

GLOBAL GEOTHERMAL DEVELOPMENT PLAN



Providing Renewable and Reliable Power for Developing Countries

The [Global Geothermal Development Plan](#) (GGDP) was formally announced by World Bank Group Managing Director Sri Mulyani in Reykjavik (Iceland), on March 6, 2013. The GGDP is an ambitious initiative by the World Bank's Energy Sector Management Assistance Program ([ESMAP](#)) and other multilateral and bilateral development partners to transform the energy sector of developing countries by scaling up the use of geothermal power.

Geothermal energy is an underutilized resource with the potential to deliver renewable and reliable electricity and heat for many low- and middle-income countries. From Africa's Rift Valley to the Andes to the islands of Asia and the Pacific, domestic geothermal resources could meet a significant portion of national electricity demand for a wide range of countries. The benefits would include increased energy security and access, more affordable power, and reduced greenhouse gas emissions.

The GGDP differs from previous efforts in that it focuses on the primary obstacle to geothermal expansion: the cost and risk of exploratory drilling. Validating the availability of commercially viable geothermal resources through drilling is an unavoidable step often requiring US\$15-25 million per field. This represents around 15% of the capital expenditure in any new utility-scale geothermal project for electricity supply to be spent upfront, with no guarantee of return. Commercial debt is often not available to finance this step. It usually takes over two years for exploratory drilling to provide sufficient confidence for investors to proceed with development of a geothermal field (i.e., through capacity drilling) and construction of the power plant. Public support has generally been the main channel to support initial development of geothermal energy, either as public projects, cost-sharing of expenditures, or in joint capital ownership schemes with private developers.



In order to address this barrier, the GGDP's main objective is to mobilize substantial new concessional financing for the risky and capital intensive upstream phases of geothermal development to catalyze investment in all other stages of the geothermal value chain, in low- and middle-income countries. Funding is sought from diverse sources, including bilateral donors, multilateral development banks, and international climate finance instruments. A robust and diverse portfolio of at least a dozen exploratory drilling projects could lead to a global pipeline of proven, investment-ready geothermal power projects that could add over 1 GW of power to current global installed geothermal capacity of 12 GW.

Donors have responded positively to the GGDP. As of March 2015, US\$235 million have been raised, to be deployed through a new window within the Clean Technology Fund ([CTF](#)) for fund-



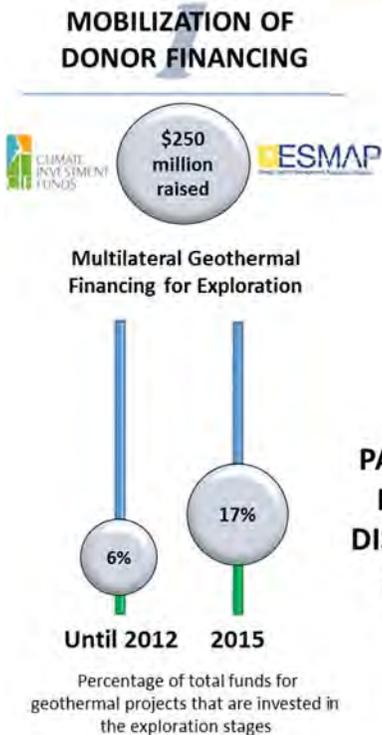
The Energy Sector Management Assistance Program (ESMAP) is a global knowledge and technical assistance program administered by the World Bank. It provides analytical and advisory services to low- and middle-income countries to increase their know-how and institutional capacity to achieve environmentally sustainable energy solutions for poverty reduction and economic growth. ESMAP is funded by Australia, Austria, Denmark, Finland, France, Germany, Iceland, Lithuania, the Netherlands, Norway, Sweden, and the United Kingdom, as well as the World Bank.

ing geothermal exploratory investments as part of the Utility Scale Renewable Energy Program. As of March 2015, three projects were approved by the CTF, for Chile and Mexico, to be implemented by the Inter-American Development Bank, and for Turkey, to be implemented by the European Bank for Reconstruction and Development. Several projects are under preparation to be presented to this CTF window by other multilateral development banks.

To lead the design and implementation of the Global Geothermal Development Plan, ESMAP has raised and set aside US\$7.5 million over 2013-16 to: (i) identify and develop a pipeline of investments in geothermal energy resource validation through drilling; (ii) promote knowledge dissemination and capacity building; and (iii) advocate for additional concessional capital mobilization. Currently, ESMAP is supporting

identification, preparation, and supervision of 8 geothermal investment operations (e.g., Djibouti, Nicaragua, Dominica, Armenia, Turkey, Indonesia). In addition, 11 countries have benefited from technical assistance deployed by ESMAP. Building strong partnerships with key bilateral, such as KfW, ICEIDA, and multi-lateral financing institutions and donors, such as Climate Investment Funds, has also been central to the GGDP efforts by ESMAP. Knowledge dissemination and capacity building have also taken central stage thanks to two GGDP Roundtables (The Hague, November 2013; Copenhagen, October 2014) and to the partnership with the International Geothermal Association (IGA) to develop of Global Standards for Classification of Geothermal Resources and the organization of a course on “Reducing Geothermal Drilling Risk” for the 2015 World Geothermal Congress.

GGDP's Accomplishments so far...



- DJIBOUTI | Geothermal Power Generation Project (June13)
- ARMENIA | Geothermal Exploratory Drilling Project (June15)
- TURKEY | Geothermal Development Project (Feb16)
- INDONESIA | Geothermal Energy Upstream Development Project (July16)
- CHILE | Technical Assistance for Geothermal Development (Feb16)
- NICARAGUA | Geothermal Resource Risk Mitigation Project (Dec16)
- ST LUCIA | Geothermal Resource Development in St Lucia (Dec14)
- DOMINICA | Support to Govt for definition of a geothermal project (ongoing)
- TANZANIA | TA Program for TGDC (identification mission Dec15)
- KENYA | Geothermal Strategy (scoping missions Nov15 & Jan16)
- FIJI | Support to identification and preparation of geothermal project (TBD)

TECHNICAL ASSISTANCE & OPERATIONAL SUPPORT FOR PIPELINE DEVELOPMENT

PARTNERSHIPS, KNOWLEDGE DISSEMINATION, & CAPACITY BUILDING



- Definition of Global Standards for Geothermal Resource Classification*
- Reducing Drilling Risk course (WGC2015)
- Geothermal Resource Risk Mitigation Mechanisms report*
- Greenhouse Gases and Geothermal Utilization guidance note*
- GGDP Roundtables (The Hague, Copenhagen, Reykjavik*)

* Forthcoming