Kenya – SEA Virtual Pilot

Brief for policy makers

The Swedish Energy Agency (SEA) has engaged Climate Focus to assess how Article 6 of the Paris Agreement could be operationalized using real host country cases and contexts. The Virtual Pilot presented here supports the development of an Article 6 Geothermal Mitigation Risk Facility to propel investments and advance the implementation of Kenya's geothermal sector. This brief elaborates on the technical, financial and transaction aspects that need to be considered in a hypothetical Article 6 Pilot transaction between Kenya and a partner country (or another international buyer). The Virtual Pilot does not represent an official (political or contractual) commitment between Kenya and/or the SEA.

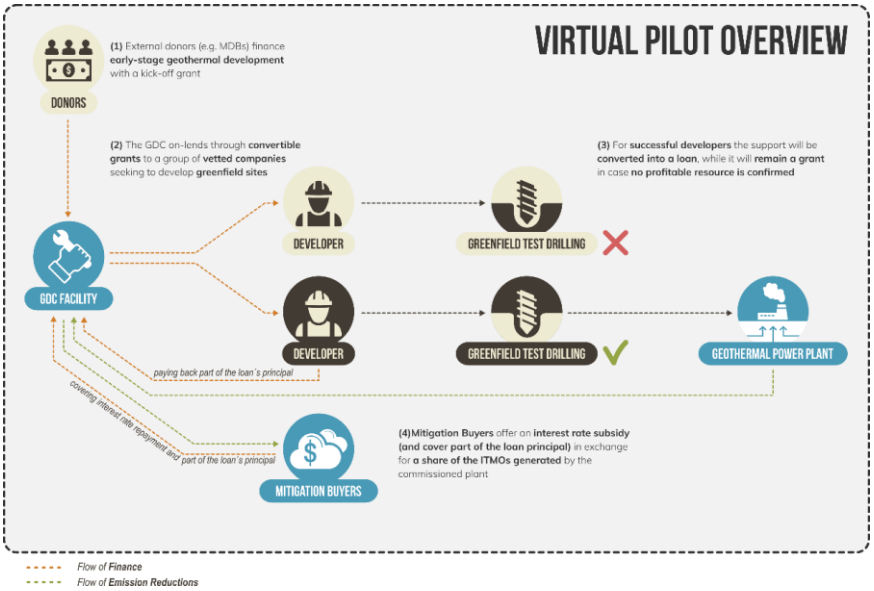
1.1 Promoting geothermal energy in Kenya through Article 6

The Kenya-SEA Virtual Pilot offers a step-wise approach to support the early-stage development of Kenya's geothermal sector. Geothermal energy is reliable and inexpensive to operate and maintain in the long-run, with the bulk of capital needed upfront to prove the presence of the resource. To scale up geothermal energy development in Kenya, the Virtual Pilot aims to leverage upfront co-funding through Article 6 cooperative approaches.

Under this approach, the Kenyan Geothermal Development Company (GDC) would initially create a dedicated funding window with the support of external donors already active in Kenya and the energy sector. To de-risk greenfield projects, the facility would provide a basis for creating a cost-sharing Public-Private Partnership (PPP) with selected developers, targeting the expansion of approximately 200 MW of geothermal resources. In order for efforts to be additional to existing governmental plans, eligible sites should not already be part of Kenya's National Climate Change Action Plan (NCCAP) roadmap.

A share of the emission reductions generated by the geothermal power plants would be tradable as internationally transferred mitigation outcomes (ITMOs) under Article 6. This transaction structure would be agreed in a dedicated Mitigation Outcome Purchase Agreement (MOPA). The Virtual Pilot builds on existing project-specific methodologies and tools from the Clean Development Mechanism (CDM). The approach aims to prove the additionality of geothermal plants, formulate project-specific baseline scenarios and calculate emission factors to ensure a robust measurement of the emission reductions generated. The Virtual Pilot could initially issue units under the Article 6.4 mechanism and later on, if a more simplified yet conservative approach is desired, transition towards cooperation under Article 6.2.

Figure 1. Overview of the Virtual Pilot



1.2 Generating ITMOs

Kenya's NDC intends to abate 30% of GHG emissions by 2030, relative to its business as usual (BAU) scenario of 143 million tonnes of CO2 equivalent (MtCO2e).[1] The NDC is founded on the NCCAP for 2013-2017 (currently being updated for the period 2018-2022) that sets a low-carbon development pathway toward 2030.[2] The Kenyan mitigation pledge is, however, fully conditional and does not feature sub-sectoral targets.

The geothermal sector, in particular, is seen as crucial for achieving the Kenyan NDC target. Kenya currently has a 636 MW (2016) installed capacity of geothermal energy and plans to reach 5,000 MW by 2030.[3] It also seeks to accelerate geothermal exploration and expansion, with the government allocating USD 125 million for geothermal in its 2018/19 budget.[4]

To successfully do so, however, a number of hurdles need to be considered and overcome. The cost of geothermal exploration is the main concern, as this phase requires substantial upfront investment. Constructing the geothermal infrastructure is similarly capital intensive. The feasibility of revenues through power purchase agreements need to be secured, along with the mitigation of local environmental risks and the support from local communities

Robust crediting baseline

To establish its NDC target, Kenya has considered two scenarios. First, Kenya considers a baseline scenario that accounts for the mitigation activities expected to be implemented under current and planned policies, using funding available (or foreseen) for the 2020-2030 period. Second, it includes an Updated Least Cost Power

[1] Ministry of Environment and Natural Resources (2015) Kenya's Intended Nationally Determined Contribution (INDC). Available here.
[2] Government of Kenya (2013) National Climate Change Action Plan (NCCAP). Available here.
The NCCAP is currently undergoing review and update for the period 2018-2022. See also Ministry of Environment and Natural Resources and UKAID (June 2017). Nationally Determined Contribution Sector Analysis 2017 – Evidence Base for Updating the Kenya National Climate Change Action Plan.
[3] See National Climate Change Action Plan 2013 – 2017, and Government of Kenya (2007). Kenya Vision 2030, available here and here.
[4] Richter, A. (2018) Kenyan government allocates $125 million for geothermal exploration 2018/19. Think Geoenergy. Available here.

Development Plan (ULCPDC) that would be implementable on the basis of (technical and financial) support from international financiers and donors. The rationale and underpinning quantitative analysis for these scenarios are part of Kenya's NCCAP.[5]

The first Kenyan NDC pledge has been expressed as fully conditional on international support. Given that a conditional target represents an aspirational goal only and is contingent on future international finance, it does not (readily) lend itself to deriving crediting baselines for ITMOs. To reduce the risk of perverse incentives for countries willing to engage in new carbon markets and to ensure that some level of 'own effort' is achieved by the relevant host country, this Virtual Pilot proposes the establishment of a bilateral crediting threshold for generating ITMOs with a threshold set below the BAU baseline scenario of the Kenyan geothermal sector.

The crediting threshold would become the accounting reference beyond which the Virtual Pilot would be able to generate transferable mitigation outcomes. It would be defined jointly by the contracting parties (e.g. Kenya and a partner country), be evidence-based, and rely on the most recent data available, including new historical activity data, drivers of emission reductions, plans and strategies of the Kenyan energy sector in general and the geothermal sub-sector in particular. Only new (greenfield) projects would be eligible for the Virtual Pilot.

The contracting parties would agree to revisit the crediting threshold within specified times (through independent auditing and verification) to further ensure and secure environmental integrity. The actual crediting threshold applied would need to be negotiated and defined between the contracting parties prior (or as a condition) to a MOPA entering into full force and effect. We outline below some possible steps that could be considered by the contracting parties when defining the crediting threshold:

1. Asses NDCs from 10 similarly sized-economies[6] with both a conditional and an unconditional NDC target (see illustration in Figure 2 below).

2. From this subset of countries, their average ambition level in terms of emission reductions can be derived using the ratio of unconditional over conditional pledges.

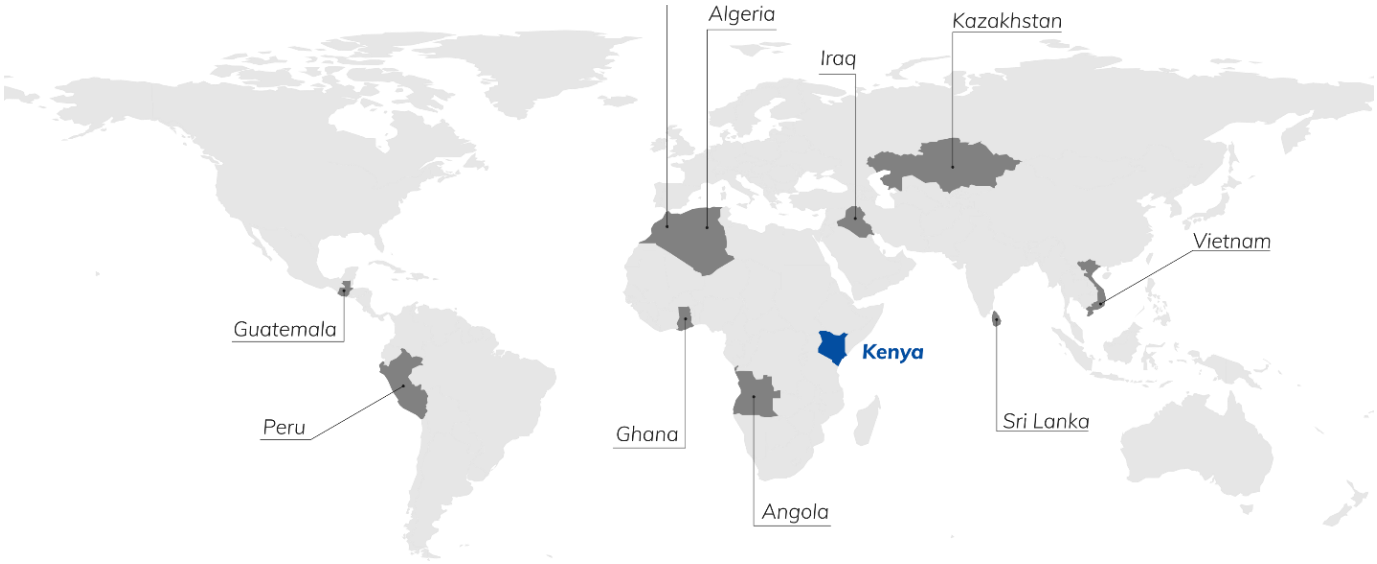
3. This would result in a factor of 0.42 (i.e. unconditional pledges approximatively representing 42% of conditional ones in average), and subsequently be used as an input to produce the crediting threshold needed for the generation of ITMOs from geothermal plants.

4. Parties could then extrapolate the 2020-2030 baseline geothermal implementation roadmap from the NCCAP and use it as a basis to create the proposed crediting threshold. To define the actual crediting threshold, the contracting parties would have to use the most up-to-date historical activity data, national action plans and strategies available.[7]

5. Under this Virtual Pilot, ITMOs would be generated and subsequently transferred to the partner country if the implementation of geothermal by Kenya exceeds the crediting threshold and its annual milestones. The crediting threshold would be reflected in the MOPA entered into by the cooperating parties and clearly specify when it is to be revisited and updated.

[5] Government of Kenya (2013) National Climate Change Action Plan (NCCAP). Available here.
[6] Nominal Gross Domestic Product (GDP) was used as a proxy for this analysis. Most recent World Bank data (2017). Available here.
[7] See, for instance, a more updated analysis of Kenya's national baseline available at Update of Kenya's Emission Baseline Projections and Impact on NDC Target. Ministry of Environment and Natural Resources. Developed with the support of the StARCK+ Climate Change Technical Assistance to the Government of Kenya. September 2017.

Figure 2: Subset of 10 countries used to derive a fair crediting threshold for Kenya's geothermal sector



Article 6 route

Host countries will likely have to enhance their domestic capacities to participate in Article 6.Thus, to swiftly engage in an Article 6 cooperation, the Virtual Pilot suggests to initially make use of the Article 6.4 mechanism and foresees a government-to-government transaction between Kenya and partner countries. While this does not exclude private sector stakeholders from also purchasing ITMOs in separate transactions, the same crediting threshold must be used for all transactions.

Article 6.4 provides an international infrastructure, including a registry and transaction-log that address double issuance concerns and ensure a level of environmental integrity when domestic capacities are still in development. Moreover, as the Virtual Pilot builds on the methodological tools and infrastructures already available from the CDM, Article 6.4 is a suitable initial route. The geothermal plants selected to participate in the Virtual Pilot would be packaged into a Programme of Activities (PoA) and be registered with the Article 6.4 Supervisory Board. Article 6.4 units would then be delivered to partner countries (or another international buyer) upon issuance. A downside, however, is that Article 6.4 can potentially have high transactional costs.

By enhancing and increasing their national and sectoral MRV capacities in the meantime, countries could make a transition toward Article 6.2 in the long run.

1.3 Financing Design

The Virtual Pilot's financial and transaction structures are designed with the overall objective to de-risk early-stage geothermal exploration, reduce the upfront financing needs and cost of capital for project developers, and crowd-in private sector financing at scale.

The Virtual Pilot proposes the use of a convertible grant, which is a category of convertible notes (see Box 1). Convertible grants relate to grant contributions that become repayable, either with interest or without. In climate finance, convertible grants are still rare, with financiers either offering outright grant or debt capital. This is a missed opportunity, as many enterprises and projects initiated through grant funding could at a later stage, have the capacity to repay the upfronted capital.

The conversion of a grant into a repayable grant or a loan is initiated through a 'trigger event'. In the case of the proposed Article 6 transaction, the developers of the geothermal resources would receive an upfront grant. This grant would be designated to allow project developers to co-finance the drilling costs of test-wells that are associated with the exploration phase. If the operations are successful, and the project's bankability is proven, the financial closure for project construction will be the next step.

Box 1: Convertible notes and loans

Convertible notes, generally, represent deal structures that allow for the conversion of one instrument into another, with the promissory 'note' outlining the details of the conversion and its pricing. Several types of convertible instruments are applied in the financial markets, with convertible loans being the most common. These relate to the conversion of an initial loan into an equity share in the investee and is commonly applied in start-up and venture capital markets.

The achievement of financial closure for this third and final development stage will act as the trigger event for converting the grant into a loan. With this, the full amount of the grant will need to be repaid to the GDC within seven years, with the initial two years requiring no debt-servicing (grace period) to alleviate the project developer's cash flow issues.

In the proposed Virtual Pilot transaction, the GCD would open up a dedicated funding window that would create an account to be capitalised by interested donors. The GDC would release the first tranche of capital to the project developer's account the moment sufficient capital is committed (i.e. sufficient to support drilling at one project site). Future payments would be contingent upon the realisation of pre-defined benchmarks, capped at USD 15 million per project developer.

Table 1: Estimates of capital expenditure requirements for 200 MW in geothermal power capacity

	Financing needs	***Share of total***
Phase 1 – Pre-feasibility	USD 1,000,000	Negligible
Phase 2 – Resource confirmation	USD 60,000,000	13%
Phase 3 – Project construction	USD 400,000,000	87%
	USD 461,000,000	

From the USD 461 million total estimated capital expenditure, USD 60 million is likely needed to confirm the resource. The basis for this assumption is the drilling of 12 test-wells, which are valued at USD 5 million each. The Virtual Pilot assumes the GDC to co-finance 50%, meaning that for a 200 MW capacity for example, USD 30 million is brought in by the project developer and a matching volume is delivered as an upfront convertible grant by the GDC.

The repayment burden of the loan to the GDC is to be shared by two actors: the project developer and the buyer of Article 6 units. The Virtual Pilot assumes the Article 6 buyer covers the full interest repayment obligation and takes on 25% of the principal repayment obligation to ensure a material de-risking effect of the transaction. With this, the total subsidy contribution by the buyer adds up to USD 11.7 million over the seven-year period.

This final value is proposed in the Virtual Pilot as the initial capitalisation goal for the Article 6 transaction. However, the actual amount can be higher or lower and would be linked to both the capacity of the GDC to mobilise resource and the buyer's capacity to deliver ex-post funding. Moreover, the pricing of ITMOs is subject to bilateral negotiations between cooperating countries and/or international buyers. The unit price can be affected if a different attribution or weight is given to the blending of general climate finance and ITMO finance.

1.4 Transaction Design

The Virtual Pilot foresees a government-to-government transaction between Kenya and partner countries. Kenya could establish domestic guidelines to guide potential ITMO buyers interested in investing in its geothermal sector and to ensure the orderly participation of buyers.

These guidelines could make transparent: the volume of ITMOs expected and issued for each vintage year by the Virtual Pilot, the corresponding adjustments effected and reported by Kenya, and the attribution of ITMOs to the relevant partner country or buyer. Should multiple international buyers intend to participate as ITMO off-takers, Kenya must ensure that the claims and priorities of the buyers are carefully reconciled and respected by the agreed and signed MOPAs.

A central legal entity could also be appointed by Kenya as the programme manager and main focal point for the Kenyan government, project developers, and partner countries or international investors. The GDC could, for example, take on this role and be tasked with selecting eligible geothermal project developers, preparing the programme documents for submission to Article 6.4 Supervisory Board, managing the inclusion of new component project activities (CPAs) into the programme, and liaising with the different stakeholders on technical matters. A set of agreements within the geothermal supply chain would also be needed to secure the GDC's title to emission reductions generated. As such, geothermal power-plant owners and companies acquiring steam for electricity generation would have to agree to assign any existing and future rights of the emission reductions to the GDC through formal agreements.

Through this structure, all mitigation outcomes produced by the Virtual Pilot would be consolidated by the programme manager. Having a streamlined process to negotiate with different project developers and one entity marketing, selling and transferring ITMOs, would reduce the overall transaction costs.

Box 2: Possible conditions precedent to the MOPA

One condition precedent could be the joint definition of a crediting threshold with yearly milestones for the geothermal sector. The sale and purchase of ITMOs would thus be conditioned on the establishment of this (sub-)sectoral crediting threshold. Only those emission reductions achieved over and above the specified crediting threshold would be deemed 'Contracted ITMOs' and subject to a delivery obligation under the MOPA.

The MOPA would also establish primary obligations for the contracting parties to revisit and update the crediting threshold reflecting more up-to-date information, policies and strategies for the geothermal sector. Contracting parties could also engage a third-party auditor to evaluate to what extent the data and methodology used to set the crediting threshold is appropriate and conservative.

The contracting parties could additionally agree to have the Virtual Pilot's crediting threshold be reflected in Kenya's NDC by 2020 (when countries are requested to update or put forward new NDCs). The crediting threshold could eventually function as an unconditional target for geothermal implementation and its inclusion in the revised or updated NDC would formalize the increase in mitigation ambition by Kenya.

1.5 Lessons Learned

There is great potential for geothermal development in Kenya. Given the capital-intensive nature of the associated investments, Article 6 market-based approaches can help to unlock this potential further if effectively combined with other sources of (climate) finance. The work on this Virtual Pilot has generated relevant insights relating to (i) the relationship between different financing structures and the attribution of emissions reductions; (ii) institutional implementation considerations; and (iii) the challenges associated with defining an adequate crediting-baseline in the context of a fully conditional NDC.

To inform the financial design of the Virtual Pilot, several project developers active in the geothermal power development in Kenya were consulted. Project developers expressed that while current financing facilities (including the GDC and GRMF) do support the development of new geothermal sites, insufficient capitalisation and/or strict co-financing requirements make it difficult for project developers to access adequate resources for scaled-up action.

The concept of a grant converted into a repayable loan upon resource confirmation was considered unique in the Kenyan geothermal field and an attractive proposition that could offer a win-win scenario. Project developers were confident that attracting follow-up commercial finance would be easier once the resource is confirmed, that this new round of funding could repay the loans. For the facility, the implication of receiving back the full principal in an accelerated fashion would create the opportunity to establish a revolving fund, thereby multiplying the potential impact of such facility.

In addition to tackling initial exploration challenges associated with geothermal resources, the Virtual Pilot needs to be able to reconcile Article 6 implementation with the conditional nature of Kenya's NDC. The absence of an unconditional NDC pledge does not suppose an exclusion from the Article 6 market-based approaches. Rather, Article 6 could be used to further incentivise host countries to increase their ambition and develop (unconditional) pledges for the relevant sectors.

If designed and implemented well, the Virtual Pilot can assist Kenya in achieving its first NDC, while increasing its ambition for subsequent ones. While Kenya's NDC is fully conditional, the Virtual Pilot can be a first step to defining a pathway for geothermal development that could function as an unconditional target for this subsector in a revised or updated NDC. To avoid any perverse incentives related to the transfer of mitigation outcomes in the absence of an unconditional target, a robust crediting baseline (set below BAU) can be developed. This crediting baseline can help to ensure that the ITMOs transferred represent a real and additional mitigation effort.

The crediting baseline would need to be developed using the most up-to-date historical activity data, action plans and strategies for the energy and geothermal sectors. The crediting baseline would define annual milestones that help determine how many emission reductions can be converted to ITMOs and transferred internationally. Corresponding adjustments would be applied to all ITMOs transferred, however, a portion could be reserved for Kenya's conditional target and accounted towards its NDC.

The attribution of mitigation outcomes in the Virtual Pilot is also pertinent. In the Virtual Pilot, the share of mitigation outcomes is calculated based on the share of phase 2 costs (USD 60 million) against the total costs (USD 461 million). This value corresponds to a 13% attribution, whereby from the overall estimated 4.5 million tCO2e by 2030, 0.58 million tonnes would be attributed to the Virtual Pilot. The direct costs for ITMO buyers is, however, just under 3%which relates to the interest-rate subsidy component and a contribution to the repayment of the repayable loan.

If a 1:1 attribution were assumed, the abatement cost would equal around USD 100 per tonne. This is not surprising given the capital-intensive character of geothermal investments. However, it can be argued that the financial contribution of the ITMO buyer allows phase 2 to fully be implemented and as such, a higher attribution level can be accepted. As Article 6 or 9 of the Paris Agreement may cover the notion of climate finance attribution in their guidance, the Virtual Pilot maintains a level of flexibility and analysed several attribution scenarios.

With respect to defining the seller of ITMOs, the GDC is well placed to operate as the managing entity of the Virtual Pilot. The GDC can raise, manage, and disburse funds to eligible project developers, and consolidate the rights to ITMOs, transferring these to a partner country and other potential international buyers. Project developers expressed an interest to potentially apply for funding through an existing finance facility such as the GDC, given their familiarity with the application procedures and funder requirements. An additional benefit of linking the Virtual Pilot to the GDC is the facility's relationship with various funders (e.g. AfDB, EIB, AFD and KfW). This could ease access to the financial resources needed to capitalize a dedicated funding window.