Global Geothermal Development Plan

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Geothermal:
A Global Coalition Needed for Clean,
Reliable and Green Energy

ESMAP

Energy Sector Management Assistance Program

TECHNICAL REPORT 002/12

GEOTHERMAL HANDBOOK: PLANNING AND FINANCING POWER GENERATION

Geothermal (hydrothermal) is wonderful ...

- ...once it works! Geothermal power projects are not easy to develop.
- Geothermal can provide power at very competitive prices, but due to a rather long project lead time, terms of financing tend to determine the final outcome.
- Geothermal is more than power: it can provide many additional benefits, from heating and cooling to canning and drying plants.
- Long lifetime and independence from fossil fuels (low operational costs) can make geothermal power very economical for a country.

Geothermal requires thorough project planning

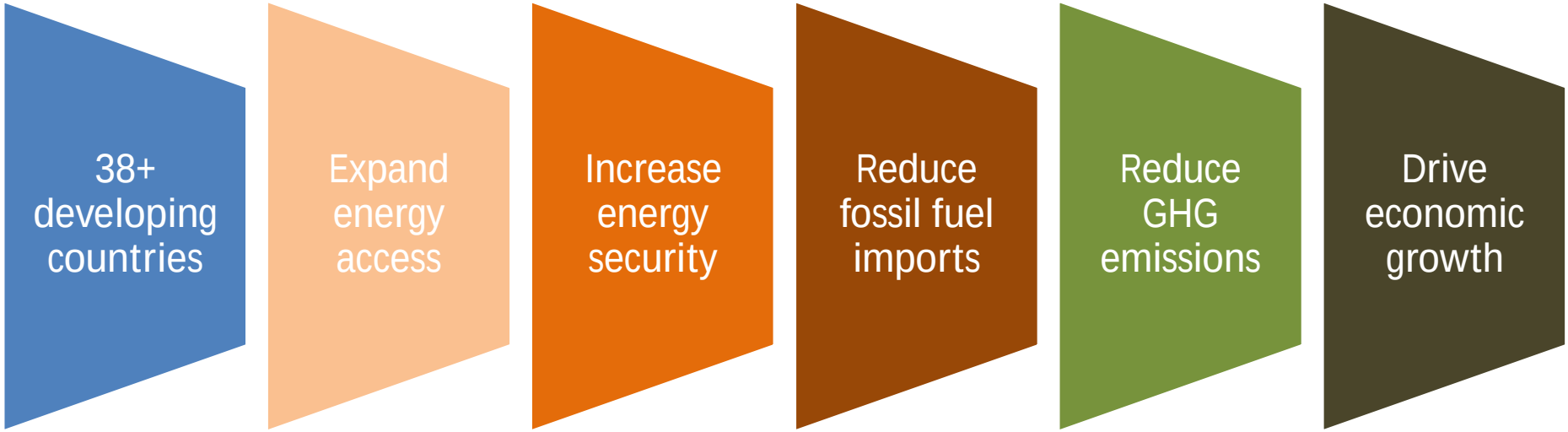
- But there are many risks and barriers: Resource risk and high upfront investment cost are typical for geothermal and relate especially to the exploration and test drilling phases.
- Several other risks add to the complexity: Off-take, sales-price, institutions, regulations, maintenance, etc.
- Both sectors, public and private, have to understand their roles and duties in project development of geothermal power projects.
- Result: To facilitate this cooperation between the two sectors, and to scale up geothermal development in developing countries in general, ESMAP has published the ….

Geothermal Handbook

Authors: Magnus Gehringer and Victor Loksha

- *Chapter 1* - Past to future utilization and economics
- *Chapter 2* - Project phases and risks (Planning)
- *Chapter 3* - Key elements of successful project development, considering institutions, supportive policies, financing options, roles of private and public sector, partnerships and development models.
- *Annex* - Drilling risk mitigation model, financial model, carbon credits.
- *Download* http://www.esmap.org/esmap/Geothermal_Handbook

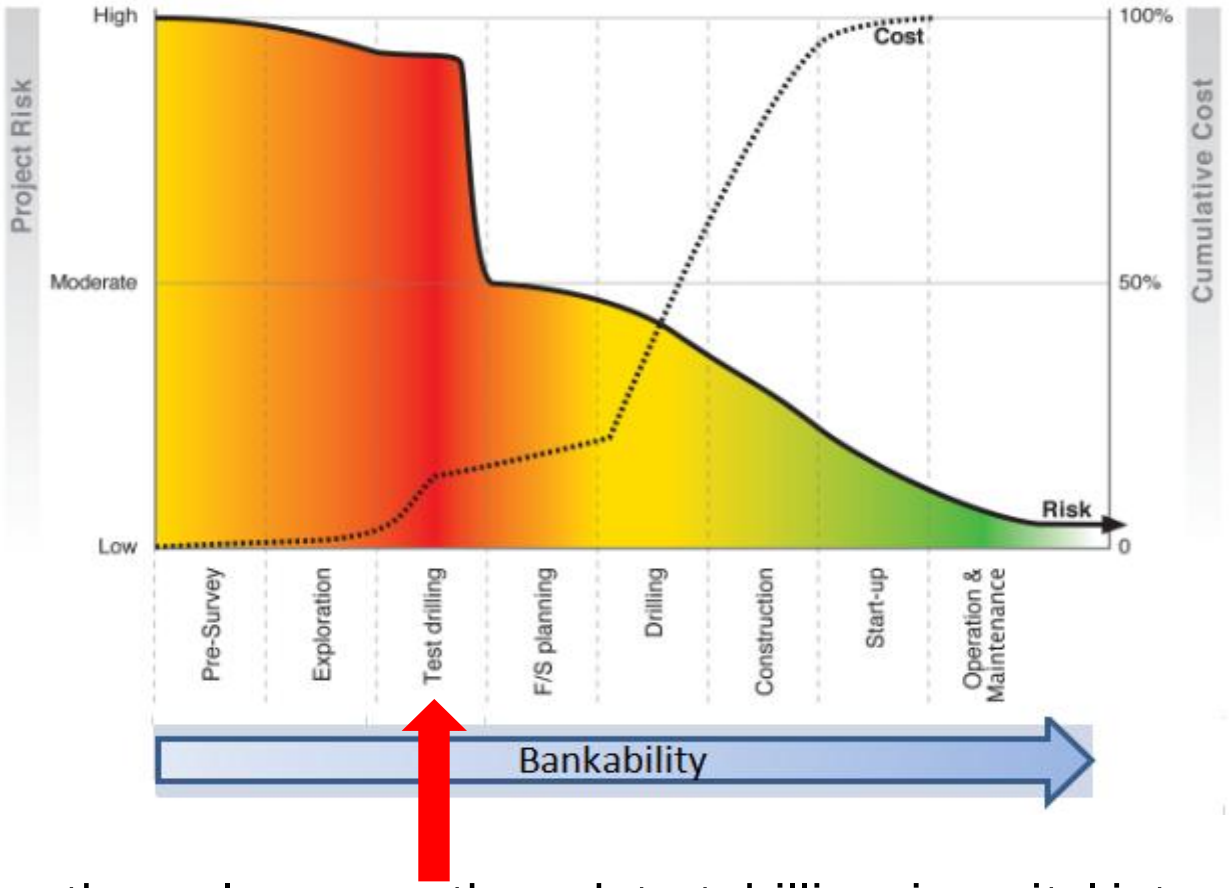
Geothermal power: sizeable potential domestic supply



Near term test drilling targets

Philippines
Indonesia
Kenya
Eritrea
Turkey
Costa Rica
Ethiopia
Guatemala
Chile
Djibouti
Mexico
Nicaragua
Colombia
Argentina
El Salvador
Saint Lucia
Uganda
Bolivia
Saint Kitts & Nevis
Dominica

… Resource risk is a major financial hurdle to scale-up

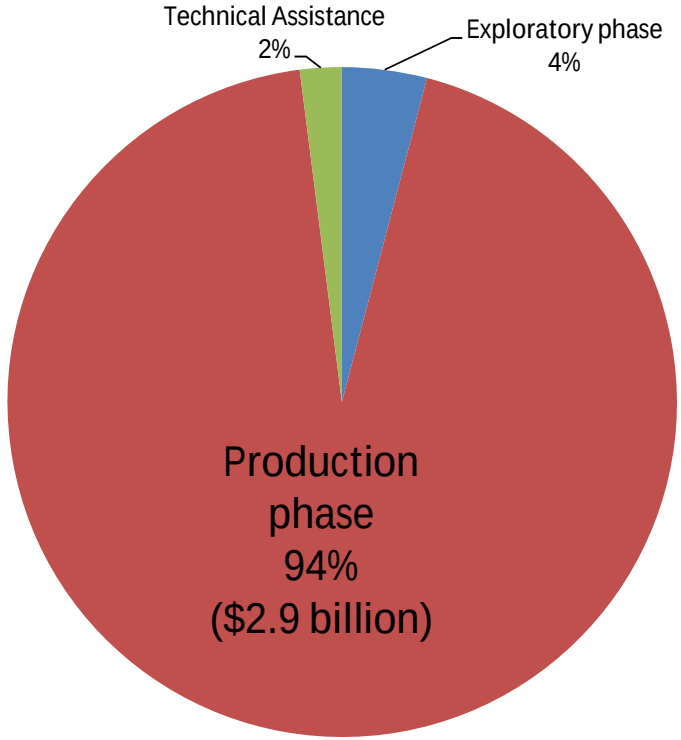


- Validating geothermal resource through test drillings is capital intensive and highly risky
- Financing for test drillings is missing. It exists for exploratory, construction
- Private equity (and government support) may be only capital to undertake test drillings

MDBs need to focus on mitigating the resource risk

(… they don't)

(Three Decades of Cumulative Multilateral Development Bank Lending for Geothermal Energy Development)

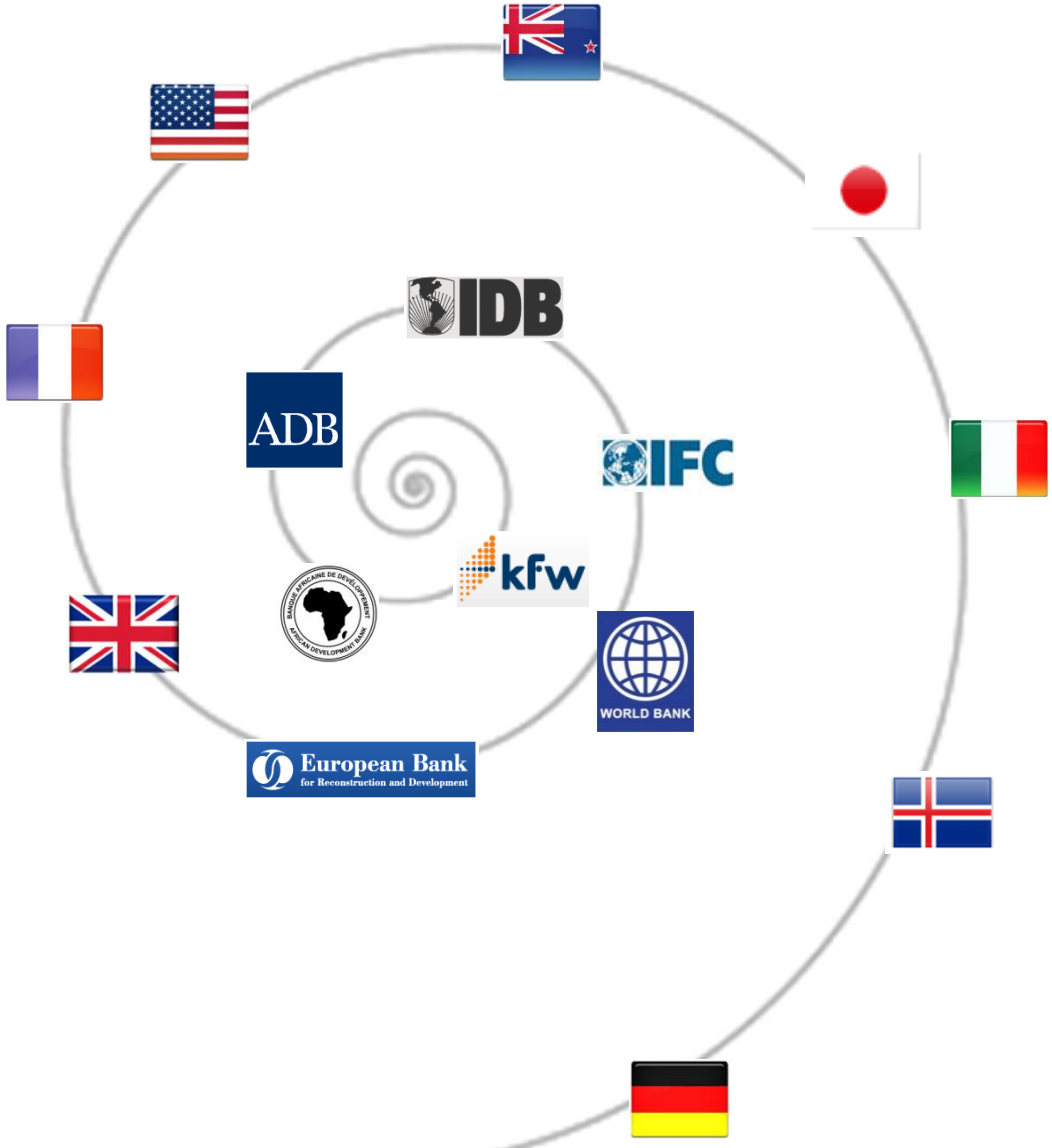


	Exploratory phase	Production phase	Technical Assistance	Total ($ millions)
World Bank	117	1,544	48	**1,710**
African Dev. Bank	4	124	-	129
Asian Dev. Bank	-	554	3	557
European Inv. Bank	-	256	-	256
Interamerican Dev. Bank	3	403	11	416
Total	124	2,881	62	**3,068**

Building a global coalition of funding agencies

ESMAP
Energy Sector Management Assistance Program

Concept being developed in consultation with…



Transformational concept

Global Geothermal Development Plan (GGDP)

Scale-up geothermal by addressing the resource risk through one-time international effort

Raising $500M for 25 projects to leverage total investment of $4G and enable 1GW

- Expand reach of donors' support by diversifying risks across multiple investments
- Opens new areas for development by enabling riskier investments
- Catalizes investments in the entire value chain by validating geothermal resources
- Triggers reduction in final costs of electricity by reducing the need for equity

Designing the GGDP: Design principles

Target resource risk (to expand market for commercially viable projects)

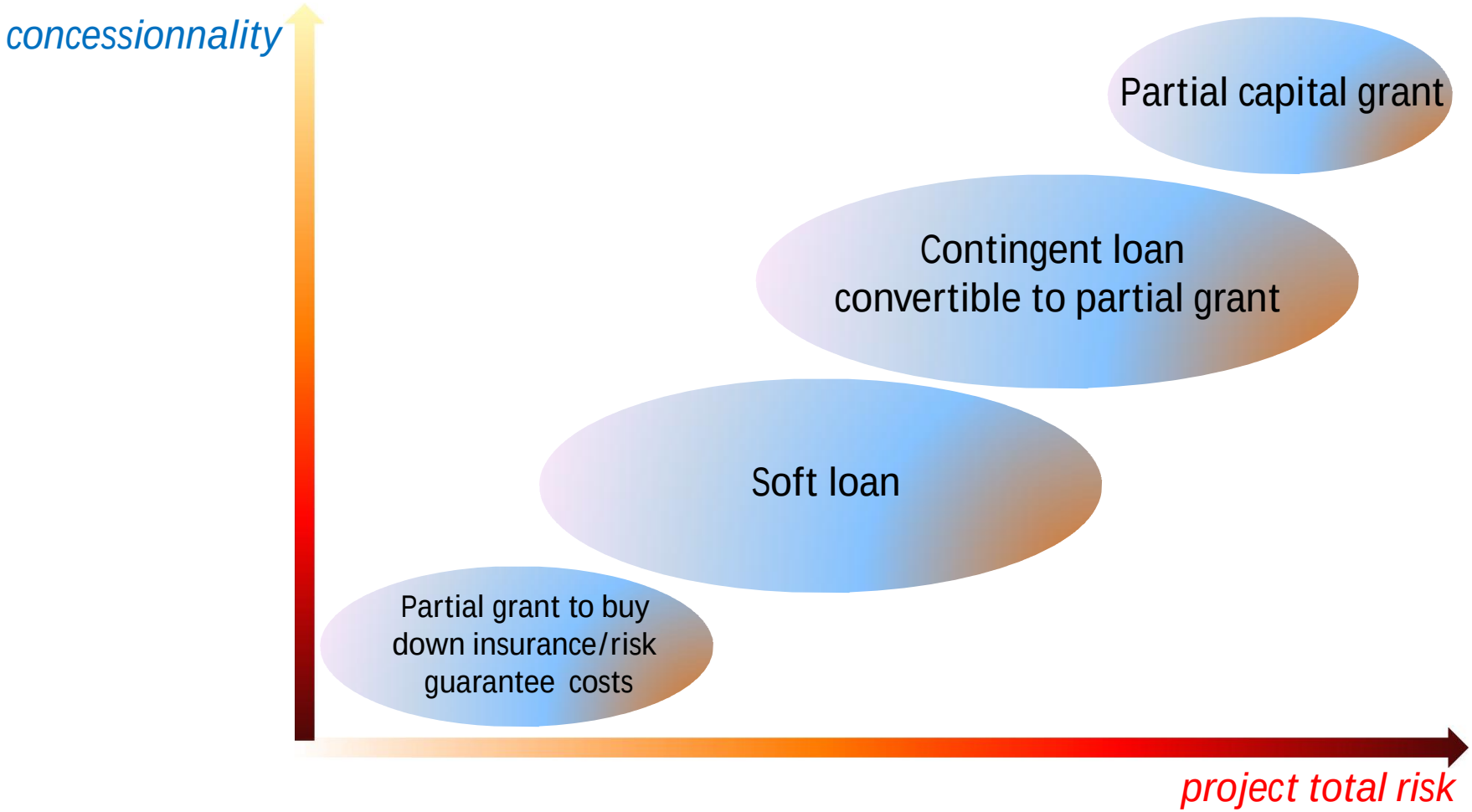
Design market instruments focused on managing resource risk (covering primarily expenditures for test drillings)

Deploy financial instruments to re-distribute resource risk between developers, donors and private sector (financiers, insurance companies, etc)

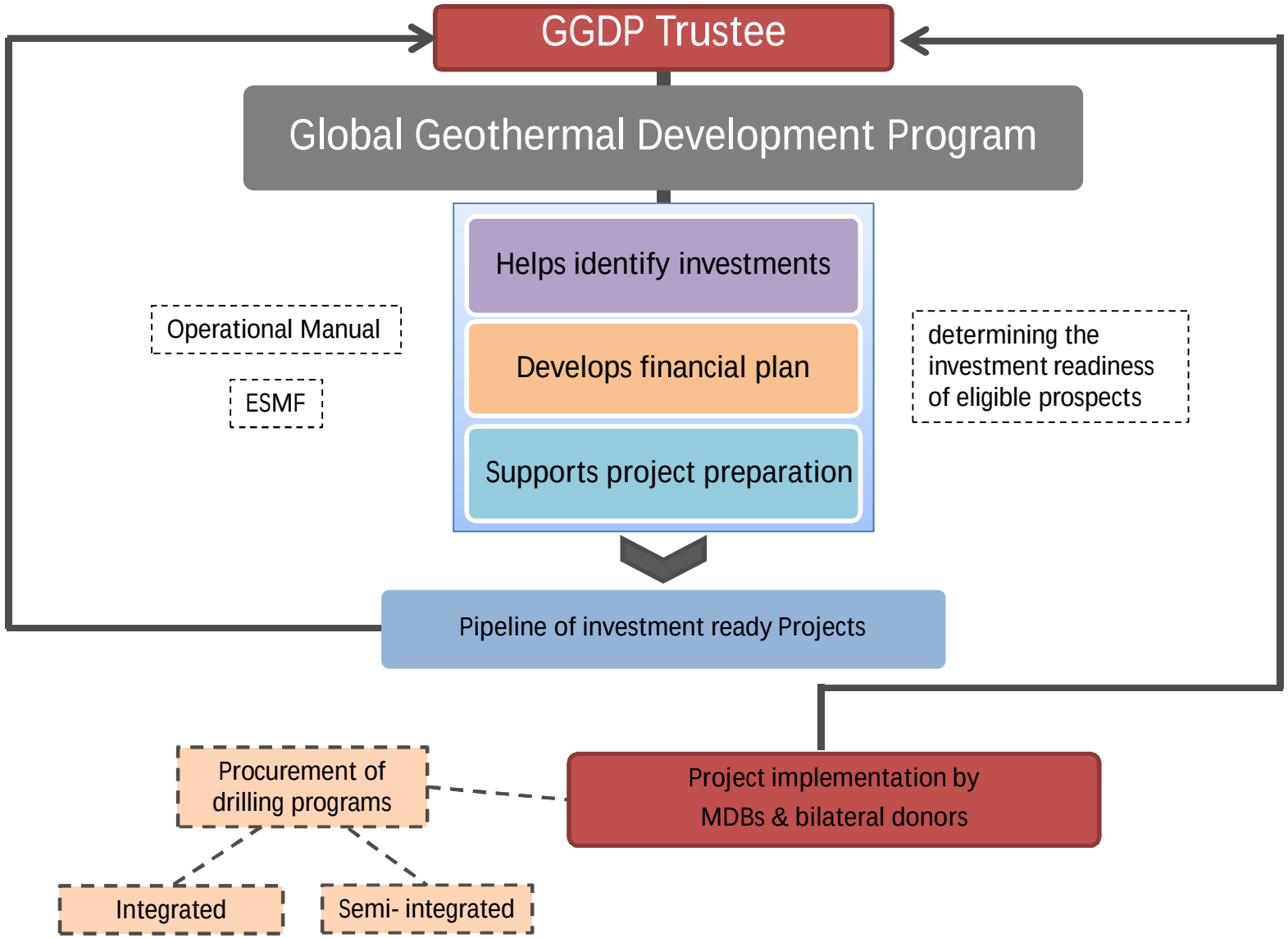
Optimize donor concessional resources by:

- Customizing the level of concessionnality based on the overall risk profile of individual projects
- Utilizing existing MDB instruments to address other projects risks (political, credit, etc.) + MDB regular financing
- Pre-identifying a pipeline of investment-ready resource assessment projects (drilling programs) with diverse risk profiles

Sharing the risks: Financial Instruments for the GGDP



Implementation Arrangements



You are invited to join
the preparation of the
Global Geothermal Development Plan

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