



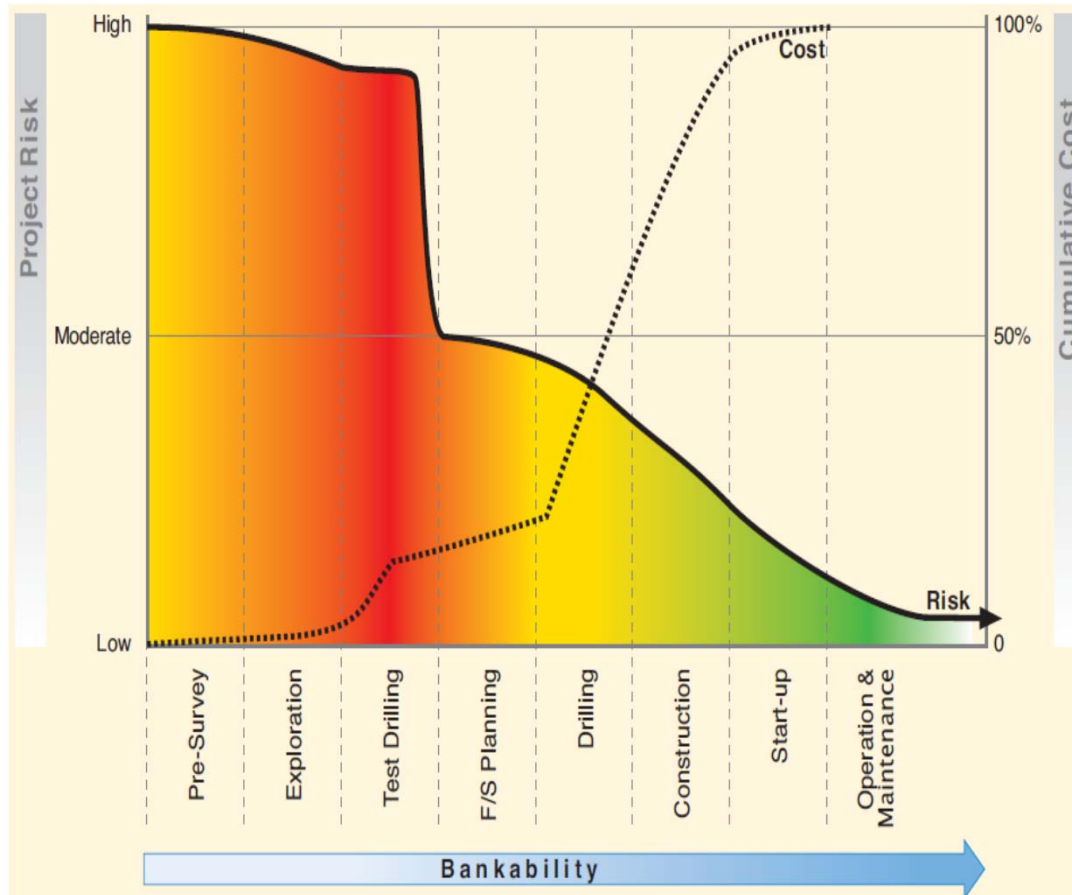
»» Geothermal Development Facility (GDF)

The First Multi-Donor Climate Initiative to Promote Geothermal Energy in Latin America

IRENA Workshop on Financing Geothermal Development in the Andes
Bogotá, Colombia, September 22nd & 23rd 2015

»» Geothermal Energy

Exploratory risk acts as a serious impediment



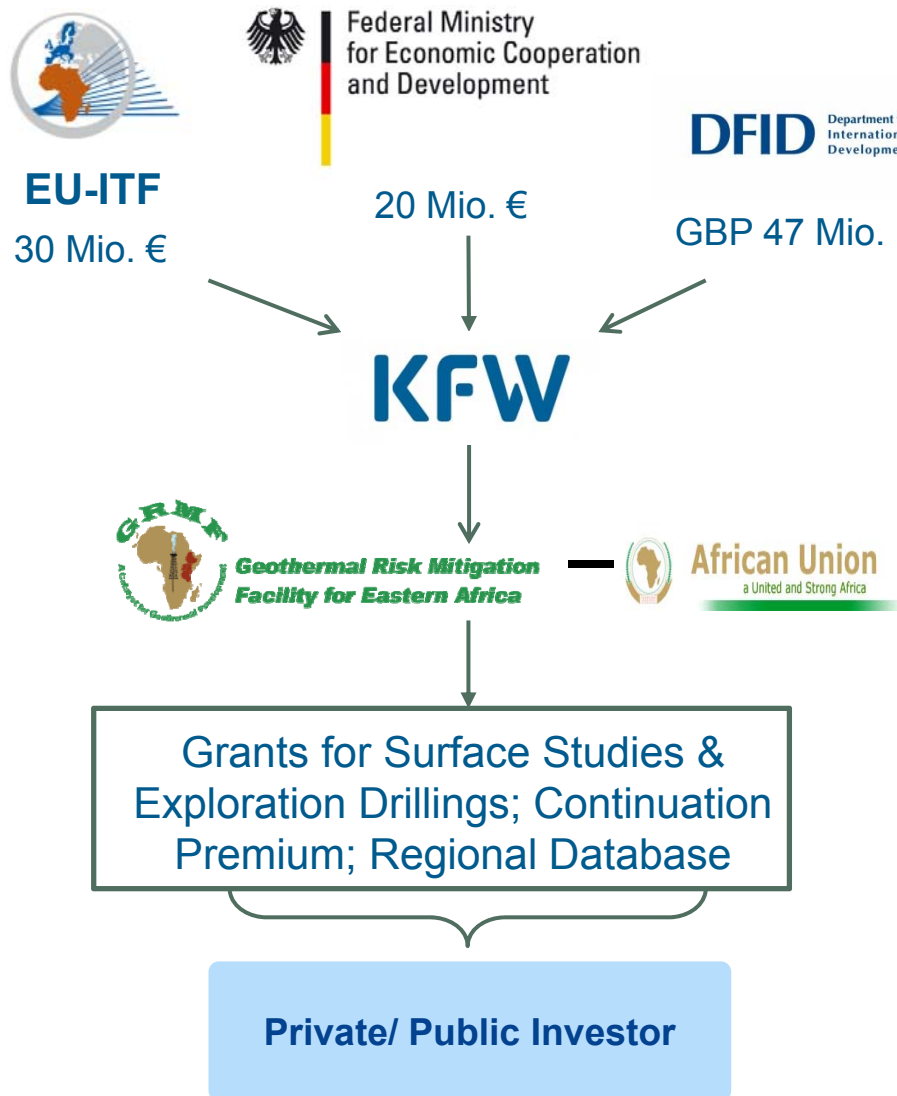
Significant investment cost for exploratory drillings at considerable risk before success of project is secured

Public and private investors shy away from making the respective investments

Public Risk Mitigation Mechanisms are playing a key role in the development of Geothermal Energy worldwide

Source: ESMAP 2012

»» A successful reference: GRMF East Africa – Progress Report



➔ Tremendous interest during the first three Calls for Proposals

1st Call for Proposal 2012/2013

9 applications from 5 countries resulting in 4 Grant Agreements

2nd Call for Proposals 2013/2014

8 applications 7 countries resulting in 4 Grant Agreements

3rd Call for Proposals 2014/2015

16 Expressions of Interest from 5 countries received, evaluation ongoing

www.grmf-eastafrika.org

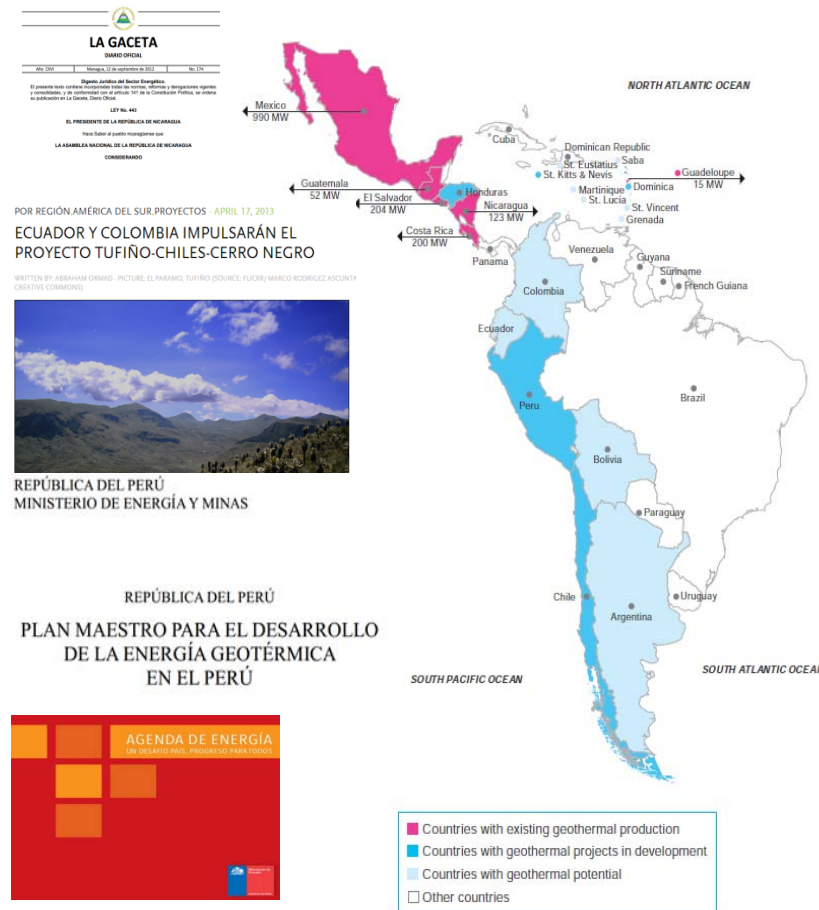
➔ Successful Approach to incentivize Project Development

➔ *Further calls for proposals to come !!*

»» Why not adapt a successful approach to Latin America?



»» Latin America has shown strong interest in the GDF...

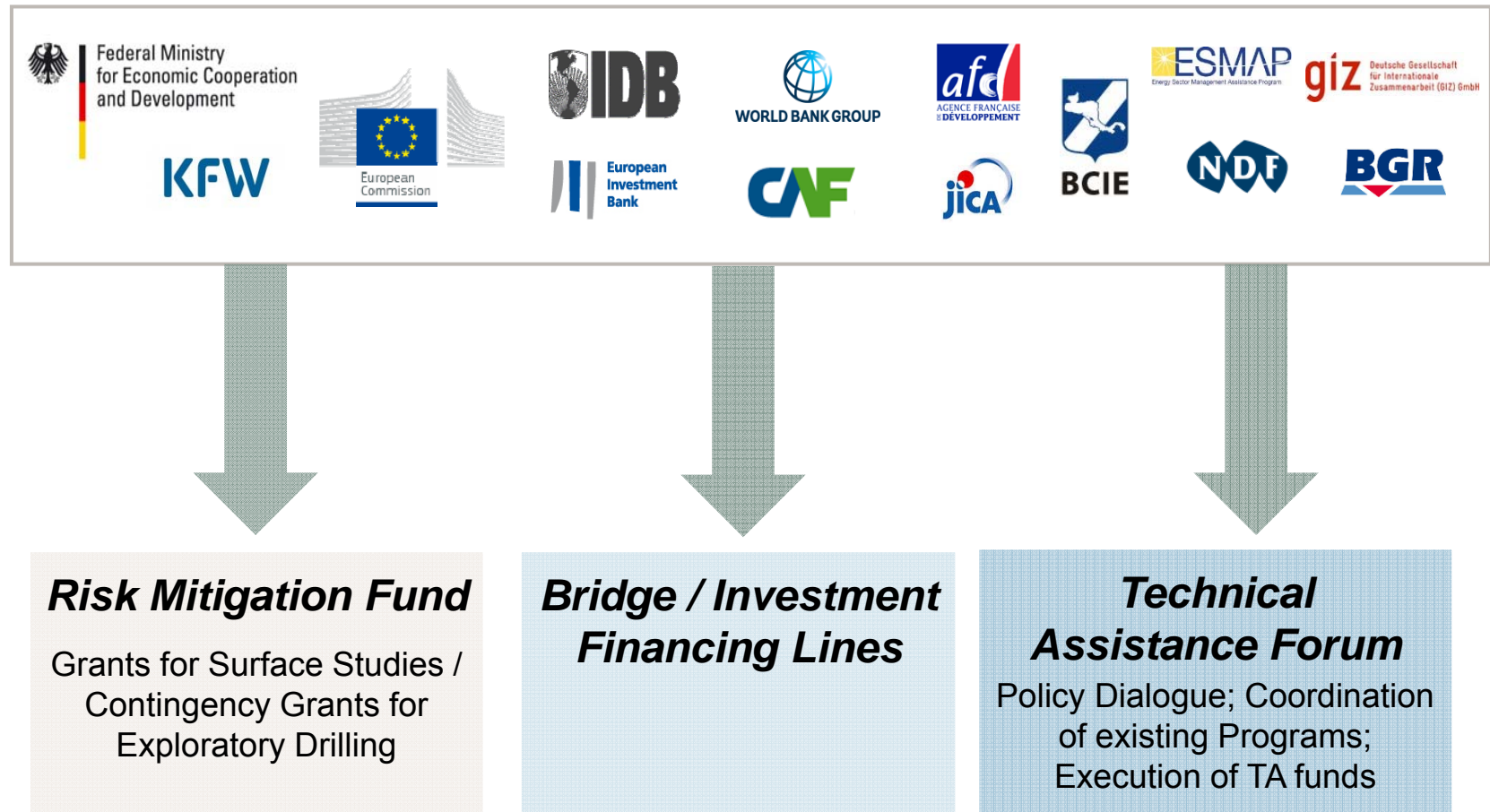


Source: IGA, 2011

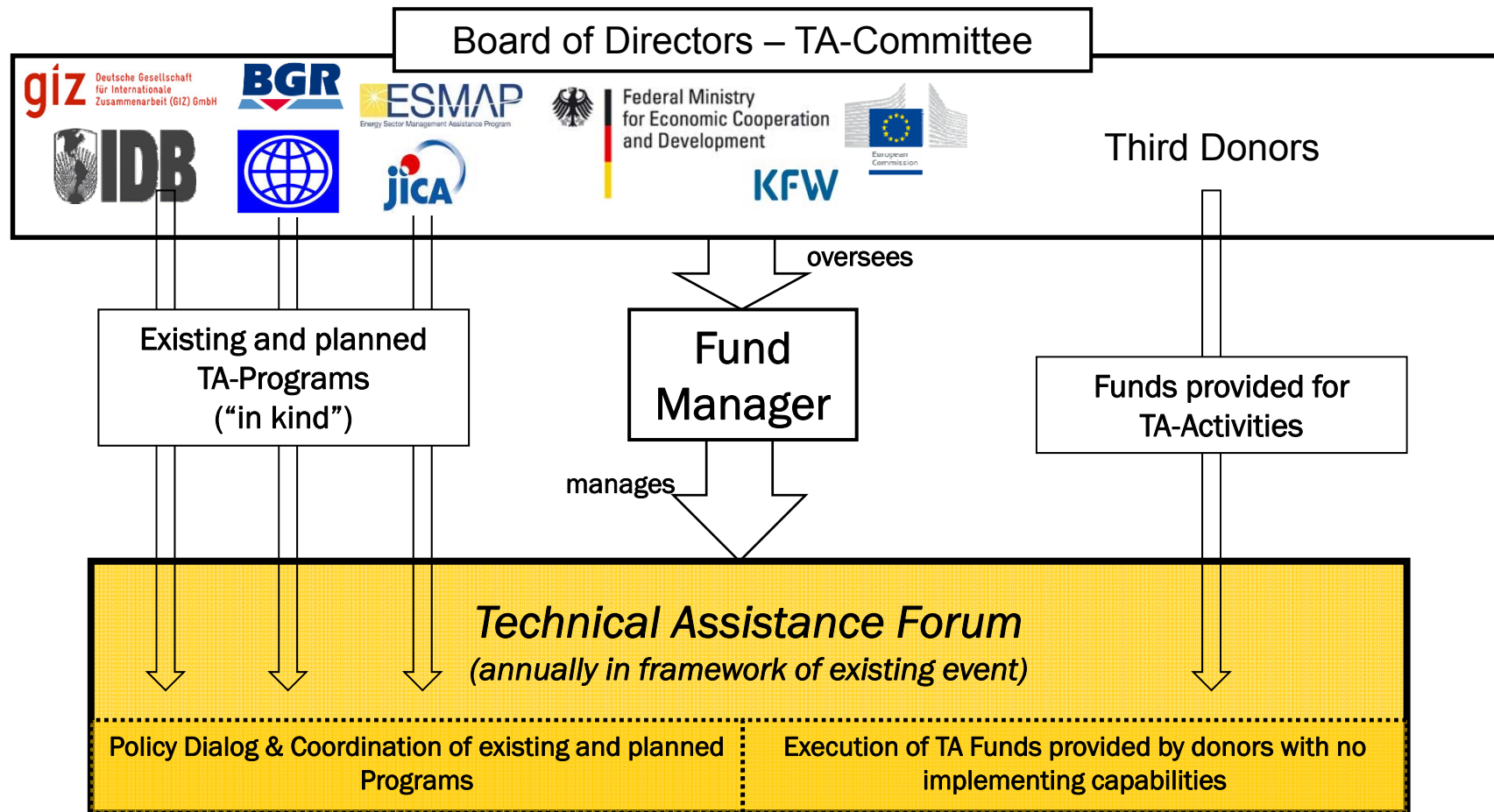
- › Considerable geothermal potential along pacific coast.
- › High interest of Governments, Utilities and Project Developers in Risk Mitigation Instruments and tailored Financing in order to exploit the potential.
- › Strong interest from Donors and Financiers as well as Regional Organisations in supporting the GDF for Latin America.

»» Geothermal Development Facility – Overview

Stakeholder Group

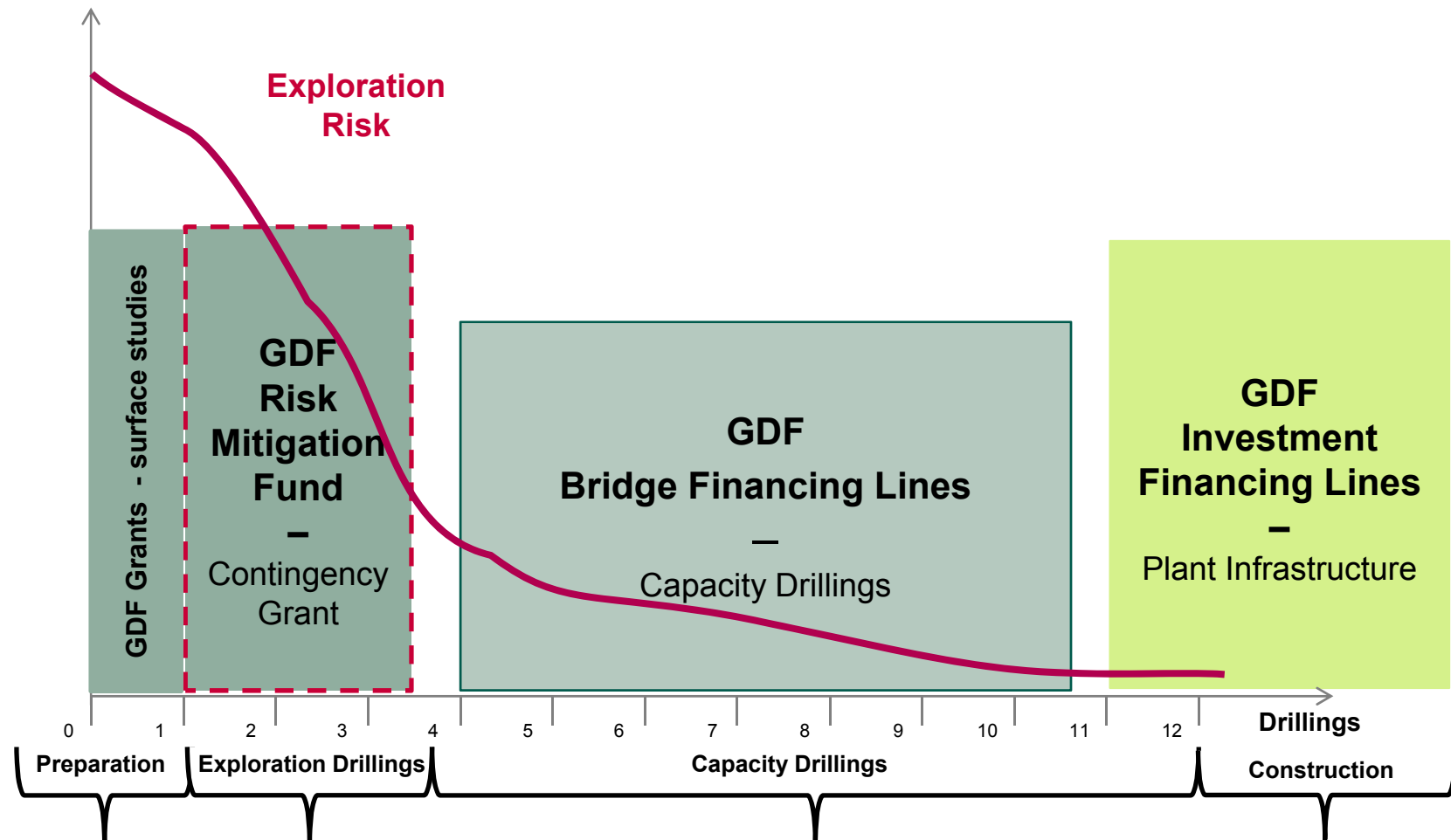


»» Geothermal Development Facility Technical Assistance Forum



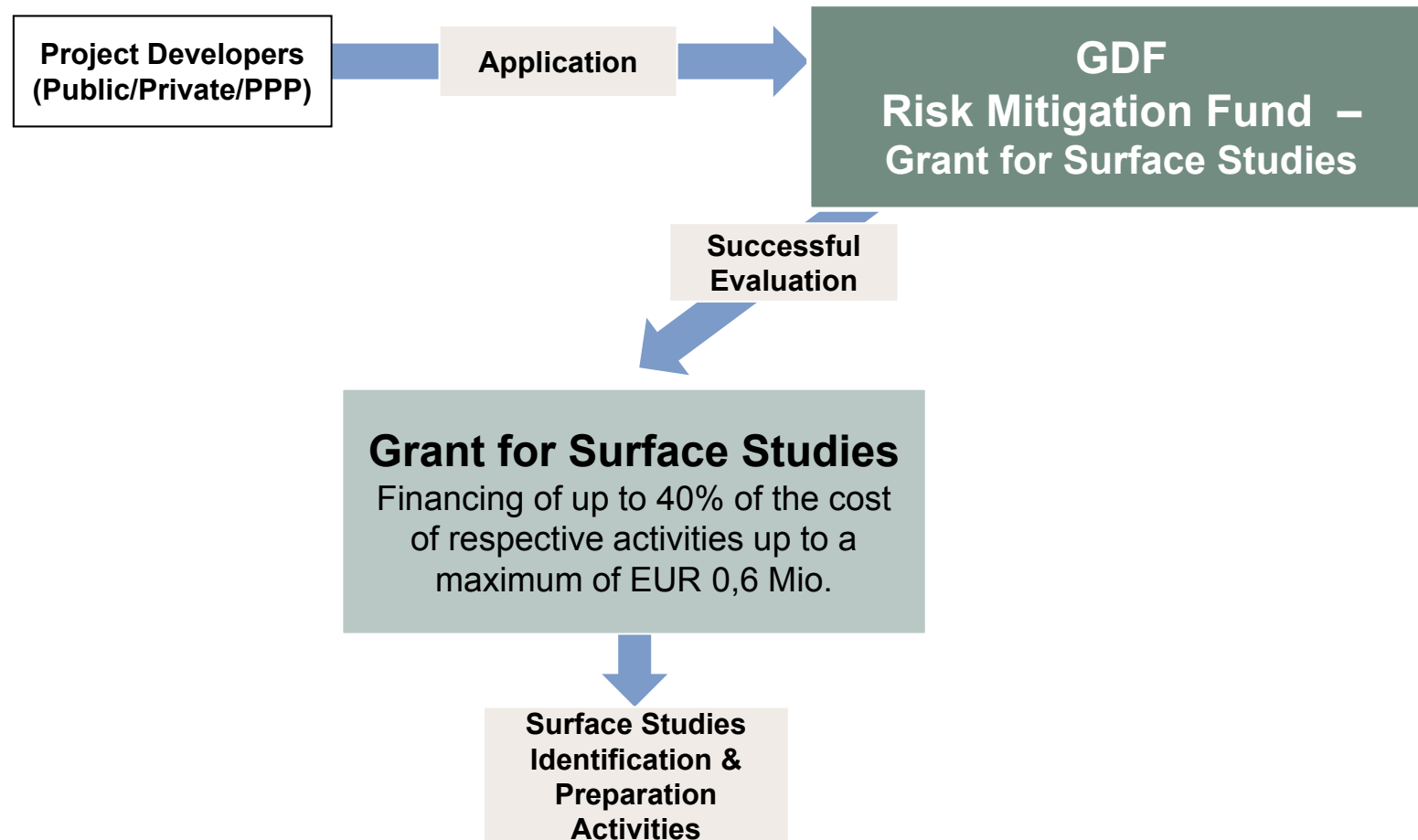
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A tailored approach to promote Geothermal Development



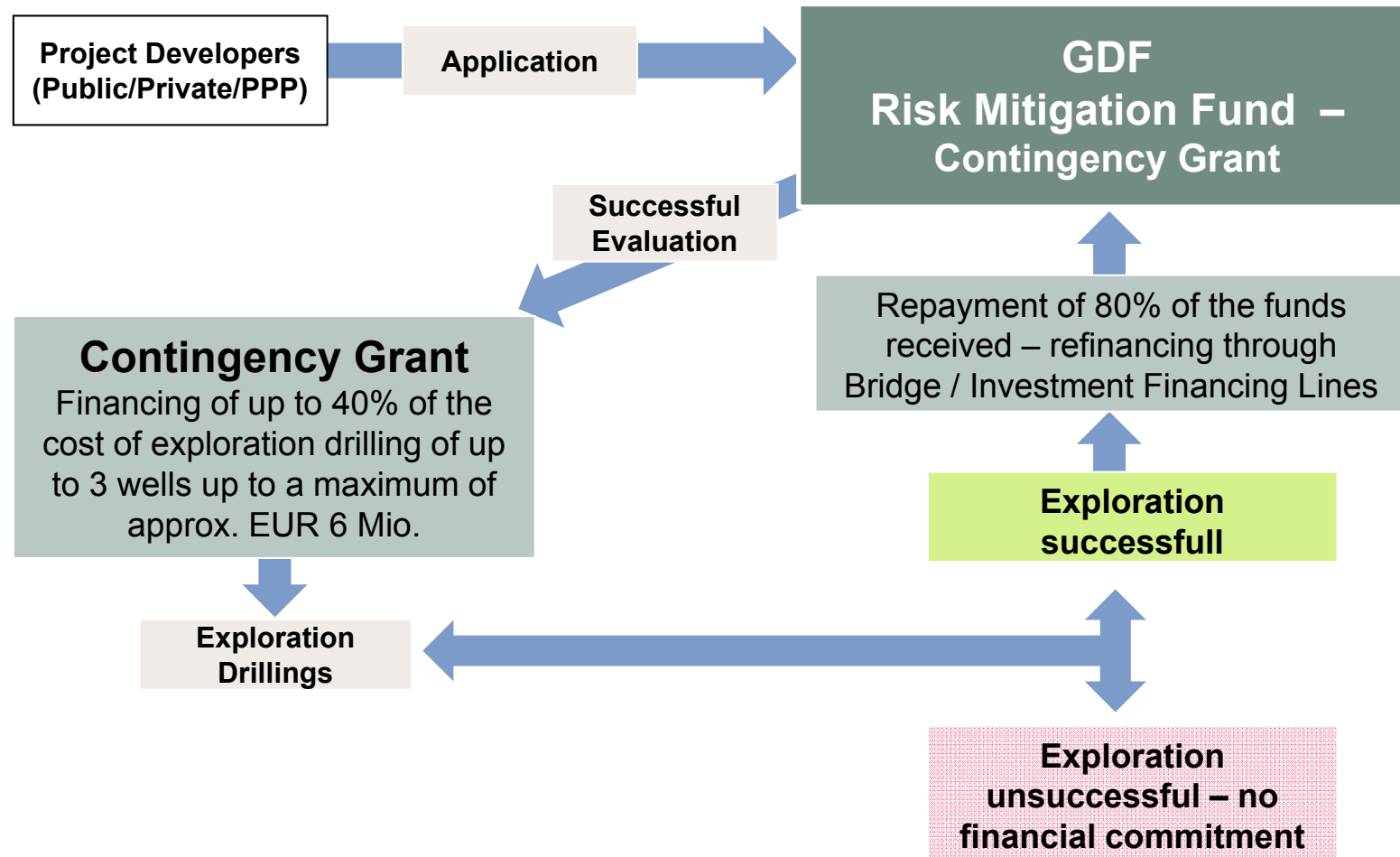
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Risk Mitigation Fund – Grant for Surface Studies



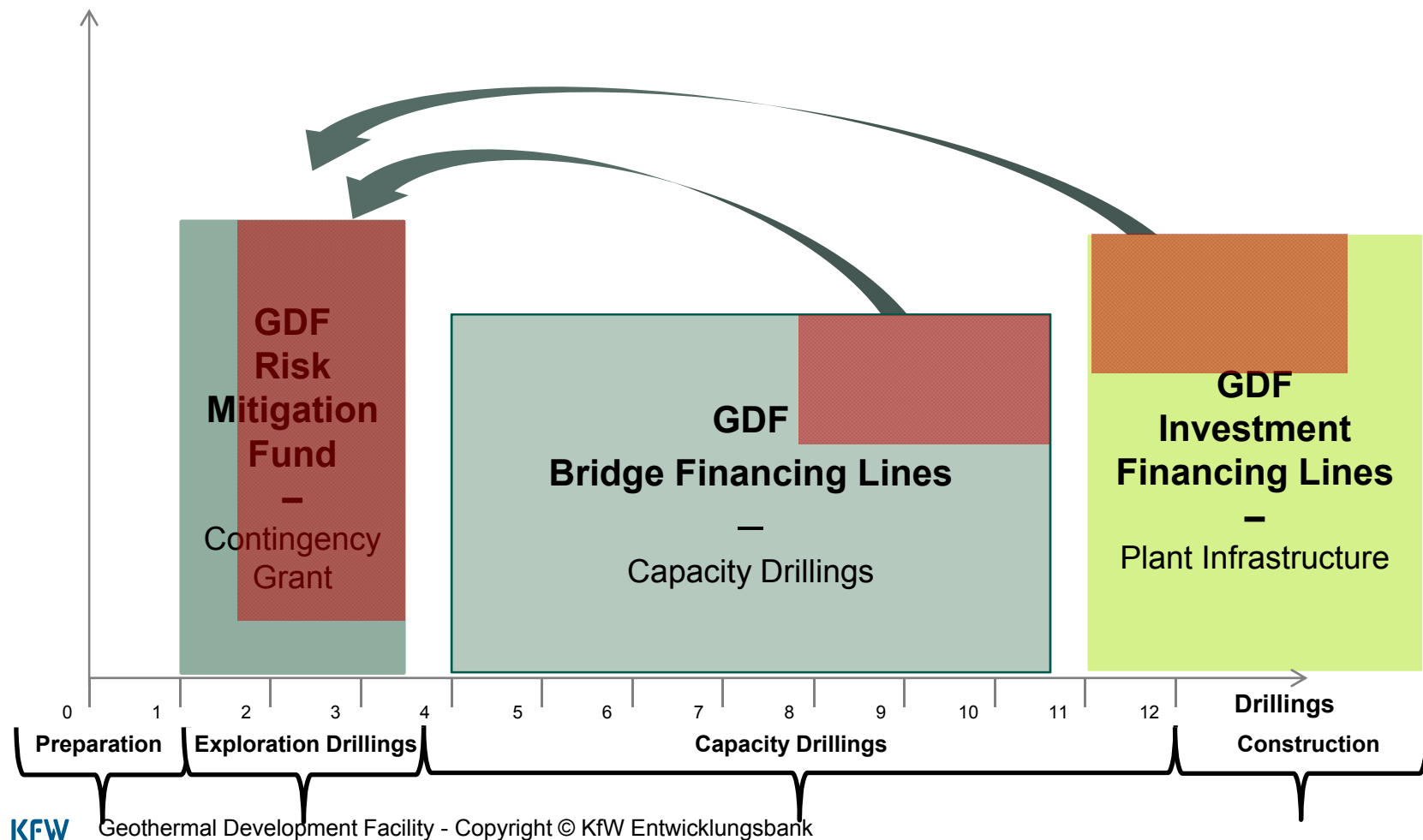
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Risk Mitigation Fund – Contingency Grant



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Contingency Grant must be repaid according to predefined rules; repayments may be refinanced through Bridge Financing or Investment Financing Lines



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Risk Mitigation Fund – Eligibility

- › Public, private or PPP developers
- › Projects in Bolivia, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Peru
- › Stringent technical and financial criteria as in the case of GRMF East Africa:
 - › Technical & financial background and experience of the developer
 - › Quality of project preparation (studies, permits, EIA, etc.)
 - › Viable business case (grid connection, PPA, etc.)
- ➔ One project per developer per country per application round per instrument

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Risk Mitigation Fund – Overview Activities

Identification & Preparation (1)	Exploratory Drilling (2)	Production (4)
<p><u>Locate and Assess a Prospect</u></p> <ul style="list-style-type: none"> • Desktop Data Research and Analysis • Regional Reconnaissance • Geology and Geochemistry Resource Studies • Historical Drilling Data • Infrastructure Availability <p><u>Assess Lease and Permits</u></p> <ul style="list-style-type: none"> • Land Acquisition • Land Use Laws • Contact Federal Agencies • Water Rights • Mineral Rights • Environmental Review <p><u>Establish Baseline Business Model</u></p> <ul style="list-style-type: none"> • Physical and baseline economic viability testing and modeling • Resource expectations baselines • Project scale baselines • Electric market analysis • Land use costs • Land use limitations (conservation, PR, NIMBY, etc.) • Grid compatibility, interconnection costs 	<p><u>District Exploration:</u></p> <ul style="list-style-type: none"> • Geochemical Analysis • Geophysical Survey <p><u>Prospect Exploration:</u></p> <ul style="list-style-type: none"> • Exploratory temperature gradient drilling • Resource measurement <p><u>Permitting:</u></p> <ul style="list-style-type: none"> • Permitting applications/procedures for exploration • Environmental Impact Statement for exploration <p><u>Re-evaluate Business Model</u></p> <ul style="list-style-type: none"> • Site, scale and technology choice • Generation potential revisions • Feasibility Analysis 	<p><u>Design and estimate cost of well</u></p> <ul style="list-style-type: none"> • Design Characteristics • Geological Structure • Predicted Drilling Curve • Extent of Engineering Requirements <p><u>Permits</u></p> <ul style="list-style-type: none"> • Drilling Permits • Environmental Impact Statement for drilling • Water Reinjection <p><u>Assemble equipment and crew</u></p> <ul style="list-style-type: none"> • Market Fluctuations with Oil and Gas • Crew availability • Rig Cost and Maintenance • Daily rate of other equipment (Compressors, Bits, Blowout Preventers, etc.) <p><u>Drill, test and complete the well</u></p> <ul style="list-style-type: none"> • Reservoir Management • Casing • Pumps <p><u>Obtain Financing</u></p> <ul style="list-style-type: none"> • Complete Power Purchase Agreement • Bankable Geothermal Reservoir report • EPC Contract <p><u>Preliminary Facility Design</u></p> <ul style="list-style-type: none"> • Equity Constraints • Geophysical Constraints • Temperature and Salinity depreciations <p><u>Permitting</u></p> <ul style="list-style-type: none"> • NEPA, NPDS, CAA • USFWS, BLM, FERC <p><u>EPC Manufacture</u></p> <p><u>EPC Construction</u></p>

Source: Deloitte. (2008) / Rödl & Partner

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Risk Mitigation Fund – Eligible Activities

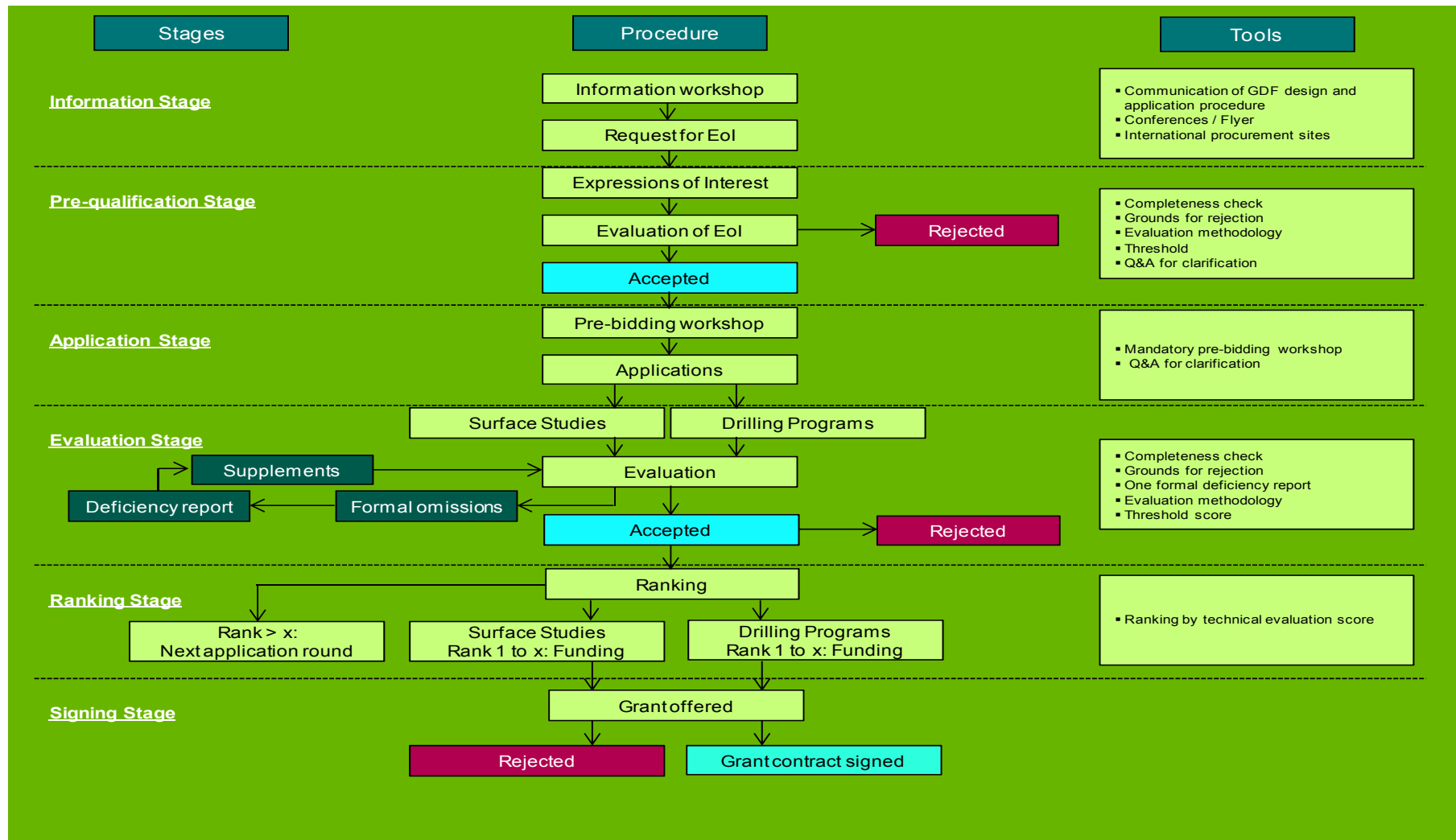
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GDF Risk Mitigation Fund - Grants for surface studies

GDF Risk Mitigation Fund - Contingency Grant

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Risk Mitigation Fund – Application Process



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Risk Mitigation Fund – Drilling Success Definition

- › Drilling success will be defined as X MW_e output per geothermal well.
- › Clear guidelines concerning testing procedure performed by Fund Manager, who monitors the execution and sampling & analysis of the fluid:
 - ➔ *If measured well output is below X MW_e or if due to the chemical composition of the geothermal fluid, the exploitation of the geothermal fluid is deemed commercially infeasible the drilling is deemed unsuccessful - no other reasons problems (commissions, missing PPA, etc.) are relevant.*
- › Clear go / no-go decision based triggers indemnification or repayment.

»» Geothermal Development Facility

Summary

- › Develop an affordable, clean, base-load capable technology
- › Provide at least USD 75 million in tailored Risk Mitigation Instruments
- › Provide at least USD 1 billion in tailored Bridge- and Investment Financing
- › Generate at least 50 Mio. tonnes of CO2 emission savings
- › Provide clean energy to at least 2 Mio. people in the region

»» Joint Launch at COP20 in Lima on December 8th 2014



EU Commissioner Arias Cañete, German Federal Minister Dr. Müller and representatives of 12 donors and financiers launch GDF as the 1st initiative to promote geothermal on a continental scale:

- ➔ Set-Up of Risk Mitigation Fund by Q2 2016
- ➔ First Call for Proposals during Q3 2016
- ➔ Bridge- and Investment Financing Lines available from 2016 on



Thank you for your attention!

KfW Development Bank

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