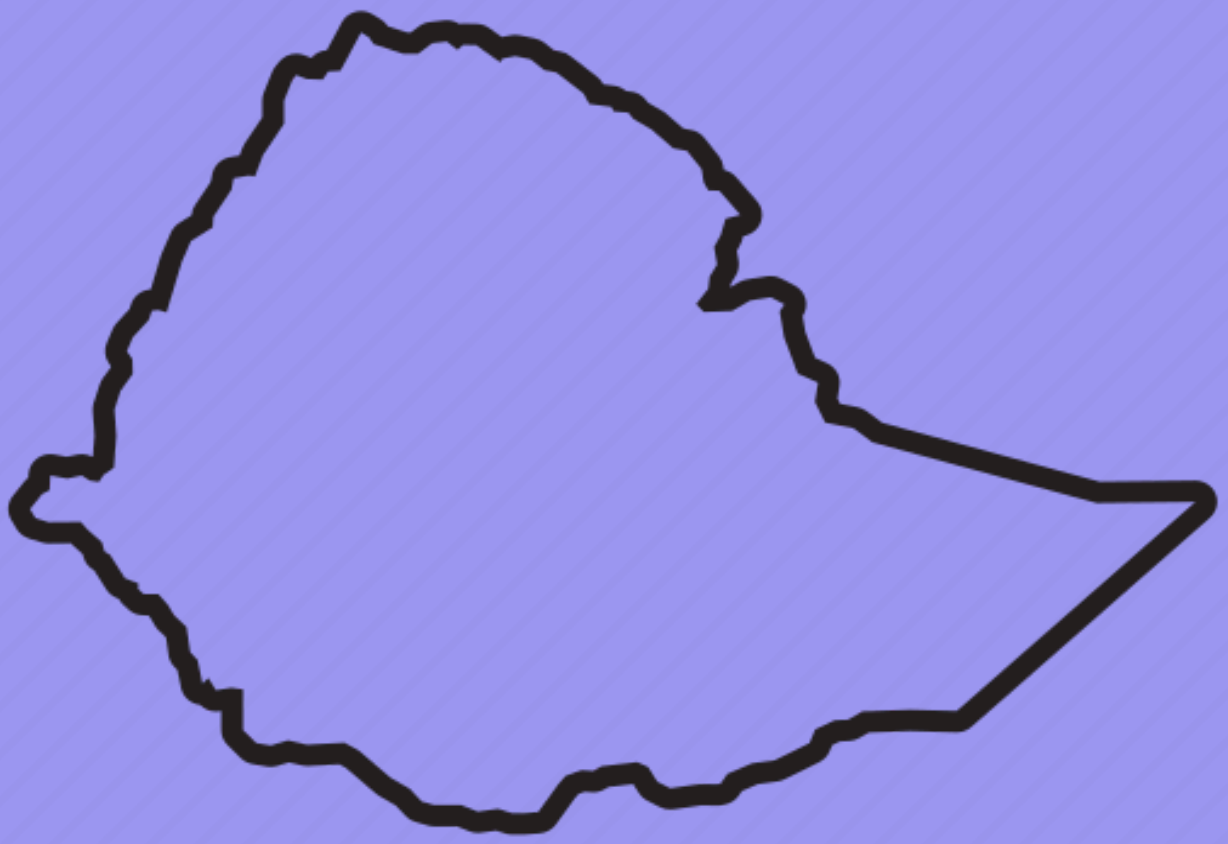
# Assessment of NDC Update planning tools/Models and Its Tracking system in Ethiopia



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## DISCLAIMER



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## Acronyms/abbreviations

| | |
|---|---|
| **10 YDP** | Ten-year development plan |
| **AFOLU** | Agriculture, Forestry and Other Land Use |
| **AR5** | The Fifth Assessment Report of the United Nations Intergovernmental Panel on Climate Change |
| **BAU** | Business as Usual |
| **CAEP** | Climate Action Enhancement Packages |
| **$CO_2e$** | Carbon dioxide equivalent |
| **CRGE** | Climate-Resilient Green Economy Strategy |
| **ETF** | Enhanced Transparency Framework |
| **FEPA** | Federal Environmental Protection Authority |
| **GACMO** | Greenhouse Gas Abatement Cost Model |
| **GEM** | Green Economy Model |
| **GES** | Global Environmental Solution |
| **GTP** | Growth and Transformation Plan |
| **GWPs** | Global warming potentials |
| **ICAT** | Initiative for Climate Action Transparency |
| **IPCC** | Intergovernmental Panel on Climate Change |
| **IPPU** | Industrial Process and Product Use |
| **LUCF** | Land use change and forestry |
| **MRV** | Measuring, Reporting and Verification |
| **NAP** | National Adaptation Plan |
| **NDC** | Nationally Determined Contributions |
| **UNEP** | United Nations Environment Programme |
| **UNEP-CCC** | UNEP Copenhagen Climate Centre |
| **UNFCCC** | United Nations Framework Convention on Climate Change |
| **WRI** | World Resources Institute |

# Assessment of NDC Update planning tools/Models and Its Tracking system in Ethiopia

## 1. Background

Ethiopian economy is highly vulnerable country for climate change[1]. The country has developed the Climate-Resilient Green Economy (CRGE)[2] Strategy to combat climate change resulted drought, famine and catastrophic events in its regions. In the strategy, the Government of Ethiopia intends to limit the country's net Greenhouse gas (GHG) emission to 145 Mt $CO_2e$ or lower by 2030. This would constitute a 255 Mt $CO_2e$ (64%) reduction from the projected 'business-as-usual' (BAU) emissions in 2030 or a 64% reduction from the BAU scenario in 2030. The implementation of the CRGE would ensure a resilient economic development pathway while decreasing the per capita emissions. The CRGE is also integrated into the Second Growth and Transformation Plan (GTP II 2016 - 2020). In the long term, Ethiopia intends to achieve its vision of becoming carbon-neutral, with the mid-term goal of attaining middle income status. Ethiopia follows a sectoral approach to implement its Strategy and has so far identified and prioritized more than 60 initiatives, which could help the country to achieve its development goals while limiting its GHG emissions (FDRE, 2011). In addition, according to the National Adaptation Plan (NAP), Ethiopia intends to undertake adaptation initiatives to reduce the vulnerability of its population, environment, and economy to the adverse effects of climate change, through building adaptive capacity and resilience, and integration of climate change into its development plan, among others.

Based on the CRGE, Ethiopia submitted its first Intended Nationally Determined Contribution (INDC) in 2015, which became Ethiopia's Nationally Determined Contribution (NDC) in 2017. The NDC[3] focused on four pillars to mitigate GHG emissions: (1) improving crop and livestock production practices for higher food security and farmer income while reducing emissions; (2) Protecting and re-establishing forests for their economic and ecosystem services, including as carbon stocks; (3) Expanding electricity generation from renewable sources of energy for domestic and regional markets; (4) Leapfrogging to modern and energy-efficient technologies in transport, industrial sectors, and buildings. In addition to mitigation efforts, the NDC identified adaptation efforts to reduce vulnerability of livelihoods and landscapes to climate impacts, focusing on three key areas: droughts, floods, and cross-cutting interventions. Many of the initiatives offer positive returns on investments, thus directly promoting economic growth and creating additional jobs with high value added (CRGE, 2011).

Following the Paris Agreement[4], Ethiopia submitted its intended nationally determined contribution (INDC) in 2015 and first NDC in 2017. In July 2021, Ethiopia submitted an updated NDC, raising its mitigation target from 64% to 64.8%. The updated NDC is integrated in Ethiopia's Ten-Year Development Plan published in June 2020, and forms the basis of updating its core climate strategy – the CRGE from 2011. The update NDC includes the conditional and unconditional mitigation activities with its specific actions. In addition, it contains cost-benefit analysis of specific actions.

The update NDC includes quantitative targets of the potential emissions of individual actions from all sectors. However, there was no models or tools identified to track the emission reduction strategies of each sector. Hence, Ethiopia has demanded an international support from the Initiative for Climate Action Transparency (ICAT) to develop and implement a greenhouse gas emission reduction tracking framework from all mitigation actions. To help Ethiopia comply with

[1] 15463A-WB_Ethiopia Country Profile-WEB.pdf (worldbank.org)
[2] climate-resilient-green-economy-crge-strategy_877eee58f4e51ec758d4d6d1c500348b.pdf (climatepolicyradar.org)
[3] Ethiopia is first Least Developed Country to submit its INDC | Climate & Development Knowledge Network (cdkn.org)
[4] The Paris Agreement | UNFCCC

requirements of the Enhanced Transparency Framework (ETF), ICAT Secretariat, Environmental Protection Agency (EPA), and UNEP Copenhagen Climate Centre (UNEP-CCC) have agreed to build Ethiopia's capacity to apply the GACMO model and conduct MRV related to Article 6 participation. This assessment was carried out to examine models/tools, key assumptions and other baseline considerations utilized during the NDC update process so as to analyse the possible GACMO use to track progress in achieving the updated NDC and support future NDC updates.

## 2. Objectives

The main objective of this assessment is to assess the ground truth of models/tools and assumptions applied to develop the Ethiopia's Update NDC and identify the possibility of using the GACMO for its implementation tracking and modelling for future NDC updates. In detail, the project has addressed the following specific objectives.

- To assess the tools/models and assumptions utilized for the NDC updating planning processes.
- To identify the mitigations actions in all sectors in the updated NDC and check to what extent these actions are covered in the mitigation options in GACMO.
- To examine the possibility of using GACMO tools to track the progress of achieving the GHG emission reduction targets in the Update NDC.

## 3. Approach and Methodology

Desk reviews of the MRV/greenhouse gas inventory practices of the country was carried out to identify the existing MRV knowledge and practices, protocols and approaches that are being used for national communication and biennial report updates preparation. Similarly, the plan, strategy and working documents of relevant organizations were reviewed to identify their institutional capacity for the update NDC implementations. The national communications, biennial update reports, raw/partially processed data, institutional guidelines and previously used methods of data collections in various sectors were reviewed so as to identify the gaps and challenges to be used in the capacity building activities. The potential mitigation plan and activities that have been submitted for the country unconditional/conditional NDCs were reviewed and the output was considered in the emission analysis using GACMO model.

Following desk review, an online semi-structured questionnaire survey[5] was utilized to assess the knowledge and skills competency levels of experts in all sectors on their NDC updating and its implementation. A key informant interview of senior experts from the line ministries who have been involved in the preparation of biennial updates and national communication report was carried out. Furthermore, stakeholders' consultation was carried out to qualify the information.

Both primary and secondary data were collected from line ministries as well as FDRE Environmental Protection Authority (FDRE EPA). The line ministries such as Ministry of Planning and Development (MoPD), Ministry of Agriculture (MoA), Ministry of Urban and Infrastructure (MoUI), Ministry of Water and Energy (MoWE), Ministry of Transport (MoT), Ministry of Mining (MoM) and Ministry of Industry (MoI) were contacted. The line ministries and federal EPA were the primary data sources at the federal level. Similarly, regional offices of the line ministries and regional EPAs were contacted from data pertaining the previous NDCs and newly deployed GACMO model activity data. Secondary data was retrieved from various archives of the sector ministry offices, EPAs and UNFCCC data bases.

[5] https://forms.gle/NgSxLN6kyZaqPv92A

Seven sectoral offices, including Federal EPA, and respective regional offices are expected to contribute to the preparation of the biennial transparency reports and the national communications. So, the survey methods of data collection were carried out on government institutions at all sectors. The qualitative information collected from various sources such as line ministries, stakeholders' consultation as well as key informant interview are categorized into its thematic forms.

# 4. Findings

## 4.1 Planning and Implementations of NDCs in Ethiopia

Ethiopia submitted its INDC to the UNFCCC on 10, June 2015 which later converted to Ethiopia's first NDC after Ethiopia ratified the Paris Agreement in March 2017. It was developed through an inclusive and participatory process. This NDC showed domestic climate change mitigation and adaptation commitments that are aligned with the second National Growth and Transformation Plan and anchored on the Climate-Resilient Green Economy (CRGE) Strategy of Ethiopia (Federal Democratic Republic of Ethiopia, 2015). As of parties' agreement on the NDC periodical update, the document clearly informed its update after five years.

The mitigation components of the first NDC aimed to reduce 255 Mt $CO_2$eq of greenhouse gas emissions (GHG) from a Business-as-Usual (BAU) trajectory by 2030. Ethiopia estimated that its emissions were approximately 150 Mt $CO_2$eq in 2010 (baseline year) and projected that they would increase to 400 Mt $CO_2$eq by 2030, marking an increase of 250 Mt $CO_2$eq. The NDC commitment of reducing emissions by 255 Mt $CO_2$eq by 2030 would amount to emissions of only 145 Mt $CO_2$eq by 2030 which is less than the level in 2010, the reference year. This commitment translates into a 64% net reduction from the 2030 BAU projections, and a 3.33% absolute reduction from the 2010 baseline of the 255 Mt $CO_2$eq of GHG emissions. Among the 250 Mt $CO_2$eq of GHG emissions, 90 Mt $CO_2$eq is from agriculture; 130 Mt $CO_2$eq is from forestry; 20 Mt $CO_2$eq is from industry; 10 Mt $CO_2$eq is from transport; and 5 Mt $CO_2$eq is from buildings. This excludes the reduction of 19 Mt $CO_2$eq in neighbouring countries due to their electricity export to them from Ethiopia (Federal Democratic Republic of Ethiopia, 2015).

The First NDC briefly presented the adaptation components with the aim to reduce the vulnerability of the Ethiopian population, environment and economy to the adverse effects of climate change whilst mainstreaming climate resilience into development activities. The short-term actions aimed to strengthen the adaptation policy and regulatory framework through the development and implementation of various adaptation strategies and plans at national, regional, sub-national and sectoral levels. Whereas, the medium and long-term actions aimed to increase resilience and reduce vulnerability of livelihoods and landscapes in three areas namely drought, floods, and other cross-cutting interventions.

## 4.2 Potential gaps and challenges in the 1st NDC planning & implementation

Studies showed the implementation of CRGE strategy (2011-2019) has addressed the progress of Ethiopia's NDC implementation on adaptation, mitigation, climate finance, institutional arrangements, policy and the role of the private sector. While implementing this strategy, several gaps and challenges were identified. Because of the methodological differences, the utilized GEM model in the NDC has omitted structures of the land use categories in the CRGE model. In addition, GEM followed a different emission calculation of the underlying model of the CRGE strategy. Granularity of CRGE calculations by sector was not congruent with the IPCC sector classification. The lack of updated and consistent data availability (GWP, livestock, etc.) affected the quality of model

output. Moreover, mitigation contributions were relatively given a priority compared to adaptation contributions.

### 4.2.1 Institutional capacity challenges and gaps

A recent institutional structures and coordination of NDC/CRGE implementation at all levels for instance at federal, regional and lower administrative levels have revealed the cause for concern. The assessment found that gaps both in procedure (such as frequency of committee meetings) and in efficacy, and that NDC actions were driven increasingly through externally funded initiatives. At the national level, the coordination of the NDC is found to be weak, which is manifested by various ways such as not following the time schedules of the steering committee meetings. It is also found that, most decisions which were passed during the inter-ministerial committee meeting are not fully implemented for various reasons, but also because regional presidents are not members of the national inter-ministerial committee. Similarly, the CRGE management committee is not regularly meeting for NDC evaluation as per the schedule among others due to reshuffling of higher officials and institutional re-arrangements. In summary, the assessment revealed that, there is declining ownership of the NDC/CRGE among the responsible officials and experts and increasing intention of associating the NDC/CRGE to external projects, manifested by active engagement of sectoral institutions when there is externally funded project and diminishing interest otherwise.

The review of this assessment has also articulated that the CRGE Directorates (or Units and Bureaus) within various line ministries have only marginal influence. They are not well integrated into duties and responsibilities of the broader Ministry, and do not have capability to track the NDC/CRGE considerations in the Ministry as a whole. As per the review, the NDC/CRGE plan implementation institutional structures do not have strong linkage with the existing line ministries MRV system. According to key informants' interview, the coordination between the national climate issue coordinator and line ministry sectors are inadequate and ineffective. Institutions both at regional and federal levels have no organized information and data management systems and archives.

### 4.2.2 Gaps in knowledge management systems

The Ministry of Plan and Development (MoPD)[6] does not appear to have a functional, integrated, searchable electronic archive of its documents and materials. This leads to the challenges of loss of institutional memory (since not all staff necessarily have access to the same content and guidance), as well as transaction costs in terms of repetitive effort to identify, track down, retrieve, and disseminate information and data when it is required.

According to the finding of this assessment, the MRV for each mitigation measures is managed by sectors of the line ministries. Accordingly, there is a possibility of re-envisioning the role of the line ministries and coordinators moving forward, not only for resource mobilization but also becoming a centralized hub for the conceptualization, tracking MRV and assessment of all climates change related activities in the country, across different sectors. Tracking and progress recording mandates of the MRV for NDC implementation in Ethiopia is given for line ministries of the centralized government at federal level. But there is no detailed Measurement, Reporting, and Verification (MRV) strategies practically implemented for projects and programs to ascertain the effectiveness of each mitigation measures on the ground.

Even though sectors of line ministries have experts with required expertise such as environment,

[6] Ministry of Planning and Development - Ethiopia (mopd.gov.et)

social and economic affairs, and relevant trainings are commonly provided to experts, the sectors technical expertise have remained dried because of human resource highest rate of turns over. The trained and experienced human resource tend to leave and are replaced by a new non-trained expert. Hence, all sectors of the line ministries require continuous training and regular knowledge updating to keep pace with the requirements of MRV implementation. Establishment of a robust MRV system that can be traced and regulated at federal level was also recommended to solve the problem of knowledge drain due to expert migration from the MRV reporting sector.

To fill this gap, the Ethiopian government has received a technical assistant from an NDC-Partnership's Climate Action Enhancement Packages (CAEP) and CDKN especially to strengthen the knowledge management and information exchange on NDC implementation processes in the country, development of strategies on aspects and sectors that are relevant to the NDC update process of Ethiopia, and dissemination of knowledge and information on the design and implementation of Ethiopia's NDC.

## 4.3 Assessment of the Stocktake of NDC 2021 update

### 4.3.1 NDC Update planning, assumptions and improvements

The preparation of an updated BAU, GHG emission pathways as well as both conditional and unconditional mitigation pathways until 2030 was undertaken using the Green Economy Model (GEM)[7]. The GEM was originally developed by WRI to support initiatives led by Ethiopia's Environment Forest and Climate Change Commission (EFCCC) and the National Planning Commission (NPC). The model has integrated the socio-economic and environmental trends, based on system-dynamics modelling to provide a simulation of the whole Ethiopian economy and its interactions regarding emissions. The model has considered GHG emission projections for the 10 Year Development Plan (2021-2030), Ethiopia's Low Emission Development Strategy 2050 (LEDS)[8], and the Ethiopian participation in the New Climate Economy project. GEM considered Ethiopia's economy in a complex adaptive system, including demographics, labor supply, fiscal space, domestic and external sectors, as well as biophysical modules, such as carbon stock and land cover while planning the NDC Update. The model, with its adaptability to changes in policy making, external shocks, such as the covid-19 crisis which may heavily affect economic growth in Ethiopia, has helped improve the quality of 1st NDC BAU projections. The model includes emissions from land use change in accordance with the Intergovernmental Panel on Climate Change (IPCC) 2006 inventory guidance so that mitigation options of the land use change has become a good mitigation option in the updated NDC.

The updated NDC in 2021 distinguishes between the effort (both mitigation and adaptation) that Ethiopia will pursue unconditionally using its own finance and those it will pursue conditionally, based on an international or donner support. In this updated NDC U, the country made a remarkable commitment to implement both mitigation and adaptations actions unconditionally using domestic financial contribution. As per the updated NDC, out of the total estimated cost of NDC implementation ($316 billion between 2020 and 2030), about 20% of the total cost was planned to be covered by domestically mobilized finance. And, the remaining 80% of finance for the strategic action implementation of the updated NDC was planned to demand an international support (Figure 1). The NDC Update planning has assumed the implementation of least cost mitigation and adaptation actions to achieve its unconditional targets by 2030. The potential mitigations and adaptation actions were identified and prioritized based on their implementable. In

[7] Green Economy Model | knowledge (ke-srl.com)
[8] ETHIOPIA_LONG TERM LOW EMISSION AND CLIMATE RESILIENT DEVELOPMENT STRATEGY.pdf (unfccc.int)

addition, associated indicators with the mitigation and adaptation actions were identified. MRV plans were also developed for tracking the mitigation measures and adaptation actions.


*Figure 1 Conditionality of the NDC Update Mitigation actions (Source: World bank, 2021)*[9,10]

Moreover, the updated NDC specified sectoral priority interventions to guide sector ministries, relevant partners, financing bodies, the private, and other stakeholders in planning and achieving the enhanced NDC targets. Six activities were performed to assess the mitigation outcomes, including (1) updating the Business-as-usual (BAU) scenario, (2) preparing GHG emission pathways to 2030 at national and sectoral levels, (3) setting 2025 and 2030 targets consistent with Ethiopia's strong political will and readiness to act on climate change, (4) assessing and prioritizing mitigation interventions and indicator selection through a consultative process, (5) disaggregating conditional and unconditional contributions, and (6) reviewing the role of carbon markets in the enhanced NDC were performed to determine the mitigation outcomes. Meanwhile, the adaptation targets and actions were determined based on (1) a review of Ethiopia's adaptation policy, institutional landscape and their respective challenges, (2) setting a 2018 baseline and 2030 targets, (3) prioritization of 40 adaptation interventions, and (4) the selection of accompanying indicators.

### 4.3.2 The NDC updating process and steps

The NDC updating process has gone through a series of steps including extensive document review, data collection, model development and validation, as well as stakeholder consultations. In addition to this, the recent IPCC 2006 guideline has been used for estimating the GHG emission. The updating process employed Ethiopia's Green Economy Model (GEM) to project the GHG emission pathways taking into consideration the Ethiopian development ambition from 2020 to 2030. Relevant data was collected from pertinent sources and sectors. In this regard, a recently updated livestock inventory, and updated global warming potentials (GWPs) as per the most recent IPCC Assessment Report (AR5) were used.

The technical analysis of the mitigation component comprises of five concisely defined methodological steps: 1. Preparing an updated BAU scenario, 2. Preparing updated GHG abatement policy scenarios for 2030, 3. Setting 2025 interim and 2030 final NDC targets, 4. Prioritizing mitigation interventions and indicator selection, and, 5. Determining conditional and unconditional policy action.

[9] Supporting Ethiopia's Nationally Determined Contributions (NDC) Update : Technical Report (worldbank.org)

[10]

The adaptation component is based on a review of existing documents including NAP-ETH, the NAP implementation roadmap and its resource mobilization strategy, as well as the various sector-based vulnerability assessments. Then, the long list of actions has been discussed and prioritized. The required resource for realizing the NDC was estimated based on goals and targets in the 10YDP. The financial estimation further disaggregated the total required resource in to conditional and unconditional components. In addition, detailed gender and institutional capacity gap analyses were conducted to inform NDC updating process.

### 4.3.3 Major improvement in the Updated NDCs

Higher robustness of GHG emissions pathways and targets through improvements in methodology, relating to more accurately and completely capturing historical emissions and emissions pathways from greater alignment with national GHG inventories, revised emission factors and improved consistency with IPCC-2006 guidelines. For the first time, Ethiopia proposes an emission reduction target in the conditional scenario that is significantly lower than historical base year emissions (2010). The 1st NDC kept projected emissions in 2030 close to the same level as the 2010 base year emissions. The updated NDC also included a detailed adaptation baseline and 2030 targets. The 1st NDC did not have a quantified baseline and targets. The updated NDC made clear distinguishment between unconditional and conditional mitigation and adaptation interventions and specified unconditional domestic contribution. It also commits to explore further ambition increases during the NDC implementation period. This includes potentially enhancing Ethiopia's NDC ambition through reducing emissions currently outside the scope of this NDC update (for instance for GHGs not covered by the current NDC (e.g., Hydrofluorocarbons (HFCs) in the context of the Kigali Amendment to the Montreal Protocol) where the government of Ethiopia (GoE) initiatives on sustainable cooling are already underway and further mitigation potential exists. If appropriate, GoE may formally include these ambitions and additional adaptation interventions in sectors in subsequent updates to the 2021 updated NDC. The GoE also plans to further adapt the GEM to potential future changes of policies or external shocks (e.g., COVID-19) with implications on emission pathways and enhance its ability to track progress on mitigation and adaptation actions with improved MRV / M&E aligned with the 10 YDP key performance indicators.

## 4.4 Mitigation and adaptation actions in the updated NDC by sector

### 4.4.1 Mitigation and Adaptation actions

#### 4.4.1.1 Adaptation interventions

Ethiopia has been putting in place various policy actions that enhance the implementation of climate change adaptation over the last decade. Core policy and institutional measures have been materialized by mainstreaming climate change adaptation into national and sectoral plans with an emphasis on implementing identified adaptation options across selected sectors. With the addition of the long-term priorities from the NAP Implementation Roadmap, the number of potential adaptation commitments to consider for inclusion in the NDC have reached to 52.

While the selection of 18 adaptation options under the NAP and the numerous adaptation actions under the Implementation Roadmap already reflect a lengthy, rigorous, and officially endorsed prioritization process and was informed by an extremely broad range of national, sectoral, and technical studies. Attempts were made to further prioritize sub-set of interventions in the updated NDC. The detailed adaptations interventions that were included in the NDC are summarized in Table 1. These adaptation actions represent the bulk of the updated NDC's commitments for strengthening Ethiopia's resilience to climate change.

*Table 1 Adaptation interventions of the Ethiopian NDC Updates*

| **Adaptation intervention (Commitment)** | **indicator(s)** | **Baseline (2018)** | **2030 Target** |
|---|---|---|---|
| **Sector 1: Agriculture** | | | |
| Enhance food security | Productivity of rain fed crop land (based on average for teff, wheat, barley and corn) | 28.9 quintals[3]/Ha | 45.9 quintals/Ha |
| by improving agricultural productivity in a climate-smart manner (promote yield increasing techniques) | Area under irrigation (based on corn, wheat, tomatoes and onions) | 62,050 Ha | 225,913 Ha |
| | Crop production through irrigation | 8 million quintals | 38 million quintals |
| Diversify livestock and animal mix, including promotion of poultry and small ruminants | Productivity of poultry and small ruminants (Tons) | Specialized poultry commercial – 33,100 Tons | Specialized poultry commercial – 80,900 Tons |
| | | Household – 13,200 Tons | Household – 16,200 Tons |
| | | Sheep – 66,000 Tons | Sheep – 324,000 Tons |
| | | Goat – 44,000 Tons | Goat – 282,000 Tons |
| | Percentage of improved livestock number (dairy) | Dairy – 2.7%* | Dairy 17%* |
| Enhanced climate resilience in livestock | Percentage of coverage of animal health services | Dairy – 11% | Dairy – 42% |
| | | Beef – 7%, | Beef – 28% |
| | | Small ruminants – 7% | Small ruminants – 28% |
| Prevent and control the spread of climate-driven vector-borne diseases | Percentage reduction of crop and animal disease cases | To be established | 30% reduction from 2022/2023 baseline (to be established) |
| Improve rangeland and pasture-land management diversification, including selection of | Percentage of improved content in dry feed | Local dairy – 77% Cross-breed – 41% Exotic – 33% | Local Dairy – 100% Cross-breed – 100% Exotic – 100% |

| Adaptation intervention (Commitment) | indicator(s) | Baseline (2018) | 2030 Target |
|---|---|---|---|
| drought- resistant animal breeds | | | |
| Expand the use of improved crop varieties with climate resilient characteristics | Improved seed coverage (Ha) | Teff – 31,000 Ha Barley – 70,000 Ha Wheat – 413,000 Ha Corn – 438,000 Ha | Teff – 100,000 Ha Barley – 193,000 Ha Wheat – 673,000 Ha Corn – 823,000 Ha |
| Strengthen crop disease and pest monitoring systems in vulnerable areas | Vulnerable districts covered by such monitoring systems | Indeterminate | All districts nationally |
| Strengthen drought and crop insurance mechanisms for climate risk management | Number of farmers (gender disaggregated) covered by drought and crop insurance | Indeterminate | 30% increase from 2022/2023 baseline (to be established) |
| **Sector 2: Forestry** | | | |
| Restoration and reforestation through tree planting | Hectares reforested/ restored (Ha) | 2.6 million Ha | 9 million Ha |
| Increase national forest coverage | Percentage of National Forest coverage | 15.50% | 25-30% |
| Enhance sustainable forest management | Area of natural forest under sustainable forest management | 2 million Ha | 4 million Ha |
| Improve sustainable utilization of forest resources | Number of green jobs created | 0.2 million | 5 million |
| | Export earnings from sustainable forest products | 41.4 million USD | 221 million USD |
| Implement forest protection and health enhancement measures in natural forest ecosystems | Area of forest protected from diseases, pests and fire | - | 17.2 million Ha |
| | Proportion of federal and regional institutions' improved capacity for forest protection | To be established | To be established |
| **Sector 3: Land Use, and Natural Resources Management** | | | |
| Enhance climate resilient livelihoods of | Number of dependent communities | 30,000 people | 1.5 million people |

| Adaptation intervention (Commitment) | indicator(s) | Baseline (2018) | 2030 Target |
|---|---|---|---|
| wildlife resource dependent communities in | | | |
| protected areas | benefiting from climate resilient wildlife resources | | |
| Enhance sustainable natural resources development, management, and watershed protection | Number of PFM associations vested with legal personality | - | To cover 10,000 catchment areas |
| **Sector 4: Water** | | | |
| Integrated watershed development in million Ha | Area under integrated watershed development | 2.24 million Ha | 10 million Ha |
| Improve access to potable water to strengthen community climate resilience | Potable water supplies per capita | 19.36 litres/capita/day | Rural – 25 litres/capita/ day by 2025/within 1km |
| | | | Urban – 50-100 litres/ capita/day by 2025 |
| | Proportion in decreasing non-functionality rate of water schemes | 19% | 7% |
| | Percentage of decreasing water waste | 39% | 20% |
| | Water Supply for humans and animals in 100 isolated and drought- affected woredas | Indeterminate | 100 woredas |
| | Number of residents using fluoride contaminated water | 3.5 million people | 0 |

| Adaptation intervention (Commitment) | indicator(s) | Baseline (2018) | 2030 Target |
|---|---|---|---|
| | | | |
| Expand the construction of medium and large- scale irrigation systems to enhance good security | Number of ha under medium and large-scale irrigation schemes | 0.49 million Ha | 1.2 million Ha |
| | Percentage of improved irrigation technologies for medium and large-scale irrigation | 2% | 20% |
| | Percentage of water use efficiency in medium and large-scale irrigations | 30% | 50% |
| | Number of gender balanced Irrigation Water User Associations (IWUAS) | none | 35.5 |
| | Number of jobs created through expansion of irrigation network | - | 930,000 |
| | Number of persons acquired skills through tailored capacity building activities | To be established | To be established |
| | Proportion of women shared development | To be established | To be established |
| | and management role in irrigation system | | |

| Adaptation intervention (Commitment) | indicator(s) | Baseline (2018) | 2030 Target |
|---|---|---|---|
| **Sector 5: Energy** | | | |
| Increasing number of households using renewable off-grid energy sources for lighting | Percentage of households using renewable off-grid energy sources for lighting (i.e. those not served by the grid) | 39.91% | 100% |
| | Percentage of population with stable access | 11% | 35% |
| | to electricity from alternative off-grid renewable energy (RE) technologies | | |
| | Number of unstable and unreliable diesel-based standalone generator systems | 36 systems | 0 |
| | Percentage of increased renewable energy contribution | 9% | 27% |
| | Percentage of reduced total electricity waste in transmission and distribution systems | 19.60% | 12.50% |
| | Percentage improvement in private sector contribution in energy generation and distribution | none | 36.10% |
| | Number of green jobs created in the Energy sector | To be established | To be established |
| | Number of capacity building interventions for actors across renewable energy value chain | To be established | To be established |
| | Percentage increase in women and youth participation in RE development and utilization | To be established | To be established |

| Adaptation intervention (Commitment) | indicator(s) | Baseline (2018) | 2030 Target |
|---|---|---|---|
| **Sector 6: Transport** | | | |
| Build sustainable transport systems for resilience through enhanced access to mobility | Length of non-motorized transport infrastructure constructed | 26.5 Km | 506 Km |
| | Number of cities/ towns (above 50k residents) with dedicated non-motorized transport lanes (for bicycles) | 2 | 69 |
| Increase climate resilient designs and safety standards for transport systems | Number of major transport infrastructures that take climate change into consideration | 1 | 9 |
| **Sector 7: Urban** | | | |
| Construct new sanitary landfill sites in cities / towns in climate resilient locations | Number of constructed landfill sites in climate resilient locations | 6 constructed sanitary landfills | 200 sanitary landfills |
| Increase the climate resilience of urban systems | Area of land covered by green infrastructure and recreational areas (Ha) | 159,263.16 Ha | 30% of the land in 200 cities/towns, equal to 5,308,772 Ha |
| Improve provision and condition of housing for enhanced human safety against climatic stressors | Percentage of urban dwellers residing in safe and adequate housing (gender disaggregated) | Indeterminate | 70% |
| Enhance urban greenery for improved climate resilience | Urb Urban green area per capita in $m^2$ | 0.41 m2 per urban inhabitant | Indeterminate |
| Undertake climate-adaptive urban planning | Area of land covered by green infrastructure and recreational areas (Ha) | 159,263.16 Ha | - |
| | Number of land use plans | Not available | 4,000 |
| **Sector 8: Climate Services and Disaster Risk Reduction** | | | |
| Number of climate and early warning data | Number of climate and early warning | 15 | 59 |

| Adaptation intervention (Commitment) | indicator(s) | Baseline (2018) | 2030 Target |
|---|---|---|---|
| produced and disseminated/year | data analyzed and disseminated/year | | |
| Number of modern weather condition monitoring stations | Number of modern weather condition monitoring stations | 325 | 806 |
| Enhancing climate service data reliability | Proportion of increase in climate service data reliability | 0.75 | 0.85 |
| Number of Eco-Hydrology Demonstration Sites in all basins | Number of Eco-Hydrology Demonstration Sites in all basins | 10 | 55 |
| Modernize and update the basin information system coverage | Modernize and update the basin information system coverage | 16.66 | 99.7 |
| Surface water resource assessment coverage | Percentage of surface water resource assessment coverage | 78% | 100% |
| Ground water resource assessment coverage | Percentage of ground water resource assessment coverage | 17.95% | 35% |
| Enhancing water quality monitoring coverage | Percentage of increase in water quality monitoring coverage | Indeterminate | 80% |
| **Sector 9: Health** | | | |
| Reduce Malaria case incidence | Percentage reduction of Malaria case incidence | 26/1,000 in 2020 | 8/1,000 |
| Reduce cholera case incidence | Percentage reduction in Cholera case incidence | Baseline in 2020 | 0 |
| Increase proportion of households with improved toilet | Percentage of households with improved toilets | 20% in 2020 | 60% |
| Increase proportion of households with safe water supply | Proportion of households with safe water supply | 70% in 2020 | 100% |
| Increase proportion of health care facilities safely managing health care waste | Percentage of health care facilities with safe waste management | 16% in 2020 | 50% |
| Increase proportion of health facilities with | Proportion of health facilities with safe energy sources | 76% in 2020 | 100% |

| Adaptation intervention (Commitment) | indicator(s) | Baseline (2018) | 2030 Target |
|---|---|---|---|
| safe energy sources (electricity, solar) | | | |

#### 4.4.1.2 Mitigation actions

A total number of **eighteen Mitigation** measures are identified across sectors (Table 2). Land use change and forestry (LUCF) has the largest mitigation potential. The policy interventions promote sustainable agriculture by increasing the share of agricultural land under sustainable management practices and reducing pre-harvest losses and land converted for agricultural infrastructure, grassland improvement for carbon sequestration, reducing residential biomass use by enabling a fuel shift from unsustainable biomass energy demand to electric stoves, renewable biofuels, and improved cookstoves, reforestation and restoration of land.

Livestock exhibits the second biggest GHG emission reduction potential. Policy interventions promote enhancing efficiency and productivity in livestock subsectors (dairy, red meat and poultry intervention packages), agricultural mechanization by using tractors for farmers and smallholders, increase in the share of poultry and improved feeding to reduce emissions from enteric fermentation. In the Energy sector, the policy interventions encompass economy-wide improvements of energy efficiency of appliances, machinery and other capital assets; shifting transport energy demand from petroleum to electricity and increasing the share of electric vehicles and public transport; industry fuel shift from industrial petroleum demand to electricity and sustainable biomass. Whereas, in the Waste sector interventions are focused on reducing waste generation, diverting organic materials from landfills, i.e., waste separation and composting, and reducing emissions from wastewater. In soil sector, it is directly linked to the livestock sector which comprises all emission- relevant policy interventions.

GACMO focuses on mitigation options in energy sector and energy use. While the Ethiopian updated NDC only includes a small number of mitigation options in the energy sector and energy use. None of the actions of livestock sector, grassland improvement and land restoration of the updated NDC is found in GACMO model. To develop Ethiopian's own GACMO model, some mitigation options important to Ethiopia need to be added to GACMO. In addition, GACMO does not have the public transport mitigation actions that GoE has identified in its updated NDC. In conclusion, some mitigation actions in Ethiopian's updated NDC are available in the GACMO model, others are not; it is necessary to adapt the GACMO to Ethiopia's national context by adding some mitigation options for sectors other than energy.

Table 2 List of mitigation actions considered for NDC update[11] Vs GACMO[12] option

| GEM sector | Reduction option | Indicator (Unit) | GACMO option |
|---|---|---|---|
| LUCF | Sustainable agriculture<br>1. Increasing the share of agricultural land under sustainable management practices<br>2. Reducing pre-harvest losses and land converted for agricultural infrastructure. | Hectares (ha) of agricultural land under sustainable management practices | Rice crop CH4 reduction<br>Zero tillage<br>Cover crops<br>Nitrification inhibitors (1000 ha)<br>Covering slurry stores (1 slurry store)<br>Fat supplementation in ruminants' diets (%DM fat added)<br>Tobacco curing |
| | Grassland improvement<br>3. Additional carbon sequestration through grassland improvement<br>4. Lowlands Livelihoods Resilience Project | Hectares (ha) of grassland improved | |
| | Household energy use<br>5. Fuel switch: shift from residential biomass energy demand to electricity<br>6. Biomass efficiency: Improved cook stoves | Energy demand shifted (TJ) of improved cook stoves distributed and used Biomass use per household (t) | Efficient residential air conditioning<br>Efficient lighting with CFLs<br>Efficient lighting with LEDs<br>Efficient lighting with LEDs replacing CFL<br>Efficient wood stoves<br>Efficient charcoal stoves<br>LPG stoves replacing wood stoves<br>Efficient electric stoves<br>Induction based cooking<br>New passive home<br>Efficient refrigerators<br>Rice husk cogeneration plants<br>Biomass power from biomass residues<br>Bagasse power |

[11] Ethiopia's updated NDC JULY 2021 Submission .pdf (unfccc.int)
[12] gacmo-country-x.xlsm (live.com)

| GEM sector | Reduction option | Indicator (Unit) | GACMO option |
|---|---|---|---|
| | Reforestation<br>7. Reforestation 3 million ha of land (conditional pathway) by 2030<br>• 20% moist Afromontane,<br>• 60% dry Afromontane,<br>• 10% acacia- commiphora,<br>• 10% combretum-Terminalia) | Area reforested / afforested (ha) Share of forest area of total land area (%) | Reforestation<br>REDD: Avoided deforestation<br>Assisted forest regeneration<br>Reforestation with agroforestry<br>Reforestation with Silvopasture |
| | Restoration<br>8. Restoration of 5 million ha of land (conditional pathway) by 2030 and 9 million ha by 2050<br>• 10% moist Afromontane,<br>• 60% dry Afromontane,<br>• 10% acacia- commiphora,<br>• 20% combretum-Terminalia) | Area restored (ha)<br>Share of forest area of total land area (%)<br>GHG-intensity of agricultural GDP | |
| Livestock | 9. Dairy, red meat and poultry intervention packages<br>• Enhancing efficiency and productivity in livestock subsectors | Number of improved cows<br>GHG-intensity of agricultural GDP | |
| | 10. Agricultural mechanization<br>• Replacing cattle/oxen by tractors for farmers and smallholders | Heads of livestock reduced<br>Number of tractors distributed | |
| | 11. Increase in the share of poultry<br>• Replacing non-dairy cattle stock by chicken (supply side) and inducing a demand shift from beef to chicken | Number of non-dairy cattle replaced | |
| | 12. Oilseed feeding<br>• Improved feeding to reduce emissions from enteric fermentation. | Improved feeding deployed (tons) | |
| Energy | 13. Energy efficiency<br>• Economy-wide improvements of energy | Efficiency parameters, e.g., efficiency of | Efficient electric motors<br>Energy efficiency in industry |

| GEM sector | Reduction option | Indicator (Unit) | GACMO option |
|---|---|---|---|
| | efficiency of appliances, machinery and other capital assets | appliances and buildings (in %) | Building materials |
| | 14. Transport electrification<br>• Shifting transport energy demand from petroleum to electricity Increasing the share of electric vehicles | Energy demand shifted (TJ)<br>Share of electric vehicles over total fleet (%) | 10% Biodiesel blend in all diesel<br>15% Bioethanol blend in all gasoline<br>Bus Rapid Transit (BRT)<br>More efficient gasoline cars<br>More efficient diesel cars<br>Natural Gas cars<br>Electric cars<br>Electric 18m buses<br>Electric 12m buses<br>Electric heavy trucks<br>Electric light trucks<br>Electric rail<br>Shifting passengers from car to rail (1Mill. Person km/day)<br>Shifting freight transport from road to rail (1000 ton km/day)<br>Restriction on import of used cars<br>New bicycle lanes<br>Electric three-wheelers<br>Electric two-wheelers<br>Better maintenance and use of motor bikes |
| | 15. Public transport<br>• Shifting transport energy demand from petroleum to electricity<br>• Increasing the share of public transport | Energy demand shifted (TJ)<br>Passenger kilometers travelled in public transport (km)<br>Share of passenger kilometers travelled in public transport over total passenger kilometers travelled (%) | |
| | 16. Industry fuel switches<br>• Fuel switch 1: industrial demand fuel shift from | Energy demand shifted (TJ) by type of fuel switch. | Switch from coal to natural gas in industry<br>Switch from fuel oil to |

| GEM sector | Reduction option | Indicator (Unit) | GACMO option |
|---|---|---|---|
| | petroleum to electricity<br>• Fuel switch 2: industrial demand shift from petroleum to sustainable biomass | | natural gas in industry. |
| Industry | 17. Clinker substitution<br>• Replacing clinker in cement with adequate and available materials without compromising cement properties | Share of clinker in cement (%) | CCS plant<br>Clinker replacement<br>Coal mine methane |
| Waste | 18. Waste management<br>• Reducing emissions from reduced waste generation rate per capita<br>• Reducing emissions from introducing ban on organic materials on landfills, i.e., waste separation and composting<br>• Reducing emissions from wastewater | Rate of waste generation (tons p/c)<br>Share of organic material per ton of waste on landfills (%)<br># of wastewater treatment plants constructed | |

### 4.4.2 MRV and M&E systems for tracking the NDC Update

The MRV and M&E framework for Ethiopia's updated NDC will work towards full alignment with Articles 4 (Mitigation), Article 6 (Cooperative Approaches), Article 7 (Adaptation) and Article 13 (Enhanced Transparency Framework) under the Paris Agreement[13]. Article 13 specifies elements of reporting in Biennial Update Reports (BTRs), although there is a differentiation between industrialized and developing countries, with further flexibility for LDCs ("trifurcation"). While LDCs like Ethiopia can report "at their discretion", Ethiopia is working towards meeting international best practices to demonstrate a high degree of ambition and climate policy leadership. Ethiopia will therefore also perform mandatory reporting and accounting for market mechanisms, through making "Corresponding Adjustment" of emissions according to transfers of Internationally Transferred Mitigation Outcomes (ITMOs), as well as information on sustainable development promotion, environmental integrity and transparency. Detailed procedures will be adjusted to multilateral NDC accounting and reporting rules once these will be finalized. Moreover, the NDC MRV and M&E Framework eventually fully integrates Ethiopia's 10 Year Development Plan (10YDP[14]) targets and key performance indicators (KPIs) for each sector. The Planning and Development Commission (PDC) will lead the evaluation of progress of achieving the 10YDP targets against these KPIs. However, for NDC MRV and M&E, a subset of the more comprehensive 10YDP M&E framework is sufficient. Only those indicators that are relevant to determine emissions reductions, adaptation impacts or means of implementation should be considered in the NDC-specific MRV and M&E

[13] The Paris Agreement | UNFCCC
[14] eth215704.pdf (fao.org)

framework, as shown in Figure 2. As far as possible, data will be disaggregated by gender.

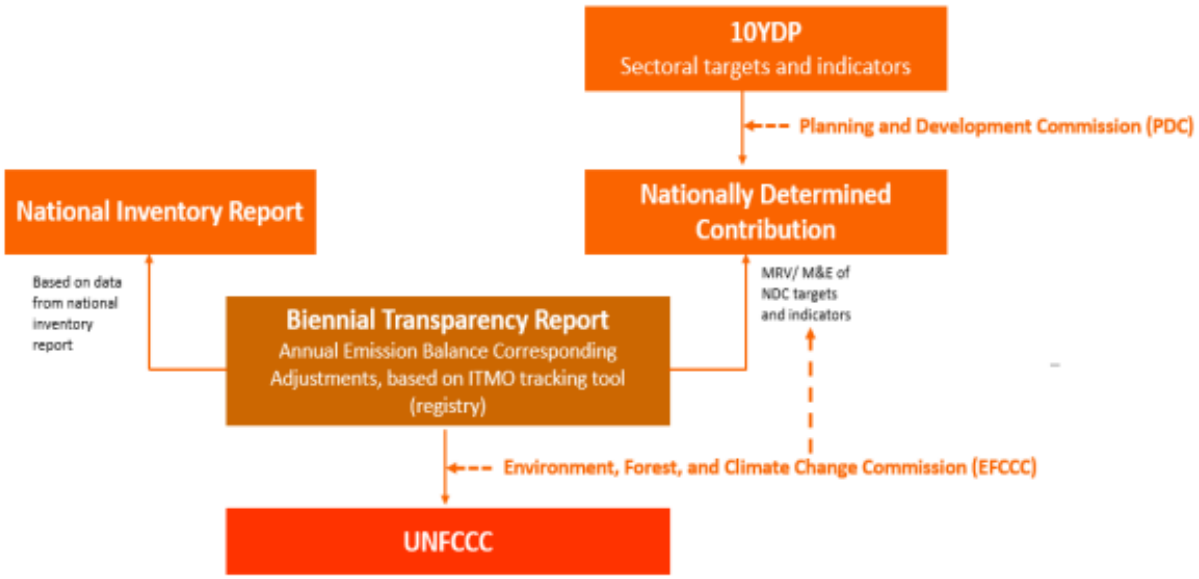


*Figure 2 MRV and M&E Frameworks of Ethiopian NDC Update Implementation* [15]

### 4.5 Initial Base of the Ethiopian NDC Update

Ethiopia's policy framework for climate change mitigation and adaptation has progressively evolved since the ratification of the United Nations Framework Convention on Climate Change (UNFCCC) in 1994. As part of its commitment, Ethiopia submitted to the UNFCCC its Initial National Communication (INC) in 2001 and Second National Communication (SNC) in 2015. The country also launched a National Adaptation Plan of Action in 2007, Ethiopian Program of Adaptation on Climate Change and Nationally Appropriate Mitigation Actions in 2010. Ethiopia endorsed a Climate-Resilient Green Economy (CRGE) strategy to build a green and resilient economy in 2011. Apart from this, sectoral policies and strategies have been formulated to provide tailored and sector specific strategic interventions. These include the following: the Climate Resilience Strategy for Agriculture and Forestry (2015), the Climate Resilience Strategy for Energy and Water (2015), the Climate Resilient Strategy for the Transport Sector (2015), the National Health Adaptation Plan to Climate Change (H-NAP, 2017) and the Climate Resilience Strategy for Urban Development and Housing (2017).

Ethiopia submitted its Intended Nationally Determined Contribution (INDC) in 2015 and ratified the Paris Agreement (PA) in March 2016, turning its INDC into its NDC. Ethiopia's first NDC aspired to reduce emissions from all sectors by 64% by 2030 from BAU scenario. As part of the endeavour to boost national adaptive capacity, Ethiopia developed its National Adaptation Plan (NAP-ETH) in 2017. To implement the NAP, subsequent strategies, notably the gender analysis for NAP, the National Adaptation Plan (NAP) Implementation Roadmap and NAP-ETH Resource Mobilization strategy were developed between 2018 and 2020. Ethiopia has been implementing its climate change policy by mainstreaming them into national development plans. In this regard, the CRGE strategy was mainstreamed into the Second Growth and Transformation Plan (GTP II) for the 2015-2020 period. The newly endorsed 10YDP has also set building climate resilient green economy as one of its strategic pillars. Ethiopia has also updated its NDC based on the 10YDP and with

[15] FDRE EFCCC. (2021). Ethiopia's updated NDC JULY 2021 Submission .pdf (unfccc.int)

extensive review and participation of relevant stakeholders. The policy frameworks that utilize for the NDC updating in Ethiopia is clearly presented on Figure 3.

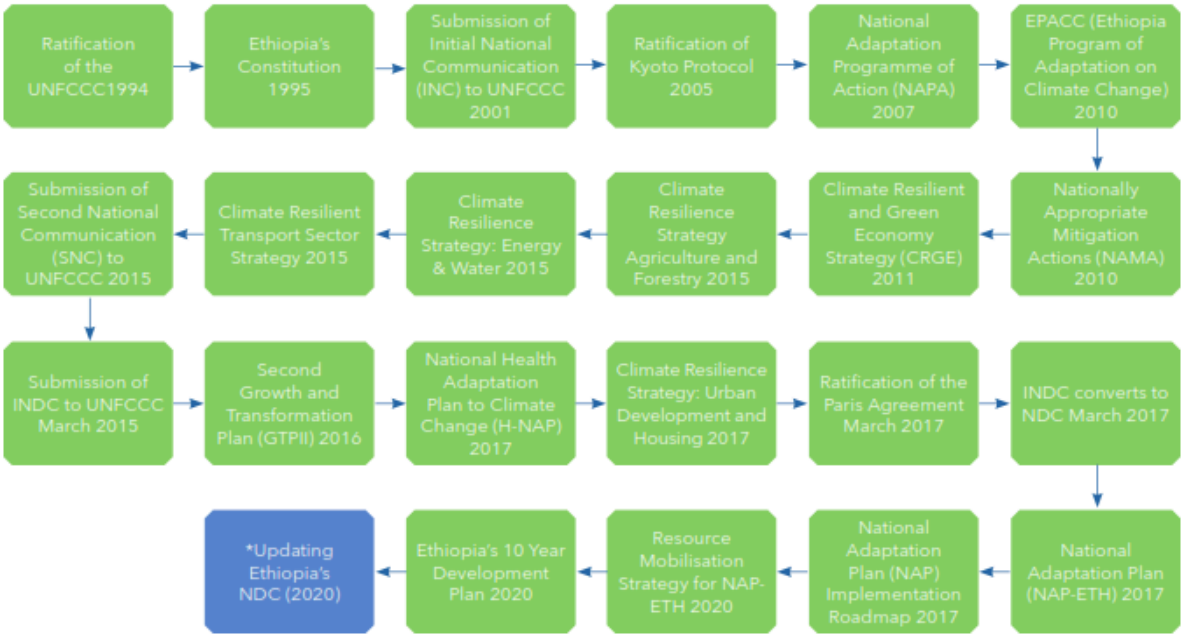


*Figure 3 Policy Road maps for NDC Update implementation*[16]

## 4.6 Technology

The updated NDC set ambitious targets for international support for capacity building and technology transfer. Ethiopia has shown particularly high ambition both in mitigation and adaption across various sectors, with a particular emphasis on forestry, agriculture, energy, industry, and disaster risk reduction. In order to fully implement the mitigation and adaptation interventions proposed under its updated NDC, the country has demanded international support on capacity building and technology transfer. The capacity building that has been identified in the updated NDCs were:

- Strengthen MRV system and its institutional setup with adequate infrastructure and human resources.
- Tools/techniques to establish a public expenditure review framework across all government institutions at all levels that enable disaggregation of budgetary flows and allocations.
- Integration of MRV/M&E with general national statistical data collection and management system.
- Enhancement of accessibility and availability of data through the state-of-the art technology.
- Strengthen the coordination among sectors and regional counterparts to ensure better implementation, monitoring and evaluation of NDC Update.
- Introduction of technology transfer including clean cement production, early warning systems, sustainable catchment and land use management.

## 4.7 Financing

As shown in Figure 4, the financial resources required to implement the updated NDC in the next 10 years was estimated as USD 316 billion. The mitigation interventions identified in the updated NDC require USD 275.5 billion and adaptation actions require USD 40.5 billion. The financial estimates

[16] FDRE EFCCC. (2021). Updated NDC of Ethiopia. *Submitted to UNFCCC*, 1–48.

are derived from climate resilience plans of sectors and Ethiopia's Ten Years Development Plan, which aims to build a climate resilient green economy by 2030.

Similar to the GHG emission reduction targeting, 20% of the total estimated finance is unconditional while the rest 80% is conditional. Ethiopia is committed to invest USD 63.2 billion on climate change mitigation and adaption actions from domestic sources, which is equivalent to an average annual investment of USD 6.32 billion by 2030. The conditional finance, which is equivalent to US$252.8 billion, should be received from international climate finance sources (Figure 5).


*Figure 4 FINANCING NEEDS TO IMPLEMENT the NDC Updates*

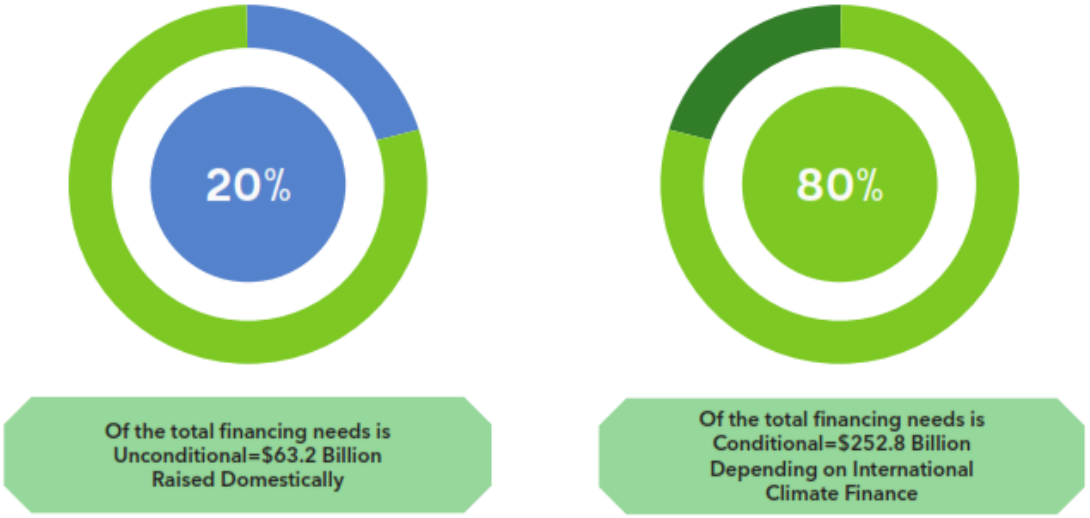


*figure 5 Breakdown of conditional and unconditional financing*[17]

## 4.8 Institutional arrangement

Ethiopia has progressively put in place an institutional architecture which follows sectoral approach to implement CRGE/NDC interventions. In this regard, the Environment, Forest and Climate Change Commission (EFCCC) is the lead agency for the coordination of Ethiopia s response to climate change and is the national focal point to the UNFCCC; it formulates environmental laws and standards; and develops, coordinates and guarantees the implementation of sectoral programs and

[17] FDRE EFCCC. (2021). Updated NDC of Ethiopia. *Submitted to UNFCCC*, 1–48. Ethiopia's updated NDC JULY 2021 Submission_.pdf (unfccc.int)

plans. A CRGE Facility was established in 2013, overseen by Ministry of Finance, which is responsible for financial aspects of CRGE implementation, while the Environmental protection authority under the autonomy of Ministry of planning and development which is responsible for technical elements and day-to-day administration, as well as developing guidance and rules for CRGE implementation. The institutional arrangements reflect a cross-sectoral, multi-disciplinary approach organized through bodies like the inter-ministerial and management committee and allows for regional engagement. Most relevant line ministries have in-house CRGE directorates, units, or bureaus that focus on climate change policy implementation.

## 4.9 ICTU in Ethiopian NDC Update

The Ethiopian NDC update has used a reference year of 2020 with an updated base year of 2010. The reference period is 2020 – 2030. BAU Projection was made until the year of 2030. The quantified reference indicator commonly be reported in the Ethiopia's Biennial Transparency Report and may be updated due to methodological improvements to the GHG inventory.

The updated NDC targets to achieve at least 68.8% of economy-wide GHG emission reduction by 2030 against its BAU projections. The mitigation target includes unconditional and conditional elements. The unconditional component foresees an emission reduction of 14% and the conditional component contributes to approximately 54.8% compared to the BAU projection by 2030.

The emission levels of both the BAU and the mitigation scenarios were determined based on an economy-wide integrated assessment model [18](the Green Economy Model). The NDC update was based on Ethiopia's GHG inventories, data from sector ministries and relevant agencies, energy data from International Energy Agency (IEA), economic projections from national and international data sources, population projections from United Nations and population Division as a data source.

The NDC Update complied with the with the Intergovernmental Panel on Climate Change (IPCC) guidelines. It covers the major GHGs, such as carbon dioxide ($CO_2$), Methane ($CH_4$), and Nitrous oxide ($N_2O$), but exclude the F-gases. It has covered the key sectors such as Land Use Change and Forestry (LUCF), Industry, Energy, Livestock, Managed soils and Waste.

Ethiopia has set an ambitious target of reaching middle-income status through green economy pathways as set out in its national Climate-Resilience and Green Economy (CRGE)[19] Strategy. Ethiopia strongly believes that current and historical responsibilities for GHG emissions as well as the capabilities to mitigate them are key considerations in determining fairness. Even though Ethiopia is responsible for only 0.04% of global emissions, the country is highly vulnerable to climate impacts that threaten its sustainable development. Despite these challenges Ethiopia has set an ambitious target for reducing its emissions, with a significant unconditional contribution, in order to contribute to the global effort to keep temperature increase below 1.5°C.

During the NDC updating, the flexibility and adaptability of the methodology (Green Economy Model) that was employed to prepare the emission pathways to future changes of emission sources or mitigation actions. In addition, the update considered an enhanced ability to track progress on mitigation actions with an improved MRV/M&E.

The NDC update contributes towards the objective and long-term goal of the Paris Agreement through mitigation and adaptation actions. It has shown strong commitment to deploying domestic resources. It expresses a strong interest for voluntary cooperation in emerging international carbon markets governed by Article 6 of the Paris Agreement. The country sees carbon markets as

[18] https://www.mofed.gov.et/programmes-projects/crge-facility/

[19] Climate Resilient Green Economy (CRGE) Facility (mofed.gov.et)

instruments to increase mitigation ambition and places high importance on environmental integrity through robust accounting as well as the promotion of sustainable development. Ethiopia therefore invites interested Parties to explore possibilities for engaging in cooperative approaches. The projected BAU, unconditional and conditional GHG emission pathways and resulting 2025 and 2030 targets have been simulated with the Green Economy Model, which has been developed in accordance with the [20]IPCC 2006 guidelines for GHG inventories; consistent with decision 18/CMA.

## 4.10 Global experience of GACMO application for NDC planning and tracking

Over the years, various methodologies and tools have been developed to enable parties to analyse their climate change-related data, prepare reporting information, and use the information to develop and track mitigation strategies. The planning and tracking NDCs are a requirement under the Paris Agreement's Enhanced Transparency Framework (ETF). It requires transparent quantitative and qualitative information on the implementation and achievement of NDCs, including indicators comparing current or projected emissions, and information that helps better understand the NDC target and its impacts. To do this, there are many guidelines and software (i.e., IPCCC Guidelines, IPCC Software, LEAP, and GACMO). The 2006 IPCC guidelines give guidance on how to properly estimate historical emissions, including on how to gather and use activity data and emission factors (Energy and Agriculture). However, the software does not do projections and mitigation impact assessment of future projects or measures. The LEAP tool also has the capacity to generate historical trends of emissions, produce future emission pathways, carry out mitigation assessments, do economic analysis and produce marginal abatement cost curves, and finally carry out the monitoring, verification and reporting functions but intensive training is required to master the tool and the license fees required to access the tool are barriers to its widespread use.

On the other hand, GACMO is a useful tool for Monitoring Reporting and Verification (MRV) ensuring transparency in climate change mitigation actions. It contains a MRV sheet, where the annual implementation of the mitigation action can be inserted. The model can estimate the GHG mitigation impacts of specific mitigation actions, which can be used to prepared National Communications, Biannual Reports, and Nationally Determined Contributions (NDCs) to the Paris Agreement. However, GACMO has some strengths and weaknesses positive for mitigation impact assessment in the four sectors Energy, IPPU, AFOLU and Waste and some limitations in the NDC implementation progress. Many countries (i.e., Afghanistan, Angola, Antigua and Barbuda, Eritrea, Ghana, Guinea-Bissau, Lesotho, Macedonia, Mozambique, North Korea, Sao Tome and Principe, Swaziland, The Maldives, Zambia, Zimbabwe, and others) have been using the GACMO model to plan, calculate and track their GHG reduction and economic effects. The general GACMO model contains 119 climate mitigation options for Agriculture, Energy, Forestry, agriculture and waste sectors. Table 3 provides an overview on how different countries use GACMO for their mitigation planning and progress tracking (Table 3)

Table 3 Countries experience of using GACMO in plan/ tracking

| Country | Experience for PLAN/ TRACKING | Source documents |
|---|---|---|
| **Eritrea** | • To projection of GHGs from the 2010 inventory and calculate the abatement potential and | [21] Eritrea's Intended Nationally Determined Contributions (INDCs) Report |

[20] 2006 IPCC Guidelines for National Greenhouse Gas Inventories — IPCC

[21] The State of Eritrea. (2015). *The State of Eritrea Eritrea's Intended Nationally Determined Contributions (INDCs)* Report. *September*.

| Country | Experience for PLAN/ TRACKING | Source documents |
|---|---|---|
| | corresponding investment requirement. | |
| **Zimbabwe** | • To evaluate some cost data | [22] Zimbabwe Revised Nationally Determined Contribution 2021 |
| **Afghanistan** | • For Greenhouse Gas Inventory Report and projection for 2020-2030 | [23] ISLAMIC REPUBLIC OF AFGHANISTAN Intended Nationally Determined Contribution |
| **Angola** | • For development of baseline scenario based on linear sectorial projections. | [24] Intended Nationally Determined Contribution (INDC) of the Republic of Angola |
| **Maldives** | • For projection of GHG | [25] Maldives First Biennial Update Report to the United Nations Framework Convention on Climate Change, Maldives: Ministry of Environment |
| **Ghana** | • For the assessment of mitigation actions and their effect (planning and tracking) | [26]Ghana's ICAT Project Progress Report Deliverable 2 Report - Renewable energy sector MRV |
| **Sri Lanka** | • For NDC planning and tracking of energy sector | [27] *Ghana ' s ICAT Project Progress Report.* climateactiontransparency.org |
| **Viet Nam** | • For NDC planning and tracking of agriculture sector | [28] *Nationally Determined Contribution (NDC) of Vietnam.* Climateactiontransparency.org |

### 4.10.1 Experience of Sri Lank and Viet Nam GACMO for update NDC planning

In Sri Lanka, GACMO was used to successfully update not only the NDC targets but also plan the GHG mitigation actions for the energy sector. The country team intended to reduce GHG emissions from the energy sector by 20 percent by 2050 and found that the country could actually reduce its

[22] Government of Zimbabwe, Z. (2021). *Zimbabwe Revised Nationally Determined Contribution, 2021*. 20–28. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjD9ZrW75v8AhULUcAKHUfJDiIQFnoECAwQAw&url=https%3A%2F%2Funfccc.int%2Fsites%2Fdefault%2Ffiles%2FNDC%2F2022-06%2FZimbabwe%2520Revised%2520Nationally%2520Determined%2520

[23] ISLAMIC REPUBLIC OF AFGHANISTAN. (2015). ISLAMIC REPUBLIC OF AFGHANISTAN Intended Nationally Determined Contribution Submission to the United Nations Framework Convention on Climate Change The Islamic Republic of Afghanistan hereby communicates its Intended Nationally Determined Contribution ( I. *Report*, *September*, 1–8.

[24] Republic of Angola. (2020). *Nationally Determined Contribution (Interim)*. *May*.

[25] Maldvies, M. of E. R. of the. (2014). *MALDIVES FIRST BIENNIAL UPDATE REPORT TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE* (Issue November).

[26] Ghana, E. P. A. (2019). *Ghana ' s ICAT Project Progress Report*. MESTI. (2021).

[27] Ministry of Environment. (2019). *Updated Nationally Determined Contributions, Sri Lanka.* 69.

[28] Government of Vietnam. (2022). *Nationally Determined Contribution (NDC) of Vietnam*. *October*, 43. https://unfccc.int/documents/622541

GHG emissions from energy by 25 per cent by 2030. Also, GACMO has produced data on costs, indicating the cost of reducing GHG emissions would be USD 68 per ton of $CO_2$eq, as of May 2020. This indicated the magnitude of climate finance of Sri Lanka would need to mobilize to achieve its NDC targets in the energy sector (climateactiontransparency.org).

Viet Nam used GACMO to assess the GHG mitigation potential of its agricultural sector in its updated NDC to reduce emissions from the **agriculture sector** by over 63 million $CO_2$e by 2030. *GACMO output shows the need to increase the use of biogas as a GHG emission reduction measure. In addition, it highlighted the total investment required, the total annual cost, the reduced total CO2e emissions, and the standard option in GACMO* (climateactiontransparency.org).

### 4.10.2 Use of GACMO to identify new mitigation opportunities

Between 2017 and 2018, Ghana used the GACMO tool to identify new mitigation opportunities in different sectors. Based on 27 new mitigation options, the country has used GACMO to update the baseline scenario and the mitigation scenario of its NDC. The implementation of the 27 mitigation options would allow Ghana to reduce its emissions by 53% in 2030 compared to the baseline scenario. By doing this, they would have saved $622 million a year (unepccc.org).

Between 2009 and 2015, Maldives used the GACMO tool to identify new mitigation opportunities in different sectors. Based on 22 new mitigation options, the country has used GACMO to develop the baseline scenario and the mitigation scenario for its INDC. The implementation of the 22 mitigation options would have allowed Maldives to reduce its emissions by 35.7% in 2020 compared to the baseline scenario. By implementing these 22 options, the Maldives would have saved $111 million a year (unepccc.org).

Besides, Colombia, Makedonia, Albania, Ghana, Sao Tome and Principe also used GACMO to assess their GHG mitigation options in their National Communication. Maldives has been used to make Low Carbon Development Strategies, and Eritrea, Afghanistan, Maldives, Djibouti, Sri Lanka, Myanmar has been used to make their NDCs. Moreover, GACMO has been used in regional low carbon studies: "Zero Carbon Latin America, A Pathway for Net Decarbonisation of the Regional Economy by mid-century" as illustrated table 2. Conversely, the suitability assessment of the GACMO as a tracking tool for Zimbabwe's NDC implementation identified gaps and barriers and related opportunities for using GACMO in NDC tracking for Zimbabwe (Table 4).

Table 4 Gaps and barriers and related opportunities for using GACMO in NDC tracking; global experiences

| **Mitigation Assessment component** | **Gaps & Barriers in using GACMO** | **Opportunities for using GACMO** |
|---|---|---|
| Historical emissions trending | Energy sector: GACMO does not calculate non-CO2 emissions, but imports them from other tools | **Energy sector:** GACMO uses the Energy balance and follows the 2006 IPCC guidelines to estimate $CO_2$ emissions from combustion for the Start Year, and these $CO_2$ emissions can be compared with the Reference Approach emissions of the BUR and with those of the IEA. |
| | IPPU: GACMO does not calculate emissions but imports them in $GgCO_2eq$ | |
| | **AFOLU:** Forestry emissions, are imported to GACMO as totals, and not disaggregated according to IPCC sub categories | **AFOLU:** Emissions from Agriculture and Forestry are imported to the Start Year by category |

| | | |
|---|---|---|
| | **Waste:** GACMO does not calculate emissions from the waste sector but imports emissions from liquid and solid waste for the Start Year, while the Waste sector categories are Solid Waste Disposal, Biological Treatment of solid waste, Incineration and open burning of waste, and Wastewater Treatment and Discharge. | **Waste:** Overall emissions are calculated with and without forestry, in line with the national GHG inventory |
| **Baseline Projection Scenarios** | **Energy sector:** GACMO is not flexible enough to project BAU emissions and mitigation potential on an annual basis (gives emissions every five years, up to 2030) | **Energy sector:** The tool allows importing of historical emissions and Baseline or BAU emissions for the years 2020, 2025, 2030 and 2050. Most countries give their emissions reduction targets for the years 2025 and 2030. |
| | **IPPU:** The GACMO generates, with the aid of growth rates, Baseline or BAU emissions for the years 2020, 2025, 2030 and 2050. | **AFOLU:**<br>- Economic growth rates are applied to activity data instead of emissions, making it relatively more accurate that methods based on emissions.<br>- GACMO produces BAU projections for the years 2020, 2025, 2030 and 2050 by applying growth rates on imported liquid and solid waste emissions for the Start Year.<br>- GACMO gives cumulative emissions reductions, as a percentage, for each reported year |
| | **AFOLU:**<br>- GACMO does not disaggregate emissions by category, making projections inaccurate because of using a single growth rate to represent all emissions from the various categories<br>- A single growth rate is used to project emissions from the AFOLU into the future are not also applied by category; a single growth rate is used | |
| **Technical mitigation assessment** | No comment | **Energy sector:** GACMO gives cumulative emissions reductions, as a percentage, for each reported year |
| | | **AFOLU:** The GACMO has some mitigation projects of various technologies which help, with proper scaling up or down, give the units penetrating, investment costs, annual costs, annual emissions reductions, and abatement costs |

| | | |
|---|---|---|
| | | **Waste:** The GACMO has some mitigation projects of various technologies which help, with proper scaling up or down, give the units penetrating, investment costs, annual costs, annual emissions reductions, and abatement costs |
| **Economic analysis** | No comment | **Energy sector:**<br>The GACMO has some mitigation projects of various technologies which help, with proper scaling up or down, give the units penetrating, investment costs, annual costs, annual emissions reductions, and abatement costs |
| | | The GACMO has some mitigation projects of various technologies which help, with proper scaling up or down, give the units penetrating, investment costs, annual costs, annual emissions reductions, and abatement cost |
| **MRV** | On tracking implementation of mitigation measures the GACMO MRV tracks only units penetrating; it does not track the emissions per the sector. | -GACMO gives the results of an economic analysis in both graphical (Marginal Abatement Revenue Curve) and tabular formats and gives flexibility to exclude some projects from the graph. |

# 5. Conclusion and Recommendation

## 5.1 Conclusion

The updated NDC was developed by integrating with the country's 10-year strategic development planning from 2021 to 2030. It has ensured the full alignment of development objectives with the climate actions. It was prepared based on a participatory green economy modelling and analysis, as well as stakeholder engagement with all ministries and development partners. The modelling and analysis were utilized for GHG emission projections for the 10-year development plan and explore Ethiopia's ambitions to achieve net-zero emissions by mid-century. Numerous intergovernmental collaboration and engagement with several development partners such as the World Bank, UNDP, Perspectives Climate Group and South-South-North, with support from WRI and the Global Green Growth Institute were explored. Lastly, additional GHG emission modelling was conducted after early submission of the NDC update in December 2020 and has gained an opportunity to refine and validate the modelling results and assumptions with considerations for the country's development ambitions and directions. While submitting the refined and validated NDC Update plan in July 2021, potential support intervention areas were identified. The capacity building demands related to transparency and MRV are:

- Finance support for IT installation of MRV data base framework & technical capacity building
- Technical skill gaps training in the NDC tracking tools (GHG emission mitigation quantification), adaptation actions measurement, and projection.
- Skill gaps filling on ETF reporting tools which is Key for BTR submission (CRF, CRT etc.,)

- Sustaining the institutional restructuring and reducing turnover of staff members, loose of institutional memory (Missing data).
- System installation on institutional coordination (vertical and horizontal) for instance Energy sector data collection,
- Lack of financial data and budget tracking and management systems for NDC, leading to difficulty in estimating what has been spent
- Improving the private sector involvement
- Enhancing donor coordination on ETF & NDC update implementation.

## 5.2 Recommendations moving forward

The fragmentation in the institutional setup and re-structure of the line ministries affects the proactive role in guiding, overseeing, and tracking all climate related actions in the country. Previously, there has been a commission of Environment, Forestry and Climate change that strongly works on the regulatory works of Environment and Climate change. The commission has been restructured into Environmental protection authority by losing few powers such as sending forestry sector for other organization and transfer few its mandates to the Ministry of Planning and Development. Hence, the redefinition of institutions in line ministries and separately autonomous institutions need to focus on the implementation, tracking, and reporting of NDC progress. One option is to make the line ministries a semi-autonomous structure that works in collaboration with an independently autonomous organization of the NDC update plan implementation coordinators.

As it was recommended by UNFCCC (2018), the line ministries should rapidly operationalize their existing MRV frameworks by translating theoretical guidance into operational systems. Hence, it is advisable to update the frameworks and guideline as necessary to ensure consistency with UNFCCC's MRV guidelines, international best practice, and (for future refinement of national MRV systems of the Modalities, Procedures, and Guidelines (MPGs) under the Enhanced Transparency Framework (ETF) adopted under the Katowice Package.

A user-friendly, reliable, well-designed and organized centralized information and knowledge management system (dual platform server based and cloud based) should be established at the Federal EPA or Ministry of planning and development.

All sectors should maintain an online, dual-platform (server-based and cloud-based) information and knowledge management system, to serve as searchable archive to trace and retrieve relevant documents and data, as well as to enable sharing and real-time dissemination of climate change related information and activities documented within the sector (at the national, regional, and woreda level).

The ministry of Planning and Development should ensure the use of a consistent set of indicators related to climate change, with a final selection and official notification of indicators (sector level, programme level, project level, and activity level both output indicators and outcome indices). Mandate the use of the same core set of indicators by all institutions, including the National Planning and Development Commission, all Ministries, donors, and implementation partners (with the freedom for all to additionally adopt, track, and report on further non-core indicators as may be contextually relevant).

The assumptions, targets, and detailed methods of achieving the set of mitigation measures that have been identified in the NDC Update should be explained, narrated and incorporated in GACMO model sheets for its target achievement tracking.

# 6. Annexes: Data collection tools/Survey Questionnaire

This questionnaire survey was designed to collect information on the NDC Tools/models' application in Ethiopia. The information to be collected from this survey will be used to improve the NDC Update strategies implementation / Emission reduction tracking in Ethiopia. The accuracy of information to be gathered is highly important to design proper NDC Update tracking tools. So, we are kindly requesting the respondents to take time and provide us a reliable data. It has no conflict of interest with any party. Also, the privacy of the respondent is kept confidential.

**Part I Baseline information on INDC and First NDC.**

1. Brief summaries of Ethiopian INDC (2015) and NDC (2017), and NDC update 2021?
   ---
2. Why the INDC (2015) do was updated to NDC (2017), and the latter was further updated in 2021? ---
3. The primary intensions of these NDCs?
   ---
4. What were the sectoral targets that were planned to be achieved in each version?
   ---
5. What models/tools were used for planning these NDCs?
6. What are the institutions/experts involved in the development of the INDC, NDC (2017), and NDC update (2021)?
7. Any international technical support behind them? What potential gaps and challenges were identified during the first NDC planning and implementation that drives for the NDC update?
   ---

**Part II Assessment of the Stock takes of NDC 2021 update?**

8. How much time did the NDC 2021 preparation take?
   ---
9. What was the development processes (steps)?
   ---
10. What was the basic assumptions that were considered?
    ---
11. What are the stakeholders participated? What was the degree of their participation?
    ---
12. What Models/tools used to develop NDC updates? (GEM, Excel spreadsheet, GACMO)
    - 12.1 What is/are the basic reason/s for selecting this model /Flexibility to update additional actions? Compatibility with UNFCCC? Robustness? technically handiness? or others? /
    - 12.2 What was the potential treat and opportunity while using this model/tool for the update planning?
      ---
    - 12.3 Was the NDC updating process based on detailed scenario modeling of GHG emissions and macro-economic assessment? Did it include detailed costing and investment needs assessment for achieving the different sectoral targets?
    - 12.4 Does the government use any tool/model to track and assess the NDC implementation progress?
    - 12.5 Can the existing tools/models meet requirements of the Enhanced Transparency Framework under the Paris Agreement? If not, what are the gaps and barriers?

13. What were the existing conditions that were referred to during the NDC update planning?

13.1 Climate change policies and institutional frameworks?

---

13.2 National development policies/plans/programs and legal binding frameworks?

---

13.3 Levels of political commitments (in creating an enabling environment, driving progress, coordinating activities, business process & structure of decision-making hierarchy, nature of stakeholders' engagement, maintaining political will etc.).

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13.4 Institutional capacity (national government, regional states and sectors)

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13.5 Technology options identified/considered ----------

13.6 Human capital (knowledge and skills) identified/considered ----------

13.7 Required resource and finance mobilization Strategy? ----------

**14. Mitigation and adaptation actions in the NDC update by sector**

14.1 Number of identified mitigations actions? ----------

14.2 Number of identified adaptations actions? ----------

14.3 Do the indicators and emission reduction targets of mitigation and adaptation activities are set across each sector? (Yes, No)

If your response is yes, please list corresponding targets and indicators of each action/activity across a sector. ----------

14.4 Prioritization criteria for selections of mitigation and adaptation actions for each sector?

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14.5 Target levels of emissions for each sector and activities/action per year?

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14.6 Emission projections and mitigation potentials by sectors/regions?

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**15. What are the international (political) circumstances that have been considered while planning the Ethiopian NDC Update?**

15.1 Paris agreement ----------

15.2 UNFCCC guidelines and tools ----------

15.3 African agenda 2063 ----------

15.4 SDG ----------

15.5 Multilateral and bilateral agreements ----------

**15.6 Others ----------**

**16. Political commitment for NDC update implementation**

16.1 Do you have any policy/strategy/plan supporting the NDC implementation in your sector/region? (Yes, No)

If yes, list them. ----------

16.2 Do your sector/region have costed budget for each activity of the mitigation and adaptation actions? (Yes, No) If your response is yes, list and indicate the amount (Table 1).

*Table 1 Financial options and NDC actions in Ethiopian NDC updates*

| [29]Sectors | NDC actions | [30]Interventions | Domestic resource, USD | | Climate finance, USD | | Total (planned), USD | Total (achieved), USD |
|---|---|---|---|---|---|---|---|---|
| | Mitigations | | Planned | Achieved | Planned | Achieved | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | Adaptation | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

17. In your sector/region, is there any M&E established system to track the adaptation interventions? (Yes, No).
    If your response is yes, indicate the system. ----------
18. In your sector/region, is there an established MRV system to track the mitigation interventions? (Yes, No).
    If yes, indicate the system. ----------
19. In your sector/region, is there a tracking system of NDC activities / actions / progress per year?
    If your response is yes, please indicate the tracking system. ----------
    If your response is No, please explain your reason. ----------

**20. Technology**

20.1 What would be the technological challenges and gaps observed during the updated NDC implementation? ----------

20.2 In your sector which technologies are applied during the implementations of NDC?
---

21. Human resource capacity

21.1 What type of technical knowledge and skills required for planning and tracking the implementation of the updated NDC in your sectors? ----------

21.2 What would be the potential gaps and challenges in human resource capacity?
---

21.3 Please write the type and number of professional experts planned to use and actually found for NDC update implementation in your sector (Table 2). ----------

[29] Agriculture, waste, industry, land use, soil management, forestry, energy, etc.

[30] Identified specific activities

*Table 2 professional experts planned to use and actually found for NDC update implementation*

| Discipline | Required for the NDC plan implementation | | | Actual Human resource found in the implementing bodies | | |
|---|---|---|---|---|---|---|
| | [31]Academic level | Work experience | | Academic level | Work experience | |
| | | [32]Related | [33]Non related | | Related | Non related |
| Environmental Sciences / Env. Management / Env. Planning/ Env. Technology / Env. Engineering / Env. Economics | | | | | | |
| Economics / Business Management / Business Administration | | | | | | |
| Natural Resource Management / Natural Resource Economics | | | | | | |
| Sociologists | | | | | | |
| Management | | | | | | |
| Others (write its name) | | | | | | |

22 Institutional arrangement

22.1 Is there any autonomous federal organization that coordinates sectors/regions? (Yes, No)

If your answer is yes, what is the name of the organization coordinating the NDC updating, NDC implementation planning, and progress tracking at federal level? ----------

22.2 In your sector/region, is there any department responsible for NDC planning and implementation tracking? (Yes, No)

If your response is yes, at what level? **(Directorate, team/unit, focal person, or others)**

22.3 In your regional state, is there any responsible entity for planning and tracking the implementation of NDC? (Yes, No)

If response is yes, at what organization structure level? (Bureau, office, team/unit, focal person level)

23 Identified technologies for both mitigation and adaptations ----------

24 Other comments

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This questionnaire survey was designed to collect information on the NDC Tools/models' application in Ethiopia. The information to be collected from this survey will be used to improve the NDC Update strategies implementation / Emission reduction tracking in Ethiopia. The accuracy of

[31] PhD, MSc/MA, BSc/BA, Diploma, Certificate

[32] Work experiences in Environmental sector

[33] Work experience outside environmental sectors

information to be gathered is highly important to design proper NDC Update tracking tools. So, we are kindly requesting the respondents to take time and provide us a reliable data. It has no conflict of interest with any party. Also, the privacy of the respondent is kept confidential.

**Part I Baseline information on INDC and First NDC.**

22. Brief summaries of Ethiopian INDC (2015) and NDC (2017), and NDC update 2021? ----------
23. Why the INDC (2015) do was updated to NDC (2017), and the latter was further updated in 2021? ----------
24. The primary intensions of these NDCs? ----------
25. What were the sectoral targets that were planned to be achieved in each version? ----------
26. What models/tools were used for planning these NDCs?
27. What are the institutions/experts involved in the development of the INDC, NDC (2017), and NDC update (2021)?
28. Any international technical support behind them? What potential gaps and challenges were identified during the first NDC planning and implementation that drives for the NDC update? ----------

**Part II Assessment of the Stock takes of NDC 2021 update?**

29. How much time did the NDC 2021 preparation take? ----------
30. What was the development processes (steps)? ----------
31. What was the basic assumptions that were considered? ----------
32. What are the stakeholders participated? What was the degree of their participation? ----------
33. What Models/tools used to develop NDC updates? (GEM, Excel spreadsheet, GACMO)

12.6 What is/are the basic reason/s for selecting this model

/Flexibility to update additional actions? Compatibility with UNFCCC? Robustness? technically handiness? or others? /

12.7 What was the potential treat and opportunity while using this model/tool for the update planning? ----------

12.8 Was the NDC updating process based on detailed scenario modeling of GHG emissions and macro-economic assessment? Did it include detailed costing and investment needs assessment for achieving the different sectoral targets?

12.9 Does the government use any tool/model to track and assess the NDC implementation

progress?

12.10 Can the existing tools/models meet requirements of the Enhanced Transparency Framework under the Paris Agreement? If not, what are the gaps and barriers?

34. What were the existing conditions that were referred to during the NDC update planning?

13.8 Climate change policies and institutional frameworks?

---

13.9 National development policies/plans/programs and legal binding frameworks?

---

13.10 Levels of political commitments (in creating an enabling environment, driving progress, coordinating activities, business process & structure of decision-making hierarchy, nature of stakeholders' engagement, maintaining political will etc.).

---

13.11 Institutional capacity (national government, regional states and sectors)

---

13.12 Technology options identified/considered ----------

13.13 Human capital (knowledge and skills) identified/considered ----------

13.14 Required resource and finance mobilization Strategy? ----------

**35. Mitigation and adaptation actions in the NDC update by sector**

14.7 Number of identified mitigations actions? ----------

14.8 Number of identified adaptations actions? ----------

14.9 Do the indicators and emission reduction targets of mitigation and adaptation activities are set across each sector? (Yes, No)

If your response is yes, please list corresponding targets and indicators of each action/activity across a sector. ----------

14.10 Prioritization criteria for selections of mitigation and adaptation actions for each sector?

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14.11 Target levels of emissions for each sector and activities/action per year? ----------

14.12 Emission projections and mitigation potentials by sectors/regions? ----------

**36. What are the international (political) circumstances that have been considered while planning the Ethiopian NDC Update?**

15.7 Paris agreement ----------

15.8 UNFCCC guidelines and tools ----------

15.9 African agenda 2063 ----------

15.10 SDG ----------

15.11 Multilateral and bilateral agreements ----------

**15.12 Others ----------**

**37. Political commitment for NDC update implementation**

16.3 Do you have any policy/strategy/plan supporting the NDC implementation in your sector/region? (Yes, No)

If yes, list them. ----------

16.4 Do your sector/region have costed budget for each activity of the mitigation and adaptation actions? (Yes, No) If your response is yes, list and indicate the amount (Table 1).

*Table 1 Financial options and NDC actions in Ethiopian NDC updates*

| [34]Sectors | NDC actions | [35]Interventions | Domestic resource, USD | | Climate finance, USD | | Total (planned), USD | Total (achieved), USD |
|---|---|---|---|---|---|---|---|---|
| | Mitigations | | Planned | Achieved | Planned | Achieved | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | Adaptation | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

38. In your sector/region, is there any M&E established system to track the adaptation interventions? (Yes, No).

If your response is yes, indicate the system. ----------

39. In your sector/region, is there an established MRV system to track the mitigation interventions? (Yes, No).

If yes, indicate the system. ----------

40. In your sector/region, is there a tracking system of NDC activities / actions / progress per year?

If your response is yes, please indicate the tracking system. ----------

If your response is No, please explain your reason. ----------

**41. Technology**

20.3 What would be the technological challenges and gaps observed during the updated NDC implementation? ----------

20.4 In your sector which technologies are applied during the implementations of NDC?

[34] Agriculture, waste, industry, land use, soil management, forestry, energy, etc.

[35] Identified specific activities

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42. Human resource capacity

24.1 What type of technical knowledge and skills required for planning and tracking the implementation of the updated NDC in your sectors? ----------

24.2 What would be the potential gaps and challenges in human resource capacity?

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24.3 Please write the type and number of professional experts planned to use and actually found for NDC update implementation in your sector (Table 2). ----------

*Table 2 professional experts planned to use and actually found for NDC update implementation*

| Discipline | Required for the NDC plan implementation | | | Actual Human resource found in the implementing bodies | | |
|---|---|---|---|---|---|---|
| | [36]Academic level | Work experience | | Academic level | Work experience | |
| | | [37]Related | [38]Non related | | Related | Non related |
| Environmental Sciences / Env. Management / Env. Planning/ Env. Technology / Env. Engineering / Env. Economics | | | | | | |
| Economics / Business Management / Business Administration | | | | | | |
| Natural Resource Management / Natural Resource Economics | | | | | | |
| Sociologists | | | | | | |
| Management | | | | | | |
| Others (write its name) | | | | | | |

25 Institutional arrangement

25.1 Is there any autonomous federal organization that coordinates sectors/regions? (Yes, No)

If your answer is yes, what is the name of the organization coordinating the NDC updating, NDC

[36] PhD, MSc/MA, BSc/BA, Diploma, Certificate

[37] Work experiences in Environmental sector

[38] Work experience outside environmental sectors

implementation planning, and progress tracking at federal level? ----------

25.2 In your sector/region, is there any department responsible for NDC planning and implementation tracking? (Yes, No)

If your response is yes, at what level? **(Directorate, team/unit, focal person, or others)**

25.3 In your regional state, is there any responsible entity for planning and tracking the implementation of NDC? (Yes, No)

If response is yes, at what organization structure level? (Bureau, office, team/unit, focal person level)

26 Identified technologies for both mitigation and adaptations ----------

27 Other comments

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