</li> </ul> </li> <li>✓ Can be recycled to provide support for more projects</li> </ul>
<b>Risk mitigation</b>	<ul style="list-style-type: none"> <li>✓ Drilling phase:                             <ul style="list-style-type: none"> <li>• <b>Insurance:</b> The insured pays a one-time premium prior to the start of drilling</li> <li>• <b>Grants:</b> Under this mechanism, the qualified applicants can obtain a grant covering the costs of the initial drilling and other related expenses</li> </ul> </li> </ul>
<b>Concessional loan</b>	<ul style="list-style-type: none"> <li>✓ Loan at below-market conditions: lower interest rate, longer maturity and no or very light securities and collaterals</li> <li>✓ Available at later stages of project development</li> <li>✓ Repaid from the profits of the operation</li> </ul>
<b>Project financing</b>	<ul style="list-style-type: none"> <li>✓ Multilateral or regional development banks typically offer project debt (e.g., AfDB, IDB, World Bank/IFC, etc.)</li> <li>✓ Equity is usually provided by investors focused on emerging markets</li> <li>✓ Project financing allows the project assets to be the only collateral → time consuming and expensive</li> </ul>



A drilling rig at Menengai, Kenya (source: Kenya GDC)

## IRENA Project Facilitation Facilities



## Project ownership models:

- (i) Stand-alone direct use systems
- (ii) Cascaded direct use systems
- (iii) Integrated geothermal direct use and electricity generation systems

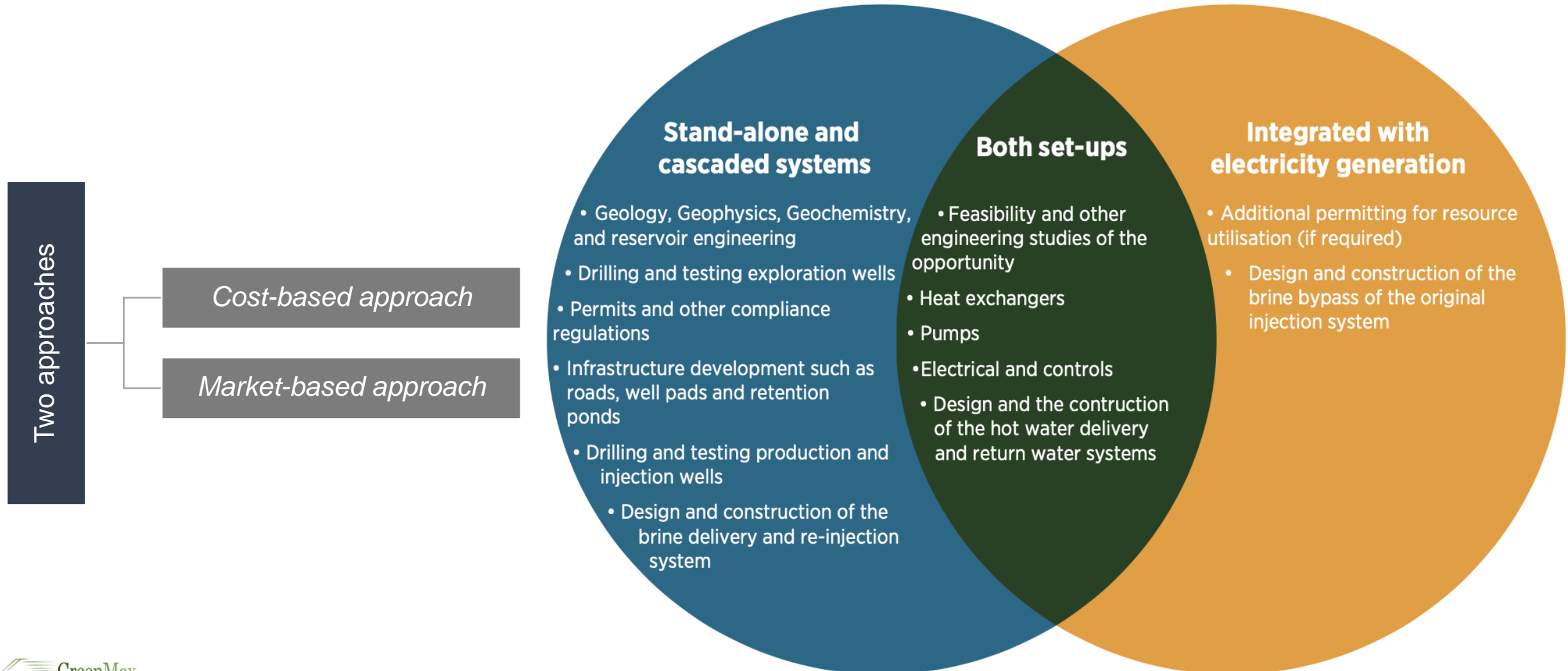


## Business models :



- ✓ Ownership models impact the financing schemes → ownership of entire operation, partnership, heat purchase agreement (HPA)
- ✓ Powering agri-food value chains with geothermal heat → parallel approach – geothermal resource and processing plant
- ✓ Unique case: Existing power generation facility
- ✓ The challenge is the processing plant – design affected by technology, market, and supply chain considerations

## Capex elements for different direct use set-up options



## Key components of a geothermal heat tariff

### ✓ Cost-plus approach

Capital Costs (CAPEX)	Operating Costs (OPEX)	Shared Costs	Markup
<ul style="list-style-type: none"><li>➤ Exploration studies</li><li>➤ Feasibility studies</li><li>➤ Permits</li><li>➤ Drilling</li><li>➤ Energy delivery systems and associated infrastructure</li></ul>	<ul style="list-style-type: none"><li>➤ Salaries/wages</li><li>➤ Electricity usage for operations</li><li>➤ Equipment maintenance</li><li>➤ Interest/bank fees</li><li>➤ Depreciation of assets</li></ul>	<ul style="list-style-type: none"><li>➤ Direct use project integrated with electricity generation</li></ul>	

### ✓ Market-based approach

CAPEX of energy supply from alternative sources is used as a benchmark for calculating the geothermal heat tariff

### ✓ Advantages and limitations of each approach

# Recommendations

Challenge/gap	Description	Recommendations/lessons learnt
Policy, legal and regulatory frameworks	<p>Laws and regulations to support the development of geothermal projects may be inadequate or lacking.</p> <p>Policy instruments to support the integration of geothermal energy into agri-food systems may be inadequate or lacking.</p>	<ul style="list-style-type: none"> <li>Establish adequate and simplified licencing procedures for geothermal direct-use projects and clearly defined regulations.</li> <li>Develop and implement policy instruments to encourage the deployment of geothermal heat in the agri-food sector.</li> </ul>
Cross-sectoral alignment and multi-stakeholder engagement	<p>Policies of different sectors whose involvement is required to implement direct-use projects are usually non-aligned.</p> <p>Numerous stakeholders are involved in the development of direct-use projects.</p>	<ul style="list-style-type: none"> <li>Develop cross-sectoral, integrated planning approaches to facilitate the adoption of geothermal energy into food systems and to align public and private sector priorities (e.g. with master plans or roadmaps for geothermal heat utilisation).</li> <li>Identify the various stakeholders in direct-use project development and devise a strategy for their engagement as early as possible.</li> </ul>
Access to financing	<p>Geothermal project development has high upfront costs and risks.</p> <p>Public financial resources are limited, especially in developing countries.</p> <p>Multilateral and international bank funding is mainly focused on geothermal electricity production projects.</p> <p>Demonstrable feasibility of direct-use projects is lacking in many developing countries.</p>	<ul style="list-style-type: none"> <li>Establish risk mitigation schemes to minimise the exposure to losses by geothermal developers.</li> <li>Develop laws and regulations that encourage the deployment of geothermal heating, including simplified licencing procedures for geothermal direct-use projects.</li> <li>Develop direct-use projects alongside existing power projects to utilise excess heat through cascading systems or available heat from sub-commercial wells.</li> <li>Assess the socio-economic benefits of deploying geothermal heat in agri-food projects to demonstrate the potential to improve the livelihoods of local communities.</li> <li>Launch pilot projects to demonstrate the technical/ financial viability of direct-use technologies and associated business models.</li> <li>Partner with local banks and build their capacity to finance direct-use projects using local currency financing.</li> <li>Leverage technical assistance and matchmaking platforms to connect investors/financiers with bankable projects.</li> </ul>





## THANK YOU!

