

JICA's Cooperation in Geothermal Development

Session V

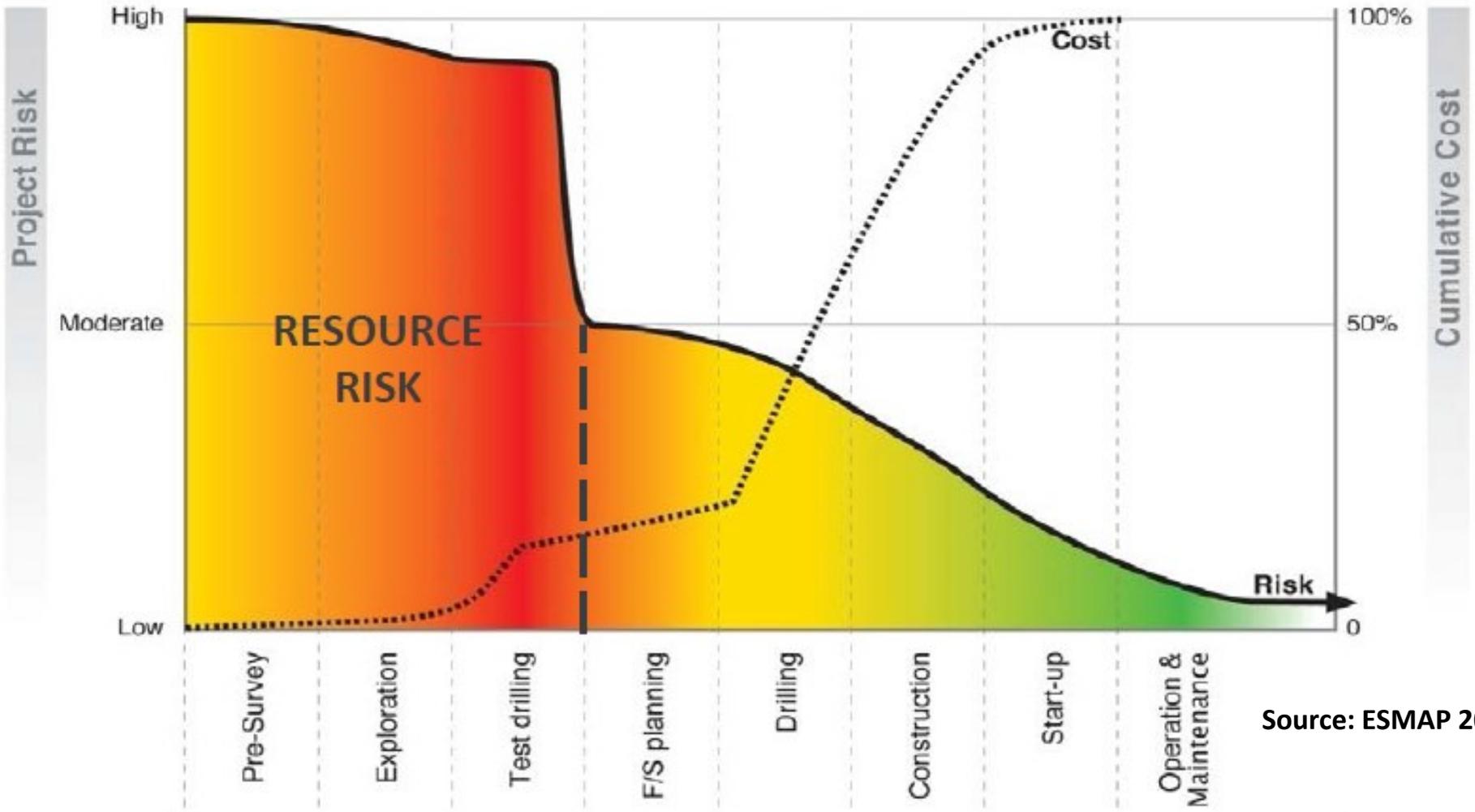
Regional Workshop on
Geothermal Financing and Risk Mitigation in Africa

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1. Strengthen the public sector to take resource development risks



Source: ESMAP 2012

Capacity Development in Kenya

The Project for Capacity Strengthening for Geothermal Development (2013-2017)

Training of over 90 trainees in geoscience, reservoir engineering, and drilling technology in Menengai and Japan

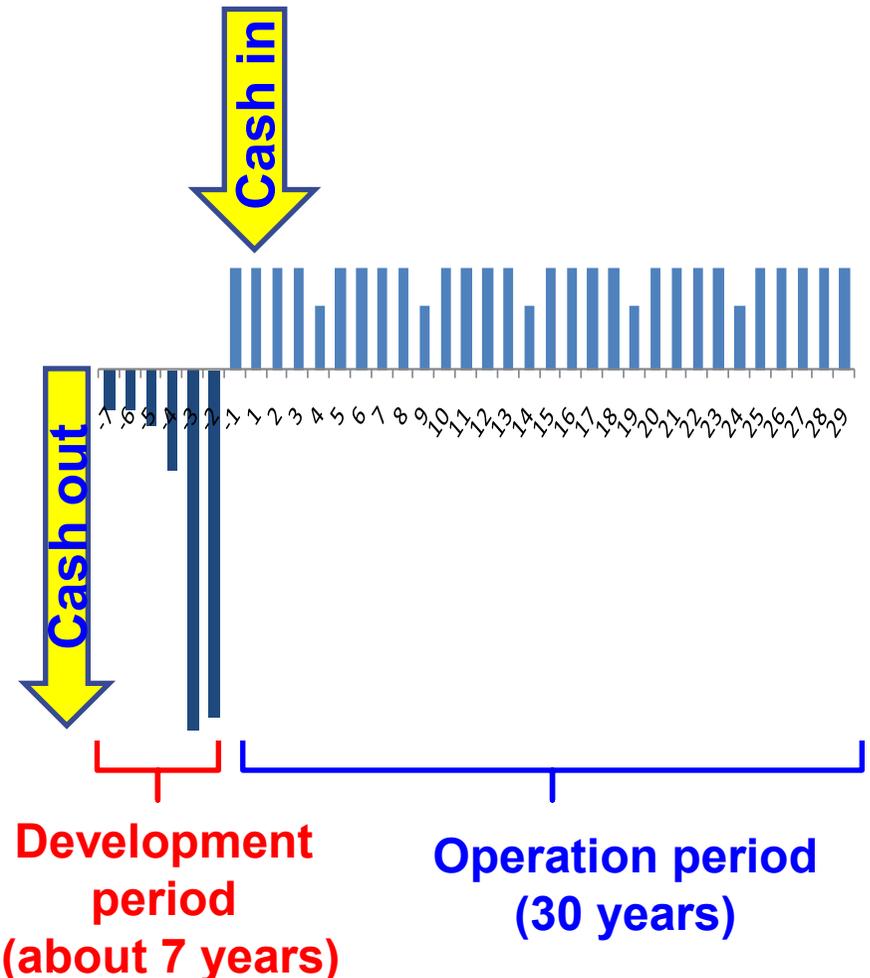


JICA training programs for geothermal energy

Geothermal Executive	1 week course for executive officers
Core human resources (administrative officer, researcher)	Long-term training (master or doctor)
Geothermal resource engineer	6 months course
Drilling manager	6 week course

2. Provide Upfront Investment

Cash flow of geothermal project



Upfront investment is a big burden for private companies

Geothermal project needs large upfront investment.



During long development period, NO cash inflow.

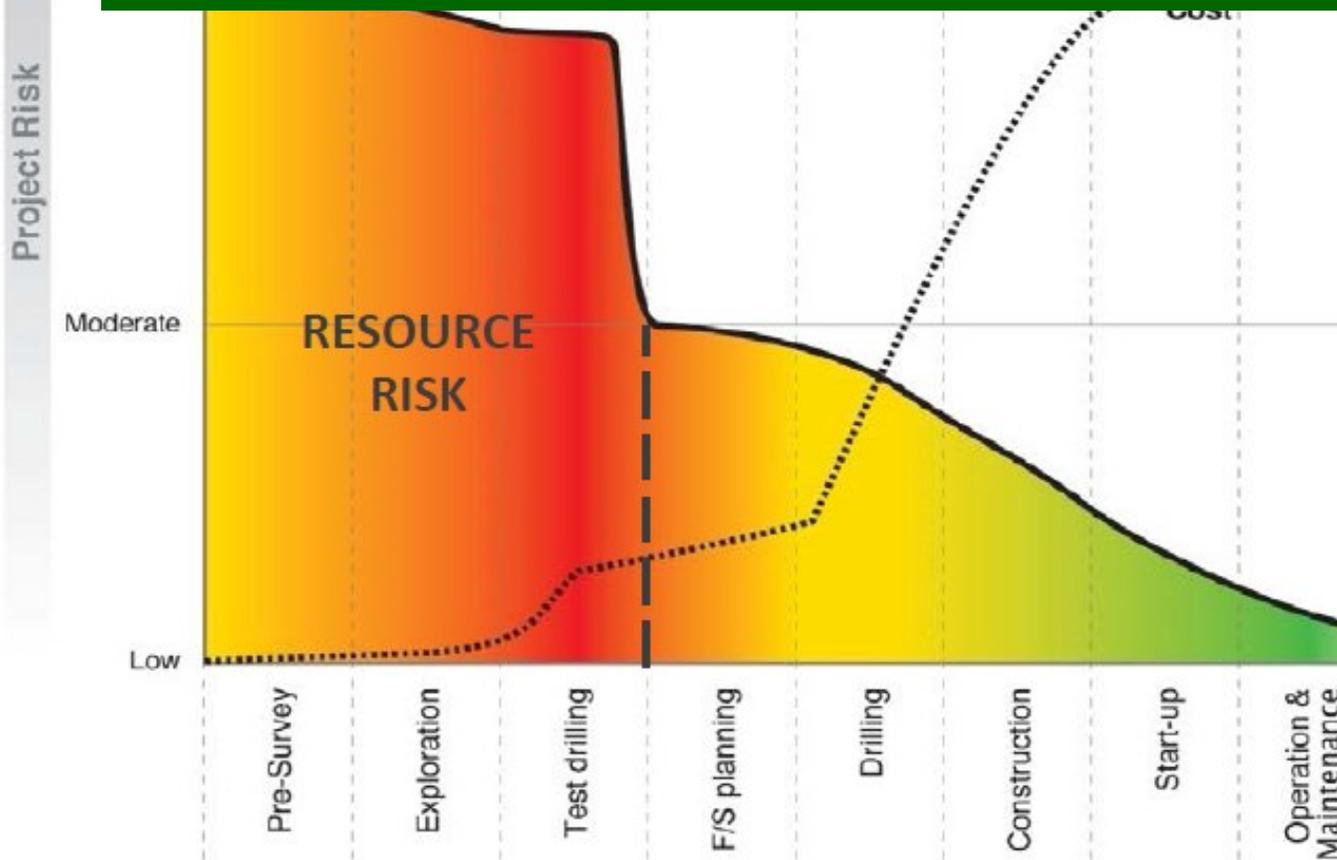


There is strong relation between capital cost (ROE) and generation cost (ct/kWh).



Private company is unlikely to start geothermal project.

JICA's Financing instruments



Grant base

(ex: Masterplans, TA projects, F/S)

Yen Loan

(ex: Engineering service loans, project loans, private sector loans)

Others:

- VGF (Viability Gap Funding) loan
- EBF (Equity Back Finance) loan
- Contingent Credit Enhancement Facility for PPP Infrastructure Development (CCEF-PPP)
- Preparatory Survey for PPP Infrastructure Projects

Examples of JICA's projects

Development policy and plan

- Kenya (2017), Ethiopia(2015), Rwanda (2015)
- Assistance to formulate geothermal master plan to rank prospective sites based on geothermal resource potential, development cost and environmental impact



Surface survey



Training for conceptual modeling in Japan

Ethiopia Tendaho Test Drilling Project



- **Geothermal Master Plan Survey(2013-15)**
- **Surface survey (2015-17)**
- **Test drill project in Tendaho (2017-2020)**

Photo: Tendaho exploration site

Djibouti Hanle Test Drilling Project

- **Surface survey (2014-17)**
- **Test drill project in Hanle (2017-2020)**



Photo : Hanle exploration site

Kenya, Olkaria I Unit 4&5



Loans: Total of 350MW in constructed or committed (L/A signed amount: 75.5 bil Yen)

- Olkaria I Unit 4, 5 (140MW. Completed 2015)
- Olkaria I Unit 6 (70MW. Planned completion 2021)
- Olkaria V Unit 1, 2 (140MW. Planned completion 2020)
- Olkaria I Unit 1, 2, 3 Rehab (planned)

Ethiopia: Alto Langano Geothermal Development



LA-9D

- Test drilling of 2 wells (GOJ, 2015-16)
- Drilling 22 production and reinjection wells (WB, 2014-2020)
- Wellhead Plant (JICA grant, 5MW. 2017-2019)
- 35MW Plant construction (JICA, 2019-22)

3. Create enabling environment (policy advice)

- Kenya: PPP Advisor for the Energy Sector (2017-2019)
 - Advise Ministry of Energy and Petroleum (MoEP) and energy related agencies (ERC, KPLC, KETRACO, KENGEN, GDC, and REA) to promote IPP/PPP
- Ethiopia: Advisor for Geothermal Development (2016-2018)
 - Advise Ministry of Water, Irrigation, and Electricity (MoWIE) and energy related agencies (EEP, EEA, GSE) on promotion of geothermal