Sectoral Overview Appendices

Ethiopia's Climate Resilient Green Economy (CRGE) Strategy (2011-2019) – Implementation Progress Assessment Report

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LIST OF ABBREVIATIONS

AFOLU	Agriculture, Forestry and Other Land Use
BAU	Business as Usual
CRGE	Climate Resilient Green Economy Strategy
EFCCC	Environment, Forestry and Climate Change Commission
GHG	Greenhouse Gasses
GoE	Government of Ethiopia
MoA	Ministry of Agriculture
MoF	Ministry of Finance
MoT	Ministry of Transport
MoWIE	Ministry of Water, Irrigation and Energy
NAP	National Adaptation Plan
NDC	Nationally Determined Contributions
REDD+	Reducing Emissions from Deforestation and Forest Degradation
UNFCCC	United Nations Framework Convention on Climate Change

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EXECUTIVE SUMMARY

Project overview

This report is a review of progress in implementing Ethiopia's national Climate Resilience and Green Economy (CRGE) strategy. The 2011 strategy sets out a vision for becoming a middle-income country by 2025 through a green economy. This report examines the efforts made to implement the priorities in the CRGE strategy, between 2011 and 2019. It describes progress in terms of mitigation, adaptation, financing, institutions, and policy development.

The strategy articulated Ethiopia's commitment to continued economic growth while keeping its total greenhouse gas (GHG) emissions at roughly the level when the strategy was formalised (145-150 Mt CO_2e). **Specifically, the CRGE strategy set target to reduce emissions by 64%below Ethiopia's projected emissions in 2030 (400** Mt CO_2e) **on a Business-as-Usual trajectory through structural transformation and increase in efficiency across sectors**. The CRGE strategy is a guidance document on how Ethiopia could avoid the difference, i.e. the 255 Mt CO_2e of additional emissions that would arise from strong economic growth to 2030 in the absence of climate change mitigation.

It is axiomatic that a Least Developed Country (LDC) like Ethiopia, which faces daunting human development challenges and is highly vulnerable to damaging impacts from climate change, must invest its attention and resources in climate change adaptation, over mitigation. Given Ethiopia's level of development, its minor contribution to global GHG emissions, and the source of its GHG emissions, the emphasis of its climate change response should not be on mitigation – it must be on adaptation. This is important to reaffirm for CRGE efforts moving forward, and to acknowledge as a principle that was recognised by the CRGE strategy's implementation progress assessment, even though the review had to track progress on the CRGE strategy's heavily mitigation-focused tenets.

The review of Ethiopia's efforts in implementing the CRGE strategy took place in a context where Ethiopia was still only accountable for 0.04% of the world's GHG emissions, and is 93rd in the ranking of nations contributing to global GHG emissions.[1] With a population of just under 110 million people (2018), Ethiopia is the second most populous nation in Africa after Nigeria, and the fastest growing economy in the region. Despite such growth, it remains one of the poorest nations on the continent, with a per capita income of $790 annually.[2]

Ethiopia aims to reach lower-middle-income status by 2025. To move towards this goal, it requires growth in all its major sectors (services, industry, and agriculture each contribute approximately a third of the country's GDP). It also requires increases in productivity and revenue in agriculture and livestock framing, where an estimated 65% of Ethiopians are employed.[3] Similarly, it needs the benefits of growth to reach rural areas, where nearly 80% of Ethiopians reside.[4] This context is relevant in evaluating the level of effort Ethiopia has invested in the realisation of the CRGE Strategy's vision of low-emissions growth, even as it pursues broader development goals under its second Growth and Transformation Plan (GTP-II).

[1] European Commission, EDGAR, Fossil CO2 and GHG emissions of all world countries (2019). Available at https://edgar.jrc.ec.europa.eu/overview.php?v=booklet2019&sort=des8
[2] The World Bank, Ethiopia: Overview. Available at https://www.worldbank.org/en/country/ethiopia/overview (last updated September 2019).
[3] The World Bank, Data: Employment in Agriculture - % of Total Employment. Available at https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS (last updated September 2019).
[4] The World Bank, Data: Rural Population - % of Total Population. Available at https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS (last updated September 2019).

National context

In 2010 (the baseline year for the CRGE strategy), 50% of Ethiopia's emissions arose from the agriculture sector, the overwhelming majority of which were from livestock (approximately 40% of national GHG emissions). To reduce GHG emissions from this sector, the CRGE strategy identified significant abatement interventions from improved soil management, watershed management, crop and nutrient management, avoided deforestation, livestock value-chain efficiency, livestock diversification, amongst others. The second largest contributor of GHG emissions was the forestry sector; nearly half of all forestry emissions were tied to deforestation to expand agricultural land, and the other half to deforestation due to fuelwood collection. In response, the CRGE strategy targeted significant abatement through fuel-efficient cookstoves, electric cookstoves, and afforestation and reforestation. The contribution of the transport, water and energy, industry, and buildings sectors to Ethiopia's national GHG emissions was 3% each, i.e. a relatively minor role (although both industry and transport emissions are projected to increase through 2030 and account for larger shares than in 2010). For the transport sector, where most emissions were tied to road transport by passenger and freight vehicles, the strategy prioritized light rail and fuel efficiency. In the buildings and urban sector, the CRGE strategy has prioritized efficient lighting to date and in the industrial and manufacturing sector, where the cement industry was the most significant source of emissions (accounting for 50% of industry emissions), the CRGE strategy pointed to abatement from clinker substitution and usage of biomass and energy efficiency techniques.

Ethiopia has been a leader on climate change action in Africa and amongst developing nations across the world. Ahead of many of its peers, it committed itself to tackling climate change through a transformative economic development approach that focuses on low-carbon growth and a 'green economy' driven by sustainability. **In 2011, well before countries undertook obligations to reduce greenhouse gas (GHG) emissions and enhance climate resilience under the Paris Agreement, Ethiopia released an ambitious national blueprint towards reducing its emissions 64% from a business-as-usual trajectory, by 2030**. Since doing so, the country has implemented a host of significant climate change-linked initiatives with major mitigation and adaptation potential. Simultaneously, the country worked to safeguard its development gains from climate change threats by building adaptive capacity amongst communities through large-scale initiatives such as the Productive Safety Net Programme (PSNP), the Agricultural Growth Programme (AGP), the Sustainable Land Management Programme (SLMP) and the ONE-Wash programme.

It is especially notable that **Ethiopia's focus on climate change and green growth are not limited to certain sectors alone, with interventions in the agricultural, forestry, transport, energy sectors as well as cross cutting areas such as media coverage, education, women, youth and children's affairs, labor affairs, wildlife management, meteorology, disaster risk management, science and innovation, and research and development.** The commitment transcends the traditional climate-linked sectors and is economy-wide, with all major areas of the economy having engaged in climate change response. This is particularly the case after climate change was mainstreamed into the country's overarching development planning architecture through the second Growth and Transformation Plan (GTP-II). In effect, Ethiopia has done, and continues to do, a great deal on climate change.

Progress on adaptation

The CRGE strategy did not address climate change adaptation or resilience. This gap was rectified in some sectors through the development of sectoral climate resilience strategies – for the agriculture and forestry sectors, the water and energy sectors, and the transport sector.[5] However, even without a specific mention of increasing resilience, Ethiopia has made great strides in development and improving resilience through development actives since 2011, such as increasing food security, decreasing unemployment and increasing agricultural output, all of which contribute to greater adaptive capacity and increased resilience.

[5] Adaptation in other sectors is guided, from 2019 onwards, by Ethiopia's National Adaptation Plan (NAP), adopted in March 2019, and by the Nationally Determined Contributions (NDC) submitted to the UNFCCC, which become effective in 2020.

Between 2011 and 2019, a large proportion of adaptation activities in Ethiopia took place in the agriculture sector, focused on soil and crops, as well as in the livestock and water sectors. These included large flagship resilience projects such as the Productive Safety Net Programme (PSNP), the Agricultural Growth Programme (AGP), the Sustainable Land Management Programme (SLMP), and the Participatory Small-scale Irrigation Development Project (PASIDP), amongst others (several of these are likely to have mitigation co-benefits through landscape restoration, but have not been measured and reported). Several other noteworthy adaptation projects have focused on improving efficiency in the livestock value chain and improving food security and nutrition. In the forestry sector, large REDD+ initiatives have contributed to adaptation, even as they are predominantly designed to have mitigation impacts through sequestration. Areas which need more focus include: pest and disease control for livestock and crops and strengthening drought, livestock and crop insurance mechanisms in the agricultural sector; improvement of rangeland and pasture management in the livestock sector; increasing urban areas with land use plans that integrate adaptation and expanding urban agriculture in the green cities and buildings sector; as well as the adoption of vulnerability and adaptation assessments at decentralised levels, climate proofing health infrastructure and updating building codes incorporating baseline, mid-term and end-term evaluations in health sector adaptation interventions, promotion of community health insurance schemes, capacity building and training for programme evaluation and reporting in the health sector.

With the inclusion of adaptation in the NDC and with the adoption of the NAP, climate change adaptation is likely to be elevated as a priority for climate action in Ethiopia, which is consistent with the country's level of vulnerability and the imperative as an LDC to safeguard its development from climatic shocks and stressors in key sectors.

Progress on mitigation

In 2010, Ethiopia's national emissions stood at 150 Mt CO_2e.[6] Since 2011, when the CRGE strategy came into effect, Ethiopia's subsequent emissions inventories have not been able to provide a clear picture of the trend in absolute total emissions, since the 2013 inventory suggested that aggregate emissions fell to 146 Mt CO_2e in 2013[7] whereas the 2016 inventory indicates that aggregate emissions – *without any forestry and land use emissions accounted for* – reached 132.8 Mt CO_2e in 2016[8] (with the implication that once forestry and land use emissions would be calculated, total emissions would significantly exceed the 2010 CRGE baseline). It is problematic to compare these numbers because of methodological differences in the calculations of the different years' inventories (particularly in terms of the emissions factors relied on). Based on these inventories, **there is no indication that emissions have decreased in the period since the CRGE strategy came into effect.**

Furthermore, in the context of a progress assessment on the implementation of the CRGE strategy and achievement of CRGE targets, there is no method to attribute the potential decrease in emissions to the CRGE strategy or the initiatives driven specifically by the CRGE strategy. In other words, even if Ethiopia's national GHG emissions could have reliably been assessed as decreasing since 2010, there are no grounds for suggesting that this decrease would have been due to CRGE implementation. The principal challenge in drawing a causal linkage are that there is no identification mechanism in place in Ethiopia to denote programmes or projects that align with or are in pursuance of the CRGE strategy (or even climate change mitigation). This prevents disaggregation of CRGE-linked efforts (i.e. implementation of activities that are driven by and would be unlikely to have taken place in the absence of the CRGE strategy) from ambient economic factors that could lead to emissions reductions (for instance, a decrease in economic growth rate, or – as the world is witnessing in 2020 – decreased emissions due to restricted economic activity as a result of COVID-19 response measures by governments, which cannot be credited to national climate change strategies).

Mainstreaming of the CRGE strategy since 2015 into Ethiopia's national development programme, i.e. the second Growth and Transformation Plan (GTP-II) has further deepened this complexity, because under the GTP-II

[6] Federal Democratic Republic of Ethiopia, Ethiopia's Climate-Resilient Green Economy: Green Economy Strategy (2011)
[7] Federal Democratic Republic of Ethiopia, Ethiopia's Second National Communication to the UNFCCC (2015).
[8] Ministry of Environment, Forests, and Climate Change, Ethiopia's Three-Years Greenhouse Gas Inventory 2007-2009 Ethiopian Calendar (2018).

mainstreaming paradigm there presently appears to be no means to identify and track CRGE-related or explicitly climate change focused interventions in Ethiopia. Put simply, **the way Ethiopia has approached CRGE mainstreaming has resulted in the lack of meaningful and effective tracking of CRGE-driven or CRGE-linked climate change activities.** This is a shortcoming in Ethiopia's CRGE mainstreaming approach and curtails measurable assessment of whether GTP-II implementation has also boosted CRGE goals and targets. While there has certainly been progress on the implementation of GTP-II, it is problematic to conflate all progress on a national development plan with progress on a climate change strategy since a national development plan also contains several elements that counteract or negate mitigation efforts (e.g. investment in roads and highways, or oil and gas). In other words, a national development plan such as the GTP-II is not a climate change action plan, and progress on the former cannot be interpreted as progress on the latter, despite what several in Ethiopia have suggested (i.e. suggestions to treat progress on GTP II as progress on CRGE implementation, based on the assumption that CRGE is deeply embedded in GTP-II and implementation of GTP-II automatically spurs progress on CRGE). **In the future this conflation can be rectified and measured by using identifiers (budget codes or tags) for CRGE-linked projects and programmes that take place within the broader umbrella of GTP-II.** Fortunately, Ethiopia has developed several CRGE indicators that will likely be used moving forward to track progress on CRGE-related objectives and targets. Additionally, Ethiopia has initiated planning for its next ten-year perspective plan (its forthcoming national development plan) and has prioritised mainstreaming of CRGE into this pivotal ten-year perspective plan. Decision-makers driving the ten-year perspective plan have affirmed that CRGE is one of the main pillars under the plan and will be mainstreamed. **Lessons from the sub-optimal CRGE mainstreaming into GTP-II (where CRGE was mainstreamed in some instances through verbiage and text, but not in practice and without any mechanisms for measuring, tracking, and reporting of what elements of CRGE were implemented) will hopefully ensure that CRGE mainstreaming into the ten-year perspective plan comes with more accountability and explicit guidance about what activities, projects, or programmes – and their corresponding targets and indicators – constitute mainstreaming of the CRGE.**

Even the question of whether Ethiopia has made progress on mitigation (without the need to link to the CRGE) is fraught because of questions regarding the accuracy of the 2010 GHG baseline calculation. These challenges could be overcome to some degree with robust, reliable, internationally reportable GHG reduction results from projects and programmes in Ethiopia (by adding up the GHG reductions measured and reported by hundreds of such activities). However, such **calculations are not tracked and recorded in Ethiopia at present by the government in a centralised, accessible, consolidated manner**.

Based on the broad characteristics of Ethiopia's climate change projects and programmes in the AFOLU sector between 2011 and 2019, it is estimated that the majority of AFOLU mitigation efforts were related to capturing existing atmospheric GHGs (activities such as afforestation), rather than preventing new emissions (reducing degradation and avoided deforestation), although there have been initiatives related to Participatory Forest Management (PFM) and clean cookstoves (whose impact cannot be estimated based on available data). This is sub-optimal, given that in Ethiopia deforestation accounts for 50% of all forestry-related emissions and forest degradation due to firewood consumption accounts for 46% of forestry emissions.[9] Another feature of the AFOLU initiatives studied during the assessment period is that in the absence of clear and explicit design elements to measurably reduce GHGs, they could potentially even lead to an increase in land-use related emissions (for example through increased livestock numbers). **Without detailed Measurement, Reporting, and Verification (MRV) of projects and programmes expected to have mitigation impacts or co-benefits, it is not feasible to ascertain the balance between activities that could be a carbon source or a carbon sink.** As a nation with a negligible contribution to global GHG emissions, it is not incumbent on Ethiopia to aggressively reduce AFOLU emissions, especially given the socio-economic context of subsistence agriculture and wood fuel dependency (over 80% of Ethiopians are engaged in agriculture,[10] over 70% keep livestock,[11] and over 80% of Ethiopia's household energy needs are met by biomass, particularly in rural areas).[12] Beyond wood fuel, forests support livelihoods in Ethiopia

[9] Ministry of Environment, Forests, and Climate Change, UNEP, The Contribution of Forests to National Income in Ethiopia and Linkages with REDD (no date).
[10] Farm Africa, Ethiopia. Available at https://www.farmafrica.org/ethiopia/ethiopia (last accessed March 2020).
[11] FAO, The Future of Livestock in Ethiopia: Opportunities and Challenges in the Face of Uncertainty (2019).
[12] Ministry of Environment, Forests, and Climate Change, UNEP, The Contribution of Forests to National Income in Ethiopia and Linkages with REDD (no date).

through timber products and a host of valuable non-timber products, including livestock fodder, coffee and honey. Nevertheless, since the CRGE strategy established a national target and commitment to abating 130 Mt CO_2e from the forestry sector by 2030, and abating 90 Mt CO_2e from the agriculture sector by 2030, an assessment of progress on the CRGE strategy's implementation would have been more robust if AFOLU projects in Ethiopia since 2011 were designed so measurable GHG changes could be ascertained.

Similarly, for mitigation in the industry, energy, or transport sectors, there is also insufficient data available to estimate emissions avoided or reduced. Several projects in these sectors were small-scale pilots unlikely to yield large GHG reductions, and in some cases the baseline emissions were already low (for instance, in the power sector, given Ethiopia's low-carbon electricity mix). Amongst these sectors, transport is the most likely source of measurable GHG reductions, due to large emissions savings from the Addis LRT, the Ethiopia-Djibouti railway line, and the national railway network.

At present, the Government of Ethiopia does not have a readily a consolidated database which is accessible, where detailed MRV data is tracked or recorded. This is an important gap to fill, so that in the future Ethiopia can meet its MRV obligations under the Paris Agreement and report progress on its NDC by deploying a comprehensive information and knowledge management system for GHG emissions. It is also critical that all future MRV be methodologically consistent and comparable.

Progress on climate finance

Ethiopia estimates that the full implementation of the CRGE strategy will require US $ 150 billion until 2030 (an average of US $ 7.5 billion annually). The CRGE sector climate resilience strategy for water and energy is costed at US $ 895 million to 2030,[13] and the sector climate resilience strategy for agriculture and forestry will require estimated finance of US $ 600 million to 2030.[14] In contrast to these numbers, the recently developed and costed sectoral CRGE roadmaps suggest a far greater budgetary requirement to achieve CRGE-linked objectives and implement CRGE-related activities through 2030: the activities and interventions identified in the Roadmaps together require finance of US $ 209,583,632,397.00 (if they were all to be implemented in full).

Calculation of finance spent by Ethiopia on CRGE implementation (adaptation and mitigation) between 2011 and 2019 is subject to the same challenges noted above. **In the absence of a governmental budget tracking or coding system that identifies spending linked to CRGE, or to climate change mitigation and climate change adaptation, there is currently no mechanism available to unpack activities funded under GTP-II to determine climate-change linked expenditure.** The closest proxy would be to break down the national budget by "budget vote" number 219 (linked to Environment, Forests, and Climate Change), but this would lead to overinclusion of initiatives that have no climate change linkage whatsoever (such as plastics, or conventional air and water pollution, hazardous chemicals, or environmental safety related activities).

One approach is to aggregate the total budgets of the hundreds of projects and programmes implemented between 2011 and 2019 that may be viewed as having a direct or indirect climate change impact. This may lead to an over-estimation of climate finance, since several of these large projects have multiple components, with the likelihood that only a portion of their overall budgets may be eligible to be classified as climate finance. However, this assessment adopted a more flexible approach to identification of climate change adaptation or mitigation projects[15] and was guided by the World Bank's categorization of activities with adaptation and mitigation co-benefits. Since the CRGE's original estimate of US $ 150 billion was for mitigation only, projections of the remaining climate finance needed to accomplish the CRGE's objectives would be compared to this baseline estimate. Using the project/programme budget aggregation approach, and adding up total budgets of all such identified projects[16] **it was**

[13] Federal Democratic Republic of Ethiopia, Ethiopia's Climate Resilient Green Economy – Climate Resilience Strategy: Water and Energy (2015)
[14] Federal Democratic Republic of Ethiopia, Ethiopia's Climate Resilient Green Economy – Climate Resilience Strategy: Agriculture and Forestry (2015)
[15] Deviating from best practice in classification of climate change mitigation and adaptation finance, as represented by the MDBs-IDFC common principles, and the OECD DAC's Rio Markers.
[16] For more details on calculation methodology please refer to section 5.1 of this report.

found that approximately US $ 82 billion has been spent on the identified projects that have a direct or indirect link to CRGE, with plausible mitigation impacts, US $ 68 billion is still required between 2020 and 2030 (or US $ 6.8 billion per year) to achieve Ethiopia's CRGE mitigation targets.[17] The vast majority of finance spent on these identified climate change-related projects during the study period came from Ethiopian public funds, with the second largest source being international aid, and private sector finance playing almost no role.

Climate finance tracking in Ethiopia will benefit from the establishment of an accessible, and consolidated data and information management system that adopts climate finance classifications used globally and records climate change-linked expenditure by the public sector, as well as donor and DFI climate change-linked expenditure. Such a system would ideally record not only total budgets, but characterise the funding by several other key features (e.g. project preparation expenditure, capital expenditure, operating expenditure; grant, loan, or equity; yearly breakdown; geographical breakdown; breakdown by source etc.) to enable a more sophisticated analysis of climate finance in the future.

Progress on institutional arrangements

To implement the CRGE strategy, Ethiopia has put in place multifaceted institutional architecture. A CRGE Facility was established, comprising of the Ministry of Finance, responsible for financial aspects of CRGE implementation as well as M&E, and the Environment, Forests, and Climate Change Commission (EFCCC) 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, through bodies like the inter-ministerial committee and steering committee and allow for regional and local level engagement as well, through regional bureaus and other non-federal bodies.** Most relevant line ministries have in-house CRGE directorates, units, or bureaus.

A great deal of attention has been invested in developing institutional rules, procedures, operating manuals, guidelines, tools, and protocols to help give effect to the CRGE. Capacity building initiatives such as the National Capacity Building Programme (NCDP) have also received attention. However, **gaps remain in actual implementation.** The action plan of proposed measures under the National Capacity Building Programme has not been completely implemented, and an important first step would be to give effect to the complete range of recommended actions in the NCDP proposal so that it becomes a foundation to build on. However, even the NCDP has a slightly skewed emphasis on trainings, preparation of guidelines, and dissemination of guidelines or documentation. Less attention has been paid to the actual operationalisation, management, and periodic performance evaluations of the systems and knowledge platforms (e.g. databases and filing methods). **Ethiopia has demonstrated that it is adept at developing manuals and guidelines and system design documents, but it needs to invest resources in actual roll-out, operationalisation, and maintenance of such systems**. Similarly, on the capacity-development front, Ethiopia has placed significant emphasis on trainings, but should now consider more long-term and sustained approaches to capacity development such as sending high-performing officials for relevant degree programmes abroad to bring back deep-seeded skills and competencies.

Overall, the focus needs to shift to implementation and measurable, trackable operationalisation of institutional guidelines and protocols. This is particularly so in terms of human resources (staff numbers and technical capacity, as well as staff retention to maintain institutional memory), and information and knowledge management resources (databases and searchable archives). **Most critical is the need for stronger MRV systems at all levels.**

It would also be advisable to re-examine certain structural elements of the CRGE Facility that appear to contribute to fragmentation and increased transaction costs in the coordination of activities – the bifurcation between the Ministry of Finance and the EFCCC. **This need for devising a refined institutional architecture is particularly pressing given that the role of the CRGE Facility has shifted from channelling funds to discrete climate change projects (and providing oversight for implementation) to supporting government departments in**

[17] Notwithstanding that Ethiopia may no longer need to target the same range of CRGE activities for mitigation through 2030, since its 2030 emissions may be lower than projected, as is suggested by the lower than projected emissions for 2013 and 2016 in the national inventories for those years.

enhancing their capacity to mainstream climate change into their activities and programmes. The lapses in the existing CRGE Facility's institutional arrangements in contributing to progress on the CRGE strategy are well articulated in a damning assessment by the EFCCC. Thus, the government is already aware that CRGE coordination is falling short of expectations.[18]

Progress on policy

The CRGE strategy has catalysed several subsequent policy developments, including three sectoral climate resilience policies (for agriculture and forestry; water and energy; and transport), and the recent 2019 sectoral implementation roadmaps. It was also mirrored in the mitigation section of the NDC. The 2013 proclamation creating the Ministry of Environment and Forestry was an important policy milestone to empowering the relevant authority to address climate change, The creation of the National Biogas Energy Programme and the enabling environment support under the Scaling up Renewable Energy Programme (SREP) has led to more mitigation-friendly policies in the energy sector. The health sector climate change adaptation plan is another illustration of a progressive climate-responsive policy in Ethiopia.

Such examples notwithstanding, the major finding is that **policy instruments enacted during the assessment period missed an opportunity to supplement and align with the CRGE strategy**. From a policy coherence perspective, more needs to be done to ensure that other sectoral policies, plans, frameworks, strategies, and regulatory instruments take cognizance of the CRGE strategy and align with its priorities as they relate to the sector. Multiple such instruments in key sectors developed since 2011 were found to not link to the CRGE or its focus areas. **Sectors such as agriculture and livestock have developed major policies since 2011 that could have had a bearing on climate change mitigation and adaptation, but were disconnected from any elements of the CRGE strategy's targets and priority areas for the sectors, and therefore not effective in supporting CRGE implementation**.

The CRGE strategy itself warrants an update to its policy framework, given that Ethiopia's emissions trajectory appears to be evolving differently than what the 2010 projections suggested. In the lead-up to the NDC coming into effect in 2020, and to plan ahead for the 2023 global stocktake and the 2025 revision of the NDC, Ethiopia would be well placed to undertake a fresh baseline-setting exercise. In conjunction with this, it should develop new national economic growth scenarios that would be integrated with regional and global climate models, and high-medium-low emissions scenarios, to produce new emissions projections nationally and sectorally through 2030. This would also be an opportunity to update the CRGE strategy, refining certain sectoral priority areas to ensure stronger selection of mitigation interventions that can measurably result in GHG reductions and sequestration.

[18] EFCCC, 'Preliminary Assessment Report on the Institutional Structure and Coordination of the Climate Resilient Green Economy (CRGE) Implementation at the Federal Level,' January 2019.

Role of the private sector

In 2016, the CRGE Facility developed a private sector strategy as a first step towards engaging the private sector more in achievement of the CRGE strategy. However, the private sector strategy is more of an explanation of the CRGE Facility's organizational structure, an articulation of GTP-II pillars, a discourse on types of finance available in Ethiopia, and an overview of Ethiopia's financial sector. It sets out objectives for what the CRGE Facility's private sector strategy must address but provides no strategic guidance or direction on what needs to be done and how. As such, this is an ineffective instrument to enhance private sector engagement in climate change related activities in Ethiopia.

Given that the private sector is slowly and steadily emerging in Ethiopia's changing political economy, and could be an important source of both technical expertise and finance for climate change interventions, **an effort needs to be made by the CRGE Facility as well as sector CRGE Directorates to establish concrete dialogue with companies**. This is particularly crucial for the industrial sector, where cement industries could be pivotal to emissions reductions, and in transportation, where freight companies could be instrumental in driving more efficiency. The role of the private sector is also significant in the forest and livestock sectors (such as through commercial forest industry development involving outgrowers, or poultry businesses). In these sectors too there is a need for clearer policy guidance that addresses enabling conditions for the private sector to engage and contribute to the objectives of the CRGE.

Key takeaways

Ethiopia's CRGE Strategy is an ambitious and exceptional national guiding document that has steered the country towards a great deal of action on climate change mitigation and adaptation since 2011. **The specific quantifiable impacts of climate change interventions (in terms of greenhouse gases reduced or avoided, and in terms of adaptive capacity built and vulnerable households or individuals reduced) in the country are less discernible due to the absence of necessary tracking mechanisms (M&E systems, MRV protocols, consistent indicators, and lack of documentation).** It is this aspect of measuring what is being done that must change in the future as Ethiopia continues to maintain its leadership on climate change and progresses further towards its CRGE/NDC goals.

Recommendations on the Way Forward

Each of the sets of recommendations in the categories below apply to climate change mitigation, adaptation, and cross-cutting activities in Ethiopia.

Recommendations on policy formulation and strategy approaches

The Government of Ethiopia should conduct a fresh national and sectoral GHG inventory, adhering to 2006 IPCC guidelines, to establish accurate baselines for the years 2010 and 2020. The CRGE Facility's technical unit (within the EFCCC)should be accountable for implementing this. This comprehensive exercise should be initiated by 2021 and completed and verified by 2023. The CRGE Inter-Ministerial Steering Committee should verify that this will be done.

The Government of Ethiopia should commission fresh GHG growth projections (nationally and by sector) between 2020 and 2030, to establish a more accurate trajectory and recalibrate the level of ambition. The CRGE Facility's technical unit (within the EFCCC) should be accountable for ensuring this. The projections should be initiated by 2021 and completed and verified by 2023. The CRGE Inter-Ministerial Steering Committee should verify that this will be done.

The CRGE Facility's technical unit (within the EFCCC) should lead the setting of fresh GHG reduction targets based on the updated calculations and opt for relevant best practice in terms of mitigation interventions recognized (globally and regionally) as having climate change mitigation outcomes. The CRGE Inter-Ministerial Steering Committee should oversee this and ensure new targets are set by 2025.

The EFCCC should conduct detailed sectoral climate change risk and vulnerability assessments to establish accurate baselines for vulnerability, and to identify high-priority areas for intervention to build adaptive capacity and reduce vulnerability, as well as measurable targets. The CRGE Facility's technical unit (within the EFCCC) should be accountable for implementing this. Assessments should be initiated by 2021 and completed by 2023. The CRGE Inter-Ministerial Steering Committee should verify that this will be done.

The Government of Ethiopia (through the technical unit of the CRGE Facility at the EFCCC and the financial wing of the CRGE Unit at the Ministry of Finance) should revise the CRGE strategy and the NDC to reflect the new baseline, new 2030 targets, updated mitigation and adaptation priorities and interventions, with a special emphasis on revised approaches for high mitigation potential and high adaptation potential sectors. The CRGE Inter-Ministerial Steering Committee should oversee this by 2023, verify this, and publish the revised CRGE strategy by 2025, before the next NDC update.

Recommendations on project design and structuring

The PDC, EFCCC, and MoF should ensure that future climate change interventions (with direct climate change related benefits or outcomes) as well as all other interventions with climate change co-benefits (indirect climate change outcomes) are explicitly conceptualised, designed, and structured to respond to an established climate change-linked baseline, and to intentionally target climate related outcomes, to avoid the loss of future opportunities to reduce GHG emissions or vulnerability. The technical wing of the CRGE Facility (within the EFCCC) should issue guidelines to ensure this by 2023, updating them regularly. The CRGE Inter-Ministerial Steering Committee responsible for verifying this is done, and for measuring results.

Both units of the CRGE Facility, i.e. the technical wing at the EFCCC and the financial wing at the Ministry of Finance, and the PDC, should ensure that during project origination and development, all project developers and champions incorporate global best practice on climate change mitigation and adaptation activities in sectors sector (e.g. IPCC reports and special reports; OECD's DAC Rio Markers; MDBs-IDFC Common Principles on Mitigation and Adaptation Finance etc.). This will ensure that interventions intended to have climate benefits or co-benefits are informed by science and technical understanding on what constitutes climate change mitigation and climate change adaptation outcomes. The government of Ethiopia should issue guidelines to ensure this by 2021, updating them regularly. The CRGE Inter-Ministerial Steering Committee responsible for verifying this is done, and for measuring results.

Recommendations on MRV and M&E

The Government of Ethiopia should rapidly operationalize Ethiopia's existing MRV frameworks (developed in 2016 for major sectors) by translating theoretical guidance into operational systems, investments, staffing, and other resources. In doing so, it should update the frameworks and guidance as necessary to ensure consistency with UNFCCC's MRV guidelines, international best practice, and (for future refinement of national MRV systems beyond 2020) the Modalities, Procedures, and Guidelines (MPGs) under the Enhanced Transparency Framework (ETF) adopted under the Katowice Package. The technical unit of the CRGE Facility (at the EFCCC) and the financial unit of the CRGE Facility (at the Ministry of Finance) should jointly establish a task force to achieve this by 2021 and publish annual MRV reports thereafter. The CRGE Inter-Ministerial Steering Committee should oversee this and ensure the MRV mechanisms are in place and effective.

The EFCCC, MoF, plus the Planning and Development Commission 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 indics). Mandate the use of the same core set of indicators by all institutions, including the Planning and Development Commission, the EFCCC, the Ministry of Finance, 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). This should be monitored through a consultative review process by 2021 onwards, with the EFCCC and Ministry of Finance (together, the technical and financial arms of theCRGE Facility), and PDC responsible for adopting and using consistent indicators. The CRGE Inter-Ministerial Steering Committee should verify that this will take place.

The CRGE Inter-Ministerial Steering Committee should require all Ministries to develop climate change mainstreaming plans for the development plan that succeeds GTP II, as well for the ten year perspective plan, using the chosen core indicators, and thereafter prepare and submit to the CRGE Facility's technical unit (within the EFCCC) annual climate change mainstreaming reports using the same consistent set of core indicators (as well as additional sector-specific climate change indicators finalized for each sector under the next plan, as relevant to its own planned priorities and activities, to be reported on for the entire duration of the next national plan period). The Government of Ethiopia should issue guidelines for this by 2021, and the Planning and Development Commission should oversee this, verify this, and monitor reporting on indicators.

Recommendations on climate finance budgeting and tracking

The Ministry of Finance should design and put in place a public expenditure review framework at the Ministry of Finance, the Planning and Development Commission, and across all government institutions (at the Federal, Regional, and Woreda level) that enables disaggregation of distinct budgetary flows and allocations. Institute a "coding" system for (a) climate change mitigation, (b) climate change adaptation, and (c) cross-cutting climate change to enable isolating public revenue and expenditure linked to climate change. These budget codes should be adopted and published by 2021, and maintained, applied, and tracked consistently thereafter. The CRGE Inter-Ministerial Steering Committee should oversee this and ensure codes are operationalised.

The CRGE Inter-Ministerial Steering Committee should direct the Ministry of Finance and the Resource Mobilization Directorate at the EFCCC to prepare annual reports on climate change finance budgeting and tracking, at the national and sectoral level, to be published in Amharic and English. The Ministry of Finance should start publishing annual public expenditure reports on CRGE finance by 2021 and making them publicly available. The CRGE Facility's financial wing (at the Ministry of Finance) and the EFCCC's Resource Mobilization Directorate should be accountable to ensure this is implemented, and the CRGE Inter-Ministerial Steering Committee should verify this will be done.

Recommendations on knowledge and information management

The CRGE Facility's technical unit should establish a user-friendly, reliable, well-designed and organized centralised information and knowledge management system (dual platform – server-based and cloud based) at the EFCCC. This searchable database and archive will capture and store all climate change related data and information in an easily classifiable, retrievable manner. The EFCCC should convene a task force by 2021 to design and bring into effect this new information and knowledge management system by 2023, and the CRGE Inter-Ministerial Steering Committee should verify this is done.

The CRGE Inter-Ministerial Steering Committee should require all sectors to 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). These Ministry systems should be completely integrated with the national centralised system at the CRGE Facility's technical wing (at the EFCCC). The EFCCC should convene a task force by 2021 to design and bring into effect this new information and knowledge management system by 2023, and the CRGE Inter-Ministerial Steering Committee should verify this is done.

Recommendations on institutional arrangements

The Government of Ethiopia should strengthen the CRGE Facility's mandate to guide, advise, monitor, seek reporting from, evaluate, and assess all interventions in Ethiopia with a climate change linkage (mitigation or adaptation). The strengthened mandate and functions should be given legal effect through a proposed Ethiopian Climate Change law by 2021, to be driven and overseen by the CRGE Inter-Ministerial Steering Committee.

The CRGE Inter-Ministerial Steering Committee should require non-governmental institutions implementing climate change related activities in Ethiopia (even those operating completely independently, i.e. not receiving any public funds directly or any pass-through funds) to submit project design documents, project monitoring and evaluation reports, project closure reports, and project financial reports to the CRGE Facility's technical wing (at the EFCCC) for all climate change initiatives. This requirement should be captured in a proposed Ethiopian Climate Change Law by 2021. EFCCC should be responsible for implementing this receipt, recording, and storage of reports, and the CRGE Inter-Ministerial Steering Committee should verify periodically that such submissions are occurring.

The Government of Ethiopia should conduct an options analysis (by an external service provider) for exploring restructuring of the CRGE Facility to end the bifurcation of responsibilities and activities between the EFCCC and Ministry of Finance, and – *if needed* -- to create a unified, integrated single institutional hub for all climate change related activities in Ethiopia (in particular, for NDC coordination). The options analysis should evaluate the stakeholder-suggested option of a semi-autonomous body independent of Ministries. The Options analysis should be completed in 2020 and its recommendations fully operationalised by 2021.

The CRGE Facility's technical unit (at the EFCCC) should create a private sector liaison office (or officer) to engage with the private sector on climate change activities, including the NDC (for enhanced private sector engagement on both resource mobilization as well as for technical partnership in implementation). This position, including its functions and mandate, should be created and brought into effect by 2021, and the EFCCC should be accountable for monitoring the results of the office. The CRGE Inter-Ministerial Steering Committee should verify that this will be done.

1 Introduction

1.1 OVERVIEW OF THE REPORT

This document serves as an appendix for the accompanying Progress in Implementing the CRGE/NDC Assessment Report. This appendix is made up of sector specific overviews of CRGE/NDC activities between 2011-2019 in the following sectors:

Agriculture (Crops and Soil)
Livestock
Forestry
Water and Energy
Green Cities and Buildings
Industry
Health, and
Transport.

Readers will find this document organized as follows:

- **Mitigation progress in the AFOLU area**
- **Mitigation progress in the Industry, Energy and Transport areas.**

Followed by sectoral overviews each one including:

- **An overview of adaptation activities in that sector in Ethiopia between 2011-2019.**
- **A financial analysis of climate change spending during the period of 2011-2019.**
- **A sectoral policy review, and**
- **An institutional review of the CRGE facility in each sector.**

In certain cases (livestock and agriculture), the policy and institutional reviews present both sectors in a combined review, as livestock falls under the broader agriculture sector for policy and governance purposes (at a Ministerial and planning level).

Transport does not include an 'Adaptation' overview, as the projects in the sector were only concerned with mitigation.

1.2 METHODOLOGY ADOPTED FOR THIS REPORT

1.2.1 DATA AND INFORMATION COLLECTION

This draft assessment report is the outcome of five months (June – October 2019) of data and information gathering. The project was designed to rely on secondary sources (i.e. previously published or prepared documents, reports, analyses, materials available to review and extract information from), and was not expected to (either in the terms of reference or in the approved methodology proposed in the technical proposal) entail primary research and data-gathering, the project team has undertaken some primary data-gathering within existing resource constraints.

Across all sectors and for the national level, the team engaged in targeted literature collection and review. At the time of writing, the team reviewed a minimum of 300 documents, approximately categorised as follows Table 1 below.

The team engaged in purposive sampling with a snowball approach for the selection of stakeholders and experts to engage in-person, in the form of key informant interviews.

Theme / Sector	Number of Documents Collected and Reviewed
Agriculture (crops & soil)	*41*
Livestock	*51*
Forestry	*65*
Power (Energy)	*15*
Water	*15*
Transport	*15*
Industry	*22*
Buildings (Cities and Urban Development)	*10*
Health and WASH	*6*
Greenhouse Gas Emissions Data and MRV	*20*
CRGE Institutional Arrangements & Capacity	*8*
Indicators	*4*
General reports on climate finance in Ethiopia	*11*
Other reports on Ethiopian political economy	*26*

Table 1 Number of Documents Reviewed

Semi-structured interviews were conducted with individuals principally at the national/federal level. At the time of writing, the team had met or spoken telephonically with at least 120 individuals, approximately spread across the thematic areas depicted in Table 2 below.

Theme / Sector	Number of Stakeholders & Experts Consulted
Agriculture (crops & soil)	*38*
Livestock	*22*
Forestry	*19*
Power (Energy)	*4*
Water	*6*
Transport	*8*
Industry	*6*
Buildings (Cities and Urban Development)	*1*
Health and WASH	*1*
Greenhouse Gas Emissions Data and MRV	*3*
CRGE Institutional Arrangements & Capacity	*9*
Indicators	*3*

Table 2 Number of Stakeholders and Experts Consulted

1.2.2 DATA AND INFORMATION ANALYSIS

The team adopted a mixed-methods approach to analysis, integrating both quantitative and qualitative research where available. Each major thematic area of the report required a differentiated approach to data and information analysis. These are summarily as follows:

1.2.3 ADAPTATION

For the years 2011 – 2019, the project team identified interventions (projects and programmes) undertaken in Ethiopia in each sector that addressed climate change adaptation directly or indirectly or had climate change adaptation co-benefits. To inform this screening, the team relied on the Intergovernmental Panel on Climate Change's (IPCC's) definitions of adaptation, adaptive capacity, and resilience, and also used the World Bank's criteria for classification of climate change adaptation co-benefits by sector. This screening was further refined by reviewing project and programme documents to determine a direct or indirect linkage to any priorities identified in the CRGE Strategy, in any of the CRGE climate resilience sector strategies (agriculture and forestry; water and energy; transport; and the national health adaptation plan), or in Ethiopia's Nationally Determined Contributions (NDC).

Thereafter, the team collected and reviewed publicly available documentation related to the projects and programmes and undertook a qualitative assessment of the adaptation strategic priorities addressed, the balance of activity, gaps, and future areas of focus, the full project list is available in Appendix A.

In addition to the conservative project-by-project approach, the team also examined the extent to which CRGE had been mainstreamed in the implementation of Ethiopia's second Growth and Transformation Plan (GTP-II), and progress on CRGE under GTP-II. This was done by reviewing annual GTP-II progress and performance reports by sector (translated from Amharic), examining the reports for progress reported against each sector's GTP-II Policy Matrix and targets under the Policy Matrix, and identifying actions listed in each sector's policy matrix that either (a) directly mentioned the CRGE; or (b) pertained to strategic priorities and themes focused on by CRGE for the specific sector, with a linkage to climate change (e.g. activities that related to resilience, adaptive capacity, adaptation, vulnerability etc.); or (c) linked to Sustainable Development Goal (SDG) 13, i.e. climate change action. Upon review of the translated GTP-II progress reports, the team found insufficient reporting on the policy matrices' elements with climate change linkages to be the subject of analysis for this assessment.

1.2.4 MITIGATION

For the years 2011 – 2019, the project team identified interventions (projects and programmes) undertaken in Ethiopia in each sector that addressed climate change mitigation directly or indirectly or had climate change mitigation co-benefits. To inform this screening, the team relied on the Intergovernmental Panel on Climate Change's (IPCC's) definitions of mitigation and sequestration, and also used the World Bank's criteria for classification of climate change mitigation co-benefits by sector. This screening was further refined by reviewing project and programme documents to determine a direct or indirect linkage to any priorities identified in the CRGE Strategy or in Ethiopia's Nationally Determined Contributions (NDC).

Thereafter, the team collected and reviewed publicly available documentation related to the projects and programmes and undertook a high-level estimation of the range of greenhouse gas emissions reduction that are plausible to attribute to such interventions, on the assumption that such projects and programmes were implemented completely and effectively. The scope of this project does not permit an on-the-ground, project-by-project, third-party evaluation based on collection and validation of output data. Thus, project and programme results and parameters described in published documentation was used as the basis of estimations.

In addition to the conservative project-by-project approach, the team also examined the extent to which CRGE had been mainstreamed in the implementation of Ethiopia's second Growth and Transformation Plan (GTP-II), and progress on CRGE under GTP-II. This was done by reviewing annual GTP-II progress and performance reports by sector (translated from Amharic), examining the reports for progress reported against each sector's GTP-II Policy Matrix and targets under the Policy Matrix, and identifying actions listed in each sector's policy matrix that either (a) directly mentioned the CRGE; or (b) pertained to strategic priorities and themes focused on by CRGE for the specific sector, with a linkage to climate change (e.g. activities that related to mitigation, low-carbon development, decarbonizing growth, sequestration, abatement etc.); or (c) linked to Sustainable Development Goal (SDG) 13, i.e. climate change action. Upon review of the translated GTP-II progress reports, the team found insufficient reporting on the policy matrices' elements with climate change linkages to be the subject of analysis for this assessment.

1.2.5 FINANCE

The finance workstream undertook a quantitative assessment of budgets attributed to the projects selected (screened as noted above, under adaptation and mitigation categories). The team engaged in primary data-collection and information gathering through a customised survey tool developed for this purpose. The tool (in excel format) was structured in alignment with a similar data-gathering tool used by the CRGE Facility for an earlier assessment of climate finance tracked in the transport, urban, and forestry sectors. This tool, designed to solicit and record project budgetary information, was disseminated to all sector CRGE Focal Points, along-with a guidance document that provided direction on the types of financial data sought and how to enter the data in the tool. For each sector, the data-gathering tool included all identified climate change adaptation and mitigation projects and required sectors to indicate or confirm the total budget of each such intervention.

Wherever the datasheets were not populated by the sector CRGE Focal Point, the team populated the projects' total budget based on publicly available online data.

This data was then analysed through the tool to provide a breakdown of budgets (funds allocated, even if not spent) to climate change mitigation and adaptation projects by sector.

The team also compared the total amount spent thus far (an aggregate of all budgets linked to identified adaptation and mitigation projects) to the total investment needs for CRGE and NDC implementation, identified by the CRGE Strategy (and consequently the NDC), and estimated the balance of finance yet to be mobilized to meet CRGE targets for 2030.

1.2.6 INSTITUTIONAL ARRANGEMENTS

In addition to targeted literature review, the team engaged in purposive sampling, with a snowball approach, for the selection of stakeholders and experts for key informant interviews. Principally, the interview subjects were CRGE focal points for each sector (Directorates, Units, and Bureaus). Semi-structured interviews were conducted, with questions focused on institutional architecture, capacity, and institutional needs and gaps. This input was qualitatively analysed, blended with takeaways from secondary literature reviewed, and documented in narrative format. The analysis yielded recommendations that the report has put forward.

1.2.7 POLICY

The principal methodology adopted for this qualitative analysis was document review of primary literature, i.e. the government-issued policies, strategies, and regulatory frameworks in each sector that have a direct linkage to and focus on climate change adaptation or mitigation, or on any of the strategic priorities of the CRGE Strategy. The structured review was conducted through a lens of the policy's relevance to and consistency with the CRGE Strategy, and its ability to complement or fill gaps left by the CRGE Strategy. The report presents recommendations that emerged from this policy analysis.

2 Mitigation: AFOLU

2.1 APPROACH TO ASSESSING THE CLIMATE CHANGE MITIGATION IMPACT OF AFOL PROJECTS BETWEEN 2011 – 2019

Ethiopia has implemented a wide range of climate change response activities, including both mitigation activities aimed at reducing Greenhouse Gas (GHG) emissions and sequestrating atmospheric carbon, as well as programs aimed at enhancing resilience and adapting to the adverse impacts of predicted climate change. This includes both the development of *policies, strategies* and further *guidance*, as well as the implementation of on-the-ground activities. To learn from implementation to date, there is value in reflecting on what has been achieved to date, the success and cost thereof, and further elements that can better shape future implementation in a more informed manner.

This scope of work focuses on the GHG emission reductions and carbon sequestration that have been achieved through on-the-ground projects as well as guiding documents where a specific emissions savings benefit can be causally estimated between 2011 and 2019.

In order to determine the impact of individual projects on the national GHG emission profile of Ethiopia, complete, robust and consistent data is required which reflects:

- The context prior to implementation (a reference case);
- What might have occurred in the absence of mitigation (would there have been growth in emissions from a particular activity, would emissions have remained constant – a reference scenario), and
- The change in GHG emissions and carbon sequestration due to the mitigation action (a with-project scenario).

2.2 THE BUSINESS AS USUAL MODEL

The Business as Usual Model (BAU) of Ethiopia was published in 2011, with the base year being 2010 as part of the Climate Resilience and Green Economy Strategy (CRGE) (FDRE 2011). The CRGE and the BAU were compiled using various in-country datasets including population growth, land use, land cover and future agricultural production. The base year inventory complies mainly with IPCC Tier I criteria.

The assessment firstly provides an overview of the most recent GHG inventory data compared to the BAU. Following the IPCC Guideline for National GHG Inventories, the data is disaggregated to a second or third tier level (depending on availability) to understand the nature and magnitude of each emission sub-category, its contribution to the national emission profile, and the contribution of mitigation activities to date in reducing total national GHG emissions. Data used to compare the current status with the BAU were sourced from Ethiopia's Second National Communication to the UNFCCC (EFDR 2015), Ethiopia's Three Years Greenhouse Gas Inventory (EFDR 2019) and the Ethiopian Forest Reference Level (EFDR 2017). It must be noted, however, that the most recent inventory, the Three Years Greenhouse Gas Inventory, did not include the Forestry sub-category. Data from Global Forest Watch (*https://www.globalforestwatch.org*) was therefore used for comparative purposes.

2.3 THE CRGE APPROACH

Four key mitigation interventions were identified in the CRGE namely:

1. Improving crop and livestock production practices to enhance food security and farmer income while reducing GHG emissions and enhancing soil organic carbon stocks;
2. Halting, reducing and reversing forest degradation for their economic benefits and ecosystem services they generate, including the sequestration of carbon;
3. Enhancing renewable energy generation for domestic and regional use, and
4. Leapfrogging to modern and energy-efficient technologies in transport, industry and construction.

The AFOLU sector is currently the largest contributor to GHG emissions in Ethiopia (Figure 1), but also has the largest potential to mitigate emissions and sequestration carbon. The CRGE strategy identified 60 potential interventions to reduce GHGs below the BAU of 400mtCO2e by 2030, possibly even keeping it on par with a 2010 emission level of 150 mtCO2e.

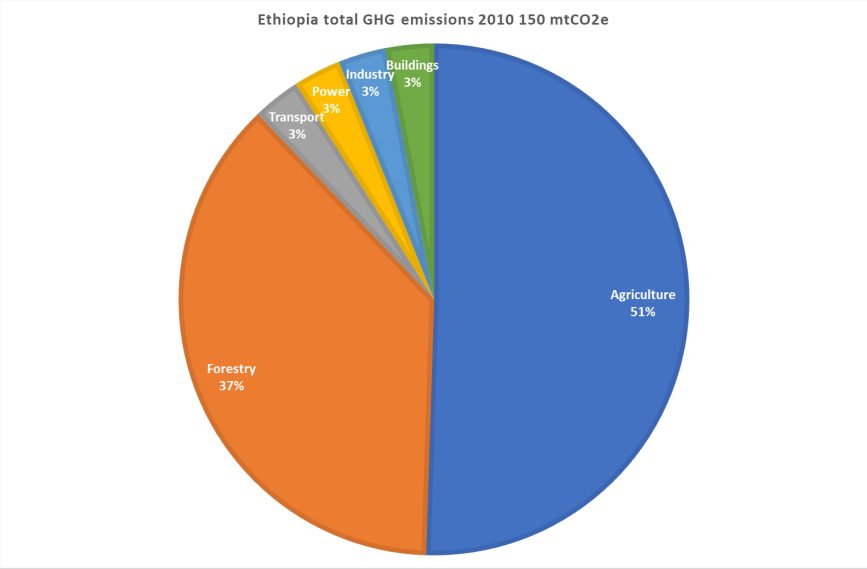


Figure 1 Ethiopia baseline GHG emissions per sector 2010.

It is important to note though that the majority of projects are adaptation projects in the Soil/3.C -category that only contributed 16% of emissions in 2010 (Figure 2). Livestock and Land have a near equal share of emissions, yet there are relatively few projects within these sub-sectors.

2.4 APPROACH TO ASSESSING THE GHG MITIGATION IMPACT OF PROJECTS FROM 2011 – 2019

In order to quantify the impacts of mitigation projects on national GHG emissions, emissions in a baseline year need to be established (which is typically presented in the greenhouse gas inventory), and then a projection made on how those emissions might have changed over time in the absence of the mitigation action. The projection is often called a business as usual or BAU scenario. So, for example, under a BAU scenario people might travel to work in private cars, whereas building a rail line could mitigate emissions from private cars, as rail has lower per trip emissions than cars. Or building renewable electricity generation infrastructure for supply to households could offset burning of kerosene for lighting and cooking.

To determine the actual benefit of mitigation actions that have been implemented, compare them to each other and determine their impact on the overall emissions trajectory, the first step is to ensure that the BAU scenarios are consistent. Ideally, they should start from the same starting year (e.g. 2011), and use the same assumptions for example about population growth, economic growth, transport demand, cooking and lighting fuel demand etc. Furthermore, it needs to be ensured that the projects are not double counting emissions. An example here is that planning for a railway line, attracting climate finance for the line and constructing the line are not separate – they all target the same emissions. A related point is that a study, strategy or energy audit cannot achieve emissions savings in and of itself – the emissions savings occur when the actions recommended are implemented.

Once the projects are being implemented on the ground, a comprehensive monitoring and evaluation (M&E) system is required to gather data on actual roll out of the project. The key data here is the activity data which can then be used to calculate emissions savings from the project.

An analysis of the available information suggests that a number of the projects identified do not have all of these requirements in place. Some projects present a baseline and projected emissions savings, although underlying data used to calculate the projections is not always available to be checked. For a number of other projects there is no clear information available on the extent to which the projects have been implemented. And so, although projects are already being successfully rolled out, contributing to the mitigation of emissions in the country, a detailed and consistent analysis of emissions savings from individual projects is not possible at this stage.

As such, this document provides a qualitative description of the projects and a comment on how they achieve emissions savings, presenting quantitative data where possible.

The document first provides an overview of the GHG inventory data, broken down to third level IPCC sub-category as per the 2006 IPCC Guidelines for GHG inventories (see Appendix A), to demonstrate the magnitude of contribution of each of the emissions sub-categories to national emissions. It then provides a mapping of the projects to emissions sub-categories and provides a comment on the emissions savings achieved. The final section presents a reflection on the potential future contribution to mitigation in the country, based on the overall inventory.

2.5 ASSESSMENT OF THE BAU AFOLU COMPONENT

2.5.1 ALIGNMENT OF AFOLU SECTORS WITH IPCC CATEGORIES

It is important to note that the BAU from the CRGE does not follow IPCC categories, thus making comparing recent inventories with the BAU difficult. An attempt has therefore been made to align the sectors in the BAU with the IPCC categories and sub-categories (Table 3).

CRGE Sector	CRGE Sub-sector	IPCC 2006 Sub-Category	IPCC 2006 Category
Forestry	Deforestation	3.B.2.b.i Forest land converted to cropland and 3.B.3.b.i Forest land converted to grassland	3.B Land
	Degradation	3.B.1a Forest land remaining forest land	
Livestock	N_2O from Manure left on pasture and range	3.C.4 - Direct N_2O Emissions from managed soils	3.C -Aggregate sources and non-CO_2 emissions sources on land
	CH_4 from enteric fermentation and manure	3.A.1 - Enteric Fermentation and 3.A.2 - Manure Management	3.A Livestock
Soil	N_2O from crops residue	3.C.4 - Direct N_2O Emissions from managed soils	3.C -Aggregate sources and non-CO_2 emissions sources on land
	N2O from synthetic fertilisers	3.C.4 - Direct N_2O Emissions from managed soils	
	N2O from manure used as fertiliser	3.C.4 - Direct N_2O Emissions from managed soils	

Table 3 Ethiopia CRGE sectors and corresponding IPCC categories

Emissions associated with Livestock in the CRGE align with emissions from *3.C -Aggregate sources and non-CO2 emissions sources on land*, the category dealing mainly with emissions from crops and soils. The result of this misalignment is that the BAU base year overestimates livestock emissions by 7% (Figure 2 Ethiopia AFOLU sector emissions in 2010 based on CRGE categories and reclassified to IPCC 2006 categories.) and it has been carried

forward to the 2030 emissions projections. Subsequent inventories have been based on IPCC guidelines and using these inventories to assess the impact of mitigation activities must therefore be treated with caution.

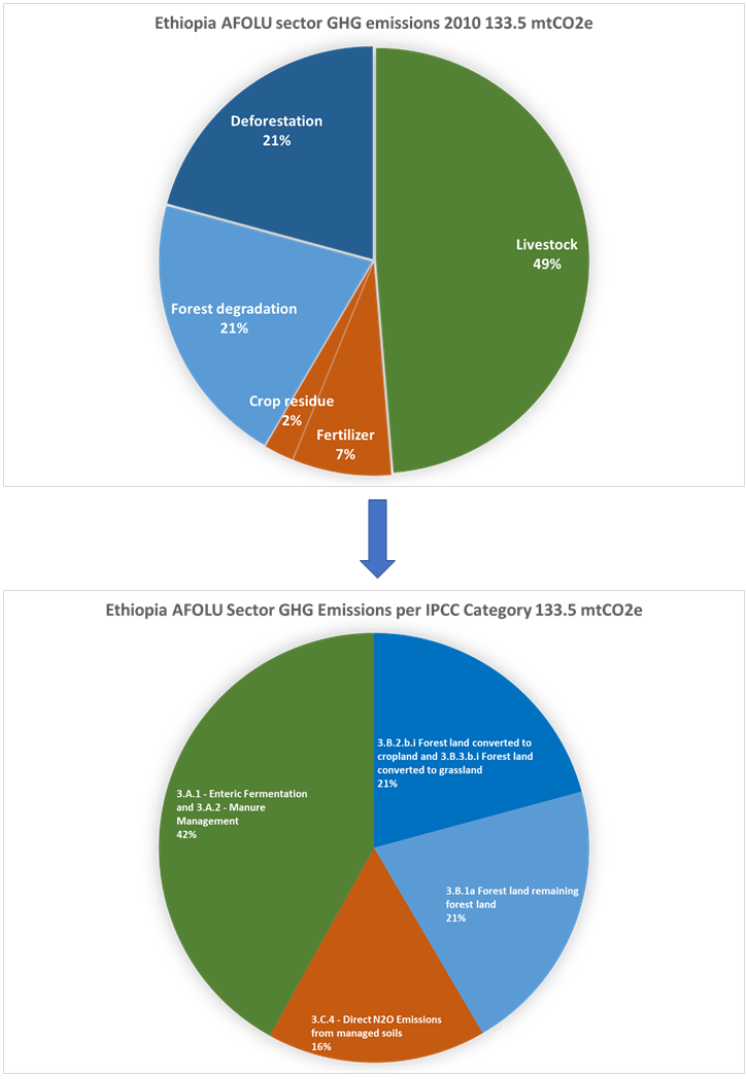


Figure 2 Ethiopia AFOLU sector emissions in 2010 based on CRGE categories and reclassified to IPCC 2006 categories.

2.5.2 POTENTIAL IMPORTANT IPCC CATEGORIES OMITTED IN THE BAU

Ethiopia is a heterogenous country with diversity and wealth of biomes ranging from tall forests to wetlands and shrublands. The CRGE BAU scenario does not cover this full range of vegetation and land-cover types and thus it potentially omits the following land management emissions sources as listed per IPCC category below:

- 3C1 Emissions from biomass burning;
- 3C2 Liming CO_2 emissions;
- 3C3 Urea application CO_2 emissions;
- 3C5 Indirect N_2O Emissions from managed soils;
- 3C6 Indirect N_2O Emissions from manure management;
- 3B2 Cropland;
- 3B3 Grassland;

- 3B4 Wetlands;
- 3B6 Other land, and
- 3D1 Harvested wood products.

It is important to take note of these omissions when comparing the BAU with more recent inventories.

Due to the misalignment between the CRGE sectors and subsequent inventories, it is not possible to compare sub-categories of more recent inventories to the BAU model, hence a higher level comparison is summarized in Table 4.

BAU 2010	BAU 2020	2nd Communication 2013	3-year Inventory 2018	3.B Land Emissions from 2017 FRL per yr
133.5	162.1	115.2	109.6	17.9

Table 4 Recent AFOLU sector GHG emissions compared to the 2010 base year and 2020 BAU, reported in mtCO2e.

It is notable that the base year of the CRGE reports higher emissions than subsequent inventories (Table 4), including 2018. When annual emissions from the FRL are included (127.5 mtCO2e), it still does not exceed the 2010 base year. It is important to note that the CRGE estimated that emissions from Forestry will increase from 53 Mt CO2e in 2010 to 88 Mt CO2e in 2030 and that this does not align with the estimated average emissions from the FREL of 17.9Mt CO2e/yr.

It is possible that the CRGE and subsequent inventories used different forest classifications and emissions factors for forest classes to calculate annual GHG emissions. When comparing forest area lost, a different result emerges, the CRGE base year 2010 estimates a loss of 279 546 ha of forest, a country specific FAO report estimates 140 800 ha lost and a global database (Global Forest Watch set to 20% forest cover) estimates a 22,572ha loss for the base year.

There is therefore substantial variation between datasets regarding a major GHG source and perhaps the largest climate change mitigation opportunity in Ethiopia. As Ethiopia consists largely of dry woodland and shrubland, vegetation types that are difficult to quantify with current remote sensing technology, changes in these dryland systems are generally underestimated and often poorly understood, thus making the tracking of emissions over time difficult. It must be noted that it is possible, but unlikely that mitigation activities could explain the theoretical decrease in the AFOLU sector emissions between 2010 and 2018 (using the total 3 years inventory 2018 AFOLU emissions combined with the average FRL annual emissions). Especially considering that the BAU did not consider several IPCC categories and that the FRL estimated forest gain at only 20% of forest loss during the reference period 2000-2013. It is possible that there are combined discrepancies between land use change/activity data and emissions factors between the CRGE and other inventories.

2.5.3 POTENTIAL CONTRIBUTION OF PROJECTS TO MITIGATION IN INDIVIDUAL SUB-CATEGORIES

Since the compilation of the CRGE, approximately 117 AFOLU sector projects have been implemented in Ethiopia to either adapt or mitigate climate change, many of them overlapping in purpose (Figure 3).

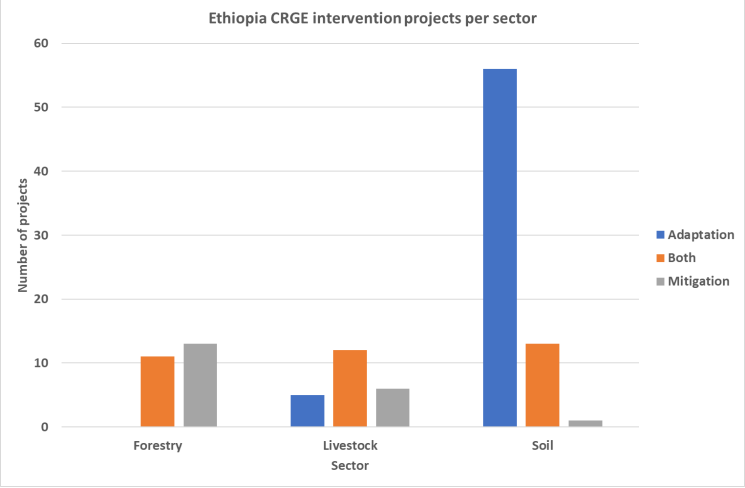


Figure 3 Summary of Ethiopian CRGE projects implemented by 2019 by CRGE GHG category

Unfortunately, a lack of availability of required data, does not allow the direct GHG reductions due to individual projects to be estimated over the period 2011-2018. Furthermore, understanding their impact on the national GHG emissions profile is further limited by the complexities of comparing the base year with the last inventory year of 2018. Potential contribution of projects to climate change mitigation and Adaptation

A set of 117 projects were reviewed ranging from large scale regional collaborations and watershed scale rehabilitation programmes, to smaller scale initiatives focussed on a particular community or commodity, for example, sustainable coffee production. In addition to on-the-ground activities that either mitigation climate change or increase resilience to predicted climate change, are further initiatives that improve and enhance institutional capacity, supply chains, policy, monitoring and reporting, as well as other necessary supporting elements.

Whereas there are approximately 22 projects principally focussed on either forests or livestock (Table 5), there are over 70 initiatives that focus on the sustainable management of landscapes. These generally fall within the ambit of "sustainable land management" and may have a particular emphasis in the form of, for example, integrated water management or community ecosystem-based adaptation, among others.

Type of project (CRGE category)	Number of projects
Disaster risk reduction	2
Forests	22
Livestock	22
Soil	71
Total	117

Table 5 The number of projects per CRGE category: Forestry, Livestock and Soil.

The term *approximately* is used above when describing this CRGE category as many projects span several different land-cover and land-use types and associated categories. Often due to their spatial scale and the heterogenous nature of most Ethiopian landscapes, a project may include forest, open rangeland and cultivated areas as well as rich set of additional livestock, crop and grassland management interventions. Readers are encouraged to review the attached spreadsheet to gain an understanding the often multi-disciplinary and multi-sector nature of projects.

For this reason, a single project may deliver both climate change mitigation and adaptation benefits (Figure 4). Particularly projects that are focused on halting, reducing and reversing the degradation of forests, rangeland or cultivated land, may lead to an increase in terrestrial carbon stocks, while improving the resilience of water services and crop and fodder production to predicted climate change.

Although it is possible to generally evaluate if an initiative will contribute to climate change mitigation and/or adaptation, it is unfortunately difficult and often not possible to evaluate the GHG emission impact of projects based on available information. The initial intention of this analysis was to calculate the change in GHG emissions and terrestrial carbon stocks due to the implementation of each project. However, a lack of required data has limited the ability to undertake such an assessment, particularly information on the location, spatial extent, prior condition and particular activities been implemented. In the case of livestock sub-sector interventions, there is often no information on actual changes in livestock populations due to an activity.

Out of the set of 117 projects, only two provide an estimate of the reduction in GHG emissions or additional carbon sequestration per year. Namely the Humbo and Soddo CDM Afforestation / Reforestation Project and the Bale Mountain REDD+ Project, which either sequestrate 29,343 tCO2e or reduce GHG emissions by 1,288,821 tCO2e per year respectively (project number 102 and 104 in the attached spreadsheet). Based on available information in project documents and web-portals, attempts were therefore made to at least assess if a project will broadly lead to an increase in GHG emissions or a decrease in atmospheric GHGs through a reduction in GHG emissions or the additional sequestration of carbon in biomass and soil (Table 6, Figure 5).

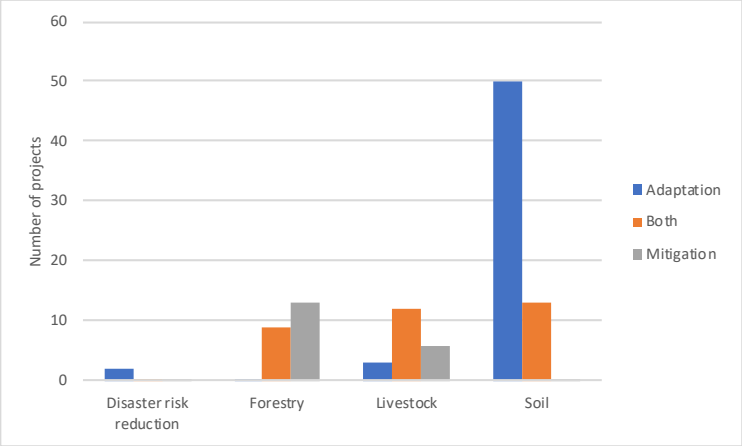


Figure 4 Summary of Ethiopian CRGE projects implemented by 2018 by CRGE GHG category

In general, projects focused on halting, reducing and reversing the degradation of forests and open landscapes were assumed to lead to a net reduction in atmospheric GHGs. This included REDD+, afforestation / reforestation and many watershed restoration programs. Alternatively, programs aimed at increasing the number of livestock, were assumed to lead to a net increase in GHG emissions generated through enteric fermentation and manure. The reason for the large fraction of programs where it was ***"not possible to estimate"*** the climatic impact (Table 6, Figure 5) is that **most landscape management programs include both the avoided degradation or enhancement of terrestrial carbon stocks as well as an improvement in livestock production**. Without detailed information on the particular number of livestock or area of land, it is not possible to estimate the balance between the two and the net climatic impact. In addition, to allow a full assessment of the GHG emission impact, further information on changes in emissions from fire, agrochemical and liquid fuel use would be required as well.

Atmospheric GHG impact	Number of projects
Potential decrease in atmospheric GHGs	41
Not possible to estimate	63
Potential increase in GHG emissions	13
Total	117

Table 6 The number of projects per CRGE category: Forestry, Livestock and Soil.

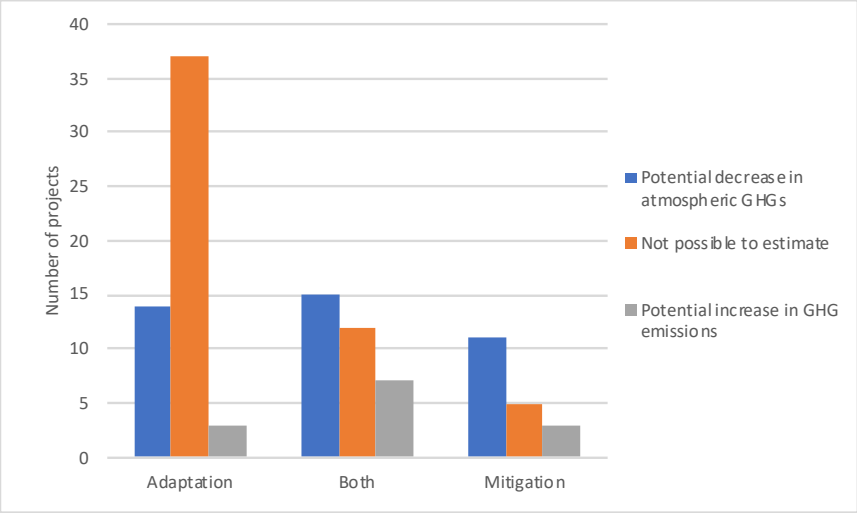


Figure 5 The number of projects per CRGE category: Forestry, Livestock and Soil.

Such project specific data is required to not only evaluate the GHG emission impact of each activity, but to understand the contribution of climate change mitigation activities at a national scale as well. A comparison of GHG emissions from the AFOLU sector between national GHG Inventories over time, reflects the total change in GHG emissions and terrestrial carbon stocks, including both mitigation activities as well as background drivers. For example, changes in market demand for certain agricultural commodities, the expansion of urban and built environments, as well as changes in biophysical drivers such as fire regimes and elevated atmospheric carbon dioxide. Project scale data is therefore vital to unpack the two and quantify the magnitude of climate change mitigation gains within the AFOLU sector over time.

Key Programmes in the Forestry Sector 2011-2019

In the AFOLU sector, the main programmes with mitigation effects and potential are the REDD+ and related forestry programmes.

The REDD+ Programme in Ethiopia

Several important and large-scale projects have been undertaken as part of the REDD+ programme in Ethiopia. The REDD+ program has been in development since 2009 and is co-ordinated by the National REDD+ Secretariat accountable to the Forest Sector of the MEFCC. The National REDD+ Strategy (2018-2030) was published in 2018 (MEFCC, 2018) and aligns with and will contribute to the targets of the CRGE/NDC and is fully aligned with the National Forest Sector Development Program (MEFCC, 2018). Under the REDD+ program, a number of projects have been undertaken and are currently in progress, including the Oromia's Forested Landscape Program (OFLP), the Project for Supporting Sustainable Forest Management through REDD+ and Certified Forest Coffee Production and Promotion (REDD+FCCP), the REDD+ Investment Program, Responding to the increasing risk of drought: building gender-responsive resilience of the most vulnerable communities, the Ethiopia REDD+ Readiness Package (R-Package) as well as several other pilot projects (including the pilot REDD+ and CDM projects in the country include the Bale Mountain Eco-region REDD+ Project in Oromia, Nono Sele Participatory Forest Management REDD+ project includes Oromia location, Yayu REDD+ Project includes Oromia location, the Ethio-wetlands REDD+ and forest related CDM Projects).

The Bale Mountain Eco-Region REDD+ project

The Bale Mountain Eco-Region REDD+ project was one of the first large scale REDD+ initiatives in Ethiopia, starting in 2010 and is expected to run for 20 years (the REDD desk, 2019). The project area covers 500,000ha and it is estimated to reduce emissions by 18 million tonnes of CO2e over this period (the REDD desk, 2019). The 2017 VCS/CCBA Verification Report states that 'Having started on January 01, 2012 the Bale Mountains Eco-Region REDD+ project activities generated over the period of 2012 and 2015 the cumulative carbon emission reduction of 5,532,367 tCO2e.' (VCS/CCBA, 2017, p. 2).

The Oromia's Forested Landscape Program (OFLP)

The OFLP runs from 2017-2022, now in its implementation stage, it has been in development since 2013 and focuses on how forested landscapes are managed to have the following positive impacts: poverty reduction and resilient livelihoods, climate change mitigation, biodiversity conservation, and water provisioning. The project covers approximately 8.7 million ha in total and is 'Oromia Regional State's strategic programmatic umbrella and coordination platform for multi-sector, multi-partner intervention on all forested landscapes in Oromia' (MEFCC, 2017, p. 37) . It is also a world first REDD+ programme as it is jurisdictional rather than project level (MEFCC, 2018). Figure 7 below highlights the expected reductions in emissions year on year as a result of the OFLP

Indicator Name	Baseline	YR1	YR2	YR3	YR4	YR5	YR6	YR7	YR8	YR9	YR10	End Target
1. Emission Reductions in the OFLP accounting area ($MtCO_2e$)	0	0	0	1.25	2.5	3.75	5.0	6.25	7.50	8.75	10	10
2. Gross deforestation reduction in the OFLP accounting area (ha)	0	0	0	8,367	17,483	26,412	35,341	44,269	53,198	62,127	71,056	71,056

Figure 6 Project Development Objective Indicators OFLP (World Bank , 2017, p. 58)

As of the most recent appraisal report published in 2018, the OLFP is still in the process of developing certain composite indicators for emissions reductions, however, has achieved the following under reforestation indicators '…the expected reforested area is 1800 ha. Of the total 1800 ha planned, 762 ha. Of lands were planted in the first year of the program implementation' (Oromia Environment, Forest and Climate Change Authority, 2018, p. 7).

The REDD+ Investment Program *(RIP)*

The RIP runs from 2017-2020 in five regions and focuses on providing opportunities for emission reductions through reduced deforestation and forest degradation by sustainable forest management and afforestation and reforestation initiatives. As of 2018, the project had achieved the following results (GHG emissions as a result of the following are yet to be tracked/published):

- Afforestation and Reforestation (AR) activities started in 36 woredas for the first year;
- 25 new nurseries established;
- 78 existing nurseries supported and strengthened;
- 17,718,819 seedlings raised;
- 3,160 ha of land identified and delineated for AR;
- 86,919 ha of land identified and delineated for Assisted Natural Regeneration (ANR);
- Physical conservation activities commenced in SNNPR, Tigray and Amhara regions;
- 3,686.96 ha of PFM sites identified in Amhara region, and
- Capacity building trainings and meetings held for 1,500 participants in the regions (MEFCC, 2018).

Supporting Sustainable Forest Management through REDD+ and Certified Forest Coffee Production and Promotion

The 'Supporting Sustainable Forest Management through REDD+ and Certified Forest Coffee Production and Promotion project' funded by JICA and running from 2014-2020 is another notable REDD+ project and aims to balance forest conservation with improved livelihoods in order to contribute to sustainable rural development. The project consists of a Forest Coffee Certification Program (FCCP), Farmers Field Schools and the establishment sub-village-based PFM authorities in order to build capacity (JICA, 2019). To date the project has seen a reduction in deforestation, with rates of change of deforestation declining from 1.16% a year to 0.46% a year, resulting in 10,000ha of deforestation suppressed (JICA, 2018).

2.6 FUTURE CONSIDERATIONS

A lack of project scale data has inhibited the opportunity to evaluate progression towards targets identified in the CRGE. As the need for this type of evaluation is likely to increase in future as countries are required to report on progression towards climate change goals, it would be prudent to at least start a basic form of project reporting as soon as is reasonably possible.

Short of requiring a full in-depth MRV process, even a basic set of metrics will assist in tracking the climatic impact of individual additional on-the-ground activities:

Restoration activities:

- Location and spatial extent - a GIS .shp file illustrating the location and boundaries of the activity;
- Number of hectares on which the restoration activities have been implemented;
- The level of degradation, particular of carbon stocks at the start of the project;
- The type and nature of restoration activities;
- Project start date and project period;
- Predicted changes in terrestrial carbon stocks and GHG emissions due to the project activity, and
- Level of success as a fraction of total initial project goals - Activity-based monitoring would occur on an annual basis.

Halting and reducing degradation activities:

- A similar set of metrics to that listed above. In addition, the development of spatially explicit reference and with-project scenarios at a project scale is required;

Livestock activities:

- In addition to location and spatial extent, the change in the type and number of livestock over time.

The reason for the particular emphasis on the location and spatial extent and the need for submission of a GIS .shp file is mainly understand potential overlap and double accounting between projects, but in addition, to facilitate the use of remote sensing to validate changes in land-use and fire regimes. The submission of .shp files also allows the distribution of projects to be better understood and to allow for future strategic positioning of programs in areas where there may be a shortage of interventions.

3 Mitigation: Industry, Energy and Transport

3.1 ASSESSMENT OF THE GHG INVENTORY

The GHG inventory for Ethiopia is contained in the Second National Communication to the UNFCCC for 1994 to 2013, and in the three-year greenhouse gas inventory for 2014 to 2016. While it would be ideal to show trends in emissions in the different sectors from 1994 to 2016, the two inventories use different global warming potentials (GWPs) – the former from the fourth assessment report (AR4) and the latter from the second assessment report (AR2). Although theoretically it would be possible to recalculate the inventories using consistent GWPs, a further complication is that the gas-by-gas breakdown in the Second National Communication uses the 1996 emissions categories, while that in the three-year inventory uses the 2006 guidelines, making them incomparable[19].

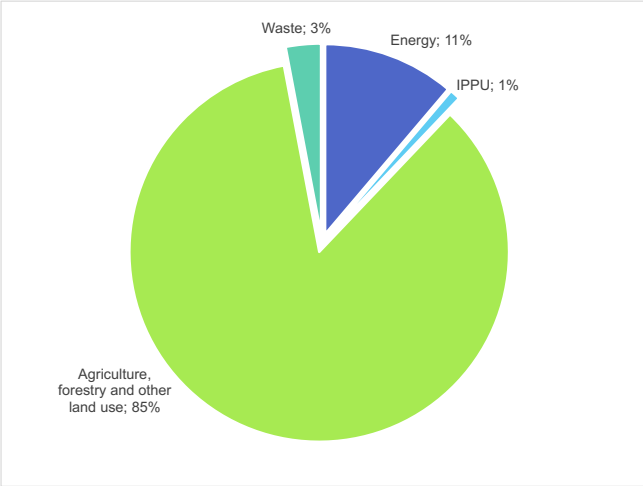


Figure 7: Sector breakdown of Ethiopia's greenhouse gas inventory in 2011

As such, only the baseline data, from 2011, as presented in the SNC is analysed in detail here and used to inform the numbers presented in the rest of this section. Figure 7 provides an overview of the contribution of the different sectors to the overall inventory in 2011, providing some context to where mitigation action could have the greatest impact. As might be expected, the majority of emissions (>85%) are from the AFOLU sector. The contribution from the AFOLU sector shown is that of net emissions, in other words it already takes into account the contribution of carbon sinks to reducing overall emissions from this sector. Energy is the next biggest contributor, followed by waste and the Industrial Processes and Product Use (IPPU) sector. A further disaggregation of the emissions categories is presented in the sections that follow.

3.1.1 ENERGY

A breakdown of the energy sector emissions to third level emissions categories is shown in Figure 8. Just over 70% of the emissions arise from "other sectors", which includes energy usage (diesel, kerosene, LPG etc) used for cooking, lighting and heating in the commercial, institutional, residential, agriculture, forestry and fishing sectors. A more detailed breakdown of these emissions is not available, although the Second National Communication does indicate commercial and residential energy to be the primary contributor to these emissions. Transport is the next greatest source of emissions. Energy industries (largely electricity supply) and manufacturing industries and construction represent similar contributions to the sector's emissions. Not shown in this figure are fugitive emissions from fuels which are negligible according to the inventory.

[19] Note that the CRGE is structured according to economic sectors rather than by emissions sources. So, for example, emissions from the industry sector as represented in the CRGE might span both 1.A.2 (energy emissions from manufacturing industries and construction) and 2 (process emissions).

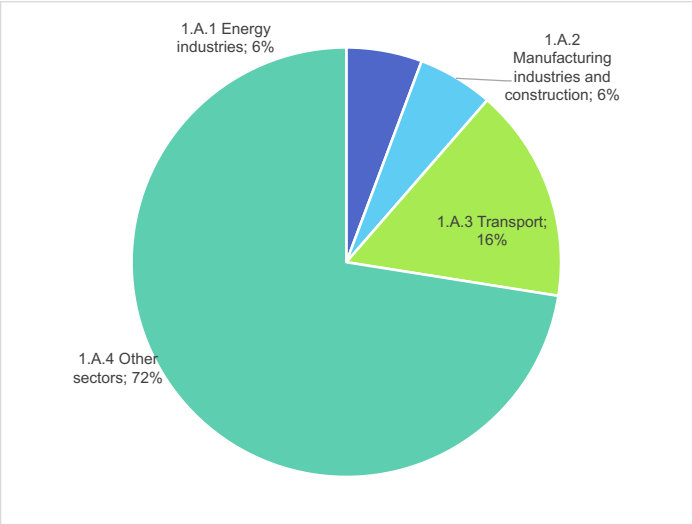


Figure 8: Emissions from the energy sector

3.1.2 IPPU

Iron and steel contribute 50% of the emissions to the IPPU sector and cement a further 49%. The remaining 1% includes emissions from lime, glass and soda ash production.

3.1.3 WASTE

Of the emissions from the waste sector, 45% were attributed to solid waste disposal and 54% to wastewater treatment and discharge. A small proportion was also attributed to incineration and open burning of waste.

3.2 POTENTIAL CONTRIBUTION OF PAST (NON-AFOLU) ACTIONS TO MITIGATION

The majority of the mitigation projects outside of the AFOLU sector target emissions in the Energy sector, apart from three composting projects that impact on the waste sector. This might be argued to be appropriate given that AFOLU and Energy are by far the overwhelming the greatest sources of emissions, with waste and IPPU jointly contributing less than 5% to the total emissions. The following sections present an analysis of the potential contribution of these projects to national emissions, based on third level IPCC emissions categories.

3.2.1 MANUFACTURING INDUSTRIES AND CONSTRUCTION (1.A.2)

Five projects were identified where energy efficiency audits were conducted in different manufacturing plants. While these projects will have some savings in terms of electricity demand, electricity in Ethiopia is largely supplied through renewable sources and so saving electricity will result in limited emissions savings. The energy efficiency audit findings could, however, result in savings in other energy carriers used on site such as gas or coal. The emissions from onsite energy usage, and any hence any savings, are accounted for in 1.A.2. Total emissions in 1.A.2 were 1,331 ktonnes in 2011, representing 6% of energy sector emissions, or approximately 0.7% of the total national inventory.

Although very little information is available on the findings from these audits, or the extent to which the recommendations have been implemented, some generic observations can be made (Table 7). As noted previously, savings are not achieved by the audits alone; implementation of the findings is required to realise savings.

Project Name	Overview of contribution to mitigation in the emissions sub-category
EE Textile	Textiles are not a very high user of energy relative to other industries in 1.A.2. As such, potential savings associated with implementation of the audit findings at one textile mill are likely to be low relative to the sub-category's emissions.
EE Steel	Steel can be a higher user of energy than some of the other industries for which audits were done, and so implementation of these audit findings could result in greater savings in this emissions category than in some of the other industries. This steel mill is one of 12 in the country, and roll-out to other mills could have the potential to lead to further savings.
EE Brewery	Given that this audit was conducted at one of 9 breweries, and breweries being just one relatively smaller contributor to 1.A.2, the overall contribution to emissions savings in the sub-category and the country as a whole would be negligible.
EE Leather	Tanneries are not a very high user of energy relative to other industries in 1.A.2, and so the savings achieved may not be significant.
EE Cement	Although cement production gives rise to high process emissions, energy audits would possibly not have addressed these emissions. Having said this, if the audit recommendations have all been taken on board then some savings would have been achieved, however being just one of 16 cement plants, and cement being just one contributor to 1.A.2, the overall contribution to emissions savings would be negligible.

Table 7 Projects contributing to reducing emissions from the manufacturing industries and construction sub-sector (1.A.2)

3.2.2 ENERGY AND RENEWABLE ENERGY

Several key projects and programmes have been undertaken in the Energy Sector, most notably (and largest), the National Electrification program 1 and 2. The NEP is supported by the Ethiopia Electrification Program (ELEAP), which has 3 pillars, Pillar 2 of which is 'Public programs supporting stand-alone solar systems and mini-grids' To date, the following has been achieved under this pillar:

- 12 pilot solar mini grids contract signed and under implementation,
- 25 additional solar mini grids (financed by AfDB and GoE) under design and bid preparation stage
- 250 solar mini grids solar under feasibility study stage (EEU, 2019).

NEP 1 and 2 are supported and complemented by other notable renewable energy projects such as the:

Electricity Network Rehabilitation and Enhancement Project (ENREP)

The ENREP Project started in 2013 and ended in 2019. The project was of sought to enable further delivery of electricity services in the country through expanding access in on and off grid areas. The project had 4 components, of which, component 3 was 'Market development for renewable energy and energy efficient product.' The project was highly successful and saw the following results (GHG emissions reductions results were not calculated for the project):

- More than one million households were positively affected by increasing access to modern energy services.
- The credit line is now fully subscribed, and 1,051,691 solar lanterns and solar home systems were procured.
- The sale of cookstoves, however, was lacklustre as micro finance institutions were not interested in providing loans due to high transaction costs (World Bank , 2019, pp. 9-10).

The project also included a Carbon Finance Programme of Activities, approved in 2015 which had the objective reducing emissions as measured by 'Certified emission reductions (CERs) issuance' with a target of 1,908,000.00 by 2019 (World Bank, 2019).

The 2018 review found that the project ad achieved a certified amount of 38,913 tCO2e for a total of 417,615 solar lamps distributed over the time of monitoring and a certified amount of 35,465 tCO2e for a total of 4,812 domestic biogas plants installed under National Biogas Program in 2015 and 2016. As such the recommendation was made to reduce the target number of PDO indicator related to "Certified emission reductions (CERs) issuance" from 1,908,000 tCO2e to 101,000 tCO2e for the project period of 2018-2020 (World Bank , 2019).

Renewable Energy Guarantee Programme (REGREP)

In 2019 the World Bank approved $200 million Renewable Energy Guarantees Program (REGREP) to mobilize International Development Association (IDA) guarantees to Ethiopia. While the program has not yet been utilised, it is worth mentioning in this report due to its potential for future growth in the renewable energy sector.

The project's objective is to 'Increase renewable energy generation capacity through private sector participation in Ethiopia through increased renewable energy generation capacity under the IPP program that has reached commercial operation from 0 MW in 2018 to 100 MW and increase in the amount of private capital mobilized under the IPP program from US$0 million in 2018 to US$35 million by 2022' (Wold Bank, 2019, p. 15). REGREP Phase 1 consists of IDA guarantee support to the Metehara Solar IPP (100 MW), which is expected to mitigate about 22,548 tons of CO2 over its lifetime at an average of about 1,074 tons per year (Wold Bank, 2019, p. 74),

3.2.3 TRANSPORT (1.A.3)

Ten projects were identified that potentially contribute to mitigation of emissions from the transport sector, as shown in Table 8. In 2011, emissions from this sector were reported to be 3,769 ktonnes (Second National Communication).

The *individual* contribution of each of these projects to the total emissions from 1.A.3 emissions has been estimated to be very small, with each individual project likely contributing far less than 0.5% to a reduction in the total emissions from this sub-sector in each year. Furthermore, when looking at cumulative savings over the 2011 to 2019 analysis period, it is important to note that some of the projects only started later in the period, as indicated in Table 8.

Of the projects presented, it is suggested that the rail-related interventions (the LRT, Ethiopia-Djibouti railway link, and the other national rail network projects) will be the biggest contributors to reducing emissions in the future: the infrastructure has a long service life and, if run on renewable energy which already makes up a large proportion of the grid mix in the country, will have low emissions. The remaining interventions will require ongoing support to remain effective in reducing emissions, as well as large scale roll-out in some cases, and thus potentially have a lower potential to achieve long-term emissions reductions.

Project Name	Overview of contribution to mitigation in the emissions sub-category
FTI Monitoring Petroleum	Without further detail, it is suggested that this project largely contributes to local air pollution benefits, although the efficiency with which appliances will run on cleaner burning fuels could result in small emissions savings. No details on emissions savings could, however, be found. Note that this project could also result in some mitigation in 1.A.4, which includes stationary burning of liquid fuels.
Anbessa Bus Expansion	This project appears to still largely be in the planning rather than implementation phase by 2019 and so no emissions savings reported.
Fuel Efficient Taxis	Insufficient detail is available to provide comment on the potential savings from this roll-out.

Project Name	Overview of contribution to mitigation in the emissions sub-category
Addis LRT	The Addis Light Rail Transport project is reported to have already been a big success, since its opening in September 2015. Various figures exist in the public domain about the emissions savings from this project. The Department of Transport's 2017 (G.C) M&E document suggests 9,000 tonnes savings in one year. Another report suggests emissions reductions from the project are estimated to grow from 55,000 tons of CO_2 per year in 2015 to 170,000 tons CO2 per year by 2030, which is higher than the Department's estimate.
Ethiopia-Djibouti Railway	According to the Ministry of Transport's M&E report in 2017 (G.C) the Ethiopia-Djibouti railway saved 639 tonnes of emissions from passenger transport and 790 tonnes of emissions in freight transport in that year, a total of 1,429 tonnes. The freight line opened in November 2015 and passenger line in October 2016, and so total emissions savings will only be counted from these dates, rather than over the whole 2011-2019 assessment period.
National Rail Network	The Ministry of Transport's M&E report in 2017 (G.C) identifies three components of rail upgrade, being North-South, East-West and the Ethiopia-Djibouti line, which this project is assumed to refer to. The Ethiopia-Djibouti upgrade is covered in the previous point. The M&E document suggests savings of 5,560 and 4,320 tonnes in 2017 (G.C) from the East-West and North-South lines respectively.
CFP Railways	This Climate Financing Project appears to refer to the previous three projects and so is not analysed further here to avoid double counting.
PTSETSE Buses	The project relates to a new bus fleet to provide free public transportation to public servants, supporting them in using public transportation to commute to their work and back. This occurred after a merger with Walia intercity bus service. There is insufficient information available to know how many passengers being transported, what the project is replacing etc, to be able to assess the greenhouse gas mitigation potential.
FTI Share the Road	The project, which seeks to support non-motorised transport, cycling and public transport, was a pilot project run between 2014 and 2016. As such it would have had a very small mitigation impact during the analysis period.
FTI Smart Parking	This project targets improving traffic flows through smart parking systems. As with the previous project, however, it appears to have been largely an analysis and pilot project, and so would have had limited emissions savings over the period.

Table 8: Projects contributing to reducing emissions from the transport sub-sector (1.A.3)

3.2.4 OTHER SECTORS (1.A.4)

As indicated previously, other sectors includes energy usage (diesel, kerosene, LPG etc) for cooking, lighting and heating in the commercial, institutional, residential, agriculture, forestry and fishing sectors. The Second National Communication indicates commercial and residential energy to be the primary sources of these emissions. Emissions from this sector in 2011, the base year of this analysis, were 16,958 ktonnes. Note that wood burning is not included in the inventory.

Table 9 lists the thirteen projects that can contribute to emissions reductions in this sub-category. The list includes projects focusing on grid connected power supply, such as those related to geothermal energy and wind. While emissions from grid-connected power are included in 1.A.1, the function that the expansion of the grid will have is to increase electrification to households that might not have had electricity before. As such it displaces the alternative fuels typically used in such households (which is considered to be the baseline), rather than displacing other more emissions intensive grid electricity options. Hence its inclusion in this sub-category.

As with 1.A.3, the contribution of each individual project to savings in 1.A.4 is negligible (again, likely to be less than 0.5% or even lower). However, given that 1.A.4 contributes to the order of 72% of energy emissions, the emissions savings potential with scaling of projects is likely to be substantial.

Project Name	Overview of contribution to mitigation in the emissions sub-category
FTI Monitoring Petroleum	Without further detail, it is suggested that this project largely contributes to local air pollution benefits, although the efficiency with which appliances will run on cleaner burning fuels could result in small emissions savings. No details on emissions savings could, however, be found. As stated previously, this project could also result in some mitigation in 1.A.3, which covers transport emissions.
FTI Biogas	This programme focuses on substitution of conventional domestic energy sources like fuel wood, charcoal and kerosene for cooking and lighting with biogas from biodigesters. Emissions savings will only come from fossil fuel substitution and possibly charcoal depending on its source, as fuel wood/biomass is considered "carbon neutral". The pilot phase focused on roll out of 40 demonstration digesters, so this project will have very minimal impact on the sector's emissions. Biodigesters may also impact on traditional manure management practice, and substitution of chemical fertilizer, and so this project could result in emissions savings in 3.A.2 and 3.C.4.
NBPE	The aim of this project was to provide 210,000 rural persons in 8 regions with clean renewable energy from 35,000 bio-digesters for cooking and lighting. The target savings, achieved via the same mechanism as the FTI biogas project in the previous line, was 66,500 tons CO_2 equivalent GHG emission reduced per year by 2020. NBPE+ is now in operation.
FTI Solar Energy	The main project outcomes are the supply of CRGE fast track investments Solar Home Systems (SHS) to 4,000 households in all the four Regions and the Supply of Solar Lanterns of 8,000 units in all the four Regions and 24 institutional photovoltaic systems units and building capacity of implementers. The solar lighting provides lighting services where none were available and/or replaces kerosene, fuel wood and charcoal for lighting. Although a large number of recipients will have benefited from this project, the number of households targeted represents a very small percentage of the total and so the impacts on this sub-category or on national emissions would have been relatively small.
Energy + Project	This project includes both AFOLU and non-AFOLU interventions. The non-AFOLU mitigation benefits of this project include replacing diesel in pumping with solar PV, biogas rollout and solar PV system roll out. Emissions savings will be from diesel, kerosene and possibly wood and charcoal. Once again while the project will be beneficial to recipients their impacts on overall emissions in this sub-category will be small given the small percentage of households targeted.
Geothermal Sector Development (GSD) Project	According to documentation found, work to date under this project appears to have been largely feasibility and contracting to date, so no emissions savings during the analysis period.
Geothermal Sector Strategy (GSS)	No information on the strategy and its implementation has been found. Furthermore, a strategy doesn't result in savings unless it is implemented.
Lighting Ethiopia	Between 2013 and 2018 lighting Africa claimed an emissions avoidance of 490.5 thousand tonnes CO_2 in Ethiopia. As with other projects in this sector this would be attributed to savings largely in kerosene and other fuels used in lighting.

Project Name	Overview of contribution to mitigation in the emissions sub-category
CRGE Carbon Sinks	Although this is largely a rural project, it does include energy components (solar power, biogas and ICS utilization) for 750 rural HHs, with emissions savings being through similar mechanisms to the other projects described thus far. The small number of households targets result in negligible savings relative to overall emissions from the sector.
Off-grid Renewable Energy programme	Limited detail was found on this programme. It is assumed to be provision of renewable electricity for lighting and cooking, which will offer similar routes for savings as the other projects. The scale of the programme is unknown.
RETs	The Mid Term Review on this project states "the project aims to reduce Ethiopia's energy-related CO_2 emissions by approximately 2 million tonnes CO2e. This is to be achieved through promoting renewable energy and low greenhouse gas GHG-producing technologies as a substitute for fossil fuels and non-sustainable biomass utilisation in the country, with a focus on rural household appliances for cooking, lighting, and heating" By November 2018 the project was estimated to have saved about 101,210.34 tons of CO_2e/a. There had been delays in starting implementation which lead to savings being lower than planned.
FTI Solar Water	The project focuses on using solar power for water supply and irrigation, assumed to mitigation emissions through reducing diesel demand. The project was expected to improve sustainability and supply of water to increase the sustainability and supply of water to 147,000 people and reduce greenhouse gas emission by 1,233t CO_2e per annum as well as contribute to improvements in local air quality.
Solar for companies	Various private companies have installed solar power and have started generating and using solar power for industrial processes (including to run a boiler). These include a soap factory and a tannery. It is assumed to replace grid electricity which is largely renewable at this point. Insufficient detail is available to determine emissions savings from this project.

Table 9: Projects contributing to reducing emissions from the other sectors (1.A.4)

3.3 SUMMARY AND POTENTIAL FOR CONTRIBUTION OF MITIGATION PROJECTS TO FUTURE NATIONAL EMISSIONS

Table 10 lists the data that is available in the public domain on emissions savings from individual projects. **It is important to note that this data has not been confirmed through own analysis, nor are the numbers necessarily comparable.** They do, however, serve to show the relative contribution of projects and a sense of scale relative to the emissions from each sub-category in 2011.

Table 10 shows that no single project will have provided material emissions savings in the 2011-2019 period. Although insufficient data is available to provide a detailed quantification of the savings for many of the projects, it is likely that the contribution of each project to reducing emissions in the emissions sub-categories is less than 0.5%. This is as a result of a combination of factors: some of the projects started late in the analysis period, some were pilot projects, and some targeted a small emissions subset (e.g. an energy efficiency audit at a single plant). This does not suggest that mitigation projects are not targeting the "right" emissions. The analysis of the inventory suggested that (after the AFOLU sector), the energy sector is the next biggest contributor of emissions, and within that the "other sectors" (mostly commercial and residential) and transport sub-sectors. A large proportion of the projects focus on reducing these emissions, which is thus appropriate. Scale up and replication of these projects has the potential to lead to more extensive savings.

Project	Indication of emissions savings
1.A.3: Transport	**Emissions from sub-category in 2011: 3,769,000 tonnes**
Addis LRT	9,000 tonnes in 2017
Ethiopia-Djibouti Railway	639 tonnes of emissions from passenger transport and 790 tonnes in 2017
National Rail Network	5,560 and 4,320 tonnes in 2017 (G.C) from the East-West and North-South lines respectively
1.A.5 Other Sectors	**Emissions from sub-category in 2011: 16,958,000 tonnes**
NBPE	Target was 66,500 tons CO_2 equivalent GHG emission reduced per year by 2020
Lighting Ethiopia	Between 2013 and 2018 lighting Africa claimed an emissions avoidance of 490.5 thousand tonnes CO_2
RETs	By November 2018 the project was estimated to have saved about 101,210.34 tons of CO_2e/a
FTI Solar Water	Project target was to reduce greenhouse gas emission by 1,233t CO_2e per annum

Table 10: Summary of available information on emissions savings from mitigation projects

3.4 CHALLENGES AND RELATED RECOMMENDATIONS TO IMPROVE ETHIOPIA'S GHG EMISSIONS CALCULATION AND REPORTING

3.4.1 OPPORTUNITY FOR ALIGNMENT WITH BEST PRACTICE REPORTING CONSIDERATIONS

With some records and reports (GTP-II progress) being in Amharic language, monitoring and reporting processes require local capacity. It may be a consideration for potential future database or M&E implementation, that an international option as reporting language is considered, which would support ease of reporting more directly into international UNFCCC reporting processes. In addition, it is recommended that a "coding" or "tagging" system be used to identify actual CRGE and climate mitigation activities under GTP-II. Such an approach will assist in disaggregating some of the "mainstreamed" work under GTP-II per sector that is climate-related. Such a coding or tagging system would also enable association of activities with the SDG-13 goal.

3.4.2 M&E CHALLENGES

There are currently no efficient M&E systems in place to track the implementation of projects that aim at GHG reduction in Ethiopia. Information on project implementation that is required to calculate GHG emissions or reductions in emissions is sparse and, in many cases difficult to validate or verify.

The roll-out of M&E systems should be prioritised in each of the sectors included in the GHG mitigation and adaptation plan, if accurate future estimations of GHG mitigation is to be estimated and verified. In addition to the developed of basic M&E systems, the study recognised the particular need for auditing or validation of project results.

3.4.3 CONCLUSION

Currently, due to the challenges mentioned in this chapter, this report cannot be rich in quantitative analyses and specifics related to sectors. Instead, the assessment is more qualitative. Due to a general lack of detailed and referenced qualitative data available to perform a sector-by-sector and overall national GHG emission assessment, the data that is available can be used as an overall indication only. It is also not possible to consider individual projects or emission reductions on a case-by-case basis.

Some sectors' reporting confidence levels are better than others. Through implementation of processes and systems such as improved data management and M&E using existing resources and governance and institutional structures would greatly benefit future reporting of GHG emission reductions in each economic sector as well as in Ethiopia as a whole.

The key focus for future emission reduction calculation processes in Ethiopia, across all sectors, is the design, implementation and operationalisation of

a. a baseline database;
b. a reporting framework (with similarities across sectors), and
c. an overall M&E system.

These interventions should save significant time and effort and would support the calculation of emissions savings from individual projects from the baseline within sectors, upwards to the national reporting level. When there is an effective data management and reporting system in place, with defined M&E parameters, time frames and detailed metadata references, the effort can shift from data collection to improved reporting. Such a shift in approach will reduce the time teams and government counterparts have to spend on trying to collect fragmented data and data that is collated or recorded in ways that are not documented in a manner that support the GHG emission reduction calculation and verification process. Their efforts and funds can be spent more efficiently and in a focussed manner. Ultimately the quality of the reported data can then be accurately reported with a much greater level of confidence.

4 Agriculture (Crops and Soil)

- The majority of all climate change related activity has been in the agricultural sector, and in adaptation efforts. This is aligned with the developmental needs of the country as a whole and the reliance on agriculture by the majority of the population.
- Several large-scale food security and agricultural productivity programmes have seen impressive results in increasing adaptive capacities and resilience for smallholders and pastoral communities.
- Projects are largely focused on food security, value chain efficiency and raised incomes, as well as Droughts, Floods and Disaster Risk Reduction.
- Areas which could be developed further include pest and disease control for livestock and crops.

4.1 ADAPTATION: AGRICULTURE

The Climate-Resilient Green Economy (CRGE) Strategy states that growth in the agricultural sector between 2011 and 2030 will see a marked increase in GHG emissions, not only from livestock, the population of which is expected to increase from 50 million to more than 90 million in 2030, causing an increase in emissions from 65 Mt CO2e to almost 125 Mt in 2030, but also from crop production. The strategy envisions an increase in crop production from around 19 million tons to more than 71 million tons in 2030 (primarily due to increased fertiliser usage and an increase in productivity of land) increasing emissions from 12 Mt CO2e today to more than 60 Mt in 2030 (Federal Democratic Repbilc of Ethiopia, 2011).

The CRGE is based around four pillars, the first of which is: 'Improving crop and livestock production practices for higher food security and farmer income while reducing emissions.' (Federal Democratic Repbilc of Ethiopia, 2011, p. i) The focus of the CRGE strategy in the crop and soil sectors is to increase the productivity of farmland rather than expanding the amount of land in use. Specifically, the CRGE strategy affirms a commitment to the following goals:

- Intensify agriculture through usage of improved inputs and better residue management resulting in a decreased requirement for additional agricultural land that would primarily be taken from forests;
- Create new agricultural land in degraded areas through small-, medium-, and large-scale irrigation to reduce the pressure on forests if expansion of the cultivated area becomes necessary;
- Introduce lower-emission agricultural techniques, ranging from the use of carbon- and nitrogen-efficient crop cultivars to the promotion of organic fertilizers. These measures would reduce emissions from already cultivated areas (Federal Democratic Repbilc of Ethiopia, 2011).

TABLE 3 : SHORTLISTED ADAPTATION OPTIONS

THEME	PRIORITIZED OPTIONS (41)	EXAMPLE INTERVENTIONS	KEY RISK	SUB-SECTOR
Capacity building and institutional coordination	Climate information, research and enhanced co-ordination	Training and the use of networks to co-ordinate resilience responses between community's and delivery agencies. Also, research on climate, future climate change and responses.	Cross cutting	Cross cutting
	Institutional strengthening and building	Ensuring the correct institutions are strengthened and built to influence the uptake of resilience measures. A key area is land security.		
Information and awareness	Meteorological and agro-metrological data	Ensuring the collection and communication of data to farmers and communities.	Cross cutting	Cross cutting
	Agricultural research and development	Research programs to develop new seed varieties, test promising options, to monitor changes.		
	Enhanced extension services	Ensuring the dissemination of information to promote effective climate resilience so that options can be implemented in the local context.		
Crop and water management on-farm	Crop switching and new varieties	More heat resistant and drought tolerant crop varieties in addition to changing planting dates.	Climate variability	Natural Resources Management
	Fertilizer use	Additional fertiliser to increase productivity including the use organic manure and residues.		
	Farm management and technology	Improved farm practice including increased use of labour, diversified crop rotation and mechanisation.		
	Pests and disease (including post-harvest losses)	Monitoring of crop disease, improved storage facilities.		
	Irrigation	Different irrigation techniques including drip, communal, small-scale, home, and rain water harvesting.		
	Water infrastructure, allocation and transfers	Water allocation through market based systems, increased water use efficiency, dams, reservoirs, wells.		
Livestock	General animal and value chain improvements	Co-operatives, improved feeding systems, management techniques, improved extension services.	Climate variability, Pests and diseases	AGD
	Herd diversification	Changing species that are more resilient to climate change such as a move from cattle to sheep, goat and camel.		
	Breeding programmes	Breeding of climate resistant livestock		
	Improved animal health	Veterinary services, vaccines, changing practices		
	Fodder and feed improvement and resilience	Addressing food shortage, forage development, natural pasture improvement, changing feeding practices		
	Rangeland rehabilitation and management	Rotation of grazing, promotion of stall feeding, natural pasture improvement		
	Resilient animal housing	Shading and cooling, suitable housing for poultry farming		
Value chain and market development	Coffee	Monitoring temperature increases and pests and diseases, R&D, shade trees, conservation, store areas, future planned zones	Cross cutting	AGD
	Irrigated sugar plantations	Improved irrigation practice, river basin management, climate risk screening for new development		
	Roads	New roads, paving, design standards, drainage		
Sustainable agriculture and land management	Conservation agriculture	Zero or low tillage, cover crops, crop residues for mulching and soil cover	Soil erosion	Natural Resources Management
	Soil and water conservation (SWC) structures	Bunds, trees, grass strips, contour levelling, terraces, shade trees, waterways.		
	SWC cover crops and wild plants	Perennial grasses and legumes		
	SWC water harvesting	River basin planning, improved land managements		
	Soil management	Residue and manure crop fertilisation, agro-forestry, efficient use of fertilisers.		
	Agroforestry	Integration of forage legumes into agro-forestry systems.		
Natural Resources Conservation and Management	Using forests for adaptation	Supporting and encouraging forest growing, remove incentives for deforestation, create integrated land use planning.	Cross cutting	Natural Resources Management
	Resilience measures for forests	Support R&D, develop a national monitoring system for forests, ensure forest and species are resilient to changing climate.		
	Conservation and rehabilitation	Improving biodiversity		
	Promoting biodiversity in agriculture	Control and management of pest and diseases, institutions for biodiversity promotion, regional level monitoring systems		
	Payment for ecosystem services	Develop policy with a focus on watersheds		
Disaster risk reduction	Early warning systems	Enhancing drought and flood warning systems, flood forecasting and drought monitoring system, proper use of climate information	Floods & droughts	Disaster Risk Management and Food Security
	Disaster risk management planning	Information, risk profiling, risk screening		
	Insurance	Micro insurance, weather index insurance		
	Structural protection	Natural and manmade approaches to stop floods (e.g. river dikes)		
Social protection for high priority groups including women and children	Safety nets	Income supplementation, social support	Floods & droughts	Disaster Risk Management and Food Security
	Asset creation and protection	Community assets, restoration of homes, food storage facilities		
	Access to credit	Micro finance, improved information		
	Livelihood diversification	Income diversification both on-farm and off-farm		
	Resettlement/migration	Relocation of vulnerable communities from areas of high climatic risk		

Table 11 Shortlisted Adaptation Options from the Sectoral CRGE

Regarding soil, the strategy has four initiatives under three categories; Enhancing of lower-emitting techniques for agriculture, enhancing of yield-increasing techniques for agriculture and the creation of new agricultural land in arid areas through irrigation (at a small scale and a large scale). The strategy is only focused on mitigation activities within the livestock sector as one of the main causes for emissions in the country. The CRGE has no stand-alone appendix for agriculture, as it is split into a focus on livestock and soil. As with the CRGE document as a whole, the soil component of the CRGE is only focused on mitigation actions.

A sector specific CRGE Strategy for Agriculture and Forestry was published in 2015, which had a broadened focus and included 41 actions, many of which had an adaptation focus, displayed in Table 11 above.

The NDC, however, has a broader focus in which agriculture plays a large role. The NDC includes the following actions for adaptation in the sector:

1. 'Increase agricultural productivity, minimise food insecurity and increase incomes irrespective of climate change by breeding and making available improved crop varieties, primarily from among those in Ethiopia that suit all agricultural areas where varieties that were grown in the past have become unsuitable;
2. Improve and diversify economic opportunities from agroforestry and sustainable afforestation of degraded forest areas;
3. Enhance irrigation systems through rainwater harvesting and conservation of water, including improved water use efficiency;
4. Improve traditional methods that scientifically prevent deterioration of food and feed in storage facilities to enable local communities to store food and feed in productive years and secure food supply in case of extreme weather events;
5. Enhancing ecosystem heath through ecological farming, sustainable land management practices and improved livestock balance, and increase vegetation cover, including drought tolerant vegetation;
6. Enhance the adaptive capacity of ecosystems, communities and infrastructure through an ecosystem rehabilitation approach in the highlands of Ethiopia. Rehabilitation of degraded lands/forests will also increase resilience of communities, infrastructures and ecosystems to droughts and floods;
7. Enhance the adaptative capacity of ecosystems, communities and infrastructure through an ecosystem rehabilitation approach in the highlands of Ethiopia. Rehabilitation of degraded lands/forests will also increase resilience of communities, infrastructures and ecosystems to droughts and flood;
8. Building additional dams and power stations to further develop energy generation potential from the same river flow as well as develop new dam sites on parallel rivers in order to maintain the baseline hydropower electricity generation capacity to levels attainable under a 'no---climate change' scenario;
9. Developing one or more insurance systems to enable citizens, especially farmers and pastoralists, to rebuild economic life following exposure to disasters caused by extreme weather events (floods and droughts);
10. Reducing the incidence and impact of fire and pest epidemics on livelihoods and ecosystems through integrated pest management, early warning systems, harvesting adjustments, thinning, patrols and wider public participation;
11. Strengthening capacity to deal with the expansion and emergence of human, animal, crop and plant diseases known to occur in and around Ethiopia and in similar environments elsewhere and make available medicines in a sufficient quantity to deal with these diseases;
12. Strengthening and increasing the capacity for breeding and distributing disease resistant crop and fodder varieties to farmers and other land users in order to deal with the emergence;
    and expansion of diseases and pests.' (Federal Democratic Republic of Ethiopia, 2015, pp. 5-7).

The NAP (prepared in 2017 and submitted to the UNFCCC in 2019) outlines the following objectives for the agriculture sector:

- Enhancing food security through improving agricultural productivity in a climate smart manner.
- Strengthening sustainable natural resources management through safeguarding landscapes and watersheds;
- Improving soil water harvesting and water retention mechanisms;
- Improving ecosystem resilience through conserving biodiversity;
- Developing efficient value chain and marketing systems;
- Strengthening drought, livestock and crop insurance mechanisms;
- Developing and using adaptation technologies (Federal Democratic Republic of Ethiopia, 2019, pp. 55-61).

Lastly, the recently developed Climate Resilient Green Economy Strategy 'Sector-wise GTP II Implementation Monitoring Checklist' (CGIAR, 2018) developed a monitoring checklist for both adaptation an mitigation activities for the agriculture sector, which includes the following approaches:

1. 'Set up environmental and social impact assessment system;
2. Increase livestock value chain efficiency to increase productivity;
3. Improvement of rangeland and pasture management;
4. Strengthening and expansion of animal health services;
5. Prevention and control of spread of existing vector borne diseases and macro parasites, accompanied by the emergence and circulation of new diseases as a result of climate change;
6. Increasing productivity of existing cropland through use of selected varieties and agricultural inputs;
7. Establishment of large scale and medium scale irrigation;
8. Improving productivity of unproductive land through the widespread use of natural fertilizer;
9. Lands developed through application of modern mechanization system;
10. Expanding the use of profitable/cost-effective new crop varieties;
11. Increasing use of chemical and natural fertilizer, and
12. Use low carbon technologies/farming methods' (Federal Democratic Republic of Ethiopia, 2019, pp. 5-9).

While the above checklist was developed for the monitoring of mainstreamed CRGE activities under the GTP II, it provides a useful metric by which to measure progress in adaptation in the sector since 2011.

4.1.1 ADAPTATION IN THE AGRICULTURAL SECTOR 2011-2019

The heavy focus on adaptation in the agricultural sector in the NDC reflects the needs of country as a whole, with the majority of its populace dependent on land or crops for their livelihoods. Reflecting this, is the amount and type of activity undertaken in the sector. The agricultural sector is the sector with the most climate related activity in the period of 2011-2019, and the majority of this activity has rightfully had an adaptation focus (although there have been mitigation activities at a Ministry level such as integrated watershed management and rehabilitation). Activities in the sector can be broadly organised under the following groupings (these grouping include the aims and objectives outlined above, detailed categorisation of which is available in Appendix A):

- Improved Eco-Systems and Biodiversity Conservation;
- Improved Food Security and N*u*trition;
- Value Chain Efficiency and Increased Incomes;
- Water and Irrigation;
- Land Management and Insurance Systems;
- Droughts, Flood and Disaster Risk Reduction;
- Climate Smart Agriculture, and
- Capacity Building and Training.

Figure 9 Initiatives by Focus Area, Pegasys, 2019

In line with the developmental needs of the country the majority of large-scale projects (with a budget of over 100,000,000 million USD) have been nationally managed large-scale projects which have a primary focus on improved food and nutrition as well as poverty alleviation. Other key areas of activity have bene in Droughts, Flood and Disaster Risk Reduction, Value Chain Efficiency and Increased Incomes and Capacity Building and Training as depicted in Figure 9 above.

The next section provides an overview of these national projects and then provides an overview of climate related activities in each sector.

4.1.2 NATIONAL LARGE - SCALE PROJECTS

There have been several national large-scale projects undertaken, primarily with a focus on improved food security and nutrition and value chain efficiency through improved agricultural productivity (and increased incomes). The largest of which being the Productive Safety Net Programme (PNSP) as well as the Agricultural Growth Programme (AGP). As with many of the initiatives in this agriculture, while neither of these programmes were designed specifically in response to climate change issue, their adaptation co-benefits are too large to not be included in the report.

Figure 10 National Large-Scale Projects Initiatives by Focus Area, Pegasys, 2019

4.1.3 IMPROVED FOOD SECURITY AND NUTRITION: NATIONAL PROGRAMMES

The PSNP has been running since 2005 and is the second biggest social protection programme in Africa after South Africa (Tamiru & Cochrane, 2016), now in PSNP 4 (which runs from 2014-2020), the project has been seen as very successful, yielding the following results pertinent to food security (ESSP II, 2013) (reporting from the end of the PSNP cycle in 2014):

- PSNP III (2010-2014/15) supported over 7.8 million chronically poor and food insecure households, including 4 million in the highland areas and 1.2 million in the lowland areas, and enabled 1.2 million to graduate out of the program by 2015;
- The average number of months that PSNP beneficiaries in the highlands experienced food insecurity was reduced from 3.26 months for public works beneficiaries to 1.8 months, and from 3.8 months for direct support beneficiaries to 1.6 months;
- Through the public works component of the PNSP, 16.1 million people in project areas had access to improved water sources, with 130,751 community water points, 10,045 springs, 120,706 wells, 88,699 ponds, and over 24,684 small-scale irrigation canals constructed or rehabilitated;
- The program also rehabilitated 901,654 ha of land through improving land and water management, constructing 528,754 km of embankments, and supporting the production of 1.3 million seedlings as well as planting of 1,162 billion seedlings and 3,200 tree nurseries, and
- Further to these outcomes, the programme saw increased household incomes and diversification of livelihood strategies, all of which contribute to increased resilience and adaptive capacity (World Bank, 2015, pp. 6-13);

The PSNP is perhaps the single programme with the most adaptation co-benefits in that it has multiple outcomes related to the NDC targets as well as the NAP. It has and continues to be successful in increasing household food security, physical assets and incomes, increased access to water resources, capacity building and training, as well as land rehabilitation (World Bank, 2015).

Major programmes in this area is the UNDP/GEF 'Integrated Landscape Management to Enhance Food Security and Ecosystem Resilience in Ethiopia' projects which utilises a mix of INRM, CSA, value chain support and gender responsive strategies. The project has positive effects in improving food security and has:

- Supported 240,000 households towards improved soil and water management;
- Diversified food production on 120,000 hectares of land to generate cash incomes;
- Restored 10,000 hectares of agro-pastoral systems;
- Strengthened farming systems and market linkages and
- Established a system of monitoring of ecosystems services (UNDP, 2019; UNDP, 2016).

Value Chain Efficiency and Increased Incomes: National Programmes

The other major national programme with large co-benefits is the Agricultural Growth Programme (AGP 1 and 2, 2010-2015 and 2015-2020). The objective of the AGP 1 was to 'increase agricultural productivity and market access for key crop and livestock products' (World Bank, 2017, p. 6), AGP 2 has the objectives 'to increase agricultural productivity and commercialization of smallholder farmers targeted by the project… also contribute to the higher level objectives of poverty reduction, improved nutritional outcomes by diversifying and improving dietary consumption and climate change mitigation and adaptation through supported CSA initiatives' (World Bank , 2015, p. 7). The AGP has also been largely successful, having the following impacts which have increased adaptive capacity:

The programme has resulted in increased land irrigation coverage, agricultural productivity, crop diversification, and farmer incomes:

- The agricultural yield index for the average beneficiary was 56% higher than for the average household that did not benefit from the project;
- In total, 44,150 hectares of land was provided with irrigation, benefiting 148, 357 farmers;
- Approximately 537,335 farmers adopted best practice technologies for crop, livestock and natural resource management, and
- Investments in marketing infrastructure successfully increased direct access to markets for rural agricultural households (World Bank, 2017, pp. 17-24)

Through increased agricultural output, both food security and income security are increased having a net positive benefit on building adaptive capacity.

Another notable project at a national level which focuses on raised incomes and value chain efficiency is the Pastoral Community Development Project (PCDP) 1, 2 and 3. The PCDP, initiated in 2003, focuses on 'improving the livelihoods of targeted communities and increasing the resilience of Ethiopian pastoralists to external shocks' (IFAD, 2016, p. iv). The PCDP, now in its third phase was effective in increasing the resilience of pastoralist communities through:

- Improving access to potable water for 1.2 million people;
- Improving access to health facilities for 750,000 people;
- Increasing access to veterinary services for over 2.2 million heads of livestock;
- Improved access to small scale irrigation, and
- Improving early warning disaster response systems (IFAD, 2016).

Water and Irrigation and Droughts, Floods and DRR: National Programmes

This section overlaps with the Water and Energy section of the report, as such, certain projects may be reflected in Water and Energy Section rather than in this section.

Further projects in the sector had a focus on water and irrigation, land management systems and capacity development. The Participatory Small-scale Irrigation Development Project (PASIDP) 1 and 2 (2016-2024) saw an increase in small scale irrigation schemes and land under irrigation, with the following outcomes:

- 121 Irrigation schemes constructed;
- 12,000 Hectares of irrigated land covered;
- 62,000 Beneficiary households, and
- 311,000 Total beneficiaries (IFAD, 2019, p. 2).

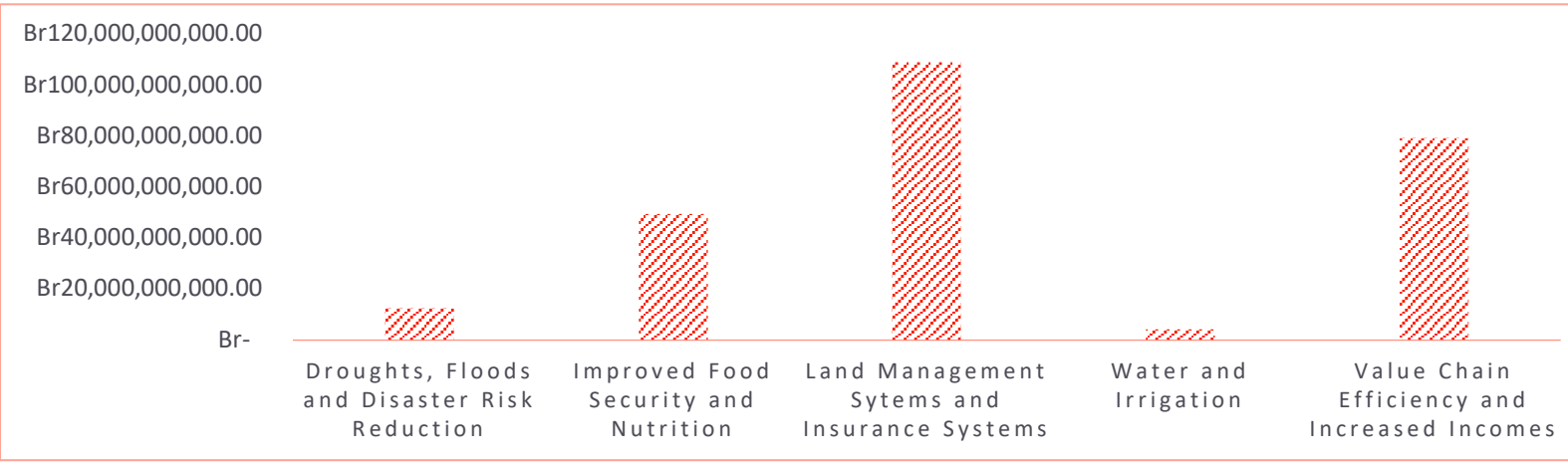
The project has increased beneficiaries resilience to changing rainfall patterns as well as improving food and income security (IFAD, 2014; IFAD, 2017). Concurrently the 'Capacity development for strengthening the drought resilience of the pastoral and agro-pastoral population in the lowlands of Ethiopia' project (active from 2013-2018) has been working towards improving resilience towards drought through encouraging land use planning across users and authorities, rehabilitating degraded water catchments and increasing food security (GIZ, 2019).

Strengthening Land Management Systems: National Programmes

Improved land management systems was the key focus of the Sustainable Land Management Programme (SLMP) 1 and 2. The programmes objectives were 'to reduce land degradation in agricultural landscapes and improve the agricultural productivity of smallholder farmers' (World Bank, 2014, p. 2). The programme was successful in its objectives, creating 45 participatory Watershed Management Plans, issuing land certificates to 59,999 households and supporting 36,450 households on 95,000 ha of farmland with improved soil and water management systems (World Bank, 2014, pp. 10-13). A further programme building on the SLMP is the Resilient Landscapes and Livelihoods Project , starting in 2018. Which will have a focus on improving 'livelihoods, climate resilience, carbon storage, and land productivity in vulnerable rural major watersheds' with the aim to restore 10 million hectares, support 20 million people (who are facing increasing food, land tenure and water insecurity), and accumulate 'at least 20 million tons of CO2e per year after restoration' (World Bank , 2018) .

Figure 11 Amount spent per focus area on National Large-Scale Projects, Pegasys, 2019

A further notable new project in the sustainable land management area, is the Climate action through Landscape



Management Program (CALM), funded by a 500 million World Bank grant, and which will focus on participatory watershed management and rural land administration and has the objective of 'increasing adoption of sustainable land management practices and to expand access to secure land tenure in non-rangeland rural areas' (World Bank, 2019, p. 24). The CALM project increases spending in the land management system area, making this the area with the highest overall spending in adaptation activities over the period (represented in Figure 11 above.)

4.1.4 IMPROVED FOOD SECURITY AND NUTRITION

There has also been a large focus on improving food security and nutrition, with over 13 initiatives in the period since 2011. Aside from the national food security initiatives there have been a number of smaller projects around food

security, especially in rural areas and for pastoralists and smallholders. Further initiatives in the food security and nutrition and nutrition field include the 'Food Security for Farmers' project, which increased household income for 67,874 farmers through enabling the organisation of savings and loans associations, it was particularly beneficial to female farmers, 93% of which had improved engagement in value chains after accessing finance made available through participation in associations. The project further supplied drought tolerant seeds to 44,743 beneficiaries, who were also trained on climate change interventions, 89% of which applied climate change practices in their production systems (Path Development Consulting, 2018). Other successful projects include the 'Capacity building and Scaling up of evidence-based best Practices in Ethiopia' (CASCAPE) project which focused on utilising soil characterisation and mapping studies to inform the best interventions for project areas to improve soil fertility and water management (ISRIC, 2019). The project saw a 30% increase in agricultural productivity for participating farmers during the project period of three years through adoption of evidence informed techniques (Wageningen, 2019). Other smaller yet notable projects include the Sustainable Community-Based Seed Production System, which aimed to improve yields and therefore food security in the SNNPR, the Climate Change Adaptation and Food Security project, which addressed social issues by increasing incomes through the promotion of 'vetiver grass, cassava, and mushroom for nutritional and environment (Irish Aid, 2015, p. 17)' and the 'Enhancing Integrated Watershed Management With Climate Smart Agriculture In Gergera Watershed' project which utilised CSA and IWM techniques to choose appropriate climate smart farming activities for the region in order to enhance food security and eco-system resilience (Irish Aid, 2015).

Another notable project in the food and nutrition area is the ongoing USAID Feed The Future programme of projects, which supports over 70 projects and organisation is various activities towards increasing food security. To date the programme has seen the following results:

- A 12% reduction in poverty in areas covered by the programme;
- Over 1 million producers have adopted new technologies and practices through FTF assistance;
- Over $40 million USD annual agricultural sales generated by the programme in 2017;
- Over $5.5 million USD private investment leveraged, and
- Over 100,000 children under 5 reached with nutrition assistance (USAID, 2019).

The ongoing Africa Research in Sustainable Intensification for the Next Generation (Africa RISING) project, now in its second phase, undertakes multi-disciplinary action research in the area of mixed crop-livestock systems, in order to contribute to

- 'Climate smart development;
- Food security;
- Gender equitable development;
- Improved nutrition;
- Income diversification, and
- Research and capacity building' (Africa RISING, 2019, p. 7).

The program is made up of three regional 'research in development' projects supported by USAID and is led by ILRI in the Ethiopian Highlands Region. The project not only undertakes research, but also awards projects of its own and have so far enabled five further projects in the areas of R4D, improving productivity and rural livelihoods and improved crop livestock systems with a variety of positive outcomes in these areas. The project has also seen several hundred academic and research outputs, which are essential in informing further adaptation interventions in the agriculture and food security field (Africa RISING, 2019).

4.1.5 DROUGHTS, FLOOD AND DISASTER RISK REDUCTION

This section overlaps with the Water and Energy section of the report, as such, certain projects may be reflected in Water and Energy Section rather than in this section.

There have been over 13 projects in the area of droughts, floods and disaster risk reduction (DRR) in Ethiopia since 2011. Many of these projects have had a focus on improving pastoralists livelihoods in order to build reserves and resilience to weather times of drought. Major programmes in this area include the World Bank funded Regional Pastoral Livelihoods Resilience Project (RPLRP) which has seen positive outcomes with the establishment of 81

water infrastructure schemes, as well as the 'Drought Resilience and Sustainable Livelihoods Program in the Horn of Africa' (DRSLP) which is now going into its second phase and hopes to reach 20 million agro-pastoralists affected by drought and land degradation in the horn of Africa (World Bank , 2019; AFDB, 2014). A further programme with this focus is the JICA funded Rural Resilience Enhancement Project which aimed to improve resilience in the lowland areas through a series of Weather Index Insurance (WII) pilot projects which saw a 20% uptake by farmers in 45 kebeles (JICA, 2016).

Other initiatives to combat drought to a focus on a broader, integrated water, agriculture and natural resource management approach, such as the Climate Smart Integrated Rural Development Project (IFAD) and the Strengthening Drought Resilience which focus on CSA, water security, capacity building as well as livelihood diversification, and rehabilitation of rangelands and construction of new irrigation schemes and water harvesting systems respectively (IFAD, 2017; DIE, 2017).

4.1.6 VALUE CHAIN EFFICIENCY AND INCREASED INCOMES

Programmes in this area have focused on improving productivity through adoption of CSA techniques, agricultural intensification, and other downstream value chain interventions such as better management of post-harvest losses. The Greening Agricultural Transformation in Ethiopia (GATE) DANIDA programme (in partnership with the Agricultural Transformation Agency and CRGE Facility) focused on increasing incomes through promoting the uptake of CSA, and saw the following results:

- The installation of 50 automatic weather stations in 50 farmers training facilities,
- Ground water mapping completed in 136 districts which in turn enabled over 90,000 smallholder access to irrigation,
- 1.5 million smallholders contacted with SMS/interactive voice messages containing agricultural content,
- Over 170 PCs and cooperative unions engaged around diversified and improved seed production and distribution,
- 32 MT improved storage capacity created to combat post-harvest losses,
- 2,314 ha of land areas rehabilitated through community-based watershed management, and
- 92,000 ha of forested area protected and rehabilitated (DANIDA , 2019).

The FAO led 'Reducing Food Losses through Postharvest Management' project focused solely on improving post-harvest losses (PHL). The project focused on capacity building, addressing information gaps, promotion of best practice and improving co-ordination, policy and strategy of different stakeholders. The project resulted in the creation and endorsement of the Ethiopia Postharvest Management Strategy as well as several key policy briefs on the topic. The project reached 7,746 smallholder farmers, cooperatives, artisans, experts and extension workers and adoption of new technologies amongst beneficiaries which improved the longevity and quality of grans and therefore their market value. The project also saw improved labour conditions through reducing the workload on women via lessened grain storage maintenance, as well as increasing job opportunities for the youth (through the creation of the actual metal silos and storage bags themselves (FAO, 2018).

Lastly the Farm Mechanization and Conservation Agriculture for Sustainable Intensification (FACASI) programme is working towards lowering labour 'drudgery' and minimising biomass trade-offs through improving the farm power balance by delivery and adoption of two wheel tractor based technologies to smallholders (FACASI, 2019a). To date, the project has, distributed 52 two wheeled tractors in 2 project areas in Ethiopia, which has seen both a rise in the number of service providers in the areas as well as a rise in rural employment (FACASI, 2019b).

4.1.7 CAPACITY BUILDING AND TRAINING

While capacity building has featured prominently in almost every project and programme, certain programmes have focused on capacity building as a primary focus. These projects operate at all differing scales, and include traditional capacity building through training and workshops, as well as more formalised long-term processes such as the creation of training colleges and institutes.

USAIDS' Feed The Future campaign of projects includes a trio of capacity building projects in differing spheres. Including the Capacity to Improve Agriculture and Food Security (CIAFS) projects, which focused on capacity building in the public sector for employees engaged in developing agriculture policy through study tours, training and

grants for pilot projects and workshops, the Ethiopian Strategic Support Program, Phase II (ESSP II) which generated research on policy in order to address key knowledge gaps, and the Knowledge, Learning, Documentation and Policy Project (KLDPP) utilised impact assessments and various analyses capture lessons learned during FTF implementation (USAID, 2011).

The UNDP'S 'Strengthening National Capacity through Sustainable Increases in Agricultural Production and Productivity' programme which ran from 2011-2016 and the focused on institutional capacity development at a Ministry level, partnership and resource and mobilisation and upstream strategic and programmatic support. The programme had multiple positive outcomes at many levels. From a capacity building perspective, the programme had many outputs including the capacitation of the ATA through hiring of 'high calibre staff', provision of support to the Ethiopian Agricultural Research Institute, and support to the GoE through delivery of a diagnostic study focusing on commercial farmers in the country (UNDP, 2014). The programmes also had large-scale 'on the ground' successes, including:

- 2.2 million farmers (33% of teff growers in Ethiopia) are estimated to have accessed the 'Teff Improved Seed Variety, Row Planting, and Reduced Seed Rate (TIRR) technology package', accounting for 36% of teff cultivated land in the country (1.1 million hectares). Between 2011 and 2015, the scaling up of the package saw a rise in national teff production by 38%.
- Smallholders access to inputs and information was increased through direct seed marketing and the creation of an 'Interactive Voice Response' (IVR) and 'Short Message Service' (SMS) platform.
- The programme also supported the Rural Financial Services (RFS) strategy, which enabled 1.9 million farmers' to access 2.3 million quintals of agricultural inputs worth 3.1 billion Birr in 2015 due to the Input Voucher System (IVS) (UNDP, 2016).

The Global Climate Change Alliance Plus Initiative (GCCA+) undertook the 'Building the national capacity and knowledge on climate change resilient actions in Ethiopia' with the specific objective to 'Increase the awareness and capacity of targeted government institutions, both at federal and regional levels, and the rural population at large, to deal with climate change' (GCCA+, 2019). The project had the following major outcomes:

- Training delivered to 706 government development agents and 1,439 female farmers on climate-smart and energy-saving technologies;
- 47 Nursery sites established, with 22.15 million tree/shrub seedlings produced and planted;
- 3,552 ha of previously degraded land now managed by 46 participatory forest user groups;
- 4,268 fuel saving stoves distributed, and
- Over 2,500 farmers enabled to engage in animal fodder production that can help in adaptation, reducing deforestation and forest degradation and improving livelihoods (GCCA+, 2019).

Lastly, the creation of higher education courses and vocational centres takes a more longitudinal approach to capacity building. The 'Agricultural Transformation Through Stronger Vocational Education' programme was designed to contribute towards the national TVET strategy through the creation of four Agricultural TVET colleges in Ethiopia. These colleges are focusing on market oriented agricultural production in line with the focus of the GTPII and are being capacitated to deliver high quality training to students as well as teachers, through the 'Teaching the teachers' programme which aims to improve capacity of instructors at the institutes to deliver gender sensitive and appropriate training in commercial agriculture (ATTSVE, 2019a; ATTSVE, 2019b).

4.1.8 IMPROVED ECO-SYSTEMS AND BIODIVERSITY CONSERVATION

This section outlines progress of projects with a focus on conservation and natural resources management. The largest of these such programmes was the Community-Based Integrated Natural Resources Management Project (CBINReMP) IFAD programme which aimed to reduce poverty for 312,000 households in the Lake Tana Watersheds. The project was executed successfully achieving the following outcomes;

- Developed and put into place 650 watershed management plans (for an area of 227,500ha), which enabled;
    - 'Area closures with 'cut and carry systems' on 29,726ha,
    - Improved pasture management on 5,924ha;
    - demonstration of pasture management by-laws and

- 486ha of land under participatory forest management.' (IFAD, 2017, p. 2);
- Delivered training through the Ethiopian Biodiversity Institute (EBI) to farmers in the watershed who have subsequently organised themselves into cooperatives, and
- Delivered further training on land administration and land certification for over 6,000 participants (IFAD, 2017).

Other projects in this area include, the 'Trilateral Resilience Enhancement in the Ethiopian Lowlands' (TREE) and 'Environmental Conservation And Economic Empowerment For Poverty Alleviation' projects. These projects had a focus on a variety of eco-system and conservation mechanisms. The TREE project aimed to increase the quantity and quality of multi-purpose and fruit trees planted by pastoralists and agro-pastoralists in the Afar Region (GIZ, 2019). The project produced over 42,000 multi-purpose tree seedlings and 16,000 Elephant grass cutting which were planted in valleys under rehabilitation, over 80 government staff, nursery staff and agro -pastoralists (GIZ, 2019). The 'Environmental Conservation And Economic Empowerment For Poverty Alleviation' also focused on production on tree seedlings in communal nurseries, construction of soil and water structures, promotion and training on conservation measures, collaboration with honey making cooperatives and the marketing of fuel efficient stoves (Irish Aid, 2015).

4.1.9 CLIMATE SMART AGRICULTURE

As previously mentioned, many of the projects included in this review were not designed specifically in response to climate change, and while agriculture features heavily in the adaptation profile of Ethiopia, Climate Smart Agriculture (CSA), as an approach, is only present in a certain number of projects; 36% of the overall agricultural projects include CSA as an explicit component. The promotion of CSA is often a component in a larger project, hence not being included in this section of the report. Therefore, CSA is prevalent as an approach, but does not dominate the landscape as a singular stand-alone measure being promoted.

Several of the CSA focused projects were implemented by the CRGE facility, with results presented in Table 12 Summary of CRGE FTI project results, (MoFEC, 2017, pp. 3-9) below.

Project Title	Output	Project Results
Agriculture Sector CRGE FTI Implementation in 22 Woredas of 8 Regions	Improving Capacity of Institutions involved in the Agriculture Sector CRGE Implementation Sectors at (National, Regional and Woreda) levels	• 35 woredas of all regions and Diredawa city administration trained. • 957 Regional, woreda and kebele experts trained. • 81 Development Agents trained. • 7,422 Famers and households trained.
	Increased Productivity of Crops and Coffee through CSA Practices that Contribute to GHG Emission Reductions	• 2,998ha of land covered by different CSA practices. • Increase in 80% of cropland productivity. • Increase in household income by 20%.
	Productive Lands Conserved and Degraded Lands Rehabilitated through Integrated NRM	• 3,689ha of degraded land rehabilitated through physical and biological conservation measures.
Technical Assistance and Capacity building on M&E, MRV and long-term Investment plan	Conducting capacity building on M&E, MRV, Long term investment plan preparation;	• Echnoserve conducted both baseline assessment and post project assessment which allowed MoA to properly monitor progress and achievement. • Echnoserve implemented the project in partnership with MOANR at federal, regional and woreda level and thus, it provided capacity

for selected Agricultural Sector CRGE Fast Track Project Woredas	Development of an M&E system as well as MRV framework, Woreda investment plan and baseline study preparation	building training for experts and worked with the experts in the preparation of the various reports.
Piloting Agriculture CRGE in the Rift Valley Ecosystem	Farmer Association and Participating Communities Climate Resilience Capacity Built and Strengthened	• 425 community members of which 170 women were made aware on climate impact adaptation and mitigation strategies, climate smart practices and started implementing grass root practices, • 36 community members (24 were women) and seven government office experts were given exposure and practical trainings in modern apiculture development and management, • 72 selected community members were participated on external experience sharing visits to areas that have best practices on environmental rehabilitation and management, • 270 different hand tools, 400 kg tie wire and 1652 cubic meters of soil and water conservation inputs were supplied to support the degraded hillside rehabilitation, • Two micro watershed community groups (300 members) organized and participated on physical land rehabilitation practices, • Two women only group were organized and started modern bee keeping practices to create alternative livelihoods opportunities.
	Degraded hillside managed and improved through area closure intervention	• 430 hectares of land was managed under different physical and biological conservation measures, • 2300-man day was mobilized to participate on different site specific soil degraded environment rehabilitation practices, • 640 gabion boxes of different dimensions and 400 kg of gabion tying wires made available to the community participating in conservation structures building, • 983 cubic meters of local materials were supplied for building used for physical conservation structures, • 657.92 cubic meter gabion wire was built, • 29.781 K.M of soil bund and 37.66 K.Ms of stone face bund constructed.
	Sustainable livelihood diversification measures facilitated and adopted	• 120 farmers (35 women) have accessed seedlings of multi-purpose tree and fruit trees in an attempt to diversify their income, • 46,352 different multipurpose tree seedlings planted, • Two women group organized into beekeeping and saving groups, • 20 modern beehives with necessary accessories and spare parts were made available to beneficiary community members.
	Experience in the project site replicated to adjacent communities	• Two consultation workshops were organized to share experiences and process of the project, • Two experience sharing visits were organized, • One training event was facilitated were mostly farmers share their experiences to their neighbouring ones.
	Planned activities followed, Adjusted and evaluated	• Five quarterly based regular follow up field visit conducted, • One external evaluation of the project conducted, • Three bimonthly and one annual progress report produced, • The salary of one technical member of field staff was covered.'

Table 12 Summary of CRGE FTI project results, (MoFEC, 2017, pp. 3-9)

Additionally to the CRGE manged projects, the 'Enhancing Integrated Watershed Management With Climate Smart Agriculture In Gergera Watershed' focused on enhancing food security through the adoption of CSA practices

through the introduction of high value trees and crops as well as fertilising trees. The project also introduced the 'ever-green' agricultural model as a CSA appropriate land management model (Irish Aid, 2015).

Farm Africa and the Technical Centre for Agricultural and Rural Cooperation (CTA) have recently launched a new project, name the 'Accelerating the Uptake of Climate-Smart Agriculture in Ethiopia' project in the SNPPR region which focuses on promoting and enabling the adoption of climate-smart technologies and practices for 20,000 smallholder in the region (Farm Africa, 2019).

4.1.10 LAND MANAGEMENT AND INSURANCE SYSTEMS

The 'Improving Livelihoods, Agriculture and National Development in Ethiopia' (LAND) project aimed to increase agricultural productivity by supporting the national Sustainable Land Management Program through measures such as land infrastructure rehabilitation, tree planting, and irrigation systems. The project created sustainable land management practices for 95,551ha of land which saw agricultural productivity increase by 92% in project areas (Global Affairs Canada, 2019). Aside from the SMLP, another large-scale project is the 'Land Investment for Transformation' (LIFT) Programme which focuses on transforming land tenure regularisation and runs from the period of 2013 - 2030. The programme supports the GoE in rural land certification in order to increase investment and productive land use and promotes a market systems approach. The programme is ambitious and seeks to issue 14 million certificates as well as the implementation and operationalisation of land administration systems in rural areas (DAI, 2018).

To date the programme has:

- Demarcated over 7 million parcels of land;
- Issued almost 4 million certificates to farmers';
- Launched a 'purpose-built, open source digital land administration information system';
- Trained in excess of 200 Land Rental Service Providers who have formalised more than 6,000 land rental transactions;
- Working with Ethiopian Micro-Finance Institutions, developed a bespoke loan based around land certificates, and
- Delivered over 4,000 bespoke loans worth over 3 million GBP through 60 MFI branches nationally (DAI, 2018, p. 3).

A newer, JICA/JST funded project is the 'Development of Next-Generation Sustainable Land Management (SLM) Framework to Combat Desertification' project which seeks to contribute towards achieving land degradation neutrality by 2030 through the development of an Ethiopian SLM model which will generate significant reductions in soil erosion, improvements in land productivity and improvements in livelihoods in the country (Tsunekawa & Hargeweyn, 2017). The project aims to create a soil erosion observation system, which integrates satellite, radar, field observation and modelling and that is easily adoptable to enable accurate risk assessments; to develop a SLM framework; impact over 180 beneficiaries through training, credit access and income generating activities; and to improve livelihoods to enable a 50% increase in farmers income (JICA, 2017).

4.1.11 WATER AND IRRIGATION

This section overlaps with the Water and Energy section of the report, as such, certain projects may be reflected in Water and Energy Section rather than in this section.

Many of the projects in the agriculture sector include irrigation as a component of a broader project, however the ongoing Small Scale and Micro Irrigation Support Project (SMIP) has a key focus on irrigation. The project aims to increase food security and agricultural growth through the promotion of SSI and micro irrigation, and expects the following outputs:

- 'Improved planning, design and construction of gender equitable and sustainable small- scale and micro irrigation schemes by public and private institutions;
- Improved management of gender equitable and sustainable small-scale and micro irrigation schemes by water users' organizations (WUOs) and individual users respectively, with support from key public institutions, and
- Improved water, soil and crop management practices for irrigated crops adopted by (male and female) farmers.' (SMIP, 2019, p. 1).

4.1.12 CRGE REPORTING: ADAPTATION OUTCOMES

The 2019 'Environment, Forest and Climate Change Commission Performance Contract in Ethiopia' report of the CRGE (CRGE, 2019) states that the following interventions have been successful in the last 3 year period:

The Agriculture Sector CRGE Fast Track Investment Project: Pilot Projects in 27 Woredas

The project delivered a series of pilot projects that supported the CRGE Strategy, with interventions primarily focused on: 'outputs which could increase livestock and crops productivity through low emitting techniques, agricultural value chain development and market access, watershed management including sustainable land management and water harvesting, capacity building and knowledge management' (CRGE, 2019, p. 9) The projects were successful in the following areas:

- Improving Capacity/ Capacity building;
- Increasing Productivity of Crops and Coffee through CSA Practices;
- Increasing Productivity of Livestock through CSA Practices;
- Productive Lands Conserved and Degraded Lands Rehabilitated through Integrated NRM, and
- Increasing of Resilient Farmer/Pastoral Households to Climate Change in Piloted Woredas.

Piloting CRGE strategy measures through agriculture sector climate resilience and low carbon agricultural investments in 8 woredas of Ethiopia

The project aimed to support the CRGE strategy implementation while meeting GTP II targets by the year 2020. The project had the following results:

- '4,274.7 ha of watersheds were covered by different climate smart agriculture (CSA) interventions; of which 1,732ha of land covered by various community based integrated watershed management practices and 2,542.7 ha of lands were covered by various climate smart crop and livestock production practices;
- 1,885 small-holder households were directly benefited from the project by implementing INRM, Climate Smart Crop and Livestock production practices in their respective areas. The achievement of these results will ultimately contribute both to the poverty reduction and climate resilient green economy building efforts, and
- Various livelihood improving interventions for smallholder households were conducted. These interventions have huge impact in increasing their incomes, create sense of ownership and ensure sustainability of the project interventions.' (CRGE, 2019, p. 9).

Agriculture Development and Natural Resource Sector

In the agriculture development and natural resource sector, the following progress was made:

- Small and Large Scale Mechanisation:
    - '6591 four-wheel tractors (60 HP), 100 two-wheel tractor (20 HP) & 1130 harvester and combiner that aims to increase work efficiency and reduce the demand for oxen are used for plowing, and traction purposes in the highland of Ethiopia. As a result of this intervention significant number of animal draught power (withdrew) removed from farming activities. (CRGE, 2019, p. 10)'.

Enabling Environment

The CRGE facility developed a number of tools in order to enable the delivery of the CRGE, including the:

- 'Agriculture sector carbon pools GHG assessment guidelines prepared (above ground biomass, soil and livestock) and training provided for Kebele, Woreda and Regional experts GHG emissions and vulnerability assessment guideline;
- The CRGE mainstreaming guideline to mainstream into existing frameworks, programs, projects and institutional arrangements;
- The CRGE task structure developed and communicated to relevant offices at different level of administration;

- The CSA field manual, developed to guide the planning and implementation of climate-change responsive interventions (natural resources management, agriculture and related interventions) in an integrated manner using landscape approach so as to build climate resilient and sustainable agricultural production system, and
- Climate resilient livelihood diversification plan and study' (CRGE, 2019, p. 11).

4.1.13 FUTURE FOCUS

The analysis suggests that there are a few key areas in which activities have been limited:

- Strengthening capacity to deal with the expansion and emergence of human, animal, crop and plant diseases known to occur in and around Ethiopia and in similar environments elsewhere and make available medicines in a sufficient quantity to deal with these diseases;
- Strengthening and increasing the capacity for breeding and distributing disease resistant crop and fodder varieties to farmers and other land users in order to deal with the emergence and expansion of diseases and pests.';
- Strengthening and expansion of animal health services;
- Prevention and control of spread of existing vector borne diseases and macro parasites, accompanied by the emergence and circulation of new diseases as a result of climate change;
- Developing one or more insurance systems to enable citizens, especially farmers and pastoralists, to rebuild economic life following exposure to disasters caused by extreme weather events (floods and droughts), and
- Strengthening drought, livestock and crop insurance mechanisms Reducing the incidence and impact of fire and pest epidemics on livelihoods and ecosystems through integrated pest management, early warning systems, harvesting adjustments, thinning, patrols and wider public participation.

This implies that these are areas in which further activities could be undertaken to ensure that Ethiopia reaches the goals of its NAP.

4.2 GTP II REPORTING

The Second National Communication to the UNFCCC (Ministry of Environment and Forestry, 2015) states the following actions carried out during the GTP I period:

- '19,807 community-based watersheds have been identified and a management plan prepared (101 per cent of the target);
- A 8,519,000 ha area has been enclosed (85 per cent of the target);
- 16,285,000 ha of soil and water conservation works have been constructed (465 per cent of the target).
- Activities that increase soil fertility have been undertaken on 1,926,000 ha, an increase of 115 on the 894,000 ha on which such activities were undertaken in the initial period;
- An additional 1,129,060 ha have been brought under small-scale irrigation compared with 853,100 ha at the beginning of the plan period, and
- Forest cover has increased by 12,296,000 ha from 13,000,000 ha at the beginning of the plan period, bringing the percentage of the land area covered by forest from 5 per cent in 2010 to 13-15 per cent in 2013.' (Ministry of Environment and Forestry, 2015, p. 49).

Since 2015, implementation of the CRGE has been mainstreamed into Ethiopia's GTP-II. The GTP-II Mid-Term Review (Federal Democratic Republic of Ethiopia, 2018) provides an account of the agriculture sector's efforts to make progress on CRGE-related activities. The mid-term review highlights a pilot project that built the capacity of communities in all agricultural sub-sectors, in relation to climate change, and was implemented in 27 woredas on a trial basis. Ethiopia estimates that 746,797 metric tons of CO_2 were reduced in 2016-17 as a result of the pilot scheme. The GTP-II mid-term review also notes (section 2.1.2) that in 2016-2017 a "vulnerability assessment manual" was prepared "to serve as guide for climate change mitigation activities." Given that vulnerability assessments inform adaptation activities and not mitigation activities (which would be informed more by GHG baseline studies or audits), this suggests that there is a lack of understanding in the agriculture sector about what constitutes climate change mitigation and what constitutes climate change adaptation.

4.3 FINANCE: AGRICULTURE

The agriculture sector accounts for the most projects (83) and largest value proportion (ETB 284.9 billion) of the 224 climate projects identified through the 2011-2019 period.

Of the 83 agriculture projects, 63 have an adaptation impact, 19 both, and just the one mitigation initiative.

Projects with both adaptation and mitigation impact account for the biggest proportion of value in the agriculture sector, at ETB 181.0 billion, predominantly made up of the large Productive Safety Net Program Phases 3 and 4. Adaptation initiatives account for ETB 103.9 billion, and just the single mitigation initiative at ETB 15.8 million.

Considering the annual breakdown of expenditure in the sector from 2011 to 2019, the total outlay specifically within this period is ETB 214.4 billion. Overall, the sector has experienced a slight year-on-year growth in

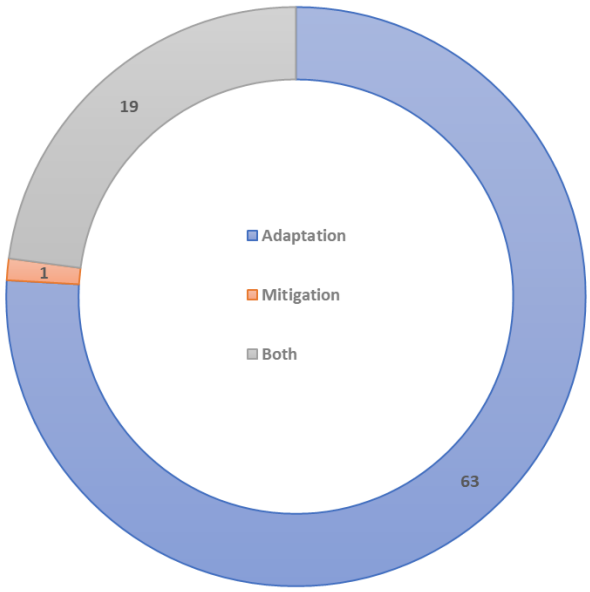


Figure 12 Number of Projects in the Agriculture Sector by Climate Impact 2011-2019

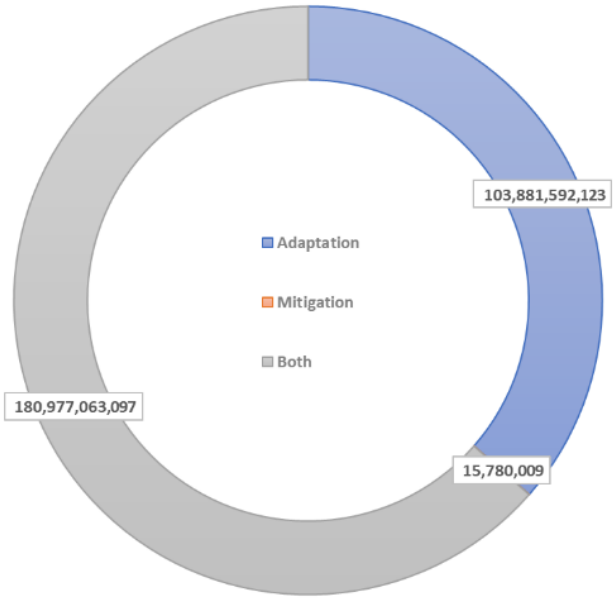


Figure 13 Total Value of Projects (in ETB) in the Agriculture Sector by Climate Impact 2011-2019

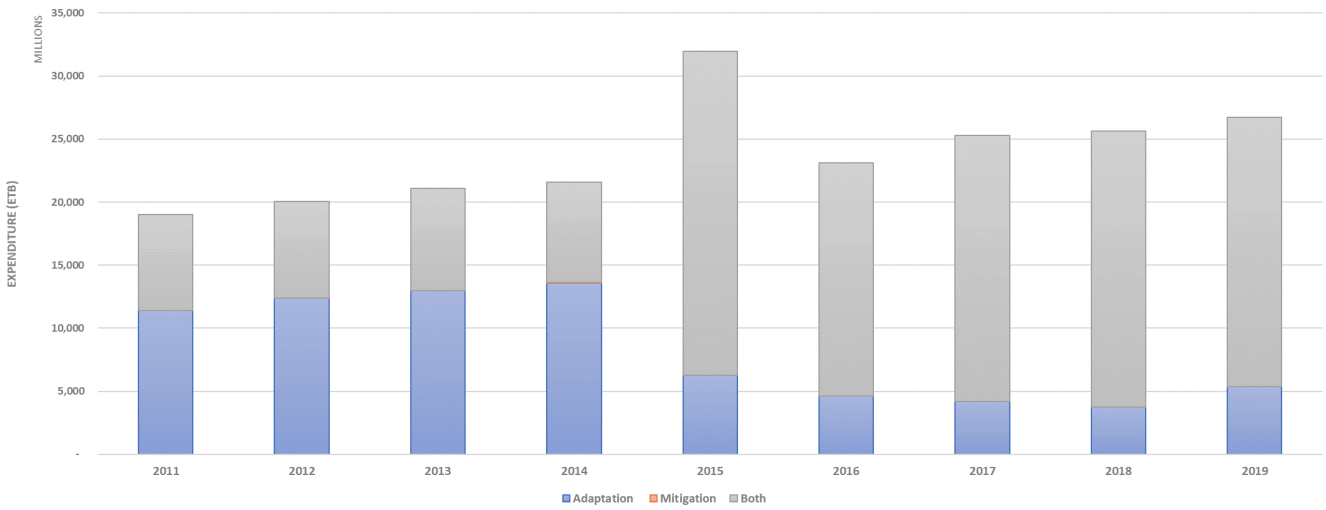


Figure 14 Annual Breakdown of Project Expenditure (in ETB) in the Agriculture Sector by Climate Impact 2011-2019

4.4 INSTITUTIONAL ARRANGEMENTS AND CAPACITY: AGRICULTURE AND LIVESTOCK

4.4.1 CRGE RELATED INSTITUTIONAL ARRANGEMENTS

The Ministry of Agriculture has an Environment and Climate Change Directorate, headed by a Director-level official. CRGE-related functions sit within this Directorate. The Directorate interacts on a regular basis with other institutional entities within the Ministry, including 14 other Directorates, the Agricultural Transformation Agency, and several agricultural research institutes. Given that so many entities across the Ministry of Agriculture engage in CRGE-related activities, there is an internal Ministry steering committee to coordinate CRGE matters. It is chaired either by the Minister or the Minister of State. At the regional level, there are several bureaus of agriculture that also engage in CRGE-linked interventions.

Like all other CRGE focal point bodies in key sector line Ministries, the Environment and Climate Change Directorate submits to the CRGE Facility quarterly progress reports, annual progress reports, and annual MRV reports. The Ministry is represented in the CRGE Inter-Ministerial Steering Committee, as well as the CRGE Management Committee, and Ministry representatives attend the half-yearly (annual and interim) review meetings of both these committees.

4.4.2 INSTITUTIONAL CAPACITY CHALLENGES AND GAPS

Overall, the CRGE team in the Ministry of Agriculture appeared to be the most capacitated and technically robust of all CRGE focal points. The resourcing and structure of the team may offer lessons for strengthening other CRGE Directorates, Units, or Bureaus.

Literature review as well as direct engagement with the CRGE team in the Environment and Climate Change Directorate in the Ministry of Agriculture, through purposive semi-structured interviews, indicated the following:

- The Ministry of Agriculture was allocated funds for four CRGE Fast Track Investment (FTI) projects – (a) piloting climate-smart agriculture in 22 woredas; (b) climate smart agriculture in pastoral areas; (c) developing M&E and MRV systems linked to CRGE; and (d) piloting conservation agriculture in the Rift Valley Ecosystem. Progress was made on the implementation of all four.
- The Directorate has developed a host of guidelines, manuals, checklists, and internal guidance on integrating the CRGE and climate change considerations into the agriculture and livestock sectors;

- The Directorate is conscious of the tenuous link between the CRGE Strategy's mitigation priorities for the agriculture and livestock sectors, and actual mitigation impacts and outcomes. There is a sound technical understanding of what constitutes mitigation and what does not, in this sector. In fact, the Directorate itself stated unequivocally that the majority of CRGE efforts in the agriculture and livestock sectors relate to building adaptive capacity through productivity gains and strengthened livelihoods;
- Data and information collection and organization for CRGE and climate-related projects and programs in the Ministry of Agriculture – i.e. knowledge management – was identified as an area for strengthening. There is no centralised repository or database of all climate-oriented agriculture and livestock projects;
- The Directorate noted that the single most pressing capacity gap or challenge related to MRV. There is a need for more trained MRV experts, as well as more data-collection protocols and actual implementation of MRV frameworks, so that information on the ground is captured;
- Several training workshops and events have helped bolster staff technical capacity over the years, including trainings that have been designed and delivered by Universities in response to the gaps identified in the training and capacity needs assessment. The Ministry of Agriculture was involved in the Regional Capacity Building Programme's (RCBP's) Training of Trainers initiative, and even regional bureaus of agriculture participated in the RCBP (Ministry of Environment, Forests, and Climate Change , 2015);
- The need for more systemic capacity development was recognized in 2015 by the CRGE National Capacity Development Program report (based on a gaps and needs assessment). The report indicated that the areas where the Ministry needed the greatest enhancement of capacity included resource mobilization, MRV, mainstreaming of CRGE priorities into GTP-II, CRGE-dedicated staffing at the regional level, knowledge management and information storage systems, document management systems, and M&E (Federal Democratic Republic of Ethiopia, 2015), and
- Such capacity needs were also flagged in a 2015 review of lessons learnt from the CRGE FTI process (LTS International, 2015). While not specific to the agriculture sector alone, the report highlighted issues across sectors that remain CRGE-linked challenges to date in the agriculture sector in Ethiopia: low technical capability in finance and project management; a lack of understanding of the need for and approach to baseline-setting; limited understanding of performance metrics and KPIs and how to measure them; M&E; and data and information collection and management.

4.4.3 INSTITUTIONAL ARRANGEMENTS RECOMMENDATIONS MOVING FORWARD

i. Enhance MRV capacity through increases in specialized staff as well as dedicated MRV trainings; ensure regional and local staff are trained to get the MRV system operational on the ground.
ii. Equip the Directorate with effective knowledge management systems, including data and information management systems, MRV-oriented software, and necessary tools.

4.5 POLICY: AGRICULTURE AND LIVESTOCK

4.5.1 CRGE STRATEGY FOCUS

When the CRGE Strategy was developed, the agriculture and livestock sector's share of Ethiopia's total greenhouse gas (GHG) emissions was just over 50%, i.e. half, at a total of ~75-78 MT CO_2e (from the 2010 baseline). These emissions were attributable predominantly to livestock (~65 MT CO_2e), in the form of methane emissions from enteric fermentation, and nitrous oxide from secretions. As such, livestock emissions alone constituted over 40% of the nation's GHG emissions. Remaining agriculture sector emissions were tied to fertilizer use in crop cultivation (~10 MT CO_2e) and nitrous oxide emissions from crop residues reintroduced into the ground (~3 MT CO_2e).

According to the projections that underlie the CRGE Strategy, GHG emissions from the agriculture sector are expected to grow by 110 MT CO_2e between 2010 and 2030. Due to growth in cattle population, livestock GHG emissions are projected to reach 125 MT CO_2e in 2030. As agricultural crop production rises and fertilizer use increases, GHG emissions from crop cultivation and soil are projected to reach 60 MT CO_2e in 2030 (Federal Democratic Republic of Ethiopia, 2012).

While the agriculture and livestock sector's contribution to Ethiopia's GHG emissions is significant (as the largest sectoral source of GHGs), it is also a source of valuable GHG abatement potential – as much as 90 MT CO_2e, which translates to 35% of the country's total abatement potential for 2030. According to the CRGE Strategy, increasing

the efficiency of the cattle value chains (for meat and milk), raising the off-take rate (decreasing the age at which livestock are sold), and enhancing productivity of livestock overall could avoid and even greater increase in livestock numbers. An estimated 15 Mt CO_2e in 2030 is linked to such avoided emissions. Shifting dietary patterns towards lower-emitting livestock such as poultry could yield further emission reductions of ~20 Mt CO_2e. Moreover, the mechanisation of draft power could reduce the need for draft animals and lower emissions by more than 10 Mt CO_2e in 2030. Another 3 Mt CO_2e can be abated by improving the quality of pastureland.

The introduction of lower-emitting techniques in crop cultivation such as conservation agriculture (low or no-till methods), watershed management, and nutrient and crop management, could reduce emissions by 40 Mt CO_2e in 2030. The Strategy also posits that agricultural intensification and capture of new agricultural land in arid areas through irrigation, and crop production techniques that increase yields, may theoretically reduce forest land that would otherwise be cleared to meet the increased need for cultivable land. This avoided deforestation is estimated to have an abatement potential of 38 MT CO_2e in 2030 (Federal Democratic Republic of Ethiopia, 2012).

From a policy standpoint, these figures point to livestock-related GHG emissions reduction as the priority area for mitigation interventions, where the most significant difference can be made. In light of what the biggest source of agricultural emissions and emissions growth is, i.e. livestock, the CRGE strategy's focus on reducing livestock-related GHGs was both strategic and optimal.

4.5.2 OTHER RELEVANT CRGE-LINKED POLICIES

In the context of assessing the progress of *implementation of the CRGE Strategy* (as opposed to assessing overall progress in the agriculture and livestock sector's development in Ethiopia), two main policy developments since 2011 in the agriculture and livestock sector are relevant to gauging progress on the CRGE strategy (depicted in Table 13 Policy Development relevant to the CRGE: Agriculture and Livestock below).

Policy Instrument	Year	Focus and Objective	Originator / Developer	Institutional Responsibility
Ethiopia's Climate Resilient Green Economy: Climate Resilience Strategy – Agriculture and Forestry Sector	2015	The strategy's objective is to ensure that economic growth in the agriculture and forestry sectors is climate resilient. The strategy identifies the impacts of climate variability and climate change on Ethiopia; highlights options for building climate resilience; and provides guidance on how these options can be financed and implemented.	GGGI	Ministry of Agriculture; EFCCC
Ethiopia's Livestock Master Plan – Roadmaps for Growth and Transformation	2015	To inform the development of GTP-II's provisions on agriculture and livestock, the Ethiopian Livestock Master Plan prepared detailed roadmaps (2015-2020) for cow dairy development; red meat can cattle feedlot systems development; poultry development; livestock feed, production, and extension; livestock health; improving animal genetics; and provisions on enabling environment and institutions.	ILRI	Ministry of Agriculture

Table 13 Policy Development relevant to the CRGE: Agriculture and Livestock

The CRGE climate resilience strategy for the agriculture and forestry sector (Federal Democratic Republic of Ethiopia, 2015) is a companion-document to the CRGE Strategy, bringing a resilience and adaptation lens to the sectors that the CRGE strategy examined from a mitigation perspective.

The sector strategy points to 41 priority climate resilience options that fall within broad categories:

- Capacity-building and institutional coordination;
- Information and awareness;
- On-farm crop and water management;
- Livestock;
- Value chain and market development;
- Sustainable agriculture and land management;
- Natural resources conservation and management;
- Disaster risk reduction, and
- Societal production for high-priority groups including women and children.

The Livestock Master Plan document (Ministry of Agriculture , 2015) is less closely linked to CRGE and climate change. For instance, even though it acknowledges that one of the key criteria for investments under GTP-II was "contribution to climate change mitigation and adaptation," virtually none of the measures built into the master plan consider climate mitigation or GHG emissions reduction at all. In relation to climate change adaptation, the master plan lends support for the identification of poultry breeds adapted to warmer (tropical) conditions. Thus, climate change was never mainstreamed into the master plan or the activities within it. Nevertheless, by virtue of creating a strong policy impetus for poultry development (which could plausibly displace some red meat consumption and reduce cattle numbers over time), it aligns with the CRGE Strategy.

4.5.3 GAPS IN THE CRGE STRATEGY'S APPROACH TO AGRICULTURE AND LIVESTOCK

The single most crucial policy position to strengthen in the CRGE Strategy moving forward is its embrace of measures in the agriculture and livestock sector that are not high-potential mitigation options. The Strategy reflects an effort to reconcile the need for economic growth driven by agriculture and livestock, improvements in food security and nutrition predicated on agricultural and livestock sector expansion, and the agriculture sector's role as the largest source of employment and livelihoods with the need for GHG abatement. The policy prescriptions that the Strategy gravitated towards do not, unfortunately, yield the definitive emissions reductions that are required for Ethiopia to meet its 2030 CRGE (and NDC) targets.

Globally, there is a wealth of literature on best practice in agriculture and livestock emissions reduction, despite the very complex nature of land-use emissions (and the ability of land-use sectors to be both carbon sinks and sources of emissions). The Intergovernmental Panel on Climate Change offers guidance on scientifically validated, well-studied climate mitigation interventions in the Agriculture, Forestry, and Land Use (AFOLU) sector (Intergovernmental Panel on Climate Change, 2014).

Development partners and climate finance institutions who are accountable to demonstrate measurable mitigation results for mitigation funding disbursed have also identified credible intervention-types in the agriculture and livestock sectors (MDBs and IDFC, 2015) that demonstrably contribute to GHG emissions reduction (Organization of Economic Cooperation and Development, 2017). The majority of interventions prioritized by the CRGE Strategy for the agriculture and livestock sectors are not reflective of such global best practice. The abatement potential attributed to them is premised on the possibility that improvements in efficiency and yield and productivity may avoid cattle population from growing on a business-as-usual trajectory, and may avoid the loss of forest cover for new farmland and pastureland. However, such hypothetical scenarios are not a sound basis for measurable mitigation results. Other hypotheticals (based on extrapolated evidence from real-world experience) may counter such scenarios, e.g. increasing agricultural productivity may boost disposable income, and rising income may translate into more consumptive dietary patterns and lead to an increase in demand for red meat, resulting in growing cattle numbers and forests cleared for pasture. Cattle breeds chosen for higher yields and productivity may also be associated with higher emissions. Improved agricultural value chains may increase livestock-related revenue to such a degree that market demand leads to a spike in livestock farming. In general, approaches that are based on efficiency and productivity gains in the AFOLU sector are fraught with complexity, and therefore treated with great caution in the climate mitigation arena.

It would be advisable for future revisions and updates of the CRGE Strategy to re-examine the priority interventions under the agriculture and livestock sectors, and pivot towards ***measures such as those recognized by the World Bank as having mitigation co-benefits*** (an approach that may be more flexible and permissive than aiming for substantial mitigation outcomes through best practice recommended under the Rio Markers).

The World Bank's list of activities with mitigation co-benefits includes the following:

Agricultural Extension and Research

- Develop, test and introduce practices or techniques that reduce GHG emissions in crop production systems; animal husbandry systems, forest management systems and aquaculture management systems;
- Develop, test and introduce practices or techniques to sequester CO_2 in agriculture, fishing and forestry, and
- Adopt sustainable land and water management that addresses land degradation and agroecological conditions.
- Adopt sustainable grassland management.

Crops

- Integrate organic and inorganic nutrient management;
- Adopt soil management techniques that reduce GHG emissions or increase carbon sequestration;
- Reduce CH_4 and NO_x emissions in rice cultivation, and
- Switch to less water intensive crops.

Animal Production

- Increase sequestration capacity in fodder production and management;
- Reduce release of GHGs in fodder production and management;
- Adopt manure management and methane capture in animal husbandry;
- Change forage systems to reduce ruminant methane emissions.

Additional options for consideration that would match Rio Markers' criteria include (Organization of Economic Cooperation and Development, 2017):

- Livestock projects that reduce methane or other GHG emissions (manure management with bio-digestors, etc.);
- Increase and maintenance of the CO_2-binding capacity of soil and vegetation, and
- Use of energy saving machineries, design of eco-efficient, carbon neutral systems etc. in farming.

Other options for consideration can be drawn from the Multilateral Development Banks' and the International Development Finance Club's 'Common Principles (MDBs and IDFC, 2015):'

- Reduction in energy use in agricultural processes;
- Agricultural projects that improve existing carbon pools (rangeland management; collection and use of bagasse; grain husks, or other agricultural waste; peatland restoration; increasing carbon content of soil);
- Afforestation on non-forested land;
- Restoration of previously forested land;
- Payments for Ecosystem Services, and
- Livestock projects that reduce methane.

The other major gap in the CRGE Strategy was the focus on mitigation to the exclusion of adaptation. The CRGE strategy is completely silent on the impacts of climate change on the agriculture and livestock sector, the vulnerabilities of the sector and the risks it faces from climate change, and what the sector should do to enhance its adaptive capacity against climate change related hazards, to make itself more resilient and able to thrive in a future beset by climatic shocks and stresses.

The Adaptation oversight in the CRGE Strategy was remedied in the climate resilience sector strategy for agriculture and forestry (mentioned above), which affirmed that in addition to mitigation, the sectors also needed to become more resilient to climate change by reducing vulnerabilities and strengthening adaptive capacity.

Further, in 2017, Ethiopia developed a comprehensive National Adaptation Plan (NAP) (Federal Democratic Republic of Ethiopia, 2019). The NAP prioritizes 18 adaptation options across the most vulnerable sectors, including agriculture and livestock. Adaptation option number 1 in the NAP emphasizes enhancing food security by improving agricultural productivity; and adaptation option 3 speaks of strengthening sustainable natural resource management through safeguarding landscapes and watersheds. Ethiopia now also has GE and NAP roadmaps to 2030, including for this sector.

Since the climate resilience sector strategy for agriculture and forestry plus the NAP have both addressed the adaptation gap in the CRGE Strategy and have identified priority channels to increase adaptive capacity in agriculture and livestock, it is recommended that both these key documents be fully and effectively implemented to ensure climate resilience in this sector. ***Specific first steps beyond the formal adoption of the NAP would be to undertake detailed climate change risk and vulnerability assessments for major crop and livestock systems in Ethiopia (particularly staple crops and milch cattle breeds); to use these evidence-based assessments to identify crucial vulnerabilities to be reduced and the associated specific, targeted interventions to build adaptive capacity and reduce vulnerability; to develop detailed adaptation plans for the crops and livestock breeds that emerge as the most vulnerable or at-risk; and track, monitor, measure, evaluate, and report on the progress made in improving adaptive capacity and reducing vulnerability of major crops and livestock breeds.*** Examples of specific response measures can be drawn from the IPCC, and from global scientific peer reviewed literature.

4.5.4 POLICY RECOMMENDATIONS MOVING FORWARD

Mitigation:

- Re-examine the CRGE Strategy's mitigation options suggested for the agriculture and livestock sectors, and choose new, high-potential mitigation options with more direct mitigation outcomes.

Adaptation:

- Mobilize and allocate resources for the complete implementation of Ethiopia's National Adaptation Plan (NAP), including in the agriculture and livestock sectors, and for the complete implementation of the CRGE climate resilience sector strategy for agriculture and forestry,
- Promote the undertaking of climate change vulnerability and risk assessments for major crops and livestock breeds of national importance, to enable to identification of key vulnerabilities and corresponding strategic interventions to reduce vulnerability and build adaptive capacity of crop systems and livestock populations against climate change impacts.

Crosscutting:

- Ensure that all major governance instruments developed in the agriculture and livestock sectors explicitly mainstream climate change considerations (both mitigation and adaptation) and align with the goals and objectives of the CRGE strategy.

5 Livestock

- The majority of activities undertaken in the livestock sector fall under the focus areas of on improving efficiency in the livestock value chain as well as improving food and security nutrition.
- Secondary initiatives were in the fields of strengthening and expansion of animal health services and prevention and control of diseases, knowledge production and Research for Development (R4D)
- Areas of future focus could be in strengthening drought, livestock and crop insurance mechanisms, and improvement of rangeland and pasture management.

5.1 ADAPTATION: LIVESTOCK

The livestock sector is a key sector in Ethiopia, accounting for a 40% share in agricultural GDP and a 12-16% share of national GDP. The sector contributes to 14% of all export earnings, amounting to US$150 million from formal exports. There are roughly 11.4 million livestock producing households in Ethiopia, many of which are smallholders, who represent 85% of the total population and are responsible for 98% of total milk production for the country (ASARECA, 2015). There are roughly 53.4 million cattle, 22.78 million goats and 25.5 million sheep in Ethiopia, however productive and reproductive performance is very low (Dagne & Dereje, 2017). Furthermore, the country has a rapidly rising population whose consumption needs cannot be matched by the sector, resulting in imports in dairy. The effects of climate change are disproportionately large in Ethiopia due to the fact that 80% of the population relies on agriculture, which is highly susceptible to climate change and its concurrent impacts (FAO, 2015).

Livestock and agricultural systems around livestock rearing and dairy, plays a large role not only in emissions reduction planning for the country, but also in terms of improving resilience for the millions of people who rely on livestock for their livelihoods. The CRGE livestock specific pillar is around “Improving crop and livestock production practices for higher food security and farmer income while reducing emissions.” (Ethiopia, 2011, p. 2). The focus of the CRGE strategy in the livestock sector in Ethiopia is to increase productivity, rather than increase cattle headcount or land used for grazing, and to increase the off-take rate (i.e. decrease the age at which livestock are sold). The strategy highlights the ample potential to increase the efficiency of the cattle value chain via higher productivity and an increased take off rate. The strategy is only focused on mitigation activities within the livestock sector.

The 2015 NDC (Federal Democratic Republic of Ethiopia, 2015) also largely focuses on the mitigation possibilities of the sector, however, under adaptation activities, it includes a livestock focus under the drought section: ‘Enhancing ecosystem health through ecological farming, sustainable land management practices and improved livestock production practices to reverse soil erosion, restore water balance, and increase vegetation cover, including drought tolerant vegetation’ (Federal Democratic Republic of Ethiopia, 2015, p. 7). This is further expanded upon in the 2019 National Adaptation Plan (Federal Democratic Republic of Ethiopia, 2019) that identified the following adaptation options in the livestock sector:

- ‘Enhancing food security through improving agricultural productivity in a climate smart manner;
- Developing efficient value chain and marketing systems, and
- Strengthening drought, livestock and crop insurance mechanisms.‘ (Federal Democratic Republic of Ethiopia, 2019, pp. 59-61).

Lastly, the recently developed Climate Resilient Green Economy Strategy ‘Sector-wise GTP II Implementation Monitoring Checklist’ (CGIAR, 2018) developed a monitoring checklist for both adaptation an mitigation activities for the livestock sector, which includes the following approaches (please see Appendix X for the full list of indicators for the sector):

1. Improving the efficiency of the livestock value chain;

2. Improvement of Rangeland and Pasture Management, and
3. Strengthening and expansion of animal health services and prevention and control of diseases. (CGIAR, 2018, pp. 5-7).

While the above checklist was developed for the monitoring of mainstreamed CRGE activities under the GTP II, it provides a useful metric by which to measure progress in adaptation in the sector since 2011.

5.1.1 ADAPTATION IN THE LIVESTOCK SECTOR 2011-2019

Matching the focus of the CRGE, the majority of activities undertaken in the livestock sector fall under the focus areas of on improving efficiency in the livestock value chain as well as improving food and security nutrition. Less has been undertaken in the fields of strengthening drought, livestock and crop insurance mechanisms, improvement of rangeland and pasture management and strengthening animal health services. A key area of activity has also been research for development and capacity building and training in livestock value chains.

5.1.2 IMPROVING EFFICIENCY IN THE LIVESTOCK VALUE CHAIN

More than 50% of projects and national programmes collected fall into this category of 'adaptation' activities for livestock.

Under Ethiopia's Agricultural Growth Programme - a five year programme which ran from 2011-2016, and aimed to 'increase agricultural productivity and market access for key crop and livestock products in targeted woredas with increased participation of women and youth' (EDRI, 2013, p. 48) - the Livestock Market Development component had a large reach in enabling market lead growth in livestock value chains. Over its course, it facilitated $106.3 million in livestock export sales, leveraged $33.2 million in new private investment leveraged in the livestock sector, and trained 37,879 individuals on agricultural-sector productivity (CNFA, 2019). Through the improvement of livestock markets as well as capacity building and training, the project increased adaptive capacity through increasing financial gains as well as human capital, broadening skillsets (especially amongst women) which enabled diversified livelihood strategies.

Notable large-scale projects included several projects supported by the International Livestock Research Institute (ILRI) focusing on improving gains in the dairy and chicken value chains. Major programmes such as the African Chicken Genetic Gains (ACCG) (ILRI, 2017), African Dairy Genetic Gains (ADDG), and Public-Private Partnership for Artificial Insemination Delivery and 'Livestock and Irrigation Value chain for Ethiopian Smallholders' (LIVES) (ILRI, 2015) programmes focused on the areas of:

- Collection of large-scale baseline data to enable a further understanding of smallholder and pastoralist preference in livestock and chicken choices;
- Large scale data capture and analysis of more productive breeds which enabled creation of data capturing and monitoring systems in order to better inform choices around breeds. This data analysis included the registering of farmers and capturing information from animal genetic material to be utilised by the National Animal Genetic Improvement Institute; and
- Utilisation of registered farmer information to enable large scale information sharing messaging systems which enabled health and market information to be effectively shared with a large number of farmers and pastoralist (ILRI, 2018).

The African Genetic Gains project delivered the following impacts in Ethiopia:

ACGG:

- 6,000 households included;
- Increases of 200 – 300% in the body weight of indigenous varieties of chicken;
- Increases of 100-160% in egg production (ILRI, 2018);

ADGG:

- Registered over 56,00 farmers;
- Registered over 94,000 animals; and
- More than 5,094 hair samples collected (ILRI, 2018).

These results enable both higher incomes and improved animal monitoring systems.

The LIVES Project, driven by the Government of Ethiopia, focused on improving efficiencies in the value chain through the introduction of appropriate mechanisation technologies, the introduction of new commercial breeds, coaching on improved production practices, and introducing modern reproductive technologies. There was also a strong focus on knowledge capture and management, as well as converting the captured knowledge into practice, learning acquired in the programme were utilised to help shape the development of GTPII (ILRI, 2015). ILRI has also recently launched a climate-smart livestock systems project in Ethiopia which seeks to support interventions that increase the contribution of livestock production towards climate-smart agriculture (CSA) through increased productivity, mitigation GHG emissions and adaptation to climate change. The programme will focus on scientific data collection and solution-led field research on climate-smart livestock production' to achieve its goals (ILRI, 2019).

Further value chain enhancing projects included programmes that included a focus on feed improvements in order to bolster efficiency. The Enhancing Dairy Sector Growth in Ethiopia (EDGET) project concentrated on the dairy value chain and included extension services as well as co-operatives in their focus. The project resulted in improved milk production amongst dairy cows, training of 1,476 extension officers, improved understanding of forage and feed leading to healthier cows, establishment of 50 agro input dealers and resource support to Woreda offices (ALINE, 2018). Certain projects focused on increasing private sector involvement in livestock value chains. The Feed Enhancement for Ethiopian Development (FEED 1 and 2) project focused on increasing incomes of smallholder by improving their access to, and use of, high-quality feed for livestock and poultry. The project resulted in the establishment of 25 union-based feed manufacturing enterprises, which established 144 feed sales outlets established, the creation of 57 new enterprises, as well as the training of over 58,000 smallholders and extension workers.

Lastly, several projects focused on enabling and promoting the inclusion of the private sector and linking farmers to commercial markets. Projects such as the Livestock and Fisheries Sector Development Project, started in 2017, and the Ethiopia-Netherlands Trade for Agricultural Growth, started in 2018, focused on enterprise development, support to producers and cooperatives, and support in the form of business plan development, inclusive business support and private sector association report respectively (World Bank , 2019; Resilience, 2019). The ENTAG project has already created 30 business platforms and dispersed 21 innovation grants in the spices, herbs & aromatics, legumes, poultry, aquaculture, dairy, potato, and sesame value chains, resulting in increased annual incomes of associations (Resilience, 2019). Innovative projects are also being found outside of the traditional value chain focus, such as the Beekeepers Economic Empowerment through long-Term Investments in Entrepreneurship and Value chain in Ethiopia (BEE LIEVE project), which focuses on 'improving the technical, business and entrepreneurial skills of small producers and other value chain actors and supporters' (EU, 2019, p. 1) in the honey value chain. Since starting in 2017, the project has trained over 10,000 beneficiaries in modern beekeeping, almost doubling annual income of those involved (EU, 2019).

5.1.3 FOOD SECURITY

Many projects had a specific focus on food security and nutrition. While these projects were more prevalent in the broader agriculture sector (crops particularly), two major national programmes included increased food security in the livestock sector:

The Empowering the New Generation to Improve Nutrition and Economic opportunities project (ENGINE) and the GRADuating Families Out of Poverty project (GRAD). Both programmes sat under GoE programmes, the National Nutrition Programme (NNP) and the Productive Safety Net Programme (PSNP) respectively (USAID, 2016; USAID, 2016). Both projects had substantial impacts in improving food security and access to optimum nutrition (both programmes had large focal and activity areas, however, this section shall focus on livestock related interventions).

The ENGINE programme reached 15,070 most vulnerable households (MVHHs) and 5.7 million children under five years of age, and provided these households with both livestock and training in animal husbandry; '8,800 MVHHs received three goats/sheep and a ram, 1,081 received a flock of 12 to 16 vaccinated chickens, and 1,667 households received a heifer' (USAID, 2016, p. 1). The programme resulted in 13% of households using income derived from farming and livestock activities to purchase additional food, and the sale of livestock and vegetables was linked to increased dietary diversity in children (USAID, 2016).

The GRAD programme benefited 63,000 food insecure households and utilised interventions including training and demonstration of improved livestock rearing techniques such as fattening in enclosures. The project had strong results, with 80% of beneficiaries being able to move off of PSNP support, household incomes almost doubling, access to credit improved, and improved national outcomes for children (USAID, 2016).

5.1.4 STRENGTHENING AND EXPANSION OF ANIMAL HEALTH SERVICES AND PREVENTION AND CONTROL OF DISEASES

The area of strengthening and expansion of animal health services and prevention and control of diseases has had less activity than the areas outlined above; a key project in this area was the 'Pastoralist Areas Resilience Improvement and Market Expansion (PRIME)' project. The project had several focus areas, however, a key focus was on improving animal health through facilitating expansion of Private Veterinary Pharmacies (PVPs) to remote pastoral areas. Grants were only granted to 23 PVPs (USAID, 2015), however. The project implemented two vaccination campaigns which covered 811,000 animals and benefited over 12,000 households and in strengthening animal health surveillance and reporting. Further project outcomes included: 17,330 households receiving seasonal climate advisories and the rehabilitation of 16 water points - supporting 22,910 households improved access to water (Global Waters, 2019).

A new project, launched by ILRI in 2019 is the Health of Ethiopian Animals for Rural Development (HEARD) project, a four-year project, which seeks to:

- 'Strengthen the quality and delivery of public and private veterinary services through the creation of an enabling and rationalizing environment;
- Improve technical competencies (knowledge, skills, and attitude) and incentives for veterinary service providers to enable them to deliver better and rationalized services, and
- Improve the food safety of primary animal origin products and achieving better control of zoonotic diseases.' (CGIAR, 2019; ReliefWeb, 2019).

The project will be the most notable project with a singular focus on strengthening animal health systems and will proffer positive adaptation impacts.

5.1.5 KNOWLEDGE PRODUCTION AND R4D

Almost all the project and programmes in the sector included large capacity building and training aspects. Certain projects, however, had a specific primary focus on 'Research for Development' (R4D) or knowledge production.

Under the USAID funded 'Feed the Future' (FTF) Programme, included two knowledge production programmes, Africa Rising and the Agriculture Knowledge, Learning, Documentation and Policy (AKLDP) programmes. The still ongoing Africa Rising project undertakes specific interventions in research sites such as integrating tree lucerne in the crop-livestock farming systems for multiple products and services, and has set up innovation Platforms (IP) at the sites to create linkages between farmers, the Africa RISING teams and private and public actors, results from interventions are fed back into farming system to optimise systems and create new practices (Africa Rising, 2015). The purpose of the AKLDP programme was to increase agricultural growth and resilience through 'improved famers incomes, strengthened markets, greater food security and improvements in household nutrition.' (USAID , 2018, p. 5). The project worked closely with the GoE and worked with worked with over 180 partners (research institutes, UN agencies, international NGOs and the private sector). Impacts listed by the program include:

- Improvement made to a variety of agricultural and livestock initiatives and programs;

- Support provided through the provision of grants to eight major research projects led by consortiums from 18 Universities/Research institutes/other partners, and
- The bringing together of policy makers, researchers, plant/animal breeders, project implementers, extension workers and private sector traders and processors into thematic collaborative working groups. (USAID , 2018).

While it is hard to ascribe specific and measurable contributions from such process towards adaptation goals in the livestock sector, knowledge production, dissemination and management are key at all levels to increasing adaptive capacity through a better understanding of the issues at hand and the sharing of resilience building mechanisms.

5.1.6 CRGE REPORTING: ADAPTATION OUTCOMES

The 2019 'Environment, Forest and Climate Change Commission Performance Contract in Ethiopia' report of the CRGE (CRGE, 2019) states that the following interventions have been successful in the last three year period:

- 'To reduce meat consumption primarily of beef to healthy level and the carbon footprint of livestock production, the production of low emitting animals like poultry, sheep and goat as well as fish resources has increased. To this end, 497,380 tons of mutton, 462,600 goat meats produced, and 365,168 tons of white meat (162,548 tons of fish & 202,620 tons of poultry meat) produced and consumed, and
- To increase the productivity, improve quality of feed and increase carbon storage capacity: 3.86 million ha of range land are rehabilitated through the implementation of various activities like bush clearing, reseeding and rotational grazing etc' (CRGE, 2019, p. 10).

5.1.7 FUTURE FOCUS

The analysis suggests that there are two key areas in which activities have been limited:

- Strengthening drought, livestock and crop insurance mechanisms, and
- Improvement of Rangeland and Pasture Management.

This implies that these are two areas in which further activities could be undertaken to ensure that Ethiopia reaches the goals of its NAP.

5.2 FINANCE: LIVESTOCK

The livestock sector accounts for 22 of the 218 224 projects analysed, with a combined value of ETB 16.5 billion through projects within or overlapping with the 2011-2019 period.

Of the 22 livestock projects, 2 have an adaptation impact, 6 a mitigation impact, and 13 generate both.

Projects with both adaptation and mitigation impact account for by some margin the biggest proportion of value in the livestock sector, at ETB 13.4 billion – the largest initiative being the Livestock and Fisheries Sector Development Project. Adaptation initiatives account for just ETB 325.6 million, while mitigation projects total ETB 2.8 billion.

Considering the annual breakdown of expenditure in the sector from 2011 to 2019, the total is ETB 13.6 billion. Overall, the sector has experienced good year-on-year growth in expenditure from 2011, peaking at ETB 2.2 billion in 2017. Since 2017, investment in the sector has been decreasing.

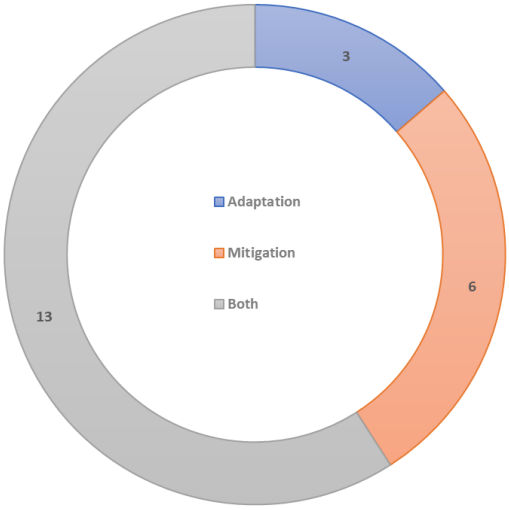


Figure 15 Number of Projects in the Livestock Sector by Climate Impact 2011-2019

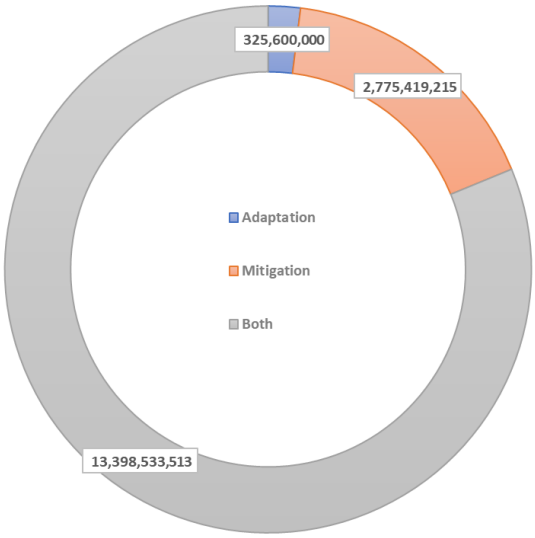


Figure 16 Total Value of Projects (in ETB) in the Livestock Sector by Climate Impact 2011-2019

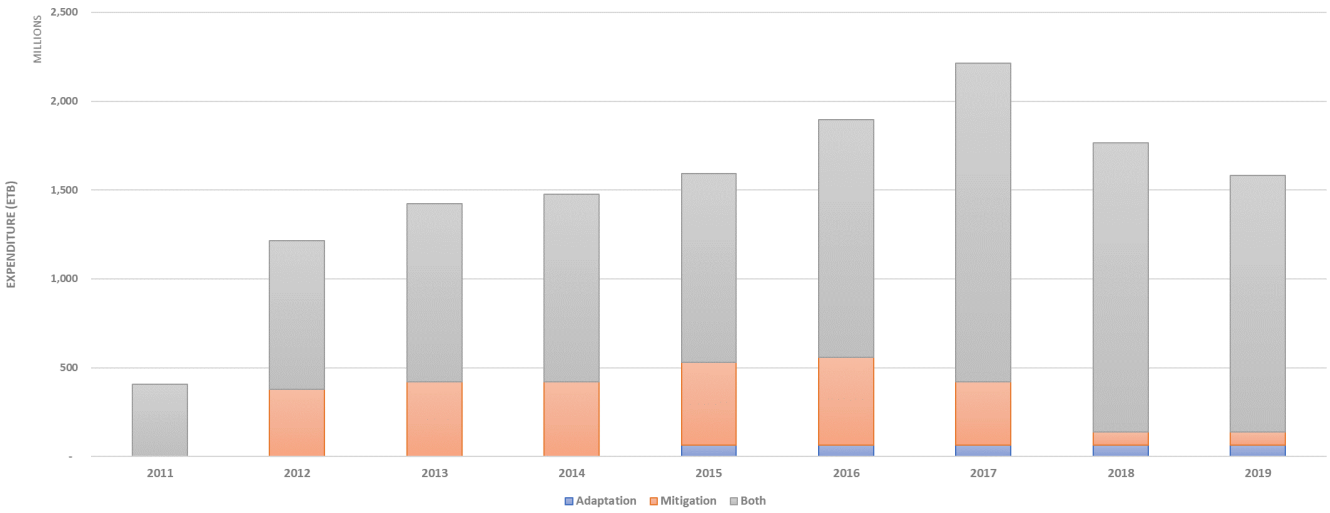


Figure 17 Annual Breakdown of Project Expenditure (in ETB) in the Livestock Sector by Climate Impact 2011-2019

5.3 INSTITUTIONAL ARRANGEMENTS, CAPACITY AND POLICY

Institutional arrangements, capacity and policy are covered in Section 4.3 and 4.4 in conjunction with the agriculture (crops and soil) sector as they are both managed under the broader agricultural section

6 Forestry

- The forestry sector is a major focus of the CRGE due to its powerful mitigation potential.
- The major forestry projects with a strong adaptation component include the REDD+ initiatives and several CRGE/FTI projects which have a strong focus on diversifying income streams through reforestation and afforestation, creation of land forestry management systems and training, and capacity building.
- The development and launch of the national forest sector development plan (NFSDP) is an important step towards reaching the goals of the CRGE/NDC and NAP.
- An area of future focus could in the creation and implementation of a regulatory system to protect wetlands.

6.1 ADAPTATION: FORESTRY

Since the Climate-Resilient Green Economy started in 2011, the Government of Ethiopia has taken significant action regarding forests through its national strategy and policy. REDD+ is being implemented in all regions and sectors. Community mobilization has been taking part in Sustainable Land Management Program (SLMP). Every year millions of hectares of degraded lands are converted into area closure, undergo afforestation, reforestation and physical conservation by constructing different site preparations for tree planting. Every year, over a billion tree seedlings are distributed to the local communities.

As with livestock, forestry represents a major mitigation pillar for the CRGE/NDC, with no specific adaptation measures identified in the CRGE itself. However, the NDC makes specific mention of the following adaptation activities:

- 'Improve and diversify economic opportunities from agroforestry and sustainable afforestation of degraded forest areas, and
- Enhance the adaptive capacity of eco-systems, communities and infrastructure through and ecosystem rehabilitation approach in the highlands of Ethiopia. Rehabilitation of degraded lands/forests will also increase resilience of communities, infrastructures and eco-systems to droughts and floods.' (Federal Democratic Republic of Ethiopia, 2015, p. 6).

The National Adaptation Plan (Federal Democratic Republic of Ethiopia, 2019) identified the following adaptation options in the forestry sector:

- 'Improving ecosystem resilience through conserving biodiversity, and
- Enhancing sustainable forest management.' (Federal Democratic Republic of Ethiopia, 2019, p. 57).

Lastly, the recently developed Climate Resilient Green Economy Strategy 'Sector-wise GTP II Implementation Monitoring Checklist' (CGIAR, 2018) developed a monitoring checklist for both adaptation an mitigation activities for the forestry sector, which includes the following:

1. Identify causes of biodiversity loss and reduce the losses, and
2. Setup a regulatory system to protect wetlands. (CGIAR, 2018, p. 13).

While the above checklist was developed for the monitoring of mainstreamed CRGE activities under the GTP II, it provides a useful metric by which to measure progress in adaptation in the sector since 2011. A comprehensive overview of the forestry sector is available in Appendix D.

6.1.1 ADAPTATION IN THE FORESTRY SECTOR 2011-2019

Most of the forestry projects and programmes recorded had a purely mitigation focus (as per the CRGE). The major forestry projects with a strong adaptation component include several CRGE FTI projects, which had a strong focus on diversifying income streams through reforestation and afforestation, creation of land forestry management systems, and training and capacity building.

Most of the forestry projects and programmes recorded had a purely mitigation focus (as per the CRGE), however, these often-large scale projects had extensive adaptation co-benefits and as such will be include in this section. The major forestry projects with a strong adaptation component include several CRGE FTI projects, which had a strong focus on diversifying income streams through reforestation and afforestation, creation of land forestry management systems, and training and capacity building.

6.1.2 THE REDD+ PROGRAMME IN ETHIOPIA

Several important and large-scale projects have been undertaken as part of the REDD+ programme in Ethiopia. The REDD+ program has been in development since 2009 and is co-ordinated by the National REDD+ Secretariat accountable to the Forest Sector of the EFCCC. The National REDD+ Strategy (2018-2030) was published in 2018 (MEFCC, 2018) and aligns with and will contribute to the targets of the CRGE/NDC and is fully aligned with the National Forest Sector Development Program (MEFCC, 2018). Under the REDD+ program, a number of projects have been undertaken and are currently in progress, including the Oromia's Forested Landscape Program (OFLP), the Project for Supporting Sustainable Forest Management through REDD+ and Certified Forest Coffee Production and Promotion (REDD+FCCP), the REDD+ Investment Program, Responding to the increasing risk of drought: building gender-responsive resilience of the most vulnerable communities, the Ethiopia REDD+ Readiness Package (R-Package) as well as several other pilot projects (including the pilot REDD+ and CDM projects in the country include the Bale Mountain Eco-region REDD+ Project in Oromia, Nono Sele Participatory Forest Management REDD+ project includes Oromia location, Yayu REDD+ Project includes Oromia location, the Ethio-wetlands REDD+ and forest related CDM Projects). These programmes and projects have had positive mitigation and adaptation benefits which will be outlined below.

The Bole Mountain Eco-Region REDD+

The Bole Mountain Eco-Region REDD+ project was one of the first large scale REDD+ initiatives in Ethiopia, starting in 2010 and is expected to run for 20 years (the REDD desk, 2019). The project area covers 500,000ha and it is estimated to reduce emissions by 18 million tonnes of CO2e over this period (the REDD desk, 2019). Since 2012, the project has:

- Identified 58 cooperatives engaged in Participatory Forest Management (PFM) who are now included in the project,; Managed a total of 382,000 ha of natural forest into Joint Forest Management,
- Involving over 100 forest management CBOs implementing Sustainable Forest Management with the Regional government, and
- Promoted of improved stoves to ca. 24,000 community households estimated to save 90,000m3 wood in three years (MEFCC, 2017).

The Oromia's Forested Landscape Program (OFLP)

The OFLP runs from 2017-2022, now in its implementation stage, it has been in development since 2013 and focuses on how forested landscapes are managed to have the following positive impacts: poverty reduction and resilient livelihoods, climate change mitigation, biodiversity conservation, and water provisioning. The project covers approximately 8.7 million ha in total and is 'Oromia Regional State's strategic programmatic umbrella and coordination platform for multi-sector, multi-partner intervention on all forested landscapes in Oromia' (MEFCC, 2017, p. 37) . It is also a world first REDD+ programme as it is jurisdictional rather than project level (MEFCC, 2018).

The REDD+ Investment Program (RIP)

The RIP runs from 2017-2020 in five regions and focuses on providing opportunities for emission reductions through reduced deforestation and forest degradation by sustainable forest management and afforestation and reforestation initiatives. As of 2018, the project had achieved the following results:

- Afforestation and Reforestation (AR) activities started in 36 woredas for the first year;
- 25 new nurseries established;
- 78 existing nurseries supported and strengthened;
- 17,718,819 seedlings raised;
- 3,160 ha of land identified and delineated for AR;
- 86,919 ha of land identified and delineated for Assisted Natural Regeneration (ANR);
- Physical conservation activities commenced in SNNPR, Tigray and Amhara regions;
- 3,686.96 ha of PFM sites identified in Amhara region, and
- Capacity building trainings and meetings held for 1,500 participants in the regions (MEFCC, 2018).

Supporting Sustainable Forest Management through REDD+ and Certified Forest Coffee Production and Promotion

The 'Supporting Sustainable Forest Management through REDD+ and Certified Forest Coffee Production and Promotion project' funded by JICA and running from 2014-2020 is another notable REDD+ project and aims to balance forest conservation with improved livelihoods in order to contribute to sustainable rural development. The project consists of a Forest Coffee Certification Program (FCCP), Farmers Field Schools and the establishment sub-village-based PFM authorities in order to build capacity (JICA, 2019). To date the project has seen a reduction in deforestation, with rates of change of deforestation declining from 1.16% a year to 0.46% a year, resulting in 10,000ha of deforestation suppressed (JICA, 2018).

6.1.3 DIVERSIFYING INCOME STREAMS THROUGH REFORESTATION AND AFFORESTATION

The majority of major forestry projects with an adaptation focus were CRGE FTI projects including the 'Empowering Woman through Better Forest Management and microenterprise development', 'Bamboo plantations in Oromia', 'Watersheds Rehabilitation in Amhara Highlands', 'Somalia Region Afforestation/Reforestation' and the 'Enhancing highland bamboo management and processing in Oromia' projects (CRGE, 2014).

These projects, which were all funded and managed by the CRGE facility through its Fast Track Investment (FTI) programme, ran for the period of 2014-2017 and had positive results. It is important to note that the projects were conducted at a local rather than national scales (due to the size and nature of each of the projects). Project results are presented in Table 14 Summary of the ongoing FTI projects implementation, (MoFEC, 2017, pp. 11-14) below.

Project Title	Aims of Project	Project Results
Empowering Woman through Better Forest Management and microenterprise development'	▪ Microclimate and vegetation cover of the local and surrounding areas of the project's site improved and carbon sink increased; ▪ Income generated for women to minimize dependency on forest resources	• 15 ha of the project site re-afforested, • Aerial closures for15 ha of the project site established, • 400 households engaged in post plantation management, • 580 individuals benefited from the project (400 from the post planting management; 30 from beehives and honey production), • 300 goats distributed for 150 community HHs.
Bamboo plantations in Oromia	▪ Skills improved on bamboo management and processing; ▪ Improved bamboo forest management, cover and carbon sink increased; ▪ Bamboo based livelihoods and	• 1000 individuals trained on biological, social, environmental and economic aspects of bamboo, • 10 community bamboo stands established, • 2 seedling multiplication centres established, • Bamboo management plan for 500 ha of bamboo stands prepared and implemented, • Participatory Bamboo Management groups established and made operational,

	business opportunities were created for youth, women and vulnerable groups;	• 80 youth members were organized in bamboo processing enterprises, • 2900 individuals were also organized as bamboo growers of which 50% were women, • 10 small scale enterprises on bamboo processing organized and linked with market, • 2 domestic private sector linkages created between processors, traders and urban consumers,
Watersheds Rehabilitation in Amhara Highlands	▪ Maps and Baseline data generated ▪ Properly managed forest protected area and rehabilitated degraded land ▪ Livelihood improved to minimize dependency on forest resources	• Baseline and development maps were generated for 500 ha of watersheds for each selected district, • 4500 ha of watershed and degraded areas become more productive with less erosion as a result of Participatory Forest Management (PFM), Construction of biophysical structures with enrichment planting, • Alternative livelihood strategies were designed for 3500 youths and poor women: organized and engaged in small business units, • 1,096 beneficiaries in Beekeeping, • 1,078 beneficiaries in improved poultry, small ruminant animal fattening, small ruminant animal breeding and improved stove production, • 269 beneficiaries in forest seedling production, • 908 beneficiaries in homestead fruit and vegetable production were identified and benefited from the project.
Somalia Region Afforestation/Reforestation	▪ Increased vegetation cover and reduced land degradation; ▪ Skills developed on seedling production and nursery management; ▪ Livelihood improved and income generate	• 300 ha of forest area protected with area closure, • 60 community members (labor) hired on nursery establishment, bed preparation and shade construction, • 45women hired during sand, clay and manure sieving, pot filling and pot arrangement, • 45community members (labor) hired during implementation of soil and water conservation activities, • Improved fruits were provided for 150 communities HHs.
Enhancing highland bamboo management and processing in Oromia	▪ Skills on bamboo management and processing improved; ▪ Bamboo vegetation cover increased, and carbon sink enhanced; ▪ Income generated and local economy improved;	• 3,597 bamboo growing farmers, 747 bamboo culms supplying farmers, 130 bamboo products processing micro and small enterprises members of the project site were organized and further built up, • 500,000 bamboos planted on 200 ha of the project site, • Bamboo management plan prepared and implemented, • Participatory bamboo management groups established within the 10 community bamboo stands, • by laws were made to operate bamboo stand protection, management and utilization, • 4,474 people (3,597 bamboo growing farmers, 747 bamboo culms supplying farmers, 130 bamboo products processing micro and small enterprises members were benefited to generate income.

Table 14 Summary of the ongoing FTI projects implementation, (MoFEC, 2017, pp. 11-14)

6.1.4 CREATION OF LAND FORESTRY MANAGEMENT SYSTEMS

The adaptation component for several projects and programmes are comprised of land and forestry management systems, especially through forestry and community forums. Certain programmes, such as the Community-Based

Integrated Natural Resources Management Project (CBINReMP) project and the Kafa Bio-Sphere Reserve Project, have adaptation at their core.

The Community-Based Integrated Natural Resources Management Project (CBINReMP) project aimed to reduce poverty for about 312,000 households in the Lake Tana Watersheds, through combating land degradation and the promote of 'Sustainable Land Management' (SLM) to increase agricultural productivity, household food security and incomes (IFAD, 2017). The project was successful and covered 650 watersheds, with development plans in place with 486 hectares of land (76% of target) under participatory watershed management. Under the participatory watershed management component, the project was able to 'develop 650 watershed development plans past three quarters, revise 256 community watershed plans and supported watershed management training for 188 kebele watershed committees and 603 community watershed committees. In addition, 76 woreda and regional staff were trained on integrated watershed management.' (IFAD, 2017, p. 3). The project also had positive results in other fields such as: off-farm and on farm soil and water conservation; off-farm employment opportunities; biodiversity and ecosystem conservation; participatory integrated wetland ecosystem conservation; and land certification (IFAD, 2017).

Hosted by the Nature and Biodiversity Conservation Union (NABU), the Kafu Bio-Sphere Reserve Project enabled the transfer of 11,000 ha of forest area to Participative Forest Management (PFM) Employment. The projects saw the training of 30 rangers, as well as the training of over 100 tourism service providers that provided business support to community-based tourism initiatives. The project employed PFM techniques, organising 1,500 community members into forest management groups who received training and were incorporated into the management of six forest areas, covering a total of almost 4,000 hectares. Through PFM, the project has improved biodiversity in the area, as well as created fuel wood plantations as community forests and agroforestry systems, consequently diversifying income streams for those in the community (NABU , 2015; IKI, 2019).

6.1.5 CAPACITY BUILDING AND TRAINING

Many of the programmes that introduced new forestry or agro-forestry had large, multi-dimensional capacity building components (individual, household, community and at the institutional level). A major programme at the institutional level was the 'Institutional Strengthening for the Forest Sector Development Program of Ethiopia (ISFSD)'. The programme ran for a duration of five years and was a key programme of the CRGE. The programme focused on strengthening government capacity in the forest sector at all levels, and spearhead the implementation of the forestry component contained in the GTPII and CRGE (MoFEC, 2017). The programme was instrumental in the creation of the National Forest Sector Development Program (discussed in section 5.3 below). It was fundamental to strengthening capacity at a governmental level through the recruitment of new personal and the creation of required forestry databases to enable further data management and collaboration between government entities. The programme also included supporting land use plan-based rehabilitation efforts in targeted micro-watersheds, which resulted in real mitigation achievements (through land rehabilitation and afforestation), as well as adaptation benefits. These benefits comprise:

- 'Training of 157 beneficiaries (60 female) on beekeeping, 153 solar lantern, 1893 improved stoves distributed, and 6 biogas plant locally built;
- 46,688 people (21,272 female) gained temporal job opportunities through the program;
- In the rehabilitation effort alone, about 176,656 (59,677 female participants) participated in the free community participation and the monetary value of this amounted to 8,723,075 ETB (as of 2017);
- 242 field experts and extension agents participated on TOT on sustainable forest management and establishment and management of forest business enterprises;
- Trained trainers provided similar training at woreda level for a total of 13,174 participants;
- Procurement of key laboratory facilities is on-going by the project support, and
- Key knowledge gaps in the research system identified and postgraduate training, academic exchanges and joint research initiated' (MoFEC, 2017, pp. 9-18).

The project has been referred to as a 'showcase project' and is a good example of how capacity building programmes can be integral to further policy and sectoral development (MEFCC, 2017).

Smaller programmes also had a focus on institutional and individual capacity building. The 'Building Institutional Capacity and Participatory Leadership in Awash and Simien Mountains National Parks for Resilience, Mitigation and Adaptation to Climate Change' (BICAS-RMACC), which was developed under the framework of Strategic Climate Institutions Program (SCIP), aimed to build park management and leadership capacity. The project was successful and published 7,400 IEC materials, as well as training over 250 women and youth with entrepreneurship skills (PHEEC, 2014).

6.1.6 THE NATIONAL FOREST SECTOR DEVELOPMENT PLAN

The National Forest Sector Development Plan (NFSDP) was developed and launched by the MEFCC (now EFCCC) as the 'main guiding document for coordinating strategic policy interventions and sector-wide investments for the coming ten-year period.' (MEFCC, 2018, p. 5). The aim of the NSFDP is to attract foreign investments and leverage the creation of the MEFCC to enable the transformation of the forestry sector. This transformation will catalyse to increase GDP growth, create employment, enhance environmental services and contribute towards self-sufficiency in forest products. The plan is expected to have a value of USD 30.8 billion, with a benefit to cost ration of 3:1 (for every dollar invested it will generate benefits of over three dollars). Furthermore, the plan is expected to create 633,141 full time jobs, and provide a reduction in soil erosion that will increase the value of agriculture and other key sectors by USD 3.2 billion (MEFCC, 2018, p. 6).

The plan is built around five main pillars:

- 'Enabling environment and institutional development;
- Sustainable forest production and value chains;
- Forest environmental services;
- Forests and rural livelihoods, and
- Urban greening and urban forests' (MEFCC, 2018, p. 7).

A successful realisation of the plan is planned to result in:

- Increasing forest cover from current 15.7% to 20% by 2020 and 30% by 2025;
- Doubling contribution to GDP from 4% to 8% by 2020, and
- Achieving 50% of the national emission reduction target. (MEFCC, 2018, p. 7).

The development and initiation of the plan is an important step forward in enabling the GoE to reach its ambitious goals, which will contribute to more than 50% of the national goal to reduce emissions by 255 MtCO2e by 2030.

6.1.7 CRGE REPORTING: ADAPTATION OUTCOMES

The 2019 'Environment, Forest and Climate Change Commission Performance Contract in Ethiopia' report of the CRGE (CRGE, 2019) states that the following interventions have been successful in the last three year period:

- Establishment of MRV Units: A national MRV laboratory was established with multiple servers that include OpenForis, Geoserver and MRV portal to host NFI and other data, as well as REDD+ Registry-Module included to store and display REDD Initiatives. A forest and land-use monitoring web portal to display REDD+ information was also developed;
- A forest change assessment was conducted: This resulted in the creation of a forest change map, which, upon assessment showed that;
    - 'Ethiopia lost, on average, about 92,000 ha of its cover per year distributed into the four biomes; Acacia-Commiphora (15,000 ha), Combretum-Terminalia (55,000 ha), Dry Afromontane (5,000 ha), Moist Afromontane (16,000 ha) and others (1,000). In the same period, there is an annual average forest gain of about 19,000 ha distributed to about 2,308 ha, 615, 13,800 ha 2,230 and 62 ha respectively. If the trend continues, the country loses about 73,000 ha per year, alerting to take appropriate measures.' (CRGE, 2019, p. 27), and

6.1.8 FUTURE FOCUS

The analysis suggests that there is one key area in which activities have been limited:

- Setup of a regulatory system to protect wetlands.

This implies that this is an area in which further activities could be undertaken to ensure that Ethiopia reaches the goals of its NAP.

6.2 GTP II REPORTING

Since 2015, implementation of the CRGE has been mainstreamed into Ethiopia's GTP-II. The GTP-II Mid-Term Review (Federal Democratic Republic of Ethiopia, 2018) offers a snapshot of the forestry sector's efforts to make progress under GTP-II on CRGE-related activities. The principal focus was planting tree seedlings, distributing climate change adaptation and mitigation technologies, and distributing energy-saving technologies (that would reduce community dependence on forest biomass for household use). Progress on the targets in 2016-2017 was 100% for climate change adaptation and mitigation, 84% for tree seedlings planted, and 66% for energy-saving technologies distributed. The 2016-2017 targets also represented raised ambition from previous 2015-2016 targets. At the time of the GTP-II mid-term review (2018), over 1 million farmers and semi pastoralists were engaged in forest development packages and earned income from forestry and forest products. The EFCCC identified roughly 612,850 hectares of land for conservation between 2015 and 2017, and established manmade forests on this land. It also distributed over 1.3 million efficient, energy-saving stoves. Under GTP-II the national goal was to increase forest coverage from 15.5% in 2014-15 to 17.5% in 2016-17, and to meet this goal the forestry sector prepared and planted 3.62 billion tree seedlings. Through the work of the forestry sector in 2016-2017, job opportunities for 204,328 people were created (of whom 54,468 were women).

6.3 FINANCE: FORESTRY

The forestry sector accounts for 26 27 of the 218 2224 projects analysed, with a combined value of ETB 1315.7 6 billion through the 2011-2019 period.

Of the 26 27 forestry projects, none have an adaptation impact, 15 a mitigation impact, and 11 12 generate both.

Projects with a mitigation focus make up the majority of the sector's value, totalling ETB 7.6 billion. This is closely followed by initiatives with both adaptation and mitigation impact at ETB 6.1 6 billion. Some of the largest projects captured were the Great Green Wall, and the Climate Protection and Preservation of Primary Forests Project.

Considering the annual breakdown of expenditure in the sector from 2011 to 2019, the total is ETB 9.3 billion. Overall, the sector has experienced very good year-on-year growth in expenditure throughout the 2011 to 2019 period, peaking in 2018 and 2019the 2017-2019 at around ETB 1.7 billion in 2017.

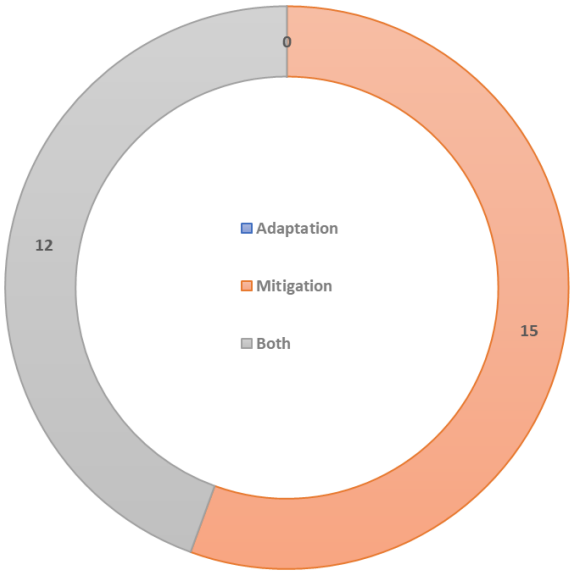


Figure 18 Number of Projects in the Forestry Sector by Climate Impact 2011-2019

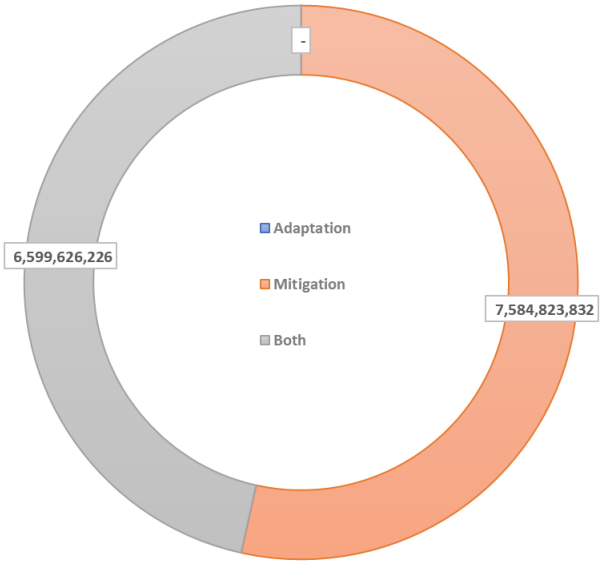


Figure 19 Total Value of Projects (in ETB) in the Forestry Sector by Climate Impact 2011-2019

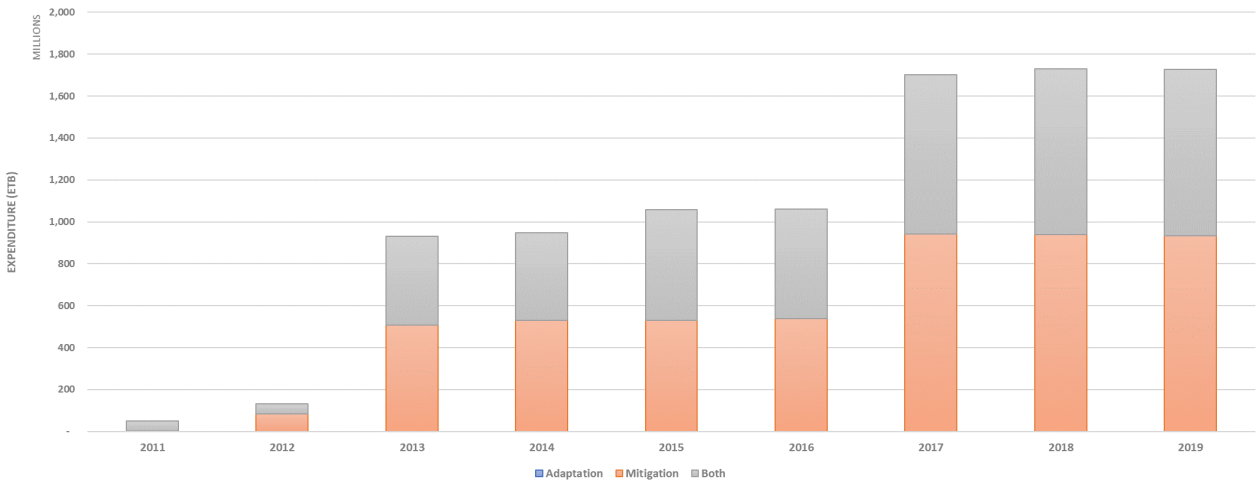


Figure 20 Annual Breakdown of Project Expenditure (in ETB) in the Forestry Sector by Climate Impact 2011-2019

6.4 INSTITUTIONAL ARRANGEMENTS AND CAPACITY: FORESTRY

6.4.1 CRGE RELATED INSTITUTIONAL ARRANGEMENTS

The CRGE functions in the Environment, Forests, and Climate Change Commission (EFCCC) fall within the purview of the Director General of Biodiversity and Climate Change, and the Deputy Commission of Forests. Below this level, forestry matters are handled by the Forest Sector Transformation Unit (FSTU), headed by a Director-level official. The FSTU interacts on a regular basis with other institutional entities within the EFCCC, including the MRV Directorate and the CRGE Facility's technical division. Other crucial institutional entities within the EFCCC that manage forestry initiatives are the REDD+ Secretariat

Like all other CRGE focal point bodies in key sector line Ministries, the FSTU's CRGE team submits to the CRGE Facility quarterly progress reports, annual progress reports, and annual MRV reports. The EFCCC is represented in the CRGE Inter-Ministerial Steering Committee, as well as the CRGE Management Committee, and Ministry representatives attend the half-yearly (annual and interim) review meetings of both these committees.

6.4.2 INSTITUTIONAL CAPACITY CHALLENGES AND GAPS

Literature review as well as direct engagement with the FSTU in the EFCCC, through purposive semi-structured interviews, indicated a range of constraints that is limiting the progress of the FSTU towards CRGE 2030 targets.

- The biggest challenge is loss of institutional memory due to staff turnover. This has led to the forestry sector as a whole in Ethiopia being somewhat unstable. Several Ministers have rotated through, and the sector has felt the effects of these periodic changes and inconsistencies;
- The other most pressing issue is the absence of systematic knowledge-management systems. There are no document repositories or archives. Key documents stay with individuals on their computers and then are often lost with them when they leave for other posts. No one knows what the extent of available documentation is on any given project or programme;
- There remains a need to build up strong technical capacity on forestry as a discipline, and in subjects like climate change. Staff capacity to integrate climate change into forestry is stymied by weak technical knowledge of climate change. Additional training and capacity development is needed on methods to detect forest cover change and forest degradation;
- The climate-forestry linkage needs specialized experts within the FSTU, and resources are needed to recruit such staff;
- The FSTU noted that MRV is also one of the major challenges. It is difficult to quantify the impacts and outputs of a project if there is no underlying reliable data for MRV. There is also a need to enforce strict standards on MRV so that the figures are reliable, verifiable, and accurate;

- The EFCCC (then the MEFCC) was involved in the Regional Capacity Building Programme's (RCBP's) Training of Trainers initiative. Due to the lack of regional and woreda level forestry institutions, regional bureaus of agriculture – which carry some forestry mandates at the regional and local level - participated in the RCBP (Ministry of Environment, Forests, and Climate Change , 2015);
- The FSTU has been involved in a number of training and capacity-building initiatives, including workshops, but these once-off events have not resulted in sustained, long-term enhancement of technical, administrative, or regulatory capacity. Something more sustainable and long-term is required;
- The need for more systemic capacity development was recognized in 2015 by the CRGE National Capacity Development Program report (based on a gaps and needs assessment). The report indicated that the areas where the EFCCC (then the MEFCC) needed the greatest enhancement of capacity included operational planning, resource utilization, knowledge of and exposure to climate change, climate change mainstreaming, integrating CRGE into forestry sector initiatives, experience with international climate change related funds, M&E, MRV, stakeholder engagement, and knowledge management (Federal Democratic Republic of Ethiopia, 2015), and
- Such capacity needs were also flagged in a 2015 review of lessons learnt from the CRGE FTI process (LTS International, 2015). While not specific to the forestry sector alone, the report highlighted issues across sectors that remain CRGE-linked challenges to date in the forestry sector in Ethiopia: low technical capability in finance and project management; a lack of understanding of the need for and approach to baseline-setting; limited understanding of performance metrics and KPIs and how to measure them; M&E; and data and information collection and management.

6.4.3 INSTITUTIONAL ARRANGEMENTS RECOMMENDATIONS MOVING FORWARD

i. Enhance human capacity by increasing the number of CRGE-focused staff and specialist climate change staff within the FSTU. Reduce staff turnover, including senior experts, by attracting and keeping permanent technical staff who will not rotate out. Maintain consistency in leadership;
ii. Empower the FSTU to engage with CRGE matters in the same way as other major sectors, by creating a formal CRGE unit within the FSTU, with clear lines of communication on CRGE issues;
iii. Enable the FSTU through more trainings and capacity building on MRV and climate change, and
iv. Equip the FSTU with effective knowledge management systems, including data and information management systems, MRV-oriented software, and necessary tools, and
v. Strengthen the FSTU's capacity and mechanisms to mobilize private sector involvement in forestry sector conservation and management, which has lagged behind intended targets.

6.5 POLICY: FORESTRY

6.5.1 CRGE STRATEGY FOCUS

At the point in time when the CRGE Strategy was developed, the forestry sector's share of Ethiopia's total greenhouse gas (GHG) emissions was an estimated 37%, i.e. well over a third, of the country's. This amounted to a total of ~55 MT CO_2e (from the 2010 baseline). Nearly half (50%) of all forestry emissions stemmed from deforestation for agricultural land, 46% of forestry emissions from forest degradation due to fuelwood (biomass) consumption, and the remaining 4% of forestry emissions from formal and informal logging.

The CRGE Strategy projected the forestry sector's emissions in 2030, finding that GHG emissions from the forestry sector are expected to grow by 35 MT CO_2e between 2010 and 2030, reaching a total of 90 MT CO_2e. The primary driver of this growth is deforestation due to an expansion of cropland for agriculture, with deforestation emissions expected to rise from 25 MT CO_2e in 2010 to 45 MT CO_2e in 2030. A secondary driver is degradation of forest land, spurred by a population growth-linked increase in fuelwood collection. Emissions from such degradation are also projected to rise from 25 MT CO_2e in 2010 to 45 MT CO_2e in 2030. (Federal Democratic Republic of Ethiopia, 2012).

It is important to note that the CRGE Strategy identified the forestry sector as the source of the largest abatement potential out of the total 2030 abatement target. In fact, forestry (afforestation, reforestation, and forest management) on 5 million ha of forest and 2 million ha of woodland alone represents around 50% of Ethiopia's domestic abatement potential (or 130 MT CO_2e). Specifically, afforestation (2 million ha), reforestation (1 million ha),

and forest management (2 million ha of forests and 2 million ha of woodlands) can increase sequestration by more than 40 MT CO_2e. Reducing pressure from agriculture on forests by agriculture intensification on existing land, and by restoring degraded agricultural land into cultivable land again is expected to reduce ~40 Mt CO_2e in 2030.

There is also extraordinary abatement potential from interventions that reduce demand for fuelwood, such as efficient stoves, at nearly 35 MT CO_2e reduction (contingent on 20 million households switching to clean and efficient cookstoves). Other advanced cooking and baking technologies that also reduce reliance on primary energy or biomass (electric, biogas, and LPG stoves) represent a combined potential to reduce more than 15 MT CO_2e (Federal Democratic Republic of Ethiopia, 2012).

In light of where the biggest sources of forestry emissions and emissions growth are, i.e. deforestation due to agricultural expansion, and degradation due to biomass collection, the CRGE strategy's focus on reducing these two categories of GHGs was both strategic and optimal.

The CRGE strategy highlighted that its strategic objective for the forestry sector was protecting and re-establishing forests for their economic and ecosystem services, including as carbon stocks.

It summarized the key areas of intervention as follows:

- Reducing demand for fuelwood via the dissemination and usage of fuel-efficient stoves and/or alternative-fuel cooking and baking techniques (such as electric, LPG, or biogas stoves) leading to reduced forest degradation;
- Increasing afforestation, reforestation, and forest management to increase carbon sequestration in forests and woodlands, and
- Promoting area closure via rehabilitation of degraded pastureland and farmland, leading to enhanced soil fertility and thereby ensuring additional carbon sequestration (above and below ground).

6.5.2 OTHER RELEVANT CRGE-LINKED POLICIES

In the context of assessing the progress of *implementation of the CRGE Strategy* (as opposed to assessing overall progress in the forestry sector's development in Ethiopia), three main policy developments since 2011 in the forestry sector are relevant to gauging progress on the CRGE strategy (depicted in Table 15 Policy Development relevant to the CRGE: Forestry below).

Policy Instrument	Year	Focus and Objective	Originator / Developer	Institutional Responsibility
Ethiopia's Climate Resilient Green Economy: Climate Resilience Strategy – Agriculture and Forestry Sector	2015	The strategy's objective is to ensure that economic growth in the agriculture and forestry sectors is climate resilient. The strategy identifies the impacts of climate variability and climate change on Ethiopia; highlights options for building climate resilience; and provides guidance on how these options can be financed and implemented.	GGGI	Ministry of Agriculture; EFCCC
Draft Biomass Energy Strategy of Ethiopia	Developed in 2013 but not yet finalised (validation workshops are in progress)	In recognition of the dominant role of biomass in meeting Ethiopia's energy needs, as well as the degradation caused by biomass harvesting, the strategy's overall aim is to ensure the sustainable use of biomass for the socio-economic and environmental benefit of Ethiopians – i.e. access to affordable and sustainable biomass for all by 2030.	EUEI	Ministry of Water and Energy, Ethiopia; EFCCC

Ethiopia's REDD++ Strategy	2018	A national strategy for reducing emissions from deforestation and forest degradation, in adherence with the UN-REDD programme.		EFCCC
Forest Law (revised)	2018	Law that recognizes the rights of communities and acknowledges their role in managing natural forests and establishing plantations, without unduly compromising ecological services or biodiversity. Includes references to climate change adaptation.		EFCCC
Ten-Year Forest Sector Development Programme	2018	Guiding document for coordinating strategic policy interventions so as to increase the national forest coverage and its contribution to national green growth	UNDP, Governments of Norway and Sweden	EFCCC

Table 15 Policy Development relevant to the CRGE: Forestry

The CRGE climate resilience strategy for the agriculture and forestry sector (Federal Democratic Republic of Ethiopia, 2015) complements the CRGE Strategy, bringing a resilience and adaptation perspective to the sectors that the CRGE strategy discussed solely from a mitigation viewpoint.

The sector strategy points to 41 priority climate resilience options that fall within broad categories:

- Capacity-building and institutional coordination;
- Information and awareness;
- On-farm crop and water management;
- Livestock,; Value chain and market development;
- Sustainable agriculture and land management;
- Natural resources conservation and management;
- Disaster risk reduction, and
- Societal production for high-priority groups including women and children.

The strategy has a stronger focus on agriculture than on forestry, but nevertheless includes key forestry-related strategic interventions that can contribute to adaptation, such as land use planning, forest monitoring, pest and disease control, payment for ecosystem services etc.

The Draft Biomass Energy Strategy (Ministry of Water and Energy, 2013) lays out five strategic objectives (and further identifies a range of activities to be undertaken to achieve each of the five):

- Ensuring an adequate and sustainable supply of biomass to keep pace with future demand;
- Increasing the efficiency of charcoal and the biomass value chain;
- Promoting the use of fuel-efficient cookstoves;
- Strengthening institutional capacity to manage biomass, and
- Aligning biomass use with the CRGE strategy and national energy policy.

The biomass strategy's promotion of clean cookstoves is directly aligned with the CRGE Strategy's emphasis on the same.

Ethiopia's national REDD++ Strategy is explicitly linked to forestry sector interventions that yield measurable mitigation outcomes from reforestation and afforestation.

A new land policy in Ethiopia has also been developed and is awaiting approval from the Prime Minister's office.

6.5.3 GAPS IN THE CRGE STRATEGY'S APPROACH TO AGRICULTURE AND LIVESTOCK

A notable gap in the CRGE Strategy was the focus on mitigation, to the detriment of adaptation. Given Ethiopia's drive towards middle-income country status by 2025 and the government's commitment to accelerated economic growth, the CRGE Strategy viewed Ethiopia's green economy through the lens of climate change mitigation. The CRGE Strategy's was framed largely as an instrument that could point to economic growth pathways in a sustainable manner, without contributing to higher emissions. One consequence of this approach, however, is the neglect of climate change resilience and adaptation. The CRGE strategy is completely silent on the impacts of climate change on the forestry livestock sector, the vulnerabilities of the sector and the risks it faces from climate change, and what the sector should do to enhance its adaptive capacity against climate change related hazards, to make itself more resilient despite ever-increasing climatic shocks and stresses.

The adaptation oversight in the CRGE Strategy was remedied in the climate resilience sector strategy for agriculture and forestry (mentioned above), which affirmed that in addition to mitigation, the sectors must also undertake climate change resilience efforts by reducing vulnerabilities and strengthening adaptive capacity.

More recently, in 2017, Ethiopia developed a comprehensive National Adaptation Plan (NAP) (Federal Democratic Republic of Ethiopia, 2019). The NAP prioritizes 18 adaptation options across the most vulnerable sectors, including forestry. Adaptation option number 3 speaks of strengthening sustainable natural resource management through safeguarding landscapes and watersheds, and adaptation option 6 affirms improving ecosystem resilience through conserving biodiversity (which implicates forest conservation). Crucially, adaptation option number 7 emphasizes enhancing sustainable forest management. Ethiopia now also has GE and NAP roadmaps to 2030, including for this sector.

Since the climate resilience sector strategy for agriculture and forestry plus the NAP have both addressed the adaptation gap in the CRGE Strategy and have identified priority channels to increase adaptive capacity in forestry, it is recommended that both these key documents be fully and effectively implemented to ensure climate resilience in this sector. ***Specific first steps beyond the formal adoption of the NAP would be to undertake detailed climate change risk and vulnerability assessments for major tree species in Ethiopia (particularly in relation to climate-sensitive diseases, pests, and parasites); to use these evidence-based assessments to identify crucial vulnerabilities to be reduced and the associated specific, targeted interventions to build adaptive capacity and reduce vulnerability; to develop detailed adaptation plans for the tree species that emerge as the most vulnerable or at-risk; and track, monitor, measure, evaluate, and report on the progress made in improving adaptive capacity and reducing vulnerability of forestry trees.*** Examples of specific response measures can be drawn from the IPCC, and from global scientific peer reviewed literature.

6.5.4 POLICY RECOMMENDATIONS MOVING FORWARD

Mitigation:

- Mobilize and allocate resources for the complete implementation of Ethiopia's National REDD++ Strategy.

Adaptation:

- Mobilize and allocate resources for the complete implementation of Ethiopia's National Adaptation Plan (NAP), including in the forestry sector, and for the complete implementation of the CRGE climate resilience sector strategy for agriculture and forestry.
- Promote the undertaking of climate change vulnerability and risk assessments for major tree species relevant for forestry, to enable to identification of key vulnerabilities and corresponding strategic interventions to reduce vulnerability and build adaptive capacity of forest stock against climate change impacts.

Crosscutting:

- Ensure that all major governance instruments developed in the forestry sector explicitly mainstream climate change considerations (both mitigation and adaptation) and align with the goals and objectives of the CRGE strategy.

7 Water and Energy

- As with most energy projects, the main focus in the sector is on mitigation.
- The main projects in the areas of water and energy focused on power generation, energy access, irrigated and commercial agriculture, access to WASH, and cross-cutting priorities.
- Areas of future focus include securing the funds to implement initiatives at scale, as well as ensuring the long-term sustainability of interventions.

7.1 ADAPTATION: WATER AND ENERGY

The Ministry of Water, Irrigation and Energy (MoWIE) recognises that the provision of assured, sustainable, clean and affordable water and energy are prerequisites to inclusive, resilient economic development. With national ambitions of becoming a middle-income country by 2025, MoWIE developed a Climate Resilient Strategy for the Water and Energy sector (CRS-WE), that complements the 2011 CRGE through enhanced analyses – including deeper insights into the adaptation components of the sector – and concretised strategic priorities and responses (Federal Democratic Republic of Ethiopia, 2015). Given the relative recency of the CRS-WE, this sector-wise chapter considers adaptation progress against the priorities set out in the CRS-WE. While some strategic priorities relate primarily to energy and others to water, they broadly reflect common adaptation threads: the need for greater diversification at macro and micro-scales; improved access and self-sufficiency of systems; and enhanced M&E/DSS[20] systems and capabilities to improve decision-making around water-energy-food balances – all of which contribute to enhancing the adaptive capacity of individuals, settlements and the sector as a whole. The following subsections therefore present progress against *relevant* CRS-WE priorities (and the interlinkages between these), as well as the adaptation indicators in the 2018 CRGE Monitoring Framework (CGIAR, 2018). It also identifies linkages to the NAP adaption options of relevance to this sector (Federal Democratic Republic of Ethiopia, 2019).

Many projects within this sector were funded and managed by the CRGE Facility, through its Fast Track Investment (FTI) programme, which ran for the period of 2014-2017. These FTI project results are largely well-documented (in 2017, and again in 2019), and thus form a useful basis upon which to assess the sector's progress against strategic priorities. A significant number of donor-funded[21] water and energy programmes have also been (and continue to be) implemented since 2011; however, only a limited number of these programme progress / evaluation reports are readily available online. It is therefore important to acknowledge that the progress reported below does not fully reflect the important contributions made by donor initiatives operating in this sector.

7.1.1 ADAPTATION IN THE WATER AND ENERGY SECTOR 2011 - 2019

7.1.2 STRATEGIC PRIORITY 1: POWER GENERATION

The resilience of the national energy mix lies in its diversity, reliability (both now and in the future), cost effectiveness /affordability and transmission footprint. With hydropower generation being intrinsically linked to rainfall, and rainfall expected to become increasingly variable, there is a need to **diversify the energy mix** *(Strategic Priority 1.1*) so that shortfalls can be met through a range of renewable sources rather than i) diesel generation, and ii) solely hydropower (from a renewable perspective). The 2014 Power Sector Expansion Masterplan, and more recent GTP Plan II (2016 – 2020), reflect this critical adaptation measure, and several large-scale energy projects implemented in recent years indicate some progress toward achieving this objective. The contribution of smaller-scale renewable

[20] Decision support systems
[21] Major contributors include the World Bank, JICA, USAID, UNDP and AfDB

energy projects is also critical to diversification, but specific projects are described in more detail under *Strategic Priority 2.2* (**Accelerate non-grid energy access**).

The 2019 'Environment, Forest and Climate Change Commission Performance Contract in Ethiopia' report of the CRGE presents an overview of the nature and scale of electricity expansion in recent years (CRGE, 2019):

- An additional 2,124MW of hydropower has been developed (Gilgel Gibe III, Genale Dawa III), with a further 2,800MW at planning and construction stages (Genale Dawa IV, Koysha and Geba) (Salini Impregilo, 2019) (Hydro Review, 2014);
- 273MW of wind power has been developed (Ashegoda and Adama Wind Farms I & II) (The Wind Power, 2017), and
- 100MW Metahara Solar PV Plant is at the final design stages (MultiConsult, 2019).

These expansion efforts have led to over 600 000 household now having access to grid electricity (CRGE, 2019), and provide increased opportunity to participate in regional energy markets – which further enhances the resilience of Ethiopia's energy mix. Linked to this, it is also important to note that Ethiopia is involved in several regional donor-funded energy initiatives such as the *Scaling Up Renewable Energy Program* (SREP)[22], *Lighting Africa* and the *Renewable Energy Performance Platform* (CDKN, 2017). However, to date there is limited publicly available data on the national impact of these regional programmes, barring *Lighting Africa*, which has tracked 11.4 million beneficiaries in Ethiopia, as a result of the 2.2 million solar products sold and distributed (Lighting Africa, 2018).

This strategic priority contributes to the NAP adaption option on 'Enhancing alternative and renewable power generation and management' (Federal Democratic Republic of Ethiopia, 2019). The option focuses on ensuring the sustainability of the power sector through diversification, increased off-grid access and improved energy efficiency. Rather than tracking energy expansion (in MW), this objective tracks i) the percentage of the population (disaggregated[23] by sex) with stable access to renewable / alternative energy sources, and ii) number of energy systems designed to take climate change into account. Responsible entities need to ensure monitoring processes are guided by methodological approaches that can be applied consistently – for example, by providing guidance on disaggregation of beneficiary counts, and developing an approach for determining whether (and how) a system considers climate change in its design and operation.

7.1.3 STRATEGIC PRIORITY 2: ENERGY ACCESS

Given Ethiopia's expansive, challenging geography, providing grid connections to the entire population is not economically or technically feasible in the foreseeable future. The CRS-WE therefore proposed two primary approaches to increasing energy access: **improving efficiency of biomass** (*Strategic Priority 2.1*) through adoption of biogas technologies and cookstove promotion and **accelerating non-grid access** (*Strategic Priority 2.2*) through decentralised, renewable systems. The latter strategic priority links closely with *Strategic Priority 4.1* (**accelerate universal access to WASH**), given these solar systems are typically designed to power/pump water supply schemes for domestic and livelihood purposes.

Notable progress had been made under this priority:

- 10,134 biogas plants have been built nationwide, enabling the equivalent number of households shifting from firewood burning to biogas (CRGE, 2019);
  Several key projects focussed on biogas development and roll-out – ranging from large-scale initiatives like the national *Biogas Dissemination Scale-up Project* and the Norwegian-funded *CRGE Energy Plus Program,* which has installed 1666 biogas plants to date (Ethio Resource Group); to smaller-scale schemes like the *FTI Accelerating Biogas Programme* which has constructed 17 household biogas digesters (Ministry of Finance and Economic Cooperation, 2017), and
- 11,488 solar home systems have been distributed, with over 4,000 home systems and 24 institutional systems installed (for schools and health stations) (CRGE, 2019)

[22] Which includes several national projects, such as the Geothermal Sector Development Project and Assela Wind Farm Project

[23] While beneficiary indicators do appear to be captured for most projects, available data is largely not disaggregated

Three projects made significant contributions to these targets:

- The *CRGE Energy Plus Program* distributed 4,950 solar home systems and 12 institutional systems (training 20 technicians in the process), benefitting 24,800 people (ERG);
- The *FTI Water Solar Power for Water and Irrigation Supply* project installed 42 solar water pumping systems (training 3 persons per site, in the process), benefitting 157,671 people (Ministry of Finance and Economic Cooperation, 2017), and
- The *FTI Improving the Livelihoods and Lifestyles of Rural Community of the Emerging Regional States through the Dissemination of Solar Energy Technologies* project distributed 3,273 solar home systems (of which 3,194 are being used), 24 institutional systems (of which four have been installed), 6,593 solar lanterns – collectively benefitting 52,985 people (Ministry of Finance and Economic Cooperation, 2017).

This priority also contributes to the same NAP objective noted under Strategic Priority 1.1

7.1.4 STRATEGIC PRIORITY 3: IRRIGATED AND INDUSTRIAL AGRICULTURE

This strategic priority adopts a threefold lens to ensuring a sustained, resilient agriculture sector – through the **acceleration of irrigation plans** (*Strategic Priority 3.1*) to increase productivity and reduce the vulnerability of the sector to climate change, whilst also acknowledging and **supporting** the important socio-economic role of **rainfed agricultural** practices (*Strategic Priority 3.2*), and ensuring **water demands are balanced** through improved watershed management and allocation of available water (*Strategic Priority 3.3*) (Federal Democratic Republic of Ethiopia, 2015). The latter priority ties in closely with *Strategic Priority 5.1* (**data systems for decision support**).

Adaptation in the agriculture sector is analysed in depth in section 4, meaning this sub-section focuses specifically on energy and water related initiatives that have contributed to enhancing the resilience of the agricultural sector through adaptation approaches. From an irrigation perspective, almost 165,000ha of land, across eight medium-to-large-scale schemes, have been prepared for irrigation – directly contributing to increased food security and reduced reliance on rainfed agriculture practices (CRGE, 2019). Whilst operating on a relatively smaller scale, the *CRGE Energy Plus Program* has also developed 17 boreholes for irrigation (capturing groundwater data in the process), and in doing so, employed 11,223 males and 1,247 females (ERG). The *CRGE Energy Plus Program* also includes a watershed management component, whereby over 100,000ha of damaged land (across six sites) has been developed to support sustainable land management, for the benefit of local livelihoods – including rainfed agriculture (ERG).

The 2019 CRGE 'Environment, Forest and Climate Change Commission Performance Contract in Ethiopia' report also noted over 1million ha of rehabilitated land, and an increase in coverage of basin and hydrological information systems, from 25% to 63%. The *FTI Strategic Support Upgrading Climate and Hydrological Information Systems* project contributed to this, through the installation of 25 automated water level and quality recorders at select sites to inform on-going decision-making around allocation as well as disaster risk reduction initiatives (Ministry of Finance and Economic Cooperation, 2017).

It will be critical to continue tracking progress against these priorities, as they directly feed into the NAP adaption option on 'Improving soil water harvesting and water retention mechanisms', which has a broad focus spanning: improved water allocation approaches, increased irrigation agriculture, as well as context-specific watershed management approaches such as soil moisture retention, water harvesting technologies, etc (Federal Democratic Republic of Ethiopia, 2019).

7.1.5 STRATEGIC PRIORITY 4: ACCESS TO WASH

Ethiopia's One WASH National Program (OWNP) is considered a critical cornerstone to enhancing the adaptive capacity of communities, by accelerating universal **access to WASH** infrastructure and services (*Strategic Priority 4.1*), with a strong focus on the provision of **climate resilient self-supply** systems (*Strategic Priority 4.2*) (Federal Democratic Republic of Ethiopia, 2015). These priorities directly align with the NAP adaptation option on 'improving access to adequate water', although the NAP places increased (or at least, more explicit) emphasis on improved water-use efficiencies (of systems and by users), improved water supply and sanitation mapping (to better inform decision making), and diversifying renewable water pumping technologies (beyond solar, to include wind).
Through a range of CRGE activities, it was reported earlier this year that 18.5 million people (from urban and rural settlements) have been provided access to safe drinking water (CRGE, 2019). Donors have also been active in this

space, where it is understood funds are largely channelled through and/or coordinated under the OWNP banner. A snapshot of these projects (which have publicly reported progress/end results) include:

- The *CRGE Energy Plus Program,* which replaced 54 diesel powered water pumped with solar powered pumps (ERG);
- The AfDB-funded *Harar Water Supply and Sanitation Project: Improving Livelihoods and Enhancing Water Security in Ethiopia* project which is providing 250,000 people with adequate water supply (African Development Bank Group, 2013);
- The USAID-funded *Water Sanitation and Hygiene Transformation for Enhanced Resiliency* (WaTER) project (also referenced in the Health chapter) which provided 221,504 beneficiaries with access to improved water access, through the construction 22 new and 19 rehabilitated boreholes (USAID, 2014);
- The JICA-funded *Jerer Valley and Shebele Sub-basin Water Supply Development Plan, and Emergency Water Supply* project which implemented 16 water supply projects across two towns and 12 woredas, with an estimated 56,000 beneficiaries (JICA, 2018), and
- The USAID-funded *Lowland Water, Sanitation and Hygiene Activity* which has, to date, installed 150 sensors in boreholes in Afar and 70 community member trained on monitoring and operation – with the ultimate aim of ensuring 200,000 people in lowlands areas have assured access to water supply (USAID, 2019).

The water and energy adaptation indicators set out in the 2018 CRGE Monitoring Framework closely align with these localised, WASH-focussed strategic priorities. They include:

- 'Activities performed to protect surface and groundwater from pollution;
- Number of people using springs and wells that use renewable energy technologies, and
- Measures to decrease wastage of water by suppliers and consumers' (CGIAR, 2018)

However, activities relating to water pollution prevention and conservation do not seem to be implemented at scale and/ or are not being well-documented. To adequately make progress on the above first and third indicators, efforts must be invested in rolling these activities out and ensuring they are properly tracked.

7.1.6 STRATEGIC PRIORITY 5: CROSS-CUTTING RESPONSES

The CRS-WE recognises the cross-sectoral challenge of inadequate data and weak data collection systems, which impede decision-makers' ability to proactively plan for, and respond to, climate change. Improved **data systems for decision support** (*Strategic Priority 5.1*) is therefore key to effectively **accelerating the delivery** (and subsequent M&E) **of existing sectoral plans**[24] (*Strategic Priority 5.2*).

Notable progress has been made against these cross-cutting priorities, ranging from capacity building of 550 woreda CRGE experts in the water, irrigation and energy sector, to technological advancements around climate information services through improved daily, weekly, monthly, quarterly and seasonal weather forecasts. (CRGE, 2019). Specific contributions of the CRGE FTI *Strategic support upgrading climate and hydrological information systems* project in upgrading the connection capability of MoWIE's hydrological telemetry data transmissions, developing a strategic programme for upgrading data systems, and providing training on the use of telemetry equipment (including actual installation and database management) (Ministry of Finance and Economic Cooperation, 2017).

In addition, over the reporting period covered in the 2019 CRGE's 'Environment, Forest and Climate Change Commission Performance Contract in Ethiopia', the sector reviewed, monitored and supervised 75 ESIA's. Tracking these ESIAs is a standard adaptation action (across most sectors) in the 2018 CRGE Monitoring Framework, and it will therefore to crucial to continue developing a database of countrywide ESIAs.

7.1.7 FUTURE FOCUS

While it is clear that significant progress has been made toward advancing adaptation efforts in the Water and Energy sector since 2011, significant investment is still required to attain the ambitious targets set out in the GTP II, CRS-WE and the NAP. Beyond securing the funds to implement initiatives at scale, due focus must be placed on ensuring the long-term sustainability of interventions (noted as a challenge in several donor-funded post-evaluation reports). This is particularly critical given the largely localised, self-sustaining approach taken to providing improved water and energy access.

[24] noting these plans are largely aligned to the CRGE

7.2 GTP II REPORTING

Since 2015, implementation of the CRGE has been mainstreamed into Ethiopia's GTP-II. The GTP-II Mid-Term Review (Federal Democratic Republic of Ethiopia, 2018) attests to the water and energy sector's efforts to make progress on CRGE-related activities, in the form of alternate energy sources (section 3.7.2). Priority interventions under GTP-II that aligned with CRGE's policy focus included distribution of: biogas technology units, charcoal making units, biogas briquettes, solar lanterns, household solar systems, and institutional solar PV systems. Additionally, CRGE-linked activities under GTP-II included the building of a number of mini hydro plants on rivers. The scale and number of such technologies distributed saw a sharp fall from 2014-2015 to subsequent years 2015-2016, and 2016-2017) due to lack of finances, and there was only modest achievement of targets (most targets were not met, except for biogas briquettes and solar lanterns). Nevertheless, Ethiopia estimates that in 2016 the distribution of solar technologies accounted for 1200 tons of avoided CO_2 emissions.

7.3 FINANCE: WATER AND ENERGY

The water and energy sector accounts for 48 of the 224 projects analysed, with a combined value of ETB 73.8 billion through the 2011-2019 period, making it the third largest after agriculture and transport.

Of the 48 water and energy projects, 14 have an adaptation impact, 30 a mitigation impact, and four focus on both.

Mitigation projects make up a substantial majority of the sector's value, totalling ETB 67.0 billion. The largest projects here include the Scaling Up Renewable Energy Projects in Low Income Countries initiative, the Ethiopia Electrification Project, the Ethiopia Electricity Network Reinforcement and Expansion Project, and the Geothermal Sector Development Project. Adaptation-focused projects make up a total of ETB 6.6 billion, dominated by the Four Towns Water Supply and Sanitation Improvement Program in Ethiopia. Projects focused on both make up the balance of ETB 247.0 million.

Considering the annual breakdown of expenditure in the sector from 2011 to 2019, the total is ETB 24.3 billion (with several large projects due to complete beyond 2019). From 2013, the sector has demonstrated strong and consistent expenditure peaking at ETB 4.1 billion in 2017, with only a dip in 2018.

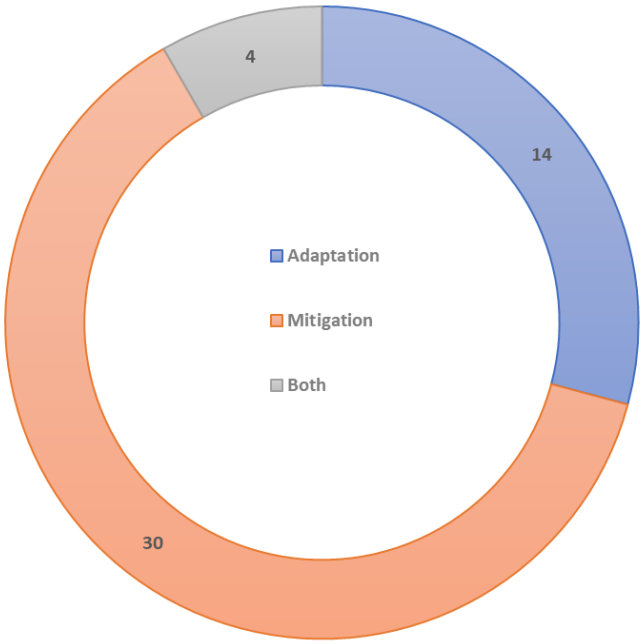


Figure 21 Number of Projects in the Water and Energy Sector by Climate Impact 2011-2019

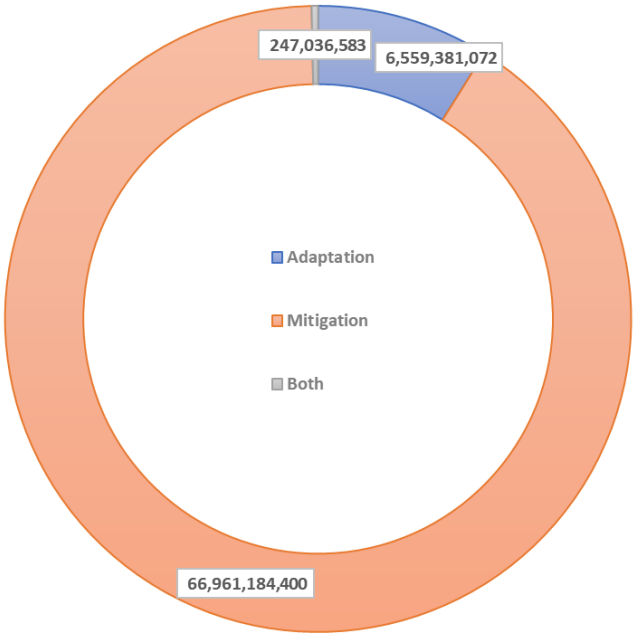


Figure 22 Total Value of Projects (in ETB) in the Water and Energy Sector by Climate Impact 2011-2019

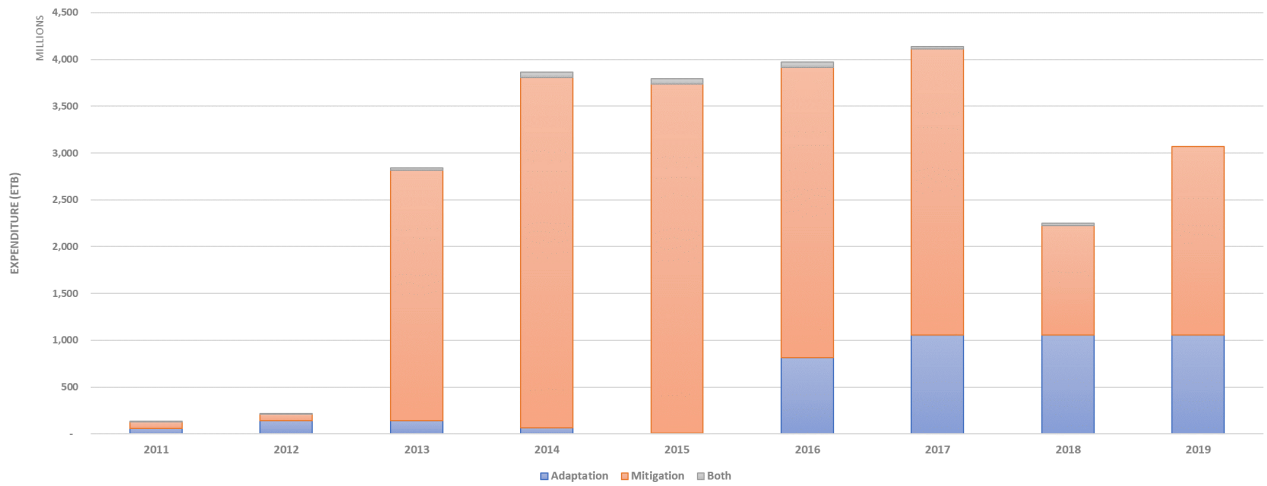


Figure 23 Annual Breakdown of Project Expenditure (in ETB) in the Water and Energy Sector by Climate Impact 2011-2019

7.4 INSTITUTIONAL ARRANGEMENTS AND CAPACITY: WATER AND ENERGY

7.4.1 CRGE RELATED INSTITUTIONAL ARRANGEMENTS

The Ministry of Water and Energy has an Environment and Climate Change Directorate, headed by a Director-level official. CRGE-related functions sit within this Directorate. The Directorate interacts on a regular basis with other institutional entities within the Ministry, including basin authorities, electric utilities, and over 20 other Directorates.

Like all other CRGE focal point bodies in key sector line Ministries, the Environment and Climate Change Directorate submits to the CRGE Facility quarterly progress reports, annual progress reports, and annual MRV reports. The Ministry is represented in the CRGE Inter-Ministerial Steering Committee, as well as the CRGE Management Committee, and Ministry representatives attend the half-yearly (annual and interim) review meetings of both these committees.

7.4.2 INSTITUTIONAL CAPACITY CHALLENGES AND GAPS

Literature review as well as direct engagement with the CRGE Directorate in the Ministry of Water and Energy, through purposive semi-structured interviews, indicated the following:

- The Ministry of Water and Energy was allocated funds for five CRGE Fast Track Investment (FTI) projects – (a) solar power for water supply and irrigation; (b) accelerating the national biogas program; (c) strategic support to improve water monitoring systems; (d) strengthening the monitoring of downstream petroleum operations; and (e) improving access to solar technologies. Progress was made on the implementation of all five;
- The number of staff in the Directorate is insufficient for the scale of operations and the potential CRGE-related activities that could be undertaken in the water and energy sector. Staff also face significant time pressures, due to balancing day-to-day administrative responsibilities with engagement of development partners and donors.
- Data and information collection and organization – i.e. knowledge management – was identified as an area for strengthening. There is no centralised repository or database;
- Several training workshops and events have helped bolster staff technical capacity over the years, but there is still a need for a higher level of capacity in the Directorate. The Ministry of Water and Energy was involved in the Regional Capacity Building Programme's (RCBP's) Training of Trainers initiative, and even regional bureaus of water and energy participated in the RCBP (Ministry of Environment, Forests, and Climate Change , 2015). Despite such efforts, there remains a need for sustained, long-term enhancement of technical, administrative, or regulatory capacity;
- The need for more systemic capacity development was recognized in 2015 by the CRGE National Capacity Development Program report (based on a gaps and needs assessment). The report indicated that the areas

where the Ministry needed the greatest enhancement of capacity included operational planning, integration of climate risk into project and programme planning and designs, knowledge management systems, financial planning and budgeting, mainstreaming and integration of CRGE considerations into sectoral planning, resource mobilization, M&E, and project management (Federal Democratic Republic of Ethiopia, 2015), and

- Such capacity needs were also flagged in a 2015 review of lessons learnt from the CRGE FTI process (LTS International, 2015). While not specific to the water and energy sector, the report highlighted issues across sectors that remain CRGE-linked challenges to date in the water and energy sector in Ethiopia: low technical capability in finance and project management; a lack of understanding of the need for and approach to baseline-setting; limited understanding of performance metrics and KPIs and how to measure them; M&E; and data and information collection and management.

7.4.3 INSTITUTIONAL ARRANGEMENTS RECOMMENDATIONS MOVING FORWARD

i. Enhance human capacity by increasing the number of CRGE-focused staff, and by providing more regular, recurrent trainings for upskilling,
ii. Empower the Environment and Climate Change Directorate in the Ministry of Water and Energy with a stronger legal framework and mandate to influence and guide the activities of other directorates and authorities within the Ministry in relation to climate change mitigation and adaptation. At present, CRGE related considerations are not being adequately mainstreamed into all parts of the Ministry,
iii. Enable the Directorate with an expanded budget and more financial resources, and
iv. Equip the Directorate with effective knowledge management systems, including data and information management systems, MRV-oriented software, and necessary tools.

7.5 WATER AND ENERGY: POLICY

7.5.1 CRGE STRATEGY FOCUS

One of the distinctive features of the CRGE Strategy is its coupling of certain sectors based on Ethiopia's institutional arrangements, instead of examining climate mitigation and adaptation issues of such 'conjoined' sectors distinctly. An example is the treatment of water and energy. The water sector and the energy sector (including electric power) each have a range of unique climate change priorities and concerns, given how climate change interacts with water as a resource and how it interacts quite distinctly with energy resources. The standalone nature of water and energy in the context of climate change is evidenced in many countries' national policies and strategies, and in global literature such as the IPCC reports, where each sector is typically represented in its own chapter (wherein the water sector often encompasses water supply and sanitation, water reticulation, water quality management, integrated water resources management etc., and the energy sector often covers primary energy sources such as biomass, as well as engineered solid and liquid fossil fuels, electric power from renewable and non-renewable sources etc.). The water sector and energy sector are also driven by highly distinct climate change mitigation and adaptation imperatives, with the energy sector being a major target for mitigation, and the water sector for adaptation.

In the Ethiopian context, however, the centrality of water resources to electric power generation (given that the majority of Ethiopia's electricity comes from hydropower), and the intrinsic link between the two (including the power and energy-intensive infrastructure required for water supply across the landscape) has led to a single institution, i.e. the Ministry of Water and Energy, being at the helm of governance across both sectors. For this reason, the CRGE Strategy treats water and energy as a unified thematic area. This section on policy and the subsequent section on institutional arrangements will therefore do the same.

At the point in time when the CRGE Strategy was developed, the water and energy sector's share of Ethiopia's total greenhouse gas (GHG) emissions was just 3% at a total of ~5 MT CO_2e (from the 2010 baseline). These emissions were attributable to the use of fossil fuels and biomass for domestic heating, as well as diesel power plants and off-grid generators.

The CRGE Strategy projected that even under a Business-As-Usual (BAU) trajectory, there would be no growth in emissions of the water and energy sector between 2010 and 2030, due to the transition to 100% renewable energy and the meeting of any growth in power demand with low-carbon electricity (hydropower, wind, solar, and geothermal). Thus, emissions in 2030 are estimated to remain ~5 MT CO_2e. For this reason, the CRGE Strategy

recognized no domestic abatement potential from the water and energy sector. ***In other words, Ethiopia's 64% reduction of GHGs from the 2030 BAU to the 2030 CRGE target do not involve any targeted reductions from the water and energy sector.***

Outside of the 64% (approximately 250 MT CO_2e) Ethiopian CRGE target, the CRGE Strategy did estimate that *if* Ethiopia's electricity generation capacity in 2030 exceeds its domestic demand and consumption, then it may be in a position to export up to 28 TWh of low-carbon, renewable power to regional markets, displacing a more carbon-intensive regional electricity mix. In this scenario, another 19.3 MT CO_2e of global GHG reductions could be attributed to Ethiopia's efforts (Federal Democratic Republic of Ethiopia, 2012).

Even without an abatement target, the water and energy sector in Ethiopia has to undertake concrete climate change mitigation initiatives to ensure that growing energy demand will continue to be met by growth in renewable, low-carbon energy, to keep emissions growth in 2030 to 0.

In recognition of the fact that Ethiopian water and energy sector needs to grow low-carbon energy at pace with growing power demand, the CRGE strategy highlighted key areas of intervention that had potential to avoid GHG emissions growth in the power sector:

- Exploiting the potential for renewable energy from hydropower, geothermal, wind, and solar power, and
- Utility-scale energy efficiency measures and consumer-oriented demand-side-management.

7.5.2 OTHER RELEVANT CRGE-LINKED POLICIES

In the context of assessing the progress of *implementation of the CRGE Strategy* (as opposed to assessing overall progress in the water and energy sector's development in Ethiopia), three policy developments since 2011 in the energy sector are relevant to gauging progress on the CRGE strategy (depicted in Table 16 Policy Development relevant to the CRGE: Water and Energy below).

Policy Instrument	Year	Focus and Objective	Originator / Developer	Institutional Responsibility
Ethiopia's Climate Resilient Green Economy: Climate Resilience Strategy – Water and Energy Sector	2015	The strategy's objective is to identify the economic and social impacts of climate variability and climate change on water and energy in Ethiopia; to identify priority options through which the water and energy sectors can build climate resilience and reduce the impacts of climate variability and climate change, and to provide guidance on possible means to finance and implement such climate resilience measures.	GGGI	Ministry of Water and Energy, Ethiopia
Draft Biomass Energy Strategy of Ethiopia	Developed in 2013 but not yet finalised (validation workshops are in progress)	In recognition of the dominant role of biomass in meeting Ethiopia's energy needs, as well as the degradation caused by biomass harvesting, the strategy's overall aim is to ensure the sustainable use of biomass for the socio-economic and environmental benefit Ethiopians – i.e. access to affordable and sustainable biomass for all by 2030.	EUEI	Ministry of Water and Energy, Ethiopia
Ethiopia's National Energy Policy	2013	The policy provides updated guidance for the energy sector as a whole, including for the promotion		Ministry of Water and Energy, Ethiopia

		and development of renewable energy. In the context of climate change adaptation, the main approach under the policy is to caution against the impacts of climate change on Ethiopia's hydropower systems and the potential power supply disruptions this can cause.		

Table 16 Policy Development relevant to the CRGE: Water and Energy

The CRGE climate resilience strategy for the water and energy sector (Federal Democratic Republic of Ethiopia, 2015) complements the CRGE Strategy's focus on mitigation with strategic approaches towards adaptation. It identifies four priority sub-sectors within which it puts forward ten priorities:

- **Electric Power;**
  - Diversify the energy mix,
  - Increase energy efficiency,
- **Access to Energy;**
  - Enhance biomass efficiency,
  - Expand off-grid energy,
- **Irrigated Agriculture;**
  - Accelerate irrigation plans,
  - Strengthen rainfed agriculture,
  - Balance water demands,
- **Access to Water, Sanitation, and Hygiene (WASH)**
  - Accelerate access to WASH, and
  - Enhance self-supply.

The Draft Biomass Energy Strategy (Ministry of Water and Energy, 2013)lays out five strategic objectives (and further identifies a range of activities to be undertaken to achieve each of the five):

- Ensuring an adequate and sustainable supply of biomass to keep pace with future demand;
- Increasing the efficiency of charcoal and the biomass value chain;
- Promoting the use of fuel-efficient cookstoves;
- Strengthening institutional capacity to manage biomass, and
- Aligning biomass use with the CRGE strategy and national energy policy.

The biomass strategy does not directly contribute to the achievement of the CRGE strategy's energy related provisions, but it does align with the broader vision of a more sustainable energy system by 2030. If biomass can be cultivated and harvested in a sustainable manner, and used in cleaner cookstoves, this would help keep the energy sector's overall GHG emissions from increasing, even if overall biomass volume used by the country rises. Sustainably produced and harvested biomass is, in fact, a renewable source of energy, which the CRGE Strategy supports.

With regard to the National Energy Policy (Ministry of Water and Energy, 2013), there may be a missed opportunity in relation to potential future power exports. The policy does not provide any specific guidance or recommendations on how Ethiopia can put itself in a position to generate surplus power and export to regional markets, a scenario environed by the CRGE Strategy. The policy does, of course, provide an impetus for the growth of renewable, low-carbon energy sources and a more diverse (and thereby adaptive) energy mix.

7.5.3 GAPS IN THE CRGE STRATEGY'S APPROACH TO WATER AND ENERGY

Ethiopia's vision of achieving middle-income country status by 2025 and the government's commitment to rapid economic growth resulted in the CRGE Strategy having an extremely strong focus on climate mitigation. This was consequence of the desire to identify an economic growth pathway that would meet GDP growth targets without

leading to an unsustainable use of environmental resources and without causing a spike in GHG emissions. One outcome of this leaning towards mitigation, however, is the relative lack of attention to climate change resilience and adaptation. The CRGE strategy is completely silent on the impacts of climate change on the water and energy sector, the vulnerabilities of the sector and the risks it faces from climate change, and what the sector should do to enhance its adaptive capacity against climate change related hazards, to make itself more resilient and better suited to a future that will bring innumerable climatic shocks and stresses.

These oversights in the CRGE Strategy were remedied in the climate resilience sector strategy for water and energy (mentioned above), which affirmed that in addition to mitigation, the sector also needed to become more resilient to climate change, and contribute to building broad-based societal climate resilience.

In 2017, Ethiopia developed a comprehensive National Adaptation Plan, which was submitted to the UNFCCC in 2019 (NAP) (Federal Democratic Republic of Ethiopia, 2019). The NAP prioritizes 18 adaptation options across the most vulnerable sectors, including water and energy. Adaptation option number 2 in the NAP underscores improving access to potable water; adaptation option 4 lends support to water harvesting; and adaptation option number 9 affirms enhancing alternative and renewable power generation and management. Ethiopia now also has GE and NAP roadmaps to 2030, including for this sector.

Since the climate resilience sector strategy for water and energy plus the NAP have both addressed the gap in the CRGE Strategy and have identified priority channels to increase adaptation in the water and energy sector, it is recommended that both these key documents be fully and effectively implemented to ensure climate resilience in this sector. ***Specific first steps beyond the formal adoption of the NAP would be for major existing and planned energy systems in Ethiopia (particularly hydropower facilities) and large water storage and water supply (reticulation) facilities to undertake climate change risk and vulnerability assessments; to use these evidence-based assessments to identify crucial vulnerabilities to be reduced and the associated specific, targeted interventions to build adaptive capacity and reduce vulnerability; to develop detailed infrastructure designs and operation and maintenance guidelines for the power and water supply systems that emerge as the most vulnerable or at-risk; and track, monitor, measure, evaluate, and report on the progress made in improving adaptive capacity and reducing vulnerability of major power and water supply infrastructure and assets.*** Particular examples of adaptation measures that could be a starting-point for consideration in Ethiopian electricity systems (such as enhanced designs and operations of hydropower dams to protect against water variability) and water supply systems (such as increased storage or more adaptive facilities to cope with greater extremes in water availability) are identified in tables provided by the OECD's Development Assistance Committee (noting that the actual applicability of specific adaptation interventions can only be determined by the outcome of site-specific and asset-specific vulnerability and risk assessments) (Organization of Economic Cooperation and Development, 2017).

7.5.4 POLICY RECOMMENDATIONS MOVING FORWARD

Mitigation:

- Mobilize and allocate resources for the complete implementation of Ethiopia's National Energy Policy;
- Ensure that KPIs and measurable milestones identified in the National Energy Policy are mainstreamed and integrated into the ten-year economic planning process and the successor to GTP-II, so that both public and private resources are invested in realization of the policy's goals, particularly in relation to renewable energy, energy efficiency, and demand-side-management;
- Develop a white paper (research and analytical report) to examine how Ethiopia can position itself in 2030 to export renewable power to the regional grid, thereby ensuring the abatement of 19 MT CO_2e;

Adaptation:

- Mobilize and allocate resources for the complete implementation of Ethiopia's National Adaptation Plan (NAP), including in the water and energy sector, and for the complete implementation of the climate resilience sector strategy for water and energy, and
- Promote the undertaking of climate change vulnerability and risk assessments in major power and water supply (storage and reticulation) systems of national importance (or strategically critical water and energy assets), to

enable to identification of key vulnerabilities and corresponding strategic interventions and enhanced designs to reduce vulnerability and build adaptive capacity against climate change impacts.

8 Green Cities and Buildings

- The majority of activities in the Green Building and cities area was centred around mitigation.
- Nationally, the Second Urban Local Government Development Programme included aspects of greening and public parks as adaptation measures.
- This is further bolstered by the URBAN Greenery Infrastructure Development Program, which promotes green infrastructure and sustainable urbanisation.
- Other key initiatives in this area include the 2014 Municipal Solid Waste Strategy and the Housing Development programme, which have numerous adaptation co-benefits.
- Areas of future focus could be increasing urban areas with land use plans that integrate adaptation and expanding urban agriculture.

8.1 ADAPTATION: GREEN CITIES AND BUILDINGS

Within the context of the CRGE/NDC, 'Green Cities and Buildings' (GCB) are broadly defined as '*initiatives that contribute to the creation of new, more sustainable urban environments'*, encompassing both mitigation and adaption activities aimed at enhancing the resilience of urban populations and the built environment (Federal Democratic Republic of Ethiopia, 2011). In recognising that buildings in urban areas contribute up to 3% of the country's GHG emissions, the CRGE's GCB analysis and monitoring framework primarily focus on mitigative approaches, such as high-efficiency lighting and improved (solid and liquid) waste management systems (CGIAR, 2018). The adaption component of this sector is less well-defined. That is, while the NDC's medium-to-long term adaptation actions refer to the need for improved adaptive capacity of urban systems (including people, infrastructure and ecosystems) through ecosystem rehabilitation, infrastructure development and sustainable service provision, this need does not appear to translate into specific actions and indicators at an implementation level. Within the GCB component of the CRGE's monitoring framework, the adaption indicators relate to i) environmental and social impact assessments (ESIA); and ii) development of green infrastructure[25].

Three programmes/proposals/plans with green cities adaptation components have been identified, including:

- the Second Urban Local Government Development Programme (ULGDP II) (2014 - 2019), which included *greenery and public parks* target within the infrastructure and maintenance workstream;
- the Strategic Climate Institutions Programme in Hawassa (SCIP-Hawassa) (2014), which primarily aimed to develop a *protected green zone* along the Lake shore, and
- the Climate Resilient Green Growth Strategy and Integrated Climate Change Response Investment Plan for Addis Ababa (CCRIP) (2015), which was a UNDP-funded study that analysed, identified and prioritised adaptation measures for the country's capital (Worku, 2015). The CCRIP's four priority adaptation intervention areas included: integrated water resource management, integrated urban land use planning and implementation, green infrastructure and ecosystem resilience, and strengthened climate related health programmes. These interventions comprise costed activities, indicators and timeframes (up to 2025).

Unfortunately, there is no readily accessible information on the status and progress of these programmes and plans beyond the initial 2014/15 documentation. Due to the limited availability of programme-specific data on urban greening / green infrastructure / sustainable cities initiatives, a broader literature review has been conducted on the status of urban green infrastructure development and planning in Ethiopia, as a basis for gauging progress, barriers and priorities toward achieving the CRGE/NDA and NAP targets. Two recent studies by Girma et al (2019) and Gashu et al (2019) explore this topic within the context of Oromia region, Bahir Dar and Hawassa.

Girma's study explored progress against principles of *multifunctionality* (the ability of green spaces to provide multiple functions and services); integration of *grey-green spaces* (primarily to protect cities from the impacts of

[25] Area of land development through improved soil and crop management; Area of land developed through integrated watershed management; Number of households benefitting from the extension of agroforestry.

flooding through permeable surfaces and plants); and *social inclusiveness*, in terms of green space planning and development. Several key urban planning documents[26] recognise the role of multifunctional green infrastructure in promoting urban sustainability by reducing urban flooding, environmental degradation and pollution (Y. Girma, 2019). However, in practice, green spaces remain predominantly mono-functional (designed solely for recreational activities), with their potential contributions to storm water infiltration rarely considered / optimised. Similarly, while national strategies and standards do promote the concept of grey-green integration, there is limited evidence of this in the study regions due to weak coordination between relevant sectors (i.e. transport, urban planning, housing, energy and water). These coordination and communication issues filter down to localised community levels, where the study revealed that the users of green infrastructure are rarely engaged in the design, preservation and benefits of these spaces – which has contributed to a fragmented, under-valued green space system. As a result, residents in both Bahir Dar and Hawassa perceive that green infrastructure had reduced in their cities (K. Gashu, 2019).

Both Girma and Gashu noted that the inadequacy of finance for the departments of greenery was a major impediment to progress in this sector, along with a lack of technical knowledge on urban sustainable development approaches amongst decision makers and planners, and poor local capacity to effectively implement these measures in a coordinated manner.

8.1.1 CRGE REPORTING: ADAPTATION OUTCOMES

The 2019 'Environment, Forest and Climate Change Commission Performance Contract in Ethiopia' report of the CRGE (CRGE, 2019) states that the following interventions have been successful in the last 3 year period:

Solid Waste Management

The development of the 2014 Solid Waste Management Strategy, developed in 2014 by the Ministry of Urban Development and Construction (MUDC) is instrumental in lowering GHG emission through improved SWM strategies. Several enabling standards and frameworks were developed to support the ISWM process.

Urban Greenery Infrastructure Development Program

The Urban Greenery Infrastructure Development Program was designed to support 'sustainable urbanization, health and mental well-being, social cohesion (e.g., sport parks) and the preservation of the natural environment and ecology' (CRGE, 2019, p. 18), and has numerous important design features that improve adaptive capacity and resilience of urban areas to extreme weather events. Several strategies, manuals and policies have been developed through the UGI programme.

The Housing Development Program

The Housing Development Program is an ambitious programme which constructed 140,000 units and is planning to construct 430,000 more GTP II. The programme will enable affordable housing to those living in urban areas in Ethiopia (CRGE, 2019).

8.1.2 FUTURE FOCUS

Looking to the future, it is encouraging to note that the NAP's adaption option on 'increased urban resilience' reflects the above needs and barriers, with the expected results and indicators aimed at

a) building capacity of urban planners;
b) increasing urban areas with land use plans that integrate adaptation (i.e. through multifunctionality approaches, introduction of grey-green spaces, etc.); and
c) expanding urban agriculture.

The sector's planning for the future continues to be focused on crucial priority areas that can strengthen adaptation as well as mitigation in cities: (i) integrated solid waste management; (ii) urban greenery; and (iii) integrated infrastructure planning. Achieving these objectives as well as the urban adaptation objectives of the NAP will be contingent on the provision of sufficient financial resources coupled with improved cross-sectoral coordination and inclusion of local communities in land use planning and preservation. Given the above-noted challenges of accessing

[26] Including: Urban Greenery and Beautification Strategy (2015), National Urban Green Infrastructure Standard (2015) and Green Infrastructure Based Landscape Design Supporting Manual (2011)

information on existing GCB projects, the entities responsible for data collection (led by the Ministry of Urban Development and Housing) will also need to coordinate a central monitoring and evaluation database that captures and tracks progress against the CRGE/NDC and NAP indicators.

8.2 GTP II REPORTING

Since 2015, implementation of the CRGE has been mainstreamed into Ethiopia's GTP-II. The GTP-II Mid-Term Review (Federal Democratic Republic of Ethiopia, 2018) showcases the urban sector's efforts to make progress on CRGE-related activities, i.e. urban green area development and sanitation (section 2.5). For he year 2016-2017, a key CRGE-linked objective was to increase the coverage of municipal solid waste collection and disposal coverage to 78%. To this end, working structures were set up in 30 towns with a population of more than 20,000. The target for solid waste collection and disposal coverage in the urban areas for the end of GTP-II has been set at 90%, and by the end of 2016-2017 coverage had reached 74%. CRGE-related institutional support was slated to be provided to 30 towns, but was provided to 15 towns. More momentum was seen in the development of urban parks, with the creation or enhancement of 67 parks, and riverbank protection, with riverbank protection designs developed for 30 towns.

8.3 FINANCE: GREEN CITIES AND BUILDINGS

The urban sector accounts for only 6 of the 224 projects analysed, however with a still significant combined value of ETB 28.2 billion through the 2011-2019 period.

Of the 6 urban projects, 3 have an adaptation impact, and 3 a mitigation impact.

Projects with an adaptation focus make up a substantial majority of the sector's value, totalling ETB 26.6 billion. This is dominated by two large projects, the Urban Local Government Development Program II (ULGDP II) at ETB 12.3 billion, and the Urban Productive Safety Net Program at ETB 14.2 billion. Mitigation-focused projects make up the remainder of ETB 1.6 billion.

Considering the annual breakdown of expenditure in the sector from 2011 to 2019, the total is ETB 22.3 billion. No expenditure was captured from 2011 to 2013, but then has risen sharply from 2014 to 2018, peaking in the latter year around ETB 4.5 billion. Expenditure in 2019 fell, due to the ULGDP II initiative completing and no new projects being commissioned.

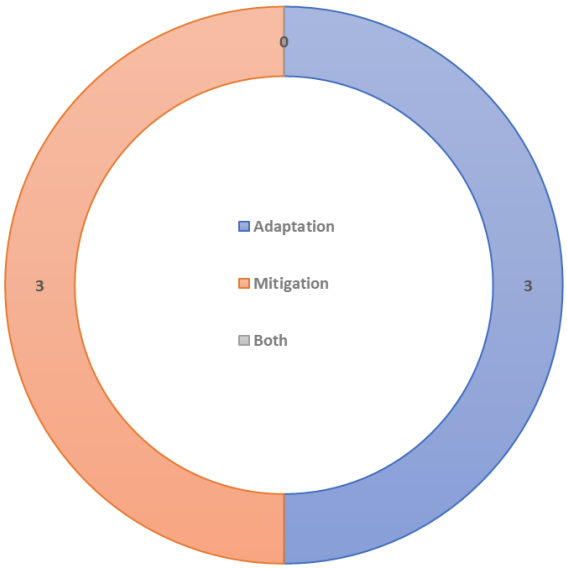


Figure 24 Number of Projects in the Urban Sector by Climate Impact 2011-2019

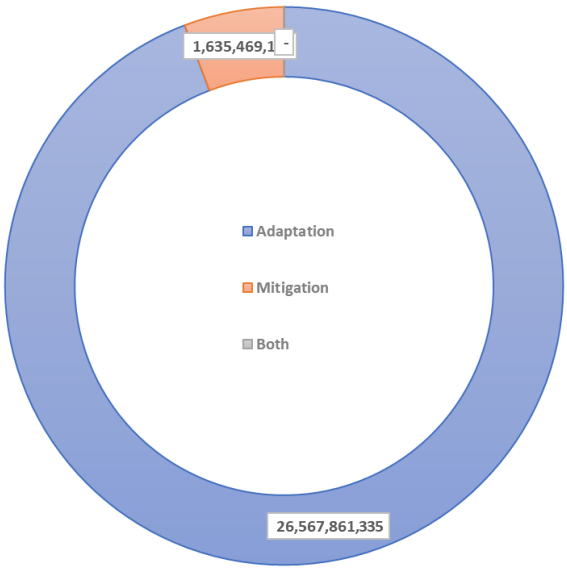


Figure 25 Total Value of Projects (in ETB) in the Urban Sector by Climate Impact 2011-2019

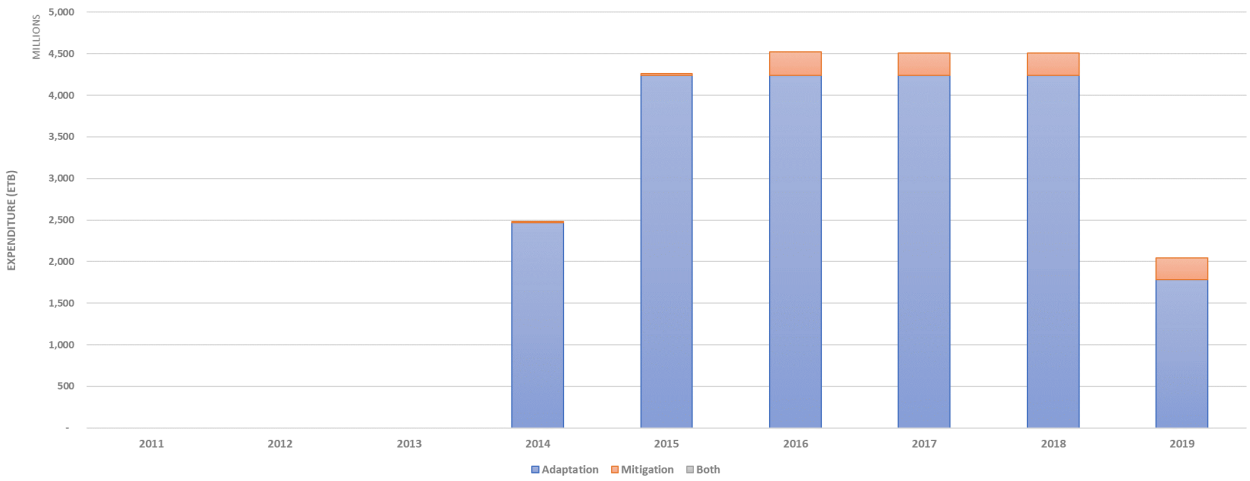


Figure 26 Annual Breakdown of Project Expenditure (in ETB) in the Urban Sector by Climate Impact 2011-2019

8.4 INSTITUTIONAL ARRANGEMENTS AND CAPACITY: GREEN CITIES AND BUILDINGS

8.4.1 CRGE RELATED INSTITUTIONAL ARRANGEMENTS

The Ministry of Urban Development has distinctive CRGE institutional arrangements, compared to other Ministries. Within the Ministry, there is an Urban Climate Change and Resilience Bureau, which comprises of a solid waste management directorate and an urban greening directorate. This is not inconsequential, given that most Ministries include a CRGE Directorate headed by a Director-level official. A CRGE Bureau with two Directorates under it is administratively not at par with a CRGE Directorate (it theoretically ranks higher), and this can translate into stronger capacity in terms of staff numbers, staff seniority and experience, budgetary resources, and relative influence within the wider Ministry. This may also be one of the reasons CRGE Directorates in other Ministries are concerned about differential pay scales and titles across CRGE focal points.

This Bureau interacts with the broader structure of the Ministry of Urban Development, Housing, and Construction, including other bureaus and agencies. Like all other CRGE focal point bodies in key sector line Ministries, the CRGE Bureau in the Ministry of Urban Development submits to the CRGE Facility quarterly progress reports, annual progress reports, and annual MRV reports. The Ministry is represented in the CRGE Inter-Ministerial Steering Committee, as well as the CRGE Management Committee, and Ministry representatives attend the half-yearly (annual and interim) review meetings of both these committees.

8.4.2 INSTITUTIONAL CAPACITY CHALLENGES AND GAPS

Literature review as well as direct engagement with the CRGE Bureau in the Ministry of Urban Development, through purposive semi-structured interviews, offered a number of insights regarding the capacity levels of the CRGE Bureau towards CRGE 2030 targets.

- The Ministry of Urban Development was allocated funds for one CRGE Fast Track Investment (FTI) project – urban greening and solid waste management across Ethiopia. The project had two main components: urban greening (development of urban parks in several cities) and solid waste management (collection, sorting, and composting to improve environmental quality, reduce emissions, create jobs, and produce fertilizer for farming). The project was implemented across al 9 regions, in 13 towns and woredas. Based on the project's terminal report that recorded positive outcomes, it appears that the Bureau's implementation capacity – including capacity to deliver projects through staff seconded to it from multilateral development partners – is fairly strong. However, despite the fact that GHG reductions were an integral component of the project's motivation and design, the terminal report offers no evidence of any GHG emissions reduced as a result of the project. This makes the impact of the project difficult to ascertain from a climate change point of view;

- A positive reflection is that there appears to be continuity between the CRGE FTI project and ongoing efforts, which was one of the goals of the CRGE FTI projects. The FTI initiatives were intended to be pilot projects and programs to be scaled up and built on. In the case of the CRGE Bureau at the Ministry of Urban Development, this objective appears to have been met, with the subsequent continuation of a GEF-funded and UNDP-driven project on urban greening and solid waste management;
- The Bureau seems to have strong internal technical capacity on climate change and sustainability issues, and it often deploys this capacity (partly a result of staff secondment from UNDP) to conduct trainings for other divisions and units within the Ministry. Staff conduct trainings on urban greening and solid waste management in different Ethiopian cities, conduct mainstreaming trainings on how to mainstream, climate change into city planning (the Bureau has a standard mainstreaming model but is able to customize this for different cities, to reflect local needs). Moreover, the Bureau undertakes M&E of different cities' performance in urban greening and urban waste management;
- The biggest challenge faced by the Bureau is capacity on MRV, not only within the Bureau but within the different directorates and regional institutions it delivers projects through;
- The Ministry of Urban Development was involved in the Regional Capacity Building Programme's (RCBP's) Training of Trainers initiative, and even regional bureaus of urban development and construction participated in the RCBP (Ministry of Environment, Forests, and Climate Change , 2015). The CRGE Bureau indicated that even though its internal staff technical capacity on climate change was once very weak, there has been steady improvement in the grasp of and exposure to climate change issues, including through a number of training and capacity-building initiatives and workshops;
- Nevertheless, the need for yet more systemic capacity development was recognized in 2015 by the CRGE National Capacity Development Program report (based on a gaps and needs assessment). The report indicated that the major capacity challenges in the urban sector in relation to CRGE implementation were ability to mainstream, CRGE into urban plans and strategies; resource mobilization; climate finance management; project coordination, project management, and project delivery in alignment with the CRGE; understanding of local level climate change impacts and risks; stakeholder consultation and engagement; and knowledge management systems for information and data analysis and retrieval (Federal Democratic Republic of Ethiopia, 2015), and
- Capacity needs were also flagged in a 2015 review of lessons learnt from the CRGE FTI process (LTS International, 2015). While not specific to the urban sector, the report highlighted issues that remain CRGE-linked challenges to date in the urban sector in Ethiopia: low technical capability in finance and project management; a lack of understanding of the need for and approach to baseline-setting; limited understanding of performance metrics and KPIs and how to measure them; M&E; and data and information collection and management.

8.4.3 INSTITUTIONAL ARRANGEMENTS RECOMMENDATIONS MOVING FORWARD

- Enable the CRGE Bureau with more training and capacity-building on mainstreaming of the CRGE into urban sector projects and programmes, in other parts of the Ministry as well as the regional and woreda level. and
- Equip the CRGE Bureau with effective knowledge management systems, including data and information management systems, MRV-oriented software, and necessary tools.

8.5 POLICY: GREEN CITIES AND BUILDINGS

8.5.1 CRGE STRATEGY FOCUS

At the point in time when Ethiopia's CRGE Strategy was prepared, the urban (cities, buildings, and waste) sector's share of Ethiopia's total greenhouse gas (GHG) emissions was a mere 3%. Of the total emissions of 5 MT CO_2e (from the 2010 baseline), nearly 60% – i.e. 3 MT CO_2e – was attributable to the generation and disposal of solid and liquid waste. The other major source of urban GHG emissions was the use of private, off-grid power generators such as diesel units, and kerosene lamps which accounted for the remaining 2 MT CO_2e.

While the urban sector (cities, buildings, and waste) constituted a small fraction of 2010 GHGs, it was projected that these emissions would display a steady rise as a result of Ethiopia's rapid urbanization rate, with more and more people shifting to cities and with the growth of not only Addis Ababa but several secondary cities across the country. The CRGE strategy anticipated that urban GHG emissions would double between 2010 and 2030, from 5 MT CO_2e to 10 MT CO_2e, and that 75% of this increase would come from waste, while 25% of the increase would be attributable to off-grid energy consumption from fossil fuel sources. The CRGE strategy's approach to the urban

sector was thus predicated on the management of solid and liquid waste as a principal lever for abatement of city-based GHGs, coupled with building energy efficiency (Federal Democratic Republic of Ethiopia, 2012). However, in terms of abatement potential identified, (as discussed below) the strategy seems to have leaned towards building energy efficiency over waste management.

The CRGE strategy highlighted key areas of intervention that had potential to reduce GHG emissions from cities:

- Accelerating the transition to high-efficiency light bulbs for residential, commercial, and institutional buildings;
- Adopting and enhancing landfill gas management technologies (e.g., flaring) to reduce emissions from solid waste, and
- Reducing methane production and emissions from liquid waste.

The CRGE strategy identified abatement potential of approximately 5-7 MT CO_2e from the projected urban GHG emissions in 2030, of which over 5 MT CO_2e, i.e. almost all, of abatement is to be achieved from the energy-efficient light-bulbs. Solid and liquid waste management abatement options were chosen for less than 1 MT CO_2e each.

Given that solid and liquid waste were the largest sources of urban emissions and also emissions growth, the CRGE strategy should have focused more on reducing waste-related GHGs. It opted for greater abatement from more cost-effective interventions, but in the process neglected opportunities for GHG reduction from waste.

8.5.2 OTHER RELEVANT CRGE-LINKED POLICIES

In the context of assessing the progress of *implementation of the CRGE Strategy* (as opposed to assessing overall progress in urban sector development in Ethiopia), two policy developments in key sub-sectors stand out as relevant to progress on the CRGE strategy (depicted in Table 17 Policy Development relevant to the CRGE: Green Cities and Buildings below).

Policy Instrument	Year	Focus and Objective	Originator / Developer	Institutional Responsibility
Ethiopia's Urban Wastewater Management Strategy	2017	The strategy's objective is to ensure a sustainable, resilient, safer, and healthier urban environment in Ethiopian cities and towns through improved wastewater management devoid of human contact by 2026 and beyond. The strategy notes that undertaking activities linked to the CRGE strategy may enable greater access to international finance.		Ministry of Water and Energy, Ethiopia
Ethiopia's National Energy Policy	2013	The policy provides updated guidance for the energy sector as a whole, but in the context of the CRGE Strategy's urban (cities, buildings, and waste) priorities, the policy lends strong support to energy efficiency technologies. The policy articulates the need to reduce reliance on kerosene for lighting, and for more efficient street lighting.		Ministry of Water and Energy, Ethiopia

Table 17 Policy Development relevant to the CRGE: Green Cities and Buildings

A key finding from a review of these instruments is that they have been developed without adequate consideration of climate change as a key factor. While sectoral instruments should principally reflect sectoral needs, priorities, resources, drivers, institutional capacity etc., it is increasingly important for climate change to inform the development of policies that may have the ability to accelerate and support the deployment and implementation of CRGE interventions in sectors. In the case of the Urban Wastewater Management Strategy (Ministry of Water, Irrigation,

and Energy, 2017), the strategy does not discuss links between wastewater management and climate change mitigation or adaptation. An opportunity may have been lost to target waste-water related GHG emissions, and to proactively design wastewater management systems and institutions in a more climate-resilient manner, taking into account climate change impacts in the wastewater management strategic actions' designs and formulation.

With regard to the National Energy Policy (Ministry of Water and Energy, 2013), the missed opportunity is less about integrating climate change considerations into the document (the policy makes note several times of the need to shift towards low-emission energy technologies such as renewables and energy-efficiency, and underscores the need for Ethiopia's energy future to be a low-carbon one), and more about integrating CRGE priority actions. **There is a disconnect between the energy policy's approach to energy efficiency in the context of urban energy use in buildings) and the CRGE Strategy's emphasis on efficient lighting in cities.** Thus, there is room for more effective mainstreaming of CRGE priorities into energy sector instruments such as this.

Overall, there appears to be a need in the urban sector for stronger policy development and the creation of a more enabling environment for environmental and climate change interventions in an urban setting. This is evidenced, for instance, by the absence of a solid waste management strategy, and an integrated waste management strategy or framework. In recognition of the fact that Ethiopia's legislative frameworks and policies for waste management are still at a very nascent stage, UN Environment has just launched a Chemicals and Waste Management Programme that will identify gaps and needs in the policy, strategy, regulatory, and legal landscape; will update existing instruments as needed to fill the gaps and formulate new instruments; and strengthen institutional arrangements and coordination. Based on preliminary information available, this effort does not appear to address climate change mitigation and adaptation aspects of waste management (UN Environment , 2019), but it is hoped that as the programme evolves further this opportunity for strengthening the policy landscape around waste management in Ethiopia will not ignore the need for emissions reduction from solid and liquid waste, and the CRGE strategy's relevant goals and targets applicable to the sub-sector.

8.5.3 GAPS IN THE CRGE STRATEGY'S APPROACH TO CITIES, BUILDINGS, AND WASTE

It is well-understood that given Ethiopia's aspirations towards attaining middle-income country status by 2025 and the government's commitment to strong and sustained economic growth, the CRGE Strategy was driven by an imperative of climate change mitigation. The Strategy sought to identify an economic growth pathway that would meet GDP growth targets whilst at the same time preserving environmental sustainability and without increasing the country's emissions. One unintended outcome of this approach, however, is the relative absence of climate change resilience and adaptation in the strategy. The CRGE strategy is completely silent on the impacts of climate change on cities, buildings, and human settlements, the vulnerabilities of the sector and the risks it faces from climate change, and what the urban sector should do to strengthen its adaptive capacity against climate change related hazards, to make itself more resilient and cope better with climate shocks and stresses.

These oversights in the CRGE Strategy have been remedied for some sectors in the form of sector-specific climate resilience strategies (i.e. the CR strategies for agriculture and forestry, for water and energy, and for transport). This was not done for cities and urban settlements.

More recently, Ethiopia has developed a comprehensive National Adaptation Plan (NAP) (Federal Democratic Republic of Ethiopia, 2019). The NAP prioritizes 18 adaptation options across the most vulnerable sectors, including cities. Adaptation option number 10 in the NAP underscores "Increasing Resilience of Urban Systems." Under the NAP, the urban sector is both a target-area for enhanced adaptive capacity, as well as a driver or source of stronger economy-wide adaptive capacity (through more reliable and resource-efficient infrastructure and services etc.). The NAP suggests that for the urban sector, adaptive capacity should be strengthened by improving housing conditions; expanding urban greenery; and enhancing urban infrastructure. It also emphasizes on more integrated urban land use planning and management, and the promotion of efficient household/urban waste management systems. Ethiopia now also has GE and NAP roadmaps to 2030, including for this sector.

Since the NAP has addressed the gap in the CRGE Strategy and has identified key initial (high-level) pathways to increase adaptation in the urban sector, it is recommended that the NAP be fully and effectively implemented to

ensure climate resilience in this sector. ***Specific first steps beyond the formal adoption of the NAP would be for Ethiopia's major urban centres (Addis Ababa and secondary cities) to undertake climate change risk and vulnerability assessments; use these evidence-based assessments to identify the most significant vulnerabilities to be reduced and the associated specific, targeted interventions to build adaptive capacity and reduce vulnerability; develop detailed implementation plans and timelines for the city-specific or even urban woreda-specific adaptation activities selected; and track, monitor, measure, evaluate, and report on the progress made in improving adaptive capacity and reducing vulnerability.*** Particular examples of adaptation measures that could be a starting-point for consideration in the Ethiopian urban setting (such as wastewater treatment and recycling; wastewater management systems; urban stormwater and drainage for flood management; more robust building codes and regulations to respond to shifting climatic conditions and increasing hazards) are identified in tables provided by the OECD's Development Assistance Committee (noting that the actual applicability of specific adaptation interventions can only be determined by the outcome of city-specific and potentially woreda/district-specific vulnerability and risk assessments) (Organization of Economic Cooperation and Development, 2017).

In terms of climate change mitigation, as noted previously, the CRGE Strategy's focus on waste management and building energy efficiency was appropriate, given that these were the major sources of urban emissions. However, the balance of abatement options in the strategy leans heavily towards efficient lighting, even though urban lighting related emissions are a much smaller fraction of emissions from buildings (the predominant sources being waste and off-grid power systems using fossil fuels). Thus, on the mitigation side the gap identified in this progress assessment is the diminished focus on solid and liquid waste management interventions, particularly measures that could reduce or capture methane from landfills or wastewater.

The urban sector in Ethiopia would therefore be well-advised to re-examine a range of potential mitigation options for the buildings and waste sun-sectors (over and above the need to identify adaptation priorities already discussed). Such guidance on high-potential urban mitigation opportunities can be drawn from the Intergovernmental Panel on Climate Change's (IPCC's) chapters on mitigation in the buildings sector (chapter 9) and in the human settlements sector (chapter 12), which showcase several scientifically-validated mitigation approaches for cities – including the waste sub-sector -- available in the IPCC's Fifth Assessment Report (AR5) (Intergovernmental Panel on Climate Change, 2014).

8.5.4 POLICY RECOMMENDATIONS MOVING FORWARD

Mitigation:

- During the next revision or update of the CRGE Strategy, or the development of an updated Sector Reduction Action Plan (SRAP) for the urban sector, analyse, evaluate, identify, and select priority solid and liquid waste management measures that have measurable GHG reduction potential, and
- Linking closely with Action B under the urban wastewater management strategy (preparation of an urban wastewater sanitation master plan), and aligning with UN Environment's chemicals and waste management programme, develop an integrated waste management (solid and liquid) strategy and action plan, with the explicit inclusion of measures that reduce GHG emissions from urban waste.

Adaptation:

- Mobilize and allocate resources for the complete implementation of Ethiopia's National Adaptation Plan (NAP), including in the buildings sector, and
- Building on (and integrating) the Woreda Disaster Risk Profiles already developed for several woredas in the country by the National Disaster Risk Management Commission (NDRMC), promote the undertaking of comprehensive climate change vulnerability and risk assessments at a city and woreda level (or strategically critical urban settlement sites), to enable to identification of key vulnerabilities and corresponding strategic interventions to reduce vulnerability and build adaptive capacity against climate change impacts.

Cross-cutting:

- Update relevant urban sector policies, strategies, master plans, and regulations to reflect mainstreaming of the CRGE strategy's priorities for the sector, and to more explicitly link interventions in such instruments to climate change mitigation or adaptation outcomes.

9 Industry

- The Industry sector has the least adaptation activity and is a traditionally mitigation focused sector.
- They key project in this sector was an CRGE FTI project: Greening of Bole Lemi Industry Park.
- The project developed 32.9ha of green space, which directly benefitted 740 jobless youth through employment opportunities and upskilling.

9.1 ADAPTATION: INDUSTRY

The overarching vision that underpins Ethiopia's Industrial Strategic Development Plan (ISDP) is "*building an industrial sector with the highest manufacturing capability in Africa which is diversified, globally competitive, environmentally-friendly, and capable of significantly improving the living standards of the Ethiopian people by the year 2025*" (Ministry of Industry, 2013). Achieving this vision is intrinsically linked to the need for sustainable, low carbon industrial processes, technologies and broader value chain systems that contribute to enhancing the resilience of the population and ensuring sustainable utilisation of the natural resources upon which many industries rely. This is referred to as 'green industrialisation', which comprises a socio-technical and environmentally conscious transition from traditional, business as usual approaches (Okereke, et al., 2019).

Given organised industrial activities currently comprise a relatively small share of Ethiopia's economy, industry only accounts for 3% of national GHG emissions (CGIAR, 2018). However, the country considers industrialisation as a primary driver of social transformation and modernization – meaning the sector's GHG emissions contribution is likely to scale up significantly, unless mitigative approaches are factored into industrial planning and implementation processes. The CRGE's 2011 Strategy and 2018 Monitoring Framework therefore predominantly focus on the promotion of energy- and waste-efficient technologies – targeting the largest five industrial sub-sectors. However, the CRGE also acknowledges the need to consider the environmental and social cross-cutting dimensions associated with industrial development, through the implementation of environmental and social impact assessments (ESIAs) and management plans (EMPs) aimed at protecting (or even enhancing) benefits to people and surrounding ecosystems. This comes with the recognition that the ability of the industrial sector to grow sustainably relies largely on resilient value chains (including access to assured energy, water and raw inputs for manufacturing processes, and a healthy working population) that can continue to function during periods of climate stress, both now and in the future.

However, the CRGE's Monitoring Framework does not disaggregate adaptation activities and indicators in depth – making it difficult to assess adaptation progress within this sector in relation to the CRGE. A broader lens has therefore been adopted in reviewing the adaptation components of several projects, which relate to the NAP adaptation option on 'adaptive industry systems' (Federal Democratic Republic of Ethiopia, 2019).

The FTI project – Greening of Bole Lemi Industry Park (2015-2016) – directly contributed to two of the NAP indicators[27], through the development of 32.9ha of green space, which: directly benefitted 740 jobless youth[28] through employment opportunities and upskilling during the implementation period, reduced air and noise pollution; and contributed to moderating the park's microclimate. Indirect, on-going health and aesthetic benefits are also accrued by the park's 8000 employees, investors and customers. The greenbelt design includes storm water drainage and water point infrastructure that has enhanced the park's resilience to events such a flooding and fires (Industrial Parks Development Corporation, 2016).

[27] Hectares of land in industrial parks/zones protected from environmental impact, and the number of people benefitting from socially responsible industries.
[28] 450 females and 290 males.

Given one of the ISDP's five primary strategic options is the development and operation of industrial zones, the 'Greening of Bole Lemi Industry Park' project should serve as a pilot for the development of 12 future industrial zone green spaces (six of which are understood to already be at construction stage) (Industrial Parks Development Corporation, 2016). One of the key challenges noted during the project was the lack of 'best practice' landscaping experience in green zone development. This should be noted as an area of capacity development that Government and international cooperating partners should seek to support as part of broader efforts to green Ethiopia's industrial sector[29]. These efforts must extend to the provision of clear guidance and tools to develop climate change adaptation strategies and plans for the sector – to enable public and private industry stakeholders to better analyse, assess and plan for current and future climate risks. Given one of the NAP's industry indicators tracks the inclusion of such strategies in industry sector performance reports and national industry development reports, there is an expectation that, as a precondition to this, the Ministry of Industry will need to spearhead the development and roll-out of this guidance.

In summary, in accelerating Ethiopia's industrialisation agenda, the government has made clear, high-level commitments to adopting a green development pathway. This comes with the recognition that, if this can be achieved, private investors with high corporate social investment interests may be attracted to channel funds into this growing sector. Likewise, this also opens up opportunities to mobilise funds from climate finance facilities. However, this will be contingent on ensuring climate resilient guidelines and environmental and social safeguards are in place to absorb and support the expanding industrial base (Okereke, et al., 2019).

9.2 FINANCE: INDUSTRY

The industry sector accounts for a relatively small 10 of the 224 projects analysed, with a combined value of ETB 56.0 million through the 2011-2019 period. However, it should be noted that this value is understated as project value data was only available for three of the industry sector projects, perhaps a function of it being dominated by private firms with confidential information.

Of the 10 industry projects, all have a mitigation impact.

Considering the annual breakdown of expenditure in the sector from 2011 to 2019, expenditure has been estimated in a period from 2013 to 2016, with nothing on either side.

Due to the data paucity in the sector, it is challenging to draw any insightful conclusions from this limited analysis. This should be kept in mind for future studies and suggests that a more rigorous method of capturing and collating data in this sector in Ethiopia would be valuable.

[29] It has been reported that the World Bank intends to launch a project that supports the greening of Ethiopia's textile industry (Intrinsic Consultancy, 2018); based on the learnings from Bole Lemi Industrial Park, this project should include capacity building components based on a skills gaps and needs assessment.

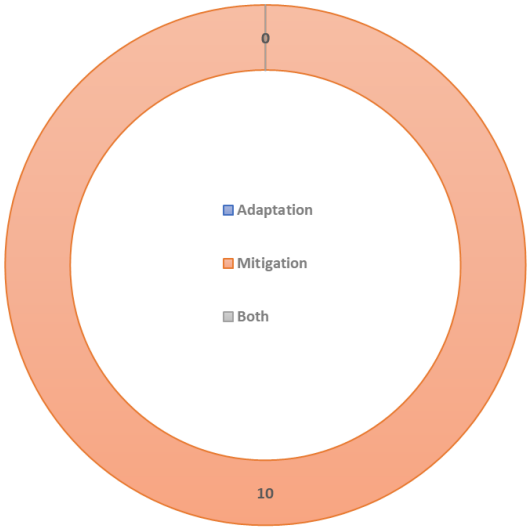


Figure 27 Number of Projects in the Industry Sector by Climate Impact 2011-2019

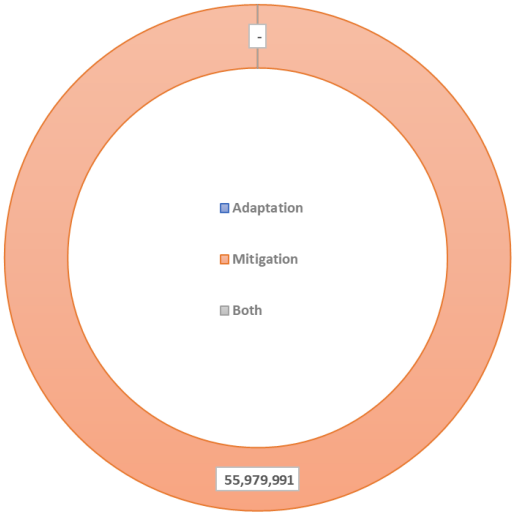


Figure 28 Total Value of Projects (in ETB) in the Industry Sector by Climate Impact 2011-2019

Figure 29 Annual Breakdown of Project Expenditure (in ETB) in the Industry Sector by Climate Impact 2011-2019

9.3 INSTITUTIONAL ARRANGEMENTS AND CAPACITY: INDUSTRY

9.3.1 CRGE RELATED INSTITUTIONAL ARRANGEMENTS

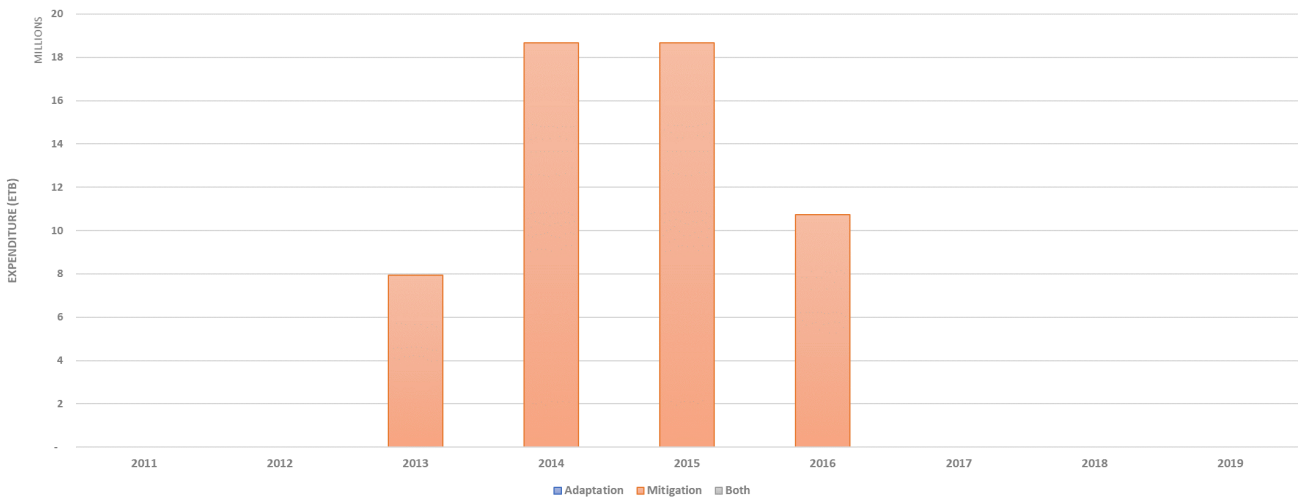
A CRGE Unit is located within the Ministry of Industry. This is noteworthy, in light of the fact that most Ministries include a CRGE Directorate headed by a Director-level official. A CRGE Unit is administratively not at par with a CRGE Directorate, and this has implications for staff numbers, staff seniority and experience, budgetary resources, and relative influence within the wider Ministry. The CRGE Unit, in this instance, is located within the environmental safeguards directorate.

This unit interacts with the broader structure of the Ministry of Industry, including its 25 Directorates and six institutes (the leather industry development institute; the textile industry development institute; the metal industry development institute; the chemical and construction inputs industry development institute; the food, beverage, and pharmaceutical industry development institute; and the meat and dairy industry development institute).

Like all other CRGE focal point bodies in key sector line Ministries, the CRGE Unit in the Ministry of Industry submits to the CRGE Facility quarterly progress reports, annual progress reports, and annual MRV reports. The Ministry is represented in the CRGE Inter-Ministerial Steering Committee, as well as the CRGE Management Committee, and Ministry representatives attend the half-yearly (annual and interim) review meetings of both these committees.

9.3.2 INSTITUTIONAL CAPACITY CHALLENGES AND GAPS

Literature review as well as direct engagement with the CRGE Unit in the Ministry of Industry, through purposive semi-structured interviews, indicated a range of constraints that is limiting the progress of the CRGE Unit towards CRGE 2030 targets.



- The Ministry of Industry was allocated funds for two CRGE Fast Track Investment (FTI) projects – (a) greening of the Bole-Lemmi Industrial Zone through increased tree cover; and (b) development of a baseline for GHG emissions and an MRV system for the industry sector, to strengthen energy efficiency measures in industries. Of the two, progress was made on the second, and energy audits were carried out in the cement, textile, and leather sub-sectors. An industry sector MRV system report (including international best practice, institutional arrangements, ICT systems database needs) recommended that the Ministry of Industry put in place the technical capacity and administrative tools needed to adopt multiple MRV protocols: the Corporate GHG Protocol for Scope 1 emissions; the Cement Sustainability Initiative's (CSI's) cement CO_2 and energy protocol for Scope 1 emissions in the cement sector; and the Corporate Value Chain Accounting and Reporting Standard for Scope 3 emissions (Ministry of Industry, Ethiopia, 2016). ***Despite the production of the report, and the completion of numerous industrial energy audits, further work to give effect to the recommendations of the report and to***

implement energy efficiency measures has not taken place. Thus, the foundation laid by the FTI projects has yet to be built upon. This is principally due to both insufficient funding and technical implementation capacity;

- The CRGE Unit within the Ministry of Industry does not have a particularly influential position, and is not empowered to drive GHG emissions reduction activities and regulatory measures that involve the Ministry's various Directorates and Institutes;
- The CRGE Unit does not have any influence over or any enforcement powers over the private sector. Given that the majority of players in the industrial and manufacturing sector in Ethiopia – particularly in the cement sub-sector – are private entities, the lack of any real power in relation to the private sector badly stymies the CRGE Unit in achieving results. The Ministry of Industry as a whole still does not have the legal framework to enforce energy efficiency and mitigation actions on private companies;
- The Ministry of Industry was involved in the Regional Capacity Building Programme's (RCBP's) Training of Trainers initiative, and even regional bureaus of industry participated in the RCBP (Ministry of Environment, Forests, and Climate Change , 2015). The CRGE Unit has been involved in a number of training and capacity-building initiatives, including workshops, but these once-off events have not resulted in sustained, long-term enhancement of technical, administrative, or regulatory capacity;
- The need for more systemic capacity development was recognized in 2015 by the CRGE National Capacity Development Program report (based on a gaps and needs assessment). The report indicated that there remained challenges in mainstreaming CRGE goals and targets into GTP-II, as well as into actual regional bureau strategic plans. The report noted that the industry sector exhibited CRGE-related capacity gaps in terms of staff capacity for strategic planning, operational planning, delivery management, engagement with international climate funds, CRGE-related information and knowledge management systems, and – at the regional and woreda level – gaps in terms of staff responsible for CRGE related responsibilities and functions (Federal Democratic Republic of Ethiopia, 2015);
- Capacity needs were also flagged in a 2015 review of lessons learnt from the CRGE FTI process (LTS International, 2015). While not specific to the industry sector, the report highlighted issues that remain CRGE-linked challenges to date in the industry sector in Ethiopia: low technical capability in finance and project management; a lack of understanding of the need for and approach to baseline-setting; limited understanding of performance metrics and KPIs and how to measure them; M&E; and data and information collection and management;
- There are significant challenges in undertaking MRV; right now the CRGE Unit has to undertake MRV manually and populate MRV data sheets and reports manually because of the lack of software and ICT systems and automated databases that can make the process more accurate and efficient;
- Despite the FTI project on GHG baseline-setting, establishing the emissions baseline is still a considerable challenge and most institutes don't have the technical capacity to undertake any MRV, and not even to effectively establish their sub-sectors' baselines, and
- The CRGE Unit in the Ministry of Industry operates within significant budgetary constraints and does not have sufficient budgetary support to undertake more comprehensive activities.

9.3.3 INSTITUTIONAL ARRANGEMENTS RECOMMENDATIONS MOVING FORWARD

i. Enhance human capacity by increasing the number of CRGE-focused staff
ii. Elevate the CRGE Unit to the Directorate level by restructuring it into a Directorate
iii. Empower the CRGE Unit/Directorate in the Ministry of Industry with a stronger legal framework and mandate to influence and guide the activities of other directorates and units and institutes within the Ministry in relation to climate change mitigation and adaptation
iv. Enable the CRGE Unit/Directorate with an expanded budget and more financial resources
v. Equip the CRGE Unit/Directorate with effective knowledge management systems, including data and information management systems, MRV-oriented software, and necessary tools.

9.4 POLICY: INDUSTRY

9.4.1 CRGE STRATEGY FOCUS

When Ethiopia's CRGE Strategy was formulated, the industry sector's share of Ethiopia's total greenhouse gas (GHG) emissions was a mere 3%. Of the total emissions of 4 MT CO_2e (from the 2010 baseline), nearly 50% or half – i.e. 2 MT CO_2e – was attributable to the cement industry alone. Other major sources of industrial GHG emissions

were mining and extractive industries, and textile and leather industries. All other industries including steel, paper and pulp, pharmaceuticals, chemicals and fertilizers, food processing etc. only accounted for a very small fraction of Ethiopia's industrial GHG emissions.

While the industry sector constituted a small fraction of 2010 GHGs, it was anticipated that this sector would exhibit the second largest growth in emissions between 2010 and 2030, given the Ethiopian government's emphasis on industrializing the economy and transitioning the country towards middle-income status by 2025. The first Growth and Transformation Plan (GTP-I) projected that the industry sector's contribution to Ethiopia's Gross Domestic Product (GDP) would grow from approximately 13% in 2010 to as much as 32% by 2025 (at a growth rate of 20% per annum), and that GHG emissions in the sector would grow somewhat commensurately by 15.7% per annum. The CRGE strategy's approach to the industrial sector was thus predicated on the projections of GHG emissions from industry growing over 12-fold by 2030, from < 5 MT CO_2e in 2010 to > 70 MT CO_2e in 2030 (Federal Democratic Republic of Ethiopia, 2012).

In light of where the biggest source of industrial emissions and emissions growth was, i.e. cement, the CRGE strategy's focus on reducing cement-related GHGs was both strategic and optimal.

The CRGE strategy highlighted key areas of intervention that had potential to reduce GHG emissions from cement production:

- Improving energy efficiency: altering the type of kilns used, the type of coolers used, introducing computerised energy management systems, and other energy demand management measures;
- Substituting input material: reducing clinker by increasing pumice content or fly-ash;
- Adopting alternate combustion materials: fuel-switching by increasing the share of biomass in energy production for cement plants, and
- Waste heat recovery: capturing some of the waste heat lost, to reduce energy intensive nature.

The CRGE strategy identified abatement potential of approximately 20-22 MT CO_2e from the projected industrial GHG emissions in 2030, of which ~ 15-16 MT CO_2e, i.e. over 70%, of abatement is to be achieved from the cement industry alone. ***Clinker substitution was identified as the most important lever for cement industry GHG abatement, in the CRGE.***

9.4.2 OTHER RELEVANT CRGE-LINKED POLICIES

In the context of assessing the progress of *implementation of the CRGE Strategy* (as opposed to assessing overall progress in industrial development in Ethiopia), two policy developments in the industry sector stand out as relevant to progress on the CRGE strategy (depicted in Table 18 Policy Development relevant to the CRGE: Industry below).

Policy Instrument	Year	Focus and Objective	Originator / Developer	Institutional Responsibility
Ethiopia's Green Manufacturing Strategy	2018 (Draft for Validation)	The strategy's focus is on improving energy management and waste management in Ethiopia's industries, reducing energy consumption and waste, and promoting low-carbon production. The strategy provides a national-level set of priority actions for green manufacturing. It also identified international best practice applicable to major industrial sub-sectors in Ethiopia, including cement.	Funded by USAID and the US Forest Service International Programme (developed by Global Development Solutions)	Ministry of Industry, Ethiopia
Roadmap for Greening Ethiopian Industrial Parks	Under Development (2019)	The proposed roadmap's focus is on identifying and recommending a set of practical policy interventions	Funded by GIZ (developed by GGGI)	Ministry of Industry, Ethiopia; Industrial Parks

		that will lead to dramatic reduction in GHG emissions from industrial production processes, whilst also addressing other environmental, economic, social, and management problems, to enable a transition to low-carbon industrial development.		Development Corporation (IPDC)

Table 18 Policy Development relevant to the CRGE: Industry

The Green Manufacturing Strategy is directly relevant to the CRGE Strategy's emphasis on energy efficiency, energy management, and waste-heat recovery. The Strategy undertakes a detailed assessment of institutional arrangements, policy and regulatory frameworks, the enabling environment, implementation capacity, and other features of the industry sector, and identifies major challenges to be addressed. Furthermore, it articulates clear and well-defined interventions and strategic actions to tackle the challenges. If implemented, these would have considerable impact on the industry sector's progress towards the CRGE Strategy's targets for 2030. However, despite a validation workshop that took place in March 2018 in Addis Ababa, it remains unclear whether the Ministry of Industry has finalized, brought into effect, and formally implemented the strategy. ***It does not appear to be in active application in the industrial sector in Ethiopia.***

The proposed Roadmap for Greening Ethiopian Industrial Parks is expected to include a clear pathway and targeted actions on: identification of environmental and regulatory gaps for the implementation of green industrial principles and procedures at the industrial parks; opportunities for streamlining and improving the management processes of the industrial parks for the implementation of the greening principles and procedures; green/clean industrial and production technologies for efficient and effective environmental management and prevention of land, air and water pollution; resource-use efficiencies, focusing on energy efficiency, water use efficiency, and materials/chemicals efficiency, with special emphasis on leveraging the opportunities for implementing circular economy and resource re-use and recycling opportunities; GHG Emission efficiencies such as fuel and feedstock switching, carbon capture and storage technologies; exploring opportunities for solar thermal energy for drying and washing in the garment and textile industries; sustainable solid waste management and opportunities for wastewater sludge treatment, management and re-use; GHG Emission reduction opportunities from centralized effluent and sewage treatment plants; industrial process optimization for GHG emission reduction from the industrial parks; exploring opportunities to address social aspects relating to sustainable and low emission transport system for workers at the industrial parks; exploring opportunities to address social aspects relating to environmental health risks as well as the associated social safeguards to ensure safety within the parks; and opportunities and interventions for the development of sustainable infrastructure (Global Green Growth Institute, 2019).

What is as yet unclear, however, is whether the roadmap will be relevant to the single most crucial industrial sector identified by the CRGE Strategy, i.e. cement. Based on current plans, the government of Ethiopia has announced 16 multi-sectoral industrial parks by 2025, and has already commissioned six (Hawassa; Bole Lemi I; Kombolcha; Mekelle; Adama; and Jimma). The sectors covered by industrial parks include textile and garments, leather and leather products, agro-processing, machinery, and pharmaceuticals. Cement is not presently a key focus of the industrial parks. Thus, while efforts to ensure GHG reductions in the industrial parks are important, and lay the foundation for replicable low-carbon development in industrial sectors that will continue to grow in Ethiopia, ***this may not be the most direct policy vehicle to tackle the largest source of GHG emissions and largest CRGE target for industrial abatement, i.e. the cement sector.***

9.4.3 GAPS IN THE CRGE STRATEGY'S APPROACH TO INDUSTRY

Given Ethiopia's drive towards middle-income country status by 2025 and the government's commitment to accelerated economic growth, the CRGE Strategy viewed Ethiopia's green economy through the lens of climate change mitigation. This was a natural consequence of the imperative to identify an economic growth pathway that would meet GDP growth targets without undermining environmental resources and without contributing to higher emissions. One consequence of this bent, however, is the neglect of climate change resilience and adaptation. The CRGE strategy is completely silent on the impacts of climate change on the industrial sector, the vulnerabilities of the sector and the risks it faces from climate change, and what the industrial sector should do to enhance its adaptive

capacity against climate change related hazards, to make itself more resilient and capable of thriving in a future beset by climate shocks and stresses.

These oversights in the CRGE Strategy have been remedied for some sectors in the form of sector-specific climate resilience strategies (i.e. the CR strategies for agriculture and forestry, for water and energy, and for transport). This was not done for industry.

More recently, Ethiopia has developed a comprehensive National Adaptation Plan (NAP) (Federal Democratic Republic of Ethiopia, 2019). The NAP prioritizes 18 adaptation options across the most vulnerable sectors, including industry. Adaptation option number 12 in the NAP underscores "Developing Adaptive Industrial Systems." Under the NAP, the industrial sector is both a subject for enhanced adaptive capacity, as well as a driver or source of stronger economy-wide adaptive capacity (through infrastructure growth etc.). Ethiopia now also has GE and NAP roadmaps to 2030, including for this sector. Since the NAP has addressed the gap in the CRGE Strategy and has identified key pathways to increase adaptation in the industrial sector, it is recommended that the NAP be fully and effectively implemented to ensure climate resilience in this sector. ***Specific first steps beyond the formal adoption of the NAP would be for Ethiopia's major industries to undertake climate change risk and vulnerability assessments; use these evidence-based assessments to identify crucial vulnerabilities to be reduced and the associated specific, targeted interventions to build adaptive capacity and reduce vulnerability; develop detailed implementation plans and timelines for the industry-specific or even unit/plant-specific adaptation activities selected; and track, monitor, measure, evaluate, and report on the progress made in improving adaptive capacity and reducing vulnerability.*** Particular examples of adaptation measures that could be a starting-point for consideration in Ethiopian industries (such as retrofitting of facilities to protect against climatic hazards such as floods; or switching to less water-intensive technologies to reduce vulnerability against future water variability and stress) are identified in tables provided by the OECD's Development Assistance Committee (noting that the actual applicability of specific adaptation interventions can only be determined by the outcome of industry-specific and potentially unit/plant-specific vulnerability and risk assessments) (Organization of Economic Cooperation and Development, 2017).

In terms of climate change mitigation, as noted previously, the CRGE Strategy's focus on the cement sub-sector was both strategic and appropriate, given the cement industry's pivotal role in reducing GHG emissions if Ethiopia is to achieve its CRGE targets in 2030. Thus, on the mitigation side the gap identified in this progress assessment is not in the policy content itself, but in the implementation of the CRGE Strategy in the industrial sector, where it appears that negligible activity has taken place in GHG emissions reduction in the cement industry. Some industries have undertaken energy audits, which are a useful first step in identifying energy-intensive aspects of the production process and thereby identifying target-areas for reduction in energy use and increase in energy efficiency. However, since energy audits themselves do not lead to GHG reduction, it is critical that future policy development and policy enforcement focus heavily on tangible emissions reductions, particularly in the cement industry.

Further guidance for the same can be sought by cross-referencing the Intergovernmental Panel on Climate Change's (IPCC's) chapter on mitigation in the industrial sector, which documents several scientifically-endorsed mitigation approaches for major industries – including the cement sub-sector -- available in the IPCC's Fifth Assessment Report (AR5) (Intergovernmental Panel on Climate Change, 2014).

9.4.4 POLICY RECOMMENDATIONS MOVING FORWARD

Mitigation:

- Mobilize and allocate resources for the complete implementation of Ethiopia's Green Manufacturing Strategy, 2018;
- Ensure that KPIs and measurable milestones identified in the Green Manufacturing Strategy are mainstreamed and integrated into the ten-year economic planning process and the successor to GTP-II, so that both public and private resources are invested in realization of the strategy, and
- Co-develop a national Cement Industry Emissions Reduction Action Plan in collaboration with private sector cement manufacturers in Ethiopia, to ensure the adoption and implementation of specific, measurable GHG reduction measures linked to CRGE 2030 targets. Integrate measures recommended by the Cement Sustainability Initiative (CSI) of the World Business Council for Sustainable Development (World Business Council

on Sustainable Development, n.d.), and lessons from cement industry leaders in the CDP league tables (CDP, n.d.). Even if the private sector is unwilling to support or participate in this, develop the action plan and enforce it on the industry.

Adaptation:

- Mobilize and allocate resources for the complete implementation of Ethiopia's National Adaptation Plan (NAP), including in the industry sector, and
- Promote the undertaking of climate change vulnerability and risk assessments in major industries of national importance (or strategically critical industrial sites and plants), to enable to identification of key vulnerabilities and corresponding strategic interventions to reduce vulnerability and build adaptive capacity against climate change impacts.

Cross-cutting:

- Update Ethiopia's Industry Development Roadmap, Ethiopia's Industry Development Strategic Plan (2013-2025), and Institutional Setup for Ethiopian Industrial Development (2013-2025) to explicitly integrate specific timebound measures aimed at measurable GHG reduction, particularly in the cement sector.

10 Health

- Ethiopia has a health specific National Adaptation plan which outlines its adaptation goals and priorities in the health sector.
- Major projects in the health sector include national scale projects such as the Ethiopia National Nutrition Programme, the Ethiopia Sanitation and Hygiene Improvement Programme and the ONEWash program which have numerous adaptation co-benefits.
- Areas of future focus could be vulnerability and adaptation assessments at decentralised levels, climate proofing health infrastructure and updating building codes incorporating baseline, mid-term and end-term evaluations in health sector adaptation interventions, promotion of community health insurance schemes, capacity building and training for programme evaluation and reporting.

10.1 ADAPTATION: HEALTH

Currently the health sector does not feature as a priority sector in the CRGE. Nonetheless, it can be argued that there are secondary health benefits that can be attributed to the four CRGE priority pillars namely: (a) adoption of agricultural and land use efficiency measures; (b) increased GHG sequestration in forestry, i.e., protecting and re-establishing forests for their economic and ecosystem services including as carbon stocks; (c) deployment of renewable and clean power generation; and (d) use of appropriate advanced technologies in industry, transport, and buildings (Federal Democratic Republic of Ethiopia, 2011).

The **Nationally Determined Contributions (NDC, 2015)** builds on the CRGE and sets a roadmap for significant GHG reductions for Ethiopia through identified adaptation and mitigation interventions. Like the CRGE, health sector interventions are factored in as a cross-cutting interventions and not as a priority sector. The NDC's long-term adaptation goal is to ensure mainstreaming of adaptation interventions into all development activities. The medium-term adaptation goal is to reduce climate vulnerability and increase resilience with emphasis on drought, floods and cross-cutting interventions (health features here). Earmarked health sector interventions include strengthening capacity to deal with the expansion and emergence of human, animal, crop and plant diseases in Ethiopia and providing respective medicines in adequate quantities (Federal Democratic Republic of Ethiopia, 2015). Collectively, all adaptation interventions of the NDC will have secondary health benefits such as ensuring food security, promoting disaster preparedness and ensuring clean water, air and energy for all.

The **National Health Adaptation Plan to Climate Change (H-NAP, 2018-2020)** elevated the focus on health with regards to climate change adaptation and bridged the gap created by previous strategies and plans. It is one of the five sectoral adaptation plans developed in Ethiopia. The plan reiterates the high vulnerability to climate change of the health sector and spells out anticipated climate change impacts with required adaptation interventions (Federal Ministry of Health, 2018). The plan has adopted a strategic approach of mainstreaming climate change to health programmes, enhancing community mobilisation, strengthening partnerships for programme implementation and strengthening existing health systems. Key intervention areas include:

- Strengthening and expanding health infrastructure;
- Strengthening existing integrated disease surveillance and response;
- Promoting climate resilient sanitation facilities;
- Promoting climate resilient water safety plan;
- Promoting family planning;
- Revising building codes of health facilities;
- Promoting climate change mitigation initiatives;
- Promoting community health insurance schemes;
- Advocating and creating awareness on climate change and health, and
- Encouraging operational research on health and climate change.

The plan set targets for the implementation period (2018-2020) as shown in Table 19: Implementation targets for the H-NAP 2018-2020 but there is little information regarding progress achieved so far. A status assessment of implementation interventions is recommended to document progress achieved.

Target	Baseline	Assumptions	Monitoring mechanisms	Responsible body
9 regional states and 2 city administrations will have functional climate change and health technical working group	0	Health bureaus of the respective regions are aware of the importance of establishing functional climate change and health technical working group	Report	FMOH
9 regional states and 2 city administrations health bureaus will have their own vulnerability and adaptation assessment report	0	WHO and other partners will support technically and financially in conducting vulnerability and adaptation assessment	Submitting copy of the assessment report	FMOH/ RHBs
754 health facilities' infrastructure will be re-innovated	NA	Government committed to allocate budget	Annual report and supervision report	FMOH and RHBs
1,126 health posts and 90 health centers will have self-supply of Water (Refer to HSTP)	45%HPs and 71% HCs	Government will allocate adequate budget for	Annual report and supervision report	FMOH and RHBs
3,789 health posts and 343 health centers will have self-generated renewable energy	29% HPs and 57% HCs	Fund will be obtained from green fund and other climate change mitigation initiatives	Annual report and supervision report	FMOH, MoEFCC and RHBs
65.5 million people will be sensitized about climate change and health	NA	Government will set it as priority agenda, and Mass Medias will cooperate for	Quarterly report	FMOH, OGCA and RHBS
7,703,040 households will plant shading trees in their compound	15% (estimation)	Government will set it as priority agenda , and MoANR will support technically	Annual report and supervision report	FMOH, MoANR, MoEFCC and RHBs
526 drought prone kebelles will assure community health insurance	NA	Local leaders will committed to mobilize people	Quarterly Report	FMOH and RHBs
The contraceptive prevalence rate will increase to 55%	42%	Local leaders will mobilize households to use contraceptives	Quarterly Report	FMOH and RHBs

Table 19: Implementation targets for the H-NAP 2018-2020

In response to the need for systematically tracking adaptation implementation progress of the CRGE and the GTP II, a sectoral monitoring checklist was developed in 2018 to guide sectoral planning and monitoring of adaptation interventions. This monitoring checklist guides the development of sectoral annual plans, including the health sector, that contribute collectively towards realisation of the CRGE and the GTP II (CGIAR, 2018). This will also ensure standard methodologies for GHG emission measurement and reporting mechanisms (MRV system). All sectors are required to monitor their achievement based on the targets set and record and document results. This will go a long way in systematically recording adaptation milestones in the long run. The monitoring checklist for the health sector is shown in Table 20: Monitoring checklist for health sector below.

Major mitigation and adaptation approach	Detailed adaptation and mitigation options	Types of actions	Indicator	Implementing sector
Expanding environmental health service	Improving human health through implementation of environmental health services in rural and urban	Adaptation	- Number of HHDs using toilet in rural & urban - Number of HHDs with modern toilet - Number of households using household economy - Number of HHDs using properly designed solid and liquid waste disposal system - Number of health service provision infrastructure in rural and urban areas - Number of models HHDs benefitted and completed health service extension - Number of health service organisations that improved liquid and solid waste disposal system - Number of organisations that established systems for disposal of expired chemicals and drugs	MoH

Table 20: Monitoring checklist for health sector

The recently adopted **National Adaptation Plan (NAP-ETH)** further builds on the CRGE and GTP II with guidance on priority adaptation interventions including interventions in the health sector. The plan has a 15-year implementation period between 2016-2030 with an estimated budget of USD 6 billion per annum (USD 90 billion total over 15 years) to be divided proportionally between 18 identified adaptation options/programs (Federal Democratic Republic of Ethiopia, 2019). Apart from reducing vulnerability to the impacts of climate change, the NAP-ETH aims to facilitate integration of climate change adaptation into new policies, programmes and activities into all sectors and at different levels. This perhaps is as a result of previous setbacks as a result of minimal integration of climate change adaptation to all sectors. The NAP-ETH has identified 18 priority adaptation options with 9 out of 18 adaptation options responding directly or indirectly to health as listed below:

1. Enhancing food security through improving agricultural productivity in a climate smart manner.
2. Improving access to potable water;
3. Improving human health systems through the implementation of changes based on an integrated health and environmental surveillance protocol;
4. Building social protection and livelihood options of vulnerable people;
5. Enhancing alternative and renewable power generation and management;
6. Developing adaptive industry systems;
7. Strengthening drought, livestock and crop insurance mechanisms;
8. Improving early warning systems, and
9. Reinforcing adaptation research and development.

From all the above, there has been steady improvement in planning and implementation of adaptation interventions for the health sector. This is evident from the improvement in mainstreaming adaptation considerations into policy and legal frameworks and programme planning, implementation and monitoring. It is worth noting that multi-sectoral approaches to adaptation implementation are increasing and thus monitoring of adaptation progress should follow suit, with attribution to the various sectors as appropriate.

The following section provides a synopsis of adaptation programmes and projects in the health sector and their status of implementation. This progress is measured against the CRGE's monitoring framework and implementation targets for the H-NAP and NAP-ETH. The assessment is for active programme/projects within the 2011-2019 period.

The Ethiopia National Nutrition Programme - Phase II (NNP II) being implemented between 2016-2020 directly contributes to the NDC's health targets[30] through improvement of the nutritional status of children from birth up to 10 years; improvement of delivery of nutrition services for communicable and non-communicable/lifestyle related diseases; strengthening the implementation of nutrition-sensitive interventions across sectors; and improving multi-sector coordination and capacity to implement the national nutrition programme (Federal Democratic Republic of Ethiopia, 2016). The NNP II programme also directly contributes to the H-NAP targets[31] by improving delivery of nutrition services for communicable and non-communicable/lifestyle related diseases and strengthening the implementation of nutrition-sensitive interventions across sectors. This programme is currently on-going and quantitative project results will only be available post-2020 after project closure.

The Water, Sanitation and Hygiene (WASH) Program implemented by World Vision between 2011-2018 contributed to two of the H-NAP priority intervention areas of promoting climate resilient sanitation facilities and promoting climate resilient water safety plans. This was achieved through the program's activities in improved water supply, improved sanitation services and improved hygiene practices. As a result, 2.9 million people have access to safe drinking water, more than 2.4 million people have access to dignified sanitation and 2.45 million people are practicing healthy hygiene behaviour in rural and urban WASH and emergency WASH response (World Vision Ethiopia, 2019). These results also respond to NAP-ETH priority intervention area of promoting access to potable water. Notably, a World Vision WASH assessment report documented in 2011 that assessed 25 WASH projects and projects in Ethiopia highlighted that conducting a detailed baseline survey is key in ensuring systematic program evaluation that is a challenge for most projects (Cornell University, Bahir Dar University, 2012). This emphasizes the need of including baseline surveys in project design from the start for monitoring and evaluation purposes.

The Water, Sanitation, and Hygiene Transformation for Enhanced Resiliency Project (WaTER) implemented by the International Rescue Committee (IRC) and Care Ethiopia between 2011-2014 directly contributed to priority intervention areas and targets for both the H-NAP[32] and NDC's health targets[33] through construction of 22 new boreholes and rehabilitated 19 existing borehole-based systems with corresponding distribution networks. This resulted in 221,504 beneficiaries having year-round access to an improved water source. Installation of new and rehabilitated water systems was complemented with hygiene promotion activities in target areas (SaafConsult B.V, 2014).

The Ethiopia Sanitation and Hygiene Improvement Programme (ESHIP) implemented between 2012-2017 under the leadership of the Federal Ministry of Health has directly contributed to attainment of the CRGE's monitoring framework's indicators of number of households using toilets in rural & urban as well as number of households with modern toilets. This was achieved through ESHIP's activities that resulted in 1.6 million people living in open defecation free environment and more than 3,600 villages triggered through behaviour change activities. A further 1.7 million people gained access to handwashing facilities (Global Sanitation Fund, 2015).

There are other on-going projects and programmes whose evaluation is expected to be conducted after project completion in 2020 which make contributions to the CRGE and its monitoring framework, H-NAP, the NDC and NAP-ETH which should be closely monitored to better understand health sector adaptation progress in Ethiopia. These are:

- Ethiopia National Nutrition Programme II - NNP II (2016-2020), and
- ONE WASH National Programme II (2018-2020).

Additionally, other on-going adaptation programmes in water, education, agriculture and energy sectors that directly and indirectly contribute to health benefits should be monitored because health sector interventions have adopted a multi-sectoral approach. A clear attribution formula needs to be put in place, at a national scale, to systematically

[30] Strengthening capacity to deal with the expansion and emergence of human, animal, crop and plant diseases in Ethiopia and providing respective medicines in adequate quantities
[31] 754 health facilities' infrastructure will be renovated and 65.6 million people sensitised about climate change and health
[32] 1,126 health posts and 90 health centers will have self-supply of water
[33] Strengthening capacity to deal with the expansion and emergence of human, animal, crop and plant diseases in Ethiopia and providing respective medicines in adequate quantities

track adaptation progress and most importantly to give guidance on a clear way of attribution of results to the various sectors.

10.1.1 FUTURE FOCUS

The analysis reveals that adaptation interventions in the health sector are steadily increasing. However, to be fully responsive to the CRGE, NAP-ETH, NDC and H-NAP targets and performance indicators, there are areas that need strengthening as listed below:

- Vulnerability and adaptation assessments at decentralised levels;
- Climate proofing health infrastructure and updating building codes;
- Incorporating baseline, mid-term and end-term evaluations in health sector adaptation interventions;
- Promotion of community health insurance schemes, and
- Capacity building and training for programme evaluation and reporting.

The above listed areas of focus should therefore be incorporated into on-going and upcoming health sector adaptation programmes and projects to bridge the gap.

10.2 FINANCE: HEALTH

The health sector accounts for only 8 of the 224 projects analysed, but with a high average value and a combined value of ETB 12.4 billion through the 2011-2019 period. This number is likely to be higher, as value data was only available for 3 of the 8 identified projects in this sector.

All 8 of the sector's projects have an adaptation impact, dominated by two initiatives – the One Wash National Program Phase II at ETB 8.9 billion, and the Ethiopia Sanitation and Hygiene Improvement Project at ETB 3.1 billion.

Considering the annual breakdown of expenditure in the sector from 2011 to 2019 is of limited use, as it only reflects the expenditure of one project (the Ethiopia Sanitation and Hygiene Improvement Project). This is due to project start/completion data only being available for this initiative, making it impossible to estimate annual expenditure for the others.

Much like the Industry sector, due to the data paucity in this sector, it is challenging to draw any insightful conclusions from this limited analysis. This should be kept in mind for future studies and suggests that a more rigorous method of capturing and collating data in this sector in Ethiopia would be valuable.

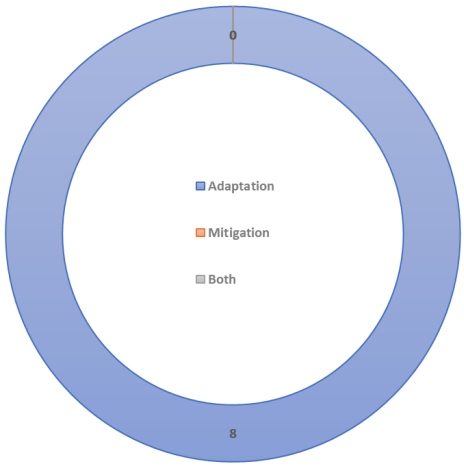


Figure 30 Number of Projects in the Health Sector by Climate Impact 2011-2019

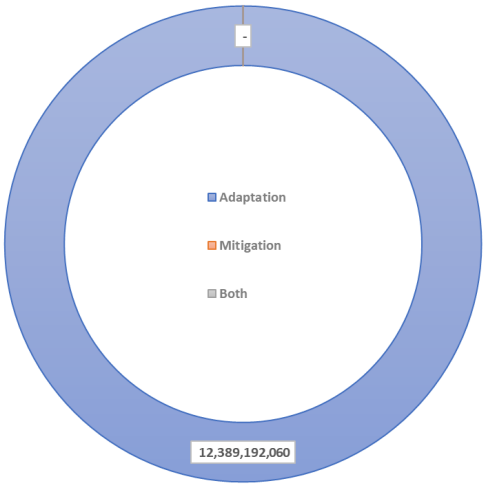


Figure 31 Total Value of Projects (in ETB) in the Health Sector by Climate Impact 2011-2019

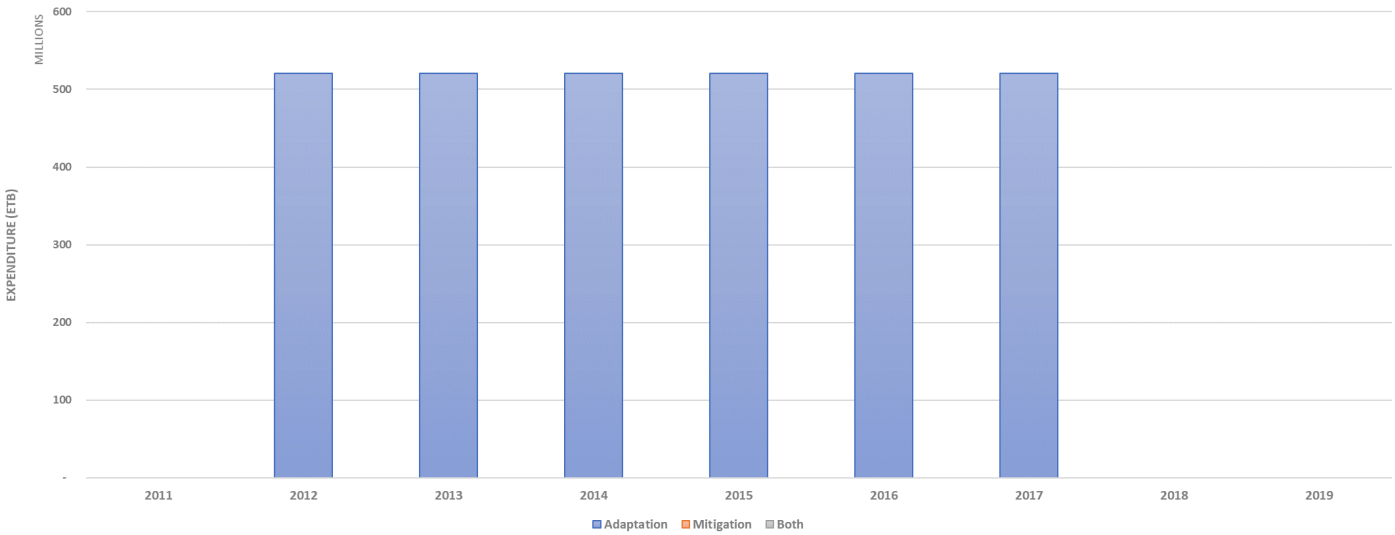


Figure 32 Annual Breakdown of Project Expenditure (in ETB) in the Health Sector by Climate Impact 2011-2019

10.3 INSTITUTIONAL ARRANGEMENTS AND CAPACITY: HEALTH

10.3.1 CRGE RELATED INSTITUTIONAL ARRANGEMENTS

The Ministry of Health does not have a CRGE Directorate, as a consequence of not being amongst the original CRGE sectors. However, it does have focal points who engage with the CRGE Facility and who bear responsibility for CRGE-related activities.

10.3.2 INSTITUTIONAL CAPACITY CHALLENGES AND GAPS

Literature review suggests that the principal challenge in terms of CRGE-linked institutional capacity in the Ministry of Health is the absence of a formal CRGE Directorate at par with other CRGE institutions in other ministries. As the

health sector gets more integrated into CRGE-related activities, it will be important to provide the focal points at the Ministry with a clear mandate, the necessary resources, and the appropriate visibility within the CRGE landscape.

- Unfortunately, due to its status as a non-CRGE sector, the Ministry of Health was not covered within the 2015 CRGE National Capacity Development Program report (based on a gaps and needs assessment). Nevertheless, it is plausible that similar capacity challenges and needs identified by the assessment in other CRGE sectors also exist in the health sector;
- Similarly, even though the health sector did not have any FTI projects, it is likely that some of the lessons learnt from the CRGE FTI process (LTS International, 2015) also apply to nascent, pilot-stage CRGE-related or climate change related initiatives in the health sector, such as the need for more robust M&E and improved knowledge management systems, and
- Despite its status as a non-CRGE sector, the Ministry of Health was involved in the Regional Capacity Building Programme's (RCBP's) Training of Trainers initiative, and even regional bureaus of health participated in the RCBP (Ministry of Environment, Forests, and Climate Change , 2015). This is a positive trend, and the Ministry's ability to design, administer, and deliver CRGE-linked projects and programs should continue to be built further through sustained, long-term enhancement of technical, administrative, or regulatory capacity.

10.3.3 INSTITUTIONAL ARRANGEMENTS RECOMMENDATIONS MOVING FORWARD

i. Create a CRGE Directorate in the Ministry of Health, and structure it at par with other CRGE Directorates (or Bureaus), and
ii. Ensure the same level of representation and participation by the Ministry of Health in CRGE governance arrangements including the CRGE Steering Committee and CRGE Management Committee.

10.4 POLICY: HEALTH

10.4.1 CRGE STRATEGY FOCUS

The CRGE Strategy's focus on climate change mitigation manifested in certain key sectors of the country being excluded from the strategy, despite the pressing need for climate resilience in such sectors. The health sector is the most significant of these omissions, given wide-ranging climate change impacts on public health and the need, therefore, for adaptation in the sector. It was not included in the CRGE Strategy since it is not a source of GHG emissions (other than through energy use, like any end-user).

Notwithstanding the mitigation focus of the 2010 CRGE Strategy, the Government of Ethiopia recognizes the health sector as central to achievement of a climate resilient green economy for the country and acknowledges the crucial need for climate change resilience in the health sector.

Future revisions and updates of the CRGE Strategy will take a holistic approach to a green and climate-compatible economy, and integrate both low-carbon development (mitigation) and climate resilience (adaptation). Thus the health sector should be clearly featured in any future iteration of the CRGE Strategy.

10.4.2 OTHER RELEVANT CRGE-LINKED POLICIES

In 2018, Ethiopia released a National Health Adaptation Plan to Climate Change, a two-year plan with short-term strategic interventions to make the health sector climate resilient, and to help mainstream climate change into Ethiopia's health services and health delivery systems. It is often referred to as the H-NAP (depicted in Table 21 Policy Development relevant to the CRGE: Healthbelow).

Policy Instrument	Year	Focus and Objective	Originator / Developer	Institutional Responsibility
National Health Adaptation Plan to	2018 (Draft)	The NHAPCC's objectives entail: enhancing early warning systems and surveillance in the context of climate change health emergency risk management; building the capacity of health sector for the	DFID/WHO	Ministry of Health, Ethiopia

Climate Change, 2018-2020[34]		realization of a climate resilient health system; enhancing the climate resilience of the health system in provision universal health coverage; and creating an enabling environment for health adaption to climate change. The plan comprises of ten key intervention areas.		

Table 21 Policy Development relevant to the CRGE: Health

The H-NAP (Federal Ministry of Health, Ethiopia, 2018) is a compelling example of a governance instrument that explicitly and intentionally creates policy guidance on climate change in a sector (in contrast to sectoral growth and development strategies that may contain mentions of climate change, but contain traditional socio-economic strategies that indirectly build resilience and adaptive capacity by supporting a better-resourced workforce).

The H-NAP describes climate change linkages to major health issues faced by Ethiopia, the impacts of climate change on human health, and the benefits of robust health and a healthy population in coping with climate change. It targets ten key intervention areas (strengthening and expanding health infrastructure; strengthening existing disease surveillance and response; promoting climate-resilient sanitation facilities; promoting a climate-resilient water safety plan; promoting family planning; revising building codes of health facilities; promoting climate change mitigation initiatives; promoting a community health insurance scheme; advocating and creating awareness on climate change and health; and encouraging operational research on health and climate change). It also developed an extremely detailed implementation plan and timeline with activities, indicators, units of measurement, and indicative budgets. ***The H-NAP is thus an excellent strategic tool to guide policy decisions and resource-allocation towards climate resilience in the health sector.***

10.4.3 GAPS IN THE CRGE STRATEGY'S APPROACH TO HEALTH

As noted above, the CRGE Strategy did not include the health sector, which in itself is a notable gap in the CRGE Strategy.

In addition to this gap being remedied by the 2018 H-NAP, Ethiopia has further rectified the lapse by including the health sector prominently in its new National Adaptation Plan (NAP). In 2017, Ethiopia developed a comprehensive NAP (Federal Democratic Republic of Ethiopia, 2019), submitted to the UNFCCC in 2019, which prioritizes 18 adaptation options across the most vulnerable sectors, including health. Adaptation option number 5 in the NAP emphasizes that Ethiopia must improve human health systems through the implementation of changes based on an integrated health and environmental surveillance protocol. This approach is underpinned by the intent to strengthen disease surveillance related to climate change and health and promote evidence-based policy decisions. The NAP's focus, in this measure, is on strengthening health systems to prepare them to better deal with gradual changes and sudden shocks, including those linked to climate change. Furthermore, the NAP highlights the need to prioritize prevention and management of climate-sensitive diseases, improve emergency medical services, balance high population growth with economic growth, manage indoor air pollution, and improve basic health services, including the health extension system. Ethiopia now also has a NAP roadmap to 2030, including for this sector.

While the NAP prioritizes disease surveillance protocols and systems related to climate change and health, as well as awareness-building within health sector workers and healthcare practitioners, the H-NAP provides an even more comprehensive approach, whilst still making improved surveillance and awareness central tenets. Given that the H-NAP was developed in a more granular manner, ***it is recommended that in the immediate-term (2019-2020), resources be dedicated to the full implementation of the H-NAP, which will automatically translate into implementation of the health sector elements of the NAP.***

[34] This document superseded (and built on) the precursor 2014 National Framework for a Climate Resilient Health Sector, by the Ministry of Health (https://www.who.int/globalchange/resources/wash-toolkit/national-framework-of-climate-resilient-health-sector.pdf?ua=1).

As the NAP itself moves into an implementation stage, specific first steps beyond the formal adoption of the NAP would be for the Ministry of Health and major public health research institutions to undertake climate change risk and vulnerability assessments for diseases and health conditions that constitute the majority of Ethiopia's disease burden; to use these evidence-based assessments to identify crucial disease-specific and region-specific vulnerabilities to be reduced; to identify associated disease-specific, targeted interventions to build adaptive capacity and reduce vulnerability; to develop detailed climate change and health response management plans for the health threats that emerge as the most climate-sensitive; and track, monitor, measure, evaluate, and report on the progress made in improving adaptive capacity and reducing vulnerability against such climate-health threats.

Beyond the lifetime of the H-NAP, when the NAP is elaborated on and complemented by implementation plans containing more specific measures, Ethiopia may also find guidance from examples of health sector adaptation measures (such as measures to control against heat stress, or combat heat-sensitive disease vectors like mosquitos, or improve food-safety regulations to address climate-related microbial diseases and contamination) that are identified in tables provided by the OECD's Development Assistance Committee (noting that the actual applicability of specific adaptation interventions can only be determined by the outcome of health sector climate change vulnerability and risk assessments) (Organization of Economic Cooperation and Development, 2017).

10.4.4 POLICY RECOMMENDATIONS MOVING FORWARD

Mitigation:

- Prioritize complete implementation of the H-NAP, which contains mitigation actions and targets for the health sector (such as the use of renewable energy, non-motorized transport for within hospital compounds, biological sequestration through tree-planting etc.).

Adaptation:

- Mobilize and allocate resources for the complete implementation of the H-NAP (even beyond 2020, if its original activities have yet to be implemented);
- Mobilize and allocate resources for the complete implementation of Ethiopia's National Adaptation Plan (NAP), including in the health sector, and
- Promote the undertaking of climate change vulnerability and risk assessments for major diseases and health conditions of national relevance, to enable identification of key health sector vulnerabilities to climate change (including regional high-risk hot-spots), and the identification of corresponding strategic interventions to reduce vulnerability and build adaptive capacity against climate change impacts in the health sector.

Cross-cutting:

- Ensure that all future revisions and updates of major health sector policy and strategic instruments will proactively integrate climate change considerations, and that new public health projects and programs developed will mainstream climate change into their design and operations, especially to align with guidance from the H-NAP and NAP.

11 Transport

11.1 FINANCE: TRANSPORT

The transport sector accounts for only 9 of the 224 projects analysed, but with a combined value of ETB 140.7 billion through the 2011-2019 period, it's the second largest assessed sector after agriculture.

Not unexpectedly, all of the transport projects identified have a mitigative impact, the largest by some margin being the ETB 100 billion National Rail Network from Awash (3 Zones) initiative, followed by the ETB 25.8 billion Ethiopia-Djibouti Railway Project.

Considering the annual breakdown of expenditure in the sector from 2011 to 2019, the total is ETB 139.8 billion, with the majority in the period 2012 to 2017. No expenditure has been identified in 2018 and 2019.

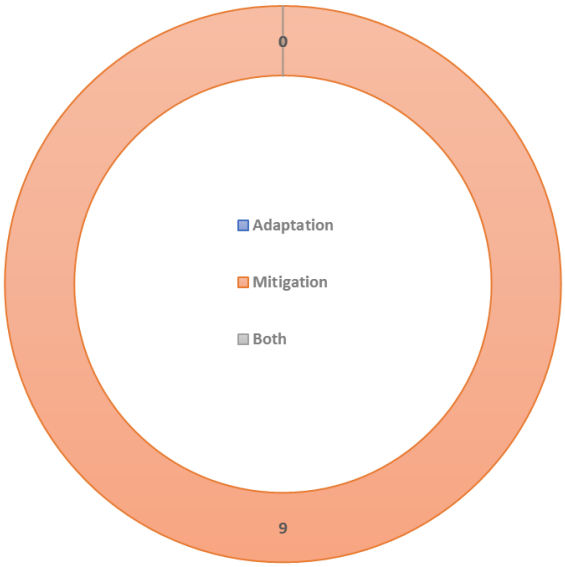


Figure 33 Number of Projects in the Transport Sector by Climate Impact 2011-2019

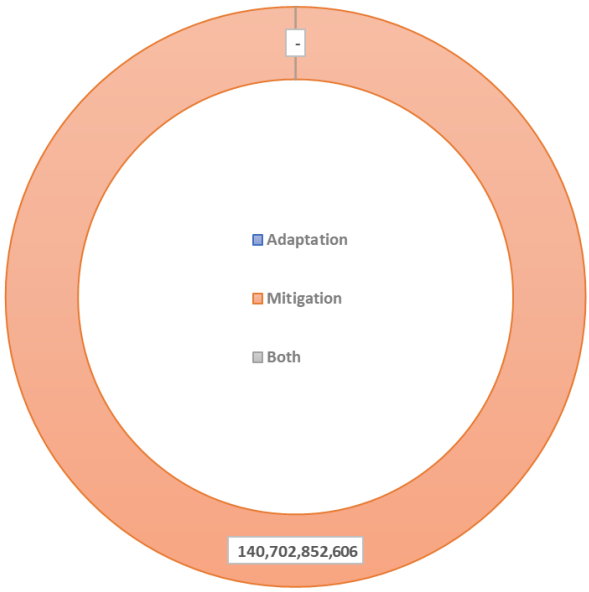


Figure 34 Total Value of Projects (in ETB) in the Transport Sector by Climate Impact 2011-2019

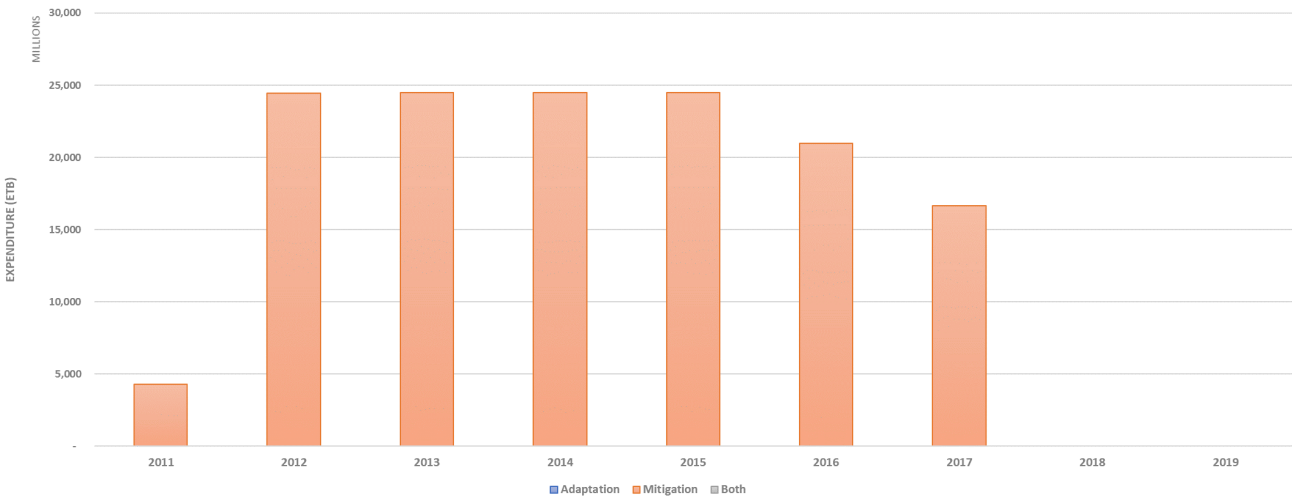


Figure 35 Annual Breakdown of Project Expenditure (in ETB) in the Transport Sector by Climate Impact 2011-2019

11.2 INSTITUTIONAL ARRANGEMENTS AND CAPACITY: TRANSPORT

11.2.1 CRGE RELATED INSTITUTIONAL ARRANGEMENTS

The Ministry of Transport has a CRGE Directorate, headed by a Director-level official. Until 2018 the Ministry had a CRGE Unit (which was below the level of a Directorate), but after internal re-structuring the Unit was elevated to a Directorate in 2018. The Directorate comprises two teams – one for climate change (which oversees CRGE-related work) and one for environmental and social impacts assessments. The CRGE Directorate interacts with the broader

structure of the Ministry of Transport, including its other Directorates and host of institutions accountable to the Ministry (including Ethiopian Airlines; Ethiopian Civil Aviation Authority; Ethiopian Airports Enterprise; Ethiopian Roads Authority; Ethiopian Maritime Transport and Logistics Service Enterprise; Maritime Affairs Authority; Dry Ports Authority; Federal Transport Authority; Ethio-Djibouti Rail Enterprise; Ethiopian Railroad Corporation; Ethiopian Road Construction Corporation; Insurance Fund; and the Road Fund).

Like all other CRGE focal point bodies in key sector line Ministries, the CRGE Unit in the Ministry of Transport submits to the CRGE Facility quarterly progress reports, annual progress reports, and annual MRV reports. The Ministry is represented in the CRGE Inter-Ministerial Steering Committee, as well as the CRGE Management Committee, and Ministry representatives attend the half-yearly (annual and interim) review meetings of both these committees.

11.2.2 INSTITUTIONAL CAPACITY CHALLENGES AND GAPS

The literature review as well as direct engagement with the CRGE Directorate in the Ministry of Transport, through purposive semi-structured interviews, indicated a range of constraints that is limiting the progress of the CRGE Directorate towards CRGE 2030 targets.

- The Ministry of Transport was allocated funds for two CRGE Fast Track Investment (FTI) projects – (a) smart parking to improve traffic flow and emissions reduction; and (b) share the road – non-motorized transport (walking and cycling) for urban mobility. Of the two, progress was made on the first, and the second project never got off the ground and did not undergo implementation. The project on NMT suffered problems during the planning stages and was stopped. In terms of the smart parking project, one location (Makato) was completed and is under operation, but GHG calculation and estimation of impact was not undertaken at any point in the project cycle since the initiative was always regarded as a small, pilot effort. The GHG calculation element was not embedded within project design;
- One of the biggest challenges identified by the CRGE Directorate in the Ministry of Transport is high staff turnover. The Directorate has to expend resources on a regular basis to replace departing staff, and the turnover in staff also results in the loss of institutional memory. At present, the Directorate has open positions that are not filled;
- Another key constraint is that there has been no regularization and harmonization of pay-scales across the different CRGE Directorates in different Ministries. Certain CRGE Directorates and Units are able to offer higher salaries than others, and as a result applicants often prefer the higher-paying CRGE vacancies;
- As a result of such turnover and pay-scale discrepancies, the current level of staff in the CRGE Directorate is lower than optimal, and staff shortage is a significant obstacle;
- Data and information collection and organization – i.e. knowledge management – was also identified as one of the most pressing challenges. There is no centralized database and information retrieval system;
- MRV of GHG emissions remains an area where substantial improvement in technical capacity is required. It is very hard to collect the relevant data from woredas, regions, and sub-regions. Whatever is collected is manually recorded, and there are no automated data management systems;
- Several training workshops and events have helped bolster staff technical capacity over the years, but there is still a need for a higher level of capacity in the Directorate. The Ministry of Transport was involved in the Regional Capacity Building Programme's (RCBP's) Training of Trainers initiative, and even regional bureaus of transport participated in the RCBP (Ministry of Environment, Forests, and Climate Change , 2015). The CRGE Directorate has been involved in a number of training and capacity-building initiatives, including workshops, and while these events always help, they have also not resulted in sustained, long-term enhancement of technical, administrative, or regulatory capacity;
- The need for more systemic capacity development was recognized in 2015 by the CRGE National Capacity Development Program report (based on a gaps and needs assessment). The report indicated that even though a number of transportation systems and projects operated at a sub-regional level, CRGE work in the transport sector mostly took place at the federal and regional level. IN some regions and woredas, CRGE-related activities were undertaken jointly with the responsible entities for buildings and industry. The assessment revealed gaps in integrating CRGE goals and targets into regional transport bureau strategic plans. The report noted that the transport sector exhibited CRGE-related capacity gaps in terms of staff capacity for strategic planning; operational planning; resource mobilization; Monitoring, Evaluation, and Learning (MEL); stakeholder coordination and consultation; and knowledge management. Several CRGE-related positions were unfilled, and CRGE

responsibilities had not been re-distributed amongst other existing staff (Federal Democratic Republic of Ethiopia, 2015), and

- Such capacity needs were also flagged in a 2015 review of lessons learnt from the CRGE FTI process (LTS International, 2015). While not specific to the transport sector, the report highlighted issues across sectors that remain CRGE-linked challenges to date in the transport sector in Ethiopia: low technical capability in finance and project management; a lack of understanding of the need for and approach to baseline-setting; limited understanding of performance metrics and KPIs and how to measure them; M&E; and data and information collection and management.

11.2.3 INSTITUTIONAL ARRANGEMENTS RECOMMENDATIONS MOVING FORWARD

i. Enhance human capacity by increasing the number of CRGE-focused staff and filling all existing CRGE-related vacancies;
ii. Harmonize CRGE-linked institutions across Ministries in terms of their names, pay-scales, mandates, and powers
iii. Empower the CRGE Directorate in the Ministry of Transport with a stronger legal framework and mandate to influence and guide the activities of other directorates and authorities within the Ministry in relation to climate change mitigation and adaptation. At present, the Directorate feels disempowered and does not feel that it has sufficient standing to solicit information from the various authorities, and feels that climate change related initiatives will be given attention to only if the request comes from higher levels in the Ministry;
iv. Enable the CRGE Directorate with an expanded budget and more financial resources, and
v. Equip the CRGE Directorate with effective knowledge management systems, including data and information management systems, MRV-oriented software, and necessary tools.

11.3 POLICY: TRANSPORT

11.3.1 CRGE STRATEGY FOCUS

At the juncture when Ethiopia's CRGE Strategy was developed, the transport sector's share of Ethiopia's total greenhouse gas (GHG) emissions was just 3%. Of the total emissions of ~4 MT CO_2e (from the 2010 baseline), nearly 75% or three-quarters – i.e. 3 MT CO_2e – was attributable to road transport, principally freight and construction vehicles, and to a lesser extent passenger vehicles. Air transport was the other major source of transport GHG emissions, accounting for an estimated 23% of transport-sector emissions. The contributions of inland waterway transport and rail transport were minimal.

While the transport sector constituted a small fraction of 2010 GHGs, it was anticipated that this sector would display marked growth in emissions between 2010 and 2030, given rising income levels and evolving consumer behaviours that trend towards more consumptive lifestyles when a country experiences economic growth. Freight transport was expected to grow at a rate of 13% per annum, and passenger transport was expected to grow at over 9% per annum, through 2030. Based on models linking elasticity of passenger-kilometres and freight ton-kilometres to GDP, the CRGE strategy projected that transport sector GHG emissions would grow over seven-fold by 2030, from < 5 MT CO_2e in 2010 to > 40 MT CO_2e in 2030 (Federal Democratic Republic of Ethiopia, 2012).

In light of where the biggest source of transport sector emissions and emissions growth was, i.e. road transport, the CRGE strategy's focus on reducing GHGs from freight and passenger vehicles was both strategic and optimal.

The CRGE strategy highlighted key areas of intervention that had potential to reduce GHG emissions from the transport sector:

- Fuel efficiency and fleet modification: introducing stricter fuel efficiency standards for passenger and cargo transportation and promoting the purchase of hybrid and electric vehicles to counter the low efficiency of the existing vehicle fleet;
- Electric rail development for freight: constructing an electric rail network powered by renewable energy to substitute road freight transport;
- Electric integrated public transport networks for urban passengers: improving urban transport in Addis Ababa by introducing urban electric rail and enabling fast and efficient bus transit, and

- Fuel-switching: substituting imported fossil fuels with domestically produced biodiesel and bioethanol.

The CRGE strategy identified abatement potential of approximately 10-13 MT CO_2e from the projected transport GHG emissions in 2030, of which ~ 8-9 MT CO_2e of abatement is to be achieved from the switch from road-based freight transport to renewable energy-powered electric rail-based freight transport. ***Fuel efficiency and fuel switching (from conventional fuels to renewables) were the primary types of interventions chosen by the CRGE strategy for the transport sector, and were appropriate choices given the major sources of transport sector GHG emissions.***

11.3.2 OTHER RELEVANT CRGE-LINKED POLICIES

In the context of assessing the progress of *implementation of the CRGE Strategy* (as opposed to assessing overall progress in transport sector development in Ethiopia), two policy developments in the transport sector are noteworthy for their relevance to progress on the CRGE strategy (depicted in Table 22 Policy Development relevant to the CRGE: Transport below).

Policy Instrument	Year	Focus and Objective	Originator / Developer	Institutional Responsibility
Ethiopia's Climate Resilient Transport Sector Strategy	Indeterminate	The strategy's objective is to support the creation of an affordable, integrated, safe, responsive and sustainable transport system that enhances the environmental, economic, social and cultural wellbeing of Ethiopia's population. The strategy's focus is on reducing exposure of human health, safety, and the environment to the negative impacts of transport pollution; and reducing GHGs from the country's transport network.		Ministry of Transport, Ethiopia
Transport Policy of Addis Ababa	2011	The strategy seeks to address and reduce the challenges of urban transport in Addis Ababa. Specifically, it aims to: provide provide safe, efficient, comfortable, affordable, reliable and accessible transport service for urban dwellers; to enable the transport sector to provide for the socio-economic development, good governance, livelihoods, and environmental protection; and to enable seamless traffic flow through a modern traffic management system.		Ministry of Transport, Ethiopia

Table 22 Policy Development relevant to the CRGE: Transport

The Climate Resilient Transport Sector Strategy articulates a climate mitigation target for 2030: reducing per capita GHG emissions by 64% between 2010 and 2030, from domestic transport (Ministry of Transport, Ethiopia, n.d.). In addition to the mitigation-oriented measures identified for the transport sector in the CRGE strategy (fuel-switching, fuel efficiency standards, electric rail, hybrid vehicles, bio-diesel and bioethanol), the Climate Resilient Transport Sector Strategy also prioritizes non-motorized transport in urban areas (walking and cycling), and establishment of age-limits for passenger and freight vehicles, to reduce inefficiency. Furthermore, the strategy mentions a range of interventions to reduce air transport emissions.

On the adaptation side, the strategy provides guidance on strengthening transport sector resilience by improving overall system planning, implementation, coordination, and efficacy, making the sector more robust and adaptive in the face of climate risks and vulnerabilities. Furthermore, it recognizes the role of a well-functioning transport sector in facilitating population-resilience, whereby people are able to use reliable transport systems as resources to improve their own socio-economic well-being, and as support systems in times of climatic shocks and stresses. Strategic objectives enumerated in the strategy include strengthening the transport planning process; improving access, mobility, and quality of service; ensuring environmental sustainability; promoting public health and reducing social disadvantages; and achieving economic efficiency. The strategy is well thought out, based on reliable sectoral evidence and insights, and provides a useful balance between mitigation and adaptation. If all its provisions are comprehensively implemented, it would provide a strong impetus for the transport sector to achieve its CRGE 2030 targets. However, it is unclear whether the strategy has adequately and effectively influenced and been mainstreamed into overall transport sector planning and operations. ***It does not appear to be in active application in the transport sector in Ethiopia.***

The Transport Policy of Addis Ababa slightly predates the CRGE Strategy. Nevertheless, it dovetails well with the CRGE Strategy's priorities for the transport sector, as well as the thematic focus areas of the climate resilient transport sector strategy. Its alignment is manifested in its emphasis on: Non-Motorized Transport (NMT); renewable energy; development and use of biofuels; limiting the age of imported vehicles; emission standards for vehicles; expansion of mass transit systems; and improved traffic management through intelligent traffic systems etc. (Ministry of Transport, Ethiopia, 2011). While the strategy focuses less on freight and construction transport, and more on passenger transport (which is responsible for a smaller share of transport sector emissions), this is natural given the geographic focus on a city like Addis Ababa. Still, in order to be an even stronger driver of CRGE 2030 transport sector targets, this strategy ***could make a deeper examination of intra-city and inter-city freight transport when it is next reviewed and updated***.

11.3.3 GAPS IN THE CRGE STRATEGY'S APPROACH TO TRANSPORT

Ethiopia's commitment to achieving middle-income country status by 2025 and the government's pursuit of accelerated economic growth resulted in the CRGE Strategy having an extremely strong leaning towards climate mitigation. This was an outcome of the underlying desire to identify an economic growth pathway that would meet GDP growth targets without degrading or depleting environmental resources and without leading to a spike in GHG emissions. One consequence of this attention to mitigation, however, is the relative lack of attention to climate change resilience and adaptation. The CRGE strategy is completely silent on the impacts of climate change on the transport sector, the vulnerabilities of the sector and the risks it faces from climate change, and what the transport sector should do to enhance its adaptive capacity against climate change related hazards, to make itself more resilient and better suited for high performance in a future characterised by climate shocks and stresses.

These oversights in the CRGE Strategy were remedied in the climate resilient transport sector strategy that followed, which affirmed that in addition to mitigation, the sector also needed to embed climate resilience considerations moving forward.

In 2017, Ethiopia developed a comprehensive National Adaptation Plan (NAP) (Federal Democratic Republic of Ethiopia, 2019) and submitted it to the UNFCCC in 2019. The NAP prioritizes 18 adaptation options across the most vulnerable sectors, including transport. Adaptation option number 11 in the NAP emphasizes "Buidling Sustainable Transport Systems." Under the NAP, the transport sector is both a subject for enhanced adaptive capacity, as well as a driver or source of stronger economy-wide adaptive capacity (through transport infrastructure growth etc.). For the transport sector, the NAP underscores protecting and improving the lifespan of transport infrastructure; reviewing and updating transportation design and safety standards; implementing adaptation-oriented asset management systems; and creating a transport system adequate enough to facilitate the movement of aid and support to climate change-affected communities in times of need. Ethiopia now also has GE and NAP roadmaps to 2030, including for this sector.

Since the climate resilient transport sector strategy and the NAP have both addressed the gap in the CRGE Strategy and have identified priority channels to increase adaptation in the transport sector, it is recommended that both these key documents be fully and effectively implemented to ensure climate resilience in this sector. ***Specific first steps***

beyond the formal adoption of the NAP would be for major existing and planned transport systems to undertake climate change risk and vulnerability assessments; to use these evidence-based assessments to identify crucial vulnerabilities to be reduced and the associated specific, targeted interventions to build adaptive capacity and reduce vulnerability; to develop detailed infrastructure designs and operation and maintenance guidelines for the transport systems that emerge as the most vulnerable or at-risk; and track, monitor, measure, evaluate, and report on the progress made in improving adaptive capacity and reducing vulnerability of major transport networks and assets. Particular examples of adaptation measures that could be a starting-point for consideration in Ethiopian transport systems (such as enhanced designs of roads and bridges to protect against climatic hazards such as floods; or improved year-round access to roads for vulnerable populations) are identified in tables provided by the OECD's Development Assistance Committee (noting that the actual applicability of specific adaptation interventions can only be determined by the outcome of transport system and network-specific and potentially asset-specific vulnerability and risk assessments) (Organization of Economic Cooperation and Development, 2017).

In terms of climate change mitigation, as noted previously, the CRGE Strategy's focus on the road transport sub-sector was both strategic and appropriate, given that the lion's share of GHG emissions reductions from the transport sector would need to come from road transport (particularly freight and construction vehicles) if Ethiopia is to achieve its CRGE transport targets in 2030. What is interesting is that several key strategic measures that support the transport sector's CRGE priorities have, in fact, been implemented during the period of this assessment – but documentary and anecdotal evidence suggests that they have likely been designed and operationalized without climate change being a principal driver and without climate change considerations having been explicitly taken into account in the development of such interventions (e.g. the Ethiopia-Djibouti railway line, and the Addis Ababa Light Rail).

Thus, on the mitigation side the gap identified in this progress assessment is not in the policy content itself, but in the implementation of the CRGE Strategy in the transport sector, where it appears that large transport sector projects may be missing an opportunity to maximize their climate mitigation impacts and position themselves for climate mitigation funding.

It should be noted that there are other transport sector mitigation interventions that did not receive prominence in the CRGE Strategy, but could win favour in future transport-sector climate mitigation planning. For instance, transit-oriented development (TOD) of mixed-use residential and commercial areas designed to maximize public transport and reduce distance travelled for certain kinds of freight vehicles (MDBs and IDFC, 2015). In selecting and adopting such additional approaches to transport-sector climate change mitigation, potential interventions can be drawn from the Intergovernmental Panel on Climate Change's (IPCC's) chapter on mitigation in the transport sector, which documents several proven and scientifically-validated mitigation approaches for transport systems – including the road transport and aviation sub-sectors -- available in the IPCC's Fifth Assessment Report (AR5) (Intergovernmental Panel on Climate Change, 2014).

11.3.4 POLICY RECOMMENDATIONS MOVING FORWARD

Mitigation:

- Mobilize and allocate resources for the complete implementation of Ethiopia's Climate Resilient Transport Sector Strategy, and the Transport Policy of Addis Ababa;
- Ensure that KPIs and measurable milestones identified in these instruments are mainstreamed and integrated into the ten-year economic planning process and the successor to GTP-II, so that both public and private resources are invested in realization of the strategy;
- Co-develop a national Freight and Construction Transport Emissions Reduction Action Plan in collaboration with private sector transport operators and the major companies responsible for freight movement and construction-related vehicle fleets in Ethiopia, to ensure the adoption and implementation of specific, measurable GHG reduction measures linked to CRGE 2030 targets. Even if the private sector is unwilling to support or participate in this, develop the action plan and use governmental authority to enforce it on transportation companies;

Adaptation:

- Mobilize and allocate resources for the complete implementation of Ethiopia's National Adaptation Plan (NAP), including in the transport sector, and
- Promote the undertaking of climate change vulnerability and risk assessments in major transport systems of national importance (or strategically critical transportation assets), to enable to identification of key vulnerabilities and corresponding strategic interventions and enhanced designs to reduce vulnerability and build adaptive capacity against climate change impacts.

Cross-cutting:

- Ensure that the National Integrated Transport Master Plan (2020-2039) being funded by the AfDB (currently under development) will proactively integrate specific timebound measures aimed at measurable GHG reduction, particularly in the freight and construction transport sub-sectors, and that projects identified under the Master Plan will explicitly be conceptualised and designed with the intention of maximizing GHG reductions.

12 Capacity Building, Floods, Drought and Disaster Risk Reduction (DRR)

- Almost all the initiatives featured in the report included an element of capacity building, however there were also standalone projects which focused on cross-sectoral capacity building at a national level.
- Certain innovative projects have components which cut across several activities, in a creative response to climate change.
- There have been several DRR projects in the agricultural and water sectors.
- The major standalone DRR project was the Strengthening Climate Information Systems and Early Warning Systems to Support Climate Resilience Development and Adaptation to Climate Change

12.1 ADAPTATION: CAPACITY BUILDING, FLOODS, DROUGHT AND DISASTER RISK REDUCTION (DRR)

12.1.1 ADAPTATION: CAPACITY BUILDING

The aim of Ethiopia's Climate-Resilient Green Economy (CRGE) strategy is to protect the country from the adverse effects of climate change and to build a green economy that will help realise the country's ambition of reaching middle-income status before 2025 (Federal Democratic Republic of Ethiopia, 2011). While the CRGE does not explicitly focus on capacity building as one of its key focal areas, the strategy does weave considerations of capacity building in its overall approach. In particular, the government has committed to develop a permanent institutional setup whereby they will identify additional required personnel and in turn, build institutional capacity. Thereafter, once the CRGE strategy has reached completion, the government intends to design and introduce green economy programmes for the relevant sectors noted in the strategy (i.e. agriculture, forestry, power and transport). The programmes will include a piloting phase as well as emphasis on policy design which is aligned with the initiatives and goals of the strategy, at both federal and regional levels.

More broadly, capacity building initiatives were considered for accessing climate finance and unlocking funding opportunities. Although accessing climate finance will support capital costs, operational investment and programme expenses, the strategy also captures the necessity to ringfence funding for project set-up, technology development, and most importantly, capacity building.

The NDC recognises the near-term goal to build the capacity required to mainstream adaptation to climate change into all public and private development initiatives. Ethiopia's NDC also acknowledges the importance of building on existing frameworks and good practices in order to mainstream and scale the requisite interventions. To fully implement the NDC's interventions and requirements, the government has noted the need for predictable, sustainable and reliable support in the form of finance, capacity building and technology transfer. The government has also committed to conduct future research in order to quantify the required capacity building support for the implementation of vulnerability abatement measures up to and beyond 2030 (Federal Democratic Republic of Ethiopia, 2015).

Following from the NDC is Ethiopia's CRGE Monitoring Framework (Federal Democratic Republic of Ethiopia, 2018). The framework recommends that all sector mitigation and adaptation interventions incorporate capacity building and access to information in order to strengthen climate change information and institutional coordination.

Finally, Ethiopia's National Adaptation Plan (NAP) builds on ongoing efforts to address climate change in the country's developmental policy frameworks, including the CRGE strategy (Federal Democratic Republic of Ethiopia, 2019). The NAP also advocates for coordinated adaptation measures aimed to develop a critical mass of capacities

and enhance capacity of sectors to attract international and domestic adaptation finances, to name but a few of the outcomes.

Two programmes/proposals/plans with capacity building components have been identified, including:

- CRGE Registry Project (2013 -2014) developed a web-based CRGE Registry to build the capacity of Environmental Protection Authority (EPA) when managing climate change projects. If implemented optimally, the registry will establish a mechanism for information exchange on various aspects of the project management cycle as well as streamline information exchange among institutions involved in the CRGE, and
- The second project introduced Capacity Building interventions to the EPA in order to implement *Mechanisms to Motivate, Support and Reward Results* (mMSR) (2012 -2013), which support optimal use of climate finance resources. In partnership with EPA and regional agencies, the project will aim to: i) increase capacity of local government institutions to undertake CRGE planning, in a participatory, pro-poor way and integrating gender and, ii) generate and disseminate learning about building institutional capacity for CRGE planning and implementation at regional level.

At the time of writing, the CRGE registry[35] and the Measurement, Reporting and Verification (MRV) database were not operational; as such, it was difficult to assess the usefulness and effectiveness of the web-based platform. However, in 2017 the Global Green Growth Institute (GGGI) launched its MRV program to support partner countries in their efforts to track progress and reporting of greenhouse gases emissions (Global Green Growth Institute, 2019). Since its inception, the GGGI has hosted intensive capacity building trainings and produced teaching materials to further support proper management of Ethiopia's MRV system. In 2017, the GGGI reported that capacity building for tracking GHG emission at national and sub-national levels was on track and operating effectively (Global Green Growth Institute, 2017).

This was confirmed by Irish Aid who, in 2018, reported that the CRGE's Steering and Technical committees were convening regularly and capacity building was improving at all levels. The report also confirmed that the MRV system for the Agriculture and Industry sectors had been established and appropriate technology selection was ongoing (Irish Aid , 2018).

While the achievements to date are commendable, there were still concerns that discussions regarding mainstreaming climate change between the Bureau of Environment and national and local level officials were disjointed. The report also records that due to the lack of capacity to translate the CRGE to inform planning and processes, plans and budgets and funding, capacity building has been slower than anticipated. There is thus room to continue strengthening capacity building to achieve the overall implementation of the CRGE from local to national levels (Irish Aid , 2018).

With regards to the second project, there is no readily accessible information on the status and progress of the project beyond the initial 2012/13 documentation.

Additional consideration include:

- Designing a user-friendly, accessible web-based platform which captures data monitoring and integrates program and financial information to track: inputs (financial and human resources); activities (educational workshop and community-led projects); outputs (number of people trained, number of projects completed), near-term outcomes (increased access to resources, strengthened capacity); and long-term impacts (improved livelihoods, healthy communities) which will assist in tracking the potential impact and progress of the notable programmes, and
- Dissemination of best practices and successful/unsuccessful case studies both through the programmes as well as in other countries with similar programmes underway.

12.1.2 ADAPTATION: CROSS-CUTTING

Although the CRGE strategy does not mention cross cutting as one of its areas of focus, Ethiopia's NDC alludes to medium and long-term cross-cutting interventions, among others: Developing one or more insurance systems to

[35] The web-based platform can be located at this address: http://www.ethcrge.info/#

enable citizens, especially farmers and pastoralists to rebuild economic life following exposure to disasters caused by extreme weather events (floods and droughts); and reducing the incidence and impact of fire and pest epidemics on livelihoods and ecosystems through integrated pest management, early warning systems, harvesting adjustments, thinning, patrols and wider public participation.

The NDC expands their considerations of cross-cutting measures, for both mitigation and adaptation to include principles of fairness, equity and ambition (Federal Democratic Republic of Ethiopia, 2015). Captured in their discussion is the Government's commitment to reduce their GHG emissions despite their per capita emissions being insignificant compared to the global average. Their commitment showcases their drive for fairness and ambition to contribute towards the achievement of the Paris Convention. Ethiopia also intends increase its ambition by expanding its forest cover beyond the initial target for the afforestation and reforestation of seven million hectares, with continued involvement from local communities that are already contributing substantially to the attainment of this target.

Teamed with the NDC is Ethiopia's NAP (Federal Democratic Republic of Ethiopia, 2019), which echoes the NDC's commitment to move towards a long-term adaptation goal to increase resilience and reduce vulnerability of livelihoods and landscapes in three areas: drought, floods and other cross-cutting interventions. Finally, the CRGE Monitoring Framework highlights how industrial issues have cross-cutting dimensions that include environment, the economy and social domains (Federal Democratic Republic of Ethiopia, 2018).

Two projects noted were as follows:

- Foremost is the "Enhancing the public awareness on climate change through broadcasting in TV and radio programmes" (2012-2015). As the name suggests, the programme emphasised the importance of the role of the media in raising awareness on issues influencing the public. The aim of the programme is to heighten awareness on the impact of climate change in rural areas. The programme also promotes strengthening institutional and organisational capacity of the Forum for Environment so they too can broaden public recognition and awareness on climate change through multiple media channels, including TV and radio.
- The second project presented in proposal form is the "Climate Resilient Green Zone alongside Akaki River" (2013-2015). The purpose of the project is to increase the availability of green goods and services in significant quantities to contribute to the vision of Ethiopia achieving middle income status with zero net GHG emissions. One of the anticipated outcomes will be the establishment of a climate resilient production systems which raise the income of disadvantaged men, women and youth. Entwined in the outcomes is a focus on capacity building and regulating the progress made in the report through regular communication and documentation using print, electronic, and social media involving men, women and the youth.

The "Enhancing the Public Awareness on Climate Change through Broadcasting in TV and Radio Programmes" has been relatively successful. According to a report by the International Institute for Environment and Development's entitled "Climate Diplomacy: Understanding Ethiopia's National Engagement" (International Institute for Environment and Development, 2016), both print and electronic media have been used in disseminating climate related events. There are currently regular education and awareness creation programmes undertaken by the Forum of Environment. Coupled with print and electronic media are environmental advocacy activities including capacity building, training, network building, communicating information, policy level discussions, public meetings, commissioning research, publications, and incentive and acknowledgement schemes. Examples include the 'Akirma' Magazine, radio programmes like EBC FM 97.1 Radio Programme, and the 'Akirma' TV programme supported by the Strategic Climate Institutions Programme (SCIP). They have all been used as a means of creating massive awareness across regions within the country and are watched/listened to regularly by those who have access.

With respect to the second project, in July 2014, a five-day training programme convened in in Addis Ababa (Tenake Bena, 2014). During the training, there were discussions on prospects, problems and experiences of the farming in the region, such as land tenure issues, high water pollution and low efficient crops. The underlying objectives of the training included challenges and opportunities, orientation, future work, relationships, how to solve problems,

marketing, production, soil improvements, composting and planning for the coming one year. Unfortunately, it is uncertain whether there has been progress beyond the training workshop held in 2014.

12.1.3 ADAPTATION: DISASTER RISK REDUCTION

As mentioned, the CRGE strategy is mandated to protect the country from the adverse effects of climate change and to build a green economy. Despite this objective, the strategy does not mention disaster risk reduction. On the other hand, the NDC briefly refers to implementing "effective early warning systems and disaster risk management policies to improve resilience to extreme weather events" (Federal Democratic Republic of Ethiopia, 2015). Similarly, the CRGE Monitoring Framework is committed to "establishing resilient systems that can withstand disaster and risks related to climate change through building collaborative partnerships among the relevant stakeholders and enhancing thematic integration among different development sectors" (CGIAR, 2018). The framework also recommends strengthening climate change risk insurances mechanisms, improving early warning systems and safety nets, humanitarian assistance and care for environmental refugees.

Ethiopia's NAP intentionally and effectively focuses on disaster risk reduction, prevention and management. The introductory remarks of the NAP reflect the constraints to the country's adaptive capacity, specifically the inadequate ability to absorb disasters and the prevailing biophysical shocks the country faces. Of note is the Productive Safety Net Programme (PSNP), which aims to enhance the livelihood opportunities of vulnerable people and develop disaster risk reduction capacities. The plan then recognises the necessity to improve early warning systems for quick and slow onset disasters and to install knowledge management systems, climate information exchange systems and enhanced networking capabilities to streamline effective data sharing and decision making.

United Nations Development Program (UNDP) executed a project between 2013-2015, named "Strengthening Climate Information Systems and Early Warning Systems to Support Climate Resilience Development and Adaptation to Climate Change" (UNDP, 2012). The programme operates in several flood and drought prone regions to reduce vulnerability to climate change risks and impacts by strengthening the capacity of the Government of Ethiopia to observe, analyse and forecast climate information. Additionally, the programme should enhance Ethiopia's early warning systems and inform climate resilient development and adaptation to climate change.

Given the importance of the mandate, the programme was divided into two phases: 1) To enhance the capacity of hydro-meteorological services to monitor and predict weather events and climate changes by installing and rehabilitating observing equipment. This also includes providing training and capacity development for the operations and maintenance of equipment and using available data for weather and climate forecasting. 2) The second phase of the project introduced the efficient and effective use of hydro-meteorological and environmental information for early warnings and long-term adaptation. As the early warning system improves so will the information required for decision making purposes for particular sectors, such as agrometeorological services and severe weather warnings.

The project envisages a myriad of impacts, including but not limited to, developing and enhancing an early warning system for severe weather; real-time weather and hydrological monitoring capabilities; upgrading land and air transport management and firming planning and policy making processes.

According to an Irish Aid report drafted in 2018, the Government of Ethiopia focused on combating recurrent droughts and food insecurity. To do so, the government created the Disaster Management and Food Security Agency, drafted a National Policy and Strategy on Disaster Management, and designed a DRM Strategic Program and Investment Framework for government and donor interventions. Yet, some challenges still remain, including insufficient capacity to carry out analysis and advocacy for: (1) enhanced understanding of risks and impacts, (2) development and strengthening of building codes, (3) land-use and urban planning, and (4) contingency planning, among others (Irish Aid , 2018). The report also noted the need to strengthen early warning systems for climate variability and change as well as resultant disasters.

Additional points for consideration, are as follows:

1) Creating multi-hazard risk metrics based on scientific evidence to inform disaster risk reduction policy making;

2) Programs hosted by multilateral and bilateral organizations should endeavour to publish their findings, including news and events, on a free accessible database consisting of publication, comprehensive set of data showcasing the progress made towards development.

12.1.4 CRGE REPORTING: ADAPTATION OUTCOMES

The 2019 'Environment, Forest and Climate Change Commission Performance Contract in Ethiopia' report of the CRGE (CRGE, 2019) states that the following interventions have been successful in the last 3 year period:

- More than 10,000 experts trained each year over the time period on climate change impacts, climate change strategies and the tools developed to implement the strategies, and
- Creation of a planning guideline with five National Technical Institutions (NTIs), to be used by Woredas to assist them in mainstreaming the CRGE within their integrated sectoral development plans (CRGE, 2019).

12.2 FINANCE: CROSS-CUTTING

The cross-cutting sector accounts for 9 of the 224 projects analysed, with a combined value of ETB 26.0 billion through the 2011-2019 period.

Six cross-cutting projects have an adaptation focus, with the remaining 3 having both mitigation and adaptation impact. None have a sole mitigation focus.

Adaptation projects make up the majority, with a combined value of ETB 22.1 billion. Joint-impact initiatives have a total value of ETB 3.9 billion, a substantial portion of which is attributed to the Ethiopia Resilient Landscapes and Livelihoods Project.

Considering the annual breakdown of expenditure in the sector from 2011 to 2019, the total is ETB 13.7 billion (with several projects extending well beyond 2019). The sector saw limited investment from 2011 to 2013, but the 2014-2016 experienced increased expenditure, with significant further growth into the 2017-2019 period peaking at ETB 3.7 billion in the latest year.

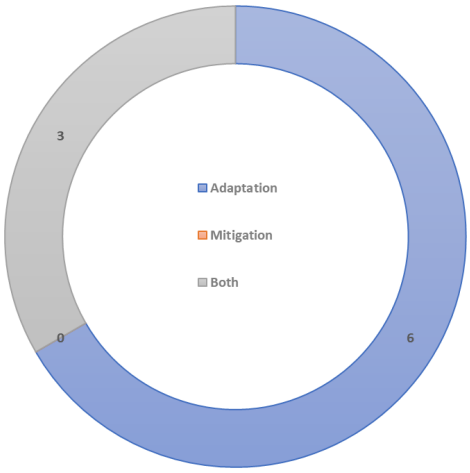


Figure 36 Number of Projects in the Cross-Cutting Sector by Climate Impact 2011-2019

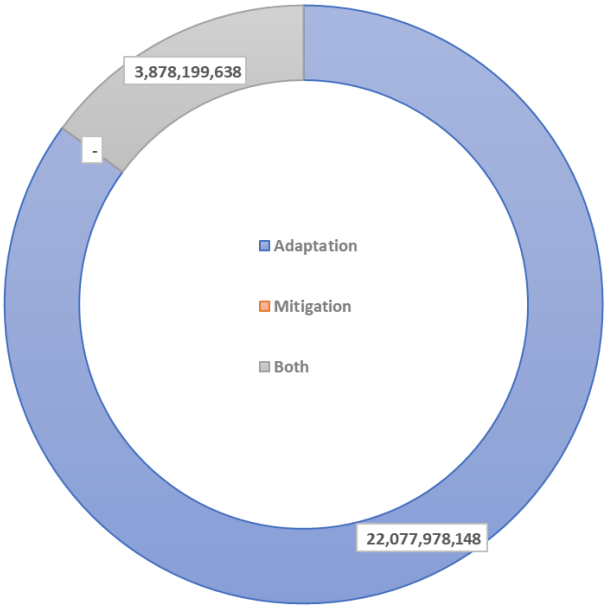


Figure 37 Total Value of Projects (in ETB) in the Cross-Cutting Sector by Climate Impact 2011-2019

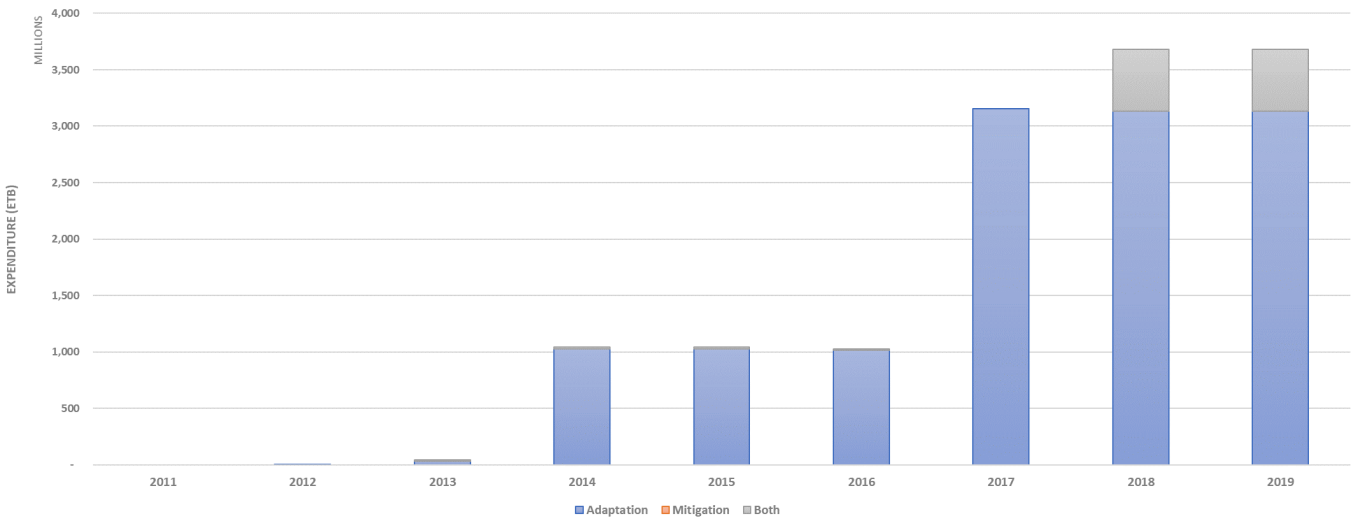


Figure 38 Annual Breakdown of Project Expenditure (in ETB) in the Cross-Cutting Sector by Climate Impact 2011-2019

12.3 FINANCE: CAPACITY BUILDING

The capacity building sector in a minor space, accounting for 2 of the 224 projects analysed, with a combined value of ETB 7.8 million through the 2011-2019 period.

Both capacity building initiatives possess mitigation and adaptation aspects.

Considering the annual breakdown of expenditure in the sector from 2011 to 2019, the total is ETB 7.8 million The sector saw all of its expenditure in the 2012-2014 period, with nothing identified since. Given the importance of capacity building in enabling and sustaining all other initiatives, this could be cause for concern. However, it is likely the capacity building initiatives have been built into other projects reflected in other sectors.

Figure 39 Number of Projects in the Capacity Building Sector by Climate Impact 2011-2019

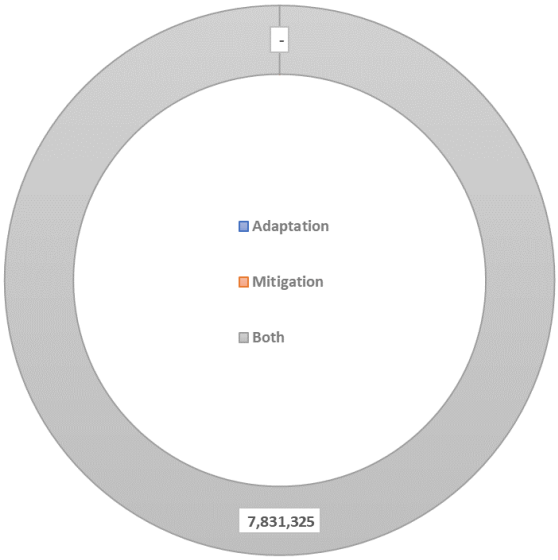


Figure 40 Total Value of Projects (in ETB) in the Capacity Building Sector by Climate Impact 2011-2019

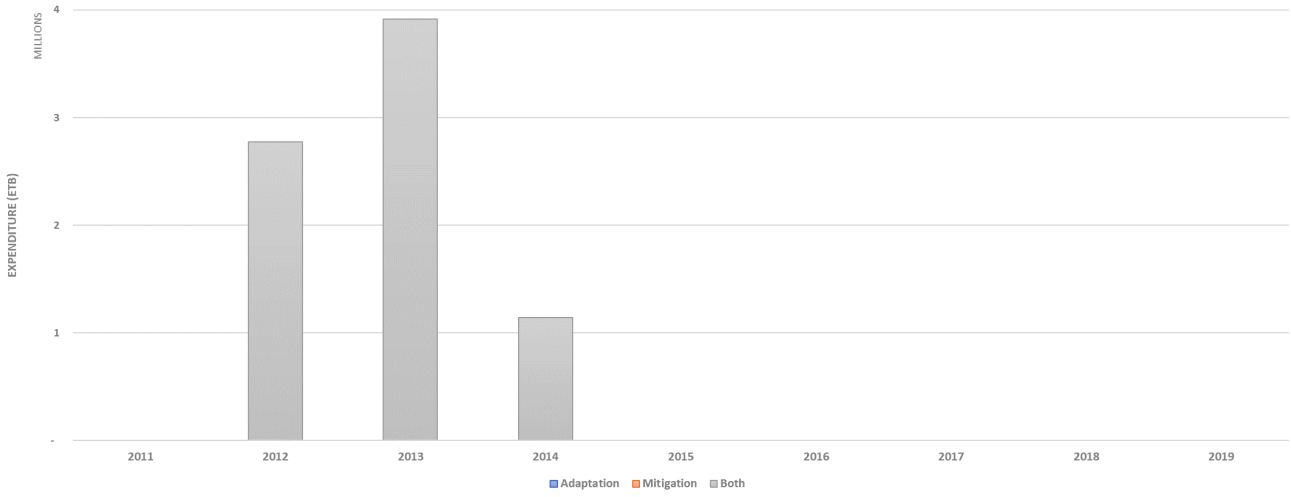


Figure 41 Annual Breakdown of Project Expenditure (in ETB) in the Capacity Building Sector by Climate Impact 2011-2019

13 The Private Sector

The CRGE published a 'Private Sector Strategy For Ethiopia's Climate Resilient Green Economy (CRGE) Facility' in 2016, which outlines:

'The overarching framework policy/guiding principles, range of private sector and potential partnership arrangements; defines mode of engagement and private sector access modalities to The Facility; appropriateness, role and responsibility of financial intermediaries, and guidelines to govern the relationship between MOFED/Facility and FI's with regard to management of climate finance.' (CRGE, 2016, p. 7)

The strategy provides a useful blueprint for financing the private sector in order to enable the realisation of the targets of the CRGE as this is not clearly outlined in the original CRGE strategy or the NDC. Little to nothing has been published on the topic of the private sector in relation to climate change in Ethiopia, and this study also found that little was known or reported around private sector involvement[36].

However, private sector partners have been key in delivering many of the projects in all sectors, and in the case of the livestock and agriculture sector, project and programme beneficiaries themselves can be seen to be private sector actors, as they are producers or processers along the agricultural value chain. There are key opportunities for new or further private sector involvement in key sectors to contribute towards the attainment of the goals set out in the CRGE/NDC.

13.1 AGRICULTURE AND LIVESTOCK

Agriculture is a key component of growth in the GTP2, with a focus on commercial and market driven agricultural production. CSA provides means of improving production in the agriculture sector which not only improves yields but is also climate smart: through the promotion of CSA there is great opportunity for private sector lead innovation along the value chain, as well as the development and dissemination of new technologies, further supporting those not only directly involved in the agricultural value chain (USAID, 2017). A review of Ethiopia's Agriculture Sector Policy and Investment Framework (2010–2020) (Chipeta et al, 2015), found that one of the outcomes of GTP2 is the advent of an 'indigenous' private sector, which is more formal and stable than prior 'micro-enterprises', which, when teamed with public sector investments in public goods, will enable the private sector more opportunities to act in agricultural value chains (Chipeta et al, 2015).

The Livestock Master Plan (ILRI, 2015) identifies the following opportunities for private sector inclusion in livestock production:

- 'The introduction of policy measures to rationalize public and private sector roles in veterinary service provision, leading to the transition to the private provision of clinical services wherever feasible and public oversight and quality regulations;
- The promotion of the establishment of more private-sector flour and oil mills to encourage the production of additional feeds from agro-industrial by-products by introducing protective policies against flour and cooking oil imports, and
- Promotion of the importation and dissemination of improved semi-scavenging poultry breeds by the private sector and/or through public-private partnerships, combined with the improved capacity of private animal health services to provide critical vaccines, in tandem with the continued promotion by the GoE extension services of improved feeding' (ILRI, 2015, pp. 3-4)

This can be made possible through better engagement with the Ethiopian Leather Industries Association (ELIA) Leather Industry Development Institute (LIDI), the Agricultural Transformation Agency (ATA), Regional Trade and Transport Bureaus and Regional Cooperative Bureaus (USAID , 2013).

[36] Experts and stakeholders were questioned around private sector involvement in their relative sectors and reported little to no active involvement.

13.2 FORESTRY

The private sector is currently a key driver of deforestation in Ethiopia; however, it also holds good opportunities to support possible solutions to deforestation and land degradation. The 2019 REDD+ programme private sector scoping study found that an important part of creating this shift towards the private sector being positive for forestation, would be through the creation of a favourable environment to leverage private sector investment. An important process would be to incentivise the sector to 'save the forests', which could be done through creating 'turning forest sustainability into something more profitable than agriculture where returns on investments are faster and higher' (UN-REDD Proramme, 2019, p. 7). The study goes on to analyse possible investment opportunities for the country and find the most favourable to be that of bamboo plantations, as they can 'provide jobs, restore the forest cover on degraded lands, as well as be used as fuel for cooking, and a source of foreign currency' (UN-REDD Proramme, 2019, p. 8)

The 2017 Ethiopia Forestry Sector Overview (MEFCC, 2017) highlights the construction, furniture and utility (electricity infrastructure) sectors as the prime sectors to absorb forestry products. However, as the CRGE focuses on reducing emissions from deforestation and forest degradation, this will have to be enabled through the private sector support in the establishment of establishment of properly managed plantations. Furthermore, private sector support towards increased domestic production of wood, would not only create green jobs, but also lower emissions through lowered imports (MEFCC, 2017). Furthermore, more domestic production of cookstoves can move reliance away from wood burning for cooking purposes. The report further goes on to state that 'public markets should be made transparent and open for the private sector' and makes the following strategic suggestions:

- An enabling environment should be created where preference is given to products that support the CRGE strategy (green jobs/construction and lowered emissions);
- Tax benefits should be given for wood processing machinery and transport vehicle imports;
- Public procurement should utilise modern wood products in the construction sector and public housing programs, and
- Utility poles for electrification and raw material production for the domestic pulp and paper industry should be prioritized (MEFCC, 2018, p. 75).

13.3 INDUSTRY

The industry sector is broad and covers cement and textile production as well as manufacturing and mining. While there has been real progress made in industry MRV and industry adoption of CRGE MRV frameworks (Ministry of Industry, 2016), there is still little private sector involvement in climate related activities. The cement industry is well monitored and reported on, this study found that initiatives that could help to increase the competitiveness of the cement industry by reducing production cost and – at the same time – would yield significant environmental and health benefits:

- Improved energy efficiency of the process by converting the technology used from dry to precalciner kilns and from rotary to grate coolers and by introducing computerized energy management and control systems, which can decrease the energy demand and hence the cost of and emissions from cement production;
- Substitution of clinker by increasing the pumice content leading to a decrease in both variable production costs and emissions;
- Increased share of biomass in the mix of energy for production in cement factories, potentially decreasing costs and emissions, and
- Sub-sectors to be included in addition to cement: textile, leather, steel , chemicals and mining – major initiatives – energy efficiency and the usage of alternative fuels in these sub-sectors (Adem, 2019).

13.4 TRANSPORT

The CRGE Climate Resilient Transport Sector Strategy outlined the aims of the CRGE for the sector, but did not include a specific focus on how the private sector would be engaged (CRGE, 2015). While the state has made

strides in the provision of improved and new green public transportation systems, there has been limited involvement from the private sector. However, the expansion of public transport systems such as railways, light train and BRT creates opportunity for private sector involvement in resource manufacturing as well as operation function (provided that the methods utilised in production and operationalisation were themselves green/emissions conscious) (AfDB , 2017).

13.5 GREEN CITIES AND BUILDINGS

There are several opportunities for enhanced private sector involvement in the green cities sector, particularly in the areas of green infrastructure and provision as well as solid waste management. This can be enabled though the creation of an enabling policy and legal environment. This can be done through:

- 'Mainstreaming green infrastructure into planning processes and documents;
- Updating codes to include green infrastructure and enforce new regulations;
- Developing incentives to promote green infrastructure;
- Communicating and demonstrating the benefits of green infrastructure, and
- Providing technical assistance and coordination for green infrastructure implementation' (USAID, 2018, pp. 2-5).

13.6 WATER AND ENERGY

The energy sector in Ethiopia is highly reliant on hydropower, which is highly susceptible to climate change, as such, Ethiopia is experimenting with a range of other power production projects which could all bolster private sector involvement, such as:

- Waste-to-energy projects in secondary cities;
- Improved cook stoves for households;
- Energy efficiency for industries;
- Small and medium-scale renewable power plants, ranging from biomass to sugarcane bagasse to small hydropower;
- Alternative fuels for industries (such as improved biomass for cement industries);
- Solar thermal for heating services (particularly water heating), and
- Ethanol for cooking to replace non-sustainable biomass and petroleum fuels (Cities Alliance, 2017, pp. xii-xiii).

However, the biggest challenge to large scale energy changes is regulatory: in order to enable new and independent power producers to be able to operate in the country, Ethiopia needs to change the entire regulatory structure of the power system. A change in regulation is required in order to move from a highly vertically integrated, single-buyer system (in which the Ethiopian Electric Power agency is in control of, and responsible for, power generation, sale, distribution and transmission) to a system which allows for independent power producers to access the market and further feed into the grid in order to expand renewable energy production sources (Cities Alliance, 2017).

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APPENDIX A Projects included in the scan.

	Sector	Project Code	Project Name	Intervention Type	Total Cost (ETB)	Status	Start Year	End Year
1	Agriculture	PASIDP II	Participatory Small-Scale Irrigation Development Program	Adaptation	4,246,653,032	Ongoing	2016	2024
2	Agriculture	PASIDP I	Participatory Small-Scale Irrigation Development Program	Adaptation	1,686,455,600	Complete	2008	2015
3	Agriculture	CSI	Climate Smart Initiative	Adaptation	331,135,358	Complete	2013	2015
4	Agriculture	DRSLP I	Drought Resilient and Sustainable Livelihoods Program	Adaptation	1,435,115,834	Complete	2013	2017
5	Agriculture	DRSLP II	Drought Resilient and Sustainable Livelihoods Program	Adaptation	1,413,909,791	Ongoing	0	0
6	Agriculture	FTI - Agri	Agriculture Sector CRGE Fast Track Investment Project	Adaptation	201,486,900	Complete	2014	2016
7	Agriculture	SPIGHM	Enhancing Smallholder Agricultural Productivity through Improved Soil health Management Financed by AGRA	Adaptation	149,000,000	Complete	2012	2017
8	Agriculture	RPLRP	Regional Pastoral Livelihood Resilience Program	Adaptation	2,190,075,000	Ongoing	2015	2019
9	Agriculture	AGP	Agricultural Growth Project - Phase One	Adaptation	12,450,440,000	Complete	2011	2015
10	Agriculture	AGP II	Agricultural Growth Program Phase Two	Both	13,761,640,000	Ongoing	2017	2021
11	Agriculture	SLMP I	Sustainable Land Management Project - Phase One	Both	1,126,440,000	Complete	2008	2013
12	Agriculture	SLMP II	Sustainable Land Management Project	Both	2,820,570,000	Complete	2013	2018
13	Agriculture	RLLP	Resilient Landscape & Livelihood project	Both	3,774,733,500	Ongoing	2018	2022
14	Agriculture	PSNP3	Productive Safety Net Program 3 and 4 - House Hold Asset Building Program	Both	50,615,063,200	Complete	2009	2015
15	Agriculture	PSNP4	Productive Safety Net Program 3 and 4 - House Hold Asset Building Program	Both	106,072,937,500	Ongoing	2015	2020
16	Agriculture	SDR1	Strengthening Drought Resilience 1 (Strengthening drought resilience of the pastoral and agro-pastoral livelihoods in the lowlands (Afar) of Ethiopia)	Adaptation	198,119,340	Ongoing	2017	2021
17	Agriculture	SDR2	Strengthening Drought Resilience - Phase Two	Adaptation	330,198,900	Ongoing	2017	2021
18	Agriculture	CSIRDP	Climate Smart Integrated Rural Development Project	Adaptation	297,639,718	Ongoing	2017	2021
19	Agriculture	RAMSAP	RAMSAP Rehabilitation and management of salt-affected soils to improve agricultural productivity by ICBA International Centre for Bio-Saline Agriculture	Both	149,000,000	Ongoing	2016	2020
20	Agriculture	FACASI	Farm Mechanization and Conservation Agriculture for Sustainable Intensification Program	Both	0	Complete	2014	2018
21	Agriculture	Push Pull	Climate -Smart Push –Pull Technology promotion	Adaptation	0	0	0	0
22	Agriculture	SMISP	Small and Micro Irrigation Support Project	Adaptation	683,511,723	Ongoing	2014	2020
23	Agriculture	Gergera	Enhancing integrated watershed management with climate smart Agriculture in GERGERA watershedEnhancing Integrated watershed management with climate smart Agriculture in GERGERA watershed	Adaptation	14,610,866	Completed	2015	2017
24	Agriculture	IFNS Tigray	Improved Food and Nutrition Security and CR through Adoptive research in Tigray	Adaptation	6,491,343	Completed	2015	2017
25	Agriculture	IFNS SNNPR	Improved Food and Nutrition Security and CR through Adoptive research in SNNP Adaptation	Adaptation	4,868,507	Completed	2015	2017
26	Agriculture	ISLR CSA	Improving Smallholder livelihood and resilience through climate smart agriculture and economic development / OROMIYA , SNNP	Adaptation	42,170,944	Completed	2015	2017
27	Agriculture	ILI East Tigray	Integrated Livelihood Improvement project in Eastern Tigray	Adaptation	6,487,837	Completed	2015	2017
28	Agriculture	Sweet Potato	Orange Fleshed Sweet Potato Promotion for Improved Nutrition and Food security	Adaptation	11,556,961	Completed	2012	2017
29	Agriculture	ORTD Tigray	Operational Research and technology Dissemination; Tigray	Adaptation	5,190,270	Completed	2014	2015
30	Agriculture	ORTD South	Operational Research and technology Dissemination; South	Adaptation	5,676,857	Completed	2014	2015
31	Agriculture	Community Seed	Sustainable Community Based seed production System in Tigray	Adaptation	17,656,455	Completed	2015	2017
32	Agriculture	ITCSWS	Integrated Termite Control and Safe Water Supply	Adaptation	1,947,403	0	2014	0
33	Agriculture	CSI Low Carbon	Climate Smart Agriculture: Piloting Climate Proof and Low Carbon Agricultural Investments in Ethiopia	Both	152,933,409	Completed	2014	2016
34	Agriculture	CSI Pastoral	Climate Smart Agriculture in Pastoral Areas	Both	25,085,107	Completed	2014	2016
35	Agriculture	CRS	Community Driven Climate Resilience Building (Civil Society Support Programme)	Adaptation	16,367,708	Completed	2014	2016
36	Agriculture	M&E MRV	Developing M&E, MRV and long-term investment plan for selected Agricultural Sector	Mitigation	15,780,009	Completed	2014	2016
37	Agriculture	River Valley Ecosystem	Piloting Conservation Agriculture CRGE in the Rift Valley Ecosystem	Adaptation	6,834,581	Completed	2014	2016
38	Agriculture	SNPAPP	Strengthening National Capacity through Sustainable Increases in Agricultural Production and Productivity	Adaptation	1,478,125,000	Completed	2011	2016
39	Agriculture	INRM Lake Tana	Community based integrated natural resources management project in Lake Tana	Both	796,187,500	Completed	2010	2018
40	Agriculture	Autonomous Adaptation	Promoting Autonomous Adaptation at the community level in Ethiopia	Adaptation	149,000,000	Ongoing	2018	0
41	Agriculture	IRDP	Integrated Rural Development Program	Both	298,000,000	Ongoing	2018	2021
42	Agriculture	GATE	Support to CRGE Facility to Greening Agricultural Transformation in Ethiopia	Adaptation	134,100,000	Completed	2014	2017
43	Agriculture	S2RAI I	Support to Responsible Agricultural Investment in Ethiopia I	Adaptation	108,965,637	Completed	2016	2018
44	Agriculture	S2RAI II	Support to Responsible Agricultural Investment in Ethiopia II	Adaptation	56,959,310	Ongoing	2019	2021
45	Agriculture	SAFE	Sustainable Agriculture and Food Security Enhancement through Integrated Recovery Support Mechanisms Project	Adaptation	97,556,250	Completed	2014	2016
46	Agriculture	LIFT	Land Investment for Transformation Project	Adaptation	2,063,844,830	Ongoing	2014	2020
47	Agriculture	RESET I	Building Resiliance Capacity and Recovery for the Vulnerable Population in Ethiopia	Adaptation	0	Complete	2012	2017
48	Agriculture	RESET II	Resilience Building and Creation of Economic Opportunities in Ethiopia	Adaptation	1,594,860,687	Ongoing	2015	0
49	Agriculture	DRMLRP	Disaster Risk Management and Livelihoods Recovery Programme	Adaptation	387,400,000	Completed	2012	2015
50	Agriculture	ILM	Integrated Landscape Management to Enhance Food Security and Ecosystem Resilience	Adaptation	4,609,584,965	Ongoing	2016	2021
51	Agriculture	ENCAGT	Enhancing National Capacity for Agricultural Growth and Transformation	Adaptation	904,550,619	Ongoing	2009	2020
52	Agriculture	MAAPS	Mainstreaming Agro-biodiversity into the Agricultural Production System of Ethiopia	Adaptation	271,558,429	Completed	2011	2016
53	Agriculture	EPSSSF	Engaging the Private Sector in Support of Smallholder Farms	Both	0	0	0	0

112	Forestry	Climate Protection Forests	Climate Protection and Preservation of Primary Forests Project	Both	2,466,696,000	Ongoing	2013	2019
113	Forestry	FTI Urban Parks	FTI: Urban greening and solid waste management across Ethiopia	Mitigation	43,830,000	Ongoing	2016	2021
114	Forestry	EWFBM	Empowering Woman through Better Forest Management and microenterprise development	Mitigation	1,305,353	Completed	2014	2016
115	Forestry	BPH Rift Valley	Bamboo Plantation in the Highlands of the Upper Rift Valley	Mitigation	12,739,401	Completed	2014	2017
116	Forestry	BFM Benishangul	Bamboo Forest Management in Benishangul	Mitigation	2,030,475	Completed	2014	2017
117	Forestry	WR Amhara	Watersheds Rehabilitation in Amhara Highlands	Both	24,707,708	Completed	2014	2016
118	Forestry	PFM Dire Dawa	Participatory Forest Management (PFM) in Dire Dawa	Mitigation	1,641,373	Completed	2014	2016
119	Forestry	LCCM Invasive Trees	Low-cost Construction Material from Local Invasive Trees	Both	3,418,581	Completed	2014	2016
120	Forestry	Somalia Region Afforestation	Somalia Region Afforestation/Reforestation	Both	2,432,422	Completed	2014	2016
121	Forestry	CBI Lake Tana	Community based integrated natural resources management project in Lake Tana	Both	762,925,200	Ongoing	2004	2019
122	Forestry	ISFSD Ethiopia	Institutional Strengthening for Forest Sector Development in Ethiopia	Both	664,962,283	Ongoing	2015	2020
123	Forestry	REDD + FCCP	Project for Supporting Sustainable Forest Management through REDD+ and Certified Forest Coffee Production and Promotion (REDD+FCCP)	Mitigation	124,627,089	Ongoing	2014	2020
124	Forestry	CRGE Innovation	Enhancing the Role of Forestry in Ethiopia's Climate Resilient Green Economy (CRGE): A Knowledge, Action Research and Innovation Project	Mitigation	0	Completed	2014	2016
125	Forestry	BICAS-RMACC	Building Institutional Capacity and Participatory Leadership in Awash and Simien Mountains National Parks for Resilience, Mitigation and Adaptation to Climate Change (BICAS-RMACC)	Both	16,338,004	Completed	2013	2013
126	Forestry	EBIB Natural Product	Evidence based institution building in the Natural product market of Herbal medicine and Natural cosmetics	Mitigation	23,889	Completed	2013	2015
127	Forestry	BCR Coffee	Building a climate resilient coffee economy for Ethiopia	Both	15,513,873	Completed	2013	2015
128	Forestry	Green Legacy	Green Legacy	Mitigation	0	Complete	2019	2019
129	Forestry	REDD IP	REDD+ Investment Program	Mitigation	1,939,166,460	Ongoing	2017	2020
130	Forestry	RRD Gender	Responding to the increasing risk of drought: building gender-responsive resilience of the most vulnerable communities	Both	1,490,000,000	Ongoing	2017	2022
131	Forestry	CRFLP	Climate Resilient Forest Livelihood Programme	Both	197,236,729	Ongoing	2018	2023
132	Industry	FTI Green Industrial Zone	Development of Green Industrial Zone – Bole Lemmi	Mitigation	14,973,300	Completed	2014	2016
133	Industry	FTI Baseline	Development of baseline and MRV system for GHG emissions from the industry sector and implementation of pilot GHG reduction through energy efficiency	Mitigation	17,213,400	Completed	2014	2016
134	Industry	EE Textile	Energy Efficiency Improvement in Almeda Textile PLC	Mitigation	0	Complete	0	0
135	Industry	EE Leather	Energy Efficiency Improvement in Ethio-Leather Industry (Awash Tannery) for GHG Emission Reduction	Mitigation	0	Complete	0	0
136	Industry	EE Steel	Energy Efficiency Improvement in C&E Brothers Steel Factory for GHG Emission Reduction	Mitigation	0	Complete	0	0
137	Industry	EE Brewery	Energy Efficiency Improvement in Diageo - Meta Abo Brewery	Mitigation	0	Complete	0	0
138	Industry	EE Cement	Energy Efficiency Improvement in National Cement Factory	Mitigation	0	Complete	0	0
139	Industry	FTI Energy Audits	Fast Track Investment - Energy audits project	Mitigation	0	Complete	2014	2016
140	Industry	Solar for Companies	Solar power installation for energy use in factories	Mitigation	0	Ongoing	0	0
141	Industry	CBMTM Ethiopia	Capacity Building to Monitor and Track Mitigation Activities in Ethiopia	Mitigation	23,793,291	Complete	2013	2015
142	Urban	FTI Urban Greening	Fast Track Investment - Urban greening and solid waste management across Ethiopia	Mitigation	44,212,500	Completed	2014	2016
143	Urban	FTI SWM	Fast Track Investment - Solid Waste Management in Cities	Mitigation	0	Completed	2014	2016
144	Urban	NAMA-COMPOST	Ethiopian Urban NAMA: Creating Opportunities for Municipalities to Produce and Operationalise Solid Waste Transformation (COMPOST)	Mitigation	1,591,256,684	Ongoing	2016	2021
145	Urban	ULGDP II	Urban Local Government Development Program - II	Adaptation	12,313,600,000	Ongoing	2014	2018
146	Urban	Hawassa	(No Title Name)	Adaptation	7,261,335	Completed	2014	2014
147	Water & Energy	FTI Solar Energy	Access to Solar Energy Technologies: Improving the Livelihoods and Life Styles of Rural Community of Emerging Regional states through the Dissemination of Solar Energy Technologies	Mitigation	58,478,453	Completed	2014	2016
148	Water & Energy	FTI Monitoring Petroleum	Monitoring and Regulatory Systems: Strengthening the monitoring Capacity of Petroleum Downstream Operations	Mitigation	18,354,700	Completed	2014	2016
149	Water & Energy	FTI Monitoring Systems	Strategic Support Improved Water Monitoring System	Both	20,454,000	Completed	2014	2016
150	Water & Energy	FTI Biogas	Accelerating the National Biogas Program Ethiopia	Both	1,865,142	Completed	2009	2013
151	Water & Energy	FTI Solar Water	Solar Power for Water Supply and Irrigation	Both	75,967,441	Completed	2014	2016
152	Water & Energy	SREP	Scaling up Renewable Energy Projects in Low Income Countries	Mitigation	9,373,050,000	Completed	2013	2017
153	Water & Energy	Energy + Project	Energy + Project	Mitigation	0	Completed	2016	2017
154	Water & Energy	FTSSIP	Four Towns Water Supply and Sanitation Improvement Program in Ethiopia	Adaptation	3,365,324,093	Ongoing	2016	2020
155	Water & Energy	HWSS Ethiopia	Harar Water Supply and Sanitation Project: Improving Livelihoods and Enhancing Water Security in Ethiopia	Adaptation	974,600,220	Completed	2013	0
156	Water & Energy	NBPE	Ethiopia: Biogas Dissemination Scale-Up Project – National Biogas Programme of Ethiopia	Mitigation	679,968,780	Ongoing	2014	2020
157	Water & Energy	S & H Transformation Project	Water Sanitation & Hygiene Transformation for Enhanced Resiliency (Water) Project	Adaptation	236,510,880	Completed	2011	2014
158	Water & Energy	WRA Rift Valley	Development Study on Ground Water Resource Assessment in the Rift Valley Lakes Basin	Adaptation	0	0	0	0
159	Water & Energy	EMS Ethiopia	The Programme For Emergency Water Supply For Addressing Climate Change In The Federal Democratic Republic Of Ethiopia	Adaptation	0	0	0	0
160	Water & Energy	Jerer and Shebele Sub-basin	The Study of "Jerer Valley and Shebele Sub-basin Water Supply Development Plan, and Emergency Water Supply	Adaptation	158,213,154	Completed	2012	2013
161	Water & Energy	Awash Basin	Development Study on Groundwater Assessment in Middle Awash Basin	Adaptation	0	Completed	2013	2015

111	Forestry	GGW Ethiopia	Great Green Wall	Mitigation	2,960,723,808	Ongoing	2013	2019

162	Water & Energy	RPs for Drinking Water	The Project for Rural Water Supply, Sanitation and Livelihood Improvement through Dissemination of Rope Pumps (RPs) for Drinking Water	Adaptation	0	Completed	2014	2018
163	Water & Energy	Water Supply Amhara	Small towns water supply in southern part of Amhara Region	Adaptation	0	0	0	0
164	Water & Energy	Water Supply SNNPR	Water Supply development for Small Towns in Rift Valley Basin in SNNPR	Adaptation	3,867,000	Completed	2015	2017
165	Water & Energy	WSP Bahir	Bahir Dar Water Supply Project (new)	Adaptation	392,259,511	Ongoing	2017	2020
166	Water & Energy	GSS	Geothermal Sector Strategy	Mitigation	44,298,000	Ongoing	2014	2020
167	Water & Energy	Lighting Ethiopia	Lighting Ethiopia	Mitigation	55,992,672	Completed	2014	2016
168	Water & Energy	GSD Project	Geothermal Sector Development Project	Mitigation	6,412,990,295	Completed	2014	2020
169	Water & Energy	RETs	Promoting Sustainable Rural Energy Technologies (RETs) for House-hold and Productive Uses	Mitigation	2,149,531,034	Completed	2013	2015
170	Water & Energy	OG Energy	Off-grid renewable energy program	Mitigation	176,100,420	Completed	2016	2017
171	Water & Energy	Pastoral SNNPR	Building climate resilience through the promotion of green enterprises in pastoral and agro-pastoral zones of SNNPR and Gambella	Adaptation	11,916,214	Completed	2013	2015
172	Water & Energy	EERF	Energy Efficiency Regulatory framework development and implementation.	Mitigation	19,086,158	Completed	2013	2014
173	Water & Energy	CRGE Carbon Sink	Local Level Initistive for Climate Resilient Green Economy (CRGE): Creati n g Carbon Sink while Promotin g Clean and Efficient Energy Utilization in Muhirna Akili Woreda	Mitigation	8,259,079	Completed	2014	2015
174	Water & Energy	EMDs	Holistic Feasibility Study of a National Scale-up Program for Ethanol Cook Stoves and Ethanol Micro Distilleries (EMDs) in Ethiopia	Mitigation	5,442,338	Completed	2014	2015
175	Water & Energy	SE4ALL	Sustainable Energy for All (Africa Hub)	Mitigation	0	Ongoing	2013	0
176	Water & Energy	EnDev	Energising Development Partnership	Mitigation	1,127,671,027	Ongoing	2005	2020
177	Water & Energy	GRM Facility	Geothermal Risk Mitigation Facility	Mitigation	1,756,857,690	Ongoing	2012	0
178	Water & Energy	SEFA IPP	Hydro IPP procurement framework :SEFA -Ethiopia	Mitigation	29,601,250	Ongoing	2019	0
179	Water & Energy	ECCEPP	Ethiopia Clean Cooking Energy Program Project	Mitigation	241,272,500	Ongoing	2016	0
180	Water & Energy	ENREP	Ethiopia Electricity Network Reinforcement and Expansion Project	Mitigation	7,378,000,000	Ongoing	2016	0
181	Water & Energy	ECIC	Ethiopia Climate Innovation Center	Both	148,750,000	Completed	2013	2018
182	Water & Energy	Assela	Assela Wind Farm – Scaling-Up Renewable Energy Program (SREP)	Mitigation	38,620,835	Ongoing	2018	0
183	Water & Energy	Transform WASH	USAID Transform WASH	Adaptation	712,800,000	Ongoing	2017	2021
184	Water & Energy	LAWD	Lowland Water, Sanitation, and Hygiene Project in Ethiopia	Adaptation	703,890,000	Ongoing	2016	2020
185	Water & Energy	REGREP	Renewable Energy Guarantees Program (REGREP) Ethiopia	Mitigation	5,940,000,000	Ongoing	2019	2025
186	Water & Energy	Scaling Solar 2	Scaling Solar 2	Mitigation	0	Ongoing	2019	2024
187	Water & Energy	EITI	Ethiopia EITI (Grant II)	Mitigation	11,261,098	Ongoing	2016	2019
188	Water & Energy	ET CCEP	ET Clean Cooking Energy Program	Mitigation	240,335,551	Ongoing	2016	0
189	Water & Energy	WPG	Monitoring water productivity by remote sensing as a tool to assess possibilities to reduce water productivity gaps	Mitigation	115,109,764	Ongoing	2018	2020
190	Water & Energy	LDHRV	Support to Livelihoods of Drought Affected Households and Resilience Building of Vulnerable Groups in Warder and Kebredahar Woredas of Ethiopia's Somali Region	Mitigation	115,752,736	Ongoing	2018	2020
191	Capacity Building	CRGE Registry	CRGE Registry	Both	2,280,622	Complete	2013	2014
192	Capacity Building	mMSR	Capacity Building to EPA to implement Mechanism to Motivate, Support and Reward Results (mMSR)	Both	5,550,703	Complete	2012	2013
193	Cross Cutting	PACC TRP	Enhancing the public awareness on climate change through broadcasting in TV and Radio programs	Adaptation	10,743,296	Complete	2012	2015
194	Cross Cutting	CRGZ Akaki	Climate Resilient Green Zone alongside Akaki River	Adaptation	15,523,132	Complete	2013	2015
195	Cross Cutting	ESACCAP	Environmental Service and Climate Change Analyses Programme (ESACCAP)	Both.	32,226,448	Complete	2013	2015
196	Cross Cutting	RCSP	Regional Capacity Support Programme (RCSP)	Both	23,126,560	Complete	2014	2016
197	Cross Cutting	ERLLP	Ethiopia Resilient Landscapes and Livelihoods Project	Both	3,822,846,630	Ongoing	2018	2024
198	Cross Cutting	WSS Hygiene I	Ethiopia Water Supply, Sanitation and Hygiene Project	Adaptation	6,928,539,086	Ongoing	2014	2020
199	Cross Cutting	WSS II	Second Ethiopia Urban Water Supply and Sanitation Project	Adaptation	14,963,407,350	Ongoing	2017	2023
200	Cross Cutting	BCT RDCL	Meeting Ethiopia's Bonn Challenge Target: Restoring Degraded Coffee Landscapes	Adaptation	24,410,169	Ongoing	2018	2021
201	Cross Cutting	EWS Climate Change	Strengthening Climate Information and Early Warning Systems in Africa for Climate Resilient Development and Adaptation to Climate Change	Adaptation	133,355,115	Complete	2013	2017
202	Health	E-SHIP	Ethiopia Sanitation and Hygiene Improvement Program	Adaptation	3,121,848,000	Completed	2012	2017
203	Health	WSHTER	Water, Sanitation, and Hygiene Transformation for Enhanced Resiliency Project	Adaptation	327,344,060	0	0	0
204	Health	ICBN	Integrated Community Based Nutrition Project	Adaptation	0	0	0	0
205	Health	CRWASH	Delivering Climate Resilient Water and Sanitation in Ethiopia	Adaptation	0	0	0	0
206	Health	CRWS	Climate Resilient Water Safety in Ethiopia	Adaptation	0	0	0	0
207	Health	WCCH - Rift Valley	Water, Climate Change, and Health in the Rift Valley, Ethiopia	Adaptation	0	0	0	0
208	Health	OneWASH I	One WASH National Program - Phase I	Adaptation	0	0	0	0
209	Health	OneWASH II	One WASH National Program - Phase II	Adaptation	8,940,000,000	0	0	0
210	Transport	FTI Smart Parking	Smart Parking as an Instrument to Improve Traffic Flow and Emissions Reduction	Mitigation	22,791,600	Complete	2014	2016
211	Transport	FTI Share the Road	Share the Road: Development of Walking and Cycling Facilities for Urban Transportation of Addis Ababa	Mitigation	20,892,300	Complete	2014	2016
212	Transport	Eth-Dibouti Railway	Ethiopia - Djibouti Railway Project	Mitigation	25,816,712,000	Complete	2011	2016
213	Transport	Addis LRT	Addis Ababa Light Rail Transport	Mitigation	14,000,625,000	Complete	2012	2015
214	Transport	National Rail Network	National Railway Network from Awash (Three Zones)	Mitigation	99,973,600,000	Complete	2012	2017
215	Transport	Anbessa	Anbessa Bus Expansion	Mitigation	854,775,000	Ongoing	2016	0
216	Transport	PTSETSE buses	Public Servants' Bus Service in Addis Ababa	Mitigation	0	Ongoing	2014	0
217	Transport	Fuel Efficient Taxis	Bajaj Fuel Efficient Taxi Fleet	Mitigation	0	Ongoing	0	0
218	Transport	CFP - Railways	Ethiopian Railways Climate Financing Project.	Mitigation	13,456,706	Completed	2013	2015

APPENDIX B Climate Change related Agriculture Activity in Ethiopia

Climate Change related Agriculture Activity in Ethiopia

2011-2019

Enhancing ecological and biodiversity systems.

- Enhancing ecosystem heath through ecological farming, sustainable land management practices and improved livestock balance, and increase vegetation cover, including drought tolerant vegetation.
- Developing and using adaptation technologies.
- Enhance the adaptive capacity of ecosystems, communities and infrastructure through an ecosystem rehabilitation approach in the highlands of Ethiopia. Rehabilitation of degraded lands/forests will also increase resilience of communities, infrastructures and ecosystems to droughts and floods.
- Strengthening sustainable natural resources management through safeguarding landscapes and watersheds.
- Improving ecosystem resilience through conserving biodiversity.
- Improvement of rangeland and pasture management.
- Increasing productivity of existing cropland through use of selected varieties and agricultural inputs.
- Improving productivity of unproductive land through the widespread use of natural fertilizer.
- Use low carbon technologies/farming methods.

Increasing Food Security.

- Increase agricultural productivity, minimise food insecurity and increase incomes irrespective of climate change by breeding and making available improved crop varieties, primarily from among those in Ethiopia that suit all agricultural areas where varieties that were grown in the past have become unsuitable.
- Enhancing food security through improving agricultural productivity in a climate smart manner.

Increasing value chain efficiency and incomes.

- Improve and diversify economic opportunities from agroforestry and sustainable afforestation of degraded forest areas.
- Developing efficient value chain and marketing systems.
- Increase livestock value chain efficiency to increase productivity.
- Lands developed through application of modern mechanization system.
- Expanding the use of profitable/cost-effective new crop varieties.
- Increasing use of chemical and natural fertilizer.
- Improve traditional methods that scientifically prevent deterioration of food and feed in storage facilities to enable local communities to store food and feed in productive years and secure food supply in case of extreme weather events.

Water and Irrigation.

- Enhance irrigation systems through rainwater harvesting and conservation of water, including improved water use efficiency.
- Building additional dams and power stations to further develop energy generation potential from the same river flow as well as develop new dam sites on parallel rivers in order to maintain the baseline hydropower electricity generation capacity to levels attainable under a 'no---climate change' scenario.
- Improving soil water harvesting and water retention mechanisms.
- Establishment of large scale and medium scale irrigation.

Disease prevention (crop and livestock).

- Strengthening capacity to deal with the expansion and emergence of human, animal, crop and plant diseases known to occur in and around Ethiopia and in similar environments elsewhere and make available medicines in a sufficient quantity to deal with these diseases.
- Strengthening and increasing the capacity for breeding and distributing disease resistant crop and fodder varieties to farmers and other land users in order to deal with the emergence and expansion of diseases and pests.'
- Strengthening and expansion of animal health services.
- Prevention and control of spread of existing vector borne diseases and macro parasites, accompanied by the emergence and circulation of new diseases as a result of climate change.

Insurance and Environmental Management systems.

- Developing one or more insurance systems to enable citizens, especially farmers and pastoralists, to rebuild economic life following exposure to disasters caused by extreme weather events (floods and droughts).
- Strengthening drought, livestock and crop insurance mechanisms.
- Set up environmental and social impact assessment system.

Flood, Fire and Natural Disaster Prevention Systems.

- Reducing the incidence and impact of fire and pest epidemics on livelihoods and ecosystems through integrated pest management, early warning systems, harvesting adjustments, thinning, patrols and wider public participation.

APPENDIX C Stakeholder Meeting List

No.	Name	Position	Institution
1	Eden Seyoum	CRGE Expert	Ministry of Trade and Industry
2	Awash Yirga	CRGE Team Leader	Ministry of Trade and Industry
3	Fikadu Gebeyehu	Senior CRGE Expert	Ministry of Trade and Industry
4	Esmael Mohammed	Senior CRGE Expert	Ministry of Trade and Industry
5	Abeba Getu	Environmental Team Leader	Metals Industry Development Institute
6	Mergia Kuma	Director, Enviornment, Protection and Social Safeguard Directorate	Industrial Park Development Corporation
7	Berhanu Assefa	MoA	Director / ECC Coordination Directorate
8	Mustefa Abu	MoA	MRV Expert / ECC Coordination Direc.
9	TsehaiyuGardachew	MoA	M & E Technical Assistant
10	Girma Mamo	MoA	MRV Expert / SLMP
11	GetuMamo	MoA	Senior SWC Expert / PSNP
12	Getachew Tsegaiye	MoA	M&E Team Leader / Planning Directorate
13	Shimles Kebede	MoA	M&E Expert / AGP
14	MeseretTesfaiye	MoA	Expert / Soil Fertility Directorate
15	Feta Zeberega	MoA	M & E Expert / SLMP
16	YebegaEshetLegesse	MoA	Environmental Specialist / SLMP
17	Desta Wordofa	MoA	M&E Specialist / PASIDP
18	AklilueMesfin	MoA	CSM / PSNP GCCA+
19	BehailuShewangzaw	MoA	Senior Expert / PSNP
20	Zelalem Terfa	MoA	M&E Expert / DRSLP
21	Jemal Ali	MoA	Project Coordinator / DRSLP
22	BefekaduAlmaihu	MoA	M & E expert / DRSLP
23	NuredinAsara	MoA	Project Coordinator
24	Tefera Solomon	MoA	Director / Soil Fertility Improvement Direc.
25	HabtuMekonen	MoA	Trans. Agenda Specialist /Mechanization Directorate – ATA Delivery Unit
26	Nigatu Bogale	MoA	Coordinator / DRDIP
27	BerhanuDerese	MoA	Natural Resource Specialist / DRDIP
28	MesfinMingestu	MoA	Soil Specialist / Soil Health Fertility Impr. Directorate - ATA Delivery unit
29	Birtukan G/Mariam	MoA	Senior Expert / Soil Health Fertility Impr. Directorate
30	Dr.TesfaiyeErtibo	MoA	RAMSAP project coordinator / Soil Health Fertility Impr. Directorate
31	Elias Amel	MoA	Director / SMI Development Directorate
32	Getachew Mekuria	MoA	Watershed and Agro Forestry Senior Specialist / ATA Delivery Unit
33	HuneNega	Agr. Team Canada Consulting	National Chief Technical Advisor /SMIS project support
34	Dr.Girma Mamo	EIAR	Researcher / Climate Geo-Spatial & Bio-Metrics Directorate

35	DemekeNigusse	EIAR	Researcher / Climate Geo-Spatial & Bio-Metrics Directorate
36	BisratGetenet	EIAR	Director / Agricultural Engineering Research Directorate
37	BelayneshBiru	MoWIE	Director / Envirnment and Climate Change
38	LeulSeged Asfaw	Embassy of Ireland	Senior Ag. And livelihood Programme Manager
39	Bedru	MERET Project	
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55	Jobir Ayalew	Ministry of Transport	Director, Environment and Climate Change
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58	Shewangizaw Kifle	Ethiopian Rail Corporation	Director, Business Development
59	Tibebu Terfe	Ethio-Djibouti Railway	Chief Safety Officer
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109	Mr.Abebe Seifu	Director of Ecosystem Rehabilitation & Combating Desertification	EFCCC

APPENDIX D Emissions categories as per the IPCC 2006 GHG inventory guidelines

1 - Energy
1.A - Fuel Combustion Activities
1.A.1 - Energy Industries
1.A.2 - Manufacturing Industries and Construction
1.A.3 - Transport
1.A.4 - Other Sectors (incl. Commercial, Institutional, Residential, Agriculture, Forestry, Fishing)
1.A.5 - Non-Specified
1.B - Fugitive emissions from fuels
1.B.1 - Solid Fuels
1.B.2 - Oil and Natural Gas
1.B.3 - Other emissions from Energy Production
1.C - Carbon dioxide Transport and Storage
1.C.1 - Transport of CO2
1.C.2 - Injection and Storage
1.C.3 - Other
2 - Industrial Processes and Product Use
2.A - Mineral Industry
2.B - Chemical Industry
2.C - Metal Industry
2.D - Non-Energy Products from Fuels and Solvent Use
2.E - Electronics Industry
2.F - Product Uses as Substitutes for Ozone Depleting Substances
2.G - Other Product Manufacture and Use
2.H - Other
3 - Agriculture, Forestry, and Other Land Use
3.A - Livestock
3.A.1 - Enteric Fermentation
3.A.2 - Manure Management
3.B - Land
3.B.1 - Forest land
3.B.2 - Cropland

3.B.3 - Grassland
3.B.4 - Wetlands
3.B.5 - Settlements
3.B.6 - Other Land
3.C - Aggregate sources and non-CO2 emissions sources on land
3.C.1 - Emissions from biomass burning
3.C.2 - Liming
3.C.3 - Urea application
3.C.4 - Direct N2O Emissions from managed soils
3.C.5 - Indirect N2O Emissions from managed soils
3.C.6 - Indirect N2O Emissions from manure management
3.C.7 - Rice cultivations
3.C.8 - Other (please specify)
3.D - Other
3.D.1 - Harvested Wood Products
3.D.2 - Other (please specify)
4 - Waste
4.A - Solid Waste Disposal
4.B - Biological Treatment of Solid Waste
4.C - Incineration and Open Burning of Waste
4.D - Wastewater Treatment and Discharge
4.E - Other
5 - Other
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3
5.B - Other

APPENDIX E Project Database Overview

The following description and guidance was provided to numerous individuals and entities in Ethiopia to assist with gathering the necessary project information to allow for comprehensive financial assessment.

ASSESSING THE PROGRESS IN IMPLEMENTING EHTIOPIA'S CRGE/NDC 2011 – 2018

PROJECT FINANCIAL DATA SHEET GUIDANCE

Numerous project financial data metrics are required, as part of the CRGE Strategy 2011-2018 Implementation Assessment. This will allow an audit and assessment of expenditure on climate projects in Ethiopia during the 2011-18 period, and generation of impact metrics to inform effectiveness and future resource requirements.

An Excel template has been provided to input all relevant data for each project. This is broken up into two main parts:

1) **High-Level Project Information**

The first section of the Data-Sheet (one of which is to be completed for each identified project) provides an overview of all important information on each project.

Inputs are required, where possible and applicable, in all of the following categories:

- **Project Name**
  - The official name of the project (or programme/initiative/business, etc.)
- **Project Code**
  - The official code of the project (if none, leave blank)

- **Project Lead/Proponent**
  - The Ministry, Department, Coordination Unit, Company, or other organisation who is leading the project
- **Lead Contact Person**
  - The main contact person within the Project Lead entity
  - Their name, position, address, telephone number, and email address

- **Project Status**
  - Choose from drop-down menu
    - Ongoing
    - Incomplete
- **Project Start Date**
  - Start date (month and year)
- **Project Completion Date**
  - Completion date (month and year)
  - If project is indicated as still 'Ongoing', include planned completion date

- **Project Type**
  - Choose from drop-down menu:
    - Public (including development organisations)
    - Private
    - Public-Private Partnership
- **Sector**
  - Choose from drop-down menu:

        - Energy (electricity)
        - Water
        - Transport
        - Agriculture
        - Cities/Buildings
        - Industry (including mining)
        - Other (describe in Project General Description)
- **General Description**
    - A brief overview and description of the project
- **Climate Impact**
    - Choose from drop-down:
        - Adaptation
        - Mitigation
        - Both
- **Climate Objectives**
    - Choose from drop-down
        - Primary objective(s) to improve adaptation/resilience or contribute to mitigation
        - Secondary objective(s) related to building climate adaptation/resilience or contributing to mitigation
        - Indirect climate adaptation/resilience or mitigation benefits
        - Limited or no climate impact
- **Other Notes**
    - Any other important details or notes (if none, leave blank)

- **Total Project Cost**
    - Broken down by preparation, implementation (capital), and operations & maintenance (O&M) costs
    - To be inputted in Ethiopian Birr
- **Total Expenditure To-Date**
    - If project is indicated as Ongoing, input the total expenditure to date
    - Broken down by preparation, implementation (capital), and operations & maintenance (O&M) costs
    - To be inputted in Ethiopian Birr

- **Project Funder**
    - Name of entity funding or financing the project
    - If more than one funder, indicate each funder separately
- **Financial Contact Person**
    - Details of the contact person within each entity funding/financing the project
    - Their name, position, address, telephone number, and email address

- **Financial Documents Sourced**
    - Name of documents or other sources of the financial data and information inputted into these data sheet

2) Detailed Funding Breakdown

The 2nd part of the Data-sheet provides tables for a detailed breakdown of project funding received and expended year-on-year, sorted by the following categories:

- By project stage
    - Project Preparation, Project Implementation (Capital), and Project O&M
- By year
    - 2011 to 2018
- By type of funding
    - Grant/transfer, loan, or other (to be specified)
    - 'Other' may include types such as equity, guarantees, etc

- By amount expended
    - Per year and type of funding
- By funding purpose
    - Choose from drop-down menu
        - 100% climate finance
        - Partial climate finance
        - Other
- By source
    - Where the portion of funding in question has come from (the name of the project funder)

The template tables provided for the detailed funding breakdown provide scope to input one or several types and sources of finance, across one or several years. Values can be inputted where appropriate, with excess table elements ignored. Conversely, it is possible in some cases (e.g. large projects receiving funding from numerous sources) that the tables will need to be expanded where necessary).

APPENDIX F Overview of the Forestry Sector

Input to the Draft Report on Assessing the Progress in Implementing Ethiopia's Climate Resilient Green Economy/Nationally Determined Contributions 2011-2019

Tilaye Nigussie
November 16, 2019

Forest Development

Based on its global commitment to implement the sustainable development goals (SDGS) and to make progress in contributing to the achievement of the Global Forest Goals by 2030, Ethiopia has been making a concerted effort regarding climate action (SDG 13) and to protect, restore and promote sustainable use of ecosystems, sustainably manage forests, and halt and reverse land degradation and halt biodiversity loss (SDG 15). In addition, consistent with the global forest goals (GFGs), Ethiopia has taken actions to:

- Reverse the loss of forest cover through sustainable forest management, including protection, restoration, afforestation and reforestation, and increase efforts to prevent forest degradation and contribute to the global effort of addressing climate change (GFG 1).
- Enhance forest-based economic, social and environmental benefits, including by improving the livelihoods of forest dependent people (GFG 2).
- Increase the area of forest cover and the proportion of forest products from sustainably managed forests (GFG 3).
- Mobilize new and additional financial resources from development partners (Denmark, Germany, Norway, Sweden, the EU) for the implementation of sustainable forest management and strengthen scientific and technical cooperation and partnerships (GFG 4).
- Promote governance frameworks to implement sustainable forest management and enhance the contribution of forests to the 2030 Agenda (GEG 5).
- Enhance cooperation, coordination, coherence and synergies on forest-related issues at all levels, across sectors, development partners and other stakeholders (GFG 6).

The specific development, policy and legal actions related to forests, biodiversity conservation, land degradation, vulnerability to climate change and adaptation actions are described below.

Reforestation Endeavor to Limit Forest Cover Loss

The Environment, Forest and Climate Change Commission (FECCC) works to transform the forest sector; rehabilitate degraded lands, increase vegetation cover; and limit the rate of deforestation. In this regard, Ethiopia has committed to sustainably manage four million ha of natural forest, afforest two million ha and reforest one million ha. While contributing to the sustainable forest management and afforestation/reforestation goals, Ethiopia's national REDD+ Strategy (2016-2030) further aims to increase timber supply through community and private plantations on 1,500,000 ha and promote area closure through the rehabilitation of degraded lands covering 10,000,000 ha (MEFCC, 2018). Ethiopia is also committed to contribute to the African Forest Landscape Restoration Initiative, the Bonn Challenge, and the New York Declaration on Forests by restoring 15 million hectares of degraded and deforested land within the same timeframe (MEFCC, 2016).

In addition, the National Tree-Based Landscape Restoration Potential and Priority Maps are the first steps in planning Ethiopia's large-scale and coordinated forest restoration efforts. The maps show where more trees could be planted, which tree-based landscape restoration options could be implemented; and where to prioritize cross-sectoral implementation. The potential maps show the opportunities for increasing the number of trees in Ethiopia's diverse landscapes. Based on the criteria and data used in this work, a total of 82 million hectares of land is deemed as having potential for tree-based landscape restoration (MEFCC, 2016).

More specifically, several activities have been undertaken through large-scale tree planting campaigns and water shade rehabilitation and conservation, area closure and biological soil conservation to enhance the natural regeneration of indigenous vegetation and expansion of tree farms as cash crops around farms and homesteads. Accordingly, seven million ha of degraded land were rehabilitated between 2009 and 2013. In the same period, soil and water conservation

activities were carried out in 57,000 community-based watersheds that cover 13 million hectares of land. Multipurpose trees, shrubs, and grasses were planted on biological and physical conservation structures. Additionally, forest management plans have also been prepared for 1.4 million ha of natural forests, and about 2.9 million ha of land were planted with 16.8 million seedlings of indigenous and exotic tree species in various parts of the country (Institute of Biodiversity 2015).

Most of the progress was made during the tree planting campaign undertaken to mark the Ethiopian Millennium in 2008. During the campaign, Oromia, SNNPR, Amhara, and Tigray regions planted a total of 2.21 and 4.4 million seedlings in 2009 and 2010 respectively (Tadesse, Desalegn and Yirgu 2012). In the 2019, tree planting season, 4 billion tree seedlings are expected to be planted through the National Greening Action Program initiated by the Prime Minister. This initiative contributes to implementation of the National Forest Sector Development Program launched on October 8, 2018.

Protecting Natural Forests and Assisted Natural Regeneration

On-going efforts of the government and local communities include establishing new protected areas in Amhara, Oromia SNNP Regional States, protecting and managing forests around places of worship and sacred sites, introducing new energy efficient stoves, rehabilitation of forests, afforestation of gullies, river banks and unproductive land, reforestation and area enclosures through participatory forest management approaches and practices (Tigabu, 2016). The GTP II plan is to enclose five million ha of land, rehabilitate one million ha of degraded forest, conserve two million ha of natural forest, facilitate the management of indigenous natural forests located in and around 2,000 religious institutions, protect four biosphere reserves (Kefa, Sheka,Yayu, and Tana) composed of one wetland and three forest areas (MEFCC, 2015).

Building Blocks for Private, and Public-Private Investment

To make forestry a viable economic sector, the Oromia Regional State has established the Forest and Wildlife Enterprise (OFWE) in 2009. The OFWE manages all state forests and protected areas and generates revenue from forests and parks. It also manages priority natural forests through participatory forest management arrangements by enlisting the cooperation of people in and around forests. In the same vein, the Amhara Regional State established a Forest Enterprise in 2011. These initiatives could be used as basis to pave the way for developing and implementing public-private partnerships.

In general, there is recognition and effort to protect and sustainably use the remaining natural forests and plantations for their economic, environmental, esthetic, social and cultural values. At the same time, the rising demand for wood and non-timber forest products, which could be supplied from existing forests (natural and plantations), call for uninterrupted access to extract forest resources. In this regard, striking a balance between the two competing intentions is a challenge for policy and decision makers (Moges, Eshetu, and Nune 2010).

Furthermore, the potential of Ethiopia's diverse bioecology to grow trees and harvest forest products in short rotations, is an important driver for investing in the forest sector; using public, private sector and other financial resources. Success in this area will reduce Ethiopia's dependence on imported lumber.

The growing interest of smallholder farmers in planting trees for growing poles has earned Ethiopia foreign currency by exporting Eucalyptus poles to Sudan. This shows that Eucalyptus has become an important cash tree with huge potential for expansion and value addition. The growing Eucalyptus pole market could also contribute to the search for new or underutilized tree species that could create economic and environmental value.

To encourage the involvement of the private sector in forest development, increase government and community investment and to ensure sustainable access to finance a draft proclamation for the establishment of forest fund has been submitted to the Prime Minister's office for review and approval by the Council of Ministers, which will then send the draft to parliament for further review and promulgation into law. The objectives of the fund are to:

- Ensure the CRGE through securing sustainable forest development conservation and utilization;
- Promote forest development, conservation and utilization through enhancing forest investment; and
- Provide long-term loan based on the principles of cost recovery.

Development and Management of Bamboo

Ethiopia has (1.47 million ha) two-thirds of all bamboo found in Africa. The Ethiopian bamboo industry has the potential to contribute to Ethiopia's ambition of becoming a middle-income country.

In Ethiopia, bamboo provides an array of market opportunities in the form of commercial, non-wood forest products and plays an important ecological role through soil erosion control, water conservation, land rehabilitation and carbon sequestration. The potential revenue and employment from bamboo for Ethiopia is enormous. Three million hectares of plantations could generate $5 billion in revenue and 1.3 million jobs. Although it has already proven a significant economic and environmental resource for Ethiopia, bamboo's full potential has yet to be fully tapped in bringing additional income to resource poor farmers and facilitating land restoration. To address this issue, the EFCCC in collaboration with INBAR has taken steps to develop bamboo strategy and action plan (UN-REDD Program 2019).

Policies and Laws

The Government of Ethiopia has taken various policy, legal and institutional measures to direct sustainable forest development and management with wider implications for improving the environment and reducing the effects of climate change.

Polices, strategies and plans

The National Forest Sector Development Program (NFSDP 2018**):** The country-driven NFSDP (2018-2027) is the roadmap for future forestry development actions to be harmonized with the natural resources management mandate of National Regional States. The core pillars of the NFSDP are *enabling environment and institutional development*; *sustainable forest production and value chains*; *forest environmental services*; *forests and rural livelihoods*; and *urban greening and urban forests*. At the writing of this report, regional Forest Development Programs are being developed in alignment to the NFSDP.

The National REDD+ Strategy (2018): The primary goal of the National REDD+ Strategy is to address the drivers of deforestation and forest degradation by strengthening governance and developing local capacities and putting in place an enabling environment for sustainable forest management while implementing targeted interventions to reduce deforestation and forest degradation and enhancing forest carbon stock by promoting conservation and restoration of forest ecosystems (MEFCC, 2018). The strategic period for implementation of the planned activities, under the national REDD+ Strategy, is divided into short-term (2016-2020), medium-term (2021- 2026) and long-term phases (2026-2030).

It is important to note that the NFSDP and RED+ Strategy are strongly aligned. This means implementing the NFSDP will achieve the REDD+ strategic objectives.

Multi-Sector Investment Plan (MSIP) for Climate Resilient Agriculture and Forest Development 2017-2030 identifies an investment need of approximately US$4 billion and has five activity groups. The forestry activities include climate resilient forest and landscape development; conservation and utilization, such as strengthening the resilience of the forest sector by expanding forest resources and improving their management; reducing pressure on landscapes from extension of the agricultural frontier; reducing forest degradation due to fuelwood harvesting; reducing pressure on landscapes from grazing-related land clearance; reducing the vulnerability of people through livelihood diversification; and improving land and water management to deliver economic growth in agriculture, forestry and livestock production.

National Adaptation Plan 2019 (NAP-ETH): Building on ongoing efforts to address climate change in the country's development policy framework, including CRGE strategy and the GTP II, NAP-ETH aims to strengthen the integration of climate change adaptation in Ethiopia's long-term development pathway, supported by effective institutions and governance structures, finance for implementation and capacity development, strengthened systems for disaster risk management, and coordination among different sectors

One of the 18 adaptation options 'enhancing sustainable forest management' is expected to "[…] create enabling situations for sustainable management of forest resources and its contribution to the livelihoods of forest dependent communities and the national economy [to enhance] the adaptive capacity of forests and forest landscapes and [improve] forest-based incomes and the national economy. It is imperative to promote value added commercialization of timber and non-timber forest products along with payment for ecosystem services. The contribution of forest resources to other production sectors, mainly energy, agriculture, and industry will be acknowledged and mainstreamed. Commercial afforestation and reforestation practices will be promoted. Wide-scale promotion of forest health activities will be planned and implemented. Furthermore, participatory forest management and community-based rehabilitation of degraded forests will be implemented."

Other adaptation options that will indirectly contribute to increase forest cover include: enhancing food security through improving agricultural productivity in a climate-smart manner; improving ecosystem resilience through conserving

biodiversity; enhancing alternative and renewable power generation and management. Enhancing food security will reduce unemployment/underemployment, particularly in rural areas endowed with forests and minimize the tendency of smallholder farmers to resort to the sale of wood to augment their income. Improving ecosystem resilience will provide for the conservation of ecosystems, including dry forests, tropical high forests, and rangelands. The use of alternative energy sources will reduce dependence on fuelwood and charcoal, thereby, decreasing the rate of deforestation and forest degradation.

Proclamations

In October 2018, the Ministry of Environment, Forest and Climate Change was restructured became a Commission without changes to its previous mandate issued in proclamation 803/2013, but with additional responsibility to oversee the Wildlife Conservation and Development Authority.

Forest Development, Conservation and Utilization Proclamation 1065/2018**:** is expected to play a crucial role to halt environmental, social and economic problems caused by forest degradation; introduce community and association forest development; classify forests into productive, and protective forests based on their environmental, social and economic significance; enhance environmental, social and economic benefits; and support the establishment and organization of research, educational, investment, trade and information systems. The proclamation provides for the establishment of private, community, association and state forests. The later are classified in to productive, protected and preserved forests.

Proclamation to Establish Forest Fund**:** the objective of the fund is to ensure the climate resilience green economy development through securing sustainable forest development, conservation, and utilization; promote forest development, conservation, and utilization through enhancing investment; and grant long-term loans based on the principles of cost recovery.

Key Challenges

There is a mismatch between the demand for wood products and supply. Population and economic growth increase the demand for and consumption of wood. In 2013, Ethiopia consumed roughly 124 million cubic meters of wood and will continue to consume more each year. In 2015, the total demand for wood was approximately 130.3 million m3. In the same year, 120.4 million m3 round wood was harvested from natural high forests, woodlands and area enclosures and plantations. It is estimated that only 32.1 million m3 of wood fuel can be sustainably supplied from natural forests and woodlands. The balance, 79.74 million m3 of fuel wood, needs to be supplied through unsustainable use of forests and woodlands. This explains Ethiopia's widespread and unabated deforestation and forest degradation. In 2015, Ethiopia imported 3 million m3 of various industrial wood products worth USD 182.53 million, and the trend is increasing. In fact, it has more than doubled between 2007 and 2015.

Ethiopia's forests are increasingly under threat, as the growing population requires more agricultural products, which leads to farmland expansion. Road, energy and water infrastructure construction is also accelerating deforestation and forest degradation. Weak regulation and enforcement of Environmental and Social Impact Assessment (ESIA) and other safeguard tools in the course of initiation and implementation of major project types with significant impact on forest resources was identified as one of the key challenges (MEFCC, 2018). The national REDD+ Strategy clearly outlines the gap in this regard and recommends a system of 'Strategic Environmental Assessments (SEAs) that assess the potential impacts of policies, plans and programs, should be in place and integrated through linking the approval of EIAs to compatibility with relevant policies and plans, for which SEAs have been successfully completed.'

Most of the protected areas are not yet demarcated and registered in the official gazette. The quality and quantity of skilled human-power in the forest sector is critically low.

The Woody Biomass Inventory and Strategic Planning Project (WBISPP) in the 1990's was the only comprehensive and reliable source of data on the country's forest resources for the last couple of decades. No national level forest resource assessment was conducted in the ensuing years until recently. In 2014, the Ministry of Environment, Forest, and Climate Change, MEFCC (currently Environment, Forest and Climate Change Commission) initiated a national forest inventory with the technical support from FAO. The NFI is finalized and validated in 2017. The absence of periodic and national level forest resource inventory and data on the same not only contributed to uninformed natural resources management and development planning but also created a critical gap in determining the contribution of forests to the national economy. In this regard, the recent study by UNEP (2016) is an important step in filling the data gap and informing the national level

development decision and redefining the contribution of the forestry sector to the national GDP. It is important that the data is made accessible to address the dearth of up-to-date data on the forest resource base of the country.

Delay in putting in place an integrated land use policy and plan: The absence of an integrated land use policy and plan is perhaps one of the key underlying drivers of deforestation and forest degradation and this is well noted in the National REDD+ Strategy of Ethiopia (MEFCC, 2018).The absence of integrated land use policy and land use plan not only contributes to forest loss but also reinforces unsustainable land use and land cover changes at large, which is detrimental sustainable economic development of Ethiopia. To this end, the preparation and effective implementation of a national framework for an integrated national land use plan, (currently under preparation and led by the Prime Minister's Office), should be finalized to address Ethiopia's persistent land management issues. Ensuring coherence and complementarity between various forest development plans and programs (National Appropriate Mitigation Action, National Adaptation Plan, Intended Nationally Determined Contribution to limit net GHG emissions, Forest Reference Level Submission, REDD+ Program, National Strategy and Action Plan for the Implementation of the Great Green Wall for the Sahel and Sahara Initiative). While the various plans and programs are worthy, they need to be aligned to the national forest sector development program and must complement each other to ensure coherence and synergy to optimize their outcomes and impact. One of the recommendations of the Strategic Environmental and Social Assessment (SESA) for the Implementation of REDD+ in Ethiopia states: "There is a clear gap in cross-sectoral coordination, joint planning and implementation of projects and programs. This needs to be seriously looked at and synergy coordination office should be established and be accountable to a higher level of government." (MEFCC 2017e).

Deforestation and forest degradation have spatial variation (Tigabu et al. 2014). Analysis of the drivers of deforestation and forest degradation are aggregated at the national level and do not reflect variations in drivers determined by space, forest ecology, local economy, and livelihood system. Hammond (1998) states that [contextual] differences powerful constrain not just what the critical problems are but also, how the problems are perceived and how solutions must be sought. Thus, [contextual] differences must play a central role in explorations of [forest development opportunities]. As shown in this report, there are emerging studies describing drivers of deforestation and forest degradation in various parts of the country, and such undertakings need to be encouraged and supported.

More and continued effort needs to be made to incorporate lessons learnt and to build on the momentum established by various projects (EFAP, Strategic Woody Biomass Project, etc.).

Institutional stability coordinated, and coherent policy implementation need to be maintained to ensure sustainable forest development.

The forest sector has a great potential to contribute to sustainable economic development through creating green jobs, supporting the bio-economy and fostering climate change resilience, by promoting high-value activities such as commercial plantations, NTFPs and sustainable agricultural and grazing practices. The forest sector needs to position itself to take advantage of the opportunities outlined above.

Biodiversity Conservation

In-situ conservation

In situ conservation includes wildlife-protected areas, forest conservation sites, on-farm crop and horticulture conservation and on-farm domestic animal conservation. In Ethiopia, there are 27 wildlife- PAs, which include 24 national parks and 3 sanctuaries. There are also other forms of PAs such as community-conserved areas, controlled hunting areas, open hunting areas, biosphere reserves, and wildlife rescue areas. To improve the management effectiveness of the PAs, 11 were re-demarcated and management plan was developed for 7 PAs. Economic valuation was also done for 14 PAs. Five biosphere reserves were established since 2010 to enhance in situ conservation in the biodiversity hotspot areas. These include Yayu Coffee Forest, Kafa, Sheka forest, Lake Tana, and Majang forest.

Apart from in situ conservation in PAs by Ethiopian Wildlife Conservation Authority (EWCA) and other regional authorities, responsible for wildlife protection and development, EBI has been engaged in in situ conservation of crop and horticulture, forest and animal genetic resources. To promote in situ conservation, conservation sites were established for crop and horticulture, forest and animal genetic resources.

Ex-situ conservation

Ex situ is conservation of genetic resources outside their natural environment. It includes conservation in gene banks (cold rooms), field gene banks, botanic gardens, and arboreta. Genetic resources in the form of seeds, semen, and microbial species are conserved ex situ in cold rooms while accessions of life plant species are conserved in field gene banks.

Policies, strategies, legal and institutional frameworks

As Ethiopia is signatory to international conventions, including CBD, the policy reflects its global commitments on how to practically deal with the biodiversity conservation and sustainable management. A set of policies, strategies, and actions can serve as a base for biodiversity conservation, sustainable use and access and benefit sharing out of the genetic resources in Ethiopia. The Biodiversity Conservation and Research Policy (1998), Environment Policy (1997), the Conservation Strategy (1997), the National Biodiversity Strategy and Action Plan (2005), the Wildlife Policy and Strategy (2005), Development, Conservation and Utilization of Wildlife Proclamation 541/2007; Forest Development, Conservation and Utilization Proclamation (2007), the National Biodiversity Strategy and Action Plan, 2015 and Growth and Transformation Plans of 2010 and 2016 are some of the major policy measures relevant to the conservation and sustainable use of biodiversity in the country.

The Biodiversity Conservation and Research Policy adopted in 1998 emphasize the provisions regarding the conservation, development, and sustainable utilization of biological resources in the country. Several attempts were made by EBI to implement the policy and bring impacts. The preparation of National Biodiversity Strategy and Action Plan (NBSAP), development of Access and Benefit Sharing proclamation and regulation (proclamation 482/2006 & Regulation 169/2009), establishment of biodiversity centers, biodiversity units at regional bureaus and agencies, education and public awareness at various levels are among the efforts made towards implementing the policy. The NBSAP, first issued in 2005, is an overarching strategy to guide national efforts in the conservation, sustainable utilization and access and benefit sharing on biodiversity. The NBSAP 2005- 2015 was drafted with four strategic objectives each followed by one or two actions. The revised NBSAP 2015- 2020 of Ethiopia, comprising 18 national targets, and 58 actions, was produced and its implementation has officially started in January 2015, following the final approval at the National stakeholders' workshop. In all the NBSAP action plans, it is envisaged that successful conservation of biodiversity would be achieved only with the active participation of the community. This could be promoted through awareness-raising activities on the value of biodiversity and its conservation through formal education and informal community meetings and participation. In this respect, biodiversity and environmental education are planned for integration into the formal education system through the development of appropriate curricula.

Ethiopia has enacted a law that regulates access to genetic resources and related traditional knowledge and Community Rights (Proclamation No 482/2006). The law applies access to genetic resources found in ex-situ or in-situ conditions and the traditional knowledge associated therein. It subjects access to genetic resources and related community knowledge to the requirement of permit from EBI and sharing of benefit arising from the use thereof. Furthermore, it stipulates that access to genetic resource under multilateral system of access of the International Treaty shall be subjected to the conditions and procedures provided therein (Article 15(2)). A regulation cited as "Access to Genetic Resources and Community Knowledge, and Community Rights" issued to implement the proclamation facilitates Access Agreement, which will be signed in accordance with Article 14(2) of the proclamation on access to, and sharing the benefits arising from the utilization of genetic resources and/or community knowledge.

EBI has the power and responsibility, among others, to initiate policy and legislative proposals for the conservation of biodiversity; explore and survey the diversity and distribution of the country's biodiversity resources; ensure the conservation of the country's biodiversity using in-situ and ex-situ methods; develop strategy for the conservation of species threatened by extinction; develop systems and technical standards for the conservation of the country's biodiversity; and issue directives on and permits for access to genetic resources and sharing benefits from genetic resources. Initially, it was established in 1976 as the Plant Genetic Resources Centre of Ethiopia (PGRCE) with the objectives to promote the collection, evaluation, conservation, and use of crop germplasm in Ethiopia, East Africa and adjacent regions. In 1998, PGRCE developed into the Institute of Biodiversity Conservation (IBC), expanding its mandate to ensure the conservation of the country's biodiversity resources. Ever since its establishment as PGRCE, EBI has been collecting, characterizing, and conserving plant genetic resources with minimal focus on animal genetic resources. Apart from formulating and putting in place policies and legal frameworks, such as NBSAP, proclamations and regulations/guidelines on biodiversity conservation, the institute has ratified CBD, Nagoya Protocol on Access and Benefit Sharing (ABS) and legalized the benefit-sharing scheme on genetic resources.

It is working towards being a center of excellence in East Africa by 2025. It used to train some professionals of gene banks from East Africa during the past capacity-building programs. The institute has initiated several in-situ conservation sites in collaboration with regional bureaus and other relevant actors. Awareness-raising activities were made at various levels on biodiversity policies and legal frameworks that enhance the conservation and sustainable use of biodiversity. Mandates over biodiversity issues are being in the process of decentralization to regional governments to ensure its conservation, sustainable use, and access and benefit-sharing. The National Biodiversity Strategy and Action Plans (NBSAPs) were used to be developed with full engagement of stakeholders both from federal and regional states to ensure their effective implementation. As a result, some sectoral and cross-sectoral stakeholders have integrated biodiversity into their policies and strategies. The EBI structure that used to be only at the federal level, has established seven biodiversity centers across different geographical regions and biodiversity units at each regional state. Two botanic gardens and a duplicate gene bank were also established.

Restoration of Degraded Landscapes

Ethiopia is implementing the CRGE strategy since 2011 with the objective of protecting the country from the adverse effects of climate change and building a green economy that will help realize its ambition of reaching middle-income status by 2025. The forest sector is among the dominant components of the CRGE pillars with the largest share of emission reduction next only to agriculture. Given that forest resources in the country are under threat mainly from deforestation and forest degradation, increasing afforestation, reforestation, and forest management to increase carbon sequestration in forests and woodlands; and promoting area closures via rehabilitation of degraded pastureland and farmland, are among the strategies devised to reverse the situation. In the CRGE document, the Government of Ethiopia has set afforestation and reforestation targets to cover three million ha of land by 2030 (FDRE, 2011).

Afforestation/reforestation and area ex-closures are the two strategies implemented in the country to restore species and ecosystems. It was planned to increase the forest cover from the current 15.5% to 20% by 2020. Ethiopia planned to produce 4.27 billon forest seedlings and plant nearly one million hectares of forest annually through afforestation and reforestation during 2016-2020. As an achievement, over 1.5 million ha of land are reportedly put under area enclosures in Tigray Region of northern Ethiopia alone (Yigremachew et al. 2015). Similarly, 399 ha of degraded areas were excluded from disturbance in Oromia region (Ethiopian Biodiversity Institute, 2017). With the pledge to restore 22 million hectares of degraded forests and lands by 2030 under the Bonn challenge and the CRGE strategy, Ethiopia is one of the countries with the most ambitious forest landscape restoration targets (MEFCC, 2016). One million ha natural forests and five million ha degraded land around hydro dams were planned to be rehabilitated through area closures by 2020.

Management of Illegal Trade in Wildlife and Their Products

Ethiopia has a policy and strategy on wildlife development, protection, and utilization that governs all activities related to wildlife development, protection, and utilization in the country. The policy framework has put in place an important issue to control wildlife trafficking in Ethiopia. It provides for combating wildlife trafficking at all levels. Article 1.5 of the policy and strategy states the need to control trafficking in wildlife and wildlife products. The policy statement states: “A system that enables proper control over the trafficking of wildlife and wildlife products will be established”.

To enhance the enforcement of the wildlife policy and strategy, Ethiopia issued a proclamation (no 541/2007) on development, conservation, and utilization of wildlife, and a regulation (no 163/2008) on wildlife development, conservation, and utilization. The Proclamation emphasizes the need for the active participation of local communities and private investors in the development, conservation, and utilization of wildlife and the need to enact laws in conformity with the present-day federal arrangement, as well as foster the role of wildlife in the economic development of the country. The Proclamation vests the power of wildlife administration in both Federal and Regional Governments. EWCA, as a federal institute, is given several powers and duties for controlling wildlife trafficking as per the proclamation.

This proclamation also gives powers that must be exercised by the Regional Governments, which include controlling illegal activities in both wildlife areas administered by them and by the Federal Government; supervising wildlife areas administered by private investors and local communities, issuing hunting permits to domestic hunters, etc. (Article 14). Additionally, the Federal Government, when necessary, can entrust some of its powers to regional states.

In addition to the national legal frameworks, Ethiopia has ratified international conventions that complement the national laws, including Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Although the proclamation gives various powers and duties to EWCA with the possibility of establishing wildlife conservation offices elsewhere when necessary (Articles 3 and 4), it does not give any power to the authority over forests, the natural habitats of wildlife. The power of administering forests remains vested in the other ministries like Ministry of Agriculture and Natural Resources and Ministry of Environment, Forest and Climate Change. This situation calls for an intimate coordination in the functions of these government institutions if both wild animals and plants are to be adequately protected and conserved in their own rights. In addition to EWCA, institutions such as police commissions (federal and regional), the Ethiopian Revenue and Custom Authority, Ministry of Justice and regional states are also key actors in wildlife trafficking control.

Land Degradation

The quality of land and its productivity is threatened by severe land degradation, resulting in significant reduction in agricultural production. To mitigate climate change, erosion and soil nutrient loss, the Government of Ethiopia has initiated several response measures, including the following:

Climate Resilience Strategy

The Climate Resilience Strategy for Agriculture and Forestry was launched in 2015; focusing on crops, livestock, forestry, food security, and disaster risk reduction. The most promising options were selected to build resilience against risks from climate variability and change. Total annual investment is estimated at approximately one billion USD, of which around 40% is government contribution. Private sector investment stands at 20% and is expected to rise to over 40% by 2030.

Input Supply and Distribution

In response to land degradation and low productivity, Ethiopia is working to increase crop yield through intensive use of fertilizers and improved seed. Despite this effort, their use remains very low, because of constraints such as availability, access, affordability, lack of information and knowledge.

Irrigation

The potential irrigable land of Ethiopia is estimated at 5.3 million ha of which surface and groundwater irrigable schemes are 3.13 and 2.03 million ha, respectively (NPC, 2015). However, by 2015 only 6.2 % of the potential was developed. The trend of small-scale irrigated area had been irregular for the entire period considered. Irrigated area declined by 9% and 14% in 2009 and in 2010, respectively as compared to 2008. It again increased by 13% in 2011 as compared to 2008. The irrigated area further decreased by 5% in 2012 as compared to 2008 and from 2012 to 2013, it decreased by 12%. However, from 2014 to 2016, it showed an increasing trend although the change is not significant. In 2016, the irrigated area was 17% and 9% higher than the irrigated area in 2014 and 2015, respectively. Overall, in 2016 the irrigated area was 9% higher as compared to the area in 2008.

Watershed Development

Ethiopia's community-based watershed development (CWD) program is a consolidated approach and guides various projects such as SLM, PSNP, and MERET; and other soil and water conservation activities through mass mobilization. It aims at conserving soil, water, and vegetation; harvesting surplus water to create water sources and recharge ground water; promoting sustainable farming and stabilizing crop yields; rehabilitating and reclaiming marginal lands; and enhancing income of individuals particularly the most vulnerable section of the rural poor. Massive land rehabilitation and natural resource conservation efforts are carried out in all parts of Ethiopia. According to the GTP II, about 20 million ha of land was rehabilitated during GTP I through implementing integrated natural resource development, protection, and utilization and this will be increased to 27 million ha of land at the end of GTP II to realize sustainable agriculture development and CRGE objectives.

Sustainable land management

The Sustainable Land Management Program (SLMP) was initiated in 2008. The objectives of the program are to reduce land degradation, improve agricultural productivity of smallholder farmers, and protect and/or restore ecosystem functions.

In collaboration with the Ministry of Agriculture, World Bank, GIZ, and other partners, the SLMP targets 937 Kebeles in 209 Woredas in six regions. So far, over 30 million people have benefited from the Program in Oromia, Tigray, Amhara and Gambella, as well as in the Southern Nations, Nationalities, and Peoples and in Benishangul Gumuz Regions.

Productive Safety Net Program (PSNP)

The PSNP tackles endemic chronic food insecurity through a program that links food aid to land and ecosystem restoration designed to rehabilitate the productive capacity of rural communities. The PSNP responds to chronic food insecurity by targeting resource poor and vulnerable rural households. It creates productive investments that improve access to natural resources and services, stimulates markets, and underpins participatory agro-ecosystem and environmental rehabilitation. The PSNP provides cash and/or food transfers to chronically food insecure households in affected Woredas. The program is implemented in Afar, Amhara, Dire Dawa, Harari, Oromia, Somali, SNNP, and Tigray Regions and supported approximately 7.9 million individuals in 2016.

A component of the PSNP, the sustainable public works program, promotes and supports participatory integrated watershed management including: degraded and marginal land rehabilitation and reclamation and promoting climate smart sustainable agriculture in smallholder mixed crop and livestock agro-ecosystems through integrated soil and water conservation and soil fertility management and agroforestry systems.

Agricultural Commercialization

Transforming the agriculture sector requires shifting from a mainly subsistence mode of production to a highly commercial farming involving 14 million smallholder farmers. In this regard, Agriculture Commercialization Clusters (ACC), which are inclusive and environmentally sustainable, are contributing to increase income, improve access to markets, increase agro-processing and value addition, and create off-farm employment opportunities. So far, 31 priority clusters are functioning in Amhara, Oromia, SNNP, and Tigray Regions. These first waves of clusters—designed to encompass 5-15 Woredas each and reach an estimated 3.5 million farmers - were selected based on their production and natural resource potential, access to market, and presence of the private sector interested in priority commodities.

Ethiopian soil information system

The Ethiopian Soil Information System (EthioSIS) project gathered and analyzed soil samples from each of the country's 18,000 agricultural Kebeles (in Amhara, SNNP, Tigray, and Harari regions, as well as Dire Dawa City Administration) to develop soil fertility maps and recommend 12 types of fertilizers, which could be applied with or without potash, based on soil type to address nutrient deficiencies. Regional Atlases are published for Tigray, SNNP, and Amhara. The project demonstrated that tailored fertilizer application can restore the fertility of soils deficient in essential nutrients.

Land Certification

One important and encouraging measure taken by the government of Ethiopia is the provision of "*first level*" landholding certificates that guarantee both women and men heads of household the right to use land they hold. This has positive implications on creating incentives for smallholder farmers to invest in improved farming practices including soil and water conservation through physical and biological methods.

Building on the efforts made to strengthen land rights, build capacity, map and certify individual and community lands in Amhara; Oromia; Southern Nations, Nationalities, and Peoples; and Tigray Regions, the government expanded certification and reached 21.2 million people by issuing certificates for 11.2 million parcels.

Large-scale Commercial Agriculture

Around 1.06 million ha of land is allocated for commercial agriculture in Benishangul-Gumuz, Gambella, and the lowland parts of SNNPR. The areas used to be intensively cultivated or were under shifting cultivation, agro-pastoral or pastoralist rangeland system.

Of all the allocated land, only a small area is reportedly developed. This is because of availability of poor infrastructure (roads, bridges, electricity, etc.) in investment areas; the high costs associated with land development; weak technical and financial capacity of investors; insecurity situation in some sites; and deliberate abuse of land investment licenses or land lease agreements (clearing forest land and producing fuelwood and/or charcoal and abandoning the land without any investment and forfeiting bank loan meant for investment).

The Government of Ethiopia is in the process of developing a land use policy and integrated land use plan. The policy and plan will facilitate the coordination of land allocation, address sectoral competition and conflict on land use and create a system that regulates land use in the country. It will also align national, sectoral, and regional demands for land and thereby protect biodiversity and environmental hot spots.

Vulnerability to Climate Change and Adaptation Actions

Ethiopia's vulnerability to climate change is shaped not only by historical and future climate trends, but also by its capacity to adapt to these changes. Ethiopia's adaptive capacity strongly depends on economic and social dimensions that enable or constrain responses to current and future climate risks (CARIAA, 2016).

The underlying drivers of vulnerability include: high population growth, poverty, chronic and acute food security, dependence on rain-fed agriculture, low capacity to provide health care and energy.

The vulnerability of key sectors is shown below:

Sector	Likely Impact of Climate Change
Agriculture	▪ Increased incidents of drought, floods and landslides ▪ Decreased water availability for crops and livestock ▪ Loss of crop and livestock productivity ▪ Increased soil erosion ▪ Changes in cropping calendar ▪ Increased incidents of pests and diseases for crops and livestock ▪ Degradation of rangelands due to soil erosion, droughts and floods
Forest	▪ Adverse ecological, social and economic impacts ▪ Expansion of tropical dry forests and the disappearance of lower montane wet forests, and the expansion of desertification ▪ Increased man-made and wildfire risk ▪ Increase in invasive species ▪ Threatens species with a narrow ecological range (for example, highland bamboo) ▪ Decreased income and livelihood insecurity of forest dependent communities ▪ Loss of biomass
Water	▪ Decrease in water flow ▪ Increased incidence of flooding and drought
Roads	▪ Washing out of roads because of heavy rains resulting in high maintenance cost ▪ Disruption of transport services
Energy	▪ Interruption of in hydropower generated energy because of damage to dams ▪ Decreased supply of wood for fuel
Health	▪ Increased incidences of water and air borne diseases ▪ Increased expenditure for health care ▪ Damage to health infrastructure and interruption in health services

Source: CAARIA Working Paper no.8, Review of current and planned adaptation action in Ethiopia (2016)

Ethiopia's National Adaptation Plan

Ethiopia's National Adaptation Plan (NAP-ETH) builds on ongoing efforts to address climate change in the country's development policy framework, including the Climate Resilient Green Economy (CRGE) strategy and the second Growth and Transformation Plan (GTP II), as well as sectoral climate resilience strategies and regional and municipal adaptation plans. Its goal is to reduce vulnerability to the impacts of climate change by building adaptive capacity and resilience.

NAP-ETH focuses on the sectors that have been identified as most vulnerable, namely: agriculture, forestry, health, transport, power, industry, water and urban. Within these sectors, 18 adaptation options have been identified for implementation at all levels and across different development sectors, recognizing the considerable diversity in context and vulnerability across Ethiopia's regions and social groups. These options are:

1. Enhancing food security by improving agricultural productivity in a climate-smart manner.
2. Improving access to potable water.
3. Strengthening sustainable natural resource management through safeguarding landscapes and watersheds.
4. Improving soil and water harvesting and water retention mechanisms.
5. Improving human health systems through the implementation of changes based on an integrated health and environmental surveillance protocol.
6. Improving ecosystem resilience through conserving biodiversity.
7. Enhancing sustainable forest management.
8. Building social protection and livelihood options of vulnerable people.
9. Enhancing alternative and renewable power generation and management.
10. Increasing resilience of urban systems.
11. Building sustainable transport systems.
12. Developing adaptive industry systems.
13. Mainstreaming endogenous adaptation practices.
14. Developing efficient value chain and marketing systems.
15. Strengthening drought, livestock & crop insurance mechanisms.
16. Improving early warning systems.
17. Developing and using adaptation technologies.
18. Reinforcing adaptation research and development.

Specific Adaptation Actions

Several adaptation actions have been and are underway in Ethiopia, many of which are national in scope and therefore have been tailored to specifically meet needs within the country. A number of these are multi-year, multi-million-dollar projects that have been supported by a range of bilateral donors and executed directly by sector ministries with the support development partners, or by NGOs.

Some of the adaptation actions include:

- Increasing the resilience of farmers, agro-pastoralists, and/or pastoralists to climate change. Many of the projects incorporate common elements, such as placing a strong focus on improving the management of water, land, and pasture resources.
- Strengthening the capacity of local institutions to manage natural resources (strengthening drought resilience of the pastoral and agro-pastoral populations inSomali region; strengthening institutions at the village, district, regional, and national levels to engage in joint land use planning, safeguard migration corridors, improve pasture lands, and conserve water and soil resources; strengthen the implementation of the sustainable Land Management program including its capacity to promote adaptation through improved water use).
- Promoting water and land conservation (water harvesting and flood control, improving access to small-scale irrigation systems through an integrated approach).
- Diversifying the livelihoods and income of farmers, agro-pastoralists, pastoralists by creating linkages with markets.
- Testing environmentally and socially responsible investment options (expansion of mobile banking and microfinance, supporting the creation of village savings and loans associations.

- Strengthening the capacity of local disaster risk–reduction committees and enable the design and implementation of action plans that will decrease the risk of climate and related disasters.
- Strengthening community disaster risk reduction and climate adaptation planning and processes at the zonal, woreda, and national levels, and providing training and support for the development of disaster response plans.

Forests and Climate Change

Ethiopia's long-term goal is to ensure that adaptation to climate change is fully mainstreamed into development activities. This will reduce vulnerability and contribute to an economic growth path that is resilient to climate change and extreme weather events. Because climate change will affect all geographic areas of the country, its solution requires the participation of the entire population, especially farmers and pastoralists. Parallel to this, Ethiopia's response to climate change aims to integrate actions that improve the status of women and the welfare of children. Measures to address climate change will also be planned and implemented in a manner that addresses the well-being of the elderly, persons with disabilities and environmental refugees. Of relevance to the forest sector is enhancing ecosystem health through ecological farming, sustainable land management practices and improved livestock production practices to reverse soil erosion, restore water balance and increase vegetation cover, including drought-tolerant vegetation. Furthermore, Ethiopia has designed comprehensive policies and strategies related to forest development and environmental protections at the federal and regional levels (FAO 2017).

Regarding mitigation, emissions reduction, which constitutes a reduction of 255 MtCO2e, or 64 percent compared to "business-as-usual" (BAU) emissions in 2030, includes 90 MtCO2e from agriculture, 130 MtCO2e from forestry, 20 MtCO2e from industry, 10 MtCO2e from transport and 5 MtCO2e from buildings (FAO 2017).

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