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NATIONALLY DETERMINED CONTRIBUTIONS IMPLEMENTATION PLAN

FINANCING STRATEGY REPORT



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NDC 淤

PARTNERSHIP



based on a decision of the German Bundestag



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Federal Ministry for Economic Cooperation and Development



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Contents

Acronyms and abbreviations	3 5	
Foreword		
Executive summary	6	
CHAPTER 1: Introduction	12	
1.1. Introduction to the financing strategy	12	
1.1.1. Objective	12	
1.1.2. Scope and methodology	13	
1.2. Key parameters to consider	14	
1.3. Summary of NDC Programmes of Action	15	
CHAPTER 2: Situation analysis	16	
2.1. COVID-19 situation	16	
2.2. Africa climate finance context	18	
Adaptation vs mitigation	19	
Sources of funds	19	
2.3. National policy and public sector context	19	
2.3.1. General	19	
2.3.2. Government structure	20	
2.3.3. Oversight and coordination: Climate finance	20	
2.3.4. Policy commitment: Climate change	21	
2.3.5. Resource mobilization	21	
2.4. Climate finance and policy context: Alignment of objectives	22	
2.5. Domestic funding outlook: Private sector	25	
2.5.1. A needed source of funding	25	
2.5.2. Barriers to address	25	
2.5.3. Current activities	26	
2.6.4. Financing instruments	27	
CHAPTER 3: NDC analysis	28	
3.1. NDC implementation plans		
3.1.1. Commitments, implementation process and timing	28	
3.1.2. Financing and resourcing need	28	
3.1.3. Overview and background: Mitigation and adaptation	29	

3.1.4. NDC NC4 report and update: Implications for financing strategy

32

Т

3.2.	Sector analysis: Modified	33
	3.2.1. Proposed cost analysis and financing strategy formulation	34
	3.2.2. Energy sector	34
	3.2.3. Forestry sector	37
	3.2.4. Transport sector	38
	3.2.5. Waste and water sectors	38
	3.2.6. Agriculture sector	39

CHAPTER 4: Financing strategy considerations and framework	41
4.1. Considerations of financing strategy	41
4.1.1. Investment gap and enabling environment: Nature of funding required	41
4.1.2. Project preparation and investment readiness: Preparing bankable project	ts 42
4.1.3. Blended finance: Achieving funding leverage	43
4.2. Strategy framework	47
4.2.1. Blended finance framework	47
4.2.1. Mapping of POAs to framework (indicative)	49
4.2.2. Financial structuring: Part of investor readiness	59
4.3. Sources of capital: Types of investors and funders	59

CHAPTER 5: Strategy implementation	62
5.1. Mobilization and partnerships	62
5.1.1. Coordination	62
5.1.2. Support continued development of 'bankable projects'	63
5.1.3. Sources of funding: Domestic and international	63
5.1.4. Climate adaptation focus	63
5.1.5. Climate mitigation focus (energy sector)	64
5.1.6. Support ongoing capacity-building	64

APPENDICES	65	
Appendix 1: Financing instruments	65	
Appendix 2: Profile of domestic climate finance providers	66	
Appendix 3: Examples of de-risking instruments and mechanisms	72	
Appendix 4: Programme of Action overview	73	
Appendix 5: NDC list of Programmes of Action	112	

References

115

Acronyms and abbreviations

AfDB	African Development Bank	
AFD	Agence Française de Développement (French development agency)	
BRT	bus rapid transit	
САР	Coronavirus Alleviation Programme	
CEO	chief executive officer	
CNG	compressed natural gas	
COP26	26th United Nations Climate Change Conference (in 2021)	
CPESDP	Coordinated Programme of Economic and Social Development Policies	
CSR	corporate social responsibility	
DFI	development finance institution	
EPA	Environmental Protection Agency	
ESG	environmental, social and governance	
EU	European Union	
GCF	Green Climate Fund	
GCFRP	Ghana Cocoa Forest REDD+ Programme	
GDP	gross domestic product	
GHG	greenhouse gas	
GOGLA	Global Off-Grid Lighting Association	
HFCs	hydrofluorocarbons	
HIA	hotspot intervention area	
IFC	International Finance Corporation	
IPP	independent power producer	
LCOE	levelized cost of energy	
LED	light emitting diode	
LPG	liquid petroleum gas	
MDAs	ministries, departments and agencies	
MDB	multinational development bank	
MESTI	Ministry of Environment, Science, Technology and Innovation	

MLGRD	Ministry of Local Government and Rural Development	
MMDAs	metropolitan/municipal/district assemblies	
MSW	municipal solid waste	
MTDPF	Medium-Term Development Policy Framework	
NAP	national adaptation planning	
NC4	Ghana's Fourth National Communication to the UNFCCC	
NCCAS	National Climate Change Adaptation Strategy	
NCCC	National Climate Change Committee	
NCCP	National Climate Change Policy	
NDB	National Development Bank	
NDC	Nationally Determined Contribution	
NDPC	National Development Planning Commission	
ODA	official development assistance	
OECD	Organisation for Economic Co-operation and Development	
ΡΟΑ	Programme of Action	
PPA	power purchase agreement	
PPP	public–private partnership	
PV	photovoltaic	
RCC	Regional Coordinating Council	
REMP	Renewable Energy Master Plan	
REDD+	reducing emissions from deforestation and forest degradation	
SDGs	Sustainable Development Goals	
SECO	Swiss State Secretariate for Economic Affairs	
SME	small and medium-sized enterprise	
SREP	Scaling-Up Renewable Energy Program in Low Income Countries	
UNDP	United Nations Development Programme	
UNFCCC	United Nations Framework Convention on Climate Change	
VRA	Volta River Authority	

Foreword

Ghana committed to 31 mitigation and adaptation actions across seven economic sectors in its Nationally Determined Contributions (NDCs) to the United Nations Framework Convention on Climate Change (UNFCCC) in 2015 and followed up with the ratification of the Paris Agreement in 2016.

This made Ghana a Party to the Paris Agreement and demonstrated political commitment to both the people of Ghana and the international community that Ghana is acting together with its peers to combat climate change.

The NDCs are the country's defined climate actions that also envisage inclusive green growth and improved resilience of infrastructure and services. The NDCs are expected to contribute to the implementation of the Sustainable Development Goals (SDGs) and will require \$22.6 billion in funding for implementation.

Significant resources (financial, technology and capacity) are needed alongside government commitments to implement the NDCs. This financing strategy is intended to provide direction to help mobilize resources for the implementation of the NDCs, and in doing so, enable Ghana to achieve climate mitigation and adaptation targets.

The strategy was developed through stakeholder consultation with relevant institutions at the national and subnational level with participation from public and private sector perspectives.

The Ministry of Environment, Science, Technology and Innovation, together with all the relevant sector institutions, will work to mobilize the needed resources for the implementation of the NDCs to accelerate our development efforts and enhance the well-being of our people.

Hon. Dr. Kwaku Afriyie

Minister Ministry of Environment, Science, Technology and Innovation

Executive summary

The 2019 NDC Implementation Plan defines 31 Programmes of Action (POAs) covering both climate adaptation and mitigation activities. These have a stated funding need of \$22.6 billion. The Government of Ghana has committed unconditionally to progress certain POAs directly and to allocate \$6.3 billion of required funding across the entire programme. The remaining \$16.3 billion needs to be mobilized from sources of international public funding and private finance.

Alongside the direct funding requirement, there is also an increased need to ensure appropriate capacity and technical capability is in place to fully resource the ongoing government and private sector coordination, programme or project preparation, and fundraising. This is important to enable full and efficient implementation, including an expected update of NDC activities. It is needed to meet the financing challenge and to catalyse and prioritize NDC implementation.

This report provides an initial strategy to enable mobilization of resources. The structure of the report covers: (1) the context and analysis of the current situation; (2) a comparative assessment of the NDC POAs; (3) an outline of strategy considerations and proposed financing framework; and (4) a proposed set of activities to implement the next phase of the strategy.

The NDC is a continuous process, which includes a cycle of implementation, analysis, refinement and update. A finance strategy must similarly be adjusted and updated.

It is acknowledged that the full context of current implementation activities under way and of existing budget allocations and funding sources is still needed in this initial strategy. An update of the existing NDC Implementation Plan is also in progress. Consideration of the outcome of this is similarly required to fully inform a 2021 strategy.

Context of the current market

The uncertainty due to the ongoing COVID-19 pandemic is a material factor in social and economic conditions, which influence NDC implementation. The needed investment in economic recovery due to the COVID pandemic is expected to include increased focus on resilience of infrastructure and services. Policymakers have the opportunity to invest in sustainable infrastructure for the long term, leading to the development of a green economic recovery. At this stage, however, it is still too early to assume the extent of this, which of Ghana's POAs under the NDC will be affected or to what extent new POAs will be introduced.

The international trend for climate and sustainable finance solutions is gaining significant momentum; however, the reality is that committed international climate finance across Africa has been and remains comparatively low. In 2018, \$12.5 billion total climate finance was secured across sub-Saharan Africa. Ghana requires over \$16 billion to meet its current NDC commitments, demonstrating the gap that needs to be filled. This is worsened by the additional demand for funding for broader (sustainable) development objectives and further pressures as a result of the COVID pandemic. NDC implementation efforts need to promote the funding need and ensure prioritization against alternative demands for funding.

The government's leadership in supporting the Sustainable Development Goals (SDGs) and its commitments to the Paris Agreement and existing policy frameworks provides a sound basis to progress NDC implementation. Early assessment and development of the Ghana Green Fund and successful engagement with international funding facilities (e.g., the Green Climate Fund) provide additional precedent to build on. However, as noted in this

report and via Ghana's Fourth National Communication to the United Nations UNFCCC (NC4), more still needs to be done to increase capacity-building and ensure continued alignment and prioritization of NDC implementation with social and economic development activity. The current moratorium on new energy generation licenses and associated commercial complexity with existing independent power producers needs to be resolved to realistically attract any meaningful level of additional private finance to the energy sector.

There is a need and opportunity to attract domestic finance to fund climate-change-related projects, business and services, such as Ghana's well-established corporate and financial services sector, which has already started to engage with SDG objectives, via the establishment of the private sector-led SDG Fund; corporate participation in climate-related projects and investments; and local banks starting to offer sector-focused finance. These local sources of capital are important building blocks of the overall NDC resourcing need, but it is also evident that more has to be done: to build awareness of climate and NDC objectives and activities; to increase the level of technical expertise; and to facilitate access to funding for organizations.

The leading banking institutions, through the coordination of the Bank of Ghana, developed and signed up to Sustainable Banking Principles at the end of 2019. It is expected that the private sector investment potential will start to be realized as these principles are fully implemented across commercial banking services. Government policy also promotes and requires local participation in NDC implementation (e.g., development of local manufacturing and supply chains), which facilitates the potential for significant industrial development and the opportunity to establish and finance these new business opportunities.

NDC activity

The 2019 NDC Implementation Plan addresses both climate mitigation and adaptation activities:

- Mitigation: The total implementation cost for the 20 mitigation Programmes of Action over the 10 years (2020–2030) is \$9.81 billion. Ghana will raise \$2.02 billion to fund unconditional NDCs (21 percent of the total investments), and the 18 remaining mitigation actions will require a further \$7.79 billion to be secured.
- Adaptation: Ghana will mobilize \$4.21 billion (34 percent) at domestic level for adaptation and is seeking the remaining \$8.29 billion from international sources to cover the remaining cost.

Energy sector – renewable penetration		
1	Hydro-electricity	Conditional
2	Wind – utility	Conditional
3	Solar — utility	Conditional
4	Solar – buildings/rooftop	Conditional
5	Mini-grids	Conditional
6	Solar – lanterns	Conditional
Energy sector – clean cooking		
7	LPG usage - 50%	Conditional
8	Cookstoves	Conditional
Energy sector – energy efficiency		
12	Efficient LED lighting	Unconditional
12 13	Efficient LED lighting Efficient refrigeration	Unconditional Unconditional
12 13 14	Efficient LED lighting Efficient refrigeration Power factor correction	Unconditional Unconditional Conditional
12 13 14 Forestr	Efficient LED lighting Efficient refrigeration Power factor correction y Sector – REDD+ Strategy	Unconditional Unconditional Conditional
12 13 14 Forestry 15	Efficient LED lighting Efficient refrigeration Power factor correction y Sector – REDD+ Strategy Cocoa REDD+	Unconditional Unconditional Conditional Conditional
12 13 14 Forestry 15 16	Efficient LED lighting Efficient refrigeration Power factor correction Sector – REDD+ Strategy Cocoa REDD+ Shea landscape REDD+	Unconditional Unconditional Conditional Conditional Conditional
12 13 14 Forestr 15 16 17	Efficient LED lighting Efficient refrigeration Power factor correction y Sector – REDD+ Strategy Cocoa REDD+ Shea landscape REDD+ Wildfire management	Unconditional Unconditional Conditional Conditional Conditional Conditional
12 13 14 Forestr 15 16 17 18	Efficient LED lighting Efficient refrigeration Power factor correction Sector – REDD+ Strategy Cocoa REDD+ Shea landscape REDD+ Wildfire management Forest plantation	Unconditional Unconditional Conditional Conditional Conditional Unconditional

Environment protection Hydrofluorocarbon (HFC) phase 20 Conditional down - air-conditioning **Transport sector** 21 Bus rapid transit Conditional Conditional 22 Rail transit system Waste (water) sector 23 Waste collection - landfill gas Conditional 24 Waste composting Conditional Conditional 25 **Biogas** plants Agriculture sector CSA – 54 districts 26 Unconditional CSA fish and livestock 27 Unconditional productivity 28 Innovation post harvest process Unconditional Water sector 29 Access to water Conditional

Undertaking comprehensive analysis of cost and specific funding needs of the NDC POAs with available data of the latest implementation status was not feasible in this study. An analysis of POAs based on comparable or equivalent international precedent is, however, provided.

Where reasonable market comparisons could be made, cost forecasts are within expected broad ranges against international precedent. However, many of the POAs are existing development programmes, and the current status of implementation and project-specific circumstances need to be fully considered.

Specific attention is needed for the energy sector, which in total accounts for approximately 50 percent of the POAs. This sector faces additional challenges due to current oversupply of energy in the market, the moratorium on new licences and the related ongoing contractual complexities with existing independent power producers. The situation needs to be resolved to facilitate additional or alternative low carbon generation capacity under the NDCs and, importantly, to restore investor confidence in proposed future development of the sector.

Strategy considerations and financing framework

The diversity of NDC funding needs requires detailed investment planning and coordination. The analysis of POAs across the different sectors highlights the diversity of asset classes and funding needs across the portfolio, as well as the granularity of outstanding project/programme preparation to secure third party finance. The development of specific investment plans or funding propositions for programmes and projects is expected to be needed to secure investment. Continued and increased coordination across programmes, sectors and

sources of funds is similarly required to best leverage overall NDC needs and identify synergies to create efficiency of implementation and funding.

The ongoing development of a detailed reducing emissions from deforestation and forest degradation (REDD+) investment plan highlights the benefit (and resourcing commitment needed) of sectoral/programme-focused investment plans. At the same time, recommendations made in this investment plan – namely, to access the green bond market; establish a dedicated REDD+ fund; and engage with multinational and bilateral sources of climate financing – is likely to benefit from a coordinated approach across NDC implementation. Similarly, recent funding commitments from the Green Climate Fund, government and industry for the Shea Landscape programme highlights the significant time period, resourcing the commitment and coordination efforts needed to prepare bankable programmes and to secure targeted funding.

Detailed design and development of 'bankable projects' is critical. The principal barrier to enabling this is the supply of bankable projects – *commercially viable and sustainable investments.* The resource commitment to transition existing NDC POAs to investor-ready **bankable propositions is the prerequisite to any mobilization of funding**.

Through a project development phase detailing financial and technical feasibility needs, development risks and barriers to implementation can be mitigated and financing mechanisms can be structured – including tailored risk-mitigating instruments where necessary and appropriate. The resulting 'bankable' project or POA then becomes viable for third-party financing.

The defined NDC POAs are an aggregation of existing and new activities, which typically are intertwined with wider and ongoing national and sectoral development efforts and budgets. A challenge for NDC implementation is to clearly design, identify, monitor and evaluate needed distinct-fundable NDC POAs from within the wider and ongoing sectorial development activity.

Securing funding and resources from third party sources for climate-specific POAs requires clarity of scope of programmes, budgets and governance. The data available to readily assess NDC POAs – their budgets, their funding requirements and options – need to be further developed from that which is immediately available.

Building capacity, leveraging resources and coordinating implementation, including cross-cutting Programmes of Action, are essential. Consistent with the above, ongoing NDC implementation coordination has highlighted, via the recent NC4 reporting update to the UNFCCC, the necessity for continued and increased capacity-building support and resources within government to be committed across NDC sector and central coordination efforts.

Broad support is required towards sector and market development, which will enable the preparation of 'bankable' programmes and projects. This is a recognized imperative to efficiently and successfully catalyse investment from both public and private sources of capital. This resourcing need sits across both the domestic public sector that is developing NDC POAs and international and domestic public and private sector partners likely to fund and finance the implementation of the resulting programmes and projects.

Delivering the cross-cutting POAs focusing on gender, disaster risk reduction and health risks fits within this. Promoting and enabling the enhanced resilience of women and the vulnerable; awareness and planning for disaster risk management and reduction; and managing the eventuality of climate-induced health risks are not specifically addressed in this strategy but are well recognized as an imperative in their own right needed to successfully deliver NDC goals.

Different approaches are to be pursued for conditional vs unconditional POAs. The government is committed unconditionally to progress and fund nine of the POAs directly. These cover: low carbon electricity supply (gas),

energy efficiency programmes, forest plantation development and climate-smart agriculture development. In doing so, the government will allocate \$6.5 billion across the entire programme. Funds will be secured from existing budgets and need coordinating with ongoing donor supported projects (e.g., European Union (EU) GAP – an EU agriculture programme). The possibility for issuing green-, SDG- or impact-driven bonds or establishing national/sectoral development funds (e.g., the Ghana Green Fund) is also likely to be available to fund a portfolio of well-structured propositions. This may also be pursued in collaboration with industry (e.g., building on the precedent of the Forestry Commission and the Ghana Cocoa Board).

A project-focused blended finance approach is appropriate for (conditional) NDC implementation. It is assumed highly likely that the majority of the conditional POAs will require or benefit from a blended finance approach. This will ensure identified risks can be appropriately allocated across different funding participants of an investment, as well as across de-risking instruments utilized to manage or mitigate these risks by respective funders.

A framework illustrating Blended Finance Models is provided with an assessment outlining potential financing strategies for identified NDC POAs.

Potential sources of funding are indicated. These cover a wide range of potential funding and finance sources reflecting the diversity of the assets under development. Appropriate coordination of this funding outreach is required, either via existing government governance structures (e.g., the Ministry of Finance) or via new structures (e.g., the proposed national development banking facilities such as the Ghana Green Fund).

Mobilization of resources

The activities, governance arrangements and funding requirements within the NDC portfolio of activity are diverse and will require significant coordination efforts to ensure the required capacity and capability are embedded across both public and private sector implementation partners. The following outlines areas of required mobilization.

Coordination: The nature of the funding across the multisectoral POAs is diverse in scope, scale, risk profile and commercial viability. The mobilization of financing strategy requires the (1) efficient development and structuring of fundable programmes and investments across a diverse portfolio, (2) identification and successful leverage of domestic and international public and private funding to both prepare for and implement POAs, and (3) ongoing implementation and monitoring of funded POAs. Commitment of sufficient coordinated resourcing capability, leveraging both public and private sector experience, is also required.

Alignment and prioritization: The current update of the NDC Implementation Plan and full details of current implementation and financing status of the POAs from the various sector leads need to be assessed against the content and proposals of this report.

Support ongoing capacity-building and continued development of 'bankable projects:' Support ongoing efforts, where appropriate, to build government capacity centrally and within sectors to deliver project preparation services to both government and, where needed, private sector stakeholders involved in the development of 'bankable projects.'

Sources of funding – domestic and international: (1) Build awareness of the NDC Implementation Plan with a full range of private sector and public funders to provide detailed NDC activities and market NDC finance requirements for identified POAs. (2) Support continued development and full alignment with NDCs for the proposed National Development Bank with a climate focus (Ghana Green Fund) and public–private partnership for the SDG Delivery Fund and Green Fund. (3) Coordinate or monitor fundraising activities that will occur at different levels, i.e., at individual project, POA, sectoral and NDC portfolio level.

The strategy presents an initial outlook of the opportunity for the private and public sectors to work hand-inhand to deliver on NDC commitments and Ghana's climate-related societal objectives. This outlook and strategy will inevitably evolve with changes to NDC targets, the ongoing development of the domestic and international climate finance sector, and continued market and technology development.

The financing framework and implementing proposals show how each POA can be operationalized. It should be noted that these will need review to determine whether they are still consistent with the implementation of expected updated NDC plans and priority actions, whether there is a need for amendments based on changes with financing organizations, and whether they should be aligned with new policies and other government planning (for example, the ongoing update of the NDC Implementation Plan).

CHAPTER 1 INTRODUCTION

1.1. Introduction to the financing strategy

Ghana was among the 196 countries that adopted the Paris Agreement in December 2015, which has the goal to limit global temperature rise to well below 2 degrees Celsius. A year later, the country joined the Paris Agreement after Parliament ratified it.

As a Party to the Paris Agreement, Ghana has committed to 31 adaptation and mitigation actions captured in the Nationally Determined Contributions (NDCs). The NDCs cover interventions in the areas of renewable energy, low-carbon electricity, lowering deforestation, climate-smart agriculture, clean cooking, climate services, mass transportation, water management, etc. The investment requirement for the 31 actions is estimated at \$22.6 billion over a 10-year period. Ghana is leading in the mobilization of \$6.3 billion investment over the decade, including existing public sector allocations. The remaining \$16.3 billion investment is expected to come from international public and private sources.

In 2016, Ghana started to implement the NDCs after they came to force earlier than anticipated. The majority of the NDC POAs are existing programmes and activities being planned and delivered by respective government ministries. These are identified as priority components of Ghana's overall climate commitments and are defined within the overarching NDC programme. The historic and ongoing budgeting and implementation progress and barriers are important contexts to any proposed financing strategy.

The United Nations Develoment Programme (UNDP) has supported the Government of Ghana to prepare the multisectoral NDC Implementation Plan to continue to translate the NDCs into realized intervention.

The NDC Support Programme is being implemented by the Ministry of Environment, Science, Technology and Innovation (MESTI) with funding support from the Government of Germany.

1.1.1. Objective

The main objective of the assignment is:

To develop a financing strategy for Ghana's NDC Implementation Plan

The assignment builds on the NDC Implementation Plan, updated actions and plans, including Ghana's latest proposed UNFCCC update of the Fourth National Communication (NC4) and related efforts to assess priority sector actions in the NDC Implementation Plan.

In assessing the actions, available data and current country priorities relating to the NDCs, the report focuses on five sectors where the most complete data is available. Attention is given to the required domestic funding and international support to enable Ghana to be on track to achieve the NDC targets. Acknowledgement is made of the historic context of securing such levels of funding but this is considered alongside the increasing trend in growth of sustainable finance. The added complexity of current COVID-19 economic and funding implications is noted. Specific additional attention is given to the broader factors needed to be in place to secure funding – the need for an appropriate enabling environment and comprehensively developed and well-structured 'bankable' projects. Furthermore, details on the critical role of resource leverage, ultimately mobilized from a blend of both public catalytic capital and the private sector is addressed.

It is noted that this strategy in its current form requires more comprehensive input from current sector activities to ensure alignment with ongoing POAs.

1.1.2. Scope and methodology

The requested scope was to provide an overarching financing strategy for Ghana's NDCs. The assignment involved the following:

- 1. Costing of the 31 climate actions listed in the NDC Implementation Plan. Costing detailes were prepared with clear source references. The costs were intended to include the perspective of required public sector funding/de-risking and private sector financing where appropriate and feasible.
- 2. Public sector funding gaps were to be highlighted that require international grant support and private sector investments to enable Ghana to be on track to reach the targets under the NDCs.
- 3. A financing strategy for the NDC Implementation Plan was to be provided through a sectoral or subsectoral approach and consideration of national public funding opportunities, international climate financing through international funds, cooperative approaches under Article 6 of the Paris Agreement and private sector financing.
- 4. Sectoral and subsectoral investment opportunities for private investors were to be identified, including barriers for private sector investment and recommendations to address the barriers. The potential role of Ghana's Green Fund, once operational, as well as the role of Green and Climate Themed Bonds, were also considered.
- 5. Implementation steps for the financing strategy of the NDC Implementation Plan were outlined with a resource mobilization and partnership strategy.
- 6. Investor soundings were explored to understand the intent to invest and support the overall delivery of the climate finance opportunity.
- 7. The intention was to conduct finance training to raise awareness of private sector relevant parameters and increase the knowledge of the public sector to enhance private sector investment opportunities.

Two factors have had a material impact on realizing the full scope of work: (1) COVID-19: face-to-face meetings, training and travel to and within Ghana were clearly constrained with the ongoing COVID-19 pandemic. (2) More fundamentally, the availability and depth of data, specific to current and ongoing POAs, were not as expected.

Full required data have not been available to undertake a comprehensive costing analysis across POAs. Ongoing development and refinement of proposed POAs are also under way by respective ministries and sector leads, which needs to be considered in a further iteration of this financing strategy.

This report follows the methodology below, adapted to reflect greater focus on the financing framework needed for the NDC Implementation Plan rather than intended specific and comprehensive data-based strategies across each Programme of Action:

- 1. The context of the domestic market to finance and implement NDC POAs is provided.
- 2. An assessment of the proposed NDC POAs is made, focusing on comparable costing and including perspective of barriers to implementation. Acknowledged is a limitation on underlying data of proposed POAs for comprehensive analysis of cost and specific funding needs.

- 3. Emphasis is placed on the required preparation needed for POAs and their underlying projects, which are intended to seek third-party funding. This emphasis is based on evidenced need due to the current gap in data availability, on the one hand, and the commonly acknowledged requirement to present comprehensive 'bankable' projects for funding, on the other hand including the context of a supportive enabling environment.
- 4. A blended financing framework is provided to categorize the diversity of types of POAs to be financed with expected sources of funding relating to the categories.
- 5. Specific examples of POAs are then explored to outline financing concepts/mechanisms to raise finance for implementation.

1.2. Key parameters to consider

The principles to guide the development of the NDC financing strategy have been established as follows:

- NDC Plan and 2020 Update The current situation. The 'Multi-sectoral Implementation Plan for Ghana's Nationally Determined Contributions to the Paris Climate Agreement' (March 2019) and the most recent update to this document in the form of 'Ghana's Fourth National Communication (NC4) to the United Nations Framework Convention on Climate Change (UNFCCC)' (March 2020) form the basis for the strategy.
- 2. Sector focus. Following review of the NC4 report and in consultation with the Environmental Protection Agency (EPA), the focus of the strategy has been refined to concentrate on specific NDC POAs within these five sectors: Energy (Renewable), Forestry (REDD+), Transport, Waste and Water.
- 3. **Conditional vs. unconditional commitments.** The government has provided unconditional commitments to implement certain POAs via an allocation from national budgets. As such, the funding strategy for these activities is different from the remaining POAs, which are conditional on securing third-party funding in order to either commence or complete implementation of the particular POA.
- 4. **Data sources.** Specific data sources were identified as a basis for forming the sector analysis. Constraints with data availability for timely and comprehensive NDC assessment are noted here and are also highlighted as needing to be improved, within the NC4 report.
- 5. Leverage. The strategy is focused on highlighting the approach to leverage Ghana's national government resources and public finance to attract additional finance to support implementation of current NDC sector objectives. This includes building a blended financing framework to develop the strategy and include examples of public and private funders who may be involved in such blended finance engagement over time.
- 6. **Enabling environment.** The finance strategy ultimately focuses on types and sources of funding needed to close the finance gap for NDC implementation. However, securing such funding is equally dependent on a supportive enabling environment being in place, including the following conditions:
 - i. A stable and consistent policy and legislative framework, including resolution of current (energy) sector constraints to NDC implementation objectives.
 - ii. Public institutional capacity to plan, prepare and deliver (infrastructure) projects. Even where projects are executed with private sector participation, the role of the public sector is crucial. This includes:
 - The ongoing management and delivery of most POAs that are already being implemented under public sector management.
 - Where required, managing the proposed transition to leverage international public sector and private sector resources, including funding and management.
 - Coordination and alignment of POAs under the broader NDC implementation planning. This will
 include, depending on heritage, current status and future strategies of POAs either separation or
 integration of POAs with ongoing core sector activities.

- iii. Strength, resilience and engagement of local economy towards relevant POAs (and the national climate agenda), including the domestic finance sector and industry (large and small) with strategic interest in NDC delivery.
- iv. Engagement of society (as end users, customers and stakeholders) towards adoption of relevant POAs (and a low carbon transition) and public awareness of the impact of climate change in general is needed.
- 7. **COVID-19.** The current pandemic and implications for the finance strategy are addressed, but only at an initial introductory level, given the rapidly evolving situation. It is noted that an ongoing assessment of this situation and implications with respect to the NDC Implementation Plan and related finance strategy is essential.

1.3. Summary of NDC Programmes of Action

Following review of available data that included the NC4 report and in consultation with the EPA, the focus of the strategy has been refined to concentrate on five sectors and specific NDC Programme of Actions within these sector perspectives: Energy (Renewable), Transport, Water (Waste), Agriculture and Forestry (REDD+). The list of POAs under consideration is as follows:

Energy sector – renewable penetration		
1	Hydro-electricity	Conditional
2	Wind – utility	Conditional
3	Solar — utility	Conditional
4	Solar – buildings/rooftop	Conditional
5	Mini-grids	Conditional
6	Solar – lanterns	Conditional
Energy	sector — clean cooking	
7	LPG usage - 50%	Conditional
8	Cookstoves	Conditional
Energy sector – energy efficiency		
Energy	sector – energy efficiency	
Energy 12	sector – energy efficiency Efficient LED lighting	Unconditional
Energy 12 13	sector – energy efficiency Efficient LED lighting efficient refrigeration	Unconditional Unconditional
Energy 12 13 14	sector – energy efficiency Efficient LED lighting efficient refrigeration power factor correction	Unconditional Unconditional Conditional
Energy 12 13 14 Forestry	sector – energy efficiency Efficient LED lighting efficient refrigeration power factor correction y sector – REDD+ Strategy	Unconditional Unconditional Conditional
Energy 12 13 14 Forestry 15	sector – energy efficiency Efficient LED lighting efficient refrigeration power factor correction y sector – REDD+ Strategy Cocoa REDD+	Unconditional Unconditional Conditional Conditional
Energy 12 13 14 Forestry 15 16	Sector – energy efficiency Efficient LED lighting efficient refrigeration power factor correction y sector – REDD+ Strategy Cocoa REDD+ Shea landscape REDD+	Unconditional Unconditional Conditional Conditional Conditional
Energy 12 13 14 Forestry 15 16 17	sector – energy efficiency Efficient LED lighting efficient refrigeration power factor correction y sector – REDD+ Strategy Cocoa REDD+ Shea landscape REDD+ Wildfire management	Unconditional Unconditional Conditional Conditional Conditional Conditional
Energy 12 13 14 Forestry 15 16 17 18	Sector – energy efficiency Efficient LED lighting efficient refrigeration power factor correction y sector – REDD+ Strategy Cocoa REDD+ Shea landscape REDD+ Wildfire management Forest plantation	Unconditional Unconditional Conditional Conditional Conditional Conditional Unconditional

Environment protection		
20	HFC phase down – air- conditioning	Conditional
Transport sector		
21	Bus rapid transit	Conditional
22	Rail transit system	Conditional
Waste (water) sector		
23	Waste collection – landfill gas	Conditional
24	Waste composting	Conditional
25	Biogas plants	Conditional
Agriculture sector		
26	CSA – 54 districts	Unconditional
27	CSA fish and livestock productivity	Unconditional
28	Innovation post harvest process	Unconditional
Water Sector		
29	Access to water	Conditional

CHAPTER 2

Situation analysis

2.1. COVID-19 situation

The tremendous uncertainty we are experiencing due to the ongoing COVID-19 pandemic is a material factor in social and economic conditions as well as proposed NDC implementation.

No country has been spared of the virus and its socioeconomic implications. The speed and extent at which COVID-19 affects developed and developing nations alike is excruciatingly distressful.

The Ghanaian economy is dominated by an informal economy characterized by self-reliant jobs such as trading, agricultural production and services. These are jobs in sectors that depend heavily on daily incomes, and, as such, have been particularly affected by the COVID-19 situation. With full and partial lockdown measures, most formal businesses (government and private) were temporarily closed or materially disrupted. Many organizations also took early and additional precautionary measures to help slow the spread while citizens were being educated.

The economic impact of the pandemic is severe across the globe, and the financial toll of the coronavirus pandemic continues to escalate.

- Oil prices (and other commodities, e.g., cocoa) have dropped significantly with further volatility in pricing since the pandemic broke, influenced by a drop in demand due to closed businesses. (PwC-Ghana COVID Report, 2020)
- There has also been a slowdown on capital investment, and layoff of workers by firms who have been severely hit by the emergence of the virus.
- The supply chain has been equally affected, since the normal way of doing things has been impacted, hence a need to restructure the supply chain processes. This automatically has led to a fall in sales for most institutions that has affected cash flows and covenant issues.
- Globally there have been general travel restrictions, which have grossly affected the aviation and hospitality industry as a whole, while impacting business and leisure demand.

Internationally, over and above the humanitarian response, most governments are attempting to intervene to support and motivate companies to maintain jobs and to stimulate a rapid economic recovery. It remains too early to tell the full impact.

A plethora of initiatives have been taken by the Government of Ghana to cushion the harsh impact on businesses and individuals. Significant to note among them are the institution of the Coronavirus Alleviation Programme (CAP); incentives and insurance packages for frontline health workers; the Soft Loan Scheme for Small-Scale Industries up to GH¢ 600 million with a one-year moratorium and two-year repayment period for micro-, smalland medium-scale businesses; among others. The absorption of 50 percent of electricity and 100 percent of water tariffs for Ghanaians from April to June was another initiative. These interventions were taken to protect households and livelihoods; support micro-, small- and medium-sized businesses; minimize job losses; and source additional funding for promotion of industries to shore up and expand industrial output for domestic consumption and exports. For the financial sector (which will contribute towards funding some of the NDCs both locally and internationally), the government through the Ministry of Finance and the Bank of Ghana has rolled out essential fiscal and monetary policy reviews and other valuable initiatives to sustain financial institutions and banks. The financial sector underwent a massive clean-up in 2019, which led to the collapse of many insolvent banks; subsequently, the banking sector reported a profit of GH¢ 843 million in the first quarter of 2020. However, without careful management and policy adjustments, the sector is at risk of suffering another period of material disruption.

Businesses in Ghana have not resumed full operations and the status quo may remain till the health risks associated with the novel coronavirus have been brought under control. This will affect funding of some NDC points of action that are expecting funding from both private and government institutions. As it stands, the banks' largest credit exposure (24 percent) is to the service industry, and this is one of the sectors worst hit by the pandemic. The suspension of social gatherings, closure of the borders to human traffic and closure of hotels and restaurants to guests are to the industries' disadvantage. This in turn affects the banks' ability to fund and increases risk of an economic contraction. Higher credit losses result, with an impact on overall asset quality, capital and liquidity.

International financing and investment in Ghana's NDCs can also be expected to be affected. As economic uncertainty unfolds, one can expect that liquidity in the market will contract, and financial investors' risk threshold will increase. Donor and development finance institution (DFI) funders – which countries are in debt to, increasing domestic budget constraints, and which base their funding for international development on a percentage of gross domestic product (GDP) – can also be expected to have reduced liquidity and are likely to have refocused their strategy.

On the positive side, however, there is growing acknowledgement that the pandemic highlights the true need for the provision of sustainable resilient services, infrastructure and products. There is a strong case to be made that the recovery from the current crisis should be linked to enabling a 'green economy' as not only an opportunity to stimulate growth and economic development, but an absolute necessity to provide for a more resilient society and to address the even greater disruption that climate change will increasingly have on society and our livelihoods.

There are numerous views being formed on how best to align climate and COVID-19 fiscal recovery packages. Understandably, these views are evolving. Some summary insights from research on this topic are given below.

The shock to the global economy will affect progress on climate change in multifaceted ways. The biggest driver of the long-term impact on climate is through fiscal recovery packages, along with possible shifts in power within and across national and international institutions.

Green fiscal recovery packages can act to decouple economic growth from greenhouse gas (GHG) emissions and reduce existing welfare inequalities that will be exacerbated by the pandemic in the short term and climate change in the long term. Short-term reductions in GHG emissions resulting from lockdowns will themselves have minor long-term effects, unless they facilitate deeper and longer-term human, business and institutional changes.

The following policy items are well placed to contribute to achieving economic and climate goals:

- Clean physical infrastructure investment
- Building efficiency retrofits
- Investment in education and training to address immediate unemployment from COVID-19
- Structural unemployment from decarbonization and natural capital investment for ecosystem resilience and regeneration
- Clean research and development investment
- Rural support spending

Given the uncertainty in the future waves of the pandemic, flexibility and timeliness will also be important considerations. Ghana will have to reassess budgets and find ways to revive the economy, as well as build the foundation for a more resilient and sustainable future. The COVID crisis has no doubt distorted Ghana's plans for NDCs in general. It is perhaps too early to assess how funding targeted at implementing the NDCs will be impacted. It can be assumed that the government's funds for combatting COVID-19 were diverted from different NDC-related projects in the country, and based on this assumption, it could be concluded that without a strong alignment of the required economic recovery with the increased focused provision of (climate) resilient sustainable infrastructure and services, the crisis will affect Ghana's level of climate ambition.

As we move from the emergency response to the recovery phase of COVID-19, policymakers have an opportunity to invest in productive assets for the long term. Such investments can make the most of shifts in human habits and behaviour already under way. There is a significant opportunity for Ghana to demonstrate continued leadership in SDG and climate ambitions and to further stimulate international support and investment by leading the development of a green economic recovery.

In particular, in the lead-up to COP26, recovery packages are likely to be examined against climate impact and NDC plans and commitments. For many countries, this will build on existing NDCs, already being positioned to facilitate investment. At this stage, however, it is still too early to assume which of Ghana's POAs under the NDC will be affected.

2.2. Africa climate finance context

The Africa climate finance context illustrates the challenge to build and secure the level of funding needed to implement the Ghana NDCs. In 2018, \$12.5 billion total climate finance was secured across sub-Saharan Africa. Ghana alone needs to secure approximately \$2 billion per annum through 2030.

The Organisation for Economic Co-operation and Development (OECD) Creditor Reporting System for Development Assistance Committee (DAC) countries illustrates a continuous increase in climate finance across the region between 2014 and 2017, except for a marginal decline in 2018. However, despite the positive upward trend, the level of funding across the region is still relatively low when considering Ghana's aspirations to secure approximately \$22 billion of funding up until 2030.



Climate finance flows in sub-Saharan Africa, 2014–2018

Source: OECD.org (http://www.oecd.org/dac/financing-sustainable-development/development-finance-topics/climate-change.htm)

Adaptation vs mitigation

It should be noted that over 90 percent of secured climate finance was for mitigation (primarily energy and transport) rather than adaptation. Financing structures and risk profiles of mitigation programmes are increasingly becoming more familiar and accepted by broader financial markets. However, careful consideration of adaptation projects and programmes is needed to motivate required funding levels. This need and complexity to attract capital towards adaptation measures is a global challenge rather than being specific to the situation in Ghana.

Sources of funds

Donors, bilateral funding, DFI and multinational development banks dominate the sources of funds, with commercial debt being more recently attracted to de-risked energy investments. Although there is a growing increase of focus from these funders on the climate impact of their funding, the demand for capital remains high, and the supply is secured only by well-structured fundable (bankable) projects and programmes that demonstrate proposed and targeted financial, social and climate impact returns.

2.3. National policy and public sector context

2.3.1. General

A climate finance strategy in Ghana is required to address the need for sufficient, predictable and sustainable financing to tackle climate issues and to deliver against national and international climate and related development commitments. As with many other developing countries, with its associated risks and challenges, Ghana acknowledges its exposure to climate change and the prospects for economic development that are also provided by climate change. Consequently, Ghana has taken a number of steps towards combating climate change by consolidating its development gains through effective adaptation and also by tapping into investment opportunities that offer the country climate mitigation. When measured by signature and documentation, Ghana's response to climate change has been very proactive in terms of meeting external requirements of international architecture.

There are also significant efforts within Ghana to progress and align broader sustainable and economic development goals in line with national targets and international efforts and support. Ghana is the current host/ Chair of the SDG Summit Agenda, further demonstrating the country's commitment and leadership to play its part in the regional and international sustainable development agenda.

To date, limited availability of resources and focus on broader economic development has affected the country's capacity to fully address emissions reduction opportunities and respond effectively to the impacts of climate change. The resourcing need is both for funding and building capacity within government (and the private sector) to efficiently and effectively prioritize implementation of NDC commitments. The government has taken initial steps to facilitate leveraging of national financial resources, especially through REDD+, the Green Climate Fund and the Adaptation Fund, and by engaging with private sector-led SDG initiatives.

The latest UNFCCC reporting via the NC4 report highlights current operational constraints. The report helpfully provides information to support decision-making at all levels and to inform national-level sectoral policy. Importantly, it also identifies the need for and opportunities to strengthen capacity within the government at the national level, and address the need for ongoing improvements to coordination, climate activity tracking, data management and monitoring – all needed to inform and implement effective policies and NDC programmes and projects.

It is recognized that this report and the outlined finance strategy is contingent on the underlying NDC Implementation Plan. This plan identifies specific POAs in order to meet defined mitigation and adaptation targets. It should be noted that the finance strategy seeks to service the need of delivering this particular NDC Implementation Plan rather than necessarily addressing any broader economic or social advantage of advancing the ambitions and outreach of the defined NDCs.

It is noted, however, that through early engagement with sector leads compiling NDC planning and the rate of technology, economic and social change towards enabling a large-scale transition to a low-carbon economy, more could be done to advance and expand on current NDC planning. NC4 reporting also highlights the various constraints to facilitate comprehensive implementation. Given funding and capacity constraints, this may include needed prioritization over time of POA implementation.

The current update of the NDC Implementation Plan is opportune, particularly with opportunities now available due to the rapid advance and cost reduction of technologies facilitating the energy transition and increasing demonstration of innovations to finance and deliver broader SDGs.

2.3.2. Government structure

Ghana operates a local government system that seeks to decentralize development (administrative, political, planning and fiscal) to the subnational (regional and district) level. The country is subdivided into 16 administrative regions and 254 metropolitan/municipal/district assemblies (MMDAs) each headed by a chief executive. The National Development Planning Commission (NDPC) has a legal mandate to coordinate the entire national development planning system across all ministries, departments and agencies (MDAs), Regional Coordinating Councils (RCCs) and the MMDAs. Through this structure, the NDPC works with all MDAs, including MESTI, to integrate climate change issues into the national development plans. Also, the Ministry of Local Government and Rural Development (MLGRD) coordinates the operations of the MMDAs and the RCCs under the local governance Act 936.¹

The NDPC and Ministry of Finance will play a critical role in the transition to mainstream climate change issues into the national development plans and the mobilization of climate finance.

2.3.3. Oversight and coordination: Climate finance

MESTI is the lead institution for climate change. It coordinates all climate change activities in the country and has set up committees and working groups to support them on their mandate. This includes working with the EPA, which acts as the focal point of climate change activities and undertakes required climate change research and awareness creation across government.

MESTI hosts the National Climate Change Committee (NCCC), which has the mandate to review policies and programmes that will help the government to address climate change in the country (NCCP, 2014).

The participants that make up the NCCC are:

Ministry of Finance (MoF)	Ministry of Lands and Natural Resources (MLNR)
Energy Commission (EC)	National Development Planning Committee (NDPC)
Ministry of Energy (MoEn)	Environmental Protection Agency (EPA)
Ministry of Health (MoH)	Ministry of Food and Agriculture (MoFA)
Ministry of the Interior (Mol)	Forestry Commission (FC)
Ministry of Foreign Affairs (MFA)	Ghana Meteorological Agency (GMeT)
Parliament of Ghana (PoGH)	Research and academia – Institute of Statistical, Social and Economic Research, University of Ghana
Private Sector – Ecobank, Ghana	Civil society organizations

In making sure that climate-relevant investments are prioritized in sectoral and district budgets, the ministry issues budget guidelines for the MDAs and MMDAs to comply with. Then all the budgets are subject to a policy hearing to give the MDAs and MMDAs an opportunity to justify what they submitted. The Ministry of Finance uses the policy hearing process to prioritize budgetary items to best align with available budgets and the Medium-Term Development Plan. It is vital that integration of both budgets and implementation of POAs is fully integrated into national development planning to ensure committed domestic funding is tracked and leveraged wherever possible.

2.3.4. Policy commitment: Climate change

Climate change policies are captured in the Coordinated Programme of Economic and Social Development Policies (CPESDP) and the Medium-Term Development Policy Framework (MTDPF). The 31 adaptation and mitigation actions have been prioritized in the NDCs to the UNFCCC. All MDAs and MMDAs similarly reflect respective activities in their sector and district medium-term plans. Parallel to this, the National Climate Change Policy (NCCP, 2015–2020) and National Climate Change Adaptation Strategy (NCCAS, 2012) outline the critical measures for the realization of the medium-term climate protection outcomes.

2.3.5. Resource mobilization

The Government of Ghana has been proactive in including climate change in policy formulation across government. Some of the institutions have created climate change units to help address the issue:

- The Ministry of Finance created the Natural Resources, Environment and Climate Change Unit to provide financial guidelines to climate change actors, stakeholders and workers. The ministry offers financial advice on issues related to green economy, and it is the host secretariat of the Green Climate Fund (GCF).
- The Forestry Commission also created the REDD+ Unit as the focal point for the UNFCCC REDD+.
- The Energy Sector developed an inventory to promote green energy (solar, hydro, wind), focused on clean fuels and energy efficiency.
- The Ministry of Food and Agriculture developed the Climate-Smart and Food Security Action Plan.
- The Ghana Meteorological Agency observes the weather, analyses the changes in climate and generates climate information for various sectors.

As noted in this report and via government NC4 reporting, more still needs to be done to increase capacity-building and ensure alignment and prioritization of NDC implementation with social and economic development activity.

Funding institutions

The government has recognized that projected NDC investments have the potential to bring a substantial positive return on the economy, green jobs and SDGs, but effective policies and leadership will be needed to do so.

It is acknowledged that an over-reliance on grant financing is no longer a viable option because many development partners have shifted their overseas development assistance policy to favour trade and investment over grant funding. More fundamentally, with the broad scope of Ghana's NDCs, it would not be feasible to rely on grant financing. Financing Ghana's NDCs will require a careful blend of multiple financial instruments that look beyond grants and government's limited funds. There is no single source of funds that Ghana can easily access.

Steps that have been taken to address this need and opportunity include the following:

- Establishing climate trust funds with the intent to secure relevant international finance.
- Ghana has commenced the initial processes towards the establishment of the Ghana Green Fund (GGF). The German government (via GIZ) has supported the Ministry of Finance to develop draft legislation for the fund, which is awaiting government review and approval. The proposed fund aims to facilitate, co-finance and channel investments required to implement adopted environment and climate change policy and law, including investments in climate change adaptation and mitigation, waste management, industrial pollution and resource use, sustainable forestry, biodiversity and nature protection and sustainable transport, as well as other sectors covered by environmental and climate change policy.
- Ghana has also introduced a public-private joint initiative to establish SDG delivery and a green fund. The SDG Delivery Fund and Green Fund were established with private sector leadership in 2019 with a group of leading corporate partners to raise funds to support the implementation of the country's SDG programme. The private sector has the target of establishing an SDG Delivery Fund of \$100 million and a \$200-million Green Fund to complement the government's efforts at tackling climate change and funding the SDG implementation. The intention is for the fund to secure capital over five years from the corporate social responsibility (CSR) budgets of corporate members.
- Direct outreach to international sources of climate finance continues to be led by individual ministries and sector outreach. This includes funds such as: climate investment funds (CIFs), the Global Environment Facility (GEF) and the Green Climate Fund (GCF). In the context of total funding need, the funding from these sources will be limited. However, the early-stage capital of such funding is needed to catalyse other funding.
- Carbon pricing policy and green bonds are both being explored and piloted with a view to scale these where appropriate to deliver funding for both NDC and SDG objectives. The Ghana Climate Innovation Centre supports entrepreneurs and small and medium-sized enterprises (SMEs) to develop local climate-smart products and services.
- Similarly, climate-related engagement continues with individual funder/donor programmes, e.g., the EU is supporting projects relating to Green Business under the Africa Trust Fund and is also supporting Resilience Against Climate Change (REACH) and Civil Society Organisations in Research and Innovation for Sustainable Development (CSO RISE) projects.

2.4. Climate finance and policy context: Alignment of objectives

Considerable efforts internationally are engaged in exploring the most appropriate mix of macroeconomic and financial policy and financial instruments that can be utilized to best address the climate change challenge. The majority of activity has been focused on climate mitigation initiatives, an area where significant progress is now recognized. Efforts to fully address climate adaptation needs are now starting to progress but are not yet well recognized.

Ghana's NDCs provide potentially attractive investment opportunities to green the Ghanaian economy. This can bring a substantial positive return on the economy and jobs, while aligning with the SDGs.

To achieve the required funding leverage, it is acknowledged that there is not a single source of funds that can be easily accessed, and achieving leverage with needed private capital will, to a significant extent, depend on the commercial viability of funding propositions. For NDC implementation, funding will have to be sourced from a variety of funding and investment portfolios across the full spectrum of public funds, capital markets, bond markets, pension funds, institutional investors, impact funds, private investors, corporate investment and CSR budgets, and philanthropic funding. Donor funds are available, typically aligned to specific development and SDG impacts. For example, the EU provided grants to Ghana under the 11 European Development Fund (EDF), which are linked to sustainable agriculture, climate change and resilience. However, overreliance on grant funding is also no longer viable as many development partners have shifted their overseas development assistance policy towards trade and investment rather than grant funding. The impact of COVID-19 has also, in general, reduced the amount and availability of international donor funding, while donor countries assess the level and prioritization of their international aid commitments.

Some of the fiscal strategies Ghana can further develop are highlighted below.

Policy tools and alignment

There is evidence that fiscal policy tools such as taxes, subsidies and public investment should be utilized to deliver the co-benefits of climate change mitigation and securing low carbon public infrastructure. Effective implementation requires efficient interaction with broader market and government considerations. Political considerations are important drivers.

A significant allocation of the required NDC funding requirement has been committed by the Government of Ghana (27 percent). This strategy focuses on the ability to leverage these national public funding commitments to secure appropriate levels of international public funds and importantly, private investment. Both private and public international investment will be needed to support NDC implementation, as well as the associated longer-term transformation of the structure and relative price changes in the energy mix.

Aligning and truly integrating NDC policy, implementation and funding with the broader development activities, ambitions and policy of the country is needed to facilitate NDC and sustainable development ambitions.

This is not yet occurring at the level required, but additional capacity-building and need for alignment are acknowledged in the NC4 report. Credibility and reliability of managing NDC data, planning and actions are required to both inform policy decisions and secure the confidence of the full range of NDC stakeholders. Without this, the required integration with current parallel economic and social development agenda will remain challenged.

National development banks/climate trust funds: The need to optimize leverage

National Development banks (NDBs) and their governments are well placed to support the change needed and the realignment of financial flows to ensure that they support NDC implementation. The profile of funding required, with often high upfront capital needs and long payback periods, requires a patient source of finance. This financing is typically difficult to source for countries like Ghana, and if it is available, it can be prohibitively expensive.

There are a number of areas where NDBs can play a vital role with respect to low carbon climate-resilient development:

1. NDBs can have a dual function, as both public funders and mobilizers and facilitators of private finance for investment, e.g., mobilizing external public and private finance, informing policy and identifying and developing projects.

24 FINANCING STRATEGY REPORT

- 2. A clear 'green' mandate with full alignment and integration with policy frameworks is needed at both national and international level with associated engagement with and support of the local and international communities.
- 3. Sufficient capitalization is required to be able to operate at required scale. Accessing and supporting the development of local capital markets is also necessary and is required to overcome scale challenges.
- 4. The ability to access concessional international climate finance can be extremely valuable to support the scale required to catalyse external finance and also to develop and demonstrate commercial projects taking on early-stage investment risk.
- 5. Good governance is of course a prerequisite.

These issues are relevant whether there is one centralized NDB or decentralized development banks/funds with regional or specialized sectoral focus.

Climate trust funds: The Ghana Green Fund

The proposed Ghana Green Fund can play the role of a sector-focused NDB as discussed above. Importantly, the alignment and integration (where appropriate) of such a mandate with other development bank/climate finance activities will be critical to optimizing alignment, efficiency and allocation of resources. For example, the Ghana Infrastructure and Investment Fund has been established to focus and align efforts to catalyse external finance towards the infrastructure sector. EcoBank Ghana was designated as the domestic bank for GCF accreditation and is the only local accredited entity of the GCF.

SDG funding

Similarly, alignment with SDG policy and funding is important in order to achieve required common objectives. As referenced in '2.5: Domestic funding outlook', the public–private joint initiative to establish the SDG Delivery Fund and SDG Green Fund provides a good focus and example of the opportunity to increase collaborative efforts and to align and leverage common funding objectives and implementation outcomes.

SDGs and green bonds

The Ministry of Finance is initiating awareness and planning to enable the green and SDG bond market, which provides a related activity to access capital markets. Issuance of well-structured bonds by the government, state-owned entities and utilities, and corporate partners can be a positive enabler to achieving access to new required forms of capital. Implicit within this is the requirement and assumption that well-structured and 'bankable' projects are being prepared and developed for financing.

Bilateral and cooperative agreements (including Article 6 of the Paris Agreement)

As development partners shift their mode of engagement with Ghana from donor funding towards trade and investment, continued modes of partnership can be developed, including further alignment of sector focus development within both countries, which can facilitate technology transfer, trade and investments. Within this, funding and demonstrating the commercial development of new projects and innovation can in itself act as a catalyst for further engagement through market development.

With respect to the Paris Agreement, Article 6.2 enables Parties to cooperate with one another directly without using an international mechanism. For example, climate change mitigation activities can be implemented in one country and the resulting emission reductions can be transferred to another country and counted towards its

NDCs. Collaboration with Switzerland² under the National Clean Energy Access Programme provides a pilot for this. Thus, Ghana would achieve needed development activity and importantly a commercial demonstration, but the measured emissions reduction benefit in this case would be allocated to Switzerland's own NDC commitments.

Ghana would benefit from continued further assessment of carbon trading and related opportunities under Article 6.4 as these markets develop internationally.

2.5. Domestic funding outlook: Private sector

2.5.1. A needed source of funding

A total of \$22.6 billion is estimated for NDC implementation, out of which \$6.3 billion is expected to be mobilized locally within government up to 2030. This makes the achievement of the NDCs highly dependent on the performance and motivation of the private sector, alongside international public funds, to support climate change.

This calls for a comprehensive approach to use public domestic funds strategically to leverage private sector capital. The international funding outlook is increasingly uncertain, so strong engagement with the domestic financial sector will be critical to achieve Ghana's climate objectives.

SMEs have a significant role to play as they constitute 90 percent or more of businesses registered in the country and contribute about 70 percent of the GDP.

It is apparent that there is a huge opportunity to direct domestic finance and investment towards climatechange-related projects, business and services; and there is demonstrated initial intent from local industry and the financial services sector to overcome market challenges and engage with this. This willingness to work towards climate and SDG objectives needs to be channelled towards meeting targeted funding for NDC POAs. To do so, strong alignment and coordination of all key stakeholders is required with the supportive enabling environment to implement the POAs.

2.5.2. Barriers to address

Private sector engagement will significantly improve the availability of resources, including funding, to tackle the issues of climate change. However, there is still work to be done to transition both industry and the financial sector to become committed climate-friendly institutions engaging in practices that support the NDCs agenda.

Although general awareness of climate-related activities is growing, there is a **lack of awareness** of the NDC activities and commitments of the government under the Paris Agreement. This in turn makes it difficult for businesses to appreciate the role they need to play in meeting commitments and the opportunities that low carbon transition can present for green growth.

Secondly, there is a general **lack of technical expertise** within organizations to readily develop, implement or transact with climate-related business propositions.

Access to funding is the other key challenge that industry faces. A number of the financing institutions in the country are not yet fully engaged with climate change issues or have the suite of products and services required to service and enable this new market opportunity. This makes it difficult for industry to secure finance to implement climate-change-related projects.

² As of 23 November 2020, Switzerland and Ghana signed a full cooperation agreement to develop long-term bilateral implementation of climate protection activities, within the framework of the Paris Agreement.

2.5.3. Current activities

The interest of most local financiers in providing climate finance has grown significantly. While this could be seen previously as the role of public development finance and non-governmental organizations, the market has started to evolve to financial products and services of mainstream financial service sectors. Aligned with the international trend, investors are becoming particular about the importance of environmental, social and governance (ESG) issues in driving long-term sustainability. Most managers of public funds, such as bank, insurance and fund managers, have put together guiding principles to direct and control the operations of their members (e.g., principles of responsible investment, principles of sustainable insurance and principles of responsible banking), to ensure ESG issues are appropriately implemented in their work.

The rationale for organizations embracing sustainable financing is still varied, with continued work yet to be done to truly transition the financial services. Rationale includes growth and profit motivation, as most businesses are requesting sustainable products and services; regulatory requirements from authorities, such as central banks; pressure from investors to ensure their funds are put into sustainable projects; and moral consideration to do the right thing and be seen as doing so.

Development of sustainable banking principles

The Central Bank (Bank of Ghana), EPA and Ghana Association of Bankers came together in 2015 to work on Sustainable Banking Principles³ to help guide banks in supporting clients to meet their sustainability needs.

Led by a steering committee made up of representatives from the three institutions above, the guiding principles and sector-specific guidelines were launched in collaboration with the International Finance Corporation (IFC) and the Vice President on 27 November 2019. The following are the seven principles:

- 1. ESG risk management in bank business activities
- 2. ESG risk management in bank internal operations
- 3. Commitment to corporate governance and ethical standards
- 4. Commitment to promote gender equality
- 5. Commitment to promote financial inclusion
- 6. Commitment to promote resource efficiency and sustainable consumption and production
- 7. Commitment to measure and report on the implementation of the principles

These guiding principles are supported by sector-specific guidelines⁴ and ESG measures stipulated to guide practical implementation towards transitioning into a climate resilient economy.

All 23 commercial banks⁵ in the country and the Apex Bank (the lead bank for all rural banks in the country) have now signed off the principles and have therefore committed to adhering to them.

To support the implementation of the principles and growth of the market, local organizations continue to be identified that are supporting climate-related projects, with the intent to identify current market activity and to scope the size and specific sustainable financing needs that can be serviced by the banks.

³ https://www.bog.gov.gh/news/sustainable-banking-principles-and-sector-guidance-notes/

⁴ Sector-specific guidelines cover: agriculture and forestry; energy and power; manufacturing; construction and real estate; oil, gas and mining.

⁵ The 23 commercial banks in Ghana (March 2020) are: Absa Bank, Access Bank, Agricultural Development Bank of Ghana, Bank of Africa, CalBank, Consolidated Bank, EcoBank, FBN Bank, Fidelity Bank, First Atlantic Bank, First National Bank, GCB Bank, Guaranty Trust Bank, National Investment Bank, OmniBSIC Bank, Prudential Bank, Republic Bank, Société Générale, Stanbic Bank, Standard Chartered Bank, United Bank for Africa, Universal Merchant Bank and Zenith Bank.

Development of the private sector: Green/sustainable/climate finance

There is an emerging sustainable finance capacity within the financial service sector. A number of financial service providers have been actively engaging with early development of the climate finance markets in Ghana. The profiles of some institutions that are currently financing projects are highlighted in Appendix 2. In financing such projects, these institutions are starting to catalyse engagement with the NDC agenda in the country.

Profiles of financial institutions in Appendix 2 include:

SME support	SME support and DFI	Commercial banks
Wangara Green Ventures	Grofin Ghana Limited	Ecobank, Ghana
Investisseurs & Partenaires (I&P)	Camco Clean Energy	Stanbic Bank
Injaro	Norfund	Absa Bank
AV Ventures		Cal Bank

UNDP/Deloitte analysis provides a further assessment of private sector investment potential in the energy sector. This includes the Ghana NDC Private Sector Engagement Project, engaging private sector in NDC implementation.⁶ The acceptance of climate finance in a number of commercial banks is encouraging with the initiation of sustainable banking principles. This provides the opportunity to build engagement towards financing well developed bankable projects within the NDC POAs by local banks and investors. The profiles of some early adopters are captured in Appendix 2, but ultimately all commercial banks from 2021 will be supporting climate finance based on the requirement of the Sustainable Banking Principles.

The private sector-led SDG Delivery Fund and Green Fund – highlighted previously and detailed in Appendix 2 – is in the process of being operationalized. This is significant in intent and scale and provides a meaningful demonstration of support for Ghana country needs and ambitions with respect to NDC and SDG delivery.

2.6.4. Financing instruments

Debt, equity and grants⁷ are the most common types of financing instruments being used by commercial banks in the climate finance sector in the country.

The difference to 'traditional' finance is in how the finance can be used rather than the types of financing instruments. Typically, finance dedicated to 'green projects' supports SMEs to specifically mitigate climate change, reduce their environmental footprint or become more climate resilient. Green finance in this regard can be defined as any financial initiative, process, product or service that is either designed to protect the natural environment or to manage how the environment impacts finance and investment.

⁶ Assessment of private sector investment potential in the energy sector.

⁷ Refer to Appendices for description of standard financing instruments.

CHAPTER 3 NDC ANALYSIS

3.1. NDC implementation plans

3.1.1. Commitments, implementation process and timing

The Government of Ghana has made commitments in its NDCs that cover both mitigation and adaptation steps. Mitigation and adaptation were built into the NDCs in accordance with medium-term national development planning (Ghana Shared Growth Development Agenda II – GSGDA 2),⁸ an anticipated 40-year structural socioeconomic plan and common goals for sustainable development. In all, 20 mitigation and 11 adaptation POAs are planned for deployment in seven target economic sectors over the 10-year timeframe (2020–2030).

It should be noted that the existing NDC commitments were compiled at a relatively early stage of national coordination in line with timings and international collaboration towards the Paris Agreement. Current work towards NC4 reporting has highlighted the complexity of fully aligning and integrating: (1) NDC planning and implementation with ongoing sector developments and budgeting, and (2) the overall management and coordination of data specifically relating to NDC commitments. Hence, it may be expected that current planning, prioritization and POAs may be refined going forward.

3.1.2. Financing and resourcing need

The 31 NDC POAs in Ghana require a total of \$22.6 billion in domestic and foreign public and private funding to implement these initiatives in the 10-year period. Domestic public sources have budgeted for \$6.3 billion, while private and international public support is expected to generate the balance required of \$16.3 billion.

Of \$22.6 billion in investments, the mitigation actions are expected to require \$9.81 billion (representing 45 percent of total funding need), while \$12.79 billion will be needed for actions relating to adaptation.

Mitigation

The total implementation cost for the 20 mitigation POAs over the 10 years (2020–2030) is \$9.81 billion. Ghana will raise \$2.02 billion to fund unconditional NDCs (21 percent of the total investments), and the 18 remaining mitigation actions will require a further \$7.79 billion to be secured.

Adaptation

Ghana will mobilize \$4.21 billion (34 percent) at domestic level for adaptation and is seeking the remaining \$8.29 billion from international sources to cover the remaining cost.

3.1.3. Overview and background: Mitigation and adaptation

Mitigation

Ghana has developed broad socioeconomic strategies over time that achieve long-term GHG mitigation outcomes. The mitigation measures within the NDC cover the following areas:

- Low carbon electricity supply
- Scaling up renewable energy
- Clean cooking and lighting
- Electric mobility and rail transit
- Lowering deforestation and restoration of degraded areas
- Energy efficiency in households, commerce and industry
- Innovative waste management
- Hydrofluorocarbon (HFC) phase-down
- Natural gas recovery and utilization and no flaring

The expected cumulative effects of the policies and measures are estimated to lead to a 45 percent reduction of business-as-usual GHG emissions of 74 million tons by 2030. In all, the mitigation target translates into 33 million tons over 14 years (2016–2030).

Although dominated by activities in the energy sector, mitigation efforts cut across different ministries, requiring cross-government coordination.

A number of the POAs are existing activities within respective ministry development programmes or are already progressing through pilot phases and into full implementation. The level of new invention in these cases is obviously more nuanced. Significant effort is still required to further develop and convert other new POAs into bankable propositions and to structure existing POAs already in development into propositions that are attractive and aligned to third-party funding and/or investment.

Due to the current market conditions in the energy sector and the hold on issuing any new independent power producer (IPP) licenses, the approach to progress IPP-related mitigation POAs needs specific attention.

Following review of available data and including the NC4 report and in consultation with the EPA, the focus of the strategy has been refined to concentrate on five sectors and specific NDC POAs within these sector perspectives: Energy (Renewable), Transport, Water (Waste), Agriculture and Forestry (REDD+).

The list of mitigation-related POAs under consideration is as follows:

Energy sector – renewable penetration			
1	Hydro-electricity (install 300 MW connected to grid)	Conditional	
2	Wind – utility (install 150 MW by 2030)	Conditional	
3	Solar – utility (install 250-MW utility scale by 2030)	Conditional	
4	Solar – buildings/rooftop (install 200,000 systems by 2030)	Conditional	
5	Mini-grids (install 55 300 MW mini-grids by 2030)	Conditional	
6	Solar – lanterns (2 million LED lamps by 2030)	Conditional	

Energy sector – clean cooking				
7	Liquid petroleum gas (LPG) usage – 50% (domestic LPG access at 50% by 2030)	Conditional		
8	Cookstoves (distribute 2 million efficient stoves by 2030)	Conditional		
Energy sector – energy efficiency				
12	Efficient LED lighting (install 7 million LED bulbs)	Unconditional		
13	Efficient refrigeration	Unconditional		
14	Power factor correction (installation of power banks in 1,000 buildings)	Conditional		
Forestry sector – REDD+ Strategy				
15/16	Cocoa/shea REDD+ (avoid deforestation in 270,000 ha)	Conditional		
18	Forest plantation (annual 25,000 ha forest plantation)	Unconditional		
Transport sector				
21/22	Rapid transit systems – bus and rail (200 km bus rapid transit (BRT) line in urban areas)	Conditional		
Waste (water) sector				
23	Waste collection – landfill gas (200 t/day facility nationwide)	Conditional		
24	Waste composting (requirement for 20% by 2015 and 30% by 2040)	Conditional		
25	Biogas plants (200 institutional facilities)	Conditional		

Adaptation

Ghana's adaptation goal is to increase climate resilience and decrease vulnerability for enhanced sustainable development. In the same context as the mitigation goals, in the last decade Ghana's climate change efforts have focused on putting in place suitable policy conditions. The NDCs address specific adaptation-related POAs and form part of Ghana's wider review and planning of adaptation needs.

The NDC commitment is anchored on Ghana's National Climate Change Policy (2012), Low Carbon Development Strategy (2015) and ratification of the Paris Agreement in 2016. These are also designed to align with the Medium-Term Development Policy Framework, including the Ghana Shared Growth Development Agenda 1 and 2 – GSGDA II.⁹

As outlined in the NDC and NC4 report, many national policies, laws and regulations are intended to support implementation in the first 10-year period and beyond with the possibility of mid-term review in 2025.

Key actions stipulated in the NDCs include:

- Resilience-building in vulnerable areas
- Agricultural landscapes
- Value-addition-based utilization of forest resources
- City-wide resilient infrastructure planning
- Early warning and disaster prevention
- Managing climate-induced health risks
- Integrated water resources management
- Resilience for vulnerable groups

The ongoing annual cost of adaptation is \$127.9 million. This equates to 2.9 percent of GDP, or \$42.8 billion (World Bank, 2016). The estimated annual domestic contribution is \$42 million, and therefore the estimated annual international support required is \$85.9 million.

It is expected that \$12.79 billion will be needed for targeted NDC POAs relating to adaptation. Ghana has budgeted to cover \$4.21 billion (34 percent) of domestic funding and will be seeking the remaining \$8.29 billion from international public sources and the private sector where feasible to cover the remaining cost.

National adaptation planning: As reported in the NC4 report, in parallel with NDC implementation, Ghana has initiated steps to undergo national adaptation planning (NAP) and is working with the United Nations Environment Programme to progress and secure funding for this.

Ghana's NAP aims to provide the enabling framework for the planning and implementation of adaptation actions highlighted in the National Climate Change Policy (NCCP),¹⁰ National Climate Change Adaptation Strategy (NCCAS)¹¹ and NDCs, all within the context of sustainable development. The specific stated objectives of the NAP framework are to:

- Clarify Ghana's approach to its NAP process. This includes an articulation of the country's vision of climate change adaptation, its adaptation objectives and principles, the roles played by stakeholders within the national government and priority adaptation actions to be undertaken. It also provides a reference point for bringing together various adaptation planning efforts from different sectors, subnational structures and scales of decision-making.
- Align the NAP process with existing policies, strategies and adaptation research.
- Identify specific themes that are particularly relevant and unique to the country context.
- Serve as a basis for stakeholder engagement.

This NAP will provide important context for NDC POA implementation and financing. The NAP process includes facilitating private sector involvement. The Private Investment for Enhanced Resilience¹² project has selected Ghana to provide technical assistance. This support is proposed to focus on the NDC Private Sector Strategy, private sector engagement, and integrating climate risk into portfolio management by the private banks.

The challenge to finance adaptation activity with third-party resources and at the scale required for NDC implementation is significant. The level of climate finance currently invested in adaptation globally has been limited. Traditional financial risk return investment models do not typically value the wider social and environmental outcome and benefits of adaptation activities. Although the climate financial sector is increasingly exploring the opportunity to address adaptation finance via new and innovative financing approaches, the funding needs of NDC adaptation POAs should prudently build from the initial expectation that the majority of funding needs to be met by the public sector.

Additional technical assistance support, such as the Private Investment for Enhanced Resilience programme, is likely to be required to further assess and explore options to catalyse both international public funding and private sector involvement.

¹⁰ Ministry of Environment, Science and Technology (MESTI), Republic of Ghana. 2014. Ghana National Climate Change Policy. Available at: https://s3.amazonaws.com/ndpc-static/CACHES/NEWS/2015/07/22//Ghana+Climate+Change+Policy.pdf

¹¹ UN Environment and UNDP. 2012. National Climate Change Adaptation Strategy. CC DARE. Available at: https://s3.amazonaws. com/ndpcstatic/CACHES/PUBLICATIONS/2016/04/16/Ghana_national_climate_change_adaptation_strategy_nccas.pdf

¹² https://winrock.org/wp-content/uploads/2017/10/PIER-Year-2-Handout_Dec-2018.pdf



Summary of adaptation Programmes of Action (as per the NDC Implementation Plan)

Source: Multi-sectoral Implementation Plan for Ghana's NDCs (2019)

3.1.4. NDC NC4 report and update: Implications for financing strategy

The recently published NC4 report to the UNFCCC provides an update of the activity under way to progress NDC implementation.

Via NC4 reporting and during the compilation of this financing strategy, it is acknowledged that additional work is needed to update and detail the ongoing POAs and proposed NDC implementation plans. In particular, the details of underlying POAs are needed. This data needs to be prepared in a structured form in order to assess and develop specific POA financing mechanisms to meet the expectations of international public funds and private finance. This is particularly the case where POAs are currently or have been implemented to some extent. The up-to-date context is vital to structure credible overarching financing strategies or specific POA financing mechanisms.

An exercise is also under way to review and update the NDC Implementation Plan. Modifications are likely to impact the proposed financing strategy.

Capacity constraints

The NC4 report acknowledges that work (and funding) is needed to improve, develop and coordinate internal technical capabilities and capacity to manage efficient climate actions, communications and reporting. This was emphasized during the preparation of the finance strategy and the lack of readily available data to undertake required analysis to best inform strategy.

The NC4 report highlighted some of the significant areas that need to be addressed:

- Difficulty in tracking climate financial inflows: Several organizations in the country receive climate funding from multiple sources that do not pass through the Ministry of Finance. Consequently, it becomes difficult to coordinate and target climate inflow to the priority areas where they are needed most. The Ministry of Finance and the EPA are implementing a national climate finance tracking tool that would sufficiently track all climate support expenditure from the Ghana government and donors.
- Duplication of activities and funding: Weak institutional coordination within government and among donors leads to duplication of intervention; and in most cases, resources are not applied to where they are

needed. In Ghana, regular sharing of information among donors is already paying off in building synergies and avoiding duplications.

- Mislabelling climate finance: There are institutions in Ghana that receive development support without knowing that it flows from international climate funds. Not being able to correctly categorize such financial flows can affect the accounting of climate finance.
- Lack of transparency on reporting on non-financial support for training and technical assistance: It is difficult to monitor and report non-monetary support. Many institutions receive training and technical assistance support from donors without financial disclosure because the source of funding is part of the global budget. When this situation arises, it becomes difficult to report because the recipient organization does not have full access to the funding and accounting information.
- Inadequate financial allocation in the national budget: Funding for climate change activities, including preparation of national communication, is mostly donor driven and project based. Domestic financing of climate change activities is difficult to estimate over a given time frame. This is because in the national budget, there is no clear demarcation of climate expenditure items, and this has led to challenges in tracking actual expenditures during the implementation of climate change activities and programmes. The Ministry of Finance is collaborating with the Institute of Statistical, Social and Economic Research to undertake climate public expenditure and institutional review, which is expected to streamline how climate change expenditure issues are addressed.

Ghana is planning through the Ministry of Finance and the EPA to implement an efficient tracking and disclosure database system to capture finance inflows and use. The intention is to secure additional external funding to build technical capacity to efficiently and credibly carry out climate actions, communications and reporting.

The importance of the credibility and reliability of this data management, analysis and communication is acknowledged via the NC4 report as being vital to policymaking. This is similarly also critically required to achieve necessary stakeholder support and commitment to align NDC implementation with broader development priorities. Both of these are in turn vital to the implementation of any financing strategy.

3.2. Sector analysis: Modified

Following review of available data, including the NC4 report, and in consultation with the EPA, the strategy's focus has been refined to concentrate on specific NDC POAs within the following five sector perspectives:

- 1. Energy (renewable) sector
- 2. Forestry (REDD+) sector
- 3. Transport sector
- 4. Water and waste sector
- 5. Agriculture sector

A summary of the sectors is provided below with a fuller review of the conditional POAs provided in Appendix 4.

Energy sector – renewable penetration				
1	Hydro-electricity	Conditional		
2	Wind – utility	Conditional		
3	Solar – utility	Conditional		
4	Solar – buildings/rooftops	Conditional		
5	Mini-grids	Conditional		
6	Solar – lanterns	Conditional		
Energy sector – clean cooking				
7	LPG usage – 50%	Conditional		
8	Cookstoves	Conditional		
Energy sector – energy efficiency				
12	Efficient LED lighting	Unconditional		
13	Efficient refrigeration	Unconditional		
14	Power factor correction	Conditional		
Forestry sector – REDD+ Strategy				
15	Cocoa REDD+	Conditional		
16	Shea landscape REDD+	Conditional		
17	Wildfire management	Conditional		
18	Forest plantation	Unconditional		
19	Enrichment planting	Conditional		

Environment Protection HFC phase down - air-20 Conditional conditioning **Transport sector** 21 Bus rapid transit Conditional Conditional 22 Rail transit system Waste (water) sector 23 Waste collection - landfill gas Conditional 24 Waste composting Conditional 25 **Biogas** plants Conditional Agriculture Sector 26 CSA - 54 districts Unconditional CSA fish and livestock 27 Unconditional productivity 28 Innovation post harvest process Unconditional Water Sector 29 Access to water Conditional

The list of POAs under consideration covering these five sectors is as follows:

3.2.1. Proposed cost analysis and financing strategy formulation

Undertaking comprehensive analysis of cost and specific funding needs of the NDC POAs with available data has not been feasible.

Appendix 4 provides an analysis of POAs based on available data and comparable or equivalent international precedent.

Where reasonable market comparisons could be made, cost forecasts are within expected broad ranges against international precedent. However, ongoing POA and project-specific circumstances need to be considered.

The critical element with respect to the fundability of POAs and related financing strategy formulation is thorough and detailed project preparation, based on real data, of the current status and assessment of the technical and financial viability of a project or POA. Through a development phase, financial and technical feasibility is then detailed, development risks and barriers to implementation are mitigated and financing mechanisms are structured – including tailored risk mitigating instruments where necessary and appropriate. The resulting 'bankable' project or POA then becomes viable for third-party financing. Various ongoing POAs have wider market and supply chain development aspects included as well, which requires additional considerations, e.g., developing local manufacturing capability and capacity.

3.2.2. Energy sector

Ghana derives electricity primarily from fossil fuels, biomass, hydropower and solar resources. Fossil fuel (oil and natural gas) accounted for the highest share of final electricity supply, totalling 58 percent in 2018, with expected increased percentages through 2019 and 2020. There is significant excess generation capacity, in which supply
is committed via contractual terms with IPPs. This presents significant complications for any transition to low and lower carbon generation capacity.

Any assessment and prioritization of proposed NDC POAs, in particular with respect to proposed new gridconnected renewable energy generation capacity and proposed efficiencies to operations of fossil fuel generation, need to be reassessed against the current excess supply and commercial situation and with ongoing negotiations to resolve this position.

Programmes of Action

There are 11 POAs in the energy sector. Seven of these POAs, indicated below, may fall outside of direct interface with fossil fuel and grid-connected electricity supply, as noted above.

In general terms, these POAs are privately financeable in Ghana and other areas with blended finance transactions. Private capital will participate as long as appropriate levels of project preparation have been achieved (bankable projects), a supportive enabling environment is in place and alignment of risk and return (financial and impact) is achieved. As renewable energy technology costs continue to fall, related projects are becoming increasingly commercially attractive.

However, the reality is that implementation of these POAs remains difficult and constrained with ongoing oversupply from existing generating capacity. New development is constrained by a combination of a moratorium on electricity supply licensing, effectiveness and efficiency of the enabling environment and lack of private sector confidence to develop and finance new development.

ENERGY SECTOR - UNCONDITIONAL COMMITMENTS:

POA 12 – Promote efficient lighting with LED bulbs POA 13 – Scale up adoption of efficient refrigeration

The above ongoing programmes reinitiate rebate schemes to exchange old inefficient refrigeration units for new ones and to replace incandescent light bulbs with LEDs.

ENERGY SECTOR - CONDITIONAL COMMITMENTS:

POA 4 – Install 200,000 solar home systems (rooftop 50 kW solar programme) An ongoing and active programme since its 2017 pilot. A capital subsidy is provided covering the cost of the 50 kW panel.

POA 5 - Establish 55 mini-grids with average capacity of 40 kW

An ongoing and active programme since 2016/2017. Costed and supported under the Scaling-Up Renewable Energy Program in Low Income Countries (SREP) programme¹³ with defined implementation strategies and support mechanisms.

POA 6 – Increase rural solar lantern penetration

This is a longstanding programme with a target to distribute 2,000,000 lanterns by 2030, replacing kerosene. The programme aim is also to support development of supply chain activity. The nationally high budget allocation of \$300 million for 2,000,000 lanterns needs verification.

POA 7 – Scale up the adoption of LPG use (cooking) in at least 50 percent of households; promote LPG and shift to cleaner fuel

An ongoing programme. Costing needs further verification. Assessment against NDC update and potential for additional measures/applications for increased LPG use. NC4 assumption of 80 percent consumer cost, 20 percent public support.

POA 8 – Scale up access and adoption of 2 million efficient cookstoves

An active programme. Over 1.2 million cookstoves have been distributed to date. Ongoing barriers to access appropriate finance but set against active and innovative market subsector. NC4 assumption of 70 percent consumer cost, 30 percent public support.

Electricity sector context (take-or-pay contracts)

Electricity generation and the proposed increase in renewable power production form a significant element of Ghana NDC priority POAs.

Promotion of such renewable energy generation projects, and in particular POA 1 – hydro, POA 2 – wind and POA 3 – solar technology, is well aligned with international trends and the now very attractive pricing that can be secured for these technologies. With the right policy framework typically managed via procurement programmes or auctions committing to long-term power purchase agreements (PPAs), which provide contractual certainty to private sector developers and financiers, such projects are now typically readily financeable by the private sector.

The Renewable Energy Master Plan¹⁴ along with complementary policy frameworks provides a sound basis for delivery of the relevant NDC POAs.

However, despite this intent, the current situation in the energy sector provides a significant barrier to enabling these projects. Of particular concern is the confidence of investors (both international and domestic) to engage with grid-tied power projects with such uncertainty of policy and the enabling environment. The government is currently committed to a portfolio of IPP 'take-or-pay' contracts while also facing a surplus of energy supply. With this situation, the Energy Commission has suspended the issuance of wholesale electricity supply licenses and permits, which includes proposed NDC utility-scale solar photovoltaic (PV) or wind plants. Due to the ongoing cost being incurred to the government against these take-or-pay contracts, the Ministry of Energy also has an ongoing programme to renegotiate the IPP contracts.

Under normal circumstances, investors in the previous round of IPP contracts would be the same or similar to those who may be attracted to now invest in a new renewable energy programme. With over 40 existing IPP contracts and multiple parties in each, the number of stakeholders associated with this issue is significant. Consultation with some investors revealed that they feel they already have enough exposure to Ghana and the energy sector.

It remains unclear who would finance new power projects on commercial terms, and it is unlikely that the Ministry of Energy will be able to progress with a private finance-driven renewable programme before this situation is fully resolved. It is noted that some current development of projects continues via the Volta River Authority (VRA; www.vra.com), the main generator and supplier of electricity in Ghana and a state-owned utility.

3.2.3. Forestry sector

The forestry sector is one of the most important sectors of the Ghanaian economy. It is a source of job creation, income for local communities, foreign exchange through timber product export and environmental protection.

Ghana has adopted the National REDD+ Strategy¹⁵ and the Ghana Forest Plantation Strategy.¹⁶ The REDD+ Strategy seeks to reduce carbon emissions from deforestation and forest degradation and enhance carbon sequestration and climate resilience through sustainable forest management and forest restoration strategies. The overall goal of the Forest Plantation Strategy is to achieve a sustainable supply of planted forest goods and services to deliver a range of economic, social and environmental benefits.

The NDC policy action is to promote sustainable utilization of forest resources through REDD+, with the goal of reducing deforestation and strengthening ecological restoration.

Programmes of Action

The NDC Implementation Plan defines five POAs that sit within the broader REDD+ and Forest Plantation strategies, budgets and investment plans.

The Forest Plantation Strategy is included with the government's unconditional commitment to progress this. The overall REDD+ Strategy is further developed through a separate investment strategy and plan, under which the NDC POAs sit.

FORESTRY SECTOR - CONDITIONAL COMMITMENTS:

POA 15 – Ghana cocoa forest REDD+ programme

Promotion of climate-smart cocoa production approaches, including intensification of yield enhancement, resulting in improved forest conservation, sustainable cocoa yield, livelihood improvements and reduced emissions.

POA 16 and POA 17 - Ghana shea landscape REDD+

Restoration of savannah forests and woodlands to be developed under self-financing community management. Restoration of shea parklands. Development of new plantations in degraded reserves. Enhanced monitoring and management systems, including wildfire management.

FORESTRY SECTOR - UNCONDITIONAL COMMITMENTS:

POA 18 – National forest plantation development programme (NFPDF)

Development of a sustainable timber resource base that will satisfy future demand for industrial timber and enhance environmental quality, relieving pressure on the natural forest and increasing forest cover. The NFPDF is a public–private joint programme targeting degraded lands. The programme is strongly anchored in the 2016–2040 Ghana Forest Plantation Strategy.

It should be noted that the ongoing development of the Ghana REDD+ implementation and investment planning supersedes and includes NDC implementation planning.

15 https://www.fcghana.org/userfiles/files/REDD%2B/Ghana%20REDD%2B%20Strategy.pdf

16 https://fcghana.org/userfiles/files/Plantation%20Annual%20Report/ghana%20forest%20plantation%20strategy.pdf

3.2.4. Transport sector

Ghana's transport sector covers air, maritime, inland waterways, rail and road transport, all of which contribute 17 percent of the country's total GHG emissions. The current NDC Implementation Plan is limited in scope to provide options to address inter- and intracity transportation via two POAs: the compressed natural gas (CNG) bus for road and expanded rail transit programmes. Ongoing activity, as indicated in NC4 reporting, also provides for additional introduction of electric vehicle initiatives, which follows growing international trends.

Programmes of Action

Two POAs are conditional commitments involving the expansion of inter- and intracity transportation modes. Both programmes are long-planned activities with ongoing development and implementation.

POA 21 – Bus rapid transit

Proposed pilot implementation of a mass transit bus scheme. Infrastructure development and fleet plus control systems required. Detailed data and further development required for any cost analysis. Clear requirement for continued and increased project preparation. Proposed bus system to be run on compressed natural gas technologies – NDC 2019. It could be assumed that a cost comparison with electric vehicles would be beneficial. NC4 assumption of 70–80 percent public investment support (for infrastructure) and 20–30 percent private investment (for vehicles).

POA 22 - Railway transit system

Proposed +\$1-billion upgrade to both freight (mining) and urban passenger systems. Early stage of development requiring additional details to assess or verify costing or emissions benefit.

3.2.5. Waste and water sectors

Solid waste and wastewater management pose major challenges in most cities in Ghana and contribute 7.5 percent of the country's total GHG emissions. The focus of NDC implementation plans is to support and increase ongoing efforts to improve landfill and biological treatment of waste, which are the country's major technologies for final waste disposal.

Ghana is endowed with freshwater resources, but availability varies by season, and distribution within the country is not uniform. NDC implementation for the water sector aligns strongly with key sector policies¹⁷ covering key areas of water resource management and water supply. The single water sector POA is aligned with key development initiatives to provide access to adequate, safe, affordable and reliable water throughout the year for all, with a focus on the 20 percent of the population living in climate-risk communities.

¹⁷ National Water Policy (NWP), the Water Sector Strategic Development Plan (WSSDP), the Ghana Water Vision 2025, the National Integrated Water Resources Management (IWRM) Plan, the National Riparian Buffer Zone Policy, and the National Community Water and Sanitation Programme (NCWSP) Strategy.

Programmes of Action

Three POAs are proposed from the waste sector and one from the water sector. All of these are conditional commitments, which are long-planned activities with ongoing development and implementation.

POA 23 – Methane recovery from landfilled urban solid waste

Development of new waste transfer stations with gas capture and utilization facility constructed. Additional market development to improve effectiveness of waste collection. No budget estimates in NDC Plan 2019. An estimated \$0.51 billion included in NC4 report. Assumption of 30 percent public investment to 70 percent private capital cost. Strong international precedent for implementation and CO₂ savings; however, financial and operational viability in local context requires evaluation.

POA 24 – Increase waste to compost capacity

No budget estimate provided in either the NDC Plan 2019 or NC4 report. However, feasible international market precedent typically requires established compost end-use market as well as established and efficient waste disposal regulation and fee structure.

POA 25 – Scale up biogas capacity

Budget estimate increased from NDC Plan 2019 (\$50 million) to NC4 2020 report (\$110 million). Insufficient details available to verify costing. Sound international precedent for market opportunity. Operations and maintenance considerations are important, including long-term consistent quantity availability and quality of feedstock. Assumed in NC4 is that 55 percent public finance (via a rebate) will be required alongside 45 percent private finance. Ongoing development of the POA is required with additional details needed to assess or verify costing.

POA 29 – Integrated water resources management – large scale programme to strengthen and improve access to water supply in (climate) water-stressed locations

Indicative budget of +\$2.27 billion provided. Covers urban and rural supply services and associated water resource management. Insufficient data to provide credible cost analysis. As presented, this POA will have limited opportunity to leverage private funding but does provide significant societal value. Full assessment can be made through the project design and development phase to explore cross-sector synergies and appropriate project and programme structuring to explore alternative funding solutions and viability.

3.2.6. Agriculture sector

Ghana's agriculture is natural resource-based, with extensive crop and livestock production systems, hunting, rain-fed agriculture and fishing from natural water bodies. There is an ongoing need to improve and modernize production and processing and improve efficiency of value chains. Climate change impacts can intensify the challenges facing the sector and impede the ability of the country to achieve its food security agenda. The NDC policy action for the sector emphasizes the need to build resilient agriculture in vulnerable landscapes that can respond to the country's development needs and also withstand future climate shocks.

Programmes of Action

Three Programmes of Action are proposed from the agriculture sector. All of these are unconditional commitments, which are long-planned activities with ongoing development and implementation.

POA 26 – Adoption of community-based conservation/climate-smart agriculture Promote and demonstrate sustainable agricultural practices and improve water and soil management. We are unable to verify costing given the level of detail available. The budgeted cost of +\$250 million over +54 regions over a multi-year (5–10 years) programme provides for an indicative spend of approximately \$500,000–1 million per year per district.

POA 27 – Increase use of climate-smart technologies to improve fishery and livestock productivity by 10 percent

Broadbased market development activity for fish farming and small-scale livestock. Budgeted costing of +\$2 billion.

POA 28 – Promote innovations in post-harvest storage and food processing and forest products (across 54 regions)

Provide storage and agroprocessing capability and capacity-building alongside broader market and supply chain development. Budget of \$467 million.

CHAPTER 4

FINANCING STRATEGY CONSIDERATIONS AND FRAMEWORK

4.1. Considerations of financing strategy

Securing significant leverage of private and international public funding against the government commitments is an imperative for and the focus of an NDC financing strategy.

The requirements, opportunities and barriers around attracting private and international finance for the NDC Implementation Plan need to be considered, i.e.: the diversity of proposed NDC POAs and corresponding nature of funding needed, an appreciation of the current activity and stage of development of each POA and an understanding of climate finance and policy mechanisms available, as well as the current Ghana context for such investment leverage. A framework for a proposed financing strategy is outlined in Section 10.

4.1.1. Investment gap and enabling environment: Nature of funding required

The defined POAs cover a diverse range of activities and use of funds – from large project and infrastructure investments, to supporting small, medium and micro enterprises to fund energy access, to capacity-building and market development programmes, etc. This covers a wide range of funding profiles, from vital public social service provision to full commercial investment opportunities. There is a growing portfolio of public and private funders to engage with who have an objective to deliver across the range of climate, sustainable development and impact outcomes, as well as those seeking to either catalyse or deliver commercial investment returns. However, the level of funding required is significant, and the risk profile of funding objectives remains high.

The ability to attract funding will be dictated by the opportunity to successfully package and segment individual projects and portfolios of projects, or their overarching programmes, to funders and investors with appreciation of the risk and reward profiles presented, as well as alignment with the strategic impact the POAs will deliver.

Ghana's NDC investment gap of \$16.3 billion is dwarfed by the estimated total annual infrastructure funding gap across emerging economies of \$2.5 trillion (OECD) but a material amount when compared to the levels of official development assistance (ODA) levels of \$142.6 billion provided (OECD, 2016). 'Competition' for the different forms of NDC funding between countries and against a multitude of sustainable development financing needs is high. With the current COVID-19 pandemic and resulting economic uncertainty both in developed and developing countries, this 'competition' will have increased further.

The funding available from donors and other providers of risk capital and concessionary finance is much needed to crowd in other forms of capital and secure the needed leverage to meet the identified investment gap.

Instruments that can be leveraged to attract and de-risk private investment include guarantee funds, blended finance, grants, public–private partnership (PPP) arrangements and risk-sharing mechanisms, including innovative insurance products.

Commercial banks will normally not invest in an untested and cash flow-free project. Thorough project design and preparation as well as additional sources of funds should be targeted to support the generation of the cash flows needed to attract investment by commercial banks. A condition for generating private sector interest in the NDCs is to build their capacity and awareness of overall objectives and available opportunities, which clearly illustrate both the potential revenue generation streams and the strategic focus and intended impact of investments. This will, in turn, also support the creation and management of bankable investment opportunities as well as an established enabling environment for effective NDC implementation.

The first step required, however, is to provide and maintain an encouraging macroeconomic and business enabling environment, including ongoing and increased awareness and focus on NDC (and SDG) plans and activities. Recent assessment of private sector investment potential in the energy sector provides an overview of this current business environment.¹⁸ The second step is to prepare and motivate the preparation of bankable projects and investment opportunities. The diverse range of actions being addressed also covers areas where commercial finance will not be (immediately) available so approaches need to be implemented to secure leverage of additional public or concessionary funds to ensure achievable implementation.

4.1.2. Project preparation and investment readiness: Preparing bankable projects

All infrastructure development across the continent that is able to attract commercial funding faces challenges, which to varying degrees are relevant to Ghana NDC plans as well. A few of the challenges are: limited availability of commercially viable projects; insufficient strength of institutional structure; political sensitivities around energy and water; lack of transparency; 'spoiled market' due to donor interventions; lack of familiarity with private players, private funding and private contract structures; various operational impediments of public companies; not-cost reflective tariffs; weak tariff collection; non-revenue services provision; and inefficiencies in administration.

The scope and scale of NDC POAs provides additional complexity to that of traditional infrastructure sectors, which demands a broader outlook to the development of bankable projects. Largely due to the challenges highlighted, there is no easy access to finance, particularly from private capital markets, for developing and financing early-stage development of projects and business cases.

Mitigation projects, particularly energy and transport, have commercial precedent, which with appropriate policy incentives and enabling environment can lead to commercial market development. This is evidenced in the international renewable energy market where commercial developers have stepped forward to both develop and finance activity.

Adaptation POAs and projects that do not have commercial precedent or are not financially viable, but serve an important public service, are more difficult to fund directly, as is project/programme preparation; e.g., water and sanitation infrastructure need long-term local currency financing whilst finance, when available, is mostly short term. Projects and their sponsors and/or off-takers may not be sufficiently creditworthy, and possible guarantees are often not available or accessible in government budgets. Moreover, projects do not attract the attention of private or multinational sources of 'commercial' finance as donors and grants still dominate the sector, having a reverse effect on the financial discipline of the sector.

Institutional response

With the significant funding gap to successfully implement NDC objectives, a solution is required to facilitate and/or structure and develop projects and align these with funding solutions to enable bankable projects.

¹⁸ The NDC Private Sector Engagement Project conducted by UNDP and Deloitte Tohmatsu Financial Advisory LLC provides an overview of the current situation. https://www.ndcs.undp.org/content/ndc-support-programme/en/home/impact-and-learning/ library/assessment-of-private-sector-investment-potential-in-the-energy-.html

Certain related capacity development efforts and plans are acknowledged within the NC4 report.¹⁹ Ghana is also already engaged in various innovative financing initiatives for infrastructure, including blending public and private sources where a comparable emphasis is needed on developing bankable projects, e.g., the Ghana Infrastructure Investment Fund.

Building on this, an efficient and funded resourcing capability is needed to develop projects to a level of rigor and bankability for targeted funders, whether targeted at public or private funding. This needs to occur in a manner which can effectively service both the diversity of needs across the POAs and the decentralized structure of stakeholders who implement POAs.

Required additional project preparation capabilities may already exist within local public and private institution(s) and among international partners, or they may need to be developed.

Precedent exists particularly across the more traditional infrastructure sectors of established project preparation facilities and models. These are structured in different ways; the illustrative groupings below demonstrate these approaches:

- Sector-specific facilities (e.g., African Development Bank (AfDB) Green Mini-Grids Africa Programme)
- Global multisector facilities (e.g., Global Infrastructure Facility and Green Climate Fund project preparation)
- Integrated models (e.g., Climate Fund Managers)
- Programmatic approaches (e.g., South Africa Renewable Energy Independent Power Producer Procurement Programme)
- Government PPP units

The presence of such structures in themselves helps to focus stakeholder engagement and support for establishing required capacity-building and an enabling environment. In doing so this can also encourage donors or concessional funders to invest alongside national public funds to de-risk the sector initiatives and ultimately draw in private sources of capital.

4.1.3. Blended finance: Achieving funding leverage

The growing prominence of the 'blended finance' concept provides an appropriate and useful framework as well as a growing ecosystem of funders and investors to engage with for NDC implementation. This is particularly relevant for climate mitigation activities and where there is precedent of motivating private sector-led investments that are financially viable, at least in the middle to long term.

The OECD²⁰ defines blended finance as "the strategic use of development finance for the mobilisation of additional finance towards sustainable development in developing countries." This focuses on using catalytic capital from public or philanthropic sources to increase private sector investment. Through this community, the concept often focuses on developing countries realizing the SDGs, so again it is well placed to engage on Ghana NDC implementation activities.

The objective of a blended finance structure is to shift the risk-return profile of projects and investment opportunities across different public and private funding sources, and in so doing, attract and mobilize new forms of (commercial) capital. This is based on the premise that while there is potential for commercial finance to fill the investment gap, inadequate risk-adjusted returns for many projects creates investment challenges (OECD, 2018). Blended finance is used to lower the risks and/or increase the returns for commercial investors in the context of projects that are considered beneficial from a development perspective in order to attract sources

¹⁹ Ghana's Fourth National Communication to the United Nations Framework Convention on Climate Change – March 2020.
20 OECD.org: 'Making Blended Finance Work,' 2018.

of capital that otherwise would be deployed elsewhere. Public monies are used to catalyse and crowd in new forms of commercial finance, with the ultimate effect of decreasing the need for development finance over time.

Implicit in this structure is the need for public or philanthropic funders to contribute a form of a de-risking instrument to a blended finance structure. Such concessional capital will typically be targeted at overcoming critical risks of an investment:

- Political risk
- Liquidity risk
- Credit or default risk
- Foreign exchange risk
- Market risk
- Technical risk

Within the structure of a blended finance transaction, different approaches can also be taken to deploy needed funding and structure transactions:

- Direct investments typically debt, equity, mezzanine or grant funding
- Intermediate financial instruments such as guarantees or insurances
- Financial structuring such as funds, syndication or public–private partnerships

The instruments and structuring mechanisms noted above can be combined in multiple ways to provide for the allocation of the risk–reward profile of an investment opportunity and in so doing mobilize new additional sources of commercial investment.

Types of risk and de-risking instruments

Within the necessary structuring of individual blended finance transactions, a clear and common understanding of the various risks involved will be needed. Balanced risk allocation is then required to ensure alignment of interests and objectives of the various public and private participants. There is complexity to this process to design bespoke financing structures and mechanisms which should not be overlooked. In simple terms, different stakeholders use different methodologies to assess risk in a blended finance transaction and derive expected returns with a real likelihood of non-alignment of expectations. A thorough, open project preparation process is needed, engaging with all stakeholders to best manage this interface and align interests.

De-risking instruments can then be utilized by different participants in the financial structuring to best align financial and impact returns sought by different parties. It is expected that risks will vary through the different implementation stages of a project or programme: development phase, construction phase and operating phase. OECD guidance notes²¹ on blended finance structuring provide an overview of managing this process.

Instrument	Function	Impact
Direct investment: debt/ equity/mezzanine	Development finance providers may provide direct investment in the riskier elements of the investment or provide direct investment on concessional terms.	Development finance will improve the commercial viability of the investments, provide additional liquidity and boost investor confidence.
Guarantees	A guarantee is an obligation to cover an agreed amount of a loan/investment in the event that the guaranteed party cannot reimburse the payment or if the investment otherwise fails.	Guarantees mitigate against key investment risks. In doing so they improve the risk–reward profile and boost investor confidence.
First loss funding	First loss capital refers to credit enhancement provided by a funder who agrees to bear first losses in an investment in order to catalyse the participation of co-investors that otherwise would not have entered the deal.	This can be similar in form and impact to a guarantee.
Insurance	Insurance transfers the risk of loss to the insurance provider for a predetermined premium.	This mitigates against key investment risks and limits financial exposure and hence improves the risk-profile of the investment.
Credit lines	Credit lines foster lending towards targeted interventions and support the capacity-building of local lending market and banking institutions to expand this line of lending after the credit line is closed.	This limits financial exposure of local financial institutions to fund targeted sectors and builds local financial institutions' capacity.
Currency hedging instruments	Currency hedging instruments provide a means to manage the exposure of foreign currency funders to changes in currency exchange rates over the term of the funding.	This mitigates against foreign exchange risk.
Grants and technical assistance	Grants and technical assistance are direct funding sources (or service provision) to an investment or project where specific project capacity support is needed. These are typically provided without expectation of repayment.	This can contribute to the overall success of an investment – overcoming key early-stage development risks, boosting investor confidence and catalysing commercial investment.
Results-based finance or performance bonds	An instrument where payments are contingent on verification of results or performance. Discretion may be applied over how the results are achieved.	This incentivizes defined outcomes and transfers the risk of non-delivery to the implementing party.

Typical de-risking instruments may include:

Source: Adapted from OECD.org

Examples of blended finance structures

The figure below provides examples of six common blended finance structures that are used to tailor financing mechanisms to address the specific needs and circumstances of individual investments:

CONCESSIONAL DEBT OR EQUITY	GUARANTEE OR INSURANCE	DESIGN/PREPARATION FUNDING GRANT	
 Public or philanthropic investors concessional within capital structure; bear non-market risk-return Subordinate, junior less-commercial terms compared to private sector and MDB/DFI co-investors 	 Risk reduction tools protecting investors against loss of capital Helps to narrow gap between real and perceived risk Can cover all risks or a sub-set 	 Grant funding supporting costs and activities that lead to bankability and investability of projects Typically provided by those with a higher risk tolerance (e.g., foundations) 	
CAPITAL STRUCTURE Senior debt Subordinate debt Equity Junior equity	CAPITAL STRUCTURE Lo grandee or debt Equity	SEE SEE SECTIONE SECT	
TECHNICAL ASSISTANCE FUNDS	GRANT FOR PROJECT COST SUPPORT	RESULTS BASED FINANCING	
TECHNICAL ASSISTANCE FUNDS • Funding to supplement the capacity of investees • Aim is to maximise quality of project implementation	 GRANT FOR PROJECT COST SUPPORT Used to reduce total investment required or support economics/ financing of project Deployed upfront (capital grant) or as ongoing payments (smart subsidies Examples include viability gap funding and interest rate subsidies 	 RESULTS BASED FINANCING Ties payment to achievement of pre-agreed measurable outputs and outcomes Donors pay for outputs and not inputs (the latter typical for grants) Examples include development & social impact bonds 	

Source: Convergence Finance

4.2. Strategy framework

4.2.1. Blended finance framework

A blended finance framework serves as a basis to structure and build a strategy. The framework is intended to provide for the diversity of sectors and types of projects and programmes under consideration with the NDC Implementation Plan. The framework provides for three different types of direct investment with varying financial viability as well as the economic and social impact. The fourth model provides for investment opportunities at the financial intermediary or capital markets level.

Blended Model 1

Traditionally private sector-led investment opportunities that are ultimately financially viable. Depending on the investment opportunities in question and the availability and bankability of the project's available funding, guarantees and other forms of de-risking instruments may be required to catalyse a particular type of investment. This is particularly relevant to the renewable energy projects and related programmes.

Blended Model 2

Investment opportunities in climate projects that by themselves are not viable but result in net economic and climate benefit. These are investment needs that cannot be met by public resources alone. De-risking instruments are required to shift the risk–reward profile of otherwise unviable infrastructure investments, in order to catalyse private capital. Key de-risking instruments may be guarantees and concessional debt/equity. It is expected that this will be applicable to closing an infrastructure (or equivalent) investment gap that cannot be filled by public sources alone. In this context, de-risking instruments and blended finance structures may be required to shift the risk–reward profile of otherwise unviable investments, and will thus catalyse the level of funding needed via private sources of capital.

Blended Model 3

Traditional public sector-funded investment opportunities in services, implementing innovative solutions to support private sector participation and finance of public services. Private sector initiatives are increasingly playing a role in the provision of public services. Blended Finance Models have the potential to support the implementation of innovative solutions in this context. Participation may also be in the form of technology providersor outsourced operating partners. Key de-risking instruments may be guarantees and concessional debt/equity.

Blended Model 4

Investment opportunities at the financial intermediary and capital market level. The country's financial sector and capital market have a crucial role to play in supporting the NDC implementation. The provision of derisking instruments and technical assistance to support further capital market development may be required and beneficial. This may catalyse commercial finance at both the financial intermediary and project recipient level.

Public-Funded Model

Unconditional government-funded projects. These are government-funded from national budgets.

Blended finance framework

	Blended Model 1	Blended Model 2	Blended Model 3	Blended Model 4	Public-funded model
Type of investment opportunity	Investment opportunities in traditionally private sector-led markets that are financially viable (at least in the middle to long term)	Investment opportunities in economic infrastructure projects that by themselves are not viable, but nonetheless result in net economic/public benefit	Investment opportunities in social services that have traditionally been provided by the public sector	Investment opportunities at the financial intermediary and capital market level	Unconditional government- committed investments
Typical sectors of relevance	Agriculture, energy generation, manufacturing and industry	Energy (transmission), transport (rail and road), water, industry (industrial parks, local manufacturing), health (infrastructure)	Health and education, water, nature-based solutions, biodiversity	Intermediary level: Financial sector Final beneficiary level: SMEs and manufacturing industry and large infrastructure projects	Agriculture–fishing: Market development, capacity-building
Role of de-risking instruments	To assist with the development of strong business cases in order to achieve bankability and access to finance To stimulate the private sector by demonstrating the viability of private sector-led investment opportunities	To shift the risk- return profile of investment opportunities, thereby making otherwise non-viable projects attractive to the private sector To crowd in private finance to the public- private domain	To improve performance (effectiveness and efficiency) in social services sectors To channel private- sector resources and expertise into social services sectors	To support the development of the financial sector To enhance access to finance for the private sector	Capital grants, capacity-building and market development activities
Key assessment criteria	 Additionality²² Financial viability 	 Additionality Net economic impact 	AdditionalityNet social impact	 Additionality Net economic impact 	 Additionality Net social impact
De-risking instruments	 Debt, equity and mezzanine finance Project preparation funding and technical assistance Guarantees, (currency) insurance 	 Debt, equity and mezzanine finance Project preparation funding and technical assistance Guarantees, (currency) insurance 	 Debt finance Project preparation grants Guarantees Technical assistance 	 Debt finance Technical assistance Guarantees Currency insurance Credit lines Results-based finance Performance bonds 	 Grants Technical assistance Guarantees
Type of commercial finance	 Private equity Commercial debt	 Private equity Institutional equity Commercial debt	 Private equity Commercial debt	Commercial debt	• None ²³
Finance structures	Direct investments/ funds	PPPs, syndication, funds and facilities, bonds	Social impact bonds, PPPs, results-based finance	Funds and facilities	Government funding, bonds, fiscal policy tools
Investment targets	Projects and companies	Infrastructure projects	Projects and companies	Intermediary level – financial institutions Underlying beneficiaries – projects and companies	Projects and programmes
Scale of investment	Small/medium	Large	Small/medium	Range	Range

22 Additionality refers to the criteria that the investment would not occur without intervention of development (concessional) finance.

23 Innovative approaches are being trialed to catalyse private finance across all climate and SDG sectors, e.g., water sector/multisector.

4.2.1. Mapping of POAs to framework (indicative)

An indicative mapping of POAs with types of de-risking facility within the context of each transaction type is provided below, mapping each POA with Blended Finance Models. This identifies challenges and gaps evident in enabling the development of (bankable) projects and programmes. We do so to indicate the type of approach that may support POA financing but not as a definitive recommendation.

What is clear from the analysis undertaken is that most POAs are already ongoing activities, often integrated into wider sector development plans being implemented. The details and full context of existing planning and activities under way is needed to structure fundable and bankable project propositions to request and secure funding. It is expected that this additional project preparation/investment readiness support is needed and helpful to progress exploration of different funding options as well as continued capacity-building within government and development of the required associated enabling environment.

POA and sector	Description of indicative financing approach		
POA 1: Utility – Hydro POA 2: Utility – Wind POA 3: Utility – Solar	All POAs are utility-scale renewable energy programmes whose projects should, based on current industry precedent, be commercially sustainable and financed predominantly by the private sector . There is strong international precedent for renewable energy procurement programmes backed by a stable enabling environment and notably with an appropriate regulatory (e.g., feed-in tariff) and contracting (PPA) structure. Depending on the details of individual projects and programmes, some level of technical assistance for project preparation and concessional funding may be expected for the development and construction phases . Importantly, Ghana's electricity sector over-supply issues are a constraint to additional grid-connected electricity supply; and historic and ongoing contractual resolution of existing IPP contracts provides a material barrier to current development. Investor confidence in regulatory/market risk issues will need to be considered when progressing procurement of new IPP contracts.		
Typical financing approach/strategy	Utility-scale grid-connected renewable energy projects can be expected to be a pr solution on the basis of contractual commitments from electricity grid off-takers (e. concessional finance (where necessary) from international development agencies; provided a concessional loan to VRA to implement a solar project in the Upper Wes This approach is reflected in a standardized capital structure as indicated. Subordinate debt and junior equity may be expected to be secured from international public funding sources, e.g., KfW or the French development agency, Agence Française de Développement (AFD), and senior debt and equity from balance sheet funding of (international) utilities/developers, or via commercial IPPs, DFIs and commercial lenders. This capital structure may also be complemented with grant funding to support costs and activities that lead to bankability and investability of projects. This may be expected to be secured from those with a higher risk tolerance, such as foundations, the same public sources of concessional funding who may participate in the capital structure or established project prepara Structured renewable energy IPP procurement programmes and auctions have den the most competitive pricing.	ivate sector-led financing g., feed-in tariffs and PPAs) plus e.g., Germany's KfW has it Ghana region. CAPITAL STRUCTURE Senior debt Subordinate debt Equity Junior equity tion facilities.	
Implementation barriers (refer to Appendices for POA assessment)	 The oversupply of electricity generation capacity in the country and the moratorium on new IPP and PPA commitments are the principal barriers to developing new utility-scale renewable projects. The related government renegotiation of existing take-or-pay PPAs adds uncertainty and risk to any future proposed IPP development and financing. This market and country risk is a barrier to IPPs' ability to increase exposure to or enter Ghana's energy sector. Distribution companies have significant debts in Ghana,²⁴ which increases the risk profile and viability for investors and IPPs. Ghana's electricity tariff policy is an additional barrier where tariffs are at times below cost-recovery levels, especially for residential consumers. Full consideration of local differentiators of specific market barriers between hydro, wind and solar is also needed. 		

Blended Finance Model 1: Private sector led

²⁴ Centre for Global Development, September 2017. *The Electricity Situation in Ghana: Challenges and Opportunities, Policy paper 109.* https://www.miningmx.com/energymx/39059-ghana-ipps-waiting-on-state-owned-distribution-companies-to-settle-400m-in-debt

POA and sector	Description of indicative financing approach
Strategy and financing approach	Resolve issues of current supply levels and existing IPP contracts: Until surplus electricity supply and related contractual negotiations are resolved it is not considered plausible to meaningfully progress these POAs.
	Prepare and manage a new IPP programme through a competitive procurement programme/auction: Current best practice would be to manage a competitive procurement programme/auction; this would also optimize competitive pricing. As a state-owned entity, the VRA also provides an alternative option for the government to progress these POAs via VRA balance sheet financing with government-linked guarantees as appropriate and where required.
	Government to provide first loss (sovereign) guarantee alongside concessional debt/equity capital structure: It is expected that to successfully attract both international public and private finance to new IPP projects, a strong government commitment will be needed. This may be in the form of first loss guarantee to be provided by the government alongside the above proposed concessional debt/equity capital structure.
	Guarantee to include consideration of complementary/alternative financial support mechanisms for IPPs: Define guaranteed levels of renewable energy purchase obligations; and adjust feed-in tariffs to compensate for increased (perceived) risk for IPPs. Both of these policy instruments are provided for within Ghana's current Renewable Energy Law. Establish payment guarantees against off-take agreements (distribution companies).
	Timing of new IPP issuance (and full assessment of financing mechanisms) to coincide with both managed levels of electricity supply and confidence in the energy sector and overall business environment at the time: Given the increasing competitive pricing of these renewable technologies, it may be advantageous to progress new IPP projects as soon as current levels of electricity supply and ongoing IPP contractual negotiations sensibly permit. Market demand, confidence and revised regulation are needed to enable this.
	Assess compatibility of government financing commitment with green/sustainability bond issuance: Assess the possibility to include government financing requirements under these POAs within any proposed green/ sustainable government bond issuance, although the principal risk(s) above will still need to be addressed through such a structure. The same approach may also be applied to any proposed corporate green/sustainable bond issuance by the VRA.
	Assess bilateral financing collaboration opportunities: Bilateral financing arrangements with international public funders may be available to support Ghana to enable full implementation of this POA. For example, Switzerland and Ghana signed a full cooperation agreement to develop long-term bilateral implementation of climate protection activities, within the framework of the Paris Agreement. This form of results-based financing may be complementary to the government requirement to provide financial support mechanisms.
	Detailed technical and financial modelling of proposed POA projects along with an assessment of the overall business environment at the time will be required to quantify and qualify the necessary proposed financial support mechanisms.
Sources of third-party funds	Well-structured utility-scale renewable programmes and projects are typically funded by the established and growing network of international energy investors, developers and operators. This includes sources of public funding, e.g., DFIs.
	The types of funders who are likely to participate in this POA activity would be similar to the current participants in the country's existing IPP programmes. This procurement process and network will be known to the Government of Ghana. Further details of energy investors are included in the recent analysis of private sector participation of NDC participation.

Programmatic and standardized approaches as proposed above have been proven to attract private investment at scale. This can help both in terms of creating several assets at the same time for investment and in doing this in a standardized manner to facilitate private sector participation. For example, procuring independent power producer (IPP) projects in renewable energy have been developed and utilized in South Africa through the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), in Zambia and other countries through the IFC-led Scaling Solar programme, in Uganda through the KfW-supported GET FiT programme and in Egypt through the European Bank for Reconstruction and Development-supported solar IPP programme. Ghana has its own experience in managing IPP programmes as well. Specialized units to manage these project/programme preparation processes, such as the South Africa IPP Office in the Department of Energy have proven effective and efficient. Several of these programmes, including project preparation, were anchored through a financing package provided by a multinational development bank (MDB). In all of these programmes, standardized contractual arrangements (e.g., for the PPA) have helped to attract several private sector bidders, thereby creating healthy competition to meet competitive end-user tariffs. MDBs collaborating in such programmatic approaches can further enhance replicability and standardization for private investors.

POA and sector	Description of indicative financing approach (cross reference with Blended Finance Model 4)	
POA 4: 50 kW rooftop solar for lighting	With the continued reduction in the cost of PV technology, domestic rooftop solar is likely to be in the position to attract commercial funding. Ongoing support through capital grants (or similar de-risking instruments) and technical assistance programmes are likely to facilitate market adoption, particularly where ancillary technology (energy storage) or services (net metering/demand response) are included.	
Implementation barriers	 Ability and appetite of end users to adopt technology and pay (upfront) capex costs. Inefficiency related to technical capacity and capability in establishing existing local chain with regulatory-driven local content requirement. Limitations in financial capacity and scale of participants within supply chain – equipment distributors, installation service providers. 	
Implementation status	The launch of the National Rooftop Solar Programme (2016–2017) (a capital subsidy scheme) did not progress past the initial pilot and to proposed full implementation due to the apparent lack of funding for both the 30-percent public subsidy and the apparent insufficient ability and appetite of private sector applicants to fund the remaining 70-percent capex costs. A full assessment of current POA status and relaunch plans/activities is needed. It is noted that with continued increased cost competitiveness of solar technologies and international trends for the adoption (and financing) of rooftop solar for commercial and industrial use, either the direct private sector- led model (Blended Finance Model 1) or via financial intermediaries (Blended Finance Model 4) is expected to be	
	viable.	
Strategy and financing approach	Undertake comprehensive review of lessons from the initial 2015 National Rooftop Programme. In a similar approach to utility-scale renewable POAs: Establish a competitive procurement programme to select providers of rooftop solar solutions. Commit to a financing mechanism to provide grant support to: • Reduce total investment required by end users • Supplement the financial capacity of suppliers and installers To be deployed as either upfront (capital grant) or an ongoing payment (payment subsidies), which will be passed through to end users or ongoing payment to subsidize working capital needs of the supply chain. Due to the failed initial launch of this national rooftop programme additional	
	grant-based technical assistance support may be required to build necessary market awareness and demonstration. Assess need for concessionary debt or other de-risking mechanisms to further incentivise market adoption – given curtailed initial programme.	
Sources of third-party funds	Non-concessional finance from industry: participants of the global and Ghanaian PV supply chain and commercial, industrial and residential end users.	
	SUNREF (AFD's green finance programme), the Swiss State Secretariate for Economic Affairs (SECO) and KfW are all active participants	
	Non-concessional finance via domestic funding sources; refer to Appendices and cross reference with Blended Finance Model 4.	

Blended Finance Model 1: Private sector led

In addition to the above, there is a regulatory requirement for local content and local participation in renewable energy sector contracts. Initial levels of 15 percent local participation/content are targeted to increase to 51 percent over the next 10 years. Despite the economic development benefit involved, current levels of technical capacity are insufficient and will require private sector investors to invest in capacity development to ensure quality and successful implementation. This represents an additional potential barrier to private sector investors. Technical assistance and grant support programmes to build local capacity may be required to catalyse market development and further support and maximize the quality of POA implementation.

Blended Finance Model 2: Public infrastructure

POA and sector	Description (cross reference with Blended Finance Model 4)			
POA 5: Mini-grids	The commercial development of the Africa mini-grid sector has not yet advanced. Public and/or concessional funding support; long-term policy commitment, particularly in low income and rural communities; and measures to catalyse productive use of energy are required to justify mini-grid market development. Grants, concessional direct investment and first loss guarantees will all assist to fund required infrastructure. However, incentives to support local economic development and adoption of productive use of electricity will provide the sustained catalyst for mini-grid development, and ultimately growth, in private sector funding.			
Implementation barriers	Mini-grids are infrastructure. As infrastructure assets, mini-grids need long-term , private sector; and to ensure provision of basic services and economic prosperity, regulatory frameworks (regulatory and subsidy support from the public sector). Ty requires certainty of costs and revenues .	low-cost capital from the they need long-term de-risked /pically, financing such assets		
	Mini-grids typically sell electricity to retail consumers who may be receiving electr difficult to fix or even predict revenues . Given the early development of this mark and risks and how they will evolve over the long-term is also difficult.	icity for the first time. It is et, fixing other mini-grid costs		
	Mini-grid tariffs need to be cost reflective or cross-subsidized to attract private investment, and have mechanisms to protect customers from increases. Rural households and businesses typically cannot afford the full cost to service them .			
	The scale of individual mini-grids – roughly \$500,000 capital cost – makes individ costs challenging to justify.	ual or even portfolio transaction		
	There is an inherent challenge of low consumption rates , particularly in rural locations. Low consumption it difficult to ensure operational cost coverage and to predict and enable any return on investment. Prod interventions are needed to support consumption alongside promotion of energy efficiency and demar management to drive value and efficiency.			
	Predictable public funding and efficiency of regulatory approval processes will pro for a growing and more experienced set of developers and investors in the sector. integration of existing stand-alone systems into mini-grids under a net metering so proper sizing of mini-grids (with approximately 500 W per capita) and providing wa mini-grid development on islands and lakeside communities.	vide the enabling environment This may include supporting cheme, as well as ensuring ater transportation facilities for		
Strategy and financing approach	Donors are needed to provide a substantive subsidy programme (to upfront capital costs), in particular to lower income areas.	CAPITAL		
	Donors and government need to promote productive use of energy and support to adapting or developing appropriate appliances and technical assistance to enable local economic development activities.	STRUCTORE Senior debt		
	Actions include setting a clear regulatory framework – ensuring certainty on long-term tariffs; providing for appropriate subsidy if tariffs are below cost recovery levels; setting clear, transparent and stable adjustment mechanisms; and establishing an integration mechanism between main-grid and mini-grid.	Equity		
	DFIs and concessional funders adapt a financing approach to allow for market development challenges, particularly difficulties in fixing or even predicting	CAPITAL STRUCTURE		
	revenues. More conservative debt sizing, tailored debt repayment schedules and grace periods need to be included.	Senior debt		
	Developers need to seek efficiency through development and construction by seeking experience and learning from longstanding market development	Subordinate debt		
	efforts and data sets available; and by seeking to bundle projects into larger 'portfolios' or partnering to do so.	Junior equity		
	A portfolio-level approach to long-term infrastructure financers needs to be promoted in order to facilitate refinance/asset sale of operating and well-establish risk sources of capital.	ed mini-grids from early high-		
Sources of third-party funds	 Financing needs and sources will vary throughout the project development cycle: Development phase and corporate funding (equity and debt): Impact equity prov Construction (debt): Impact funders and related DFIs. Long-term operation: Traditional infrastructure funders or mini-grid operating co Corporate/energy utility balance sheet funding can bridge the above three phases AfDB, SECO, World Bank and Korea have all been active participants in this progra 	and sources will vary throughout the project development cycle: hase and corporate funding (equity and debt): Impact equity providers and concessional finance. debt): Impact funders and related DFIs. ration: Traditional infrastructure funders or mini-grid operating companies. / utility balance sheet funding can bridge the above three phases. Id Bank and Korea have all been active participants in this programme, including under SREP.		

POA and sector	Description	
POA 7 and 8: LPG (market development)	The development of the proposed downstream domestic LPG market requires public support to establish the required fuel supply infrastructure. Long-term activity has progressed, but further intervention is needed to resolve the efficiency and reach of LPG supply via cylinders. It may be expected that with this direct capital, funding from the public sector may shift the risk–return profile of the private sector to then participate in the required development and growth of the market development. Development of rural locations, and in particular with lower income groups, is likely to require ongoing subsidy support towards capital purchases and/or fuel supply costs.	
Implementation barriers	Capital cost of establishing infrastructure to scale; fuel and cylinder distribution infr upfront capital investment. Investment in the inventory of gas cylinders Investment in bottling plants and storage Safety considerations of cylinder refill model: Inspection equipment is not affordable filling stations, and technical expertise is lacking. Highly fragmented LPG marketer companies (numbering over 80) in the supply chain with a high-risk business model. Slow market adoption and growth: Low levels of awareness, inefficient fuel and coo upfront capital costs for new users. Rural markets: Producers lack the capacity to reach rural markets for distribution of both cooksto Upfront capex costs and ongoing fuel costs are a constraint to lower income group	astructure requires significant e/available, especially to micro- n are financially constrained kstove distribution model, and ves and fuel os
Implementation status	The development of the proposed downstream domestic LPG market requires public support to establish the required fuel supply infrastructure and regulation to set parameters for how the LPG market can operate for the mutual benefit – including safety – of all participants. Long-term activity has progressed to support cylinder manufacture and logistics, but market development has not occurred as forecast and further interventions are needed to resolve the efficiency and reach of the required level of LPG supply via cylinders. The Ghana Cylinder Manufacturing company (government owned) has been established to catalyse development of this market. Establishing an efficient and effective fuel supply and distribution model and an (unbranded) cylinder ownership model has been unsuccessful. Government is implementing a standard branded cylinder recycling model to establish (marketer) ownership of cylinders and set regulation on LPG supply and safety	
Strategy and financing approach	 Invest in national inventory of branded residential LPG cylinders by Ghana's numerous LPG marketing companies. Refurbish or scrap the existing inventory of unbranded cylinders. Invest in construction and operation of a network of regional cylinder refilling bottling plants across the country. Both activities above require high capex investment with an expectation of subordinate concessional finance needed to attract any level of non- concessional debt. Provide additional technical assistance grant support to supplement the capacity of LPG marketers and bottling plant owners and to stimulate additional demand. Provide a microfinance solution to support adoption by rural users. Include a capital grant for equipment purchases and ongoing payments (subsidies) against fuel supply and cylinder costs. Potential for this to be deployed via rural banks/financial intermediates. Assess bilateral financing collaboration opportunities: Bilateral financing arrangements may be available to support Ghana to enable full implementation of this POA; e.g., up to now, Germany via KfW has supported certain LPG market development activities relating to this POA. Assess viability to expand scope and scale capacity of a State- owned company, Ghana Cylinder Manufacturing Company (or new sister company), to increase capacity and proactively demonstrate the commercial market potential of LPG for home use. Raise direct investment for company(s). 	CAPITAL STRUCTURE Senior debt Equity CAPITAL STRUCTURE Senior debt Equity TA FACILITY Grants CAPITAL STRUCTURE Senior debt
Sources of third-party funds	Non-concessional finance from industry: Participants of the global and Ghanaian LPG supply chain. Membership of the Global LPG Partnership provides a useful list. Technical assistance managed via Clean Cooking for Africa Programme and other market development agencies. Both concessional and non-concessional finance from national donors/DFIs. Similar engagement may be sought from AfDB or equivalent MDBs. Non-concessional finance via domestic funding sources. See Appendices.	Subordinate debt Equity Junior equity

Blended Finance Model 2: Public infrastructure

Blended Finance Model 2: Public infrastructure

POA and sector	Description
POA 21: Bus rapid transit POA 22: Railway transit system	Rapid transit systems are examples of public investments that make sense for public debt financing. Because the benefits of a well-designed transit system will be enjoyed for decades to come, it is reasonable to pass some of the construction costs on to future taxpayers. How these costs are financed, however, can have a significant impact on system operating costs. The following sources of transit financing are typically used: bonds; bilateral loans or loans from export credit agencies; MDB loans; commercial loans; national government and national development bank loans. These may include a range of de-risking factors within them: credit lines, first loss funding, guarantees, etc. Commercial loans may be linked to vehicle supply and/or commercial operation of transport fleet. It should be expected that technical assistance and project preparation support is required to ensure the projects and financing are efficiently designed and structured.
Implementation barriers	Adequate project preparation: Comprehensive programme (and individual project) preparation is required to deliver bankable project and financing structure.
	User acceptance and adoption of new transport means: A phased development of such POAs can be necessary, delivering short-term projects that are easy to implement, symbolic and effective as a leading demonstration of the wider POA. This can help both policymakers and the public (users) to understand the benefit, necessity and effectiveness of the transport improvement plans.
	Commercial viability of overall project.
Strategy and financing approach	Developed countries have traditionally supported construction of infrastructure for economic development through MDBs or ODA. With the advancing economic status of Ghana and limits to MDB finance, these funding sources should not necessarily be relied upon.
	Early iterations of this POA have been under development for a substantial period (since 2007). Project preparation funding aligned to current POA implementation resourcing needs may be sought from public funders, e.g., World Bank/IFC and AfDB. Similarly, engagement with strategic partners and suppliers has also progressed and can be built upon: Daewoo Bus Company and Scania have both engaged in this POA.
	Define a POA subcomponent where the commercial viability can be validated – transport fleet (buses/trains) and the construction of the transportation terminals – and finance and manage these via a public private partnership. Leveraging concessional loans from donors or public funders and export credit finance against imported transport fleet to mitigate commercial viability. Packaging the provision of equipment, services and finance – with corporate strategic partners – provides another potential funding route.
	The remainder of the infrastructure (predominantly the road/rail network) to be funded via public loan, leveraging international government/donor lending from MDBs or potentially bilateral arrangements.
Sources of third-party funds	The World Bank/IFC and AfDB could be considered traditional funders of such transport infrastructure and services.
	Strategic corporate investors and operators of transport services would consider financing projects or elements of the project. These may be complemented by bilateral concessional funding and/or export finance. Scania (Sweden) and Daewoo (Korea) have engaged in this through the longstanding period of development of the bus rapid transit project.
	This procurement process and network will be known to the Government of Ghana. Further details of energy investors are included in recent analysis of private sector participation of NDC participation.

POA and sector	Description				
POA 23: Solid waste collection (landfill gas recovery)	The efficient collection and segregation of waste streams to ensure availability of supply of consistent quality and quantity of feedstock is vital to progress this POA. Public investment in this infrastructure is needed along with regulatory alignment to change incumbent waste disposal and informal dumping practices.				
POA 24: Increase waste composting POA 25: Institutional biogas	Private sector engagement and investment in 'downstream' facilities to generate and capture landfill gas, compost or biogas is reasonably expected to follow. Depending on individual project circumstances, it is likely that concessional support from technical assistance, first loss funding or guarantees may also be required to de-risk commercial investment.				
Implementation barriers	The cost effectiveness of the logistics to collect, transport and segregate waste, which is required for efficient and effective waste conversion, is a barrier to commercial development. This includes the capital cost of establishing such infrastructure.				
	Revenue collection and payment against such waste collection services is a relate implementation.	d barrie	er to d	commercial	
	All waste conversion programmes require efficient separation. The value and qual example, is directly related to the type of waste that has been processed. To comp and to conform with food safety standards the quality of the product needs to be h present.	ty of the ete with igh. Co	e cor h syn ntarr	npost product, for thetic fertilisers, inants cannot be	
	Similarly, the biological process of biogas plants requires consistent volume and q efficiently operate.	uality of	f was	te feedstock to	
	End user awareness and acceptance of new technology and product usage require	es appro	opria	te support.	
Financing and strategy approach	Public-funded investment in the establishment of waste collection and manageme cost-effective engagement of the private sector. Existing investment in waste tran the Greater Accra region is an example of this.	nt infras sfer anc	struc 1 sep	ture will support the aration facilities in	
	Providing licenses/allocating franchises to private sector operators to deliver efficient waste collection and management services is a typical modus operandi for the sector. Larger corporate industry participants may be in a position to directly finance well-structured projects or contracts.			CAPITAL STRUCTURE	
	These arrangements may be funded via concessional debt and long-term operating contracts or via regulatory (dis)incentives like landfill tax.	brants	>	debt	
	Similar fiscal support for the generation and use of landfill gas or biogas can provide additional incentives for private finance. This may be via tax incentives to operators or consumers (capital allowances) or regulation (blend of fuel for consumption).	U		Equity	
	Where equipment is sourced from international sources, export credit financing can provide an additional form of funding for particular projects. Carbon finance incentives under Article 6 should also be explored. Comparable mechanisms (including the previous clean development mechanism) enabled the development of the landfill gas sector.		CAPITAL STRUCTURE		
			Senior debt		
			Subordinate debt		
	Particular focus needs to be placed on the long-term operations of these activities, where the consistent efficiency and effectiveness is vital to service delivery and financial viability.		Juni	or equity	
Sources of third-party funds	Corporate participants in the implementation of these projects may also provide finance. ZoomLion Ghana is one dominant participant in the market. Bilateral loan funding and export finance relating to equipment supplies complement this. Recent projects include such participation from Hungary and Austria.				

Blended Finance Model 3: Social/climate resilient services and infrastructure

POA and sector	Description
POA 29: Access to water	The provision of water services in urban and rural areas and funding of water resource management have historically been provided (unconditionally) by the public sector. Attracting new forms of finance is needed to fill the gap of constrained public budgets and to improve operational disciplines and efficiency of service delivery.
Financing strategy and approach	Concessional loan funding is expected to be needed to underpin the delivery of this POA. Similarly, guarantees from bilateral funders, grants and technical assistance support the establishment of this option.
Sources of third-party funds	The World Bank and AfDB are traditional funders of water sector projects, particularly to the public sector. The World Bank is an existing funding partner to Ghana water sector development, which needs to be further developed while access to new sources of finance is progressing. Bilateral funding programmes, such as ongoing partnership with the Netherlands, need to be fostered.
	New financing approaches under development and being piloted in different locations are yet to be proven at real scale but warrant consideration in the Ghana context.
	In the first instance, however, technical assistance and project preparation is needed to develop and structure projects with appropriate financing arrangements. Relevant projects such as the Ghana Netherlands WASH Programme are helping to progress towards private sector engagement and developing sustainable financing and business models. This precedent needs to be further developed. The Kenya Innovative Finance Facility for Water provides precedent for long-term evolution of this programme model.
	Other parallel approaches to facilitate and engage private finance include:
	The Water Finance Facility: Issuing local currency bonds in the capital market in support of the country's own national priority actions on water and sanitation service delivery. The aim is to develop several country-level water financing facilities, which can issue bonds in their capital markets to provide long-term loans to public or private water utilities that have little or no access to commercial finance or that have access at unfavourable terms, such as short tenors. Through the pooling of projects of creditworthy water and sanitation companies, the bonds will have lower risk. This risk can be further reduced, if reserve funds, guarantees, soft loans or grants for blended finance can be incorporated into the capital market structures.
	Funding solutions for water resource management are being developed through climate change adaptation funding facilities – results-based finance frameworks and nature-based solutions – bringing together a range of de-risking instruments around bespoke requirements of project structures and risks. The AfDB Adaptation Benefits Mechanism provides an example of this. This will de-risk and incentivize investments by facilitating payments for delivery of adaptation benefits. It will certify the social, economic and environmental benefits of adaptation activities. The value of adaptation action captured in these certificates, including the incremental costs of generating the benefits, will be promoted to potential investors or lenders.
	Demonstrated infrastructure development and finance models are being adapted and piloted to sector needs to ultimately attract private capital to the sector. These typically seek to de-risk development and construction of investments via a combination of grants, technical assistance and first loss guarantees. This follows the precedent of parallel infrastructure market development that is more advanced. The Private Infrastructure Development Group and Climate Fund Managers – Climate Investor Two provide two examples of this approach.

Blended Finance Model 3: Social/climate resilient services and infrastructure

POA and sector	Description
POA 15: Cocoa REDD+ POA 16: Shea landscape REDD+	These are active POAs under a distinct REDD+ Strategy, programme and investment planning. This overarching strategy is significantly larger than the NDC POAs. REDD+ Strategy funding proposals are well aligned with an NDC blended finance approach. Significant progress towards demonstrating the blended finance model has been achieved with the recently closed financing for the Ghana shea landscape REDD+ programme, bringing together a blend of Government of Ghana grants, ODA funding support, Green Climate Fund grant funding and private sector investment towards establishing a results-based payments framework. It should be noted that the recent success of securing +\$50 million funding for the shea landscape programme followed a two-year period of project preparation, supported by donor funding and technical assistance. There is good precedent of the cocoa sector securing funding from a variety of sources, which the broader REDD+ activity can build on. It is proposed that funding will be secured via the green bond market to fund the broader REDD+ investment plan, including the NDC subprojects. Alongside the key stakeholders – the Ghana Cocoa Board, Forestry Commission and Bank of Ghana – it is proposed to establish a specific Ghana REDD+ fund to mobilize required funding and manage the financing of implementation of the REDD+ Strategy. From an NDC financing strategy perspective, the development of the REDD+ Investment Plan and experience of project preparation and funding application to the Green Climate Fund for the shea landscape REDD+ programme provides a good example for other sectors to review and replicate.
Strategy and financing approach Sources of third-party funds	 Refer to REDD+ Investment Plan Detailed sector-specific plan developed (publication pending) Via Forestry Commission – UNDP Ghana Office

Blended Finance Model 3: Social/climate-resilient services and infrastructure

In the above two scenarios, establishing the required project and programme preparation support and capacitybuilding within government ministries, agencies and commissions will be important to best structure the required funding opportunities as distinct projects or programmes to fund, or as a component part of larger or ongoing development activities. This function then needs to work closely with national funding bodies, whether already established or the newly established or proposed national funding facilities: REDD+ Fund, Green Fund and SDG Fund to build the required support and detailed financing structures.

Blended Finance Model 4: Financial and capital markets development

POA and sector	Description (cross reference with Blended Finance Model 2)									
POA 5: Mini-grids	A key barrier to mini-grid development is typically the consistent energy demand of communities being served. Private sector and impact/donors are promoting the productive use of electricity in such communities to stimulate demand. The capital cost of purchasing this equipment creates a further barrier to adoption. Providing credit guarantees or results-based finance to local finance providers – banks, microfinance institutions or equipment suppliers and developers – is considered an important step to de-risk adoption.									
Implementation barriers	Awareness, ability and appetite of end users to adopt technology and pay (upfront) capex costs.									
	Inefficiency of technical capacity and capability in establishing the existing local supply chain with regulatory- driven local content requirement and the production of electrical equipment tailored to local market conditions.									
Financing approach	Financial intermediaries (rural banks, microfinance) and mini-grid developers or equipment suppliers can overcome this barrier through the provision of comparable incentives to reduce the upfront finance barrier via credit guarantees against payment default or a results-based finance mechanism to reward successful deployment.									
Sources of third-party	AfDB, SECO, World Bank and Korea have all been active participants in this POA, including under SREP.									
funds	The impact investment community and relevant participants of emerging market energy sector investment are increasingly exploring options to progress results-based finance and credit lines/guarantees to participants within well-structured renewable energy projects and programmes.									
	Recent reports highlight these communities of funders: Energy and impact investors.									
POA and sector	Description (cross reference with Blanded Finance Model 1)									
POA 4: Selar lighting	Where the ability and appetite to pay for unfront capital expenditure of anyinment is a barrier exwhere facilitation									
POA 4. Solar lanterns	of finance through the local supply chain is needed, financial intermediaries can be motivated to support the									
	financing through guarantees, credit lines, results-based finance structures, etc. This includes solar lanterns,									
POA 8: Cookstoves	Similarly, fiscal incentives such as VAT exemption, lower import duties or incentives to manufacturers within local									
POA 25: Biogas equipment	supply chains may reduce capital costs to end users. Elements of unconditional POAs may also be applicable to									
POA 12, 13 and 27: Climate- smart technologies	this approach, e.g., energy efficiency and climate-smart agri technology.									
POA 4: 50 kW rooftop solar for lighting	With the continued reduction in the cost of PV technology, domestic rooftop solar is likely to be in the position to attract commercial funding. Ongoing support through capital grants (or similar de-risking instruments) and technical assistance programmes are likely to facilitate market adoption, in particular where ancillary technology (energy storage) or services (net metering/demand response) are included and increase capital costs.									
Implementation barriers	Awareness, ability and appetite of end users to adopt technology and pay (upfront) capex costs.									
	Inefficiency in technical capacity and capability in establishing existing local supply chain with regulatory-driven local content requirement.									
Implementation status	The launch of the National Rooftop Solar Programme (2016–2017) (a capital subsidy scheme) did not progress past the initial pilot phase and to proposed full implementation due to the apparent lack of funding for both the 30-percent public subsidy and the apparent insufficient ability and appetite of private sector applicants to fund the remaining 70-percent capex costs. Full assessment of current POA status and relaunch plans/activities are needed.									
Strategy and financing	Cross reference with Blended Finance Model 1.									
approach	Assess viability to engage financial intermediaries and provide comparable incentives to reduce upfront finance via capital grant, ongoing payment subsidies or via an alternative approach such as tax rebate. Similarly, donors or concessionary funders may provide credit lines to commercial or national banks to foster investment into renewable energy or energy efficiency measures at the household level.									
Sources of third-party funds	SUNREF (AFD), SECO and KfW are all active participants in renewable energy and energy efficiency funding. The impact investment community and relevant participants of emerging market energy sector investment are increasingly exploring options to progress results-based finance and credit lines/guarantees to participants within well-structured renewable energy and energy efficiency projects and programmes.									

4.2.2. Financial structuring: Part of investor readiness

Each POA/project needs tailored structuring to present a bankable solution and to secure funding. There is a need to appropriately position POAs to accommodate the requirements of all involved partners and stakeholders, sector circumstances and the financiers. Risks related to the proposed POAs (investments) need to be addressed for both the public and the private sector. This is where typically a form of project preparation facility can play a valuable role in establishing fundable programmes and investments.

The figure below illustrates the many pieces of the (non-linear) process involved. All component parts of the puzzle need to be solved during the development phase of a project. This typically requires a range of skills and resources from different sources to complete and requires conscientious and consistent planning and project management to maintain efficiency and viability over sometimes long timeframes (years). It is generally required that all of these individual pieces of the puzzle are addressed without material constraint or risk. The focus of a project preparation or investor readiness support activity is on solving the whole puzzle together with the lead developer or procuring authority as a joint development effort.

An integral part of this is the financial structuring, modelling and fundraising. This is expected to fit within the proposed NDC Blended Finance Framework. This effort of project development ends at financial close when ongoing funding is committed, or before if eventually financial close seems unreachable, and the project is aborted.



Illustration of the component parts of project/programme preparation and development process

4.3. Sources of capital: Types of investors and funders

In this section, we provide an overview of examples of types of funders and investors who may participate in the different transaction types and/or sector-based initiatives.

The table below outlines the different sources of capital as well as the different investment modalities they use. This covers the full spectrum of blended finance participants, from focused commercial finance providers to providers of concessional capital.

Sources of capital and types of financial instruments

Capital providers													
Commercial capital				Hybrid capital							Concessional capital		
Institutional investors, e.g., Pension funds			Corporations,								Government agencies		
Sovereign wealth funds Insurance funds		ds	companies, SMEs and developers		Development banks (MDBs, RD					DBs, NDBs), green banks			
Commercial banks					Philanthropy								
			Private investors, e.g., Hedge funds Real estate			Eamily offices			Export credit agencies			Development agencies	
			Private equity Venture capital		Faining Onices		Multilateral climate funds						
Investment modalities and financial instruments Standard investment instruments De-risking and catalytic instruments													
Debt				Eq		ity							
Direct investments	Project finance	Bonds	Mezzanine finance		Listed	Private							
Climate investment opportunities													
Private capital providers													
Asset managers	Hybrid	As own	set ners	Pu pi	blic capital roviders								

Source: UNDP: Ecosystem of Private Climate Investment 2020

Interfacing with these finance providers are organizations and programmes that provide funding and service support to accelerate investment opportunities and best develop and prepare bankable projects and investor-ready climate investment opportunities. This funding and support may typically be provided in the form of grants and technical assistance in either recoverable or non-recoverable contracts.

An overview of the domestic funding landscape is provided in section 2.5 of this report, including a sample of a range of private finance providers operating in the market (Appendix 2).

The international funding landscape is of course far broader. A sample overview of facilities that offer grant and de-risking instrument funding against the proposed range of blended finance opportunities is provided in Appendix 3.

Not included are sources of direct investment (debt/equity). In principle, this list is extensive for those who may invest directly in projects, funds or (other) financial intermediaries and needs to be regularly explored against the sector and deal type as well as timing of investment need. Market dynamics, of course, mean that this pool of funders is constantly evolving. The risk appetite (Ghana focus) of these funders will vary significantly under different economic, political and industry circumstances – including COVID-19.

The bilateral and multilateral development banks are arguably the most important source of equity and debt providers in Ghana and other developing countries. They are relatively flexible and are involved in transaction types across the blended finance spectrum. They can also offer their funding products at rates that are lower than the rates used by the commercial financial institutions – often structured to catalyse such commercial/ private funding participation.

Two recent reports provide additional relevant details of: (1) the impact of investment opportunity in the country as well as (2) private sector investment potential in the energy sector:

- 1. Ghana Impact Investment Landscape The Global Steering Group for Impact Investment. (https://gsgii.org/ reports/ghana-impact-investment-landscape/)
- 2. Engaging Private Sector in NDC Implementation Assessment of private sector investment potential in the energy sector. (https://www.gh.undp.org/content/ghana/en/home/library/environment_energy/engaging-private-sector-in-ndc-implementation---assessment-of-pr.html)

CHAPTER 5

STRATEGY IMPLEMENTATION

5.1. Mobilization and partnerships

The activities, governance arrangements and funding requirements within the NDC portfolio of activity are diverse and will require significant coordination effort to ensure the required capacity and capability is embedded across both public and private sector implementation partners. As well as being appropriately prioritized, the overarching components of the strategy are required to be progressed in parallel:

- 1. Coordinate detailed data and status update of current POA activity.
- 2. Progress design and development of 'bankable projects'.
- 3. Pursue different approaches for conditional vs unconditional POAs.
- 4. Progress a blended finance approach appropriate for conditional NDC implementation.
- 5. Ensure engagement with domestic funding sources.
- 6. Further develop subsector or POA focused funding plans and financing mechanisms in a comparable manner to the REDD+ investment, but ensure strong cross-sector coordination.
- 7. Build awareness and capacity across government and private sector leveraging of resources and coordination of implementation is essential.

The following outlines areas of required mobilization.

5.1.1. Coordination

The nature of the funding needs across the multisectoral POAs are diverse in scope, scale, risk profile and commercial viability. The mobilization of financing strategy requires the (1) efficient development and structuring of fundable programmes and investments across a diverse portfolio, (2) identification and successful leverage of domestic and international public and private funding to both prepare for and implement POAs, and (3) ongoing implementation and monitoring of funded POAs.

Commitment of sufficient coordinated resourcing capability leveraging both public and private sector experience is required to increase funding leverage, improve efficiency and unlock synergies. Building on the established NDC governance structure that is in place – via MESTI and EPA NDC functions – an assessment of international best practice and precedent may identify the most appropriate and beneficial institutional structure for Ghana's circumstances.

NDC POA alignment and prioritization:

- Assess any requirements to update NDC implementation plans as a result of current NDC review and ongoing development of international climate solutions – across policy, technology and finance.
- Secure greater definition and detail of POAs for NDC implementation plans, in order to best inform support of resourcing needs and approach across capacity-building, POA preparations, POA (and portfolio of POA) financing, ongoing development and prioritization of NDCs.
- Work through established NDC governance structures to continue to improve climate data, sector alignment, integration, management and data.

Specific focus is needed on the cross-sectoral POAs to ensure prioritization, funding and resource commitment and implementation across sectors: i.e., (1) gender – enhanced resilience of women and the vulnerable; (2) disaster risk reduction – early warning systems and disaster risk management; and (3) health – managing climate-induced health risks.

5.1.2. Support continued development of 'bankable projects'

Support ongoing efforts, where appropriate, to deliver project preparation services to both government and private sector stakeholders involved in the development of needed 'bankable projects':

- Facilitate focused support for project/programme preparation across all sectors including review, validation or development of needed POA planning and budgeting.
- Specifically support cross-sector project/programme preparation to explore synergies and opportunities.
- Fully assess best approach to implement project/programme preparation given decentralized government structures, sector-focused MDA activity and international experience and best practice.
 - Building on established NDC governance structures, establish mechanism/secretariat for proactive (co) development and coordination of individual NDC POAs.
 - Importantly, this should incorporate a cross-sector initiative to ensure full sector synergies are explored in POA design, implementation and financing.
 - Working closely across all stakeholders ministries, sector leads, Ghana Green Fund and SDG
 Fund, (plans for Ghana REDD+ Fund), domestic and international finance markets, and private sector developers.
- Actively market bankable programmes/projects and investments.

5.1.3. Sources of funding: Domestic and international

- Build awareness of NDC programme with private sector and domestic funders: engage with industry as well as banks and other financial institutions in the country to detail NDC activity; and motivate and get commitment to play private sector role in delivering and financing the identified sectors, POAs and continued NDC activity.
 - Ghana Association of Bankers and other associations may be useful conduits to mobilize or support funding for climate change.
 - Include engaging with insurance organizations, stock exchange and pension funds (with large-scale patient funds under management).
 - Support alignment and continued development of both proposed National Development Bank with climate focus (Ghana Green Fund) and public–private partnership for SDG Delivery Fund and Green Fund.
 - Collaborate on funding support and engagement across both domestic and international stakeholders.
- Market NDC finance requirements to international climate finance audience.
- Coordinate fundraising activities that will occur at different levels POA, sectoral and NDC portfolio.

5.1.4. Climate adaptation focus

- Acknowledge dominance of availability of climate finance for mitigation: work with international efforts to facilitate adaptation finance to support Ghana NDC implementation. Take lead from the NAP process to ensure full country alignment.
- Promote NDC adaptation activity and engage within the 'established' climate finance market, pursuing financing solutions and fundable propositions across evolving related themes of nature-based solutions, biodiversity and water "water is to adaptation what energy is to mitigation."

5.1.5. Climate mitigation focus (energy sector)

- Resolve ongoing electricity market IPP contractual issues.
- Explore (new) initiatives to support complexity of fossil fuel transition. Increase focus on LPG/CNG market development determine if aligned with climate targets.
- Communicate needed mitigation activity and funding needs within the 'established' climate finance market with appropriate context of broader energy sector situation.

5.1.6. Support ongoing capacity-building

Support ongoing efforts, where appropriate, to build government capacity centrally or through sector leadership to enable needed activities to implement a financing strategy: (1) distinct structured fundable POAs, (2) facilitate implementation, (3) ensure comprehensive monitoring and evaluation and (4) provide for and integrate any required update to NDC plans.

- Support resourcing needs or constraints of existing POAs.
- Support the design and preparation of planned POAs.
- Support further assessment and (re)prioritization of NDC Plan as well as assessment for inclusion of alternative POAs.
- Support the continued assessment and capacity-building with government ministries to align and integrate climate policy objectives and reporting with broader development strategies and budgets.
- Assess resourcing, financing and reporting/monitoring needs of ongoing NDC programmes and interface with wider sector development.

Appendices

Appendix 1: Financing instruments

Equity financing, often used in the early stages of developing a project or company, is the method of investing capital in a company in return for an ownership right. There are two types of equity: (1) junior equity, which is capital invested in ordinary shares of a company; and (2) senior equity, which is capital invested in preferential shares of a company. Investing in junior equity might involve higher risk. If a company liquidates its assets, preferential equity has higher priority than, or is 'senior' to, junior equity.

Debt financing is typically used at later stages of development of a company where cash flow is available to service debt. In debt financing, investors lend money to borrowers, who pay back this amount (the principal) with interest under strict conditions. Seniority is usually determined on what liability has preference in case a company liquidates its assets. If a company liquidates its assets, debt has higher priority than, or is 'senior' to, equity.

Grants are non-repayable funds provided by one party (grantmakers, such as a government department, corporation, foundation or trust) to a recipient (e.g., a business). They are often used to build capacity in new business ideas or technologies or to promote or showcase the viability of a new innovative technology or business idea that most investors will shy away from unless proven.

A **financial guarantee** is a non-cancellable indemnity bond backed by an insurer to guarantee investors or lenders that principal and interest payments will be made. The guarantee provides investors with an additional level of comfort that the investment will be repaid in the event that the securities issuer would not be able to fulfil the contractual obligation to make timely payments. It also lowers the cost of financing for issuers because the guarantee typically earns the security a higher credit rating and, therefore, lower interest rates.

Source: Access to Green Finance ITC, 2019

Appendix 2: Profile of domestic climate finance providers

Small and medium-sized enterprise finance

Wangara Green Ventures

Wangara Green Ventures is an evergreen climate-focused fund in Ghana, sponsored by Innohub Foundation through the Ghana Climate Venture Facility (GCVF) from the World Bank under the infoDev Climate Technology Program. The fund invests between \$50,000–500,000 through equity and quasi-equity instruments and provides technical assistance to portfolio companies.

The fund focuses on projects with positive social and environmental impact. In the case of social impact, programmes such as access to clean water, agricultural productivity, employment generation, women's equality and empowerment, food security and income/productivity growth are encouraged. In the space of environmental impacts, key areas are climate change mitigation, energy and fuel efficiency, pollution prevention and waste management, sustainable energy, sustainable land use and water resources management. The fund has invested \$2 million so far in various projects.

FOCUS SECTORS:

Renewable energy, energy efficiency, waste management, water management, climate-smart agriculture, general climate-friendly businesses

TYPICAL SCALE OF FUNDING:

Funding amount: GH¢ 250,000–2,500,000

Investisseurs & Partenaires

Investisseurs & Partenaires (I&P) is a private equity investor exclusively dedicated to small and medium-sized companies in sub-Saharan Africa. I&P's mission is to foster champions of African entrepreneurship and demonstrate the strong potential of impact investing to address development challenges in Africa.

I&P is an active partner bringing its skills in management, strategy and finance with an entrepreneurial approach. The investor's model hinges entirely upon the entrepreneur, with whom they wish to establish a long-term relationship based on trust and sincerity. I&P's investment process is three-fold, as follows:

- 1. Financing through equity investment as a minority shareholder in companies or by way of participative loans.
- 2. Strategic and managerial mentoring through analysis of companies and the strategy to be implemented as well as continuous support during investment period till exit.
- 3. Provision of technical capacity in team building depending on the specific need of business, e.g., information systems, sales/marketing, human capital management, governance, etc.

FOCUS SECTORS:

Health, agriculture, agribusiness, construction, distribution services, energy

TYPICAL SCALE OF FUNDING: Funding amount: €300,000–3 million

AV Ventures

AV Ventures, an ACDI/VOCA investment management subsidiary, provides innovative, catalytic financing to SMEs in West Africa and Central Asia through relationships with financial institutions and investors.

FOCUS SECTORS: Agriculture, financial services

TYPICAL SCALE OF FUNDING: Funding amount: \$50,000–1,000,000

Grofin Ghana Limited

GroFin Ghana Limited is part of the GroFin, a pioneering private development finance institution that was started in South Africa, specializing in the finance and support of small and growing businesses. The Ghana office was opened in November 2008. Since its inception, the Ghana office has invested in over 66 businesses with an average investment of between \$400,000 and \$500,000. The investee companies have been from various sectors of the Ghanaian economy. These investees have benefited from two fFunds that have invested in Ghana: The GroFin Africa Fund (GAF), which is closed and in harvest now, and the Small & Growing Businesses (SGB) Fund, which is currently actively investing.

FOCUS SECTORS:

Health, education, agribusiness, manufacturing and essential services, including climate change/ impact-oriented business

TYPICAL SCALE OF FUNDING:

Funding amount: \$100,000–1,500,000

Injaro

Injaro Investments is a private capital investment firm that focuses on SME investments in Africa. Injaro, through its funds, makes equity, debt and quasi-equity investments in organizations that catalyse sustainable economic growth and improve the livelihood of the communities in which they operate. Injaro manages over \$50 million of capital earmarked for deployment across sub-Saharan Africa. Its investments have benefited over 2.6 million people, mainly smallholder farmers in rural Africa. Injaro's team comprises professionals based in Côte d'Ivoire, Ghana and Mauritius. The Agri-Business Capital Fund (ABC Fund) is managed by Injaro and invests in smallholder farmers and small- to medium-sized rural agribusinesses in developing countries to support sustainable and inclusive agricultural value chains. The ultimate aim is to help reduce rural poverty, feed the planet and build food systems resilient to climate change.

FOCUS SECTORS: Agriculture

TYPICAL SCALE OF FUNDING: Funding amount: \$200,000–800,000

Development finance institutions

Norfund

Norfund is Norway's DFI with the mandate to support the building of sustainable businesses in developing countries. Norfund's priority geographical areas are primarily sub-Saharan Africa and selected countries in South East Asia and Central America.

FOCUS SECTORS:

Agribusiness, manufacturing, clean energy, green infrastructure (waste management, water networks and electric transmission and distribution) and financial services

TYPICAL SCALE OF FUNDING:

Funding amount: Minimum €3 million. Target €5–10 million (no upper limit)

Renewable energy: Projects

Camco

Camco Clean Energy funds sustainable energy projects. It has a track record within Africa's renewable energy sector. Camco manages funds on behalf of the Renewable Energy Performance Platform (REPP).

REPP works to mobilize private sector development activity – and investment – in small- to medium-sized projects (typically up to 25 MW) and is supported with £148 million funding from the UK's Department for Business, Energy and Industrial Strategy (BEIS) and the International Climate Finance Initiative. The original concept for the programme was developed by UN Environment and the European Investment Bank in response to the Sustainable Energy for All initiative of the United Nations.

TYPICAL SCALE OF FUNDING:

Funding amount: Dependent on project need.

Commercial banks: Funding climate-related projects

Stanbic Bank

Stanbic Bank Ghana has been in operation since 1999. It is ranked among the leading banks in Ghana by size, financial solidity and the sheer quality of the financial intermediation and transaction products and services it provides. Stanbic Bank Ghana acquired a universal banking license in March 2004 and has expanded its geographical reach and broadened its scope of financial services, growing consistently over the years to become one of the most recognized brands on the Ghanaian banking landscape. Being a member of the Standard Bank Group headquartered in Johannesburg, South Africa, Stanbic Bank is backed by a parent that has over \$15 billion in assets.

Stanbic Bank Ghana currently has one wholly owned subsidiary, SBG Securities Limited, which offers stock brokerage services to complement Stanbic Bank Ghana's broad range of banking and financial services. Stanbic has successfully adapted best banking practice to the particular needs of both medium- and small-sized businesses.

FOCUS SECTORS:

Agriculture and forestry, power and infrastructure, property, real estate, sovereign, public sector, telecoms and media

TYPICAL SCALE OF FUNDING:

Funding amount: \$50,000 and above based on project need – up to \$5,000,000 for small- to medium-sized businesses

Ecobank

Ecobank Ghana Limited is a subsidiary of Ecobank Transnational Incorporated with a mission to consolidate a modern pan-African bank and to contribute to the economic development and financial integration of the continent. Ecobank has operations across 33 African countries, including Ghana. The bank continues to play a pivotal role as a recognized pioneer in inclusive banking with its focus on SMEs and women-led businesses.

FOCUS SECTORS:

Green finance, asset finance

TYPICAL SCALE OF FUNDING:

Funding amount: \$50,000–5,000,000 for SMEs, and more can be funded for bigger private sector entities

Absa

Absa Group Limited owns majority stakes in banks across Africa and markets its ability to provide local solutions tailored to uniquely local challenges. To this end, the bank offers all clients across the continent a range of retail, business, corporate, investment and wealth management solutions.

Absa Group Limited is listed on the Johannesburg Stock Exchange and is one of Africa's largest diversified financial services groups with a presence in 12 countries across the continent and around 41,000 employees.

FOCUS SECTORS:

Green finance, asset finance

TYPICAL SCALE OF FUNDING:

Funding amount: With an unsecured loan, the maximum loan amount is GH¢ 500,000 without financials and GH¢ 1 million with financials while a secured loan has no limitation

Cal Bank

Cal Bank commenced operations as a local merchant bank in 1990. It acquired a universal banking license in 2004 and in the same year undertook an initial public offering. Cal Bank is focused on the growing Ghanaian corporate business sector. Since 2006, the bank has developed its retail banking operations. Cal Bank currently has three wholly owned subsidiaries: Cal Asset Management, Cal Trustees and Cal Bank Nominees Limited ('Cal

70 FINANCING STRATEGY REPORT

Nominees'). The bank has embarked on an expansion programme and will continue to expand its footprint by increasing the number of branches throughout the country.

FOCUS SECTORS:

Green finance: Renewable energy (RE) projects, energy efficiency projects, sustainable use of natural resources

TYPICAL SCALE OF FUNDING:

Funding amount: \$200,000 maximum for SMEs; and more can be considered for corporate

businesses based on the project

The SDG Delivery Fund and Green Fund

The Ghana Green Fund is a private sector initiative, started by eight key stakeholders in 2018 to support and complement the government's efforts in implementing the SDGs at the request of the President of Ghana, Nana Addo Danquah Akufo-Addo. For Ghana to meet its SDG and climate change commitments, there is the need for a vibrant private sector to actively play its part in supporting businesses, implementing initiatives, and running businesses that take into consideration the government's programme of becoming a low carbon and climate-resilient economy by 2030 in full compliance with the Paris Agreement.

The following companies and their chief executive officers (CEOs) are the founding members of the initiative and form the steering committee to oversee the set-up and implementation of the fund to drive private sector participation.

Private sector organization	Responsible CEO					
Stanbic Bank	Mr. Alhassan Andani – Convener					
Fidelity Bank	Mr. Edward Effah					
Standard Chartered Bank	Ms. Mansah Nettey					
Svani Motors	Mr. Thomas Swaniker					
Unilever Ghana	Ms. Gladys Amoah					
Kosmos Energy	Mr. Joe Mensah					
Reroy Cable	Ms. Kate Papafio					
Deloitte and Touché	Mr. Charles Larbi Odoom					

Two separate funds are to be set up under the Ghana Green Fund.

Sustainable Development Goals Delivery Fund

This is expected to serve goals that might not be the preserve of government under the SDGs and climate change and that most institutions already support under their corporate social responsibility or corporate social investment drives, e.g., education, health, water, gender, poverty alleviation, etc. It is recognized that a number of existing initiatives are being carried out in an uncoordinated manner and are also difficult to identify, monitor, control and report on.

The fund implementation team will provide central coordination of these and is expected to expand to work with as many private sector businesses as possible to ensure funding alignment and support with businesses
that are driving a sustainable, green and climate-resilient economy. Resources will be mobilized and projects will be carried out on a larger scale.

Green Fund

The Green Fund will serve the private sector in getting the needed financing in meeting and contributing effectively towards the government's commitment, especially in the area of climate change. Ghana has committed to 35 POAs in mitigation and adaptation under the Nationally Determined Contribution of the climate change agreement, and 75 percent of the funding under this across the world is expected from the private sector. Therefore, the mobilization under this fund is critical in ensuring the private sector actively participates in driving individuals' and businesses' acceptance in supporting the country through transitioning into a low carbon and climate-resilient economy.

Objectives

- Lead joint reflection of CEOs' contribution to the delivery of the SDGs.
- Define a core set of practical and joint actions that the CEOs can undertake in support of the national SDG efforts.
- Lead the CEO advocacy with the Office of the President in creating the enablers for achieving the SDGs.
- Develop innovative financing solutions (including the use of private sector combined balance sheets).
- Develop policy imperatives that will enable the achievement of the SDGs.
- Set up two funds: SDG Delivery Fund and the Green Fund with a target to raise \$100 million in two years and \$200 million in five years, respectively.

Source: Green Fund Strategy 2019

Sources of funding

- Private sector combined CSR budget
- Multilateral agencies
- Non-governmental organizations
- Green bonds
- Ghana government

The Green Fund is being established to become the vehicle that will drive the private sector side of mobilizing resources towards implementation of the Nationally Determined Contribution. The setup is critical to the success of the climate initiative in Ghana since the organizations running the fund understand the local issues very well and will take decisions much faster than supporting organizations outside the country.

Appendix 3: Examples of de-risking instruments and mechanisms

Grants or technical assistance for blended finance transactions		Relevance for type of transaction			
		BM2	BM3	BM4	
Blended models: Private sector-led (BM1); Public infrastructure (BM2); Social sectors (BM3);	Financial s	sector (BM4	4)		
Bilateral grant facilities are bilateral windows, available for technical assistance for project preparation and strengthening of institutions.	•		•	•	
The AfDB provides technical assistance/grant funds for project preparation and to supplement its financial support for both the public and private sector windows.	•				
The International Finance Corporation PPP Advisory Services advises governments on structuring public-private partnership transactions.					
Public Private Infrastructure Advisory Facility (PPIAF) is the global facility dedicated to strengthening the policy, regulatory and institutional underpinnings of private sector investment in infrastructure in emerging markets and developing countries. PPIAF is housed within the World Bank.					
European Union—Africa Infrastructure Trust Fund (EU-AITF) offers grant support for cross-border projects and sustainable energy projects.					
The World Bank's Global Financing Facility (GFF) provides flexible financing to governments for the preparatory work and technical assistance required to identify priorities.					
The African Local Currency Bond Fund (ALCB) acts as an anchor investor and provides technical assistance for local currency bond issuances by financial service providers and companies operating in developmental sectors.					
Impact funders and microfinance institutions contribute alongside funding and can often also provide technical assistance.				•	
The Private Infrastructure Development Group (PIDG) Technical Assistance Facility provides funding to support capacity-building and to help scope out potential investment opportunities for PIDG companies.	•				
Guarantees or insurance for blended finance transactions	BM1	BM2	BM3	BM4	
USAID/Development Credit Authority (DCA) . DCA's partial credit guarantee aims to reduce risks to generate additional lending to underserved markets and sectors.	•			•	
Sovereign guarantees are a flexible instrument that can be used for transactions by the Government of Ghana.			•		
The Currency Exchange Fund (TCX) is a special purpose fund that provides over the counter derivatives to hedge the currency and interest rate mismatch that is created in cross-border investments between international investors and local borrowers in frontier and less liquid emerging markets.	•	•			
Private Infrastructure Development Group (PIDG) GuarantCo is a facility for providing guarantees to lenders that enhances the credit for local currency debt issuance by the private, municipal and parastatal infrastructure sectors.	•	•			
The Swedish International Development Cooperation Agency (Sida) offers a flexible guarantee facility that is able to guarantee a variety of risks, such as political and credit risks.	•		•	·	
African Guarantee Fund (AGF), designed and funded by the AfDB, provides financial guarantees to financial institutions to stimulate financing to SMEs.	•			•	
The Multilateral Investment Guarantee Agency (MIGA) – World Bank Group – provides guarantees to protect investments against non-commercial risks and can help investors obtain access to funding sources with improved financial terms and conditions.					
International Finance Corporation (IFC) Blended Finance Facility (BFF) guarantee aims to mitigate various financial risks associated with investments in SMEs and agribusiness as well as pioneering investments across sectors to unlock private sector opportunities that promote productivity improvements and innovation with strong development impact.					
The IFC/MIGA Private Sector Window Risk Mitigating Facility (PSW-RMF) can provide project-based guarantees without sovereign indemnity to crowd in private investment in large infrastructure projects and public private partnerships. It can also expand the coverage of MIGA guarantees through shared first loss and risk participation, like reinsurance.					
The African Local Currency Bond Fund Technical Assistance Fund provides technical assistance for structuring and issuing bonds.					
MFX Solutions (MFX) provides microfinance and SME lenders with affordable and accessible hedging instruments.					
Various facilities for direct investments – alongside bilateral and multilateral development banks (and DFIs). Funds and facilities provide direct investment in projects with the aim to catalyse and crowd in additional investors, e.g., Global Energy Efficiency and Renewable Energy Fund (GEEREF), Climate Investor One and Two, the Danish Climate Investment Fund (KIF).					

Appendix 4: Programme of Action overview

ENERGY SECTOR: RENEWABLE ENERGY

Market context and costing

Conditional funding commitment:

- POA numbers 1–6
- Energy sector renewable energy

POA 1: INCREASE IN SMALL-MEDIUM HYDRO INSTALLED CAPACITY UP TO 150-300 MW Government commitment: Conditional Expected budget: \$720 million

Hydropower subsector context

Small-medium hydro projects are commercially proven with the technology and engineering profile that will typically secure commercial finance. Commercial project developers will readily engage with a market that demonstrates a positive enabling environment. Typically, a strong energy PPA under a strong policy framework and incentives (e.g., feed-in tariffs, tax credits) is a prerequisite for this. Standalone commercially viable projects can also be found. Related regulatory frameworks and technical assistance will often govern and support complementary integration with usually required environmental, social and economic development considerations. Increasingly critical to hydro projects is the sustainability of water resources and the management and integration of solutions with other land and water users in the respective river basin. With increasing weather volatility and occurrences of water scarcity/flooding along with the long-term nature of hydropower projects, additional focus on climate resilience and reliable long-term hydrological surveys and forecasts are required through the design and development of projects. This requires increased time and resource commitment and expertise during the feasibility and development phase of projects, which have material impact on commercial viability and attractiveness.

Costs and budget

The cost of hydropower depends significantly on location. The International Renewable Energy Agency (IRENA) reports average investment costs for large hydropower plants with storage typically ranging from as low as \$1,050/kW to as high as \$7,650/kW, while the range for small hydropower projects is between \$1,300/kW and \$8,000/kW. Adding additional capacity at existing hydropower operations or existing dams that do not have a hydropower plant can be significantly cheaper, and can cost as little as \$500/kW.

The operating hydropower system costs are not included in the above figures and depend on many factors, including the size of the system and the head and type of the turbine.

Overall generation cost is between \$40 and \$110/MWh (typically \$75/MWh) for large hydropower plants (above 100 MW); between \$45 and \$120/MWh (typically, \$83/MWh) for small plants; and from \$55–185/MWh (\$90/MWh) for very small plants (<1 MW).

74 FINANCING STRATEGY REPORT

Funding source for this POA is conditional, and the budget of \$720 million for 150–300 MW equates to a cost of \$2.4–4.8 million per MW. This is mid-range for IRENA capital costs with perhaps small hydropower capital costs at the upper end and medium-size capital costs at the lower end of this range. (IRENA, 2019).

Current activity

POA implementation lead

Ministry of Energy

Partner institutions/organizations

- Energy Commission technical regulator (licensing)
- Public Utility Regulatory Commission market regulator
- Volta River Authority and BUI Power Authority state-owned electricity producers
- Public funders (DFIs, donors)
- Private sector (developers, IPPs, debt and equity funders, energy service providers)

Progress and achievements

There has been progress with the Programme of Action, including the development of a pipeline of projects under assessment and development dominated by the two state-owned utilities, VRA and BUI Power Authority. The completion of the first mini-hydro project (45 kW Tsatsadu) by BUI Power Authority allows for the demonstration of mini-hydro capabilities to provide for rural targeted energy access.

- Pwalugu (medium hydro, approximately 45 MW, integrated with dam and other infrastructure) project development is ongoing with construction to commence (SinoHydro Power, at a cost of \$993 million – unverified) in 2020. Forecast to be operational in 2026.
- Hemang (medium hydro 60 MW, integrated dam, reservoir, transmission line) commenced construction with the engineering procurement and construction contractor China International Water & Electric Corporation (CWE) at a cost of at a cost of \$307 million (unverified) in 2019. Forecast to be operational in 2024.
- Tsatsadu mini hydro at 45 kW has been completed by BUI Power Authority.

Note: The scope of these projects and details of actual budgets and or costs have not been made available. As such like for like comparisons of hydropower costs have not been possible.

Noted requirements to instigate or facilitate POA implementation strategies include:

- The design and deployment of innovative financing instruments to facilitate the use of hydropower for peaking requirements and not simply consistent baseload supply.
- Provision of framework model and legislation for further small- and medium-scale hydropower development.
- Provision of incentives and funding to support project development (and public–private partnership).
- Facilitating and supporting the development of multipurpose hydro projects to integrate and support associated industry (transportation, land-use and agriculture, and fisheries).
- Building capacity of utilities to develop, operate and maintain hydropower facilities.
- Exploring opportunities to desilt reservoirs and dams to increase capacity and supply construction industry.

Verification of the latest progress against these requirements is required. However, these requirements provide a sound basis for credible development of the sector if implemented effectively. This includes the support for multipurpose facilities with implied synergies across sectors – water, transport, agriculture, forestry and industrial users.

Summary

Ghana hydropower resource potential is clearly evident and previously demonstrated by the historic prominence of hydropower energy supply. With formalization of identified implementation strategies – including the required strong government framework and model for the promotion and development of hydropower – the existing pipeline of projects under development is a material step towards achieving delivery of this POA. Funding of the medium-scale projects via large corporates Volta River Authority, BUI Power Authority and China International Water & Electric Corporation provides for a balance sheet financing approach. With a strong enabling environment and the required government framework and implementation model, international and national renewable energy developers and financiers are expected to be attracted to the sector for both small- and medium-sized projects.

However, the broader issues across the energy sector relating to current surplus electricity supply and IPP contracts present a known and material risk to successful full delivery of this POA. It is not feasible at this time to attract new private finance providers with current sector conditions.

Recent (October 2020) completion of rehabilitation of the 160.5-MW Kpong hydroelectric power station complements this POA. The contract was awarded in 2013 by VRA and funding was enabled via a €50 million concessional loan from AFD.

POA 2: ATTAIN UTILITY-SCALE WIND POWER CAPACITY UP TO 50-150 MW

This is an ongoing POA that aims at developing domestic wind projects in high wind potential areas in Ghana. The main projects under this programme in development are the \$525 million 225-MW (150 MW + 75 MW) Ayitepa and four VRA wind projects of 150 MW. The capacity of these projects alone exceeds POA 2 objectives (although targets for the Renewable Energy Master Plan are higher at 325 MW by 2030). The NC4 report forecasts resulting emission reductions of about 325 MWp by 2030.

Government commitment: Conditional **Expected government budget:** \$91–273 million

Wind power subsector context

Onshore wind projects are commercially proven with the technology and engineering profile that will typically secure commercial finance. As with utility-scale hydro and solar projects, commercial project developers will readily engage with a market that demonstrates a positive enabling environment. Typically, a strong energy PPA under strong policy framework incentives (e.g., feed-in tariffs, tax credits) are a prerequisite for this. Standalone commercially viable projects can also be found. Related regulatory frameworks and technical assistance will often govern and support complementary integration with the usually required environmental, social and economic development considerations.

Costs of electricity from onshore wind are now at the lower end of the fossil fuel cost range. The lower cost of electricity for onshore wind in 2018 was driven by continued reductions in total installed costs, as well as by improvements in the average capacity factor. The factors driving this trend include continued improvements in turbine design and manufacturing; more competitive global supply chains; and an increasing range of turbines designed to minimize levelized cost of energy (LCOE) in a range of operating conditions. Higher wind turbine hub heights with larger rotor diameters also result in higher MW capacities per turbine. This simply harvests more electricity from the same wind resource.

Costs and budget

The global weighted-average installed costs of onshore wind have declined by 35 percent in the last 10 years to \$1,500/kW in 2018. This was driven primarily by declines in wind turbine prices and also the balance of project costs. The total installed costs for onshore wind projects are very site and market specific. For projects commissioned in 2018, the range between the lowest and the highest installed cost was significant for onshore wind in most regions. The average 2018 installed costs in Africa range from \$1,100/kW to \$2,350/kW (IRENA renewable power generation costs in 2018, IRENA, 2018).

The wind turbines typically make up approximately 64–84 percent of the overall installed costs onshore, and the remainder includes grid connection, construction costs and other costs. Turbine supply and pricing are therefore significant considerations to overall costs and perhaps a factor to consider when assessing options to ensure local content and economic development options across the wind industry.

Ghana's stated NDC budget of \$91–273 million for 50–150 MW equates to \$1.82 million per MW. Ayitepa IPP is investing at \$2.33 million per MW. Both figures are within average 2018 price ranges.

Current activity

POA implementation lead

Ministry of Energy

Partner institutions/organizations

- Energy Commission technical regulator (licensing)
- Volta River Authority/BUI Power Authority state-owned electricity producers
- Public Utility Regulatory Commission market regulator
- Private sector (IPPs)

Progress and achievements

- There is an ongoing feasibility study for VRA projects. An environmental impact assessment for this has already been completed.
- A wind resource assessment has been completed at a height of 60 m with 'marginal' or 'moderate' wind speed results of between 4.0 m/s and 7.0 m/s for limited sites assessed.
- A PPA has been signed and a feasibility study has been completed for the Ayitepa IPP project.

Summary

There is a substantial untapped wind resource, although of marginal to moderate wind speed according to the limited resource assessment undertaken to date. With completion of required implementation strategies and an enabling environment, the targeted NDC capacity implementation is readily achievable and within expected cost range. Current projects under development already exceed NDC targets for this POA, and form part of expanded capacity within the Renewable Energy Master Plan. We would expect international and national renewable energy developers and financiers to be attracted to develop and fund proposed utility-scale wind projects with appropriate enabling environment, including power purchase arrangements. Funding of medium-scale projects via large corporations developing projects like VRA provides for a balance sheet finance approach.

However, the broader issues across the energy sector relating to current surplus electricity supply and IPP contracts present a known and material risk to successful full delivery of this POA. It is not considered feasible at this time to attract new private finance with current sector conditions. It could be expected that with an appropriate enabling environment in place, limited public funding may be required to implement this POA, although perhaps,

given the background of complexities with IPP arrangements, some level of government guarantee or financial commitment may well also be expected.

With the IPP arrangements resolved and with the lifting of the ban on new issuance of electricity production licenses, the implications of required local content and participation laws will also need to be considered in financing arrangements and cost expectations.

POA 3: ATTAIN UTILITY-SCALE SOLAR ELECTRICITY INSTALLED CAPACITY UP TO 150–250 MW Government commitment: Conditional Expected budget: \$180–300 million

Solar electricity subsector context

Solar PV projects are commercially proven with the technology and engineering profile, which will typically secure commercial finance. As with utility-scale hydro and wind projects, commercial project developers will readily engage with a market that demonstrates a positive enabling environment. Typically, a strong energy PPA under strong policy framework incentives (e.g., feed-in tariffs, tax credits) are a prerequisite for this. Related regulatory frameworks and technical assistance will often govern and support complementary integration with usually required environmental, social and economic development considerations.

The sustained, dramatic decline in the cost of electricity from utility-scale solar PV continued in 2018 and 2019, with a fall in the global weighted-average LCOE of solar PV to \$0.085/kWh – 13 percent lower in 2018 than for projects commissioned in 2017. This takes the decline between 2010 and 2018 in the global weighted-average LCOE of solar PV to 77 percent (IRENA, 2019).

New record low prices continue. The recent record price set in 2020 was from the United Arab Emirates (Abu Dhabi) with a cost of \$1.35/kWh for a very large project of 2GW expected online in 2022. To understand the competitiveness of this price, recall that old and fully depreciated coal power plants have LCOE values of around \$3.3/kWh (Lazard's Levelised Cost of Energy, 2019). Lower solar PV module prices and ongoing reductions in balance of system costs remain the main drivers of reductions in the cost of electricity from solar PV, as well as economies of scale in certain cases.

Ghana's geographical location gives it good exposure to solar radiation. The country receives an average solar radiation of about 4–6 kWh/m²/day and sunshine duration of 1,800–3,000 hours per annum, with the highest occurring in the northern belt. However, despite the abundant natural resource availability and potentially attractive costs, challenges remain with project preparation and grid integration: availability and efficiency of financing through development, competing land use, and commercial and technical integration with grid usage – including storage options and requirements.

The current suspension of issuance of new wholesale electricity supply licences and permits overrides all potential opportunities and realistically halts all new development. Some existing development continues including via VRA, which is building a number of plants to support grid stability. These include the Kaleo (13 MW) and Lawra (4 MW) solar power plants in the Upper West Ghana region. These two projects are funded with support (\$25 million) from KfW.

Costs and budget

The global weighted-average total installed cost of utility-scale solar PV projects commissioned in 2018 was \$1,210/kW, down from \$1,389/kW in 2017, a 13-percent decline. Although there has been a convergence in total installed costs towards the most competitive benchmark countries, which have historically been China and Germany, there still remains a wide spread in total installed costs.

The country average for the total installed costs of utility-scale solar PV in G20 countries ranged from a low of \$793/kW in India to a high of \$2,427/kW in Canada in 2018. The lowest cost average was three times less than the highest, despite the convergence of installed costs in major markets in the last three years. The country average for South Africa was \$1,671/kW (IRENA, 2018).

Ghana's stated NDC budget of \$180–300 million for 150–250 MW as a direct comparator equates to \$1.2 million per MW and is equivalent to global average costs but 25 percent lower than South Africa 2018 costs.

Current activity

POA implementation lead

Ministry of Energy

Partner institutions/organizations

- Energy Commission technical regulator (licensing)
- Volta River Authority/BUI Power Authority State-owned electricity producers
- Public Utility Regulatory Commission market regulator
- Private sector (IPPs)

Progress and achievements

- The Renewable Energy Master Plan provides a comprehensive outline of the Programme of Action and details of ongoing planning needed for implementation, including required regulatory schemes and highlighting coordination requirements for project implementation.
- According to IRENA statistics, the country had just 64 MW of solar capacity at the end of 2018.
- 40 MW is represented by two projects, both contracted under the 2016 energy crisis and at relatively high tariffs of IPPs at the time of 18 cents per kWh and over:
 - 2016 by subsidiary of Chinese developer, BXC Company Ghana Limited (20 MW operational in Gomoa Onyadze, Central Region).
 - 2018 by local IPP Meinergy Ghana Limited in Gomoa Onyadze, in southern Ghana.
- Others include the Volta River Authority, with various projects in development the 2.5 MW solar PV project in Navrongo, Upper East Region is operational. BUI has 50 MW in development, and IPPs have an advanced project pipeline of at least 240 MW.
- A hold on new IPPs and PPAs provides a barrier to progress, although some projects are completed and have been under development.

Summary

The substantial potential of utility-scale solar PV is largely on hold while broader electricity sector supply and demand dynamics are resolved. Planning and initial actions towards supporting required implementation strategies and creating an enabling environment are well progressed to facilitate the targeted capacity implementation. This is readily achievable and within expected cost range, particularly with the ongoing reduction in solar prices.

Current identified projects already exceed NDC targets for this POA, but form part of expanded capacity within the Renewable Energy Master Plan.

It is expected that international and national renewable energy developers and financiers would be attracted to develop and fund proposed utility-scale wind projects with an appropriate enabling environment, including power purchase arrangements. Competitive bidding via structured renewable energy IPP procurement programmes continues to play a significant role in observed industry-wide cost reductions. Funding of medium-scale projects via large corporations developing projects like VRA and BUI also provides for a balance sheet finance approach.

It is not considered feasible at this time to attract new private finance for utility-scale projects with current sector conditions.

With an appropriate enabling environment in place, it could be expected that only limited public funding may be required to implement this POA, although given the background of complexities with IPP arrangements, some level of government guarantee or financial commitment should also be expected.

With the IPP arrangements resolved and with the lifting of the ban on new issuance of electricity production licenses, the implications of required local content and participation laws will also need to be considered in financing arrangements and cost expectations.

POA 4: SCALE UP THE 200,000 SOLAR SYSTEMS FOR LIGHTING IN RESIDENTIAL AND NON-RESIDENTIAL BUILDINGS Government commitment: Conditional Expected budget: \$52 million

Solar systems context

Alongside motivations to shift to cleaner energy supply, the growth of the rooftop solar and related energy services market has been spurred by energy security concerns stemming from rising electricity costs, combined with decreasing technology costs and the ability in certain countries to generate revenue via net metering facilities back to the grid. African markets lag behind international market developments, but the South African market growth of more than 330 percent in 2019 (GreenCape) indicates the potential opportunity.

Typically, innovative energy service financing models alongside domestic tax incentives and capital subsidy schemes continue to be enablers for market development. A supportive enabling environment and efficient regulatory regime are assumed.

The aim of this POA is to reduce consumption for household electricity during peak hours and to enable solar photovoltaic panels to reach homes. Some implementation strategies include:

- Providing incentives through the energy levy, intensifying efforts to create awareness and develop capacity among stakeholders, and putting in place innovative market-driven policy instruments, e.g., matching grants, subsidies, revenue generation models.
- Supporting the implementation of the 200,000-rooftop solar programme.
- Supporting the private sector to facilitate the establishment and growth of a local solar component manufacturing industry.
- Encouraging local assemblers/manufacturers to supply solar systems and components for GoG-fundedprojects in line with the Local Content and Participation Policy.

Removing import duty and taxes on raw materials and components for the production of renewable energy systems.

The Ghana National Rooftop Solar Programme was established in 2016 as the main emphasis of this POA with the intent to catalyse the installation of 50W PV systems. The supply of a 50W solar panel is covered by a capital subsidy (30 percent of total costs), and householders or SMEs pay for the balance of systems and the rest of the unit. Lights are required to be replaced with LEDs.

Costs and budget

The total installed cost of PV systems can vary widely across countries and between countries and regions. These variations reflect the maturity of domestic markets, local labour and manufacturing costs, incentive levels and structures, and a number of other factors.

Total installed system costs in the United States of America (US) were \$2.70 for residential rooftop PV (6.2 kW) and \$1.83 for commercial rooftop PV (200 kW) (*Solar Installed System Cost Analysis*, NREL, 2018). The average total installed cost for residential PV systems in the markets of Australia, France, Germany, Italy, Japan and the US decreased from a range of between \$4.3/W and \$8.6/W in the second quarter of 2010, to a range of \$1.5/W to \$4.7/W in the second quarter of 2016 (*Cost and Competitive Indicators: Rooftop solar PV*, IRENA, 2017).

Comparable data sources on total installed costs in African locations has not been readily available. Capital costs for a 100 kWp solar home system are stated as \$1,100 in Ghana (*Solar PV in Africa: Costs and Markets,* IRENA, 2016), and in South Africa small-scale solar PV prices in 2019 of between 50 kWp and 100 kWp had a capital cost of the system at R12,000–R15,000 per kWp (@ 1 US\$ = R14.38, December 2018); this equates to \$835–1,045 (*Energy Services Market Intelligence Report 2020*, GreenCape). These appear comparable costs given time adjustments.

The intent within Ghana is also to stimulate local manufacture and assembly of PV systems. It is unclear what the cost (to government as a subsidy, or to the consumer) implications, if any, are for this additional local content and supply chain participation.

The POA has a target of 200,000 units of approximately 50 W equating to 10 MW. At assumed total installation costs comparable to average international costs of between \$2.5/W and \$5/W a budget of \$25–50 million is required, which is within the POA budget of \$52 million. This does not take into consideration the ongoing support of market development activities and creating the needed enabling environment, including support for local manufacture and content as well as expected leveraging of private sector participation in funding.

Current activity

POA implementation lead

■ Ministry of Energy – policymaker

Partner institutions/organizations

- Energy Commission technical regulator (licensing)
- Public Utility Regulatory Commission market regulator
- Private sector

Progress and achievements

- The launch of the National Rooftop Solar Programme (a capital subsidy scheme) has not progressed to full implementation due to the apparent lack of funding for both the 30-percent public subsidy and the apparent insufficient ability and appetite of private sector applicants to fund the remaining 70-percent capex costs.
- The number completed during the pilot phase was 1,014.
- 5.9 MW has been installed by the private sector.
- EC Rooftop Solar Programme (pilot phase completed in 2017; scale-up phase completed 2018–2030; modelcapital subsidy to home owners covering the cost of 50W solar panel. Homeowners are to pay for the cost of balance of system) (NDC reporting).
- It can be assumed that both households and businesses that have the resources to do so are starting to explore and implement such rooftop PV and storage systems for their own consumption requirements particularly with an outlook of lowering costs and ensuring predictability of electricity supply and costs.

POA 5: ESTABLISH 55 SOLAR MINI-GRIDS WITH AN AVERAGE CAPACITY OF 100 KW (10 MW) Government commitment: Conditional Expected budget: \$53 million

Mini-grid subsector context

The African mini-grid and rural electrification sector is still a nascent market where public funding remains an essential catalyst to attract private investors and to continue to enable scale-up, which will foster continued cost reductions. Efficient coordination of development efforts to bring together the political dynamics of rural development and implementation efforts is an imperative. Trust, confidence, capacity and experience are needed to deliver required and targeted energy access.

Market growth has increased, alongside donor funding, with under 2,000 connections in 2016 to over 41,000 in 2019 (Africa MiniGrid Developers Association). This growth has largely occurred in East African markets.

Continued barriers to implementation and growth are efficient regulatory compliance processes and challenges of low consumption rates. Low consumption makes it difficult to ensure operational cost coverage and to predict and enable any return on investment. Predictable public funding and efficiency of regulatory approval processes will provide an enabling environment for a more experienced set of developers and investors in the sector.

The development of the sector is part of the ongoing rural electrification challenge. It is expected that a broadscale demand-growth programme will be enabled through a combination of innovative finance (for appliance purchases), micro-entrepreneurship training and capacity (ensuring use of electrical appliances and local incomes) and interface with local economic opportunities – typically agriculture and fishing. Developing such systematic change requires continued engagement across wider NDC POAs (climate-smart agriculture and productivity) and national development priorities (One District One Factory).

Ghana has one of the highest electricity access rates in sub-Saharan Africa, with more than 70 percent of the population able to access electricity. However, the remaining portion of the country's population (approximately 5 million people) are mostly located in remote areas that are difficult to reach and are unlikely to be connected to the national grid. The prohibitive cost of extending the transmission and distribution network to those areas often requires expensive underground cabling and/or crossing national parks and reserves.

Island and lakeside communities constitute a significant proportion of the population with no access to electricity (approximately 5–6 million). An assessment based on the World Bank-funded Geographic Information System (GIS) has estimated a population of 2.9 million people in those island and lakeside communities. Out of this number, about 350,000 people residing in some 400 communities have been identified to benefit from decentralized renewable mini-grid systems. Efficient access to these communities (and project locations) to assess and implement distributed renewable energy systems and to provide ongoing operations, maintenance and support adds to the logistical challenge and cost of efficient implementation.

Ongoing support to the sector development through implementation efforts under the SREP and Renewable Energy Master Plan (REMP) provide continuity to deliver this POA. The implementation strategies identified in NDC implementation planning include:

- The creation of a special funding envelope such as Government of Ghana budgets, loans, grants, rural electrification levy, etc., for mini-grid development, promoting energy efficiency, demand-side management, and productive use interventions in all mini-grid projects.
- Supporting integration of existing stand-alone systems into mini-grids under net metering scheme.
- Ensuring proper sizing of mini-grids (with approximately 500 W per capita) and providing water transportation facilities for mini-grid development on islands and for lakeside communities.

Costs and budget

Capital expenditure related to the construction of new mini-grids is one of the main cost inputs determining the affordability of electricity to end users. Across AMDA (Africa MiniGrid Developers Association) members, the average installed costs have decreased by 65 percent between 2015 and 2018, from approximately \$14,000/ kW to \$6,200/kW. With growth in the market and the significant drop in installed costs during the 2014–2018 period, the average price of connection dropped from \$1,555 to \$733 in 2018.

It is recognized that the limited size of the market and data set involved makes broad assumptions unclear; however, it can be recognized that cost improvements were more prevalent in more established markets of East Africa. New market development saw cost increases particularly where there were variances in mini-grid system sizes, variance on VAT costs on solar assets, fewer connections per site and higher site development costs (*Benchmarking Africa's MiniGrids* – Africa MiniGrid Developers Association, 2020).

At average costing, a notional 100 kW mini-grid will have an installed cost of between \$620,000 and \$1.4 million. The NDC budget of \$53 million will therefore broadly cover the proposed installation costs of establishing 55 mini-grids with an average capacity of 100 kW.

Broader market development costs, including raising awareness and capacity-building in public support, as well as costs of operations and maintenance and an efficient enabling environment, alongside the expected level of private, development or impact financing are not fully considered with the currently available data.

It is recognized within the industry that although there is a drive to standardize designs and operations of minigrids, most current mini-grids are unique, with custom installations tailored to their community and location circumstances. This results in the typical LCOE for a well-run mini-grid of at least \$0.60/kWh making electricity too costly for widespread use without subsidy. Electricity from a mini-grid must compete with costs of running a small gasoline or diesel generator (\$0.35–0.70/kWh), the cost from power from the grid if available and the new customers' ability and willingness to pay (*MiniGrids in the Money: Six Ways to Reduce MiniGrid Costs by 60 percent for Rural Electrification*, Rocky Mountain Institute, 2018).

Current activity

POA implementation lead

Ministry of Energy

Partner institutions/organizations

- Energy Commission
- Public Utility Regulatory Commission
- Private sector

Progress and achievements

Mini-grids were installed in five island communities in 2016 – in Pediatorkope, Atigagome, Wayokope, Aglakope and Kudorkope – with a total of 1.7 MW of installed capacity serving approximately 10,000 people. Fourteen mini-grids of 100 kW were installed in different communities up to April 2018 (NDC Implementation Plan), and pilot phases of private sector development were also implemented. Related support for the enabling environment is ongoing – community awareness and training, assessment of different business models and GIS mapping of communities to support identification of appropriate locations.

The SREP programme was identifying and undertaking project preparation activities towards securing additional funding via a concept note during 2020 (*SREP Country Portfolio* update, January 2020). Fuller diagnostic assessment of NDC POAs was also expected around the end of 2020. New open engagement from market participants provides a useful roadmap to tailor a specific investment plan for the Ghana market. See for example:

- https://www.crossboundary.com/energy-access/open-source/
- https://www.powerforall.org/resources/calls-to-action/investor-position-paper-unlocking-private-capitalmini-grids-africa

Summary

A greater understanding of core data behind the longstanding Ghana development efforts for mini-grids is needed to develop full financing assessments. Current costs of mini-grid development and the nascent stage of development of the targeted rural electrification market requires continued public funding support. The alignment of this POA with the SREP-funded programme provides continuity and the necessary scale. This public/donor funding support and continued cost reduction of renewable technologies, engaged private sector developers and innovative financing solutions should allow for active and increased private finance once sector strategies and targeted community programmes are further developed.

Coordination with economic development activities in adjacent sectors, particularly relating to productive use of energy within agriculture, fishing (NDC POA's for the agriculture sector) and 'One District One Factory,' is assumed to deliver additional alignment.

POA 6: INCREASE SOLAR LANTERN PENETRATION IN RURAL NON-ELECTRIFIED HOUSEHOLDS TO 2 MILLION Government commitment: Conditional Expected budget: 300 million

Solar lanterns subsector context

Ghana has one of the highest electricity access rates in sub-Saharan Africa, with more than 70 percent of the population able to access electricity. However, the remaining portion of the country's population (approximately 5 million people) with no access to electricity are mostly located in remote areas that are difficult to reach and are unlikely to be connected to the national grid. This POA is intended to encourage the use of solar LED lights rather than kerosene lamps within these communities.

Various pilot programmes have predated this POA with acknowledged lessons to successful implementation (referenced via the outcomes of the Ghana Energy Development and Access Project (pre-2015) – SREP Investment Plan):

- Ineffectiveness of subsidies to bring down product costs. Subsidies covered additional logistics costs of accessing remote communities only.
- High willingness of communities to pay for solar systems (particularly where access to LED colour TV was included).
- Trade financing and working capital facilities were required enablers to solar PV suppliers.
- Product quality and the ability to maintain the products was vital for overall success of implementation.
- Local rural banking facilities play a critical role in the successful implementation and sustainability of service offerings.

In addition to the proposed supply of 2 million solar lanterns, and as indicated in the Renewable Energy Master Plan, the strategy to promote solar lanterns includes the objective to make Ghana the manufacturing hub for solar lanterns in the region. Therefore, it was proposed that at least one company would be established by 2020 to manufacture solar lanterns. This would be expected to create jobs and develop local skills.

Proposed implementation strategies include:

- Continued subsidizing of the cost of the solar lanterns.
- Providing incentives for local manufacturing/assembly.
- Ensuring compliance of local content and participation policy for solar lantern procurement.
- Strengthening relevant regulatory institutions to implement quality compliance.

The growth of the off-grid solar market across Africa has been significant. This includes lighting products but increasingly also a wider range of household appliances and tools – TVs, fans, refrigeration units, water pumps, etc. Some 8.5 million off-grid solar lighting products and 1.2 million off-grid solar appliances were sold in 2019 by a growing number of companies (participating in the World Bank/GOGLA (Global Off-Grid Lighting Association) annual market survey). Financing options include both cash sales as well as pay-as-you-go finance. However, the majority of this activity and growth is in East Africa where 3 million units were sold in the second half of 2019. In West Africa, 370,000 units were sold (45 percent in Nigeria) in the same time period, and Ghana recorded only 17,000 units sold. Cash sales are the majority of transactions with 10,000 units sold, and pay-as-you-go systems account for around 7,000 units sold.

A now-established group of off-grid solar companies is operating across the continent, with new entrants also emerging. This sector has attracted more than \$500 million of investment to date, with a sharp increase in recent years (BNEF.com). The leading suppliers and investors in the sector are detailed within GOGLA membership. The majority of these companies are targeting household and larger systems, which provide the scope and scale which drive the commercial profile. These will typically include pay-as-you-go or innovative asset financing and/ or insurance services alongside the product. A number of established energy companies, innovative finance and

impact investors are now actively participating in the sector. The challenge remains to serve the market need for more basic solar lanterns, particularly to the remote communities targeted in this POA, in a cost-efficient way.

However, it should be noted that few of these off-grid solar companies are active in meaningful scale in Ghana. PEG Africa stands out as one such company, although the prime market is focused on larger solar home systems than is the focus of this POA. Potential reasons include: relatively small market size; accessibility of target communities (3 million persons living in lakeside fishing communities with no road access); requirements for local content and inclusion when most companies have committed to predetermined supply chains; and VAT and import duty. At the same time, across the continent there is an influx of cheaper, inferior products, which will decrease confidence in product adoption.

Costs and budget

Every six months the World Bank and GOGLA (GOGLA.org) undertakes a market review of sales and impact of off-grid solar lighting products sold by GOGLA affiliates and members.

Figures for the second half of 2019 include:

- Portable lanterns without mobile charging capability (< 1.5Wp) 1.3 million units sold at an average price of \$6.26/unit
- Portable lantern with mobile charging capability (1.5–3.0Wp) 1.48 million units sold at an average price of \$24.34/unit
- Multi-light system with mobile charging capability (averaging approximately 6.5Wp) 780,000 units sold at an average price of \$74.08/unit

The NDC budget is stated as \$300 million. The precursor programme to the NDC has been running since 2013 with significant assumed cost through early market development activity, grant and subsidy arrangements offered to initiate solar lantern distribution and supply chain and local manufacture developments. A direct comparison with current unit prices is not achievable.

Current activity

POA implementation lead

Energy Commission

Partner institutions/organizations

- Ministry of Energy policymaker
- Energy Commission technical regulator (licensing)
- Ghana Standards Authority

Progress and achievements

The ongoing diagnostic assessment of NDC activity is assumed to provide the required fuller analysis of the historical status of the POA and future needs. The NDC Implementation Plan states that 150,000 units were distributed by 2017. Significant learning and early market intervention are evident through the ongoing solar lantern distribution project.

It is expected that with the right enabling environment the growing private sector market for solar lighting and related products will actively pursue and deliver this POA. Synergies may also be sought with climate-smart agriculture and productivity NDC POAs, as well as access to clean water initiatives. For example, alongside

86 FINANCING STRATEGY REPORT

provision of solar lanterns, participants have been trained in solar powered irrigation systems as well as how to use solar dryers and farm management systems. In addition, 537 irrigation systems have been installed, with support from the Ghana Grains Council, and 16 solar hybrid balloon dryers have been installed in Brong Ahafo region (MESTI, EPA, 2018).

Summary

A greater understanding of core data behind the expanded economic development and market development strategy of the solar lantern programme is needed to develop financing assessments. That said, it is acknowledged that current costs of solar lantern and off-grid solar products – along with the growth in the entrepreneurial private sector innovative financing solutions and with increasingly strong financial backing – should allow for active and increased private sector participation to facilitate implementation of this POA. Donor- and impact-led financing options may also be available for targeted projects in communities where commercial applications are not obvious. A balance may be required by the Government of Ghana on the level of local content aspiration and related economic development objectives against the desired participation and impact of cost effective POA implementation by private sector participants.

ENERGY SECTOR: CLEAN COOKING

Market context and costing

Conditional funding commitment:

- POA numbers 7 and 8
- Energy sector clean cooking

POA 7: SCALE UP ADOPTION OF LPG IN AT LEAST 50 PERCENT OF HOUSEHOLDS Government commitment: Conditional Expected budget: \$317 million

LPG and clean cooking subsector context

This Programme of Action is being implemented as part of the government's efforts to reduce deforestation and promote the use of LPG as a cleaner and safer form of cooking fuel. The Government of Ghana has set a policy goal of 50 percent of the population using LPG as their main cooking fuel, and for other uses, by 2030.

This is a long-standing and ongoing effort to shift to the use of LPG. The policy commitment in 2010 followed national (and then rural) LPG promotional programmes to support implementation. Today, approximately 20–25 percent of Ghana's population uses LPG as its main cooking fuel.

It appears that although sufficient (or surplus) supply of LPG may be available at wholesale markets, the downstream market is constrained. In addition, increased consumer awareness and education along with improved affordability are needed to increase widespread adoption and usage. It is expected that, geographically, Ghana's southern and central regions provide the most accessible growth opportunity; and the combination of lower average household incomes, the availability of 'free' wood fuel for collecting, and less developed road and transport infrastructure would result in proportionally lower growth and growth rates in the three northern regions.

Regarding the time (and investment) horizon, LPG is at a minimum a bridge to a fully renewable, clean, modern and effective cooking and other energy solution. With the level of investment in establishing LPG upstream industry and evolving wider LPG market development, including the potential for biogas, the lifespan of investments in LPG-based solutions for clean cooking may well extend far beyond 2030 (*National Feasibility Study: LPG for Clean Cooking in Ghana*, the Global LPG Partnership).

Costs and budget

An assessment undertaken in 2019 (*LPG for Clean Cooking in Ghana: Investment and Implementation: Global LPG Partnership,* KfW and EU) sets out the investment and implementation requirements to meet national LPG sector development and targets.

The analysis sets out that to expand and reengineer the supply chain to serve the projected demand effectively and efficiently, an estimated LPG sector capex investment of €335 million will be required over 10 years. This is comparable to the headline budget number of \$317 million for this POA, although it does not consider the extent of existing commitments/expenditure from this budget.

Important factors to note from this Global LPG Partnership assessment include:

- The clear acknowledgement of the challenges of attracting private capital to this POA from both domestic and international sources.
- The key asset for LPG market expansion is the inventory of cylinders, without which there can be no growth in residential LPG users.
 - The bulk of investment assumed needed was in cylinders (€235 million) against bottling plants, storage and related items (€100 million).
 - The number and efficiency rate of rotation of cylinders within the market are key indicators of market development and saturation. Reacting and influencing this provides for the opportunity to assess and commit funding with commercial return expectations.
- A phased investment approach over the course of 10–12 years is proposed to build market adoption and manage risk.
- Technical assistance is needed both in the form of project/investment preparation as well as to encourage additional demand and can influence the ability over time to leverage private capital into the sector. Approximately €15 million is assumed to be needed.
- It is assumed that a form of microfinance support may increase consumer financing requirements (for initial capex investment in LPG usage) although this was as yet untested.
- Outline targets are established to leverage 75 percent of funding (€251 million) from concessional sources (40 percent) and non-concessional debt (30 percent) once initial market development has progressed with public funding.

The business model for cylinder ownership and fuel supply is a key determinant and risk in future successful market development. Historical complexity with the manufacture and supply of cylinders has led to constraints in market development and private sector involvement. There is a current initiative to facilitate, regulate and enforce a branded cylinder recirculation model, which is foreseen to be a critical enabler of market development.

Current activity

POA implementation lead

Ministry of Energy

Partner institutions/organizations

- Energy Commission technical regulator (licensing)
- Ghana Standards Authority
- Clean Cooking Alliance and Ghana Alliance for Clean Cookstoves
- Private sector, manufacturers

Progress and achievements

Over the past years, Ghana has taken some important steps towards achieving the policy. Below, a few of them are listed along with achievements:

- Today, approximately 20–25 percent of Ghana's population uses LPG as its main cooking fuel.
- Regulations for the wood fuel sector have been developed.
- The current user-ownership of the LPG cylinder was transitioned to the cylinder recirculation model of distribution to remove the adoption barrier of the high cost of LPG cylinders in addition to stove and accessories cost.
- Support from the UNDP and Clean Cooking Alliance provided support to establish two test centres at the KNUST Technology Consultancy Centre and the Council for Scientific and Industrial Research Institute to test the thermal efficiency and emission levels of stoves and fuels.
- The government successfully, through its Ghana National Gas Company, completed the Atuabo Gas Project, which commenced commercial operations in April 2015. The new gas processing plant, aside from delivering over 100 MMSCF of lean gas per day for thermal plants to generate power, is also currently producing 500 tons of LPG a day for the domestic market. The plant is also on track to produce more than 180,000 metric tons of LPG per year, amounting to over 50 percent of the present estimated 360,000 metric tons of annual LPG national demand.
- The Ministry of Energy will be partnering with LPG marketing companies and local dealers to facilitate the setting up of mini-refill plants in low access districts to guarantee the constant supply and safety of refilled LPG cylinders in a cylinder recirculation model.
- There has been increased awareness on the benefits of using cookstoves.
- The introduction of the LPG cylinder recirculation model has enabled development of the sector but with complexity. New efforts to develop a branded cylinder recycling model provide alternatives to the incumbent approach.
- A subsidy on LPG to finance LPG access by rural communities has been redirected.
- Through microfinance institutions, a 40 percent subsidy has been provided to women involved in agroprocessing to purchase improved institutional biomass stoves.
- 97 metropolitan, municipal and district assemblies have received over 149,500 cylinders and 85,000 single burner stoves plus accessories.
- 1.2 million stoves for households have been distributed.
- The Ministry of Energy and Energy Commission have launched Ghana's 500,000 improved cookstove project in collaboration with Korean investors seeking emissions reductions to be transferred to the Korean carbon market within the framework of the Paris Agreement Article 6. Ghana is the host of 14 improved cooking stove programme activities with a potential average of 151.1 kt/year each in the first period. (MESTI, EPA, 2018)

Summary

Longstanding and ongoing government-led efforts to promote the use of LPG as a cleaner and safer fuel for cooking have enabled penetration today to between 20–25 percent. The significant investment in the supply of gas provides the option to increase LPG market penetration wherever possible as well as the necessity to support the ongoing and increased LPG demand. However, the programme has faced diverse challenges ranging from initial inadequate LPG production, to limited storage and poor rural distribution infrastructure, which need to be addressed. Standardization of LPG cookers and cylinders is also a challenge as well as development of an efficient and sustainable fuel supply and related cylinder rotational model, alongside increased awareness of the technology opportunity to further diversify to new applications. Continued and efficient commitment of domestic resources are needed, perhaps aligned with fuel supply arrangements, to further progress sector development before meaningful international and private capital is likely to be secured.

POA 8: SCALE UP ACCESS AND ADOPTION OF 2 MILLION EFFICIENT STOVES Government commitment: Conditional Expected budget: \$20 million

Clean cooking subsector context

The Ministry of Energy and the Energy Commission, in partnership with the Ghana Alliance for Clean Cookstoves and Fuels and the Global Alliance for Clean Cookstoves and Fuels, are leading the implementation of biomass cookstoves and fuels interventions. The target is to facilitate the adoption of efficient biomass cookstoves by 2 million households by 2030.

Investment in the sector globally is growing (\$40 million 2017, Clean Cooking Alliance), but demonstration of true scalability (demonstrable growth rates and profitability) continues to hamper confidence to invest to enable required market expansion and replication of business models. Over 50 percent of this investment activity has been focused on East Africa, with enabling policies, well-established charcoal markets and product awareness as a result of longstanding clean cooking development programmes. Similarly, alongside the concentration of impact investors in East Africa, a variety of business models have been supported in early development, often building on innovative approaches in parallel clean energy markets. It is assumed that mobile money applications and fuel-based business models will be critical for clean cooking sector growth.

Costs and budget

Average manufacturing costs per unit for wood-based stoves are approximately \$16 and \$30 for charcoal and pellet stoves, respectively, with market prices of approximately \$25 for wood and \$40–45 for charcoal or pellets (Clean Cooking Alliance, 2017).

So, based on stated cost references for defined improved cookstoves, the indicative capital cost of 2 million stoves will range from \$50–90 million.

Domestic manufacture of cookstoves and/or perhaps varied product specification (including traditional cookstoves) to those in the Clean Cooking Alliance assessment may also impact on costs.

The indicated POA budget of \$20 million appears low considering longstanding and ongoing efforts in this area. Such funding needs to be deployed efficiently to create the conducive enabling environment to facilitate the

deployment of innovative business models and entrepreneurship alongside attracting the innovative impact and development finance investment needed in this sector.

Current activity

POA implementation lead

Ministry of Energy

Partner institutions/organizations

- Energy Commission technical regulator (licensing)
- Ghana Standards Authority
- Clean Cooking Alliance and Ghana Alliance for Clean Cookstoves
- Private sector, manufacturers

Progress and achievements

Over the past years, Ghana has taken some important steps towards achieving the policy. Below a few of them are listed, along with achievements:

- The development of regulations for the wood fuel sector.
- Support from the UNDP and Clean Cooking Alliance in the successful establishment of two test centres at the KNUST Technology Consultancy Centre and the Council for Scientific and Industrial Research Institute to test the thermal efficiency and emission levels of stoves and fuels.
- Increased awareness on the benefits of using cookstoves.
- Through microfinance institutions, a 40-percent subsidy provided to women involved in agroprocessing to purchase improved institutional biomass stoves.
- The distribution of 1.2 million stoves for households.
- The Ministry of Energy and Energy Commission's launch of Ghana's 500,000 improved cookstove project in collaboration with Korean investors seeking emissions reductions to be transferred to the Korean carbon market within the framework of the Paris Agreement Article 6. Ghana is the host of 14 improved cooking stove programme activities with a potential average of 151.1 kt/year each in the first period (MESTI, EPA, 2018).

Summary

There is active engagement in implementation of this POA, including the domestic manufacturing market and related supply chain, but continued challenges remain, including: inadequate production and distribution; limited expertise in designing and producing more efficient technologies; high cost of improved cookstoves compared to traditional cookstoves; and the weak development of innovative financing schemes for stove producers, retailers and consumers. Strengthening the capacities of cookstove testing centres should aid the implementation of standards and labelling, while the Ghana Standards Authority carries out certification of testing laboratories. Increased adoption of products and business models being tested and deployed in other countries may also be beneficial to achieve POA targets, desired impact and the SDGs.

TRANSPORT SECTOR

Market context and costing

Conditional funding commitment:

- POA numbers 21 and 22
- Transport sector mass transit bus and rail

POA 21: EXPANSION OF INTRACITY TRANSPORTATION MODES (BUS RAPID TRANSIT) Government commitment: Conditional Expected budget: \$310 million

Bus rapid transit subsector context

The intention of the Programme of Action is to provide high occupancy mass transit buses, which will alleviate the transportation difficulties facing workers and school children in the metropolis, municipalities and surrounding districts in Accra/Tema and Kumasi Metropolitan Areas; provide safe and reliable public transportation in the metropolis and municipalities and reduce the rate of avoidable accidents; and promote a shift to an environmentally safe mode of transport and clean technology, including the introduction of compressed natural gas buses.

This aligns with the outlook that bus rapid transit (BRT) systems present an attractive proposition to sub-Saharan African governments as a low-cost public transport solution that can be implemented with relatively little fixed infrastructure and has the benefits of easing congestion, reducing pollution and improving urban mobility. These issues are becoming increasingly pressing as population growth and urbanization continue at pace throughout the region, putting existing urban transport networks under considerable strain and hindering labour mobility and economic development. This rapid population expansion, combined with fiscal constraints on many sub-Saharan African governments, makes BRT systems a potentially viable public transport solution.

However, it is also noted that various pilots launched in the previous decade have had limited success, including examples in Lagos, Dar es Salaam, Johannesburg, Cape Town and Pretoria. The material risk and complication for governments trying to implement new formal public transport systems such as BRT is that they directly compete with the incumbent informal, unregulated transport systems – buses, taxis and mini-buses. These can exert powerful vested interests and hinder prospects for success, especially where the new BRT systems risk taking market share and potentially putting drivers out of work. Alignment of new infrastructure with existing urban planning and convenience for consumers as well as inherent required shifts in consumer behaviour and possible costs can also provide challenges and risks to manage (BMI Research market analysis).

Costs and budget

The Institute for Transportation and Development Policy (ITDP) (www.itdp.org) provides analysis and planning guides for urban transportation systems. Average cost per kilometre (2013) in lower-income countries is \$11.5 million/km with a range of approximately \$9.5–16.5 million/km.

Publicized costs for the 20-km BRT system in Addis Ababa are 5.9 billion Ethiopian Birr, or approximately \$165 million. This equates to \$8.5 million/km, slightly lower than 2013 ITDP figures. It appears that 50 percent of this cost was funded via a soft concessional loan from AFD, with government guarantee. It is understood that French firms have been involved in the construction activities.

92 FINANCING STRATEGY REPORT

The POA budget of \$310 million plus an earlier \$95 million grant would, against the above metrics, simplistically provide for approximately 35–47 km of BRT.

The POA intends to pilot four corridors in total amounting to 90 km. Thus, it may be assumed that a budget for a pilot of a third to half of this is reasonable. Or on the understanding of the approximately 21-km Amasaman–Tudu corridor being progressed first, the \$310 million budget would presumably cover both capital costs plus vehicle purchase, as well as wider POA establishment.

Rapid transit systems are classic examples of public investments that make sense for public debt financing. Because the benefits of a well-designed transit system will be enjoyed for decades to come, it is reasonable to pass some of the construction costs on to future taxpayers. The manner in which these costs are financed, however, can have a significant impact on system operating costs. ITDP analysis looked at urban transit financing in nine countries and indicated the following five typical sources of transit financing: bonds; bilateral loans or loans from export credit agencies; MDB loans; commercial loans; and national government and national development bank loans.

It is stated in NDC implementation plans that export credit facilities are expected in the region of \$110 million to invest in both infrastructure and the purchase of the required fleet of BRT buses. Therefore, \$200 million would need to be financed from or via government.

Current activity

POA implementation lead

Ministry of Transport

Partner institutions/organizations

- Ministry of Roads and Highways
- Ministry of Local Government and Rural Development
- Greater Accra Passenger Transport Executives (GAPTE)
- Department of Urban Roads
- Driver and Vehicle Licensing Authority
- Local metropolitan assemblies
- Public funders (DFIs, donors, export agencies)
- Private sector (debt and equity funders, construction and vehicles suppliers)

Summary: Progress and achievements

There has been progress with the POA, including completion of 5 percent of the entire infrastructural works for dedicated bus lanes in the Amasaman–Tudu corridor. Offices have been set up for GAPTE and BRT bus operating companies. The provision of infrastructure works for the Adneta–Accra corridor is ongoing; and inter-MMDA coordinating, bus operating companies and grant operating licensing have been set up. Buses have also been procured for BRT operations, and appropriate regulation for dedicated BRT operation has been developed. A framework to establish a national road transport service regulator is also being developed (NDC Planning Report).

Challenges remain around user commitment to transition and regulation of incumbent informal transportation options. Consistent political commitment is needed alongside funding.

POA 22: EXPANSION OF INTER- AND INTRA-CITY TRANSPORTATION MODES (RAILWAY TRANSIT SYSTEM) Government commitment: Conditional

Expected budget: \$1.2 billion

Railway transit system subsector context

The intention of the Programme of Action is to expand the railway network, including the redevelopment of the Western and Eastern Lines, to facilitate the haulage of bauxite, manganese, cocoa, cement, iron ore and other bulk commodities, as well as the transportation of people. The measure also includes the development of an integrated light rail transit system for major cities in Ghana to connect main business districts with outlying residential locations.

More broadly, despite the limited rail operations in the country, trains consumed 0.3 million tons of diesel, mainly for freight transport. In this regard, Ghana adopted a new programme to develop a vibrant and modern rail transport system to catalyse economic development. The current railway development plan outlines the ambitious railway industry revitalization agenda. The plan envisages that the over 4,000 km of railways would be constructed in 15 years (Ministry of Finance, 2019).

The NC4 report highlights that Ghana has a flagship railway development programme; and currently the Ministry for Railway Development is implementing the National Railway Master Plan to modernize the railway network nationwide by aiming at mobilizing \$7.8 billion investments into the 1,394 km rail network.

This includes a section of 340 km of the rail network where in 2019 the Government of Ghana and the Ghana European Railway Consortium (GERC) reached a concession agreement for the implementation of this project at a cost of \$2.2 billion. This equates to \$6.5 million/km for a combination of rehabilitation of an old existing railway and partial construction of new line.

Costs and budget

Full comparison of budgeted costs requires greater detail than is immediately available. The following, however, provides examples of some railway greenfield and brownfield project costs. The cost per kilometre may vary significantly depending on the amount of civil engineering structures, the terrain, the total length of the railway line, or labour, raw materials and expropriation costs.

According to AfDB analysis (*Fundamentals of Rail Economics and Operations*), the total cost of greenfield projects may range from \$2 million/km for single-track non-electrified lines in a developing country to \$4 million/km for an electrified line. This may increase to \$6.5–7.5 million/km in developed countries. At the other extreme, a high-speed electrified line with full environmental and biodiversity measures included can cost \$40–50 million/km in European urban areas.

Rehabilitation of brownfield projects typically has lower cost. For example, projects in Turkey, Uganda and Angola range from \$1–2 million/km and \$3.5 million for an electrified line in Ethiopia.

Some considerations in financing of such infrastructure include:

Railway infrastructure is rigid, expensive and requires operating and maintaining. Rail requires high volumes to be feasible, and it is a business of high volumes with low margins.

- Rail freight and rail passenger transportation need to be assessed separately as they are very different businesses.
- Most rail projects around the world require high levels of subsidy for the construction and/or operations to be sustainable. This subsidy needs to reflect the economic, social and environmental benefits of railways compared with other transport modes.

There is no single 'fit for all' business model for railways. A large number of railway business models can be found worldwide with various levels of integration/separation of infrastructure and operations, and with more or less private participation. Significantly, the bigger and apparently more efficient railways in Africa (e.g., RSA or Morocco) are public sector undertakings, which is not the mainstream pattern in the Americas or in Europe.

Looking at light rail–urban transit infrastructure, the Institute for Transportation and Development Policy provides analysis and planning guides for urban transportation systems. Alongside bus rapid transit, analysis is provided of comparable urban transit options of light rail transit (LRT) and heavy rail transit (HRT). LRT is integrated into street-level roadways and HRT is distinct, separate right-of-way transit generally requiring tunnelling or the construction of elevated rights of way and stations.

Comparable average (2013) costs in lower-income countries were assessed as follows:

BRT is \approx \$11.5 million/km.	LRT is \approx \$25.5 million/km	HRT is ≈ \$87.5 million/km
And within higher-income countri	es as follows:	
BRT is ≈ \$10.0 million/km	LRT is ≈ \$37.5 million/km	HRT is ≈ \$434 million/km

Current activity

POA implementation lead

Ministry of Railways Development

Partner institutions/organizations

- Ministry of Transport
- Ministry of Finance
- Ghana Railways Development Authority
- Ghana Railways Company Limited
- Ghana Bauxite Company Limited
- Bulk Oil Storage and Transportation Company (BOST)
- Ghana Ports and Harbour Authority (GPHA)
- Ministry of Roads and Highways
- Public funders (DFIs, donors, export agencies)

Summary: Progress and achievements

There has been progress with the Programme of Action. Namely, \$398 million has been secured to develop the Tema–Akosombo railway link, and the Ghana Railway Master Plan has been implemented by the Ministry of Railway Development. Another \$500 million is pending Cabinet and Parliament approval for the construction of the Western Line, while the Government of Ghana has provided \$2.44 million to conduct feasibility studies on that line. The challenge is how to obtain long-term financing for railway construction. This includes continued difficulties to operationalize the proposed Railway Development Fund. Diverse forms of encroachment on railway lands and reservations also remain a challenge.

The development of individual projects with required feasibility and project planning and preparation activities will provide the basis to understand the details of financing requirements for bespoke projects. Given successful development of recent projects aligned to the Ghana Railway Master Plan, this project preparation approach is aligned to the Ministry of Railway Development.

WASTE (WATER) SECTOR: BIOGAS

Market context and costing

Conditional funding commitment:

- POA numbers 23, 24 and 25
- Waste sector biogas

POA 23: IMPROVE EFFECTIVENESS OF URBAN SOLID COLLECTION TO 70–90 PERCENT AND BUILD ENGINEERED LANDFILLS FOR METHANE Government commitment: Conditional Expected budget: Not estimated

Waste management and landfill subsector context

The aim of this Programme of Action is to increase municipal solid waste (MSW) collection and ensure recovery of landfill gas for economic use. The operational target is to process 200t/day of landfill gas.

Solid waste and wastewater management are major challenges in most cities in Ghana and contribute 8 percent²⁵ of the total national GHG emissions, with a high growth rate. Increased emissions levels correspond to the rise in nitrogen addition to managed soil, unmanaged waste disposal practices and ineffective resource recovery via wastewater treatment technologies.

In the waste sector, solid waste disposal and wastewater treatment/discharge account for 36 percent and 58 percent of the total GHG emissions, respectively. On average, about 13,720 tons of solid waste are generated per day nationwide. Landfills (open burning, improved dumping, high-density aerobic and sanitary landfills) and biological treatment like composting and biogas are the major technologies for final waste disposal in the country.

As of 2018, Ghana had seven final disposal sites operating as sanitary landfill, out of the over 172 official disposal sites scattered across the 254 districts. About 80 percent of the present sanitary landfill sites are being operated by Waste Landfills Company.

The main MSW management strategy has been collection, transportation and disposal of co-mingled solid waste on dumpsites. Collection of MSW – largely undertaken by private contractors – has been house-to-house (curbside) where compactor collection vehicles move from one house to another, collecting stored solid waste once a week at a monthly cost to the service beneficiaries. The other mode of collection has been the use of central communal containers where skip trucks go in to hoist skip containers placed at sanitary sites within the communities. Such containers are filled with solid waste by household members who do not have access to the house-to-house services. The frequency of collection at such sites depends on the rate at which the containers

fill up. In some cases, collection can be eight times per day. Collected MSW is transported over an average distance of 14 km within the Accra metropolis.

Costs and budget

A budget was not estimated for this POA in the NDC Implementation Plan.

Summary data points to assess financing metrics may include waste generation for Ghana at 0.51 kg/capita/day against the sub-Sharan average of 0.46 kg/capita/day and the global average of 0.74 kg/capita/day.²⁶

Budgeting needs can be split into collection and transfer, and type of treatment. The table below shows typical waste management costs by disposal type (US\$/ton).²⁷

	Low-income countries	Lower middle-income countries	Upper middle-income countries	High-income countries
Collection and transfer	20–50	30–75	50–100	90–200
Controlled landfill to sanitary landfill	10–20	15–40	20-65	40–100
Open dumping	2–8	3–10		
Recycling	0–25	5–30	5–50	30-80
Composting	5–30	10-40	20–75	35–90

World Bank project lending across its solid waste management portfolio during 2014–2019 indicates just 8 percent of projects include landfill gas.

Limited reference²⁸ costs for comparable landfill gas projects are available. Examples include:

- The Kamphaeng Saen projects in Thailand, receiving 5,000–7,000 tons of waste per day. A total project cost of \$16.4 million (2009) was invested to purchase the gas rights, landfill gas infrastructure and operations, and to pay for grid electricity connection. The project financing was underpinned by strong renewables energy regulation and the clean development mechanism market, which was available at the time.
- The Santa Rosa Landfill Gas Project in Brazil (2014) cost \$16.6 million to implement with a forecast annual operations and maintenance cost of \$290,000.

Costs are provided with recognition that there are limited reference projects and direct comparable financing for such landfill gas projects is not possible. Each project has a set of site-specific factors that determine the technical and financial viability. As a result, there is not a standard financial architecture that is consistently applied. Every project requires customized analysis and development through detailed site-specific project preparation.

Current activity

POA implementation lead

■ Ministry of Sanitation and Water Resources

²⁶ World Bank: Financing Solid Waste Management in Africa, 2019.

²⁷ World Bank: Financing Solid Waste Management in Africa, 2019.

²⁸ World Bank: Urban Development Series: Financing Landfill Gas Projects in Developing Countries.

Partner institutions/organizations

- Metropolitan, municipal and district assemblies (MMDAs)
- Ministry of Local Government and Rural Development (MLGRD)
- Private sector, academic institutions

Progress and achievements

Over the past years, Ghana has taken some important steps towards achieving the objectives of the policy. A few of these are listed below, along with achievements:

- There are five operational engineered sanitary landfills. Less than 5,000 tons of waste is deposited in engineered landfills.
- About 172 official dumpsites are operated in various MMDAs.
- Private sector involvement in waste collection and transportation is based on franchises for specific districts.
- Waste transfer stations are under development.
- Feasibility studies and development have progressed by the private sector for new engineered landfill for methane recovery.
- Revenue collection and subsequent payment to waste management companies' operating sites continues to be a material constraint of service delivery and development.

POA 24: INCREASE THE CURRENT WASTE-TO-COMPOST CAPACITY OF 200T/DAY TO 400T/ DAY (OR 500T/DAY) Government commitment: Conditional

Expected budget: Not estimated

Waste treatment: Compost subsector context

This POA is a joint initiative with local government and participating private sector businesses, including Accra Compost and Recycling Plant Limited (ACARP), Jekora Ventures Limited and the Kumasi Compost and Recycling Plant (KCARP) (Jospong Group of Companies).

Targets include phased development of large-scale plants (+500t/day MSW) as well as 5–10 small composting facilities planned for regional siting, with total additional treatment capacity of 200t/day MSW.

Costs and budget

Composting markets can be volatile and fluctuate with uncertainties with feedstock supply and product usage. Expected profits generated from product sales and gate fees typically may not be sufficient to sustain an operation. The major costs in composting are in sourcing feedstock (collection and transport), operations and maintenance, and end-product transportation.

Sourcing consistent quality and quantity of waste streams, such as agricultural waste, is important since the additional sorting and processing are expensive. Separated MSW needs to be managed for contaminants (including plastics) and nutrient value.

Locating composting plants close to the feedstock source is most efficient for logistics, since input volumes of waste are three times higher than output volumes of compost. Low-tech, labour-intensive processes rather than high-tech, mechanized solutions are likely to have advantages, e.g., an open windrow system rather than

an in-vessel system. It should also be noted that many of the benefits of composting are difficult to price – such as improved crop quality, reduced erosion, and better air and health.

Directly comparable costs are not readily available. Generic costing is indicated within POA 23, i.e., typical waste management costs by disposal type (\$/ton)²⁹ for lower middle-income countries (\$10–40/ton) and upper-middle-income countries (\$20–75/ton). The World Bank Urban Development Series report provides a case study for smaller-scale plants from Bangladesh, as indicated in the table below.

Waste concern projected cost of community-based, decentralised composting facility

llows	Capacity			
items	3 MTPD	10 MTPD	3 MTPD	
Land required per plant (ft ²)	5,040	14,400	25,200	
Fixed cost per plant (US\$)	14,609	41,739	73,043	
Operating cost per plant (US\$)	4,348	14,493	28,986	
Workers per plant	4	12	25	
Compost produced per day (kg)	750	2,500	5,000	

Source: UNDP, 2011, currency in US\$ 2011.

Current activity

POA implementation lead

Ministry of Water and Sanitation

Partner institutions/organizations

- Private sector: including ZoomLion, ACARP (Jospon Group/ZoomLion), Jekora Ventures
- MMDAs notably district assemblies given the local implementation of projects
- Ministry of Agriculture compost use

Progress and achievements

- Feasibility studies and developments reportedly under way collectively significantly exceed POA targets.
- Feasibility studies and development under way for expansion of facilities in Accra (approximately 1,000 tons per day, i.e., 330 tons of compost per day), Kumasi (Phase 1 and 2: 400 tons and 500 tons of compost per day), Ashanti Region, Bosomtwi (200 tons of compost per day).

Summary

Compost has historically experienced a challenged past in Ghana.³⁰ Municipal source separation programmes have not been in place; compost products have been typically manufactured from mixed MSW. Achieving required cost and quality of compost product is therefore more challenging. The synthetic fertilizer market is also more established with predictable boosts in crop productivity.

Investment in transfer stations and increased separation of waste, along with ongoing enrichment of compost product with animal and agricultural wastes and policy and fiscal support will facilitate ongoing private sector

²⁹ World Band: Financing Solid Waste Management in Africa, 2019.

³⁰ World Bank: Urban Development Series 2016 – Sustainable Financing and Policy Models for Municipal Composting.

developments. New or expanded operations have been in development since NDC Implementation Plan drafting, and these are in excess of targeted capacity increase.

POA 25: SCALE UP 200 INSTITUTIONAL BIOGAS FACILITIES Government commitment: Conditional Expected budget: \$50 million

Waste management and treatment: Biogas subsector context

The aim of this POA is to build on the ongoing efforts to popularize the adoption of biogas as waste management technology in institutions like senior high schools, prisons and hospitals. The target is to scale up 200 institutional biogas facilities and process 1,000 tons of biogas per year.

Costs and budget

Generally, providing generic costing comparisons of biogas facilities is inconsistent, given the bespoke nature of each project set-up and variety of type and supply of feedstock, local circumstances, technology choice, energy usage, etc. When comparisons are provided, these are typically provided on the basis of energy output rather than by capacity of a digester or volume of feedstock. However, a collection of data points is provided below to assess financing metrics.

The feasibility study undertaken as part of technical assistance³¹ to the Energy Commission (2014), funded by the EU Climate Support Facility as the precursor to this POA, provides background of the assessment and cost expectations of the national biogas programme.

Using actual quotations to construct the proposed fleet of biodigesters, overall costs for the implementation of 200 systems was estimated at \$20 million. This included average construction costs of 20 larger systems (for 4,000 people) and 180 smaller systems (for 1,000 people) plus a 20 percent overhead.

It was acknowledged through this assessment that the upfront cost was too high for most of the beneficiaries, but that expected cost savings would result from effective operations, which would presumably allow for payment over a period of time.

The REMP provides an estimate of the capital costs of larger units (200–400 m) at \$1,000,000 per unit and smaller domestic units (10 m) at \$3,000 per unit.

A cost comparison for small units (6–8 m) is provided as \$750–900 (2007)³² for the biogas digester alone. The costing of \$3,000 per unit (2020) in the REMP, although perhaps high, provides for inclusion of balance of systems around the digester to meet site circumstances and needed technical assistance, awareness-building and training.

The commissioned 40 m digester at the Kumasi Institute of Tropical Agriculture generating 10 m of gas per day had a capital cost of €70,000. This indicates both variability and need to consider the detail of individual project design as part of overall costing estimates.

³¹ Climate Support Facility – WO46 – Feasibility Study of Ghana Institutional Biogas Programme.

³² A Cost-Benefit Analysis of National and Regional Integrated Biogas and Sanitation Programs in SSA, 2007, Winrock International for Dutch Ministry of Foreign Affairs.

100 FINANCING STRATEGY REPORT

Examples of larger digesters in South Africa include:

- Uilenkraal biogas project (commercial cow farm): 7,000 m lagoon digester. Capital cost R11 million (\$750,000).
- Elgin Fruit Juices: 2,700 m digester. Capital cost R20 million (\$1.6 million).

Current activity

POA implementation leads

- Ministry of Sanitation and Water Resources
- Ministry of Environment, Science, Technology and Innovation

Partner institutions/organizations

- Senior high schools, prisons, owners of commercial installations and hospitals
- Ministry of Energy
- Ministry of Health
- Ministry of Education
- Ghana Education Service
- Energy Commission
- Industrial Research Institute of the Council for Scientific and Industrial Research

Progress and achievements

At the time of issuing the NDC Implementation Plan Report 2018, out of 50 biogas plants constructed, 44 percent are operating well, 20 percent operating partially, 28 percent not operating and 4 percent have been abandoned.

The National Institutional Biogas Programme (NIBP) and the REMP outline the strategies for the promotion of domestic and institutional biogas production. The NIBP aims at installing 200 biogas digester systems in public boarding schools, hospitals and prisons. In the REMP, the target of the total number of biogas installations has increased to 900 units, of which 400 are for general and domestic use and the remaining 500 are institutional. Out of the 900 installation units, 160 biogas units (100 institutional and 60 domestic/commercial) are in place. Under the Switch Africa Green initiative implemented by the Ghana National Cleaner Production Centre, 10 biogas plants have been constructed in seven senior high schools within the Greater Accra Metropolitan Area. A total of 101 artisans have been trained and commenced building biogas plants, and standardized documentation has been produced to facilitate development.

FORESTRY SECTOR: REDD+

Market context and costing

Conditional funding commitment:

- POA numbers 15, 16, 17, 19
- Forestry sector REDD+

POA 15: GHANA COCOA REDD+ PROGRAMME Government commitment: Conditional Expected budget: \$237 million

Ghana cocoa subsector context

Ghana is the second largest producer of cocoa beans in the world, and its continual expansion of cocoa farming is leading to the increasing loss of forestland in the country. According to the Forestry Commission, there was a global net loss of 6.2 million hectares of forestland between 2000 and 2010. Ghana has the highest rate of deforestation in Africa at over 3 percent, and cocoa-farming expansion is the leading cause. Forests are critical to maintain a balanced natural ecosystem. Between 1990 and 2010, Ghana lost an average of 125,400 hectares of forestland a year, and this represents 33.7 percent of its forest cover (2,508,000 hectares of forest) to deforestation (FAO, 2011).

Ghana's Forest and Wildlife Policy 2012 defined the key early approach for the sector and aims at the conservation and sustainable improvement of forest and natural life resources. Ghana has also adopted the National REDD+ Strategy (2016–2035) and the Ghana Forest Plantation Strategy (2016–2040).

The Ghana Cocoa Forest REDD+ Programme (GCFRP) is the world's first commodity-based emission reductions programme. Using a climate-smart cocoa production strategy, the GCFRP aims to significantly lessen emissions driven by deforestation and forest debasement, while improving smallholder farmers' livelihoods through substantial yield increases and other advantage-sharing arrangements. The programme is intended to make Ghana's cocoa and forestry sectors stronger, while establishing another asset class and income stream from climate-smart cocoa beans, approved against a landscape standard.

This programme, which has a \$2.27 billion budget, is being co-led by the National REDD+ Secretariat of the Forestry Commission and Ghana Cocoa Board, with support from the chocolate industry and companies along its value chain, as well as support from other government agencies and civil society partners. The scope of the overarching Ghana Cocoa Forest REDD+ Programme far exceeds that of the NDC POA (\$237 million).

A Ghana REDD+ Investment Plan is in the process of being developed to outline the framework for REDD+ investments over a 20-year implementation period. It is intended to describe the various POAs, geographic coverage, budget, financing plan, governance arrangement, and monitoring and evaluation framework.

The GCFRP is a results-based payment programme through which the government, private sector, civil society, traditional authorities and local communities can collaborate towards its goal. It has five components, namely: (1) institutional coordination and measurement, reporting and verification; (2) landscape planning in hotspot intervention areas (HIAs); (3) climate-smart cocoa practices to increase yield and sustainability, (4) risk management and financing; and (5) legislative and policy reforms.

Difficulty in sourcing funds, uncoordinated land use and laws, as well as the threats from activities of illegal and irresponsible mining practices from both small and large mining groups remain risks which may hinder the success of the programme.

Costs and budget

The REDD+ Investment Plan provides a breakdown of budget items for the complete Ghana Cocoa Forest REDD+ Programme as follows:

Programmes	Budget items (activities)	Cost (US\$)	Total budget (US\$)	
Resilient and climate-smart agriculture-forest coupled landscapes – IP1				
Ghana Cocoa Forest REDD+ Programme (GCFRP)	1.1 Degraded forests rehabilitated and restored	187,017,000		
	1.2 Institutional coordination and measurement, reporting and verification system established and operational	1,018,610,802		
	1.3 Landscape planning within the HIAs instituted	52,055,000	0.07 killing	
	1.4 Climate-smart cocoa practices to increase yield and sustainability promoted	730,040,000	2.27 billion	
	1.5 Risk management and financing measures implemented	281,712,500		
	1.6 Legislative and policy reform enacted	3,080,000		

Alongside this, a reduced scope of the NDC POA set out a budget of \$237 million.

The overarching GCFRP is an ongoing activity, which is progressing with resource and funding commitments from various stakeholders and incorporates NDC POA activities and budgets. It appears sensible to view NDC POA funding requirements as an integral part of the overall programme.

The programme uses results-based mechanisms. In other words, emission reduction is demonstrated before funds are given. It is expected that in exchange for reducing emissions, Ghana will receive up to \$50 million from the Cocoa Forest REDD+ Programme, and it is estimated that Ghana's engagement with the Forest Carbon Partnership Facility (FCPF), could generate approximately \$63 million per year from this programme.

By international comparison, the Vietnam forest sector development fund receives an amount of \$80 million each year for efforts made at the district level to sustain forest management (FAO, n.d.).

The REDD+ Investment Plan outlines the following context, from the overarching GCFRP:

- Without project implementation, there is unsustainable expansion of cocoa farms/conversion to agriculture, indiscriminate felling of trees on farms and illegal logging.
- Implementing the REDD+ programme will result in forests that are managed by limiting farm expansion, but farmer incomes are enhanced by increased yields (100 percent) from climate-smart cocoa.
- Projected results-based payments: The programme is expected to result in emissions reductions of 295.4 MtCO₂e (or 1,414.29 kt/year). At a rate of \$5 per ton (as offered by GCF), results-based payments over the 20-year period could reach \$1.48 billion. Total resources required to implement the entire programme for the 20-year period is estimated at \$2.07 billion. This results in a deficit of \$590 million, which can be offset by other financial benefits from climate-smart cocoa.
- Financial feasibility of increasing yields via climate-smart cocoa is attractive since a positive net present value is provided through the analysis undertaken.

Sources of finance to cover the gap need to be secured, but the analysis provides for positive impact and financial opportunity to secure these. The Investment Plan goes on to recommend sources of funding, including expanding cocoa/green bond offering and the establishment of a Ghana REDD+ Fund to efficiently coordinate and deliver this funding need.

POA implementation lead

Ministry of Lands and Natural Resources

Partner institutions/organizations

- Forestry Commission and Ghana Cocoa Board; Ministry of Agriculture; Ministry of Environment, Science, Technology and Innovation; and Environmental Protection Agency
- Private organizations in the cocoa and forestry sector
- Local government (MMDAs)
- Civil society organizations
- Traditional authorities

Progress and achievements

The NC4 report provides an update on NDC POA activity as follows (MESTI, 2019):

- Forest reference emission levels/forest reference levels established for both national and subnational level and consistent with IPCC and UNFCCC methodological guidance.
- Benefit-sharing plan for GCFRP being finalized.
- Emission reduction purchase agreement (ERPA) negotiating team inaugurated and ERPA term sheet submitted pending commencement of ERPA negotiations.
- Bia-Juabeso HIA launched, and development of HIA work plan under way.
- Safeguards focal persons selected for all forest districts and trained to ensure awareness and compliance with safeguards at landscape level.

Prior to kickstarting the implementation of GCFRP, adequate investment in stakeholder engagements and coordination with development partners, leverage of investment and country partnership may lay a firm foundation. Ghana's Readiness Preparation Phase (GRPP) has received adequate financial support, as evidenced by the \$8.4 million grant from the FCPF to the National REDD+ Secretariat to build capacity and understanding, conduct analyses and develop the required mechanisms and structures to support the implementation of REDD+. The additional funding of \$20 million to other government institutions and civil society organizations has also gone a long way to further support this process. For the REDD+ Strategy to be successfully implemented to achieve the anticipated emission reductions, support from both public and private sources for implementation activities is imperative.

The REDD+ Investment Plan provides an assessment of financial and socioeconomic benefits:

- Financial feasibility: Successfully increasing yields via climate-smart cocoa provides a positive net present value under various (simplified) scenarios/financing assumptions.
- Socioeconomic benefit: The REDD+ Investment Plan highlights other socioeconomic gains that also make the GCFRP project worthwhile.
- The programme will increase cocoa productivity from 400 kg/ha to 600 kg/ha and double incomes of some 126,000 farmers from the current \$6.52–13.04/ha.
- There will also be increased protection of threatened and endangered species in the HIAs.
- By leveraging private sector support, the programme will enable 181,800 farmers to receive financial products to support livelihoods.
- About 380,000 farmers will acquire skills in good agricultural and climate-smart cocoa practices.
- A total of 13,000 farmers will acquire land tenure documentation.

104 FINANCING STRATEGY REPORT

REDD+ Investment Plan recommendation: Sustainable increase in cocoa yields by employing climate-smart techniques is well documented and proven. The analysis above further proves the profitability of CSC. Private sector operators will find GCFRP attractive and needs to be courted into partnerships/consortiums to fund aspects of the project. Both equity and debt are suitable. The introduction of green bonds will widen the scope for other investors to be part of the programme. Leadership by government through the Forestry Commission and National REDD+ Secretariat will speed up the process.

POA 16: GHANA SHEA LANDSCAPE REDD+ PROGRAMME Government commitment: Conditional Expected budget: \$109.13 million

Shea landscape subsector context

The shea savannah landscape is a vast landmass principally located in the Northern or Guinea Savannah, which stretches through about six administrative regions and which has highly valuable savannah woodland species and wildlife. The area produces shea butter, shea kernel and rosewood, all for global consumption. Shea trees (*Vitellaria paradoxa*) occur naturally in the landscape, and women harvest the fruits and produce shea butter or shea kernel, products that are used and consumed locally, nationally and globally. However, shea trees are being lost to indiscriminate charcoal production driven by a burgeoning urban demand (Green Climate Fund, 2017).

The shea landscape project is designed to elevate sustainable approaches to land use and forest conservation. This includes local support mechanisms to help stem the ongoing corruption and deforestation from illicit logging, charcoal production, rural expansion and illegal mining that compromise the forests and shea production system. This venture will also be a significant activity to strengthen rural economies in the north, support the femaledominated demography that engages in shea harvesting systems and income streams and address poverty, which is broadly considered to be endemic in this zone.

The Northern Savannah forest landscape is a significant source of several Ghanaian staples, including root tubers like sweet potato, cereals such as millets, assorted vegetables and nuts. With its huge tracts of grasslands, it hosts most of Ghana's livestock populace, helping in a significant way to meet the protein needs of the nation. Of considerable concern is that the zone is profoundly susceptible to climate change, which further deepens poverty and natural resource degradation.

According to the NDC document, the project seeks to:

- Restore 200,000 ha of off-reserve savannah forests/woodlands and place them under self-financing community management in Community Resource Management Areas (CREMAs).
- Restore 100,000 hectares of degraded shea parklands.
- Create 25,500 hectares of modified taungya system/forest plantation in severely degraded forest reserves.
- Implement an integrated monitoring system and strengthen the national REDD+ safeguards and forest monitoring and reporting systems.

These actions will deliver 6.135 million tCO_2e in emission reductions and removals over the first seven years of the project's lifetime and 25.24 million tCO_2e over 20 years.

The project will directly strengthen the livelihoods and climate resilience of 100,200 people (78,850 women and 21,350 men).

The project has four interrelated outputs that will be implemented through a cross-sectorial, comprehensive and holistic approach, driven by communities and women's groups. This will be anchored on long-term community resource management, sectorial investments, capacity building, training, knowledge sharing, community monitoring and PPPs at the landscape level.

- Output 1: Off-reserve, degraded, savannah woodlands and forests restored under self-financing community management in CREMAs.
- Output 2: Degraded shea parklands restored through public private partnerships.
- Output 3: Forest cover restored in forest reserves through MTS³³ plantation and re-management.
- Output 4: Integrated monitoring system implemented and REDD+ systems strengthened.

The project's success may be hampered by ineffective management of forestlands that are located off-reserve; unproven models for commercial production of wood fuels, saw timber and non-timber forest products in community-managed land; inefficient value chain for shea; inefficient charcoal production; threats of benefits from the shea parklands; limited control of land by women as primary beneficiaries of shea collection and processing; and the lack of tested proven incentives and techniques for effective shea parklands restoration.

Costs and budget

The Government of Ghana estimates about \$109.13 million for the Implementation Plan over the first seven years (2019–2026) (NDC Implementation Plan).

This includes \$63.78 million of private sector investment and more than \$15.03 million in government support, as well as \$29.96 million in anticipated GCF grant funding. However, the GCF has allocated only \$25.6 million, based on their investment information. This proposed figure comes in the form of GCF funding and co-financing to the private sector. The GCF budgets \$18.5 million as loan facilities and \$1.5 million in grants. It is estimated that through this financing, 3.2 million tons of emissions will be avoided (https://www.greenclimate.fund/project/fp114).

There is an investment of \$350,000 from UNDP to support the preparation of this project for GCF and partner funding. This highlights the significant resourcing requirement and focus needed to ensure the programme is appropriately structured and sufficiently developed with alignment of multiple stakeholders to both market and secure funding for implementation.

Current activity

POA implementation lead

Forestry Commission

Partner institutions/organizations

- Ministry of Agriculture; Ministry of Environment, Science, Technology and Innovation; and Environmental Protection Agency
- Private organizations in the shea sector
- Local government (MMDAs)
- Civil society organizations
- Traditional authorities

³³ Ghana has introduced a number of forest-based strategies to improve the livelihoods of forest communities, restore the country's forest cover and address timber deficits. Among these strategies is the modified taungya system (MTS).Under the MTS, farmers are given access to degraded forest reserve areas for tree planting with integration of food crops until tree canopy closure.

Progress and achievements

- In recent times, there has been increased enforcement of the laws protecting the forest landscape in the Northern Savannah region. The arrest and prosecution of illegal rosewood loggers has served as a major deterrent to the foreigners who engaged in this business.
- The Ghana Shea Landscape Emissions Reduction Project document was finalized and submitted to GCF for funding.
- Continuous consultations and sensitization of relevant stakeholders (CREMAs, traditional authorities, MDAs, MMDAs and community members, as well as farmers) were carried out on the GSLRP objectives and their expected roles.
- In September 2020, a modified project secured funding and in-kind support from the Government of Ghana, Green Climate Fund and private sector to implement the GCF Project and NDC POA.

POA 17: WILDFIRE MANAGEMENT IN THE TRANSITION AND SAVANNAH DRY LANDS IN GHANA Government commitment: Conditional Expected budget: \$36 million

Subsector context

Wildfire can be defined as any fire that consumes natural vegetation or farmland with little or no control over it. In Ghana, burn farming, grazing and game hunting are some of the main causes of wildfire, which can be considered as one of the main challenges besetting the economic progress of Northern Ghana.

Although statistical data on incidence and impact of wildfire is inadequate, it has been estimated that the total land area prone to wildfire annually ranges from 30 percent in the High Forest and Transitional zones to over 90 percent in the dry Northern Savannah zones (National Wildfire Management Policy 2007).

Under the 'Promote Sustainable Utilization of Forest Resources Through REDD+' policy action in 2012, the primary goal was to reduce emissions, reduce deforestation and improve biodiversity conservation, especially in the drylands, and improve degraded lands for productive use.

Current activity

POA implementation lead

Forestry Commission

Partner institutions/organizations

- Ministry of Land and Natural Resources; Ministry of Environment, Science, Technology and Innovation; and Environmental Protection Agency
- Private organizations in the shea sector
- Local government (MMDAs)
- Civil society organizations
- Traditional authorities
Progress and outlook

This POA is captured within the REDD+ Investment Plan as the 'Emissions Reduction Programme for Forest Savannah Transition Landscape'.

This programme covers an area of 5.3 million ha in the forest–savannah transition zone. The area is threatened by agriculture expansion, wildfires, and illegal logging and mining. Thus, it focuses on reducing emissions from forest degradation through wildfire management, establishment of multispecies plantations, and climate-smart agriculture.

A budget of \$55 million is expected to be funded via public funds and private capital – to be sourced from a combination of Government of Ghana funding, ODA funding and grants, private sector contributions, results-based payments and bilateral funding arrangements.

The feasibility of the project is based on socioeconomic benefits rather than financial returns:

- Without-project situation: Forest reserves in the Northern Savannah Zone are severely degraded by wildfires, and illegal logging for wood fuel and timber takes place.
- With-project situation: A partnership between the Forestry Commission and communities adjacent to the reserves has been formed to co-manage the restoration of the degraded forest reserves.
- Financial feasibility: This output also has a positive net present value but is in the lower single digits (REDD+ Investment Plan). It is not an ideal investment for private sector operators with profit motive. However, it has with other socioeconomic benefits that make the project worth investing in.

Socioeconomic benefits

- 1. The programme will generate increased income for some 100,200 people and improved livelihoods for some 540,200 people.
- Intercropping will be possible before the canopy sets in in the first two years with decreasing yields. Intercropping can raise net revenue of about GH¢ 677 for the two years before the canopy sets in.

Recommendation

Grant financing is recommended for this output. Grant funding will enable communities to create the systems and capacity that do not exist at this point in time.

POA 19: ENRICHMENT PLANTING Government commitment: Conditional Expected budget: \$36 million

Enrichment planting subsector context

Reforestation and the concerted effort to increase the quantity of high-value wood species in the forests in Ghana can be said to have surfaced around the 1940s. Species like the *Khaya*, *Lovoa*, *Heritiera* and others were planted on 2,500+ ha in order to improve the stock of the wet evergreen forest reserves and sustain the species. This planting is said to have been discontinued due to inadequate funds or budgetary allocation.

Enrichment planting can simply be described as the introduction of high-value tree species into a poorly stocked natural forest to sustain the supply of desirable species. This usually involves seedling/striplings of

up to 1-metre height planted at 5-metre intervals within 2-metre-wide strips, 20 metres apart (Ghana Forest Plantation Strategy, 2016).

Enrichment planting is planned for upgrading the commercial productivity and usefulness of a corrupted forest. It is undertaken where there are insufficient numbers of economically important trees in the common stand. It accelerates the recuperation of corrupted forest with respect to its stocking, functions, and resilience (Ghana Forest Plantation Strategy, 2016).

The strategy adopted for the effective delivery of this programme consists of the following:

- Undertake enrichment planting in poorly-stocked/convalescence forest reserves.
- Undertake maintenance of enrichment planting sites (new and existing).
- Undertake trials of selected exotic and indigenous timber tree species (30 ha/yr) to determine their suitability for plantation establishment and enrichment planting.
- Recruit labour from fringe communities to undertake enrichment planting, plantation establishment and maintenance.
- Develop and publish a manual of procedure on enrichment planting.

Key actions were to:

- Facilitate the enactment of policy/legislation to support ownership by farmers of planted trees on farms.
- Liaise with relevant institutions to rehabilitate mined sites and reforest degraded watersheds, etc.
- Undertake and maintain 100,000 ha of enrichment planting sites within under-stocked/convalescence forest reserves.
- Develop and publish a manual of procedure for enrichment planting.
- Procure improved seeds of selected exotic and indigenous tree species.

Costs and budget

The Ghana Forest Plantation Strategy 2016–2040 provides details of the overall sector budgeting requirements. This includes specific items for enrichment planting:

- Action 1.16: Undertake enrichment planting in poorly-stocked forest reserves (5,000 ha/yr)
- Action 1.17: Undertake maintenance of enrichment planting sites (new and existing)

The budgeted unit cost for undertaking the enrichment planting in poorly stocked forest reserves is US\$200/ ha. In total, a budgeted \$1 million per year for 20 years was projected for the enrichment planting exercise. Planting ceased after 20 years; hence no funds were allocated to the exercise for the last five years of the strategy period. Total cost is \$20 million.

Maintenance costs vary from \$150/ha for first five years and then \$80/ha thereafter. Building up over 100,000 ha to meet the target means the resource requirement over the duration of the strategy is significant. A total projected cost of \$146 million is forecast, with costs for incremental five-year periods spanning 2016–2040 at \$8,140,500, \$21,341,600, \$31,341,600, \$41,341,600 and \$43,841,600, totalling \$146,006,900.

There is a clear discrepancy with the budgeted costs of the POA in NDC planning at \$36 million. This may be assumed to just cover enrichment planting costs with perhaps a level of project management resource allocation and is assumed to not include full lifetime maintenance costs; however, this needs further review and reconciliation.

Current activity

POA implementation lead

Forestry Commission

Partner institutions/organizations

- Ministry of Land and Natural Resources; Ministry of Environment, Science, Technology and Innovation; and Environmental Protection Agency
- BUI Power Authority, VRA, Minerals Commission and Water Resources Commission
- Local government (MMDAs)
- Civil society organizations
- Traditional authorities

Progress and achievements

- The Manual of Procedure for enrichment planting was successfully published within the first two years. There has been improved stocking and maintenance on the planting in terms of area (ha) and number.
- Members of local communities have been recruited to undertake the enrichment planting, plantation, establishment and maintenance.

WATER SECTOR: STRENGTHEN EQUITABLE DISTRIBUTION AND ACCESS TO WATER FOR CLIMATE CHANGE RISK COMMUNITIES

Market context and costing

Conditional funding commitment:

- POA number 29
- Water sector water distribution and access

POA 29: STRENGTHEN EQUITABLE DISTRIBUTION AND ACCESS TO WATER FOR 20 PERCENT OF THE POPULATION LIVING IN CLIMATE CHANGE RISK COMMUNITIES Government commitment: Conditional Expected government budget: \$2.27 billion

Water sector context

The intent of this Programme of Action focuses on three water service areas:

- Improving access to water services, especially for residents of urban and peri-urban areas.
- Improving access to water services in rural areas and small towns.
- Water resources management: the objectives are to strengthen the regulatory framework for managing and protecting water resources for water security and enhancing resilience to climate change, enhancing public awareness and education, improving access to water knowledge base to facilitate water resources planning and decision-making and improving transboundary and international cooperation in the management of shared water resources.

110 FINANCING STRATEGY REPORT

The specific aspects of this POA and with respect to wider sector development activities are not clearly defined from available data.

Although the budget is significant in scale compared with various other NDC POAs, at \$2.27 billion it forms a fraction of the ongoing water infrastructure investment needed of about \$1.6 billion per year (World Bank). Despite Ghana's middle-income status, the country is still addressing a water deficit and lack of sanitation. This is not an uncommon occurrence, particularly in sub-Saharan Africa. For instance, Kenya continues to address a water sector funding gap of similar quantum. The challenge for Ghana, and multiple other countries, is to continue to deliver and expand water and sanitation services to meet national development, SDG and climate goals, while resolving this funding need.

The reality is that most governments cannot afford to fund this water sector need alone. Ultimately, accessing private sector capital is needed to do so. However, conventional commercial financing approaches do not typically support widespread and meaningful investment into the sector. New perspectives are needed and emerging – e.g., nature-based solutions – to shift outlook on both design and financing of needed intervention and market developments. Various innovative sector development and financing approaches are being piloted and developed to help catalyse private sector engagement – e.g., accessing domestic bond markets for municipal water services; and catalysing private sector participation in the sector through development of bankable projects and blended finance approaches – but more needs to be done.

Isolating aspects of the water sector attributable to climate mitigation and/or adaption is also not necessarily straightforward. This is particularly true since, on the one hand, water, be it too much (floods) or too little (drought), provides possibly the most obvious demonstration and impact of climate change. On the other hand, at the same time, water continues to present a material challenge to fund the sector on any commercial terms and any meaningful scale. The majority of climate finance has also focused on mitigation needs and opportunities and has been dominated by energy-related investment. Leading climate funders are now addressing the issue and developing strategies to support and catalyse water-related investment. Proactive engagement with international climate funders is required as well as proactive development of fundable projects, and investment propositions are needed while all stakeholders work through options to catalyse and fund the sector.

Costs and budget

It is not possible to provide a direct comparison of budgeted costs for this POA from the data that is available. However, as stated previously, we have recognized comparable investment requirements with the overall water sector funding need of other countries, e.g., Kenya.

For water supply and sanitation, a headline assessment of costs to connect or service new users is used as a benchmark for funding needs.

It is also recognized that leading international climate funders in the sector, while actively supporting water investment, are still in the process of clarifying how to most appropriately measure and capture this need from a climate finance perspective – across both adaptation and mitigation – and to best facilitate the design and preparation of appropriate funding/investment opportunities to support. For example, the Green Climate Fund is in the process of agreeing on a water strategy/policy, which will be operationalized with guidelines, testing and support to regional and national stakeholders through the next 12–18 months.

Current activity

POA implementation lead

Ministry of Sanitation and Water Resources

Partner institutions/organizations

- Water Resources Commission
- Ghana Water Company Limited
- Community Water and Sanitation Agency
- Volta Basin Authority
- Environment Protection Agency
- Metropolitan, Municipal and District Assemblies
- Private sector

Progress and achievements

- The national water supply (urban and rural) and sanitation coverage rates increased from 59 percent and 13 percent in 2009 to 76 percent and 15 percent in 2015, respectively.
- The national demand for urban water currently stands at 287.2 million gallons per day while production is 220 million gallons per day. The deficit of 67.2 million gallons per day is to be delivered by 2025 when the country expects to attain universal water coverage.
- Wider water sector development is progressing, which may also bridge with the NDC POA, e.g., World Bank commitment (2019) of \$200 million towards the Greater Accra Resilient and Integrated Development project, which focuses on supporting the improvement of flood risk management.

Summary

The Programme of Action is well progressed and is part of wider water sector development.

Proactive engagement with international donors and climate funders, who are actively engaged in the development of water development strategies related to finance, is no doubt opportune for Ghana.

The World Bank commitment of a \$125 million loan to the Government of Ghana (September 2020) provides for the implementation of water and sanitation projects in both Greater Accra and the Greater Kumasi Metropolitan Area for the proposed benefit of 550,000 low-income people. Such international and domestic public funding collaboration will be needed as the barriers to attracting commercial finance to the water sector remain significant.

It will be prudent to monitor and engage as appropriate with new innovative market development and financing initiatives currently being progressed/tested selectively across the continent. For example, the Dutch government has supported a few that seek to attract new forms of finance to the sector: (1) The Water Finance Facility seeks to enable local currency bond finance for water utilities; (2) Kenya Innovative Finance Facility for Water seeks to work with and finance commercial developers of water investments; and (3) Climate Investor Two seeks to bring experience in developing, constructing and operating renewable energy projects to the water sector via the blended finance approach.

Appendix 5: NDC list of Programmes of Action

Overview of NDC Programmes of Action, their targets, indicators, responsible institutions and budget up to 2030.

No	Programme of Action	2030 threshold target	Sub-units	Indicators	District/ sector	Lead institutions	Cost (US\$) million	Contact persons
PO1	Increase small—medium hydro installed capacity up to 150—300 MW	300	MW	Mini-hydro installed capacity	S	Ministry of Energy	720	Wisdom Togobo
PO2	Attain utility-scale wind power capacity up to 50–150 MW	150	MW	Grid-connected wind power installed capacity	S	Ministry of Energy	273	Wisdom Togobo
PO3	Attain utility-scale solar electricity installed capacity up to 150–250 MW	250	MW	Grid-connected solar installed capacity	S	Ministry of Energy	300	Wisdom Togobo
PO4	Scale up the 200,000 solar systems for lighting in residential and non- residential buildings	200,000	500 W	Number of installed solar home systems	S/D	Ministry of Energy	52	Wisdom Togobo
P05	Establish 55 mini-grids with average capacity of 40 kW	55	40 kW	Number of 40 kW mini-grids installed	S	Ministry of Energy	53	Wisdom Togobo
PO6	Increase solar lanterns penetration in rural non- electrified households to 2 million	2,000	1,000 lamps	# of LED lamps distributed	S/D	Ministry of Energy	300	Wisdom Togobo
PO7	Scale up adoption of LPG in at least 50% households	134	1,000 LPG stoves	# of LPG stoves adopted, % of households using LPG for cooking	S/D/GSS	Energy Commission	317	Paula Edze
PO8	Scale up access and adoption of 2 million efficient stoves	2,000	1,000 efficient stoves	# of efficient stoves distributed	S/D	Energy Commission	20	Paula Edze
PO9	Switch from heavy fuel oil to natural gas in existing electricity power plants	50	100 TJ fuel use/ year	Quantity of natural gas per thermal electricity generated	S	Volta River Authority, IPPs	1,000	Benjamin Sackey
PO10	Improve thermal power plant efficiency by converting single cycle power plants to combined cycle	3.3	100 MW increase	Amount of capacity added due to single cycle to combined cycle conversion	S	Independent Power Producers	600	Benjamin Sackey
PO11	Recovery and utilisation of associated gas from Jubilee and Tein oil fields	120	1 MMSCF/day	Amount of gas recovered from oil field	S	Ghana National Gas Company	1,000	Salifu Addo
PO12	Promote efficient lighting with LED bulbs	20,000	1,000 bulbs	# of LED bulbs distributed	S/D	Energy Commission	10	Kennedy Amankwa
P013	Scale up adoption of efficient refrigeration	2,000	1,000 refrigerators	# of efficient refrigerators distributed	S	Energy Commission	15	Kennedy Amankwa
PO14	Scale up of installation of power factor correction devices in 1,000 commercial and industrial facilities (capacitor banks)	1,000	1 facility	# of industrial and commercial facilities that have installed capacitors	S	Energy Commission	8.4	Kennedy Amankwa

No	Programme of Action	2030 threshold target	Sub-units	Indicators	District/ sector	Lead institutions	Cost (US\$) million	Contact persons
PO15	Ghana Cocoa REDD+ Programme	270	Avoided deforestation 1,000 ha	Avoided deforested area (ha)	S	Forestry Commission	236.7	Roselyn Adjei
PO16	Ghana Shea Landscape REDD+ Programme				S	Forestry Commission	109.13	Roselyn Adjei
PO17	Wildfire management in the transition and savannah dry lands in Ghana				S/D			
P018	National Forest Plantation Development Programme	660	Reforestation of 1,000 ha	Areas reforested (ha)	S	Forestry Commission	4,100	Hugh Brown
P019	Enrichment Planting				S			Hugh Brown
PO20	HFC Reduction in the RAC sector (scale up market share of climate- friendly and energy efficient air conditioners)	70%	Market share of green and energy efficient air conditioners	% of market share of green and EE air conditioners	S	Environmental Protection Agency	15.5	Joseph Baffoe
PO21	Expansion of intra city transportation modes (bus transit system)	200	1 km BRT line	Length of BRT km	S	Ministry of Transport	310	Daniel Essel
PO22	Expansion of inter and intra city transportation modes (railway transit system)	TBD	TBD	TBD	S	Ministry of Railways	TBD	Daniel Essel
PO23	Improve effectiveness of urban solid waste collection up to 70–90% and the construction of engineered landfill for methane recovery	14	200 t/day plant	Quantity of gas recovered from engineered landfills	S/D	Ministry of Sanitation and Water Resources	TBD	Patrick Affum
PO24	Increase the current waste-to-compost capacity of 200 t/day to 500 t/day	0.5	1000 t/day plant	Waste-to-compost processing installed capacity	S/D	Ministry of Sanitation and Water Resources	TBD	Patrick Affum
PO25	Scale up 200 biogas facilities	1	1000 t/year plant	Quantity of biogas produced	S/D	Ministry of Sanitation and Water Resourc- es, Ministry of Environment, Science, Technology and Innovation	50	Patrick Affum
PO26	Adopt modified community-based conservation agriculture/ climate smart agriculture in 54 districts	54	Number of districts	Number of districts practising conservation agriculture/CSA	S/D	Ministry of Food and Agriculture	259.5	Kingsley Amoako
P027	Scale up penetration of climate smart technologies to increase fisheries and livestock productivity by 10%	10	% fish/livestock production	% increase in fisheries/livestock production	S/D	Ministry of Food and Agriculture, Ministry of Fisheries and Aquaculture	1,920	Kingsley Amoako
PO28	Promote innovations in post-harvest storage and food processing and forest products in the 54 districts	54	Number of districts	Number of post- harvest storage technologies	S/D	Ministry of Food and Agriculture	467.1	Kingsley Amoako

No	Programme of Action	2030 threshold target	Sub-units	Indicators	District/ sector	Lead institutions	Cost (US\$) million	Contact persons
PO29	Strengthen equitable distribution and access to water for 20% of the population living in climate change risk communities	20	% of population living in climate change risk communities	% of population living in climate change risk communities having access to water	S	Ministry of Sanitation and Water Resources, Water Resources Commission	2270	Dr Bob Alfa
PO30	Strengthen climate related disease surveillance and outbreak response in all vulnerable districts	#	Number of surveillance and disease outbreak response system established and operational	Number of cases of climate-induced diseases reported	S	Ministry of Health, Ghana Health Service	1.26	Dr Carl Osei
PO31	Incorporate climate change into health infor- mation systems including traditional knowledge on health risk management	#	Levels of climate change issues health informa- tion management systems adopted	Number of cases of climate-induced diseases reported	S	Ministry of Health, Ghana Health Service		Dr Carl Osei
PO32	Enhance resilience for gender and the vulnerable							
PO33	Strengthen early warning and disaster risk management	#	Number of early warning centres established nationwide	Number of early warning centres established nationwide	S/D	NADMO	50.63	Charlotte Norman
PO34	Enhance climate services for efficient weather information management	50	Number of modernised synoptic stations	Number of modernized synoptic stations	S/D	Ghana Meteorological Agency	10	Dr Kwadwo Owusu
PO35	Governance reform for utilisation of forest resources for sustainable energy use and biodiversity business							Not yet developed
PO36	Manage 413,000 ha fragile, ecologically sensitive and culturally significant sites in 22 administrative districts in the forest and savannah areas							Not yet developed
PO37	Tracking of SDG Goal 13 targets (catalyse ambitious climate actions)	#	Strengthened Institutions, laws and regulations, policies and plans	Number of NDC actions implemented	S	National Development Planning Commission	0.2	Dr Felix Addo- Yobo
PO38	NDC implementation progress of programme of action and tracking of targets	#	Implementation of NDC actions and their effects	NDCs and their effects	S	Ministry of Environment, Science and Technology, Environmental Protection Agency	1.6	Peter Dery, Antwi Boasiako, Daniel Benefoh, Emmanuel Tachie-Obeng
PO39	Tracking of support inflows	\$	Millions of investments	Amount of investment made	S	Ministry of Finance	0.2	Foster Gyamfi

Source: Table 7, Multi-Sectoral Implementation Plan for Ghana's NDCs (2019).

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